

School of Allied Health

**Homelessness, Mental Health and Resilience of Young People
Transitioning from Out-of-Home Care**

Fadzai Chikwava

0000-0001-7751-3822

**This thesis is presented for the Degree of
Doctor of Philosophy
of
Curtin University**

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Author's Declaration

To the best of my knowledge and belief, this thesis contains no material previously published by any other person except where due acknowledgment has been made. This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated in March 2014. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number # HRE2021-0151.

Signature:

Date: 10/09/2024

Acknowledgement of Country

We acknowledge that Curtin University works across hundreds of traditional lands and custodial groups in Australia, and with First Nations people around the globe. We wish to pay our deepest respects to their ancestors and members of their communities, past, present, and to their emerging leaders. Our passion and commitment to work with all Australians and peoples from across the world, including our First Nations peoples are at the core of the work we do, reflective of our institutions' values and commitment to our role as leaders in the Reconciliation space in Australia. Curtin University Version Date: November 2022.

Statement of Contributors

Supervisors

- Professor Reinie Cordier
- Adjunct Associate Professor Anna Ferrante
- Professor Melissa O'Donnell

Co-authors

Professor Reinie Cordier, Adjunct Associate Professor Anna Ferrante, Professor Melissa O'Donnell, Professor Renée Speyer, Dr Lauren Parsons, and Dr Eduwin Pakpahan are co-authors of the manuscripts presented in this thesis.

Research Assistance

Professor Renée Speyer who assisted with the systematic database search; Dr Lauren Parsons who assisted with abstract screening and methodological quality ratings; Bronte Walter, Megan Watts and Halima Abukar who assisted with data collection; Dr. Eduwin Pakpahan who assisted with planning of statistical analyses.

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Signed: Fadzai Chikwava Date: 10/09/2024

Signed: Reinie Cordier Date: 10/09/2024

Abstract

Out-of-home care (OHC) involves placing children and young people with alternative caregivers when they experience or are at risk of experiencing various forms of abuse and neglect, and it is determined that the benefits of this placement outweigh the risks of remaining with their biological parents. Young people transitioning from OHC often face poorer outcomes than their peers in the general population. These outcomes include poorer mental health, substance misuse, and homelessness or housing instability. While there is sufficient evidence regarding the multiple challenges faced by young people transitioning from OHC, there is a lack of large-scale, population-level data and longitudinal studies that evaluate different pathways and their associations with the outcomes experienced by this group.

To improve future outcomes for those transitioning from OHC, a combination of retrospective and prospective-based knowledge is required, as research to date has primarily sampled individuals using services. This thesis aimed to develop a comprehensive understanding of the complex interplay of factors contributing to homelessness, resilience, and variable mental health outcomes for young people transitioning from care. The thesis utilised comprehensive linked administrative datasets from the Australian states of Victoria and Western Australia, along with integrated administrative and longitudinal self-report data, to further evaluate outcomes and trajectories into adulthood.

The outcomes experienced by young people transitioning from OHC were evaluated through four distinct study phases. Phase One (Chapter 2) involved a systematic review identifying the evidence base for studies integrating retrospective administrative data with prospective longitudinal data and the statistical methods applied in child protection settings. Phase Two consisted of two chapters. Chapter 3 determined patterns of homelessness and housing instability and their association with mental health disorders, while Chapter 4

examined trajectories of homelessness and their association with mental health and substance misuse disorders. Phase Three (Chapter 5) involved an analysis of the trajectories of internalising, externalising, and psychotic mental health disorders in young people transitioning from OHC. Phase Four (Chapter 6) examined the mediating and moderating factors associated with mental health and perceived resilience using administrative data that had been integrated with self-report data.

Phase 1 (Chapter 2) aimed to identify different methods of analysis used when integrating administrative data with longitudinal data and to make recommendations for enhancing research findings. The systematic review was conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement. The review identified 30 studies reporting on child maltreatment, mental health, drug and alcohol abuse and education. While the overall quality of the studies was strong, they rated poorly in reporting data linkage methods. Additionally, the statistical analysis methods employed often failed to consider mediating factors that might have an indirect effect on the outcomes of interest, and there was a lack of utilisation of multi-level analysis.

Phase 2, which consists of Chapters 3 and 4, involved the same cohort of young people who transitioned from OHC in Victoria and used the European Topology of Homelessness (ETHOS) framework to determine various levels of homelessness risk. Chapter 3 examined the relationship between mental health, homelessness and housing instability among young people aged between 15 and 18 years who transitioned from out-of-home between 2013 and 2014 in Victoria, Australia, with follow-up till the end of 2018. Using de-identified retrospective linked administrative data from various government departments, the study mapped various dimensions of homelessness based on the European Topology of Homelessness (ETHOS) framework and associated mental health variables were determined from the WHO ICD-10 codes.

The ETHOS framework provides a more in-depth understanding of the homelessness construct and provides a more accurate estimation of the true prevalence of homelessness. This study used ordered logistic regression and Poisson regression analyses to estimate the impact of homelessness and housing instability, respectively. A total homelessness prevalence of 60% was found in the care-leaving population. After adjustment, an elevated risk of homelessness was found to be associated with a range of factors, including a dual diagnosis of mental health and substance misuse disorders, intentional self-harm, anxiety, psychotic disorders, assault and maltreatment, a history of involvement with the justice system, substance misuse before leaving care, residential and home-based OHC placement, and a history of staying in public housing.

Chapter 4 involved the same cohort of young people who transitioned from OHC in Victoria (Chapter 3) and also used the ETHOS framework to determine various levels of homelessness risk. In Chapter 4, Latent Class Growth Analysis (LCGA) was employed to identify the characteristics of subgroups of young people who followed distinct trajectories of homelessness risk from their transition from OHC to early adulthood. Additionally, the study investigated how mental health issues or substance misuse, and dual diagnosis of substance misuse and mental health were associated with these trajectories.

The findings indicated that young people transitioning from OHC can be categorised into three distinct subgroups. The *'moving on'* group (88%) experienced the lowest levels of homelessness, and their risk remained relatively stable over time. The *'survivors'* group (7%) initially faced an elevated risk of homelessness, but this risk decreased sharply over time. The *'complex'* (5%) group began with a small risk of homelessness but experienced a sharp increase in risk as time progressed.

Young people who had stayed in home-based care or residential care or who had a history of substance misuse were more likely to be in the *'survivors'* group rather than in the

'*moving on*' group. Conversely, young people of Aboriginal background, those who had lived in residential care, or those with chronic mental health and substance misuse issues after leaving care were more likely to be in the '*complex*' group rather than in the '*moving on*' group.

Phase 3 (Chapter 5) involved an analysis of the trajectories of internalising, externalising, and psychotic disorders amongst a birth cohort of 414,746 young people born in Western Australia between 1993 and 2008. The study included three distinct sub-populations. The first sub-population comprised those who transitioned from OHC, the second sub-population comprised those who had child protection contact but did not end up in OHC (CP contact), and the third sub-population comprised those who never had any child protection contact (no CP contact). Group-based trajectory modelling was conducted to identify factors associated with mental health trajectories across the three sub-populations, including gender differences and the effect of substance misuse on these trajectories.

This study revealed two distinct trajectories for all mental health disorders: Trajectory group 1, the "*low stable*" group (>85%), exhibited consistently low levels of internalising, externalising, and psychotic trajectories. In contrast, Trajectory Group 2, the "*high increasing*" group (<15%), displayed escalating mental health disorders over time, with more pronounced peaks observed in the OHC subgroup. Females had higher rates of internalising disorders compared to males, while males experienced externalising disorders at an earlier age compared to females. Additionally, males and young people of Aboriginal descent demonstrated higher levels of psychotic disorders compared to females and non-Aboriginal counterparts. A combination of socio-demographic, environmental and placement characteristics, including substance misuse, emerged as predictors for diverse mental health trajectories.

Phase 4 (Chapter 6) involved path analysis to explore the mediating and moderating factors associated with perceived resilience and mental health outcomes among a sample (N=122) of young people aged 15 to 25 transitioning from OHC. Baseline self-report data integrated with linked administrative data was utilised for the study. Young people who were still in care (aged 15-17.9 years) were more likely to be more resilient than young people who had left care (aged 18-25 years). Independent living skills moderated the association between adverse childhood experiences (ACEs) and perceived resilience. Social inclusion, self-determination and mental health mediated the effects of care status and maltreatment exposure on perceived resilience. Placement stability independently influenced mental health outcomes.

The thesis highlights how individual, familial, social, and systemic factors interact to influence perceived resilience, mental health, and homelessness outcomes among young people transitioning from OHC. The distinct trajectories observed emphasise the need for targeted, multi-layered interventions. These should promote individual agency, foster supportive relationships, enhance community engagement, and address key life transitions to support these young people better.

The thesis also demonstrated the strength of using population-level administrative data, which allowed the modelling of risk factors at a population level by comparing outcomes among the three groups of young people. Integrating administrative data with self-report data mitigated potential recall and selection bias. Sensitive information that may not have been collected directly from respondents was obtained from administrative data, including more accurate mental health and substance misuse diagnostic information from health data sources.

Advanced statistical techniques, such as latent class growth analysis and group-based trajectory modelling, allowed for examining developmental trajectories across different ages

in young people. Future research should expand on this by exploring broader influences, examining additional variables, integrating data with qualitative interviews, identifying bidirectional associations, and assessing the impact and effectiveness of various extended care models. These efforts will provide deeper insights and enhance our understanding of the complexities involved in supporting young people's development.

Policymakers and service providers must collaborate to create effective housing pathways and integrated health services, including mental health and substance misuse support, for the diverse group of young people transitioning from OHC. Given their complex needs, it is crucial to adopt integrated, holistic, and person-centred approaches that address the unique challenges faced by these young individuals. The findings highlight the urgent need for coordinated efforts to ensure comprehensive support for this vulnerable population.

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Dedication

This work is dedicated to my children: Tafadzwa, Tanya and Jordan. You have made me stronger, better and more fulfilled than I could have ever imagined. I love you to the moon and back.

List of Publications

This doctoral thesis consists of the following publications:

1. Chikwava, F., Cordier, R., Ferrante, A., O'Donnell, M., Speyer, R., Parsons, L. (2021). Research using population-based administrative data integrated with longitudinal survey data in Child Protection Settings. A Systematic Review. *PloS One*, doi: <https://doi.org/10.1371/journal.pone.0249088>
2. Chikwava, F., O'Donnell, M., Ferrante, A., Pakpahan, E., Cordier, R. (2022). Patterns of homelessness and housing instability and the relationship with mental health disorders among young people transitioning from out-of-home care: Retrospective cohort study using linked administrative data. *PloS One*, doi: <https://doi.org/10.1371/journal.pone.0274196>
3. Chikwava, F., Cordier, R., Ferrante, A., O'Donnell, M., Pakpahan, E. (2024). Trajectories of homelessness and association with mental health and substance use disorders among young people transitioning from out-of-home care in Australia. *Child Abuse & Neglect*, doi: <https://doi.org/10.1016/j.chiabu.2024.106643>.
4. Chikwava, F., Cordier, R., Ferrante, A., O'Donnell, M. (2024). Trajectories of psychosis, internalising and externalising mental health disorders among young people transitioning from out-of-home care: a comparative study using population-level linked data. *Manuscript submitted for publication*.
5. Chikwava, F., Cordier, R., Ferrante, A., O'Donnell, M. (2024). Resilience and mental health among care leavers. Role of social inclusion, self-determination, independent living skills. *Manuscript submitted for publication*.

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List of Presentations

Research findings contained in this thesis have been presented, in part, at the following international conferences and at the WA Mental Health Commission's Mental Health Advisory Council:

1. Chikwava, F., Cordier, R., Ferrante, A., O'Donnell, M. Using linked administrative data to examine mental health outcomes among young people transitioning from out-of-home care in Australia. *The International Public Health Conference 2024* (Singapore, March 2024).
2. Chikwava, F., Cordier, R., Ferrante, A., O'Donnell, M., Pakpahan, E. Homelessness among sub-groups of young people transitioning from out of home care. *The European Scientific Association on residential and family care for children and adolescents* (UK, September 2023).
3. Chikwava, F., O'Donnell, M., Ferrante, A., Pakpahan, E., Cordier, R. Homelessness and housing instability among young people transitioning from OHC in Australia. *The International Congress on Child Abuse and Neglect* (Canada, March 2022).
4. Chikwava, F., O'Donnell, M., Ferrante, A., Pakpahan, E., Cordier, R. Homelessness and housing instability among young people transitioning from OOHC in Australia. *Mental Health Commission, Mental Health Advisory Council* (Australia, July 2023).

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List of Abbreviations

ABS	Australian Bureau of Statistics
ACEs	Adverse Childhood Experiences
ADIS	Alcohol and Drug Information System
AHURI	Australian Housing and Urban Research Institute
AIC	Akaike information criterion
ARC	Australian Research Council
BIC	Bayesian Information Criterion
BLRT	Bootstrapped likelihood ratio test
CDL TRE	Curtin's Centre for Data Linkage Trusted Research Environment
CFI	Confirmatory Fit Index
CP	Child Protection
CVDL	Centre for Victorian Data Linkage
DoC	Department of Communities
DoH	Department of Health
ED	Emergency Department
EDDC	Emergency Department Data Collection
ETHOS	European Topology of Homelessness
FIML	Full Information Maximum Likelihood
GBTM	Group-based trajectory modelling
GEE	Generalized estimating equations
GLM	Generalised linear models
GMM	Growth Mixture Modelling
GUILD	Guidance for Information about Linking Data sets
HMDC	Hospital Morbidity Data Collection

ICD	International Classification of Diseases
ILS	Independent Living Skills
IRR	Incidence rate ratio
LCGA	Latent Class Growth Analysis
LGCM	Latent Growth Curve Modelling
LMR-RT	Lo-Mendell-Rubin likelihood ratio test
MAR	Missing at Random
MCAR	Missing completely at random
MHIS	Mental Health Information System
MLE	Maximum Likelihood Estimation
MNS	Midwives Notification System
MNAR	Missing not at random
OHC	Out-of-home care
OR	Odds Ratio
PRISMA	Preferred Reporting Items for Systematic Review and Meta-Analyses
RTP	Research Training Program
RECORD	Reporting of studies Conducted using Observational Routinely-collected Data
RMSEA	Root mean square error of approximation
RQ	Research Question
RRR	Relative Risk Ratio
SDT	Self-determination theory
SEIFA	Index of Relative Socio-economic advantage and disadvantage
SEM	Structural equation modelling
SES	Socio-economic status

SHS	Specialist Homelessness Service
SRMR	Standardised root mean square residual
STROBE	Strengthening the Reporting of Observational studies in Epidemiology
TLI	Tucker–Lewis’s index
WHO	World Health Organisation
ZIP	Zero-inflated Poisson

Key Definitions

Term	Definition
Socio-economic indexes for areas (SEIFA)	SEIFA is a tool created by the Australian Bureau of Statistics that ranks regions in Australia based on their relative socio-economic advantage and disadvantage, using data collected from the Census, which occurs every 5 years (Australian Bureau of Statistics, 2023).
Remoteness area index	The Australia Statistical Geography Standard (ASGS) Remoteness Structure categorises Australia into five levels of relative geographic access to services: major cities, inner regional, outer regional, remote and very remote areas (Australian Bureau of Statistics, 2022).
Navigating Through Life (NTL) Study	NTL is a 5-year study that was funded by the Australian Research Council. This study commenced in April 2018, and it is comprised of three interrelated studies (Study 1, 2 and 3) (Parsons et al., 2020). Study 1 is a population-level analysis of outcomes for young people transitioning from OHC using linked administrative data from various government departments in WA. Study 2 is a prospective mixed-method longitudinal study that was conducted with young people aged 15 to 25 years old with lived experience of OHC. Study 3 is a phenomenological study investigating perspectives of OHC young people of Aboriginal background, their families and communities from Perth and

regional and remote communities. This thesis utilised data from Studies 1 and 2.

Data Linkage

Data linkage is a process of connecting information from multiple data sources together to create a richer and more comprehensive dataset (Brownell & Jutte, 2013). Data related to an individual, family, place or event can be linked together to offer a population-level view that supports important policy decisions and research. A unique identifier or linkage key is used to match records.

Transitioning from OHC

This is a planned or unplanned movement or change from OHC to independent living. The transition from OHC to independent living is quite often challenging and difficult for young people (OECD, 2022).

Trauma

Trauma refers to events that pose a threat of serious injury, or harm to a person's physical integrity, overwhelming an individual's ability to cope. This can include experiences such as physical or sexual violence, childhood abuse or neglect or the death of a parent (AIHW, 2022).

Intergenerational trauma

This refers to trauma that is passed down from one generation to the next, mostly for people from Aboriginal backgrounds. People experiencing intergenerational trauma may experience symptoms, reactions, patterns, emotional and psychological effects from trauma experienced by previous generations. This may manifest in individuals in the form of low self-esteem, extreme reactions to stress, substance misuse and poor mental health (Darwin L et al., 2023).

Trauma-informed approach	A trauma-informed approach involves three key elements: (i) understanding the widespread occurrence of trauma; (ii) recognising the impact of trauma on everyone involved with the program, or system, including its workforce; and (iii) responding by applying this knowledge in practice. Trauma-informed care emphasises the significance of treating each individual uniquely instead of using standardised treatment methods (Substance Abuse and Mental Health Services Administration, 2014).
Culturally sensitive	This entails an awareness and appreciation of the values, norms, and beliefs characteristic of a cultural, ethnic, racial, or other group different from one's own, along with a willingness to adapt one's behaviour accordingly (Tucker et al., 2011).
Dual diagnosis of mental health and substance abuse	Dual diagnosis refers to one or more diagnosed mental health problems occurring at the same time as problematic substance use (Timko et al., 2005).

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Chapter 1 Introduction

The purpose of this thesis was to understand, at a population level, how varied pathways are associated with mental health, homelessness and resilience among young people transitioning from out-of-home care (OHC) in Australia. In this Chapter, I introduce the background of my thesis and the rationale for conducting it. This information sets the stage for the framework that guided this thesis, including Bronfenbrenner's ecological systems theory and life course theory. These theories guided the analysis and interpretation of this thesis. Researchers have used these frameworks to understand varied pathways and how biology and environmental factors interact to understand outcomes affecting young people transitioning from care. To conclude this chapter, I will outline the thesis, detailing its aims and the methods used.

Background to the Thesis

I embarked on my Doctor of Philosophy journey with a desire to add new knowledge on health outcomes that impact young, vulnerable people. When I was offered a scholarship to study trajectories, risk and protective factors of mental health, resilience and homelessness among young people transitioning from OHC in Australia, I saw this as a perfect opportunity that aligned with my career goals. After several years of working in research involving young people and marginalised populations across many countries, I had the background and understanding of the issues related to young people and high-risk behaviours, including alcohol and drug use. Still, I lacked the understanding of one critical developmental component of young people, which is their trajectories of mental health, resilience, and homelessness.

My experiences to date have been conducting research involving cross-sectional studies, so this thesis was a unique opportunity to gain a population-level understanding of longitudinal trajectories of outcomes experienced by young people transitioning from OHC. I

was intrigued to understand the vulnerabilities and strengths of young people's challenges as they navigate the transition to adulthood.

Several studies have been conducted to understand risk factors of mental health, homelessness, and resilience among young people. However, few studies have been undertaken to understand the longitudinal trajectories of mental health, resilience, and homelessness, particularly among young people transitioning from OHC. In addition, most of these studies have not been conducted with comparison population groups to accurately gauge the elevated risk that young people who have been in OHC experience compared to young people in the general population or young people who had child protection contact but did not end up in OHC. Additionally, I was motivated to pursue this thesis due to the unique integration of longitudinal self-report data with linked administrative datasets. This integration provides a rich retrospective and prospective analysis of young people's trajectories since birth.

Rationale for the Thesis

OHC entails the placement of children and young people with alternative caregivers. This occurs when it is determined that young people have experienced harm or are at risk of harm through abuse and/or neglect and when the benefits of a child being removed into care outweigh the risks associated with remaining in the care of their biological parents (AIHW, 2022; Statistics UK, 2022).

The transition from out-of-home care to independent living usually starts around the age of 15 years and can continue until the age of 25 years. This significant life event requires thoughtful planning; for certain young people, planning may need to commence even earlier (OECD, 2022). In November 2022, all Australian states and territories agreed to extend care for young people up to the age of 21 years (Create Foundation, 2022). Extensive research has determined that young people transitioning from OHC experience poorer outcomes compared

with their peers in the general population (Mersky & Janczewski, 2013; OECD, 2022). These outcomes include higher levels of homelessness and housing instability, lower levels of educational achievement, substance misuse, greater poverty, early pregnancies, unemployment, poor physical and mental health, and increased contact with the criminal justice system (Berridge et al., 2020; Jones, 2019; Mendes & Rogers, 2020). In addition to being exposed to multiple forms of disadvantage, young people leaving OHC often face unplanned and accelerated transitions to adulthood (Jones, 2019).

The increase in the number of children and young people living in OHC is concerning (OECD, 2022; Statistics UK, 2022), with young people of Aboriginal background in Australia being over-represented. Young people of Aboriginal background make up approximately 5.1% of the total population of young people in Australia, yet comprise 44% of children aged 0-17 in OHC in Australia (Australian Government, 2023). In 2021, children of Aboriginal background were admitted to OHC at a rate of 13 per 1,000 compared to a rate of 2 per 1,000 for non-Aboriginal children (AIHW, 2022; OECD, 2022; Thoresen & Liddiard, 2015).

Young people transitioning from OHC experience multiple forms of disadvantage, which subsequently affect various outcomes throughout their life course. These factors are interrelated and include individual, family, social and structural factors (Elder, 1998; Johnson et al., 2015). These factors include the type of abuse experienced before entering OHC, the age of entry into OHC, placement instability while in OHC, socio-economic and cultural backgrounds, types of family and community supports, and various other in-care experiences (Courtney & Heuring, 2005; Elder, 1998; Kelly et al., 2023; Stein, 2008).

Previous studies involving young people transitioning from OHC have often focussed on a single population group, such as those who were placed in foster care. However, the experiences and outcomes of these young people can vary significantly by placement type

(Fowler et al., 2011; Rebbe et al., 2017). Other limitations of previous studies of young people transitioning from care include small sample sizes (Carol et al., 2020) and being purely qualitative in nature, which restricts the ability to draw population-level inferences (Narendorf, 2017).

Young people transitioning from OHC experience homelessness at a higher rate compared to young people in the general population (AIHW, 2022; Dworsky et al., 2013; Harris & Udry, 2022). Approximately 30% of young people leaving OHC face homelessness at some point within the first year of leaving care (AIHW, 2022; Dworsky et al., 2013). Previous studies have neither examined all the different forms of homelessness nor housing instability, potentially underestimating the true prevalence of homelessness (Crawford et al., 2015; Dworsky et al., 2013; Shah et al., 2017). There is some evidence suggesting that a dual diagnosis of mental health and substance use is common among young people who experience homelessness, but this has not been thoroughly examined among young people leaving OHC (Hossain Md et al., 2020; Narendorf, 2017).

There is a lack of longitudinal data linking pre-care exposures to developmental outcomes over time. Additionally, some studies focus only on static variables, whereas trajectories in young people's outcomes are influenced by both dynamic (e.g., substance misuse, mental health hospitalisations) and static, non-dynamic factors (e.g., Aboriginal status, first age of entry into care) that interact throughout their life course (Elder, 1998; Naccarato & DeLorenzo, 2008). Furthermore, some studies use either prospective qualitative interviews or quantitative surveys or administrative data independently but not combinations of these methods.

Administrative data often fail to capture comprehensive mental health or social variables, while qualitative or quantitative studies may be limited by small sample sizes and attrition (Narendorf, 2017). As part of this thesis, a systematic review of studies integrating

linked administrative data and longitudinal surveys was conducted to help overcome the limitations of each data source, including addressing missing values (Chikwava et al., 2021; Wulczyn et al., 2017). Retrospective self-reporting of adverse childhood experiences can introduce recall bias, which can be mitigated using linked administrative data from child protection records (Fowler et al., 2011; Keller et al., 2007).

Some studies have integrated longitudinal self-report studies and linked administrative data in child protection (CP) settings; however, these have lacked statistical rigour (Mills et al., 2019; Olsen & de Montgomery, 2018; Teyhan et al., 2019). They have also failed to address biases associated with missing data (Kisely et al., 2020; Sidebotham & Heron, 2003) and have minimally reported the data linkage processes (Hansson & Gustafsson, 2020; Sidebotham et al., 2002).

Research Need

While there is mounting evidence of the multiple outcomes faced by young people transitioning from OHC, there is a lack of large-scale, population-level data and longitudinal studies that evaluate different pathways and their associations with the outcomes experienced by young people. Typically, existing research is retrospective and does not provide a comprehensive understanding of young care leavers' pathways to independence or the relationship between these pathways and key outcomes.

To improve future outcomes for those transitioning from OHC, a combination of retrospective and prospective population-based knowledge was required, as research to date has sampled those using services. Additionally, previous longitudinal studies have had limited follow-up. Therefore, research with extended follow-up into early adulthood would provide a more thorough understanding of mental health and homelessness trajectories among various sub-groups of young people. This requires using both person- and variable-centred approaches (Keller et al., 2007).

A population-based research study with comparison groups was needed to ensure that findings could be generalised. More comprehensive and robust measures of risk, protective factors and outcomes were required. This involved maximising the use of variables from both data sources and mapping these variables to inform the thesis outcomes. It was crucial to address the biases that arise from using only qualitative or quantitative research or administrative data and to manage missing data with appropriate techniques. The current thesis applied more sophisticated analytical methods for longitudinal data, accounting for mediation and moderation effects in the analysis.

When young people transition from OHC, there is a lack of support, especially for those with highly complex needs, such as individuals with comorbid mental health and substance use disorders. There is a pressing need for evidence-based research to guide the development of programs and policies that cater to diverse groups of young people. Early intervention using various methods and tools may be essential to support young people during their transition from care, particularly within the first few years when they are most vulnerable. This underscores the importance of trauma-informed and culturally sensitive care for these highly vulnerable population groups.

Despite the evidence regarding outcomes experienced by young people transitioning from care, a strong theoretical base was required to articulate how utilising and integrating population-level retrospective and prospective data informs developmental pathways and outcomes experienced by young people leaving OHC. A holistic understanding of multiple outcomes affecting young people requires multiple statistical techniques and complex analysis of socio-economic, environmental, and familial risk factors from birth to adulthood.

This thesis was conducted as part of two large Australian-funded studies (i.e., the Australian Housing and Urban Research Institute (AHURI) study (Martin et al., 2021) and the Navigating Through Life Study, a five-year Australian Research Council (ARC) Linkage

Grant) (Parsons et al., 2020). The AHURI study utilised data from the state of Victoria in Australia, while the Navigating Through Life Study utilised data from Western Australia. The thesis utilised comprehensive linked administrative datasets from these two states to evaluate homelessness, mental health and resilience outcomes and trajectories into adulthood. De-identified linked administrative data from both sources were obtained from various government departments, including health, justice, family violence, mental health alcohol and drug use information systems and child protection.

Due to delays in obtaining linked data from Western Australia, linked data from Victoria was used to investigate homelessness outcomes. Aside from the delays in getting the Western Australian data, Victorian housing data was found to be more comprehensive than that available in Western Australia. The Victorian data allowed the mapping of different forms of homelessness using the European Topology of Homelessness (ETHOS) Framework (Pleace & Bretherton, 2013).

A Framework for Understanding Homelessness, Mental Health, and Resilience

A detailed understanding of the developmental pathways of young people involves a complex interplay of individual, family, and broader community characteristics that impact homelessness, mental health and resilience pathways of young people transitioning from OHC (Bronfenbrenner, 1988; Crawford, 2020; Elder, 1998; Kelly et al., 2023). Each of these factors represents different levels of environmental and biological influences on the young person's growth and behaviour.

This thesis draws on both life course theory and Bronfenbrenner's ecological systems theory, as both acknowledge the impact of social, environmental and historical context on human behaviour and development (Kelly et al., 2023). The development of young people in OHC is influenced by a myriad of personal and environmental factors throughout their life

course, stemming from multiple levels of disadvantage and adverse childhood experiences (Bronfenbrenner, 1994; Elder, 1998; White & Wu, 2014). In this thesis, both theories are used to define an ecological approach to childhood experiences and a life course approach to pre-care, during care, and transitioning from OHC.

Bronfenbrenner's ecological systems theory was used as a framework for understanding how a young person's development is influenced by multiple levels of the surrounding environment, including the family, care settings, the community, the broader culture, policies, and laws (Brady & Gilligan, 2018; Bronfenbrenner, 1988; Crawford, 2020). The systems in Bronfenbrenner's ecological systems theory that interact to influence a young person's outcomes throughout their life course include the micro-system, meso-system, eco-system, macro-system and chrono-system (Bronfenbrenner, 1994).

The micro-system

This is the most influential level of a child's development as it involves the immediate environment, such as influences from friends, school, work, and family (Bronfenbrenner, 1994). As an active agent, the child has a role in influencing the outcomes they experience (Bronfenbrenner, 1994; Crawford, 2020). This includes the child's characteristics, behaviours, and personality (Kekoni et al., 2017; Ma et al., 2022).

Life course theory posits that development spans from historical experiences, such as experiences of adverse childhood experiences, through multiple life stages, influencing mental health and homelessness trajectories in a young person's life (Brady & Gilligan, 2018; Colman & Ataullahjan, 2010; Elder, 1998; Kelly et al., 2023). Additionally, the timing of some life transitions or turning points may impact the outcomes experienced by young people transitioning from care (Brady & Gilligan, 2018; Kelly et al., 2023). This may include transitioning from out-of-home or moving from one placement to the next (Elder, 1998; Kelly et al., 2023). Like Bronfenbrenner's theory, the life course theory emphasises the importance

of linked lives and that the interaction and relationship between a young person, their family, peers, carers and their environment over time shapes their development and overall mental health and well-being (Elder, 1998; Kelly et al., 2023) (Colman & Atallahjan, 2010). Individual agency highlights the capacity of young people to shape their own lives through their choices and actions. However, this agency is influenced by the social and cultural environments surrounding them, which can either expand or limit their ability to act independently. To exercise agency, young people require the opportunity and capacity to make decisions about their present and future lives. When young people are excluded from critical decisions, such as transition planning, it can negatively affect their outcomes, particularly as they transition from OHC (Elder, 1998). The life course stages of a young person transitioning from OHC typically include childhood, adolescence, young adulthood, and later adulthood (Nurius et al., 2015).

Cumulative exposure to various forms of abuse or maltreatment may not have an immediate impact on a young person's mental health but can manifest later in life (Dunn et al., 2018). Young people transitioning from care may experience mental ill health at an earlier age compared to those in the general population (Hutchison, 2005). Previous research has determined that young people are not homogenous (Miller et al., 2017; Rebbe et al., 2017; Stein, 2008). Hence, from a life course perspective, trajectories of mental health or homelessness will vary by sub-population depending on several factors (Dunn et al., 2018; Hutchison, 2005; White & Wu, 2014).

Adversity, strained child-parental relationships, parental mental health, substance misuse and dysfunctional family dynamics during early childhood are closely linked to poor mental health outcomes in adulthood (Bradford et al., 2017; O'Donnell et al., 2015; Zhang, 2018). While many young people experience adverse outcomes during their transition from OHC, some successfully overcome these challenges and adapt well following trauma or

abuse (Elder, 1998; Kairyte et al., 2023). These young people are more likely to have experienced nurturing relationships with their families, friends, carers, and child protection workers (Piel et al., 2016; Stein, 2008).

Personality traits such as self-efficacy, self-determination, and self-regulation are known to facilitate positive development in young people (Sharma & Kumra, 2022). Some researchers argue that life course theory should expand beyond negative outcomes experienced by young people leaving care and explore factors associated with positive outcomes or resiliency factors that positively impact life trajectories (Brennan, 2008; Hutchison, 2005; Sattler & Font, 2018).

A myriad of factors could influence housing instability or homelessness among this highly vulnerable population group. In a young person's lifespan, the critical time when they could be at high risk of homelessness or housing instability is the first two years after leaving OHC; hence, the timing of interventions is critical during this turning point of young people transitioning from care (Chikwava et al., 2024; Elder, 1998). Chronic mental health and substance misuse over the life course can further worsen homelessness trajectories.

The meso-system

This level of Bronfenbrenner's framework explores how each of the factors from the micro-system interacts to influence a child's developmental outcomes (Liao, 2016). Negative family or carer experiences may be associated with negative peer influences and ultimately lead to poor mental health outcomes (Li et al., 2022). Peers or family may have also influenced a young person's history of substance misuse (Keyzers et al., 2020). Young people may lack the necessary support to successfully transition from care (Stein, 2008).

The exo-system

This incorporates other formal and informal social structures. While not directly interacting with the child, the exo-system still influences the micro-systems (Crawford, 2020;

Hong et al., 2011). Education policies can influence the child's learning opportunities, academic success, and emotional well-being. At the same time, housing affordability impacts young people's ability to find stable housing, thereby reducing the risk of homelessness (Crawford, 2020). Child protection policies affect support systems, placement stability and the overall wellbeing of young people in OHC. A healthcare system that provides comprehensive and accessible mental health services can help address the mental health needs of these young people (OECD, 2022). Additionally, training and employment opportunities significantly impact their ability to achieve financial independence and housing stability (Stein, 2008).

The use of community support, resources, or other support systems are important factors in a child's development. This may include formal or informal child support, such as peer workers assisting young people transitioning from care, housing support from housing agencies or financial resources to help a child with education (Liao, 2016). These factors may mediate the relationship between adverse childhood experiences and mental health or resilience (Giovanelli et al., 2020).

This thesis demonstrates that as young people transition from out-of-home care, they encounter challenges such as homelessness or housing instability. The absence of different levels of support exposes them to various forms of disadvantages that may persist into adulthood. As articulated in life course theory, supportive relationships and interactions with peers and other key people in a young person's life are important (Elder, 1998; Kelly et al., 2023). Such supports are crucial for children in OHC settings where parental support for child development is lacking (Kekoni et al., 2017). This thesis investigates variations in outcomes experienced by young people due to diverse formal and informal structures, incorporating community engagement, social participation, education, and employment.

Planning for transitioning in OHC impacts how a child will cope with life's stressors when they leave care. The supports, resources and quality of care provided in OHC and home settings would differ and subsequently impact a young person's development.

The macro-system

This level focuses on the broader socio-cultural characteristics that may influence the child's development. This encompasses the influence of the established culture, beliefs, norms, or behaviours as influenced by a child's environment when growing up (Crawford, 2020; Hong et al., 2011). These beliefs can vary based on geographical location and socio-economic status. Negative stigma associated with being in the child welfare system can lead to feelings of shame, low self-esteem, and social isolation, which are all risk factors for poor mental health (Prizeman et al., 2023).

Cultural identity positively impacts the health and well-being of young people from Aboriginal backgrounds. Life course theory underscores the influence of the social and cultural environment on young people's ability to exercise agency in shaping their lives (Brady & Gilligan, 2018; Elder, 1998). Additionally, active support from extended family and community significantly enhances their resilience and well-being (Verbunt et al., 2021).

The macro-system also involves policies or legislations which may influence the context in which a child develops. The age at which young people leave care impacts their development. Extending the age of leaving care from 18 to 21 years has been shown to lead to positive outcomes in areas such as housing, education, and employment (Courtney, 2019; Mendes, 2021). Regions with high unemployment rates and limited affordable housing may impact young people leaving care and finding stable employment and housing.

The thesis analyses data based on socio-economic statuses, remoteness area index and Aboriginal status of the child, which are important indicators for designing interventions targeted at young people with different socio-economic or cultural backgrounds.

The chrono-system

This fifth level of Bronfenbrenner's system focuses on the transitions or changes a child goes through in their developmental stages (Bronfenbrenner, 1994; Crawford, 2020). The transitional points in a young person's life are important to understand in life course theory (Elder, 1998; Hutchison, 2005; Kelly et al., 2023). The process of change during the life course plays a critical role in influencing the development or trajectories of a young person. This involves planned or unplanned transitions, such as changing from one school to another due to relocation or transitioning from primary to high school. Other transitions include placement changes, transitioning to independent living, adoption, or permanent placement (Elder, 1998; Stein, 2008). This movement within a micro-system alters the makeup of that micro-system, which in turn impacts the type of relationships or associations that a child may have with different people and systems over time (Crawford, 2020).

Additionally, these transitions, whether positive or negative, can produce stress and can make coping especially difficult for young people (Bronfenbrenner, 1988, 1994). Previous research has determined that the age at which young people transition from care is a critical point in a young person's life as they undergo rapid developmental changes while transitioning to adulthood (OECD, 2022). The difficulty during transitions requires emotional support from within families or carers and from external agencies.

Life course theory further postulates that the timing of events, such as the age of entry or exit from OHC, the number of placements, duration in OHC, and the type of placement where the child spent the longest time, significantly influences outcomes (Elder, 1998; Kuh et al., 2003; Zlotnick et al., 2012). Placement instability, based on the timing, duration, and type of placement, may provide useful insights into the care experiences of young people, which may subsequently impact long-term outcomes. (Anderson et al., 2021; Hare et al., 2022). This thesis focussed on different ages of transitioning and their experiences or outcomes as

they grew older. In addition, the study examined how placement changes impacted the mental health or resilience the young people experienced as they transitioned from care (McGuire et al., 2018).

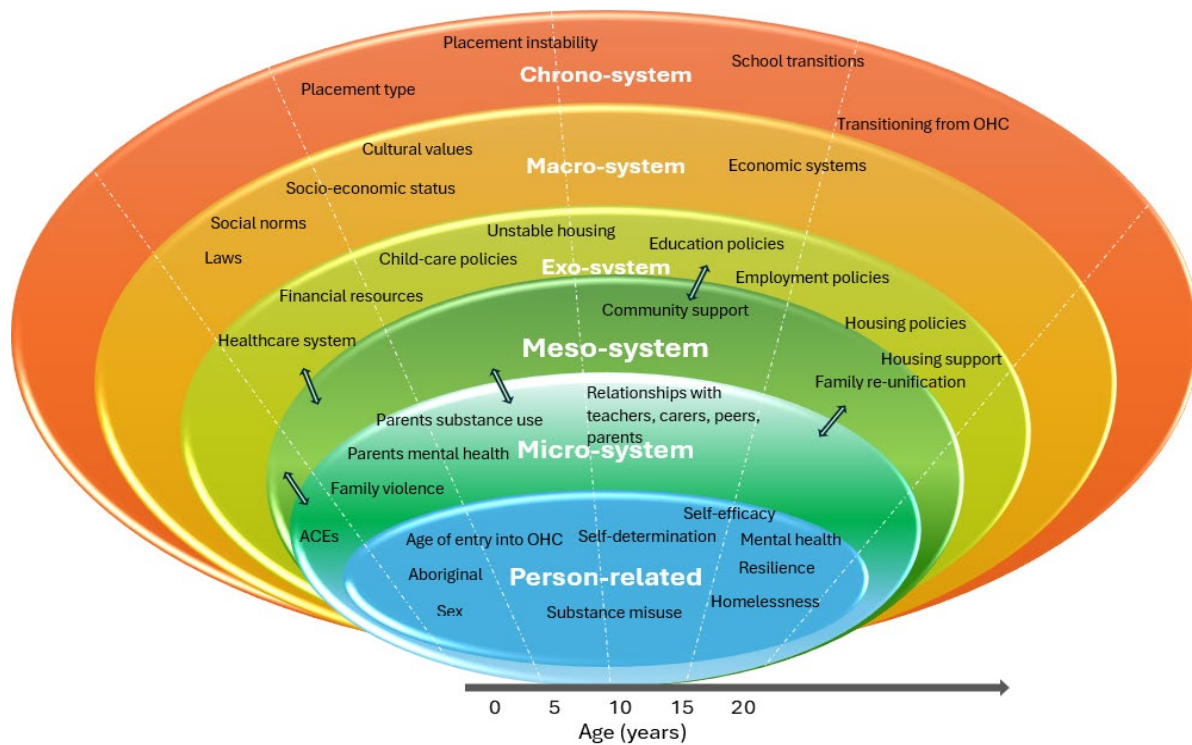
Mapping different pathways that young people are exposed to throughout the life course helps us understand the outcomes experienced later in life (Hutchison, 2005). In summary, some key features of Bronfenbrenner's ecological systems theory and life course theory, which apply to this thesis, are as follows:

1. The mental health, resilience and homelessness outcomes are conceptualised as trajectories or changes over time during a child's development (White & Wu, 2014). These experiences depend on the interactions of a continuum of risk and protective factors, experiences, and interactions throughout the young person's life (Callahan et al., 2015; White & Wu, 2014). This thesis aims to disentangle some environmental, social, and childhood characteristics associated with various trajectories experienced by different groups of young people transitioning from OHC.
2. All stages of the young person's life are connected and interdependent with past, current, and future interactions involving friends, carers, families, relatives, and communities in which they live (Elder, 1998; Parker et al., 2003). This developmental aspect is important, particularly for young people who have been exposed to multiple forms of trauma and abuse, such as family and domestic violence, parental/ carer mental illness or substance misuse (Colman & Atallahjan, 2010; Elder, 1998).
3. At a policy and program level, the life course theory emphasises that early interventions in a young person's life are crucial for achieving better outcomes later in life. Additionally, the theory suggests that building strong, people-focussed health systems is important for improving outcomes in mental health and homelessness by focussing on individual needs (Elder, 1998; World Health Organization, 2015).

Based on the review of the two theories, our conceptual framework encompasses Bronfenbrenner's model and the life course theory as shown in Figure 1 below.

Figure 1

Bronfenbrenner's ecological systems theory and life course theory, Adapted from (Grossman & Magana, 2016)



Notes

The first 5 years of life represent early life predictors. At the micro-system level, these include experiences of child abuse and maltreatment, parental mental health and substance abuse issues and exposure to family and domestic violence. Person-related factors include age of entry into care, sex, Aboriginal status, and socio-economic status. At the macro-system level, the cultural norms, beliefs, and values influence a child's upbringing over the years. At an exo-system level, children may face unstable housing.

Age 5 to 15 years: At the chrono-system level, factors include placement characteristics and school transitions. At the exo-system level, childcare and education policies may play a role. Person-related factors during this period include self-efficacy, self-determination, substance misuse and emerging mental health issues.

Age 15 years and onwards: This period involves transitioning from OHC. Person-related factors include mental health, homelessness, and substance misuse. Some young people may be re-unified with their parents or carers. At the exo-system, housing policies are significant. The exo-system level during this period reflects young people's engagement in further training and employment, as well as housing support for some.

Research Aim

The overarching aim of this thesis was to investigate the complex interplay among personal, environmental and social factors in predicting mental health and homelessness trajectories, including perceived resilience, by synthesising longitudinal evidence and exploring patterns of outcomes among young people transitioning from out-of-home care. Through an integrated analysis of linked administrative and longitudinal data, this thesis aimed to inform targeted interventions and policies to improve mental health and social outcomes for this group of young people. Guided by Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1994; Crawford, 2020) and the life course theory (Brady & Gilligan, 2018; Colman & Ataullahjan, 2010; Elder, 1998; Hutchison, 2005), this thesis evaluated the pre-care, in-care and post-care factors associated with homelessness, mental health and perceived resilience outcomes of young people transitioning from OHC at a population level. To achieve the overarching aim, we undertook four phases of inquiry, the specific objectives of each of which are detailed below.

Thesis outline

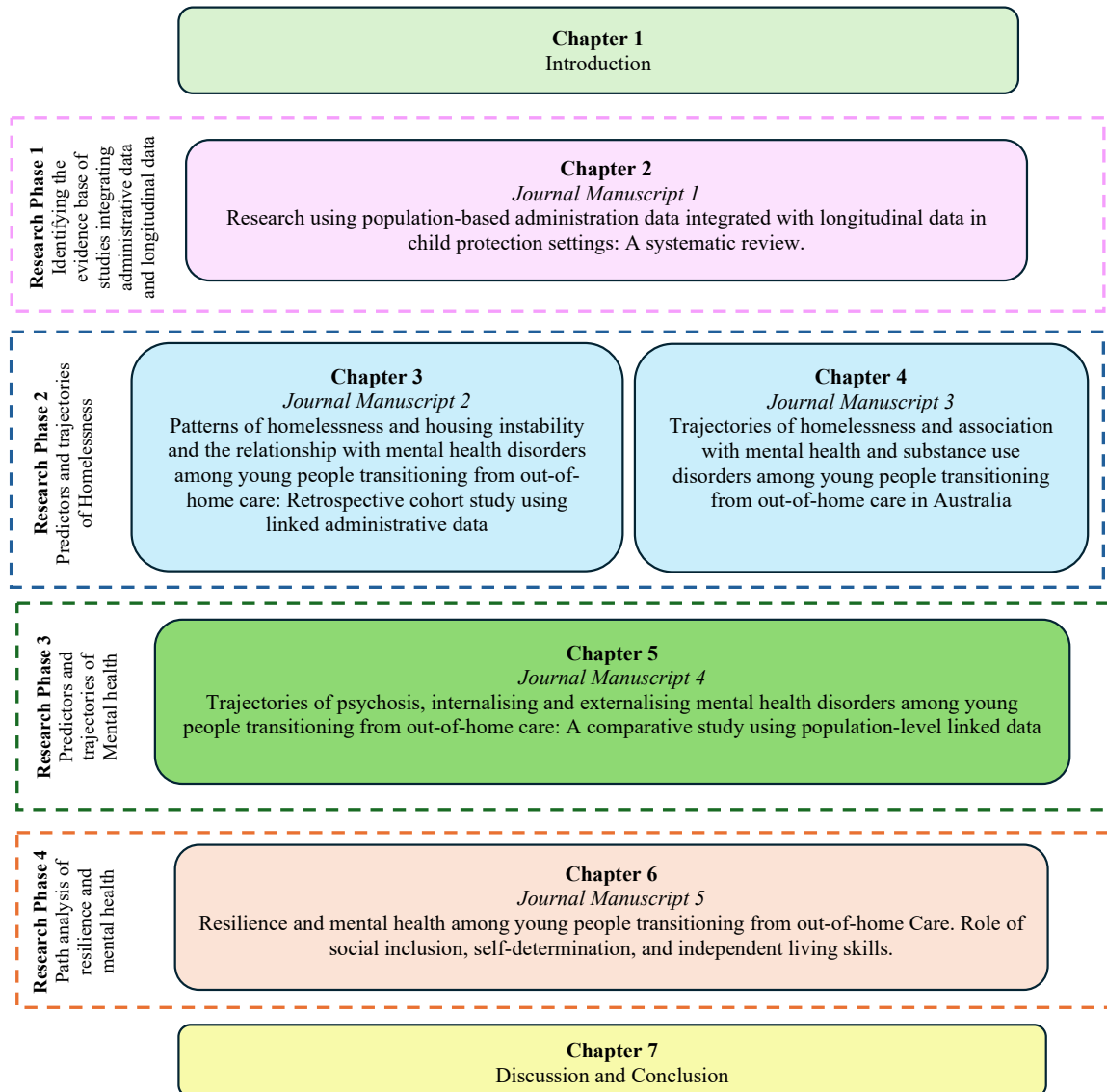
This thesis consists of chapters or studies in the form of journal manuscripts (i.e., Chapters 2 to 6) and two traditional chapters (i.e., Chapters 1 and 7) (see Figure 2). Chapter 1 provides background information on the thesis and outlines the rationale, research aims, and theoretical framework underpinning the thesis. The thesis concludes with Chapter 7, which synthesises the findings, discusses lessons learned, implications for policy and practice, and outlines future research directions concerning young people transitioning from OHC.

Manuscripts are formatted in the same way as traditional Chapters in line with the American Psychological Association 7th edition (*Publication manual of the american psychological association (7th ed.)*, 2020). The manuscripts in Chapters 2, 3 and 4 have been published, while manuscripts in Chapters 5 and 6 are currently undergoing peer review. All

references and supplementary material relating to manuscripts are listed at the end of each chapter. Relevant appendices are included after Chapter 7. Figure 2 outlines the chapters and manuscripts included in this thesis.

Figure 2

Thesis Outline



Research Phase 1

This phase (Chapter 2) involved a systematic review of research studies that integrated longitudinal data with administrative data in child protection settings. The overarching aim of Phase 1 was to systematically review the literature on different methods of

analysis used when administrative data is integrated with longitudinal data and make recommendations about appropriate statistical analysis methods to enhance research findings. A critical evaluation and analysis of the methods used in this review formed the basis of recommended analytical approaches which were applied to subsequent phases of this thesis. The specific objectives of this phase were to:

- i) identify and describe the study designs and methods used in reporting linked administrative data when combined with longitudinal data in child protection settings; and
- ii) identify statistical methods, gaps, and opportunities in the analysis of administrative data integrated with longitudinal data in child protection settings.

Research Phase 2

This phase focussed on analysing population-level administrative data (Appendix D.2) from Victoria. There are two chapters in this phase (Chapters 3 and Chapter 4). Chapter 3 involved examining factors associated with homelessness as young people transitioned from OHC. Building on the insights gained from the systematic review in Phase 1, this chapter reports on a detailed analysis of a combination of pre-care and in-care factors associated with homelessness. A framework for understanding and accurately measuring homelessness was developed based on the European Typology of Homelessness and Housing Exclusion (ETHOS) framework (Busch-Geertsema et al., 2016; Pleace & Bretherton, 2013). This involved defining homelessness based on 13 operational categories, thus providing a more nuanced understanding of the nature of homelessness.

Chapter 3. The overall aim of Chapter 3 was to provide a holistic analysis of the relationship between mental health disorders and homelessness. The findings from this phase were used to determine specific factors associated with homelessness, which were further explored in Chapter 4. Specifically, the objectives of Chapter 3 were to:

- i. Explore the different types and severity of homelessness experienced by young people transitioning from care.
- ii. Determine the mental health disorders that are significantly associated with homelessness and housing instability among young people transitioning from care.
- iii. Assess whether young people with dual diagnosis of mental health and substance abuse experienced higher levels of homelessness compared to young people without a dual diagnosis.

Chapter 4. This chapter builds on the work conducted in Chapter 3, whereby longitudinal data from population-based data in Victoria was utilised to understand trajectories of homelessness and mental health, including the impact of substance use on these trajectories. This chapter integrates both person-centred and variable-centred approaches to evaluate these trajectories (Laursen & Hoff, 2006; Muthen & Muthen, 2000). This integrated approach allows for identifying factors associated with outcomes and identifying subgroups of individuals who share similar characteristics. As the systematic review from Phase 1 recommended, complex longitudinal data analysis was conducted using Latent class growth analysis (LCGA) (Nagin, 1999).

The overall aim of Chapter 4 was to determine the trajectories of homelessness and associations with dual mental health and substance misuse disorders. The specific objectives were as follows:

- i. Determine the characteristics of subgroups of young people who follow distinct trajectories of homelessness risk from the time they transition from OHC to early adulthood.
- ii. Examine the extent to which a history of mental health or substance misuse (prior to leaving care) and a dual diagnosis of mental health and substance misuse are associated with the latent class trajectories of young people leaving care.

Research Phase 3

This phase (Chapter 5) involved analysis of population-level administrative data (Appendix D.1) from Western Australia. The data were used to understand trajectories of internalising, externalising, and psychotic mental health disorders among the following three population groups: (i) young people in OHC, (ii) young people with Child Protection contact (CP contact), and (iii) young people without CP contact (no CP contact). A complete birth cohort of young people was utilised to determine trajectories of mental health across these population groups. As the systematic review from Phase One recommended, complex longitudinal data analysis was conducted using growth mixture modelling techniques (Muthen & Muthen, 2000). The specific objectives of this phase were to:

- i. Describe the mental health (internalising, externalising, and psychotic mental health disorders) trajectories of young people in the OHC cohort, comparing these with the trajectories of young people with CP contact and the trajectories of young people with no CP contact.
- ii. Identify the factors (socio-demographic, environmental, and placement characteristics) associated with the mental health trajectories and how these vary across the three population groups.
- iii. Assess the time-varying effect of substance misuse on trajectories of internalising and externalising mental health disorders within each of the three population groups.
- iv. Investigate gender differences in the trajectories of internalising and externalising mental health disorders.

Research Phase 4

Phase 4 (Chapter 6) involved integrating administrative (Appendix D.1) and longitudinal mixed-method study data (Appendix C.3) from Western Australia to understand

factors associated with mental health and perceived resilience. This phase forms the culmination of the thesis, applying techniques and strategies from Phases 1-3 to study the outcomes of young people transitioning from care. A range of factors from both data sources were examined, including moderating and mediating factors utilising a structural equation modelling (SEM) framework.

During this phase, we demonstrated the value of utilising integrated data to determine risk and protective factors associated with mental health and resilience. Mediation and moderation models were constructed to test the contributions of various paths in each model. Specifically, the following objectives were addressed:

- i. Examine the association between ACEs and poor mental health and assess whether this association was moderated or mediated by perceived resilience, social inclusion, independent living skills (ILS), self-determination, and placement stability.
- ii. Investigate the association between ACEs and perceived resilience and assess whether this association was moderated or mediated by social inclusion, ILS, self-determination, mental health, and placement stability.
- iii. Determine if there are differences in perceived resilience and mental health outcomes between young people still in care (14-17.9 years) and those who have left care (18-25 years).

Discussion and Conclusion

The final chapter (Chapter 7) synthesises the research findings from all phases, applying both Bronfenbrenner's ecological theory and life course theory. Recommendations for future research are discussed, as well as the strengths and limitations of the thesis. The chapter also explores policy and program implications.

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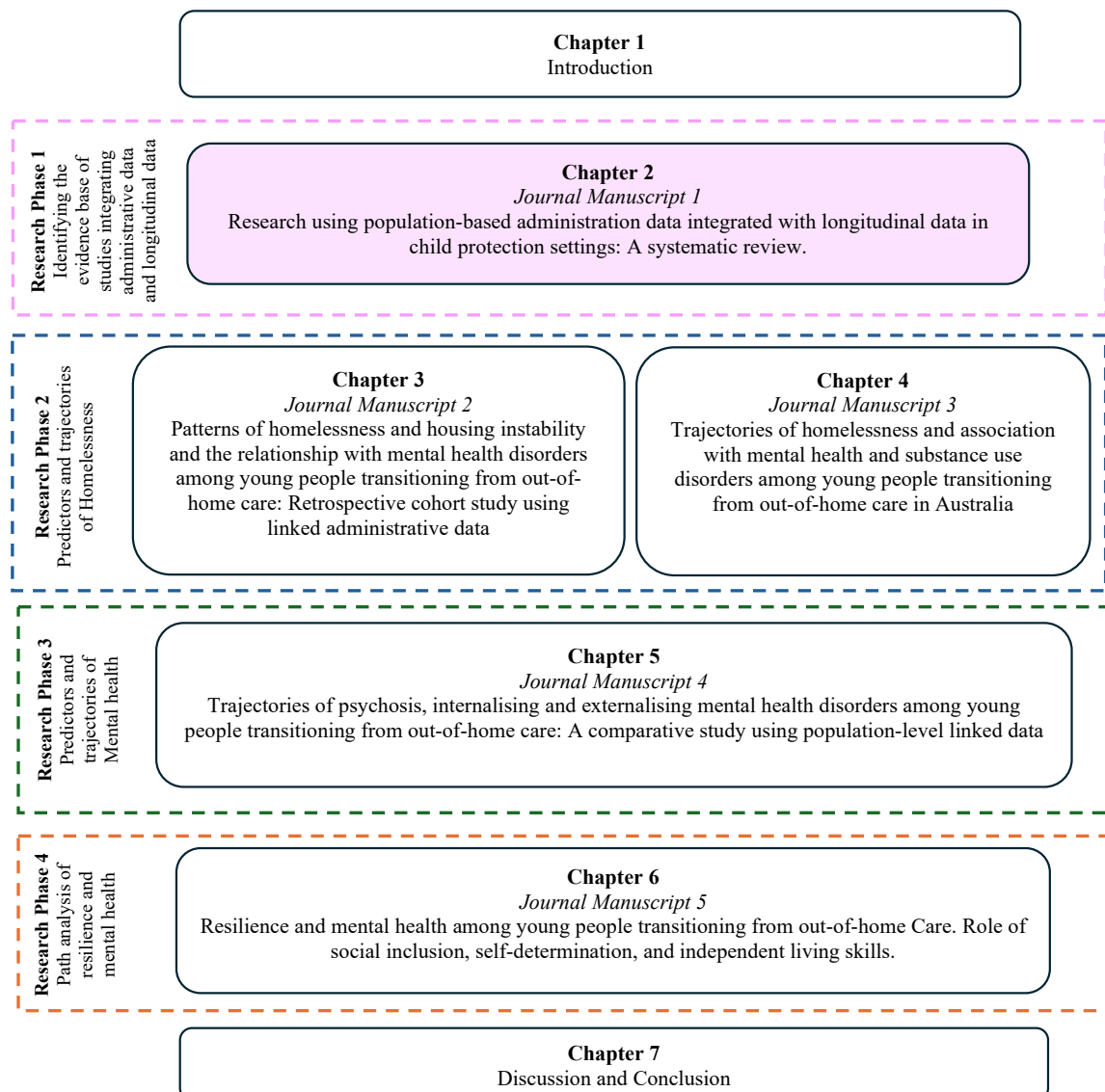
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Chapter 2 Systematic Review



Phase 1 (Chapter 2) involved a systematic review of research studies integrating longitudinal data with administrative data in child protection settings. The review detailed study designs, data sources, data linkage methods and quality, outcome measures, biases and statistical methods used. Several limitations in these studies were identified, including poor reporting of data linkage processes, failure to account for biases and missing data, and a lack of sophistication in the statistical methods used for the integrated datasets. The review

highlights the strengths and limitations of using population-based or self-report longitudinal data separately to study young people's outcomes. Consequently, it underscores the benefits of integrating the two data sources to improve data completeness and outcomes reporting. Bringing these two data sources together allows for a comprehensive retrospective and prospective understanding of risk and protective factors of outcomes inherent in young people transitioning from OHC.

The review highlighted both the strengths and limitations of integrating datasets, as well as the current limitations of statistical methods applied to these integrated datasets. This phase sets the stage for subsequent chapters, emphasising the value of using population-based linked administrative data in multiple ways, and the final chapter (Chapter 6) highlights the strength of integrating the two data sources. The review underscores the importance of utilising advanced statistical methods in studies involving population-level administrative data integrated with longitudinal data. Additionally, it highlights the necessity of accounting for missing data and biases in these studies. The manuscript was accepted for publication in *PLoS One* on the 24th March 2021 and has since been published.

Author Contribution Statement: Chapter 2

As co-authors of the paper entitled, '*Research using population-based administrative data integrated with longitudinal data in child protection Settings: A systematic review*', we confirm that Fadzai Chikwava has been the principal researcher and has made the following contributions:

- Conceptualisation and design of the research;
- Data collection, analysis, and interpretation;
- Writing the manuscript and critical appraisal of the findings;
- Corresponding author for communication with the journal

Our contribution to the paper was consistent with co-author and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data collection;
- Review and editing of the manuscript.

Signed: Renée Speyer Date: 12/09/2024

Signed: Lauren Parsons Date: 11/09/2024

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data analysis and interpretation; and
- Review and editing of the manuscript.

Signed: Reinie Cordier Date: 10.09.2024

Signed: Anna Ferrante Date: 10.09.2024

Signed: Melissa O'Donnell Date: 10.09.2024

Journal Manuscript 1

Research using population-based administration data integrated with longitudinal data in child protection settings: A systematic review

Fadzai Chikwava^a, Reinie Cordier^{b, a}, Anna Ferrante^c, Melissa O'Donnell^{d, e}, Renée Speyer^{f, g},

^a, Lauren Parsons^a

- ^a School of Occupational Therapy, Social Work and Speech Pathology, Curtin University, Perth, Western Australia, Australia
- ^b Department of Social Work, Education and Community Wellbeing, Northumbria University, Newcastle, United Kingdom
- ^c School of Public Health, Curtin University, Perth, Western Australia, Australia
- ^d Telethon Kids Institute, University of Western Australia, Nedlands, Western Australia, Australia
- ^e Australian Centre for Child Protection, University of South Australia, Adelaide, South Australia, Australia
- ^f Department of Special Needs Education, University of Oslo, Oslo, Norway
- ^g Department of Otorhinolaryngology and Head and Neck Surgery, Leiden University Medical Centre, Leiden, The Netherlands

Abstract

Introduction: Over the past decade there has been a marked growth in the use of linked population administrative data for child protection research. This is the first systematic review of studies to report on research design and statistical methods used where population-based administrative data is integrated with longitudinal data in child protection settings.

Methods: The systematic review was conducted according to Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement. The electronic databases Medline (Ovid), PsycINFO, Embase, ERIC, and CINAHL were systematically searched in November 2019 to identify all the relevant studies. The protocol for this review was registered and published with Open Science Framework (Registration DOI: 10.17605/OSF.IO/96PX8)

Results: The review identified 30 studies reporting on child maltreatment, mental health, drug and alcohol abuse and education. The quality of almost all studies was strong, however the studies rated poorly on the reporting of data linkage methods. The statistical analysis methods described failed to consider mediating factors which may have an indirect effect on the outcomes of interest and there was lack of utilisation of multi-level analysis.

Conclusion: We recommend reporting of data linkage processes through following recommended and standardised data linkage processes, which can be achieved through greater co-ordination among data providers and researchers.

Introduction

Population-based administrative data is routinely collected by organisations to deliver services and to monitor, evaluate and improve upon those same services (Calderwood & Lessof, 2009). Some examples of the types of data include administrative health data, disease registries, primary care databases, electronic health records, population registries and birth and death registries (Nicholls et al., 2015). The data may be linked within a single service sector, such as health, or with surveys and across sectors such as education, child protection and corrective services (Calderwood & Lessof, 2009; Malvaso et al., 2017; Mills et al., 2017). Bringing together data from various administrative data sources provides a rich repository of data that can be used for research purposes.

The linked data enables researchers to study risk and protective factors and to examine outcomes from various databases brought together (Brownell & Jutte, 2013; Doiron et al., 2013). The trend of using administrative data for research purposes has increased exponentially (Ferrante, 2009; Gilbert et al., 2018; Maclean et al., 2018; Maclean et al., 2017; Randall et al., 2018; Vinnerljung et al., 2008; Young & Flack, 2018). To date, there has not been a systematic review that has focussed on methods of analysis of integrated population-based administrative data with longitudinal data in child protection settings.

Population-based administrative data is invaluable in research as it offers complete coverage of a given population which overcomes the imprecision associated with sampling errors (Putnam-Hornstein et al., 2013). It offers superior statistical power and precision to determine associations between rare exposures and outcomes and using these samples as sampling frames for subsequent surveys (Calderwood & Lessof, 2009; Carr et al., 2016; Cohen et al., 2018; Findlay et al., 2018; Simon, 2014). Administrative data is useful when studying causes of complex diseases and conditions as well as assessing outcomes of clinical or therapeutic interventions (Cohen et al., 2018; Jolley et al., 2015; Kalilani et al., 2019;

Kisely et al., 2018). Use of multiple linked administrative data allows researchers to explore comorbidity and variability in outcomes within target populations and compare these between specific clinical population groups and against outcomes in the general population (Egelund & Lausten, 2009; Green et al., 2020; Maclean et al., 2019; Vinnerljung et al., 2006). As the purpose of this systematic review is related to child protection settings, it will be used as an example to elucidate the benefits and limitations of using population-based administrative integrated with longitudinal data in research.

Population-based administrative data allows the study of outcomes among cohorts of hard to reach or high-risk populations such as those in the juvenile justice system, and those involved with the child protection system (Carr et al., 2016; Hurren et al., 2017; Tew et al., 2017). For example, child protection administrative data allow longitudinal examination of population-level patterns and trends in child maltreatment and complex multi-level analysis, particularly where the data is linked to individuals who are related (Gilbert et al., 2012; O'Donnell et al., 2012; Simoila et al., 2019; Vinnerljung et al., 2005). The data allow the determination of cumulative incidence of risk and protective factors among various population subgroups with different levels of child protection involvement (Maclean et al., 2019; Segal et al., 2019). Therefore the data allows researchers to trace various trajectories of specific cohorts from birth to adulthood (Østergaard et al., 2019).

Use of child protection administrative data in research reduces the burden on individuals to disclose sensitive or traumatic experiences and also reduces the risk of recall bias, social desirability and stigma, which may occur, for instance, in retrospective self-report of child maltreatment (Hurren et al., 2017; Mills et al., 2017). Administrative data is less prone to selection bias since the data includes the entire population served by the Child Protection Agency. Such data is also used to evaluate the frequency of use, effectiveness and costs of services across populations and over time (Clarke et al., 2008). Further, using

administrative data is more cost-effective and efficient in that data is readily available when needed and one can avoid the cost and burden associated with face to face data collection (Rotermann et al., 2015).

Despite all the advantages of using population-based administrative data, there are some limitations to using and accessing administrative data. Key variables of interest to researchers are often not recorded since administrative data are primarily collected for the delivery of programs and services (Putnam-Hornstein et al., 2013). The data may be subjected to biases, such as under-reporting of the incidence of child maltreatment in child protection research or lack of availability of data for some respondents, particularly difficulty in reaching vulnerable groups (Calderwood & Lessof, 2009). In addition, the type of data being collected routinely may lack the depth of information required to answer important research questions (Hurren et al., 2017). Another important limitation of administrative data is that individual-level socio-economic status (SES) parameters are often not available (Jutte et al., 2011).

Linked administrative data may be subject to linkage error when some records that should be matched or able to be linked were not linked (missed matches) or records were linked incorrectly (false matches), which could lead to biased estimates of association (Gilbert et al., 2018; Harron et al., 2017). There are also data access challenges, such as delays in getting approvals to link datasets, especially getting access to cross-jurisdictional linked datasets (Tew et al., 2017). There may be restrictions placed by data custodians on who may access linked data, thereby limiting the ability of researchers to access all the data they may need (Calderwood & Lessof, 2009). Despite the above limitations of using population-based administrative data alone, there are advantages of linking population based administrative data to longitudinal data.

The benefits of conducting longitudinal research in child protection settings are well documented, as this type of research allows researchers to analyse trends, changes in early exposures, risks, behaviours and outcomes over a long period of time (Findlay et al., 2018; Wagner et al., 2005). Longitudinal studies are also powerful in that they overcome common issues around temporal associations and causal risk factors for outcomes of child abuse and neglect (Brownell & Jutte, 2013). Longitudinal studies also allow researchers to update certain information about participants, such as socio-demographic characteristics, and also obtain in-depth information about certain topics and service involvement, which otherwise could not be collected from administrative data alone (Findlay et al., 2018; Meer & Mittag, 2015).

Despite the notable benefits of conducting longitudinal studies, they are known to be notoriously expensive as they involve several waves of data collection and could run for several years before the outcomes of a study are determined (Jutte et al., 2011). It may be difficult to obtain sufficient numbers of eligible participants, particularly when recruiting hard to reach populations and access to children in out-of-home care is generally tightly controlled, resulting in low response rates (Taplin, 2005). Longitudinal data are also subject to different biases such as under-reporting, recall errors and high attrition rates (Findlay et al., 2018), resulting in reporting of biased estimates if the biases are not appropriately accounted for in the analysis. A systematic review conducted by (Farzanfar et al., 2017) highlighted the potential for bias and on the reporting of longitudinal studies. Another review by (Karahalios et al., 2012), found that 56% of studies had a high risk of bias with regards to attrition. Longitudinal studies also place a high burden on respondents due to frequent contact.

Combining population-based administrative data with longitudinal data has several advantages. For example, linking child protection administrative data to longitudinal data allows use of retrospective administrative data on prenatal or early childhood experiences to

determine a trajectory of long term adult outcomes which can be measured from longitudinal data (Abajobir, Najman, et al., 2017; Olsen & de Montgomery, 2018; Putnam-Hornstein, 2011; Teyhan et al., 2019). Young people who have had child protection contact are known to have worse outcomes than young people in the general population (Campo & Commerford, 2016; Mendes, 2012). Thus, integrating longitudinal data and administrative data enables comparison of outcomes using population level data. Other benefits of linking longitudinal data with administrative data include the following: i) cross-validation of self-reported information from longitudinal surveys with administrative data (K. Harron et al., 2017; Hilder et al., 2016; Tew et al., 2017); ii) reducing data incompleteness and biases inherent in longitudinal data as reported earlier (Bell et al., 2018; Meer & Mittag, 2015; Mills et al., 2013); and iii) overcoming high attrition rates common in longitudinal data (Eyawo et al., 2018; Mills et al., 2013; Parrish et al., 2017). In summary, combining these two data sources increases the usability and possible applications of the data.

Using population-based administrative data integrated with longitudinal data has its own limitations. One of the challenges is the introduction of bias by linking data only where consent has been provided by respondents (Calderwood & Lessof, 2009; Knies et al., 2012). Further, the linkage may be of poor quality and the data from administrative records may not exist or be incomplete for many longitudinal participants (Calderwood & Lessof, 2009).

A wide variety of factors affect the accuracy of reported results in child protection settings. These include the reference population, data source, sampling strategy, sample size and analytical factors (Knight et al., 2000; Taplin, 2005). While data integration offers unique advantages, it is important to consider various techniques and methods of analysis to report study outcomes and to correct for biases which may be introduced by bringing together data from various sources. When modelling outcomes using administrative data integrated with longitudinal data it is important to consider time between occurrences of events (survival

analysis), all possible confounders, and mediating and moderating factors. These may include early childhood experiences, pre-natal and parental risk factors, socio-demographic and environmental factors (Abajobir et al., 2017; Kisely et al., 2020; Williams et al., 2017). Failure to account for these factors may lead to biased estimates and false inference. Sensitivity analysis may be conducted to investigate the extent to which some changes or modifications in the confounding variables may have an effect on reported outcomes. For example, multiple regression models may be constructed involving child maltreatment notifications as a risk factor compared to modelling substantiated maltreatment on outcomes (Kisely et al., 2020; Abajobir et al., 2017; Teyhan et al., 2019).

Some of the considerations that need to be considered when analysing these datasets involve methods of dealing with biases in the datasets. Missing data can lead to biased estimates of regression parameters when the probability of missingness is associated with outcomes. Different strategies are used to handle missing data in statistical analyses, such as: i) imputation of missing data, (Allen, 2017; Asendorpf et al., 2014); ii) using maximum likelihood estimation methods to model data from subjects who drop out of the study compared to those who complete the longitudinal study; and iii) weighting the available data using non-response methods to account for missing data (Gustavson et al., 2012; Wolke et al., 2009). Some concurrence or agreement tests may need to be conducted to determine validity of responses from either data sources (Baldwin et al., 2019; Naicker et al., 2017).

Some studies have demonstrated that longitudinal data analysis should account for possible within-subject correlation and different covariance structures of episodes of various disease outcomes over time. Some of the analytical methods used for this include generalized estimating equations (GEE) and mixed-effects models (Ballinger, 2004; Compier-de Block et al., 2017; Crowne et al., 2012; Kohl et al., 2011; Yoon et al., 2018).

Previous reviews have focused on measurement of the diagnosis of diseases or outcomes, including administrative data characteristics and strengths and limitations of the two data sources (Cohen et al., 2018; Leong et al., 2013; Macdonald et al., 2016; van Mourik et al., 2015). A systematic review conducted by Tew et al. (2017) focussed on the use of linked hospital data for research in Australia, thereby limiting the generalisability of the findings. Young and Flack (2018) conducted a review that reported on recent trends of using linked data. Even though this paper used systematic search strategy, it was not published as a systematic review. In addition, the study highlighted areas where linked data is commonly used, particularly in cross-sectorial linked data and areas where its use could be improved, however it did not mention use of longitudinal data to enhance reporting of outcomes. A systematic review conducted by Andrade et al. (2019), highlights the need for future research to focus on collecting better measures for outcomes data and linking data to multiple administrative databases. A systematic review conducted by da Silva et al. (2012) examined the issue of consent for data linkage, which is one of the sources of bias in using linked data.

Selecting appropriate statistical analysis of administrative data integrated with longitudinal data can improve the reporting of risk and protective factors related to child protection outcomes. This can be achieved through careful selection of variables and optimal use of the data extracted from the administrative and longitudinal data. The over-arching aim of this review is to provide a synthesis of the different methods of analysis used when administrative data is integrated with longitudinal data and make recommendations about approaches to enhance research findings thereby minimising risk of bias and other limitations. Specifically, the following objectives will be investigated: i) to describe the study designs and methods used in reporting linked administrative data when combined with longitudinal data in child protection settings; and ii) to identify statistical methods, gaps and

opportunities in the analysis of administrative data integrated with longitudinal data in child protection settings.

Although research on combining administrative data integrated with longitudinal data in child protection research is available, to the best of our knowledge, no systematic reviews have reported on the statistical methods used when the two data sources are combined. This systematic review is an essential step towards informing policy, practice and future research directions in methodological aspects of using administrative data integrated with longitudinal data in child protection settings.

Methods

The systematic review was conducted according to the PRISMA statement (Moher et al., 2015) which outlines minimum standards for reporting systematic reviews and meta-analysis. A completed PRISMA checklist is provided in SI Table i. The protocol for this review was registered and published with Open Science Framework (Registration DOI: 10.17605/OSF.IO/96PX8).

Eligibility Criteria

To be included in this review, peer reviewed studies needed to have at least one administrative database integrated with a longitudinal data. Selected studies were limited to studies involving child protection settings and published in English only. Studies involving systematic reviews or meta-analysis were excluded. In addition, anecdotes, reviews, book chapters, letters to the editor, editorials and conference abstracts were excluded. Studies had to meet all eligibility criteria to be included in the review.

Information Sources and Search Strategy

The electronic databases Medline (Ovid), PsycINFO, Embase, ERIC, and CINAHL were systematically searched in November 2019 to identify all the relevant studies. In line with the objective of this review, terms were identified in electronic databases that are related

to the following three concepts: i) data source (administrative data or population based data); ii) study design (longitudinal study or cohort study or prospective study); and iii) setting (child protection). Searches were conducted using free-text in all databases because we had too few relevant subject headings for our purposes. In addition, websites that provide a publication repository for studies involving linked data, such as the Population Health Research Network, were searched. The reference list of included studies was manually searched to find additional relevant studies. A full search strategy for all databases is shown in SI Table ii.

Study Selection

Screening of titles and abstracts of the retrieved studies was conducted between December 2019 and March 2020. The first author screened all titles and abstracts while the second reviewer (LP) independently screened a random selection of 40% of studies to identify the candidate studies for the full text review. The reviewers graded each abstract as eligible, possibly eligible or not eligible (using the inclusion and exclusion criteria defined above). Both reviewers independently screened 100% of full-text studies. Any disagreements about eligibility of full-text studies were settled by discussing the differences in the assessment and reaching a consensus on which studies to include. Five studies were used to pilot the screening criteria, and data extraction process, which were modified after consultation between researchers. Inter-rater reliability using weighted Kappa between the two independent reviewers was established for the abstract selection and quality appraisal of included studies. The weighted Kappa measures the degree of disagreement between the two raters; the greater the disagreement the higher the weight.

Methodological Quality

Since there is no standard criteria for assessing the quality of study designs involving integration of population-based administrative data and longitudinal data, a combination of

three critical appraisal methods for assessing the methodological quality of studies was utilised. The critical appraisal methods were the “*Qualsyst*” critical appraisal tool by Kmet et al. (Kmet et al., 2004) (henceforth referred to as *kmet* checklist), the Guidance for Information about Linking Data sets (GUILD) (Gilbert et al., 2018), which focus on the methodological process of linking data, and the Reporting of studies Conducted using Observational Routinely-collected health Data (RECORD) (Benchimol et al., 2015).

The Kmet checklist has 14 items that use a 3-point ordinal scale (0 = no, 1 = partial, 2 = yes) of which three items were not applicable to our study design. The checklist items assess the study design, description of participants’ characteristics, appropriateness of sampling strategy and sample size, robustness of outcome and exposure variables, analytical methods, estimates of variance, control for confounding and whether conclusions drawn reflect results reported. A Qualsyst score of > 80% was interpreted as strong quality, 60–79% as good quality, 50–59% as adequate quality, and < 50% as poor methodological quality.

The GUILD statement has three broad domains with items within each domain that focus on the data source population, the data linkage process and quality of data linkage including accounting for linkage error. The RECORD statement, an extension from the STROBE guidelines, consists of a checklist of 13 items related to the title, abstract, introduction, methods, results, and discussion section of studies and other items relating to routinely collected health data (Benchimol et al., 2015). Three items were selected from the RECORD checklist as they were the only items that did not overlap with the GUILD items; these items were combined with the GUILD statements. Due to the absence of a standard scoring system for the GUILD and RECORD statements, a similar scoring method to Kmet was used. Prior to conducting the quality appraisal, the two reviewers (FC and LP) met to discuss the scoring method for these guidelines.

The second reviewer conducted quality assessment (using Kmet, GUILD and RECORD statements) on a random selection of 40% of the included studies. Any differences in ratings from the two reviewers were settled by discussing the differences in the assessment and reaching a consensus on the final score for each of the quality appraisal methods. The differences for Kmet were defined as any difference in the rating from one category to the next (e.g., when a study was rated as good quality (60-79%) by one reviewer, while the same study is rated as poor quality (<50%) by the other reviewer). However, because most studies received poor GUILD and RECORD ratings, discussions on agreement between scores were conducted for GUILD and RECORD ratings with more than 15% difference for each study.

Data collection process

Comprehensive data extraction forms were developed to extract relevant data from the included studies under the following four headings: study characteristics, administrative data, longitudinal data and statistical methods. The included studies were heterogeneous in terms of study design and quality, therefore a narrative synthesis of the findings of the included studies was conducted.

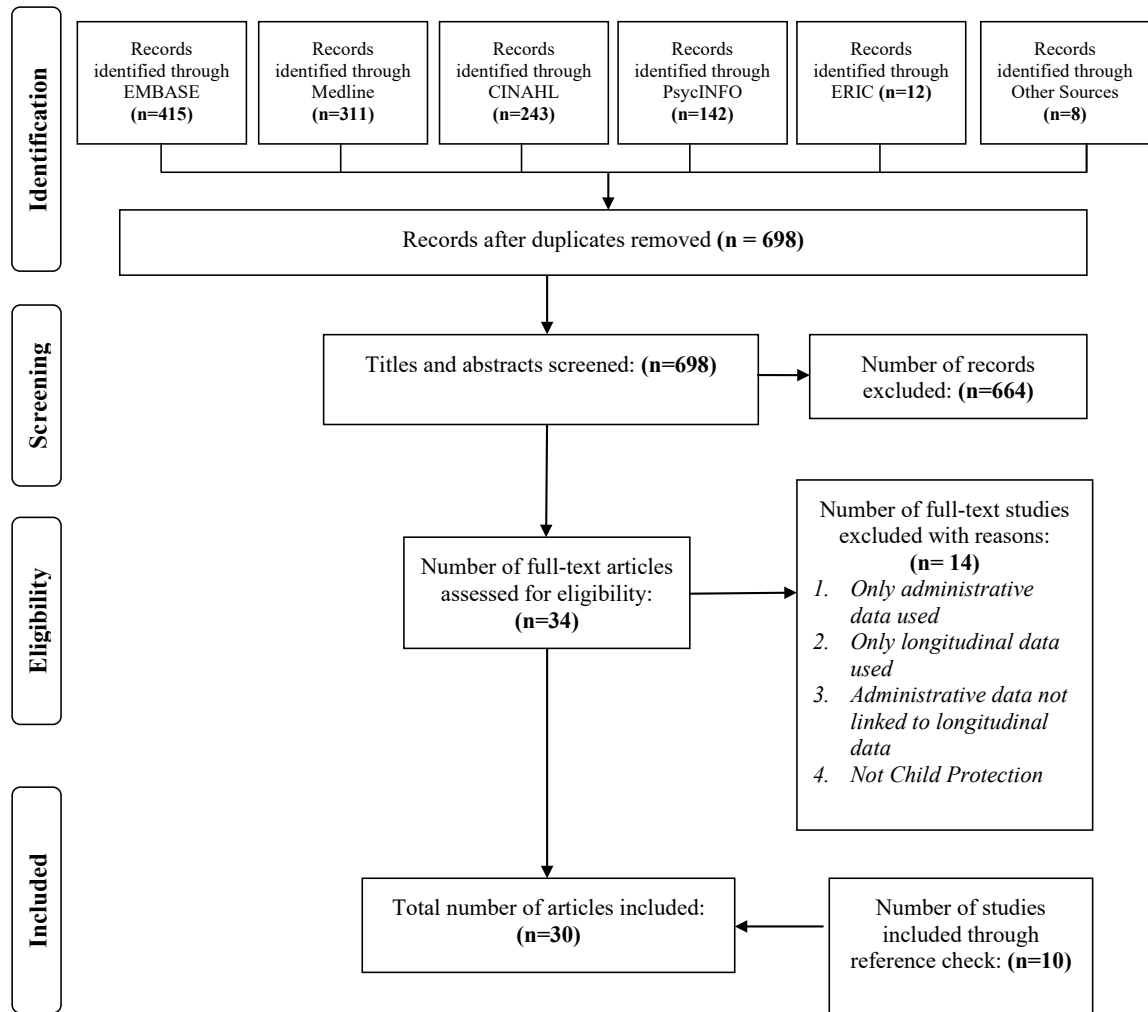
Results

Study Selection

A total of 1,123 studies were retrieved from the electronic database search and eight from other sources. Out of these, a total of 698 studies remained after duplicates were removed. A total of 664 records did not meet the inclusion criteria, resulting in 34 full-text studies which were assessed for eligibility. The final number of studies that met the inclusion criteria and were included in data synthesis were 30 and of these 10 were identified by manually scrutinising the references of the eligible studies. Figure 3 below shows a flowchart of the search and selection process of the included studies.

Figure 3

PRISMA Flow Diagram



Characteristics of included studies

The studies were conducted in a variety of countries with Australia having the highest number of publications (50%), followed by the USA (20%) and the United Kingdom (17%). While all studies were conducted in child protection settings, only a few were specific to out-of-home care settings (20%). The outcomes investigated were varied; the most common outcomes were child maltreatment (30%), mental health (20%), drugs and alcohol abuse (20%), education (17%), domestic violence (7%), and health insurance (7%). Table 1 below

shows a summary of all included studies, and Table 2 has more detailed information for each study.

Almost all studies were birth cohorts and they each measured different variables at different points in time. In the majority of studies, baseline data consisted of prenatal or postnatal data as reported by the mothers, while outcome data were obtained during follow-up waves. Six major longitudinal studies were reported from the publications, the main one being the Mater-University Study of pregnancy (MUSP) which was conducted in Queensland, Australia from 1981-2004 (Abajobir et al., 2017; Kisely et al., 2019; Williams et al., 2017; Kisely et al., 2019; Mills et al., 2019; Strathearn et al., 2009). While these studies had multiple follow-up waves, the authors mostly reported on the baseline wave and one follow up wave. The duration of follow up from the baseline to the last wave ranged from 3 to 21 years. Each longitudinal study had multiple publications demonstrating that a range of exposures and outcomes can be investigated in linked child protection datasets. There was an almost equal number of males and females reported in 70% of studies, while the gender split was unknown in 9 studies.

The cohort sizes ranged from 1,200 children to approximately 14,000 children. Most studies (83%) reported only one administrative database that was integrated with the longitudinal data, while 17% had multiple datasets linked and these ranged from census data, psychiatric registers, educational databases, medical aid data, childbirth and death reviews. Almost all (97%) of the studies reported a state-wide child protection dataset integrated with the longitudinal data. About 23% of studies from two longitudinal studies reported systematic random sampling method. These studies were the Alaska Pregnancy Risk Assessment Monitoring System (PRAMS) and the Evaluation through Follow-up (ETF) studies.

GUILD (Gilbert et al., 2018) recommend reporting on the following three aspects when reporting on studies using linked datasets: i) description of the population included in

the data set i.e. how the data were generated, processed and quality controlled, ii) data linkage processes, and; iii) quality of data linkage including accounting for linkage error. Most studies only reported on one of the steps which is the data linkage method used. Fifty seven percent reported using a deterministic linkage method which mainly involved using a unique personal identification number to link datasets. This linkage method is well established in Scandinavian countries (Egelund & Lausten, 2009; Maret-Ouda et al., 2017), and is increasingly becoming common in other countries. Only two studies reported using probabilistic matching, which involves using a set of non-unique identifiers to link data (Sayers et al., 2016). Two studies (Parrish et al., 2017; Raghavan et al., 2017) reported using a combination of probabilistic and deterministic methods and nine studies did not report on any linkage methods.

Only four studies reported on the linkage quality. (Parrish et al., 2011) reported on the proportion of successful matches, manual review of suspected matches that met a certain probability score threshold (Parrish et al., 2011), while two studies from Raghavan et al. (2017) and reported on the number of records that were linked and unlinked from the source file including statistical differences in linked and unlinked data on key variables.

Table 1*Characteristics of the study population*

Characteristic	N	%
Country		
Australia	15	50%
USA	6	20%
UK	5	17%
Denmark	2	7%
Sweden	2	7%
Research Area		
Child Protection	9	30%
Drugs & Alcohol	6	20%
Mental Health	6	20%
Education	5	17%
Domestic Violence	2	7%
Health Insurance	2	7%
Population group		
Child protection Contact	24	80%
Out-of-home care	6	20%
Linkage Method		
Deterministic	17	57%
Probabilistic	2	7%
Deterministic & Probabilistic	2	7%
Not reported	9	30%
Admin datasets		
1	25	83%
>1	5	17%
Name of Longitudinal Study		
The Mater-University Study of pregnancy (MUSP)	14	47%
Alaska Pregnancy Risk Assessment Monitoring System (PRAMS)	5	17%
The Avon Longitudinal Study of Parents and Children (ALSPAC)	5	17%
Danish longitudinal survey of children (DALSC)	5	17%
Swedish longitudinal Evaluation Through Follow-up (ETF) project	2	7%
National Survey of Child and Adolescent Well-Being (NSCAW)	2	7%

Table 2
Characteristics of included studies

Author (Year)	Country	Aims/ Objectives	Research Area	Child Protection Contact (CPC) vs. OHC	Administrative Data Source	Number of administrative datasets (Deterministic/ Probabilistic Linkage)	Linkage Quality (Yes/ No)
Abajobir et al. (2017)	Australia	This study examines whether distinct types of childhood maltreatment differentially predict different forms of intimate partner violence	Domestic violence	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Abajobir et al. (2017)	Australia	This study investigates the association between exposure to prospectively-substantiated childhood maltreatment between 0 to 14 years of age and lifetime cannabis use, abuse and dependence reported at 21 years	Drugs & alcohol	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Abajobir et al. (2017)	Australia	Examine the association between different types of substantiated child maltreatment and self-reported psychotic experiences as measured by the Young Adult Self-Report (YASR) items and the Peter's Delusions Inventory (PDI) using data from a large population-based birth cohort study.	Mental Health	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Abajobir et al. (2017)	Australia	Examine the effect on QoL of multiple forms of substantiated child maltreatment controlling for selected potential confounders and/covariates, and concurrent depressive symptoms.	Mental Health	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Abajobir et al. (2017)	Australia	Determine the association between substantiated childhood maltreatment and injecting drug use	Drugs & Alcohol	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Austin et al. (2018)	USA	To use multiple novel data sources and time-to event analysis to examine preconception and prenatal predictors of time to first contact with CPS among a representative sample of Alaska children.	Child protection	CPC	1. Alaska Office of Children's Services (OCS); 2. Alaska Child Death Review; 3. Death certificate files; 4. Alaska Dept. of Revenue 5. Geographic census classification data	6 (NR)	No

Author (Year)	Country	Aims/ Objectives	Research Area	Child Protection Contact (CPC) vs. OHC	Administrative Data Source	Number of administrative datasets (Deterministic/ Probabilistic Linkage)	Linkage Quality (Yes/ No)
					6. Alaska Birth Defects Registry		
Austin et al. (2019)	USA	Identify longitudinal trajectory classes of CPS contact among Alaska Native (AN/AI) and non-Native (NN) children and examine preconception and prenatal risk factors associated with identified classes	Child protection	CPC	1. Alaska Office of Children's Services (OCS); 2. Alaska Child Death Review; 3. Death certificate files; 4. Alaska Dept. of Revenue	4 (NR)	No
Egelund et al. (2009)	Denmark	To identify problems among children in foster and residential care compared to in home care children, and to all non-welfare children of the same age, and to analyse factors associated with mental health problems in children in out-of-home care	Mental Health	OHC	1.National Health Register; 2.Psychiatric Research Register 3.Child Protection Register	2 (Deterministic)	No
Hansson et al. (2018)	Sweden	To describe and discuss differences between children placed in OHC and non-OHC children in the Swedish compulsory school, with respect to special needs education, school mobility and academic achievement.	Education	OHC	Statistics Sweden	1 (NR)	No
Hansson et al. (2020)	Sweden	To investigate the effects of school mobility on academic achievements for OHC-children as well as for NOHC-children.	Education	OHC	Statistics Sweden: Child Welfare Register	1 (NR)	No
Kisely et al. (2018)	Australia	To examine, using a prospective record-linkage analysis, whether substantiated child maltreatment is associated with adverse psychological outcomes in early adulthood.	Mental Health	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Kisely et al. (2019)	Australia	To examine whether notified and/or substantiated child maltreatment is associated with the prevalence and persistence of smoking in early adulthood	Drugs & Alcohol	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Kisely et al. (2020)	Australia	To study the association of different types of child maltreatment with alcohol use disorders at 21 years of age	Drugs & Alcohol	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No

Author (Year)	Country	Aims/ Objectives	Research Area	Child Protection Contact (CPC) vs. OHC	Administrative Data Source	Number of administrative datasets (Deterministic/ Probabilistic Linkage)	Linkage Quality (Yes/ No)
Mills et al. (2013)	Australia	To examine whether notified child maltreatment is associated with adverse psychological outcomes in adolescence, and whether differing patterns of psychological outcome are seen depending on the type of maltreatment.	Mental Health	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Mills et al. (2014)	Australia	This study examines whether child maltreatment experience predicts adolescent tobacco and alcohol use. The secondary question was whether specific patterns of types of maltreatment were associated with alcohol and/or tobacco use.	Drugs & alcohol	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Mills et al. (2016)	Australia	Investigate the incidence of CSA in the same birth cohort using both retrospective self-report and prospective government agency notification and examine the psychological outcomes in young adulthood.	Mental Health	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Mills et al. (2017)	Australia	To investigate whether: (1) child maltreatment is associated with life-time cannabis use, early-onset cannabis use, daily cannabis use and DSM-IV cannabis abuse in young adulthood; and (2) behaviour problems, tobacco use and alcohol use at age 14 are associated with cannabis use.	Drugs & Alcohol	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Mills et al. (2019)	Australia	to investigate whether child maltreatment is associated with adverse outcomes in cognitive function, high school completion and employment by the age of 21	Education	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Olsen et al. (2018)	Denmark	To investigate the association for children in OHC and non-OHC peers between school change in lower secondary school and two educational outcomes: (1) self-perceived academic abilities at age 15 and (2) staying-on rates in upper secondary school at age 18	Education	OHC	Danish Register Data	1 (Deterministic)	No

Author (Year)	Country	Aims/ Objectives	Research Area	Child Protection Contact (CPC) vs. OHC	Administrative Data Source	Number of administrative datasets (Deterministic/ Probabilistic Linkage)	Linkage Quality (Yes/ No)
Parrish et al. (2011)	Australia	To assess the utility of combining PRAMS data with child protective services (CPS) records to identify risk factors associated with Protective Services Reports (PSR) suggestive of child maltreatment	Child protection	CPC	Alaska's Child Protective Services Agency Register	1 (Probabilistic)	Yes
Parrish et al. (2016)	USA	To determine the predictive relationship between a maternal pre-birth self-reported history of intimate partner violence (IPV) and any post-birth reported allegation to Child Protective Services (CPS) by age 2	Domestic violence	CPC	Alaska's Child Protective Services Agency Register	1 (Probabilistic)	No
Parrish et al. (2017)	USA	A description of the creation of the (ALCANLink) project and the benefit of the ALCANLink methodology by documenting the bias in incidence and hazard ratios that can arise in birth cohort linkage studies due to incomplete data linkages, non-linkage assumptions, and single source outcome ascertainment	Child protection	CPC	1. Vital records; 2. Child death review; 3. Alaska Permanent Fund Dividend (PFD) records	3 (Deterministic & Probabilistic)	Yes
Raghavan et al. (2012)	USA	To estimate the amount of Medicaid expenditures incurred from the purchase of psychotropic drugs – the primary drivers of mental health expenditures among children in the child welfare system	Health insurance	CPC	1. Medicaid Analytic eXtract (MAX) Research Data Assistance Centre; 2. Child Welfare Agency	1 (Deterministic & Probabilistic)	Yes
Raghavan et al. (2017)	USA	To quantify the magnitude of non-ascertainment bias, develop a profile of children who are at greatest risk for non-ascertainment.	Health insurance	OHC	1. Medicaid Analytic eXtract (MAX) Research Data Assistance Centre; 2. Child Welfare Agency	1 (Deterministic)	Yes
Sidebotham et al. (2000)	UK	A study of patterns of child abuse and factors that may affect risk in a pre-school population	Child protection	CPC	Avon Social Services Child Protection Register	1 (NR)	No
Sidebotham et al. (2002)	UK	To determine risk factors for child maltreatment within the socio-economic environment of a contemporary UK child population	Child protection	CPC	Avon Social Services Child Protection Register	1 (NR)	No

Author (Year)	Country	Aims/ Objectives	Research Area	Child Protection Contact (CPC) vs. OHC	Administrative Data Source	Number of administrative datasets (Deterministic/ Probabilistic Linkage)	Linkage Quality (Yes/ No)
Sidebotham et al. (2003)	UK	To determine characteristics of children that may predispose to maltreatment.	Child protection	CPC	Avon Social Services Child Protection Register	1 (NR)	No
Sidebotham et al. (2006)	UK	to analyse the multiple factors affecting risk of abuse in young children within a comprehensive theoretical framework	Child protection	CPC	Avon Social Services Child Protection Register	1 (NR)	No
Strathearn et al. (2009)	Australia	Explored whether breastfeeding may protect against maternally-perpetrated child maltreatment.	Child protection	CPC	Queensland Department of Families, Youth and Community Care (DFYCC)	1 (Deterministic)	No
Teyhan et al. (2019)	UK	To use record linkage of birth cohort and administrative data to study educational outcomes of children who are looked-after (in public care) and in need (social services involvement) and examine the role of early life factors.	Education	OHC	<ol style="list-style-type: none"> 1. Children Looked-After (CLA) Data Return; 2. Children in Need (CIN) Census; 3. National Pupil Database 	3 (NR)	No

Table 2

Characteristics of included studies cont.'

Author (Year)	Name of Longitudinal Study	Study Period	Sampling Method	Study Population				Waves in the study: (Age: sample size)	Wave reported: (Age: Sample Size)
				Age at Baseline	Year of birth	Gender-Males (%)	Cohort size at Baseline		
Abajobir et al. (2017)	The Mater-University Study of Pregnancy (MUSP)	1981-2004	NR	Birth	1981-1983	45%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 4 (14 years: n=NR); Wave 5 (21 years: n=3,322)
Abajobir et al. (2017)	The Mater-University Study of Pregnancy (MUSP)	1981-2004	NR	Birth	1981-1983	48%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 4 (14 years: n=NR); Wave 5 (21 years: n=2,526)
Abajobir et al. (2017)	The Mater-University Study of Pregnancy (MUSP)	1981-2004	NR	Birth	1981-1983	47%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth, n=7,223); Wave 3: 5 years; Wave 4 (14 years: n=NR); Wave 5 (21 years: n=3,752)
Abajobir et al. (2017)	The Mater-University Study of Pregnancy (MUSP)	1981-2004	NR	Birth	1981-1983	50%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth, n=7,223); Wave 3: (5 years: n=NR); Wave 4 (14 years: n=NR); Wave 5 (21 years: n=3,730)

Author (Year)	Name of Longitudinal Study	Study Period	Sampling Method	Study Population				Waves in the study: (Age: sample size)	Wave reported: (Age: Sample Size)
				Age at Baseline	Year of birth	Gender-Males (%)	Cohort size at Baseline		
Abajobir et al. (2017)	The Mater-University Study of Pregnancy (MUSP)	1981-2004	NR	Birth	1981-1983	47%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth, n=7,223); Wave 5: (21 years: n=3,750)
Austin et al. (2018)	Alaska Longitudinal Child Abuse and Neglect Linkage (ALCANLink) project & PRAMS	2009-2015	Stratified systematic sampling	Birth	2009-2011	51%	3,549	1990-2016 Cohorts: (Birth, n=1,000-3,000)	Wave 1 (Birth -5/6 years)
Austin et al. (2019)	Alaska Longitudinal Child Abuse and Neglect Linkage (ALCANLink) project & PRAMS	2009-2014	Stratified systematic sampling	Birth	2009-2011	(53% AN & 49% NN)	AN (1,257); NN (2,102)	1990-2016 Cohorts: (Birth, n=1,000-3,000)	Wave 1: (Birth -5/6 years)
Egulend et al. (2009)	Danish longitudinal survey of children (DALSC)	1995-2007	NR	Birth	1995	NR	1. Non-CPC (6,000); 2. OHC (1,072); 3. In-home care (1,457)	Wave 1, Baseline: (4 months, n=6,622); Wave 2: (3.5 years, n=6,622); Wave 3: (7 years, n=7,198); Wave 4: (11 years, n=8,225); Wave 5: (15 years, n=7,132)	Wave 4: (11 years, Non-welfare children n=5,242; OHC: n=433; In-home care: n=95)
Hansson et al. (2018)	Swedish longitudinal Evaluation Through Follow-up (ETF) project	1971-2001	Stratified systematic sampling	9 years	1972; 1977; 1982; 1987; 1992	NR	(4,500-12,000)* 5 Cohorts	1948 Cohort: (12 years, n=12,000); 1953 Cohort: (12 years, n=9,000); 1967 Cohort: (12 years, n=9,000); 1972 Cohort: (9 & 12 years, n=9,000); 1977 Cohort: (9 & 12 years, n=4,500); 1982 Cohort: (12 years, n=9,000); 1987 Cohort: (15 years, n=9,000); 1992 Cohort: (9 years, n=9,000)	Wave 1, Baseline (7 years; n=N/A); Wave 2: (9 years; Pooled Data from 5 Cohorts (non-OHC: n=40,107; OHC: n=1,482)

Author (Year)	Name of Longitudinal Study	Study Period	Sampling Method	Study Population				Waves in the study: (Age: sample size)	Wave reported: (Age: Sample Size)
				Age at Baseline	Year of birth	Gender-Males (%)	Cohort size at Baseline		
Hansson et al. (2020)	Swedish longitudinal Evaluation Through Follow-up (ETF) project	NR	Stratified systematic sampling	9 years	1972; 1977; 1982; 1987; 1992	NR	(4,500-12,000)* 5 Cohorts	1948 Cohort: (12 years, n=12,000); 1953 Cohort: (12 years, n=9,000); 1967 Cohort: (12 years, n=9,000); 1972 Cohort: (9 & 12 years, n=9,000); 1977 Cohort: (9 & 12 years, n=4,500); 1982 Cohort: (12 years, n=9,000); 1987 Cohort: (15 years, n=9,000); 1992 Cohort: (9 years, n=9,000)	Wave 2: (9 years, n=NR); Wave 3: (12 years, n=NR)
Kisely et al. (2018)	The Mater-University Study of Pregnancy (MUSP)	1981-2004	NR	Birth	1981-1983	53%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth, n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 5 (21 years: n=3,778)
Kisely et al. (2019)	The Mater-University Study of Pregnancy (MUSP)	1981-2004	NR	Birth	1981-1983	47%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth, n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth, n=7,223); Wave 4 (14 years: n=NR); Wave 5 (21 years: n=3,758 & subset n=2,548)
Kisely et al. (2020)	The Mater-University Study of Pregnancy (MUSP)	1981-2004	NR	Birth	1981-1983	47%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 5 (21 years: n=3,762)

Author (Year)	Name of Longitudinal Study	Study Period	Sampling Method	Study Population				Waves in the study: (Age: sample size)	Wave reported: (Age: Sample Size)
				Age at Baseline	Year of birth	Gender-Males (%)	Cohort size at Baseline		
Mills et al. (2013)	The Mater-University Study of Pregnancy (MUSP)	1981-2000	NR	Birth	1981-1983	52%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth, n=7,223); Wave 4: (14 years: n=5,172)
Mills et al. (2014)	The Mater-University Study of Pregnancy (MUSP)	1981-2000	NR	Birth	1981-1983	52%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 4: (14 years: n=5,200)
Mills et al. (2016)	The Mater-University Study of Pregnancy (MUSP)	1981-2004	NR	Birth	1981-1983	52%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth, n=7,223); Wave 5: (21 years: n=3,739)
Mills et al. (2017)	The Mater-University Study of Pregnancy (MUSP)	1981-2004	NR	Birth	1981-1983	47%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline (Mother and child dyads at birth: n=7,223); Wave 4: (14 years: n=NR); Wave 5: (21 years: n=3,778)

Author (Year)	Name of Longitudinal Study	Study Period	Sampling Method	Study Population				Waves in the study: (Age: sample size)	Wave reported: (Age: Sample Size)
				Age at Baseline	Year of birth	Gender-Males (%)	Cohort size at Baseline		
Mills et al. (2019)	The Mater-University Study of Pregnancy (MUSP)	1981-2004	NR	Birth	1981-1983	NR	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 5: (21 years: n=3,778)
Olsen et al. (2018)	Danish longitudinal survey of children (DALSC)	1995-2011	NR	Birth	1995	53%	907 OHC; 5,900 non-OHC	Wave 1, Baseline: (4 months, n=6,622); Wave 2: (3.5 years: n=6,622); Wave 3: (7 years: n=7,198); Wave 4: (11 years: n=8,225); Wave 5: (15 years: n=7,132); Wave 6: (18 years: n=5,139)	Wave 1, Baseline: (Birth, OHC: n=907, non-OHC: n=5,900); Wave 5: (15 years: OHC: n=169, non-OHC: n=4,568); Wave 6: (18 years: OHC: n=817, non-OHC: n=4,322)
Parrish et al. (2011)	Alaska Pregnancy Risk Assessment Monitoring System (PRAMS)	1997 - 2004	Stratified systematic sampling	Birth	1997-1999	48%	5, 421	1990-2016 Cohorts: (Annual sample sizes per state range from about 1000 to 3000 women)	Wave 1, Baseline (Birth: n=5,421); Wave 2: (48 months: n=4,217)
Parrish et al. (2016)	Alaska Pregnancy Risk Assessment Monitoring System (PRAMS)	2009-2014	Stratified systematic sampling	Birth	2009-2010	NR	2,389	1990-2016 Cohorts: (Annual sample sizes per state range from about 1000 to 3000 women)	Wave 1: (Birth-2 years: n=2,389)
Parrish et al. (2017)	Alaska Pregnancy Risk Assessment Monitoring System (PRAMS)	2009-2014	Stratified systematic sampling	Birth	2009-2011	NR	1,235	1990-2016 Cohorts: (Annual sample sizes per state range from about 1000 to 3000 women)	Wave 1: (Birth: n=1,235)
Raghavan et al. (2012)	National Survey of Child and Adolescent Well-Being (NSCAW)	1999 - 2003	NR	2 years	NR	48%	NSCAW (2,831); Matched child observations (2,821)	Wave 1: (Birth: n=6,228); Wave 2: (9 years: n=5,873); Wave 3: (14 years: n=NR)	Pooled (Wave 1-wave 4): n=5,652

Author (Year)	Name of Longitudinal Study	Study Period	Sampling Method	Study Population				Waves in the study: (Age: sample size)	Wave reported: (Age: Sample Size)
				Age at Baseline	Year of birth	Gender-Males (%)	Cohort size at Baseline		
Raghavan et al. (2017)	National Survey of Child and Adolescent Well-Being (NSCAW)	1999-2003	NR	NR	NR	NR	Child Protection Contact (CPC) (5,501); Long term foster care placement (LTFC) (727)	Wave 1: (Birth: n=6,228); Wave 2: (9 years: n=5,873); Wave 3: (14 years: n=NR)	Pooled (Wave 1-wave 3) sample: (CPS: n=2,309, LTFC: n=423)
Sidebotham et al. (2000)	The Avon Longitudinal Study of Parents and Children (ALSPAC)	1991-1998	NR	Pre-birth	1991-1992	NR	14,451	Wave 1: (Pre-birth: n=14,893); Wave 2: (1 month: n=14,256); Wave 3: (6-8 months: n=11,194, Partner=6,861); Wave 4: (18 months: n=10,750); Wave 5: (21 months: n = 10,323); Wave 6: (30 months: n = 10,289); Wave 7: (33 months: n= 9,635)	Wave 3: (8 months, n=11,194, Partner: n=6,861); Wave 4: (18 months, n=10,750); Wave 5: (21 months, n=10,323); Wave 6: (30 months, n=10,289); Wave 7: (33 months, n=9,635)
Sidebotham et al. (2002)	The Avon Longitudinal Study of Parents and Children (ALSPAC)	1991-1998	NR	Pre-birth	1991-1992	52%	14,256	Wave 1: (Pre-birth: n=14,893); Wave 2: (1 month: n=14,256); Wave 3: (6-8 months: n=11,194, Partner=6,861); Wave 4: (18 months: n=10,750); Wave 5: (21 months: n=10,323); Wave 6: (30 months: n=10,289); Wave 7: (33 months: n=9,635)	Wave 2: (One month: n=14,256); Wave 3: (8 months: n=11,194); Wave 5: (21 months: n=10,323); Wave 7: (33 months: n=9,635)
Sidebotham et al. (2003)	The Avon Longitudinal Study of Parents and Children (ALSPAC)	1991-1998	NR	1 month	1991-1992	(56% registered & 52% non-registered)	14,256	Wave 1: (Pre-birth: n=14,893); Wave 2: (1 month: n=14,256); Wave 3: (6-8 months: n=11,194, Partner=6,861); Wave 4: (18 months: n=10,750); Wave 5: (21 months: n = 10,323); Wave 6: (30 months: n = 10,289); Wave 7: (33 months: n= 9,635)	Wave 2: (1 month, n=14,256); Wave 6: (30 months, n=115 registered vs n=14,105 non-registered children)

Author (Year)	Name of Longitudinal Study	Study Period	Sampling Method	Study Population				Waves in the study: (Age: sample size)	Wave reported: (Age: Sample Size)
				Age at Baseline	Year of birth	Gender-Males (%)	Cohort size at Baseline		
Sidebotham et al. (2006)	The Avon Longitudinal Study of Parents and Children (ALSPAC)	1991-1998	NR	Pre-birth	1991-1992	NR	14,256	Wave 1: (Pre-birth: n=14,893); Wave 2: (1 month: n=14,256); Wave 3: (6-8 months: n=11,194, Partner=6,861); Wave 4: (18 months: n=10,750); Wave 5: (21 months: n=10,323); Wave 6: (30 months: n=10,289); Wave 7: (33 months: n=9,635)	Wave 2: (One month: n=14,256); Wave 7: (36 months: n=NR)
Strathean et al. (2009)	The Mater-University Study of Pregnancy (MUSP)	1981-2000	NR	Birth	1981-1983	52%	7,223 Mother & Child pairs	Wave 1, Baseline: (Mother and child dyads at birth: n=7,223); Wave 2: (6 months: n=6,720); Wave 3: (5 years: n=5,308); Wave 4: (14 years: n=5,216); Wave 5: (21 years: n=3,805); Wave 6: (30 years: n=2,904)	Wave 1, Baseline: (Mother and child dyads at birth, n=7,223); Wave 2: (6 months: n=6,621); Wave 4: (15 years: n=5,890)
Teyhan et al. (2019)	The Avon Longitudinal Study of Parents and Children (ALSPAC)	1991-2009	NR	Pre-birth	1991-1992	(50% (No CLA/CIN); 48% CIN; 51% CLA)	14,868	Wave 1: (Pre-birth: n=14,893); Wave 2: (1 month: n=14,256); Wave 3: (6-8 months: n=11,194, Partner=6,861); Wave 4: (18 months: n=10,750); Wave 5: (21 months: n=10,323); Wave 6: (30 months: n=10,289); Wave 7: (33 months: n=9,635)	Wave 3: (1 year: n=13,988); Wave 8: (7-18 years, Booster: n=718); Wave 9: (>18 years, Booster: n=183)

Table 2

Characteristics of included studies cont.'

Author (Year)	Timeframe between reported waves (months)	Outcome Measures		Missing data (Yes/No)	Attrition rate	Described attrition (Yes/No)	Corrected attrition (Yes/No)	Attrition analysis (Yes/No)	Selection bias (Yes/No)	Sensitivity analysis (Yes/No)
		Standardized	Non-standardized							
Abajobir et al. (2017)	(Waves 1 - 2 = 6 months); (Waves 2 - 3 = 54 months); (Waves 3 - 4 = 108 months); (Waves 4 - 5 = 84 months)	1. Composed abuse scale (CAS) 2. Child Behaviour Checklist (CBCL) 3. Life events scale; 4. Conflict tactics scale	None	Yes	54%	Yes	Yes	Yes	No	Yes
Abajobir et al. (2017)	(Waves 1 - 2 = 6 months); (Waves 2 - 3 = 54 months); (Waves 3 - 4 = 108 months); (Waves 4 - 5 = 84 months)	WHO (CIDI-DSM-IV) scale for Lifetime cannabis abuse and dependence	Early age of onset of cannabis abuse	Yes	65%	Yes	Yes	Yes	Yes	No
Abajobir et al. (2017)	(Waves 1 - 2 = 6 months); (Waves 2 - 3 = 54 months); (Waves 3 - 4 = 108 months); (Waves 4 - 5 = 84 months)	1. Achenbach's YASR Behaviour Checklist (Auditory & Visual Hallucinations); 2. Peter's Delusional Inventory (PDI); 3. WHO (CIDI-DSM-IV) scale for diagnoses of psychosis	None	Yes	48%	Yes	Yes	Yes	Yes	Yes
Abajobir et al. (2017)	(Waves 1 - 2 = 6 months); (Waves 2 - 3 = 54 months); (Waves 3 - 4 = 108 months); (Waves 4 - 5 = 84 months)	1. Achenbach's Young Adult Self-Report (YASR) Behaviour Checklist (4 items); 2. Centre for Epidemiological Studies Depression Scale (CES-D)	QoL Self Report (Happy/Satisfaction scales)	Yes	48%	Yes	Yes	Yes	No	No
Abajobir et al. (2017)	(Waves 1 - 5 = 252 months)	Depression: Delusions-Symptoms-States Inventory scale (DSSI)	Ever injected illicit drugs	Yes	48%	Yes	Yes	Yes	Yes	Yes
Austin et al. (2018)	Wave 1 (5/6 years)	None	Age at first CP contact	Yes	NR	No	No	No	No	Yes
Austin et al. (2019)	Wave 1 (5/6 years)	None	Child Protective Service Contact	Yes	NR	No	No	No	No	No
Egelund et al. (2009)	36 months	1. Strengths and Difficulties screening (SDQ) for mental health 2. ICD-10 Psychiatric diagnosis	1. School performance and satisfaction; 2. Leisure activities	Yes	NR	Yes	Yes	No	No	No

Author (Year)	Timeframe between reported waves (months)	Outcome Measures		Missing data (Yes/No)	Attrition rate	Described attrition (Yes/No)	Corrected attrition (Yes/No)	Attrition analysis (Yes/No)	Selection bias (Yes/No)	Sensitivity analysis (Yes/No)
		Standardized	Non-standardized							
Hansson et al. (2018)	Waves 1 - 2=24 months	Cognitive Test Scores	Academic achievement	Yes	NR	No	Yes	No	Yes	No
Hansson et al. (2020)	Waves 2 - 3=36 months	None	Cognitive ability	Yes	NR	No	No	No	No	No
Kisely et al. (2018)	(Waves 1 - 5 = 252 months)	1. Centre for Epidemiological Studies-Depression scales (CES-D) 2. Achenbach Youth Self-Report (YASR) scale; 3. WHO (CIDI-DSM-IV) scale	None	Yes	48%	Yes	Yes	Yes	No	Yes
Kisely et al. (2019)	(Waves 1 - 4 = 168 months); Waves 4 - 5 = 84 months)	1. WHO (CIDI-DSM-IV) scale for Nicotine use, dependence & withdrawal; 2. Depression (CES-D) scale	1. Prevalence of smoking; 2. Persistent smoking	Yes	48%	Yes	Yes	Yes	No	Yes
Kisely et al. (2020)	(Waves 1 - 5 = 252 months)	WHO (CIDI-DSM-IV) scale for alcohol use and dependence	Alcohol use in the last month	Yes	48%	Yes	Yes	Yes	No	No
Mills et al. (2013)	(Waves 1 - 4 = 168 months)	Achenbach Youth Self-Report (YSR) questionnaires	None	Yes	28%	Yes	No	Yes	No	Yes
Mills et al. (2014)	(Waves 1 - 4 = 168 months)	None	1. Smoking status; 2. Alcohol use	Yes	28%	Yes	No	Yes	No	Yes
Mills et al. (2016)	(Waves 1 - 5 = 252 months)	WHO (CIDI-DSM-IV) scale for psychological outcomes at age 21	None	Yes	48%	Yes	Yes	Yes	No	Yes
Mills et al. (2017)	(Waves 1 - 5 = 252 months)	1. WHO (CIDI-DSM-IV) scale for Cannabis use/ dependence; 2. Achenbach Child Behaviour Checklist (CBCL); 3. Delusions-Symptoms-States Inventory (DSSI)	Self-report	Yes	48%	Yes	No	No	No	No
Mills et al. (2019)	(Waves 1 - 5 = 252 months)	Peabody Picture Vocabulary Test (PPVT)	1. Failure to complete high school; 2. Failure to be employed or education at 21 years	No	48%	Yes	No	No	No	No
Olsen et al. (2018)	(Waves 1 - 2 = 180 months); Waves 2 - 3 = 36 months)	None	1. Self-perceived academic ability (SAA) 2. Staying-on rates	Yes	NR	Yes	No	Yes	No	No
Parrish et al. (2011)	(Waves 1 - 2= 48 months)	None	Protective service report	No	22%	No	No	No	No	No
Parrish et al. (2016)	N/A	None	Maltreatment report to Child Protective Services	Yes	N/A	No	No	No	No	Yes

Author (Year)	Timeframe between reported waves (months)	Outcome Measures		Missing data (Yes/No)	Attrition rate	Described attrition (Yes/No)	Corrected attrition (Yes/No)	Attrition analysis (Yes/No)	Selection bias (Yes/No)	Sensitivity analysis (Yes/No)
		Standardized	Non-standardized							
Parrish et al. (2017)	N/A	None	Child maltreatment	Yes	NR	Yes	Yes	Yes	Yes	No
Raghavan et al. (2012)	Wave 1- Wave 4 = 48 months	Internalizing or externalizing scales of the CBCL	1. Non-zero Medicaid expenditures in a calendar year; 2. Mean total annual Medicaid expenditure per child	No	NR	No	No	No	No	Yes
Raghavan et al. (2017)	Wave 1- Wave 3 = 36 months	None	Ascertainment of foster care status	Yes	NR	No	No	No	Yes	No
Sidebotham et al. (2000)	(Waves 3 - 4 = 10 months); (Waves 4 - 5 = 3 months); (Waves 5 - 6 = 9 months); (Waves 6 - 7 = 3 months)	None	Child abuse investigations and registrations	No	NR	No	No	No	No	No
Sidebotham et al. (2002)	(Waves 2 - 3 = 7 months); (Waves 3 - 5 = 13 months); (Waves 5 - 7 = 12 months)	None	Child abuse registration	Yes	NR	No	No	No	Yes	No
Sidebotham et al. (2003)	(Waves 2 - 6 = 29 months)	None	Child protection registration	Yes	NR	Yes	No	No	Yes	No
Sidebotham et al. (2006)	Wave 2 - 7: 35 months	None	1. Investigation for suspected maltreatment; 2. Registration on the child protection register	Yes	NR	Yes	No	No	Yes	No
Strathearn et al. (2009)	(Waves 1 - 3 = 6 months); Waves 3 - 4 = 174 months)	Depression: Delusions-Symptoms-States Inventory scale (DSSI)	Child maltreatment	Yes	18%	Yes	Yes	Yes	Yes	Yes
Teyhan et al. (2019)	(Waves 3 - 8 = 84 months); (Waves 8-9 = 132 months)	None	1. Educational attainment; 2. Persistent absence from school; 3. Special educational needs (SEN) status; 4. School Mobility	Yes	NR	No	No	No	No	Yes

Table 2 Notes

CIDI	Composite International Diagnostic Interview
CPC	Child Protection Contact
CPS	Child Protective Services
CSA	Child Sexual Abuse
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4th edition
DVSA	Domestic violence and sexual assault;
IPV	Intimate Partner Violence
LTFC	Long Term Foster Care
N/A	Not Applicable
NR	Not Reported
OHC	Out-of-home care
SDQ	Strength and Difficulties Questionnaire
WHO	World Health Organisation
YASR	Young Adult Self Report

Biases Reported

There are several biases which commonly occur in longitudinal studies (Olsen & de Montgomery, 2018). However, for the purposes of this review we report on three of the most common occurring biases, attrition, missing data and selection bias.

Missing data. Incomplete data is common in longitudinal research, as reflected in this review where missing data were reported in 87% of the studies (Table 3). In the past, three traditional mechanisms of missing data were reported (Ibrahim & Molenberghs, 2009) . When missingness is unrelated to the data, this is termed missing completely at random (MCAR), while if the probability of missing data on a variable is unrelated to the value of that variable itself but may be related to the values of other variables in the dataset this is referred to as missing at random (MAR). A mechanism which should not be ignored in longitudinal analysis is termed missing not at random (MNAR) (Ibrahim & Molenberghs, 2009; Liu, 2016). This refers to missingness that is contingent on the unobserved data, as reported in studies where there was an over-representation of children exposed to child protection agencies with missing data resulting in over-estimation of outcomes in this group compared to the general population (Hansson & Gustafsson, 2020; Hansson et al., 2018) and also missing data due to attrition.

Studies in this review reported missing data on certain covariates (MCAR) such as child maltreatment, parental race, paternal income and education and breastfeeding status (Austin et al., 2019; Mills et al., 2013; Olsen & de Montgomery, 2018; Parrish et al., 2016; Sidebotham & Heron, 2003, 2006; Sidebotham et al., 2002; Strathearn et al., 2009). Missing data were also reported on outcome variables such as those from the Strengths and Difficulties Questionnaire (Egelund & Lausten, 2009). There are a range of simple to more sophisticated analytical methods of handling missing data that can be applied to reduce bias in reported outcomes. The simplest method reported was listwise deletion (Kisely et al.,

2020; Abajobir et al., 2017; Kisely et al., 2018; Kisely et al., 2020; Mills et al., 2016; Mills et al., 2017) and including missing data as a separate category for each covariate in regression analysis (Missing Indicator Method) (Olsen & de Montgomery, 2018; Parrish et al., 2016; Sidebotham & Heron, 2003, 2006; Sidebotham et al., 2002; Strathearn et al., 2009). Sophisticated methods included multiple imputation using Markov chain iterative regression methods (MCMC) (Parrish et al., 2016), multiple imputation using chained equations (MICE) (Teyhan et al., 2019), and multiple imputation using the fully conditional specification (FCS) method (Austin et al., 2018) (SI Table iii).

Attrition. Attrition is a type of missingness that can occur in longitudinal studies, typically due to loss to follow-up, death, emigration or non-return of a survey and withdrawal from the study (Cameron et al., 2017). Attrition rates were reported for 53% of the studies, ranging from 18% to 65% (Table 3). Even though the attrition rate was not mentioned in almost half of the studies, attrition was described for 63% of all studies. The review identified attrition as occurring due to loss of follow-up or differential attrition occurring among families with reported cases of substantiated maltreatment, those from higher socio-economic disadvantaged backgrounds and among males and indigenous people (particularly among MUSP studies) (Abajobir et al., 2017; Williams et al., 2017; Abajobir et al., 2017; Najman et al., 2017; Kisely et al., 2018; Mills et al., 2014; Mills et al., 2016; Mills et al., 2017, 2019). Other attrition reported was death or early infant loss (Olsen & de Montgomery, 2018; Parrish et al., 2017; Sidebotham & Heron, 2003, 2006), non-response (Olsen & de Montgomery, 2018) and emigration (Olsen & de Montgomery, 2018; Parrish et al., 2017).

Forty seven percent (47%) of all studies mentioned that they conducted some attrition analysis, while 40% reported some methods of correcting attrition loss. While these methods were described in the studies, the analysis output was not shown for all studies. Attrition analysis was conducted to determine if there would be any significant differences in

outcomes among participants lost to follow up and those remaining in the study. The main methods of correcting for attrition were inverse probability weighting (Abajobir et al., 2017, Williams et al., 2017; Abajobir et al., 2017; Kisely et al., 2020; Scott et al., 2017; Abajobir et al., 2017; Kisely et al., 2020; Williams et al., 2017; Abajobir et al., 2017; Najman et al., 2017; Kisely et al., 2020; Strathearn et al., 2009) and propensity score analysis (Kisely et al., 2018; Kisely et al., 2020; Mills et al., 2020; Mills et al., 2016), while no specific method was described in some studies (Egelund & Lausten, 2009). Inverse probability weighting was conducted to the analysis of subjects remaining in the cohort to adjust for loss to follow up to the included subjects to restore the representation of subjects. Propensity score analysis was conducted to determine the impact of differential attrition by inclusion of a weighted variable which takes account of baseline covariates.

Selection bias. Selection bias occurs when there is a systematic difference between those who participate in the study and those who do not (affecting generalisability) (Haine et al., 2018; Henderson & Page, 2007). Selection bias was reported for 33% of the studies (Table 3). Selection bias may result in over-estimation of outcomes among young people exposed to child protection compared with young people in the general population (Hansson et al., 2018). Restricting the study to certain population groups which may not be representative of the entire population of interest may lead to selection bias (Parrish et al., 2017; Raghavan et al., 2017). In addition, selection bias also occurs if a population of interest possesses certain unique characteristics giving them a higher chance of recruitment to a study compared to the population without those characteristics (Sidebotham & Heron, 2003, 2006; Sidebotham et al., 2002). Some authors reported conducting weighted analysis in order to account for potential selection bias (Abajobir et al., 2017; Scott, et al., 2017; Abajobir et al., 2017; Najman, et al., 2017).

Sensitivity Analysis. Sensitivity analysis is conducted to determine if small changes in exposure or confounding variables alter the significance of reported outcomes in situations where there could be potential measurement errors (Böhler et al., 2013). Sensitivity analysis was reported for 43% of the studies, but only eight out of the thirteen studies reported the actual method of analysis conducted. Sensitivity analysis was conducted through modifying some covariates, such as child maltreatment, by expanding the definition to include or exclude notified or suspect cases of maltreatment and through measuring multiple forms versus a single form of abuse (Abajobir, Kisely, Williams, et al., 2017; Abajobir, Kisely, Williams, et al., 2017; Kisely et al., 2020; Kisely et al., 2018; Mills et al., 2013; Strathearn et al., 2009).

Other authors also reported restricting the analysis to groups of people with certain characteristics (Teyhan et al., 2019) or adding (Parrish et al., 2016) or removing (Strathearn et al., 2009) one or more covariates to the analysis in order to reduce bias. Addition of covariates at subsequent waves resulted in either strengthening, weakening or no change to the effect sizes in some studies (Austin et al., 2018). The main sensitivity analysis methods presented in the eight studies were logistic regression (Abajobir et al., 2017; Williams et al., 2017; Kisely et al., 2020; Kisely et al., 2018; Mills et al., 2014; Mills et al., 2016; Strathearn et al., 2009; Teyhan et al., 2019) and multiple regression analysis (Mills et al., 2013) controlling for known confounders and effect modifiers (SI Table iii).

Table 3*Biases Reported*

Type of Bias	N (Number of studies)	%
Missing data	26	87%
Attrition rate	-	18 - 65%
Described attrition	19	63%
Corrected attrition	12	40%
Analysis of attrition	14	47%
Selection bias	10	33%
Sensitivity Analysis	13	43%

Statistical Methods

There were two groups of statistical methods identified in the study. These included data preparation methods and the main statistical analysis method reported.

Data Preparation Methods. Most authors conducted some preliminary data preparation, descriptive or bivariate analysis to address missing data and identify significant covariates to include as confounders in final in multivariate models. Multiple data preparation methods were described and ranged from descriptive statistics to bivariate and simple regression analysis (SI Table iii). In addition, multiple imputation, data weighting and propensity analysis procedures were applied to correct for missing data. Some authors did not provide full details of the analytical methods used to correct for missing data. Common descriptive parameters were frequencies, percentages, means, incidence rates and population attributable risk. Chi-square tests (53%) were also commonly reported as a method to determine association of confounders and outcome variables. Other methods included two-sample *t*-tests (13%), correlation analysis (7%) and to a lesser extent, concordance analysis (3%), logistic regression (3%), and cumulative risk factor analysis (3%).

Main Analytical Method. The main method of analysis for each study was identified. These are shown in Table 4. The main analytical method reported by most studies was logistic regression (63%) followed by multiple regression methods (10%). Logistic regression

methods were used for analysing risk factors and associated outcomes, attrition analysis and sensitivity analysis. Advanced analytical methods included generalised linear models (GLM) (Raghavan et al., 2012), multinomial logistic regression using Vermunt's three step Latent Class Analysis approach and Growth Mixture Modelling (Austin et al., 2019), and survival analysis using Kaplan-Meier, Cox (proportional hazards) regression and Nelson-Aalen Estimation methods (Austin et al., 2018; Parrish et al., 2017). A few studies used a combination of methods, where in most cases logistic regression was included as one of the main methods (Mills et al., 2019; Olsen & de Montgomery, 2018; Parrish et al., 2017; Teyhan et al., 2019). Only one study reported descriptive statistics as their main method of analysis (Sidebotham, 2000).

The main outcomes evaluated in the studies were standardised and self-reported measures from the main research areas reported in Table 5. There were some notable similarities of reported confounding variables across all studies and most of them (93%) used individual and family characteristics as confounders. These included early childhood experiences, socio-demographic variables, pre-natal exposure and parental (mostly maternal) risk factors. Five studies reported on potential mediating variables, these included school mobility (Hansson et al., 2018; Olsen & de Montgomery, 2018), parenting age, education, psychiatric history and poverty (Sidebotham & Heron, 2006), gender (Abajobir, Najman, et al., 2017), young people's income, education, marital status, neighbourhood characteristics (Kisely et al., 2018), smoking and alcohol use (Kisely et al., 2020; Mills et al., 2014), receipt of social welfare, education and marital status (Abajobir, Kisely, Williams, et al., 2017), race and receipt of public aid (Parrish et al., 2011). One study (Parrish et al., 2016) found that parenting and social stress did not moderate the relationship between intimate partner violence and maltreatment. One study reported (Mills et al., 2016) the following as potential mediating variables: receipt of social welfare, the young person's educational achievement,

and the young person's marital status. Only three studies (Austin et al., 2019; Hansson & Gustafsson, 2020; Olsen & de Montgomery, 2018) reported some assumptions of statistical tests such as tests for normality and homogeneity in variances before conducting data analysis.

Table 4

Main Statistical Method

Author	Domain & Analysis Procedure	Statistical parameters	Assumption test	Independent Variables	Mediation and Moderating Variables
Abajobir et al. (2017)	<u>Regression Analysis</u> Logistic Regression	Prevalence, Odds ratios, p-values, 95% CI	NR	Individual, family	NR
Abajobir et al. (2017)	<u>Regression Analysis</u> Logistic Regression	Prevalence, Odds ratios, p-values, 95% CI.	NR	Individual, family	NR
Abajobir et al. (2017)	<u>Regression Analysis</u> Logistic Regression	Prevalence, Odds ratios, p-values, 95% CI.	NR	Individual, family, community	NR
Abajobir et al. (2017)	<u>Regression Analysis</u> Logistic Regression	Prevalence, Odds ratios, p-values, 95% CI.	NR	Individual, family	<u>Mediating:</u> Gender
Abajobir et al. (2017)	<u>Regression Analysis</u> Logistic Regression	Prevalence, Odds ratios, p-values, 95% CI.	NR	Individual, family	<u>Mediating:</u> Gender
Austin et al. (2019)	<u>Advanced Regression Analysis</u> 1. Multinomial logistic regression 2. Growth Mixture Modelling	1. Trajectory class probabilities 2. Lo-Mendell-Rubin Adjusted Likelihood Ratio test, P-value	Yes	Individual, family	NR
Austin et al. (2018)	<u>Survival Analysis</u> 1. Kaplan-Meier method 2. Cox (proportional hazards) regression.	1. Cumulative incidence proportion 2. 95% CI, Hazard ratios, p-values	NR	Individual, family	NR
Egelund et al. (2009)	<u>Regression Analysis</u> Logistic Regression	Odds ratios, 5% significance level	NR	Individual, family	NR
Hansson et al. (2018)	<u>Regression Analysis</u> Multiple Regression Analysis	Beta, standard errors, t-statistic, significance level	NR	Individual, family	<u>Mediating:</u> School change
Hansson et al. (2020)	<u>Regression Analysis</u> Multiple Regression Analysis	Standard errors, t-statistic, p-values, 95% CI	Yes	Individual, family	NR
Kisely et al. (2018)	<u>Regression Analysis</u> Logistic Regression	Odds ratios, 95% CIs, p-values	NR	Individual, family, community	<u>Mediating:</u> Income, education, Marital status, Characteristics of neighbourhood
Kisely et al. (2019)	<u>Regression Analysis</u> Logistic Regression	Odds ratios, 95% CIs, p-values	NR	Individual, family	<u>Mediating:</u> Alcohol use and depression

Author	Domain & Analysis Procedure	Statistical parameters	Assumption test	Independent Variables	Mediation and Moderating Variables
Kisely et al. (2020)	<u>Regression Analysis</u> Logistic Regression	Odds ratios, 95% CIs, p-values	NR	Individual, family, community	NR
Mills et al. (2013)	<u>Regression Analysis</u> Multiple Regression Analysis	Mean differences in internalizing and externalizing scores, regression coefficients, 95% CI	NR	Individual, family	NR
Mills et al. (2014)	<u>Regression Analysis</u> Logistic Regression	Odds ratios, 95% CI, p-values	NR	Individual, family	<u>Mediating:</u> Smoking & alcohol use at 14 year follow-up
Mills et al. (2016)	<u>Regression Analysis</u> Logistic Regression	Odds ratios, 95% CI, p-values	NR	Individual, family	NR
Mills et al. (2017)	<u>Regression Analysis</u> Logistic Regression	Odds ratio, 95% CI, p-values	NR	Individual, family	NR
Mills et al. (2019)	<u>Regression Analysis</u> 1. Multiple Regression Analysis 2. Logistic Regression	1. Frequencies, percentages, mean scores, standard deviation, Population Attributable Risk (PAR%), Unstandardised regression coefficients, 95% CI, p-values; 2. Odds ratio, 95% CI, p-values	NR	Individual, family	NR
Olsen et al. (2018)	<u>Regression Analysis</u> Multiple Regression Analysis & Linear Probability Model	Unstandardized beta, P-values, adjusted R-squared, standard errors, Significance testing p values (95%, 99%, and 90%)	NR	Individual, family	<u>Mediating:</u> School change
Parrish et al. (2011)	<u>Regression Analysis</u> Logistic Regression	Beta coefficient, standard errors, Wald F statistic, p-values, 95% CI, Odds ratio	NR	Individual, family	<u>Mediating</u> Public aid, race
Parrish et al. (2016)	<u>Regression Analysis</u> Logistic Regression	Frequencies, percentages, odds ratios, 95% CI	NR	Individual, family	<u>Moderating:</u> Parenting and social stress
Parrish et al. (2017)	1. <u>Regression Analysis</u> Logistic Regression 2. <u>Survival Analysis</u> Nelson-Aalen Estimation	1. Odds ratios, confidence intervals, p-values; 2. Weighted Aalen hazard-based estimation, incidence proportion, frequency counts, weighted proportions, Hazard ratios, 95% CI, p-values	NR	Individual, family	NR
Raghavan et al. (2012)	<u>Regression Analysis</u> 1. Logistic Regression 2. Generalized linear model(GLM)	1. Odds ratios, 95% CI, p-value; 2. GLM coefficients, 95% CI, p-value	NR	Individual	NR
Raghavan et al. (2017)	<u>Regression Analysis</u> Logistic Regression	Odds ratios, standard errors, p-values	NR	Individual	NR

Author	Domain & Analysis Procedure	Statistical parameters	Assumption test	Independent Variables	Mediation and Moderating Variables
Sidebotham et al. (2000)	Descriptive Analysis	Frequencies, Percentages, Incidence rate/ 10,000 children	N/A	Individual, family	N/A
Sidebotham et al. (2002)	<u>Regression Analysis</u> Logistic Regression	Odds ratios, 95% CIs	NR	Individual, family	NR
Sidebotham et al. (2003)	<u>Regression Analysis</u> Logistic Regression	Odds ratios, standard errors, p-values	NR	Individual, family	NR
Sidebotham et al. (2006)	<u>Regression Analysis</u> Logistic Regression	Odds ratios, 95% CIs, p-values	NR	Individual, family, community	<u>Mediating:</u> Age at parenting, education, psychiatric history, poverty
Strathearn et al. (2009)	<u>Regression Analysis</u> Logistic Regression	Prevalence, Odds ratios, p-values, 95% CI.	NR	Individual, family	NR
Teyhan et al. (2019)	<u>Regression Analysis</u> Multilevel regression analysis (Linear and logistic regression models)	Odds ratios, 95% CIs, p-values	NR	Individual, family, community	NR

Table 4 Notes

CPS	Child Protective Services
CI	Confidence Interval
LTFC	Long Term Foster care
DVSA	Domestic violence and sexual assault
N/A	Not Applicable
NR	Not Reported
PPVT	Peabody Picture Vocabulary Test

Table 5

Study Description

Author	Sample Size	Confounders	Outcome
Abajobir et al. (2017)	Total (3,752)	Youth gender, ADHD at 5 year, alcohol use, smoking, aggressive behaviour (at 14 years), receiving benefits, educational levels, marital status, residential problem area at 21 years, familial income over the first 5 years, chronic stress over first 6 months, and maternal reports of violence in homes at 14 years, any abuse, sexual abuse, physical abuse, emotional abuse, neglect	1. Auditory hallucinations 2. Visual hallucinations 3. Peter’s Delusional Inventory (PDI) 4. DSM-IV Psychosis
Abajobir et al. (2017)	Total (3,730)	Child maltreatment, maternal age at first clinic visit, family income at first clinic visit, gender at birth, educational status, receipt of social security benefits and depressive symptoms at 21-year follow-up	Quality of Life Index Score
Abajobir et al. (2017)	Total (3,322)	Substantiated child maltreatment, sex at birth, receipt of social security benefits, educational level, marital status and residential problem area at 21-year, aggressive child behaviour, maternal poverty level, maternal marital stability, maternal stress, maternal negative life events, family violence	Intimate partner violence victimization
Abajobir et al. (2017)	Total (2,526)	Any maltreatment, sexual abuse, physical abuse, neglect, emotional abuse, age at substantiation, frequency of substantiation, maternal age at pregnancy, maternal prenatal and postnatal cigarette smoking, family poverty, educational level, marital status, gender at birth	Cannabis abuse, dependence, early age of onset of cannabis abuse and dependence
Abajobir et al. (2017)	Total (3,750)	Any maltreatment, sexual abuse, physical abuse, neglect, emotional abuse, receiving social security benefits, educational level, marital status at 21 years and paternal or maternal race at pregnancy, maternal alcohol use at 3–6 months and chronic depressive symptoms	Injecting drug use
Austin et al. (2019)	1. AN(1,253); 2. NN (2,094)	Maternal age and education at childbirth, preconception and prenatal substance use, and experiences of emotional, traumatic, partner, and financial stress in the 12 months prior to childbirth	Longitudinal trajectory classes of CPS contact
Austin et al. (2018)	Total (3,549)	Maternal race, maternal age, maternal education, maternal marital status, residence at childbirth, number of living children, maternal history of pregnancy terminations, pregnancy intendedness, timing of prenatal care, number of stressful live events, maternal experience of intimate partner violence (IPV), maternal alcohol use, maternal smoking during pregnancy, maternal marijuana use, socioeconomic status, infant sex, infant birth defects	Age at first CP contact
Egelund et al. (2009)	1. OHC (1,072); 2. In-home care (1,457); 3. Non- Child Protection Contacts (71,321)	All Children, Children in out-of-home care, In-home care children, non-welfare children, number of siblings, Danish born children, Mother's age, teenage mothers, single mothers, mother's education, mother's employment status, mother/ father died, mother/ father with a psychiatric illness, mother/ father substance abuse problem, mother/ father previously convicted, mother/ father in care as children	Clinical diagnosis of psychiatric illnesses
Hansson et al. (2018)	1. Non-OHC (40,107); 2. OHC (1,482)	Gender, migration, parents' education, OHC vs Non-OHC, relocations	1. Cognitive Ability Test Level; 2. Special Needs Education
Hansson et al. (2020)	1. OHC (1,099); 2. Non OHC(30, 936)	Gender, migration, parents' education, school relocations, Cognsum	Academic achievement
Kisely et al. (2018)	1. YASR(3,725); 2. CIDI-Auto (2,508); 3. CES-D (3,778)	Gender of the child; parental ethnicity; maternal age; mother’s relationship status; family income at the time of study entry (first prenatal visit) and maternal education status at study entry, overall child maltreatment, emotional, physical, sexual abuse, neglect.	1. YASR (Internalising & Externalising);

Author	Sample Size	Confounders	Outcome
			2. CIDI, DSM-IV (Depression, Anxiety, PTSD) 3. CES-D
Kisely et al. (2020)	1. Alcohol use in the last month (3,762); 2. Alcohol use disorder (2,531)	First prenatal visit (Race, maternal age, mother's education, marital status and family income) and at 21-year follow up (employment, marital status, educational level and residence in a problem area), childhood maltreatment	1. Alcohol use in the last month; 2. CIDI DSM-IV Alcohol use disorder
Kisely et al. (2019)	1. Smoking status (3,758); 2. Nicotine use dependence (2,548); 3. Propensity Analysis (7,223)	Gender of the child, parental race, maternal age, mother's relationship status, family income at study entry (first prenatal visit), maternal smoking, and maternal education at study entry, childhood maltreatment	1. Cigarette smoking; 2. Any cigarette use; 3. Long-term cigarette use; 4. CIDI-Auto (12-month Nicotine use disorder)
Mills et al. (2013)	Total (5,098)	Notified and substantiated maltreatment, type of maltreatment (exclusive; hierarchical scheme), gender, race, During pregnancy (maternal age, marital status, maternal education) family income prior to birth	Internalizing and externalizing scales of the Youth Self Report (YSR)
Mills et al. (2014)	1. Any alcohol use (5,153); 2. Any smoking (5,154)	Maltreatment notification, type of maltreatment, Family income, maternal alcohol use and maternal smoking (14y follow-up); maternal education and marital status (prenatal); and race, age, and gender.	1. Alcohol use; 2. Smoking
Mills et al. (2016)	1. Major depressive disorder (2,304); 2. Anxiety disorder (2,298); 3. PTSD(2,292)	Self-reported CSA, Agency-notified CSA, Agency-substantiated CSA, gender, parental race, maternal age, maternal relationship status, family income, and maternal education	1. Major depressive disorder; 2. Anxiety disorder; 3. PTSD
Mills et al. (2017)	Total (3,778)	Age, gender, race, family income, and maternal age, education, marital status, alcohol use, smoking, anxiety and depression, maltreatment type, additional adjustment for youth smoking and alcohol use at 14-year follow-up, youth internalizing and externalizing scale	Cannabis use/ dependence
Mills et al. (2019)	1. Peabody Vocabulary Test (2,150); 2. Failure to complete high school (3,750); 3. Failure to be employed or in education (3,739)	Notified maltreatment, substantiated maltreatment, age, sex, race, family income, maternal education, birthweight z score, neonatal intensive care admission, maternal tobacco and alcohol use in pregnancy, breast feeding	1. Peabody picture vocabulary test 2. Failure to complete high school 3. Failure to be employed or education at 21 years
Olsen et al. (2018)	1. OHC (107); 2. Non-OHC (3,805)	Gender, birth weight, ethnicity, citizenship, psychiatric diagnosis, bullying, family type, mother's educational level, father's educational level, mother's disposable income, father's disposable income.	1. Self-perceived academic ability at age 15 years; 2. School change in lower secondary school
Parrish et al. (2011)	1. Total Population (28,592); 2. PSR (3,271)	Maternal age and education, DVSA (maternal physical abuse and forced sexual activities), Maternal tobacco use, Maternal marital status, Substance abuse, living children, medically vulnerable, public aid, risk group category	PSR to child protective services
Parrish et al. (2016)	Total (2,389)	Self-reported IPV, race, maternal education, maternal smoking, maternal alcohol use, poverty, parents' marital status, prenatal care, maternal age	Maltreatment report to Child Protective Services

Author	Sample Size	Confounders	Outcome
Parrish et al. (2017)	Total (1,235)	Birth paid by Tricare (military families), sex of the child, maternal education at child's birth, marital status at birth, maternal alcohol use during pregnancy, maternal smoking during pregnancy, maternal race, birth defect, mother or child on Medicaid at birth, fathers name listed on birth certificate, maternal age at birth, multi-agency maltreatment report, mother reported being divorced/separated 12 months before pregnancy, mother reported moving 12 months before pregnancy, mother reported losing a job 12 months before pregnancy, mother reported partner/husband losing a job 12 months before pregnancy	1. Censorship; 2. Multi-source report of maltreatment
Raghavan et al. (2012)	Total (5,652)	Child age, gender, race/ ethnicity, rural/urban location, insurance type, placement status, health status, CBCL score, maltreatment type	1. Annual probability of having any medication expenditures 2. Expenditures per child per year
Raghavan et al. (2017)	1. LTFC (1,569); 2. CPS (8,917)	Age, gender, race/ethnicity, Insurance type, primary care case management, urban/rural location, health condition, health care access	Ascertainment of foster care status
Sidebotham et al. (2000)	1. Registered children (139); 2. Children investigated but not registered (190); 3. Children neither investigated nor registered (13, 927)	1. Time period (8, 18, 21, 30 33 months); 2. Registered children; children investigated but not registered; children neither investigated nor registered	1. Rates of child protection registrations; 2. Proportion of child abuse investigations and registrations; 3. Parental reporting of child abuse
Sidebotham et al. (2002)	1. Registered children (85); 2. Non-registered children (13, 089)	Maternal employment, mobility (house moves), social network score.	1. Child Abuse registrations 2. Child maltreatment
Sidebotham et al. (2003)	1. Registered children (115) 2. Non-registered children (14,105)	Low birthweight, unintended pregnancy, hospital admissions, developmental concerns, reported positive attributes, feeding difficulties, temper tantrums, parental concerns about the child's development, and not seeing the child in a positive light.	Child protection registration prior to 6 years of age
Sidebotham et al. (2006)	1. Registered children (115); 2. Investigated children (178); 3. Neither registered nor investigated (13, 963)	Parental ontogenic background (Young parent, low educational achievement, psychiatric history, history of childhood abuse (any); Exosystem (socio-demographic) variables (Any indicator of poverty, Mother employed, Poor social network. Microsystem (family) variables (high parity, single mother, reported domestic violence, reordered family); Child variables (Unintended pregnancy, Low birthweight, Few positive attributes reported	1. Children registered for maltreatment; 2. Children investigated for maltreatment
Strathearn et al. (2009)	Total (5,890)	Maternal prenatal demographic factors (age, marital status, education, race, employment); prenatal behaviours/attitudes (cigarette consumption and binge drinking during pregnancy, anxiety and pregnancy ambivalence); infant factors (birth weight and gender), and 6 month postpartum maternal behaviours and attitudes (mother-infant separation, employment, maternal stimulation/teaching of baby, maternal attitude of caregiving and postpartum depression). Models: 1. Breastfeeding duration, 2. Single vs. multiple episodes of maltreatment, 3. Exclude previously enrolled children, 4. Only children in Queensland at 14 years of age	Substantiated maternal child maltreatment
Teyhan et al. (2019)	1. No CLA or CIN (9,432); 2. CIN(64); 3. CLA (49)	Social care status, Age, sex, socio-economic position, maternal age, highest educational qualification; financial difficulties; housing tenure; partner status; smoking; alcohol intake; social support; and depressive symptoms	1. Educational attainment; 2. Persistent absence from school; 3. Special educational needs (SEN) status; 4. School Mobility

Table 5 Notes

AN	Alaska Native
CI	Confidence Interval
CIDI	Composite International Diagnostic Interview
CES-D	Centre for Epidemiological Studies – Depression Scale
CLA	Children Looked After
CIN	Children In Need
CP	Child Protection
CPS	Child Protective Services
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4 th edition
DVSA	Domestic violence and sexual assault;
IPV	Intimate Partner Violence
LTFC	Long Term Foster Care
N/A	Not Applicable
NR	Not Reported
NN	Non-Native
OHC	Out-of-home care
PPVT	Peabody Picture Vocabulary Test
PSR	Protective Services Report
PTSD	Post-Traumatic Stress Disorder
SDQ	Strength and Difficulties Questionnaire
YASR	Young Adult Self Report

Quality Assessment

The Kmet, GUILD and RECORD checklists were used to rate the methodological quality of included studies. The results of the quality assessment are shown in Table 6. Based on the “*QualSys*” Standard Quality assessment for evaluating primary research papers by Kmet et al. (2004), the final quality scores ranged from 55% (adequate quality) to 100% (Strong quality) with a median score of 91%, indicating high quality across all studies reviewed. The final quality scores for the GUILD and RECORD checklist ranged from 10% to 79% and only three studies had scores greater than 50%. The median score was 23%, indicating poor quality across all studies reviewed. The inter-rater reliability test was 81% (95%CI: 75%; 88%) for the Kmet scores and 77% (95%CI: 70%; 85%) for the GUILD and RECORD scores.

Table 6*Quality appraisal of included studies*

Study	Qualsyst (KMET)		GUILD and RECORD	
	Score (%)	Methodology Quality	Score (%)	Methodology Quality
Abajobir et al. (2017)	95%	Strong	26%	Poor
Abajobir et al. (2017)	95%	Strong	26%	Poor
Abajobir et al. (2017)	91%	Strong	29%	Poor
Abajobir et al. (2017)	95%	Strong	22%	Poor
Abajobir et al. (2017)	95%	Strong	26%	Poor
Austin et al. (2018)	95%	Strong	71%	Good
Austin et al. (2019)	86%	Strong	72%	Good
Egelund et al. (2009)	50%	Adequate	24%	Poor
Hansson et al. (2018)	68%	Good	10%	Poor
Hansson et al. (2020)	73%	Good	9%	Poor
Kisely et al. (2018)	91%	Strong	22%	Poor
Kisely et al. (2019)	91%	Strong	26%	Poor
Kisely et al. (2020)	91%	Strong	22%	Poor
Mills et al. (2013)	95%	Strong	22%	Poor
Mills et al. (2014)	95%	Strong	21%	Poor
Mills et al. (2016)	95%	Strong	21%	Poor
Mills et al. (2017)	100%	Strong	16%	Poor
Mills et al. (2019)	91%	Strong	16%	Poor
Olsen et al. (2018)	86%	Strong	21%	Poor
Parrish et al. (2011)	95%	Strong	19%	Poor
Parrish et al. (2016)	82%	Strong	33%	Poor
Parrish et al. (2017)	86%	Strong	79%	Good
Raghavan et al. (2012)	100%	Strong	45%	Poor
Raghavan et al. (2017)	86%	Strong	33%	Poor
Sidebotham et al. (2000)	60%	Good	10%	Poor
Sidebotham et al. (2002)	91%	Strong	16%	Poor
Sidebotham et al. (2003)	80%	Strong	16%	Poor
Sidebotham et al. (2006)	91%	Strong	29%	Poor
Strathearn et al. (2009)	95%	Strong	47%	Poor
Teyhan et al. (2019)	91%	Strong	28%	Poor
Median	91%	Strong	23%	Poor

Discussion

This systematic review sought to describe the study designs and statistical methods used when administrative data is integrated with longitudinal data in child protection settings and make recommendations about approaches to improve the quality of reporting of research findings, thereby minimising risk of bias and other limitations. There has been a steady growth in the number of studies which use administrative data integrated with longitudinal data in child protection settings since 2000. A total of 30 studies were identified that integrated these data to determine outcomes in the areas of child maltreatment, mental health, drug and alcohol abuse and education. Since the focus of the review was on studies in child protection settings, the main administrative data reported was child protection data.

While most studies had multiple data collection points, the median number of waves reported for the longitudinal studies was two. The findings from this review can be grouped under three themes: i) quality of reporting on data linkage procedures; ii) biases reported; and iii) statistical methods used. Though some systematic reviews have been conducted on administrative data alone or longitudinal data alone in child protection or other settings (Kinner et al., 2013; Tew et al., 2017; Wilcox et al., 2016), this is the first systematic review of studies utilising administrative data integrated with longitudinal data in child protection settings.

Quality of reporting on Data Linkage Procedures

Overall, the quality of all studies was strong (Qualsyst median score=93%), but most of the studies rated poorly on the reporting of data linkage methods (GUILD and RECORD median score = 23%). Only three of the 30 studies (Austin et al., 2019; Austin et al., 2018; Parrish et al., 2017) described the data linkage procedures in sufficient detail. This is of concern, as a small amount of data linkage errors may lead to significant bias and inconsistencies in estimating parameters of a statistical model. As described in the GUILD

(Gilbert et al., 2018), researchers utilising linked data should take account of biases inherent in the data linkage process and account for such biases in the analysis. The GUILD guidelines recommend following three key steps when reporting analyses using linked data: i) describing the population included in the data set (i.e., how the data were generated, processed and quality controlled); ii) describing the data linkage processes; and iii) describing the quality of data linkage, including accounting for linkage error. Similar reporting items are recommended in the RECORD statement (Benchimol et al., 2015).

K. Harron et al. (2017) supports the notion of accounting for linkage errors as recommended by GUILD and RECORD, but states that it may be difficult for researchers to determine the quality of linked data since researchers may not have access to identifiable data. The authors therefore recommend conducting the following three methods to evaluate data linkage quality and identify potential sources of bias: i) post-linkage validation, ii) sensitivity analyses, and iii) comparison of characteristics of linked and unlinked records.

Most authors did not report sufficiently on the population included in the data set and how the data were generated and quality controlled. Most authors provided descriptions of the population in the source data and how the data were collected, but no information was reported on how the data were updated, processed and quality controls. Only a few authors explained how data were cleaned, including standardisation of missing data and treatment of special characters (Austin et al., 2019; Austin et al., 2018; Parrish et al., 2017), and how manual linkages were conducted by reporting on data mismatches and duplicate cases (Parrish et al., 2011).

The second GUILD step, which focusses on data linkage processes, was described in sufficient detail by the same authors (Austin et al., 2019; Austin et al., 2018; Parrish et al., 2017) by reporting on how linkage rates were calculated and how probability match scores were used for weighting. Benchimol et al. (2015) state that the methods of linkage and

methods of linkage quality evaluation should be reported by authors, though this information may not be provided by the data linkage unit. Furthermore, information on disclosure controls to reduce the re-identification of individuals from linked data was not reported in any of the studies. However, the majority (80%) of studies reported the method of data linkage (deterministic or probabilistic, or both), including reporting the unique ID that was used as the variable for deterministic linkage.

The last GUILD step involves analysis of linked data which takes linkage error into account. While the quality of data linkage can be determined prior and during data linkage, this step allows researchers to report on linkage error post data linkage. The analysts who conduct data linkage should provide researchers with reports of the data linkage process, including estimates of false and missed matches, so that there is transparency. If there are linkage errors, analysts can determine methods or procedures to correct for this before conducting any analysis, while acknowledging this may not always be possible (Gilbert et al., 2018). Analysts could identify linkage errors by analysing differences or similarities between linked and unlinked data (Harron et al., 2017), though this method may introduce additional bias caused by missing records (Randall et al., 2018). A simulation exercise developed by Parrish et al. (2017) enables post-estimation of linkage errors. The inclusion of linkage errors into research analyses is an evolving and relatively new area of methodological research. Some methods that have been developed by researchers model simple linkage errors derived from one-to-one matches rather than the more complex many-to-many or many-to-spine match scenarios that exist in modern day production linkage systems. (Chipperfield et al., 2018; Harron et al., 2017)

Biases Reported

In longitudinal studies there is commonly missing data for various reasons, such as non-availability of data from specific variables or missing data due to participant attrition.

Missing data may result in loss of statistical power, bias in estimation of parameters, and diminish the representativeness of samples in a study (Kang, 2013). Almost all studies described missing data and a few conducted some analysis to correct for missing data. Biases may occur due to certain population groups being over-represented, for instance Aboriginal children are over-represented in child-protection or out-of-home care systems compared with other young people in Australia. Systematic bias may occur as a result of Aboriginal young people being more often reported and therefore at increased contact with child protection services. Some studies reported over-representation of children in OHC among those with missing school grades and this was corrected by replacing the missing grades with estimated grades (MAR) (Hansson & Gustafsson, 2020; Hansson et al., 2018). If the missing data were not accounted for in the analysis this could have resulted in over or under-estimation of outcomes among the OHC group.

This review shows some variability in the reporting and analysis of missing data. A review conducted by Karahalios et al. (2012) highlighted that there is generally inconsistent reporting of missing data in cohort studies and methods employed to handle missing data in some studies may be inappropriate. While weighting was described as one technique to account for missing data, this method has limitations. For example, standard errors of estimates, such as means and proportions, are larger than they would be if the data were not weighted (Asendorpf et al., 2014).

Listwise deletion as a method of handling missing data also has limitations as it requires data to be MCAR (Gemici et al., 2012). While some studies in this review applied this method it may not be appropriate, particularly if the missing values occur among populations with certain characteristics, such as those lost to follow up who were mostly disadvantaged or are hard to reach. In addition, listwise deletion results in a reduced sample size (and ultimately loss of statistical power), which is a concern particularly among young

people with child protection contact where smaller sample sizes are reported compared to comparison groups in the general population.

Statistical Methods

Most studies reported using logistic regression as a method of analysing the factors associated with reported outcomes. While this method was appropriate to determine the impact of reported outcomes with a binary scale, controlling for multiple confounders, more sophisticated methods of analysis were expected, particularly where mediating or moderating effects of some variables were required. One of the limitations in the reporting of logistic regression analysis was lack of descriptions on why this method was chosen in relation to fulfilling the assumption that there is a linear relationship between the logit of the outcome and each predictor variables. Likewise, with multiple regression methods the assumption of linearity has to be satisfied; this was not often described where linear regression methods were used.

Survival analysis methods were well described and utilised where there were more than two pre-specified time points and these included the Nelson-Aalen Estimation method (Parrish et al., 2017), the Kaplan-Meier method, and the Cox regression method (Austin et al., 2018). Three studies described more advanced methods of analysis which are Multinomial logistic regression model using Vermunt's three step Latent Class Analysis Approach, Growth mixture modelling and Generalised Linear Model (Austin et al., 2019; Raghavan et al., 2012). Sensitivity analysis was conducted particularly when definitions of child maltreatment were altered to either include substantiated maltreatment or reported allegations. Conducting sensitivity analysis prior to data modelling may not be necessary since sensitivity analysis is usually done after a statistical model has been estimated and the results interpreted (Miocevic et al., 2017).

The statistical methods applied to most of the included studies lack the sophistication expected of longitudinal studies with certain covariance structures. The methods used fail to consider random or systematic error which may be inherent to the measurable observed variables (Cole & Maxwell, 2003). Failure to account for such errors in the analysis may lead to under or over estimation of the true values of the measured outcomes. This limitation can only be overcome by using techniques such as SEM that estimates latent variables which are not directly observed and which provide a closer estimation to measurement error for each observed variable (Verdam et al., 2017). Only one study used multi-level modelling; an analytical approach with similar benefits to SEM (Teyhan et al., 2019). These methods were not explored in other studies as a technique for analysing longitudinal data where outcomes are studied over time (i.e., involving multiple data collection points) or accounting for the correlation of individual responses over time. This is surprising given the usefulness of these methods when analysing participants with varying lengths of follow-up due to death and MAR outcomes (Jansen et al., 2016).

SEM also allows the estimation of the indirect effect of mediating variables on outcomes of interest (Cameranesi et al., 2019; Herrenkohl et al., 2017). Seven studies (Abajobir et al, 2017; Kisely et al, 2020; Williams et al., 2017; Hansson et al., 2018; Kisely et al., 2018; Kisely et al, 2020; Mills et al., 2020; Mills et al., 2014; Olsen & de Montgomery, 2018; Sidebotham & Heron, 2006) reported the role of mediating variables, without reporting on the indirect effects that these variables have on outcomes. Most authors reported several logistic regression models per study, whereas SEM is able to model multiple regression equations simultaneously, and hence provides a flexible framework for testing a range of possible relationships between the variables in the model, including mediating effects and possible latent confounding variables (Kupek, 2006; Lang et al., 2008).

Logistic regression analysis and multiple linear regression analysis assume a direct pathway analysis and, therefore, fail to take into account mediating factors which may have an indirect effect on the outcomes of interest (Kupek, 2006) . More recently, Bayesian methods have been proposed as important complementary approaches for testing for mediation and computing the value of the mediation effect (often referred to as Bayesian Mediation Analysis) (Enders et al., 2013; Wang & Preacher, 2015). Literature has determined that Bayesian methods of analysis are better suited to analyse data with small sample sizes as compared to frequentist methods, though it is important that the prior distribution is correctly specified to avoid obtaining less accurate estimates (McNeish, 2016; Miocevic et al., 2017).

Strengths and Limitations

This review has several strengths. The systematic search used a comprehensive range of databases including directed search strategies from linked child protection data and longitudinal study websites and manual scrutiny of reference lists were conducted. The integrity of the review process was maintained through quality control procedures including independent assessment of the included and excluded studies. However, the review was limited to peer reviewed studies published in English only, thus limiting the ability to review unpublished studies and studies from non-English speaking countries.

Recommendations for future research

Overall, the quality of studies was good but the reporting of data linkage procedures was poor. It is important that in future, researchers should conduct adequate data preparation consisting of checking for errors and missing data and ways to address these. Additionally, the generalisability of the findings on the reported studies may be questionable as the reporting omitted important aspects of mediation analysis and ways to overcome bias due to small sample sizes.

The review has shown that it is important that researchers follow the guidelines recommended by the GUILD and RECORD statements to report the quality of data linkage so that there is transparency in the reporting process. While some data linkage communities have recognised the need to improve on their reporting of linkage quality to researchers it remains apparent that there should be improved communication and engagement between researchers and the data linkage units so that the reporting of linkage quality can be provided more routinely and consistently (Network, 2017). The poor or lack of transparency in reporting data linkage processes, such as reports on linkage errors, may under or overestimate the quality of studies reported, particularly among the hard to reach populations as exemplified in these studies. The more vulnerable or hard to reach populations are often missed or miss matches, resulting in reduced sample size and loss of statistical power (Harron et al., 2015; Randall et al., 2018).

Reporting of missing data may be done by following some recommended guidelines such as the STROBE (Vandenbroucke et al., 2014) and RECORD (Benchimol et al., 2015) guidelines. According to these guidelines, the number of individuals used for analysis at each stage of the study should be reported followed by reasons for non-participation or non-response. When it comes to handling missing data, simple to more complex analytical methods should be applied and the method used should take into account the mechanism for missingness (Kang, 2013). If a wrong technique is applied, this may lead to biased inferences (Lee et al., 2016).

If data is MCAR, listwise deletion can be conducted because the reason for missing data is unrelated to the data itself. Pairwise deletion can be used as an alternative to listwise deletion since it preserves more information than listwise deletion (Kang, 2013). While if data is MAR, analysis of complete records only may be invalid and thus techniques such as multiple imputation and likelihood based methods should be applied, though if not carried out

appropriately, this could lead to biased estimates. If the reason for missing data depends on the missing values (NMAR), it is important to account for this by modelling the missing data and thus avoid getting parameters with biased estimates.

Basic regression methods of analysis were reported in most studies. More advanced statistical techniques, such as SEM and Bayesian, should be incorporated in analysis of cohort studies, particularly where small sample sizes are involved and where there are multiple data collection time points and multiple covariates. Multilevel structural equation modelling (ML-SEM) combines the advantages of multi-level modelling and SEM and further enables researchers to scrutinize complex relationships between latent variables at different levels (Meuleman, 2019).

Conclusions

Studies utilising administrative data integrated with longitudinal data in child protection settings were homogenous in nature. Most were birth cohort studies that were integrated with child protection data. There was poor reporting of data linkage processes, whereby only three studies (10%) reported the data linkage process in sufficient detail. A few techniques to account for missing data were reported, but generally lacked sufficient analytical details. The main statistical method of analysis reported in most studies were regression analysis which fail to consider mediating factors which may have an indirect effect on the outcomes of interest. Furthermore, there was lack of utilisation of multi-level analysis as would have been expected in longitudinal studies reported where an individual's responses over time are correlated with each other. While a few studies (10%) reported advanced statistical analysis methods, there is an opportunity to implement other advanced techniques in future studies where small samples are involved. Additionally, the methods should account for measurement and linkage errors and missing data due to attrition. The review emphasises the need for more effort to be channelled towards improvements in reporting of data linkage

processes through following recommended and standardised data linkage processes, which can be achieved through greater co-ordination among data providers and researchers.

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Supplementary Information

SI Table i

PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Title Page
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	3-9
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	9
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	2
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	10
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	10
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	SI Table ii
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	10-11

Section/topic	#	Checklist item	Reported on page #
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	13
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	13
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	12-13
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	n/a
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	n/a
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	n/a
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	n/a
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	14
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	18-22
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	47-48
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	n/a
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	n/a
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	n/a
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	n/a

Section/topic	#	Checklist item	Reported on page #
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	49-55
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	55
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	57-58
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	59

SI Table ii

Search Strategy from all Databases

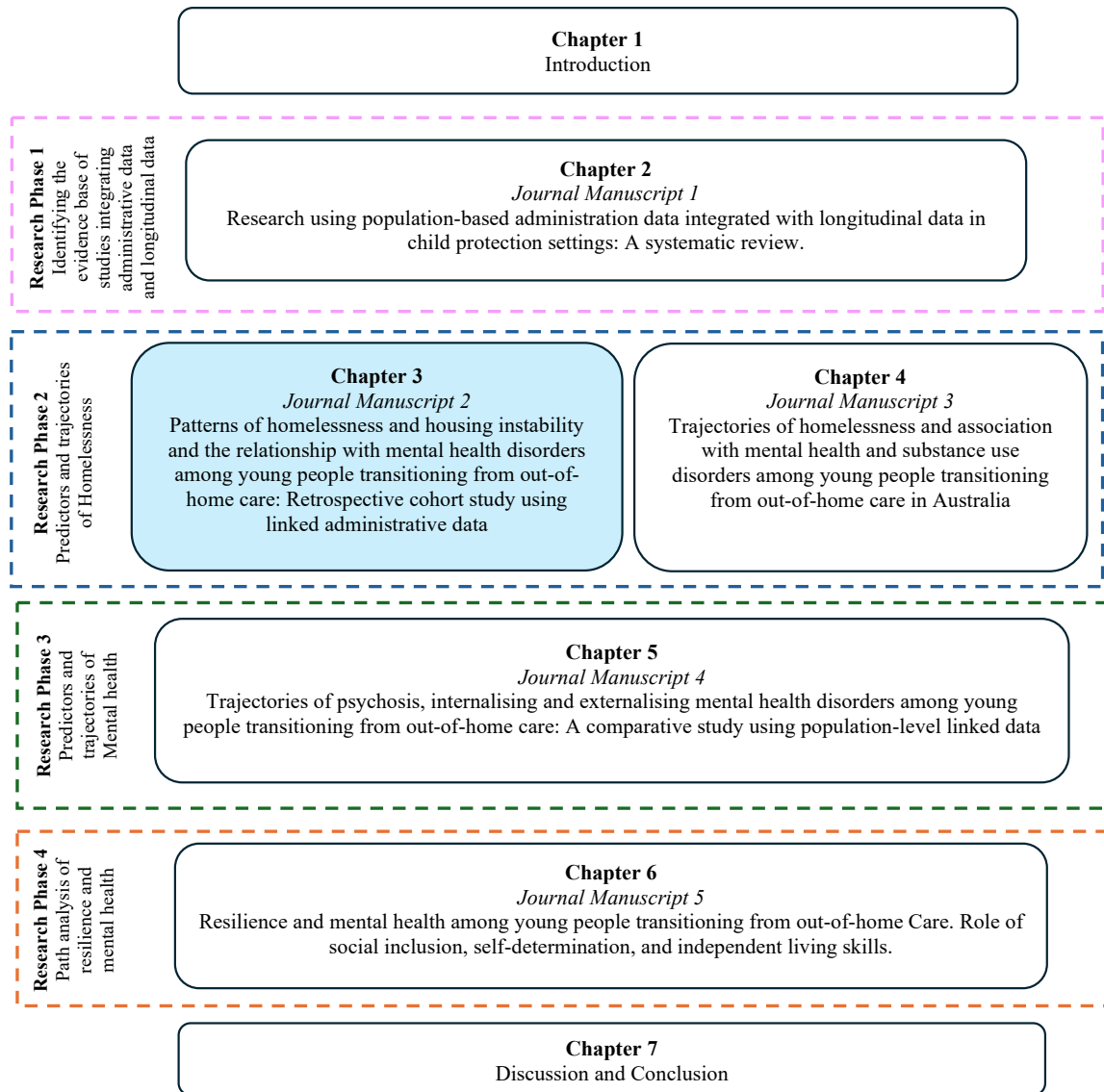
Database and search terms	Number of records
CINAHL: ("data link*" or "record link*" or "linked data" or "linked record*" or "medical data" or "medical record*" or "electronic health data" or "electronic health record*" or "subject link*" or "subject-link*" or "population-based data" or "population based data" or "population-based record*" or "population based record*" or "population data" or "population record*" or "hospital data" or "hospital record*" or "personal data" or "personal record*" or "administrative data" or "administrative record*" or "cross-sectoral-link*" or "cross-sectoral link*" or "cross sectoral link*" or "cross-jurisdictional-link*" or "cross-jurisdictional link*" or "cross jurisdictional link*" or "cross-agency-link*" or "cross-agency link*" or "cross agency link*" or "census*" or "entity resolution*" or "deterministic link*" or "probabilistic link*" or "register*" or "registry" or "registries" or "personal data" or "personal record*") AND ("cohort stud*" or "longitudinal stud*" or "panel stud*" or "repeated measure*" or "prospective stud*" or "follow up stud*" or "follow-up stud*") AND ("out-of-home care" or "out of home care" or "out-of-home placement*" or "out of home placement*" or "foster care" or "foster home*" or "foster youth" or "child*-in care" or "child* in care" or "young people in care" or "adolescents in care" or "children's home*" or "kinship" or "group home*" or "adopted child*" or "relative care" or "home-based care" or "home based care" or "orphan*" or "state care" or "public care" or "looked after child*" or "looked-after child*" or "substitute care" or "childcare system" or "child protection" or "child welfare" or "care leav*" or "care-leav*" or "leaving care" or "leaving-care" or "left care" or "transition* care" or "transition* from care")	243
Embase: As per CINAHL.	415
Eric: As per CINAHL.	12
Medline: As per CINAHL.	311
PsycINFO: As per CINAHL.	142

SI Table iii

Data Preparation Methods

Statistical Analysis Domain	Statistical Analysis Procedure	Statistical parameters	N	%
Descriptive Analysis		Frequencies, %, mean (sd), incidence rate, population attributable risk (PAR)%	9	30%
Non-parametric test	Chi-squared test	Frequencies, percentages, Chi-squared statistic, chi-squared p-value	16	53%
Parametric test	Two-sample t-test	Frequencies (95% CI), Percentages, F-test, t-statistics, significance level, Mean scores, standard errors, P-value,	4	13%
Bivariate Analysis	Correlation Analysis	Pearson's coefficient	2	7%
	Logistic Regression	Frequencies, percentages, odds ratios (95% CI)	1	3%
	Concordance Analysis	Frequencies and percentages	1	3%
Cumulative Risk Factor Analysis		Sensitivity (%), Specificity (%), Positive Predictive value (PPV)	1	3%
Attrition Analysis	Propensity Analysis	Odds ratios (95% CI), p-values	3	10%
	Inverse Probability Weighting-using Logistic Regression	Prevalence, Odds ratios (95% CI), p-values	7	23%
Multiple imputation Methods	Markov chain iterative regression methods	NR	1	3%
	Chained equations analysis	% missing values, frequencies before/ after imputation) (95% CI)	1	3%
	Fully conditional specification method	NR	1	3%
Sensitivity Analysis	Logistic Regression	Prevalence, Odds ratios (95% CI), p-values	7	23%
	Multiple Regression Analysis	Mean scores, regression coefficients, 95% CI	1	3%

Chapter 3 Patterns of Homelessness and Housing Instability



Phase 2 (Chapter 3) involved analysing predictors of homelessness using the Victoria data. This chapter demonstrates the value of using linked data for a cohort of young people transitioning from OHC. Multiple linked datasets were used, including those from health, alcohol and drug use and child protection information systems. This was the first study to use the ETHOS framework (Busch-Geertsema et al., 2016; Pleace & Bretherton, 2013) to create a more nuanced measure of homelessness using thirteen operational definitions. This study highlights the strength of using linked administrative data to determine individual,

environmental and placement predictors of homelessness. The manuscript was accepted for publication in *PLoS One* on the 2nd of September 2022 and has since been published.

Author Contribution Statement: Chapter 3

As co-authors of the paper entitled, '*Patterns of homelessness and housing instability and the relationship with mental health disorders among young people transitioning from out-of-home care: Retrospective cohort study using linked administrative data*', we confirm that Fadzai Chikwava has been the principal researcher and has made the following contributions:

- Conceptualisation and design of the research;
- Data collection, analysis, and interpretation;
- Writing the manuscript and critical appraisal of the findings;
- Corresponding author for communication with the journal

My contribution to the paper was consistent with co-author and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data analysis and interpretation; and
- Review and editing of the manuscript.

Signed: Eduwin Pakpahan *Date:*

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data analysis and interpretation; and
- Review and editing of the manuscript.

Signed: Melissa O'Donnell *Date:* 10.09.2024

Signed: Anna Ferrante *Date:* 10.09.2024

Signed: Reinie Cordier *Date:* 10.09.2024

Journal Manuscript 2

Patterns of homelessness and housing instability and the relationship with mental health disorders among young people transitioning from out-of-home care: Retrospective cohort study using linked administrative data

Fadzai Chikwava^a, Melissa O'Donnell^{d, e}, Anna Ferrante^c, Eduwin Pakpahan^f, Reinie Cordier^{b, a}

- ^{a.} Curtin School of Allied Health, Curtin University, Perth, Western Australia, Australia
- ^{b.} Department of Social Work, Education and Community Wellbeing, Northumbria University, Newcastle upon Tyne, United Kingdom
- ^{c.} Curtin School of Population Health, Curtin University, Perth, Western Australia, Australia
- ^{d.} Australian Centre for Child Protection, University of South Australia, Adelaide, South Australia, Australia
- ^{e.} Telethon Kids Institute, University of Western Australia, Nedlands, Western Australia, Australia
- ^{f.} Department of Mathematics, Physics & Electrical Engineering, Northumbria University, Newcastle upon Tyne, United Kingdom

Abstract

Objectives: The study examined the relationship between mental health, homelessness and housing instability among young people aged 15-18 years old who transitioned from out-of-home in 2013 to 2014 in the state of Victoria, Australia, with follow-up to 2018. We determined the various mental health disorders and other predictors that were associated with different levels of homelessness risk, including identifying the impact of dual diagnosis of mental health and substance use disorder on homelessness.

Methodology: Using retrospective de-identified linked administrative data from various government departments, we identified various dimensions of homelessness mapped from the European Topology of Homelessness (ETHOS) framework comprising 13 operational definitions of homelessness and associated mental health variables determined from the WHO ICD-10 codes. Ordered logistic regression and Poisson regression analysis were used to estimate the impact of homelessness and housing instability, respectively.

Results: A total homelessness or housing instability (as calculated from the ETHOS mapping) prevalence of 60% was determined in the care-leaving population. After adjustment, a high risk of homelessness was associated with a dual diagnosis of mental health and substance use disorder, intentional self-harm, anxiety, psychotic disorders, assault and maltreatment, history of involvement with the justice system, substance use prior to leaving care, residential and home-based OHC placement and a history of staying in public housing.

Conclusions: There is clearly a need for policy makers and service providers to work together to find effective housing pathways and integrated health services for this heterogeneous group of vulnerable young people with complex health and social needs. Future research should determine longitudinally the bidirectional relationship between mental health disorders and homelessness.

Introduction

Homelessness Rates

Homelessness is a significant global issue. In Australia, there is evidence of an increase in homelessness, with the number of clients assisted by specialist homelessness services increasing from 279,200 in 2015/2016 to almost 290,500 in 2019/2020 (AIHW, 2020). The state of Victoria in Australia had the second highest rate of homelessness at 175 per 10,000 people, an increase from 42 per 10,000 people in 2016, with 57% of people experiencing homelessness being under the age of 35 years (AIHW, 2020).

Studies have shown that homelessness is one of the many negative outcomes experienced by young people leaving OHC (Kaleveld et al., 2018; Nilsson et al., 2019). Homelessness rates among young people ageing out of care range from 20% to 40% (Dworsky et al., 2013; Fowler et al., 2009; Shah et al., 2017). In Australia, almost 8,800 children and young people from OHC received assistance during 2019/20 from the specialist homelessness services (AIHW, 2020). The risk of homelessness has been attributed to various factors such as poor transition planning from government departments and lack of suitable housing options (Brackertz et al., 2018).

Specialist Homelessness Services in Australia

Since 2013, the Australian government made a commitment through the Specialist Homelessness Service System (SHSS) to provide almost 300,000 Australians each year with a range of support services to those at risk of or experiencing homelessness (AIHW, 2019). Through the National Housing and Homelessness Agreement (NHHA), which commenced in July 2018, state and territory governments committed to implementing a policy of 'no exits into homelessness' from institutions, which include those at risk of homelessness such as young people transitioning from OHC (AIHW, 2019). Data on the number of clients

accessing Specialist Homelessness Services (SHS) in Australia provide some indication of the rate of homelessness or housing instability in Australia.

The number of clients assisted by specialist homelessness agencies increased at an average annual rate of 2.6% since 2011 (AIHW, 2020), with the state of Victoria having the second highest number of people accessing SHS. The people accessing homelessness services were mostly female (60%), young people below the age of 18 years (33%), and those who identified as Aboriginal (27%). The main reasons stated for seeking SHS among young people from OHC were family and domestic violence (50%) and having a mental health problem (42%) (AIHW, 2020). This study utilises the Victorian portion of the national collection of homelessness services data from which these statistics are drawn.

Types of Homelessness

There is a lack of universally accepted definition of homelessness. Most definitions are premised on three domains relating to what constitutes a “home” and the lack of it is then an indicator of homelessness. This includes (i) absence of adequate housing; (ii) lack of privacy; and (iii) lack of legal entitlement to housing (Australian Bureau of Statistics, 2012; Busch-Geertsema et al., 2016; Chamberlain & Mackenzie, 2014). There has been increasing international attention on the need for a consistent definition of homelessness, hence in 2005 the European Federation of National Organizations Working with the Homeless (FEANTSA) launched a typology to define data collection on homelessness called ETHOS, the European Typology of Homelessness and Housing Exclusion (Busch-Geertsema, 2010; Edgar & Meert, 2005; Pleace & Bretherton, 2013), which is premised on the three domains defined above. This framework has been used in some countries to monitor homelessness and housing exclusion (Busch-Geertsema, 2010; Pleace & Bretherton, 2013), including the Australian Bureau of Statistics which draws heavily on the ETHOS definition.

Homelessness ranges from the most severe or highest risk form, commonly referred to as “rough sleeping” or primary homelessness (Busch-Geertsema et al., 2016; Chamberlain & Mackenzie, 2014; Farrell et al., 2017), to temporary housing or secondary homelessness which involves people moving between various forms of temporary shelter such as emergency accommodation, staying with friends or supported accommodation (Busch-Geertsema et al., 2016; Chamberlain & Mackenzie, 2014). The least severe forms or tertiary homelessness may include non-conventional accommodation or sleeping in extremely overcrowded conditions (Busch-Geertsema et al., 2016; Chamberlain & Mackenzie, 2014).

The ETHOS framework is comprised of four conceptual definitions (“rooflessness”, “houselessness”, “insecure housing” and “inadequate housing”) each of which was expanded to 13 operational definitions ranging from the most severe to the least severe form of homelessness. The last two ETHOS conceptual definitions do not refer to the literal form of homelessness (not having a roof over one’s head) but refer to individuals who may be at risk of homelessness.

The length of time that one spends being homeless or the number of homeless episodes also determines the severity of homelessness or instability in housing (Chhabra et al., 2019). There is, however, some debate or disagreement on what constitutes short-term or long-term homelessness (Johnson & Chamberlain, 2008). A number of studies have identified individuals as chronically homeless if they have experienced continuous homelessness for one year or more, or four or more episodes of homelessness in the last three years where the combined length of time being homeless on those occasions is at least 12 months (Farrell et al., 2017). Short-term homeless has been defined as experiencing less than three months in duration of homelessness or medium-term homelessness, if they have experienced episodes of homelessness for 3 to 11 months (Johnson & Chamberlain, 2008).

Others use the term “episodically homelessness” to refer to frequent shifts between sheltered and unsheltered circumstances (Fortier et al., 2020; Lippert & Lee, 2015).

Risk and protective factors for Homelessness

Risk factors for homelessness among young people leaving care comprise interrelated and dynamic individual, family, social and structural factors (Bender et al., 2015; Johnson et al., 2015). These factors are both intrinsic and extrinsic (involving various groups) (Anderson & Christian, 2003). The background or family risk factors that put young people leaving OHC at risk of homelessness include family violence, family separations (Sznajder-Murray et al., 2015), poor relationships with caregivers or parents (Kelly, 2020; Van den Bree et al., 2009), poverty (Shelton et al., 2009), child maltreatment (Nilsson et al., 2019; Van den Bree et al., 2009), parental substance abuse (Bender et al., 2015), and previous homelessness (Dworsky & Courtney, 2009). Intrinsic risk factors include poor mental health and substance abuse problems (Kelly, 2020; Nilsson et al., 2019), poor in-care experiences (Dworsky & Courtney, 2009; Stein, 2006), leaving care early, running away from home or care (Kelly, 2020), multiple OHC placements (Fowler et al., 2009), living in group care settings or state shelter compared to living with a family member or relative (Crawford et al., 2015) and criminal justice involvement (Shah et al., 2017).

Lack of in-care planning, and financial and social support may result in young people leaving care without sufficient knowledge or capacity to navigate the housing market (Baidawi et al., 2014). These factors are worsened by structural forces such as lack of available low-cost housing, poor economic conditions, and insufficient mental health services (Flatau et al., 2018; Johnson et al., 2015). Protective factors, which reduce the odds of homelessness, include having a close connection with a family member or carer (Kelly, 2020), staying in care until the age of 21 years (Kelly, 2020), having completed high school education (Dworsky et al., 2013; Kelly, 2020), being employed, and access to social support

(Dworsky et al., 2013). Prevention of homelessness after leaving care requires adequate preparation and planning with support from family or carers, caseworkers, and housing service providers.

Homelessness and Mental Health

Having a mental health disorder is one of the most significant risk factors for young people experiencing homelessness. Mental health prevalence of up to 75%, including alcohol and drug disorders, have been reported in previous studies among young people experiencing homelessness (Flatau et al., 2018; Lippert & Lee, 2015). In 2018–19, there were 603 SHS clients per 100,000 population in the state of Victoria with a current mental health issue, which is much higher than the Australian national rate of 393 SHS clients per 100,000 population (AIHW, 2019).

Research on the relationship between homelessness and mental health has been previously conducted (Narendorf, 2017; Piat et al., 2015), however, this has not been investigated among young people transitioning from care. Young people who have entered OHC are at significant risk of mental health issues due to possible exposure to maltreatment and/or adverse social circumstances (Brackertz et al., 2018). These young people who end up being homeless often have histories of mental health issues, which may reinforce and lengthen their episodes of homelessness (Baidawi et al., 2014; Chu et al., 2020; Lippert & Lee, 2015). Moreover, young people experiencing homelessness are at an increased risk of developing or experiencing worsened mental health issues (Adair et al., 2017; Fowler et al., 2009; Johnson Guy et al., 2009) compared to young people with stable housing.

The evidence also shows that mental health disorders are unevenly distributed in people across the different types of homelessness. Young people with persistent periods of homelessness have higher rates of mental health disorders than young people who have recent or single episodes of homelessness (Kelly, 2020). There are variations in the type and

severity of mental health disorders, ranging from alcohol and drug use, psychosis, depression, stress adjustment disorders, anxiety, and self-injury, including dual diagnosis of mental health and substance use disorders (Hodgson et al., 2013). There is some evidence that suggests that dual diagnosis of substance use and mental health disorders is common among young people experiencing homelessness (Hossain Md et al., 2020; Narendorf et al., 2017); however, this evidence has not been determined among young people transitioning from OHC.

The interaction between homelessness experienced by young people and mental health disorders further perpetuates the homelessness cycle, making it harder for young people to achieve housing stability. By examining the relationship between mental health disorders and homelessness in this leaving care group, we can determine whether certain types of mental health disorders are associated with the risk of homelessness and housing instability.

Gaps in the current evidence

While prior research among young people transitioning from care has documented a strong relationship between mental health and homelessness, some of these studies are qualitative in nature or used small sample sizes, thus making it difficult to draw inferences at a population level (Carol et al., 2020; Narendorf, 2017). Some studies have been conducted without a complete psychiatric assessment to profile participants' mental health or have not explored the different mental health disorders associated with homelessness or housing instability. This limits the knowledge of specific mental health disorders associated with homelessness and, in some cases, may over-estimate the prevalence of certain psychiatric disorders (Dworsky et al., 2013; Fowler et al., 2011; Moss et al., 2020). Further, some studies involve young people who have a history of OHC involvement but have not investigated the relationship between mental health and homelessness among young people transitioning from care (Cowal et al., 2002).

Homelessness is a multi-faceted construct that constitutes a much wider group than rough sleeping only. Previous studies have not examined the different types of homelessness or housing instability, which will invariably lead to an under-estimation of the prevalence of homelessness (Crawford et al., 2015; Dworsky et al., 2013; Fowler et al., 2009; Moss et al., 2020; Shah et al., 2017). Young people transitioning from out-of-home care who experience housing instability are at increased risk of becoming homeless and, therefore, the definition of homelessness should encompass various domains of housing instability and episodes of homelessness.

The relationship between homelessness and mental health disorders are not well understood regarding young people transitioning from OHC. Linked administrative data offers opportunities for examining the different types of homelessness and mental health problems to fill these gaps. The lack of robust evidence in young people transitioning from care examining the relationship between homelessness and different types of mental health disorders suggests that additional research is required.

Purpose of Study

The current study examines the relationship between mental health and homelessness among young people who transitioned from care between 2013 and 2014 in the state of Victoria, Australia using linked administrative data with follow-up to 2018. The linked datasets enable the investigation of demographic, contextual and mental health risk factors for young people transitioning from care and their relationship to homelessness. Such evidence is vital to contribute to understanding the relationship between homelessness and mental health among this population group, but also to inform the design and focus of homelessness interventions.

The ETHOS framework used in our study has been used to classify homelessness in studies internationally (Brändle & García, 2015; Gaffney, 2021; Pleace & Bretherton, 2013)

and therefore can be replicated in future research. By utilising this framework, our study provides a more nuanced understanding of homelessness by considering the spectrum of homelessness from rooflessness, at the severe end, to the less severe form of extreme overcrowding. The framework provides a more in-depth understanding of the construct and provides a more accurate estimation of the true prevalence of homelessness.

The overall goal of the study is to provide a holistic analysis of the relationship between mental health disorders and homelessness. Specifically, the following research questions will be addressed:

1. What are the different types and severity of homelessness experienced by young people transitioning from care (RQ1)?
2. What are the mental health disorders that are significantly associated with homelessness and housing instability among young people transitioning from care (RQ2)?
3. What other significant predictors are associated with homelessness and housing instability among young people transitioning from care (RQ3)?

Do young people with dual diagnosis of mental health and substance use have higher levels of homelessness compared to young people without a dual diagnosis (RQ4)?

Methods

Study Population

The study comprised a retrospective cohort of 1,848 young people aged 15-18 years who left the Victorian OHC system in 2013-2014, with follow up until 2018.

Data Sources

The study used de-identified linked administrative data from various government departments and these included data from the health, justice, family violence, alcohol and drug use information systems and child protection data collections. De-identified datasets

with a unique identification number for each individual were provided to the researchers from The Centre for Victorian Data Linkage (CVDL). Ethics for conducting the study was provided by the Curtin Human Research Ethics Committee (Ethics number HRE2021-0151) and as per normal practice with linked datasets, the need for consent was waived by the ethics committee because of the anonymised nature of the linked administrative data used. The datasets for the individuals were available from 2011 to 2018, which allowed the study to obtain historical data 2-3 years prior to leaving care and up to 4-5 years after leaving care. The analysis was conducted for the total follow-up period from the time young people were in care until the period after they left care.

Study Measures

The following measures were used in the analysis. A full description of all the variables and the data sources is shown SI Table iv. The analysis comprised participants' demographic characteristics, homelessness and mental health variables and control variables described below.

Participants' Characteristics. These were obtained from child protection data and they included participants' age of leaving care, their gender, Indigenous status, and geographical location classified as either regional or urban area.

Outcome variable: Homelessness. The main data source for housing information and homelessness was the homelessness data collection, of which the specialist homelessness service collection (SHSC) data is part of. The SHSC collects information on an ongoing basis about people who may be referred to, or access the SHS agencies for housing assistance (AIHW, 2020). The homelessness data contained information on individuals who were either homeless or at risk of becoming homeless. Due to limited SHSC data prior to 2015, other sources were used to obtain housing information. These included the Victorian admitted hospital patient data, emergency department, and alcohol and drug use data collections.

The definition of homelessness used in this study is based on the ETHOS four conceptual definitions of roofless, houseless, insecure and inadequate accommodation. It thus encompasses all young people who were homeless and those at risk of homelessness. The ETHOS framework (Pleace & Bretherton, 2013) was used to map the various housing types to 13 operational definitions from the worst form of homelessness (rough sleeping) to the least severe form of homelessness (extreme overcrowding). These variables included housing situation at present, residential type, tenure type and reasons for seeking homelessness services. A detailed mapping of this data is shown in SI Table v. A comprehensive and continuous housing dataset was then constructed by merging data from the different data sources. Derived variables of homelessness were then constructed as shown in SI Table iv.

Once the ETHOS homelessness type was determined for each episode from the combined dataset, the worst homelessness situation for that episode was then derived. This is consistent with the ABS report on defining homelessness (Australian Bureau of Statistics, 2012) which recommends that to avoid double counting, where an individual could be classified in more than one homelessness category, it is advised to classify them in the category that is the highest on the hierarchy of homelessness (depicted in Figure 4 as the worst form of homelessness). Once the worst homelessness situation was determined, three key variables were constructed:

Homelessness outcome (binary). If an individual had any record of homelessness based on the ETHOS framework the data was coded as one. The data was coded as zero if no evidence of homelessness was recorded from any of the housing data sources.

Homelessness risk score (continuous). Records containing evidence of homelessness were considered to relate to the same 'episode' if they occurred within 60 days, otherwise they were considered to be separate episodes of homelessness. The 60 days was determined based on the average number of days that a new and different type of homelessness episode

was recorded. A count of the different types of homelessness recorded was then conducted (Figure 4). Once the total for each of the operational categories of rough sleeping, emergency accommodation up to extreme overcrowding was recorded, we assigned a risk score for each category whereby the highest score was given to the worst form of housing. For instance, we assigned a score of 13 to rough sleeping, followed by emergency housing with a score of 12 and the least score was assigned to the least severe form of housing (i.e., overcrowding which had a score of 1). We then divided the total homelessness score by the total number of time periods (years) when homelessness was recorded. The final outcome variable was constructed as shown below (Table 7) to form a continuous homelessness risk score, whereby the higher the score the higher the risk profile of homelessness.

Table 7

Calculation of Homelessness risk score

Homelessness risk score =

$$\frac{(\text{Tot_R} * 13) + (\text{Tot_E} * 12) + (\text{Tot_H} * 11) + \dots + (\text{Tot_O} * 1)}{N}$$

Key:

- Tot_R=Total episodes of Rough sleeping*
 - Tot_E=Total episodes of Emergency shelter housing*
 - Tot_H=Total episodes of accommodation for the homeless*
 -*
 -*
 - Tot_O=Total episodes of extreme overcrowding*
 - N=Total number of time periods (years) when homelessness was recorded*
-

Housing Instability (Frequency Count). Housing instability was defined as movement from one unstable housing situation or worst homelessness type to the next. This could mean having the first recorded episode as rough sleeping and the next recorded episode could be emergency accommodation, regardless of the date or duration from the first to the next episode. The curved arrows depict this movement from one worst homelessness type to the next, which could be any homelessness type as defined in the 13 ETHOS homelessness operational categories (Figure 4). A count of the number of movements was then obtained


over the total follow-up period. The count ranged from 0 (= No movement) to a maximum of 46 movements (= very unstable). This variable was used in the Poisson regression analysis to determine the risk factors for housing instability.

Figure 4

Construction of homelessness and housing instability variables

Date	ETHOS Homelessness Operational Category (Yes=1; No=0)						Worst Homelessness type	Worst Homelessness type (in 60 days)
	Rough	Emergency	Transitional	Violence	Eviction	Unconventional		
Day 1	1	0	0	1	0	1	Rough	Rough
Day 2	0	0	1	0	0	1	Transitional	
Day 8	0	0	1	1	0	0	Transitional	
....	0	1	0	1	1	1	Emergency	Emergency
....	0	1	0	0	1	0	Emergency	
....	0	0	1	0	1	0	Transitional	

Key

 Housing instability: Moving from one unstable housing to the next

Exposure Variable: Mental Health Disorders. Information about mental health disorders were obtained from the following sources:

- i. The Victorian Admitted Episodes (hospital admissions) data which contains data on all public and private in-patient hospital admissions in Victoria, including detailed information on diagnosis and cause, along with information on separation type and referrals.
- ii. The Victorian Emergency Department data contains information on all emergency department (ED) presentations at Victorian public hospitals and includes symptom, diagnosis and cause information where available for each presentation, along with departure and referral information.

iii. The Clinical Mental Health data contains information on clinical public mental health services provided in Victoria. The data includes both summaries of the services provided for each patient along with information on each individual contact with the mental health system (both inpatient and outpatient).

These sources contain diagnostic information based on the WHO International Classification of Diseases (ICD 10), recorded for each episode of care. SI Table vii shows a list of these mental health disorders and corresponding ICD10 codes. Mental health disorders were combined from the above data sources and classified in four ways.

1. The first was a binary indicator of any mental health diagnosis or admission (including substance use disorder) (yes or no).

2. The second was by type of mental health disorder (diagnosis or admission) coded (yes or no) with eleven groups (outlined below) which were non-exclusive (young people with more than one diagnosis or admission could be counted in more than one mental health group): (i) Substance use mental and behavioural disorders; (ii) Schizophrenia and psychoses (including manic/ bipolar disorders); (iii) Mood (affective) or depressive disorders; (iv) Severe stress and adjustment disorders; (v) Anxiety disorders; (vi) Personality disorders; (vii) Disorders of psychological development or behavioural and emotional disorders with onset usually occurring in childhood and adolescence; (viii) Intellectual disability; (ix) Self-harm (intentional); (x) Other substance use disorders (including poisoning by narcotics and psychodysleptics, anaesthetics, therapeutic gases and psychotic drugs and alcohol); (xi) Other mental health (behavioural syndromes associated with physiological disturbances and physical factors including organic mental disorder and eating disorders,)

3. The third variable was a derived dual diagnosis variable which consisted of the following four mental health categories: (i) No mental health admission or diagnosis

recorded; (ii) Substance use only; (iii) Mental health only (no substance use); (iv) Mental health and substance use

4. The fourth was a categorical variable with four levels constructed for each of the nine mental health disorders as a mental health admission or diagnosis only, classified as follows: (i) No mental health admission or diagnosis recorded; (ii) Mental health diagnosis only (Clinical Mental Health or ED data); (iii) One mental health hospital admission; (iv) Two or more mental health hospital admissions.

Double counting from the Admitted episodes data and clinical mental health data was avoided by taking the highest number of admissions recorded from either data source.

Covariates

Based on previous literature the following variables were evaluated as potential predictors of homelessness and housing instability given, they have an influence on the outcome of interest in the analysis:

Socio-demographic characteristics: These include gender, age when leaving OHC, indigenous status and region.

Child Protection Involvement: The data included information on the last placement date, allegations, substantiations and information on care placements for all closed cases. Substantiated child maltreatment allegations included physical, sexual, psychological and child abandonment. Placement types included kinship care, residential care, general home-based care, complex or intensive home-based care and permanent care. Home-based care is the term used in Victoria to refer to foster care (Victoria State Government, 2022).

Alcohol and Drug use involvement: We obtained data pertaining to assessment, treatment and support services provided to young people in our cohort who had alcohol and/or drug use problems prior to leaving care. Any involvement with these services was coded as one, and no involvement was coded as zero.

Assault and Maltreatment: The variables relating to abuse and maltreatment were obtained from the Child Protection and the Victorian admitted episodes data, Victorian emergency management data and clinical mental health datasets, where ICD10 codes relating to any form of assault were recorded. Any recorded instance of assault from these data sources was coded as one and zero if there was no recorded instance of assault.

Family Violence: The family violence dataset contains information on services provided to both victims and perpetrators of family violence. The control variable was whether a young person was a perpetrator of violence prior to leaving care. Any recorded instance of violence from this data was coded as one, and zero if there was no recorded instance.

Youth Justice: The youth justice dataset contains information on all criminal court orders in the youth justice system in Victoria. Variables extracted and utilised, were custodial or community justice involvement prior to leaving care. Any recorded instance of youth justice involvement from this data was coded as one, and zero if there was no recorded instance.

Housing Integrated Information Program: This dataset contains information on Victorian public housing including applications for housing, tenancies, funding support for tenancies, and income sources used to pay rent. The main variable utilised was whether young people had a public housing tenancy as a dependent or main applicant prior to leaving care. Any recorded instance of public housing tenancy from this data was coded as one, and zero if there was no recorded instance.

Statistical Analysis

RQ1: Initially descriptive analysis of the prevalence of mental health disorders and homelessness was conducted. We examined the distribution of continuous variables and reported on mean scores where the distribution was normal and median scores where the

distribution of continuous variables was skewed and there were large variances. Since the homelessness risk score outcome variable was highly skewed, a categorical variable was created which was used in the bivariate and multivariable analysis. The homelessness outcome variable was categorised into 4 groups with almost equal number of respondents in each group (not homeless, low, medium, and high).

RQ2 and RQ3: We then conducted ordered logistic regression analysis which is appropriate for ordered categorical data to predict homelessness risk. Bivariate regression analysis was conducted to determine the association between each predictor variable and the homelessness outcome variable. All covariates that were statistically significant or approached significance at $p < 0.10$ in the bivariate analysis were included in the multivariable analysis.

The ordered logistic regression analysis has to satisfy the proportional odds assumption or parallel regression assumption test (Fullerton, 2009; Williams, 2016). That is, the relationship of predictors to the odds of a response being in the next higher order category is the same regardless of which category is being compared. We therefore conducted the approximate likelihood-ratio test of proportionality of odds across response categories. A significant test statistic provides evidence that the parallel regression assumption has been violated (i.e., $p < 0.05$) (Fullerton, 2009). We adjusted for all socio-demographic and background characteristics as potential confounders in our models. Due to this large number of predictor variables (16 in total), a forward stepwise regression procedure was followed so that after each step in which a variable was added, all candidate variables in the model were checked to see if their significance had been reduced below a specified tolerance level of p -value of 0.1. This method allowed us to determine the variables which improved the fit of the model (Harrell et al., 2003)

The second part of the research question was addressed using Poisson regression analysis to model the predictors of housing instability because the response variable is a count variable. Scaling of standard errors was conducted to account for over dispersion of the data. The last model on housing instability was restricted to young people who experienced homelessness since housing instability was determined among this sub-population of young people experiencing homelessness.

RQ4: Ordered logistic regression analysis was used to model the impact of dual diagnosis of any mental health disorder and substance use on the homelessness outcome.

For all models, the level of significance was set at a *p-value* of 0.05, and 95% confidence intervals were presented for all estimates. Maximum Likelihood Estimation (MLE) was used to estimate parameters in our model. Sensitivity analysis was conducted to determine homelessness prevalence from each data source to validate the other data sources as proxy data for homelessness. Missing data on predictor variables was handled using the list-wise deletion method. The data was analysed using STATA 14.2.

Results

Descriptive Analysis

Homelessness Patterns. Our total cohort of 1,848 young people comprised more females (55%) than males (45%) and more left care at a younger age of 15-16 years old (55%) compared with those who left care aged 17-18 years old (45%). The majority of the cohort was mostly non-indigenous (82%) compared to indigenous young people (18%). We determined a total homelessness prevalence of 60% from the merged datasets which includes those who are literally homeless and those at risk of homelessness as per ETHOS definition. This prevalence was significantly higher ($t=4.25$; $p<0.001$) as compared to the homelessness prevalence (40%) of young people (15-24 years old) in the state of Victoria (AIHW, 2020). The main data source for homelessness was the Victorian homelessness data collection,

which identified that 57% of young people were or had been homeless in the study period. The other data sources identified the following homelessness numbers: Alcohol and Drug Information System (15%), Victorian Emergency Management Dataset (10%) and Victorian Admitted Episodes (3%). The young people had a median of four homelessness episodes (Table 8).

A significantly higher prevalence of homelessness was reported among young people who left care aged 15-16 years old (64%), Indigenous young people (78%), people from regional areas (63%), young people who stayed in residential care (74%), and among those who experienced any form of abuse or maltreatment (>70%). Higher prevalence was also reported among those who had a history of involvement with the community justice (81%), custodial justice (84%), prior substance abuse problems (81%) and those who had stayed in public housing in the past (71%).

The homelessness risk score among those who were homeless ranged from 3 to 65, showing great variability in homelessness risk (Mean 13.2, SD 7.62). The highest homelessness risk scores (14 and above) and highest housing instability (4 or more homelessness type changes) were among young people who were: Indigenous, lived in residential care, experienced physical assault and sexual assault, involved in substance abuse prior to leaving care, and involved with community or custodial justice prior to leaving care.

The most common homelessness types experienced were insecure (41%), transitional supported housing (40%), leaving institutions (38%) or facing threat of eviction (34%) (Figure 5). The homelessness types where the highest multiple episodes were recorded were temporary or transitional supported housing (18%), leaving institutions (13%) and insecure accommodation (13%) (Figure 5).

Figure 5

The proportion of young people who experienced various forms of homelessness types (2013 - 2018)

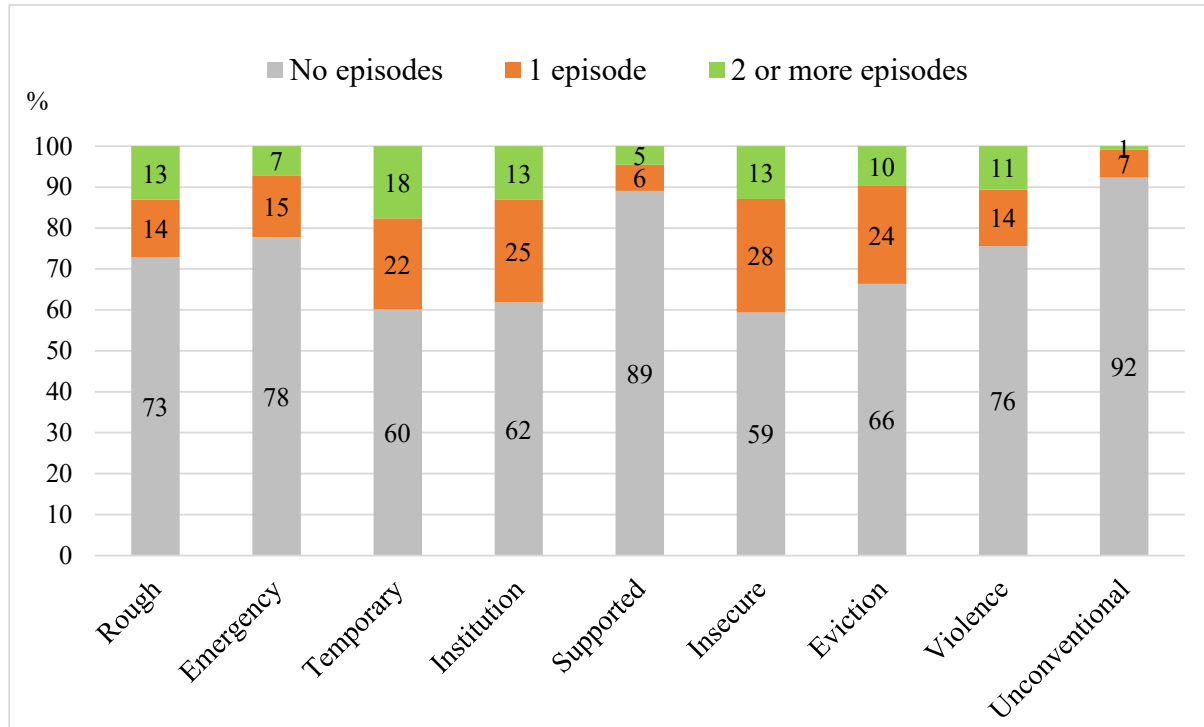


Table 8*Demographic and background characteristics for total cohort, homelessness and housing instability summaries*

Independent Variables	Total Cohort		Homeless	Chi-Squared test	Total homelessness	Homelessness	Housing
	N	(%)	N (%)	statistic (<i>p</i> -value ¹)	episodes: Mean (SD)	risk score: Mean (SD)	Instability Mean (SD)
TOTAL	1, 848	(100%)	1,111 (60.1%)		4.1 (3.3)	13.2 (7.6)	3.3 (4.8)
Sex							
Male	841	(45.5%)	492 (58.5%)	1.7 (p=0.194)	3.8 (3.1)	13.6 (7.8)	2.7 (4.4)
Female	1,007	(54.5%)	619 (61.5%)		4.4 (3.4)	12.8 (7.5)	3.7 (5.1)
Age when leaving OHC							
15 – 16 years	1,016	(55.0%)	652 (64.2%)	15.5 (p<0.001)	3.9 (3.0)	12.6 (6.9)	2.9 (4.1)
17 – 18 years	832	(45.0%)	459 (55.2%)		4.5 (3.6)	13.9 (8.5)	3.7 (5.7)
Indigenous Status							
Indigenous	333	(18.0%)	259 (77.8%)	52.8 (p<0.001)	4.8 (3.6)	14.0 (8.3)	4.1 (5.7)
Non-indigenous	1,515	(82.0%)	852 (56.2%)		3.9 (3.2)	12.9 (7.4)	3.0 (4.5)
Region							
Major cities	1,170	(63.3%)	683 (58.4%)	4.0 (p=0.044)	4.3 (3.5)	13.6 (7.8)	3.5 (5.3)
Regional areas	678	(36.7%)	428 (63.1%)		3.8 (2.9)	12.4 (7.2)	2.8 (3.9)
Type of OHC							
Kinship care	664	(35.9%)	333 (50.1%)	100.8 (p<0.001)	3.4 (2.7)	11.5 (6.7)	2.5 (3.7)
HBC-General	313	(16.9%)	215 (68.7%)		4.2 (3.2)	13.2 (6.7)	3.0 (4.0)
HBC-Complex/Intensive	176	(9.5%)	103 (58.5%)		3.8 (3.1)	13.5 (9.4)	3.3 (5.6)
Permanent care	47	(2.5%)	15 (31.9%)		2.5 (1.7)	11.3 (6.1)	1.1 (1.2)
Residential care	560	(30.3%)	417 (74.5%)		4.9 (3.7)	14.5 (7.9)	4.1 (5.7)
Other/not specified	88	(4.8%)	-		3.1 (3.2)	11.5 (9.2)	2.6 (4.3)
Child Protection history of abuse and maltreatment							
Psychological abuse	1, 057	(57.2%)	696 (65.8%)	33.8 (p<0.001)	4.3 (3.4)	13.5 (7.8)	3.4 (5.2)
Physical abuse	615	(33.3%)	378 (61.5%)	0.7 (p=0.405)	4.2 (3.1)	13.3 (7.8)	3.2 (4.4)
Sexual abuse	162	(8.8%)	90 (55.6%)	1.5 (p=0.214)	4.0 (3.1)	13.0 (6.8)	3.0 (4.4)
Physical development	157	(8.5%)	102 (65.0%)	1.7 (p=0.195)	3.9 (3.1)	13.4 (6.1)	2.9 (3.5)
Assault and Maltreatment from Hospital Data							
Physical assault	234	(12.7%)	193 (82.5%)	55.9 (p<0.001)	5.2 (3.9)	15.1 (8.4)	4.6 (6.5)
Sexual assault	223	(12.1%)	158 (70.9%)	12.2 (p<0.001)	5.0 (3.7)	14.8 (8.9)	4.7 (6.2)
Family violence perpetrator	72	(3.9%)	51 (70.8%)	3.6 (p=0.060)	3.9 (2.8)	13.4 (6.2)	2.6 (2.9)
Alcohol & Drug use prior leaving OHC	435	(23.5%)	354 (81.4%)	107.3 (p<0.001)	5.3 (3.8)	15.1 (7.8)	4.6 (6.0)
Community justice involvement prior leaving OHC	376	(20.3%)	304 (80.8%)	84.6 (p<0.001)	5.1 (3.9)	14.5 (7.3)	4.2 (5.8)
Custodial justice involvement	207	(11.2%)	174 (84.1%)	55.7 (p<0.001)	5.4 (3.8)	15.2 (7.2)	4.2 (5.9)
Public Housing tenant prior leaving OHC	482	(26.1%)	341 (70.8%)	30.7 (p<0.001)	4.2 (3.5)	12.8 (7.3)	3.3 (5.1)

Notes: OHC = Out-of-home Care; HBC = Home-based care; SD=Standard Deviation. ¹ Chi-square test for significant difference among young people experiencing homelessness vs. those not experiencing homelessness

Homelessness and Mental Health. There were varied mental health diagnostic groups recorded for young people and the young people could be grouped into one or more diagnostic groups. Overall, 61% of the sample had any form of mental health diagnosis or substance use disorder from the time young people were in OHC to the time they left care in the total follow up period. However only 623 (34%) young people had mental health disorders after they left OHC. The most common forms included substance use disorder (32%), childhood and psychological development disorders (31%), intentional self-harm (31%), mood disorders (25%), and depression (25%). Dual diagnosis of any mental health disorder and substance disorder was 27% (Table 9).

Very high prevalence of homelessness was experienced by young people with any form of mental health disorder ranging from 72% to 85%. The highest prevalence rate of homelessness was among young people who had dual diagnosis mental health and substance use disorder (85%). Young people with psychotic disorders had the highest number of homelessness episodes (Mean 5.5, SD 4.1). The worst forms of homelessness were experienced among those who had psychotic disorders (risk score 16.4), dual diagnosis mental health and substance use disorders (risk score 15.6), substance use disorder (risk score 15.3), anxiety (risk score 15.1), stress and adjustment disorders (risk score 15.1), intentional self-harm (risk score 14.8) and personality disorders (risk score 14.9). The same pattern of mental health disorders was experienced for high housing instability scores (Table 9).

Table 9*Mental health characteristics for total cohort, homelessness and housing instability summaries and risk scores*

Mental Health Disorder	Total Cohort N (%)	Homeless N (%)	Chi-Squared test statistic (<i>p-value</i>¹)	Total homelessness episodes Mean (SD²)	Homelessness risk score Mean (SD)	Housing Instability Mean (SD)
No mental health disorder	716 (38.7%)	280 (39.1%)	215.2 (p<0.001)	3.0 (2.5)	11.3 (6.3)	1.9 (2.7)
Mental health or substance use	1,132 (61.3%)	831 (73.4%)	215.2 (p<0.001)	4.5 (3.4)	13.8 (7.9)	3.7 (5.3)
Mental health and substance use	500 (27.1%)	423 (84.6%)	171.3 (p<0.001)	5.3 (3.9)	15.6 (8.8)	4.9 (6.5)
Mental health due to substance use only	91 (4.9%)	66 (72.5%)	6.1 (p=0.013)	3.8 (2.8)	12.8 (5.2)	2.9 (4.1)
Mental health only, no substance use	541 (29.3%)	342 (63.2%)	3.1 (0=0.080)	3.6 (2.7)	11.7 (6.5)	2.4 (3.1)
Psychosis	226 (12.2%)	189 (83.6%)	59.4 (p<0.001)	5.5 (4.1)	16.4 (9.1)	5.0 (7.1)
Childhood and psychological development	567 (30.7%)	435 (76.7%)	94.0 (p<0.001)	4.8 (3.7)	14.5 (8.5)	4.2 (6.0)
Substance use disorder	586 (31.7%)	485 (82.8%)	185.4 (p<0.001)	5.1 (3.8)	15.3 (8.4)	4.7 (6.2)
Mood or depression	465 (25.2%)	365 (78.5%)	87.5 (p<0.001)	4.9 (3.7)	14.6 (8.1)	4.2 (6.0)
Anxiety	321 (17.4%)	257 (80.1%)	64.4 (p<0.001)	5.1 (3.9)	15.1 (8.4)	4.7 (6.6)
Stress and adjustment	463 (25.1%)	357 (77.1%)	74.3 (p<0.001)	5.1 (3.8)	15.1 (8.6)	4.5 (6.2)
Personality	350 (18.9%)	293 (83.7%)	100.3 (p<0.001)	5.1 (3.8)	14.9 (8.3)	4.7 (6.5)
Intellectual disability	105 (5.7%)	77 (73.3%)	8.1 (p=0.004)	5.0 (4.2)	14.2 (8.1)	4.2 (6.5)
Intentional self-harm	576 (31.2%)	462 (80.2%)	140 (p<0.001)	5.0 (3.8)	14.8 (8.4)	4.5 (6.0)
Substance use (other)	415 (22.5%)	336 (81.0%)	97 (p<0.001)	5.2 (3.9)	15.1 (8.1)	4.7 (6.4)
Mental Health (other ³)	233 (12.6%)	193 (82.2%)	57 (p<0.001)	5.6 (4.1)	16.1 (9.1)	5.3 (7.3)

Notes¹ Chi-square test for significant difference among young people experiencing homelessness vs. those not experiencing homelessness² SD=Standard Deviation³ Behavioural syndromes associated with physiological disturbances and physical factors

Multivariable Analysis

Predictors of Homelessness. The assumption of the approximate likelihood-ratio test of proportionality of odds across response categories for the ordered logistic regression analysis was satisfied ($X^2(32) 42, p=0.11$). In the bivariate analysis, each predictor was significantly associated with the odds of high homelessness risk scores, however, this association was attenuated after controlling for background and demographic characteristics. In the multivariable analysis, significant mental health predictors of high homelessness risk scores were substance use disorder (Adjusted Odds Ratio (aOR): 1.97, 95% CI: 1.57-2.47), intentional self-harm (aOR: 1.57, 95% CI: 1.23-2.02), anxiety (aOR: 1.48, 95% CI: 1.14-1.92), and borderline significance for psychotic disorders (aOR: 1.35, 95% CI: 0.99-1.83) (Table 10).

The odds of a high homelessness risk score versus the combined medium, low and not homeless categories were 1.97 times greater among young people with a substance use disorder compared with those not having a substance use disorder. Likewise, the odds of the combined high and medium risk categories versus the low and not homeless categories was 1.97 times greater among young people with a substance use disorder compared with those not having a substance use disorder. This interpretation applies to all other significant predictors of high homelessness risk scores.

Indigenous young people had double the odds of being in the higher homelessness categories versus being in the lower/not homeless categories (aOR: 2.24, 95% CI: 1.77-2.83). Other significant predictors were physical assault (aOR: 1.45, 95% CI: 1.10-1.92), psychological harm (aOR: 1.26, 95% CI: 1.04-1.51), history of involvement with community justice (aOR: 1.58, 95% CI: 1.23-2.04) and substance use prior to leaving care (aOR: 1.69, 95% CI: 1.33-2.16). A history of OHC residential placement was associated with higher odds of being in the high homelessness risk category compared with young people who stayed in

kinship care (aOR: 1.75, 95% CI: 1.39-2.20). General home-based care was associated with higher odds of homelessness compared with kinship care (aOR: 2.15, 95% CI: 1.66-2.79) and complex home-based had higher odds of homelessness compared with kinship care (aOR: 1.43, 95% CI: 1.04-1.97). Young people with a history of staying in public housing had higher odds of homelessness compared to young people without any history of public housing tenancy (aOR: 1.47, 95% CI: 1.21-1.80).

In a separate model testing the significance of dual diagnosis of mental health and substance use disorders on homelessness risk, the odds of high homelessness risk scores were highest among young people with dual diagnosis (aOR: 5.31, 95% CI: 4.14-6.81) compared with those who only had one mental health disorder (aOR: 2.41, 95% CI: 1.93-3.01) or those with substance use only disorder (aOR: 2.70; 95% CI: 1.77-4.14) (Table 11).

Table 10

Ordered logistic regression analysis for predictors of homelessness risk

Characteristic	Homeless N (%)	Bivariate Analysis Crude OR (95% CI)	P-value	Multivariable Analysis Adjusted OR (95% CI)	P-value
Mental Health Disorder					
Psychosis	189 (83.6%)	3.29 (2.56 to 4.24)	<0.001	1.35 (0.99 to 1.83)	0.056
Stress and adjustment	357 (77.1%)	2.81 (2.31 to 3.41)	<0.001	1.15 (0.89 to 1.47)	0.286
Anxiety	257 (80.1%)	2.79 (2.25 to 3.48)	<0.001	1.48 (1.14 to 1.92)	0.003
Substance use disorder	485 (82.8%)	4.66 (3.86 to 5.61)	<0.001	1.97 (1.57 to 2.47)	<0.001
Mood or depression	365 (78.5%)	2.89 (2.38 to 3.50)	<0.001	1.27 (0.98 to 1.65)	0.072
Personality disorder	293 (83.7%)	3.32 (2.69 to 4.11)	<0.001	1.15 (0.86 to 1.53)	0.350
Intellectual disability	77 (73.3%)	1.84 (1.29 to 2.62)	0.001	0.91 (0.61 to 1.36)	0.643
Self-harm	462 (80.2%)	3.73 (3.10 to 4.48)	<0.001	1.57 (1.23 to 2.02)	<0.001
Indigenous status					
Non-indigenous	852 (56.2%)	<i>Reference</i>		<i>Reference</i>	
Indigenous	259 (77.8%)	2.46 (1.98 to 3.05)	<0.001	2.24 (1.77 to 2.83)	<0.001
Age of leaving care					
15-16 years	652 (64.2%)	<i>Reference</i>		<i>Reference</i>	
17-18 years	459 (55.2%)	0.81 (0.68 to 0.96)	0.013	0.85 (0.71 to 1.02)	0.086
Abuse and Maltreatment					
Physical assault victim	193 (82.5%)	3.06 (2.38 to 3.92)	<0.001	1.45 (1.10 to 1.92)	0.009
Psychological harm victim	696 (65.8%)	1.67 (1.41 to 1.98)	<0.001	1.26 (1.04 to 1.51)	0.016
Community justice involvement	304 (80.8%)	3.36 (2.72 to 4.14)	<0.001	1.58 (1.23 to 2.04)	<0.001
Substance use prior to leaving care	354 (81.4%)	3.88 (3.17 to 4.75)	<0.001	1.69 (1.33 to 2.16)	<0.001

Characteristic	Homeless N (%)	Bivariate Analysis Crude OR (95% CI)	P-value	Multivariable Analysis Adjusted OR (95% CI)	P-value
Last OHC placement type					
Kinship care	333 (50.1%)	<i>Reference</i>		<i>Reference</i>	
HBC-General	215 (68.7%)	2.21 (1.73 to 2.83)	<0.001	2.15 (1.66 to 2.79)	<0.001
HBC-Complex/Intensive	103 (58.5%)	1.39 (1.03 to 1.88)	0.033	1.43 (1.04 to 1.97)	0.029
Permanent care	15 (31.9%)	0.46 (0.25 to 0.85)	0.013	0.72 (0.38 to 1.37)	0.321
Residential	417 (74.5%)	3.08 (2.50 to 3.80)	<0.001	1.75 (1.39 to 2.20)	<0.001
Public housing tenant prior OHC	341 (70.8%)	1.56 (1.29 to 1.87)	<0.001	1.47 (1.21 to 1.80)	<0.001

Notes: OR=Odds Ratio; OHC=Out-of-home care; HBC=Home-based care; 95% CI=Confidence Interval

Table 11

Ordered logistic regression analysis for dual diagnosis mental health and substance use predictors of homelessness risk

Dual Diagnosis	Homeless N (%)	Bivariate Analysis Crude OR (95% CI)	P-value	Multivariable Analysis Adjusted¹ OR (95% CI)	P-value
No mental health	716 (38.7%)	<i>Reference</i>		<i>Reference</i>	
Substance use only	91 (4.9%)	4.12 (2.77 to 6.12)	<0.001	2.70 (1.77 to 4.14)	<0.001
Mental health only	541 (29.3%)	2.67 (2.16 to 3.30)	<0.001	2.41 (1.93 to 3.01)	<0.001
Mental health & substance use	500 (27.1%)	8.30 (6.61 to 10.42)	<0.001	5.31 (4.14 to 6.81)	<0.001

Notes: ¹ Adjusted for placement type, age of leaving care, indigenous status, abuse and maltreatment, involvement with the community justice, history of alcohol and drug abuse and history of public housing tenant

OR = Odds ratio; CI=Confidence Interval

Predictors of Housing Instability

Young people with substance use disorder had a housing instability rate 1.44 times greater than those without any substance use disorder (IRR: 1.44, 95% CI: 1.24-1.67). Other significant predictors of housing instability were intentional self-harm (IRR: 1.23, 95% CI: 1.05-1.44), young people from Indigenous background (IRR: 1.24, 95% CI: 1.08-1.43), sexual assault victims (IRR: 1.25, 95% CI: 1.05-1.47), substance use prior leaving care (IRR: 1.30, 95% CI: 1.13-1.51), and those who stayed in residential OHC (IRR: 1.18, 95% CI: 1.00-1.39) (Table 12).

Table 12*Poisson regression analysis for predictors of housing instability*

Characteristic	Multiple moves N (%)	Bivariate Analysis Crude IRR (95% CI)	P- value	Multivariable Analysis Adjusted IRR (95% CI)	P- value
Mental Health Disorder					
Psychosis	120 (53.1%)	1.45 (1.24 to 1.70)	<0.001	1.04 (0.88 to 1.23)	0.616
Anxiety	163 (50.8%)	1.46 (1.27 to 1.69)	<0.001	1.11 (0.95 to 1.30)	0.175
Stress and adjustment	221 (47.7%)	1.52 (1.33 to 1.74)	<0.001	1.13 (0.97 to 1.32)	0.104
Substance use disorder	306 (52.2%)	1.83 (1.60 to 2.08)	<0.001	1.44 (1.24 to 1.67)	<0.001
Depression	219 (47.1%)	1.40 (1.22 to 1.60)	<0.001	0.95 (0.81 to 1.11)	0.483
Intellectual disability	42 (40.0%)	1.14 (0.89 to 1.47)	0.288	-	-
Self-harm	284 (49.3%)	1.64 (1.44 to 1.87)	<0.001	1.23 (1.05 to 1.44)	0.011
Indigenous status					
Non-Indigenous	420 (27.7%)	<i>Reference</i>		<i>Reference</i>	
Indigenous	156 (46.9%)	1.28 (1.10 to 1.49)	0.001	1.24 (1.08 to 1.43)	0.003
Age of leaving care					
15-16 years	330 (32.5%)	<i>Reference</i>		<i>Reference</i>	
17-18 years	246 (29.6%)	1.17 (1.02 to 1.33)	0.026	1.09 (0.96 to 1.25)	0.178
Abuse and Maltreatment					
Psychological harm victim	369 (34.9%)	1.09 (0.95 to 1.26)	0.216	-	-
Physical assault victim	125 (53.4%)	1.41 (1.21 to 1.66)	<0.001	1.14 (0.98 to 1.33)	0.099
Sexual assault victim	102 (45.7%)	1.39 (1.17 to 1.65)	<0.001	1.25 (1.05 to 1.47)	0.012
Custodial justice involvement	109 (52.7%)	1.27 (1.07 to 1.51)	0.006	0.94 (0.79 to 1.12)	0.549
Substance use prior to leaving care	221 (50.8%)	1.59 (1.39 to 1.82)	<0.001	1.30 (1.13 to 1.51)	<0.001
Last OHC Placement Type					
Kinship care	156 (23.5%)	<i>Reference</i>		<i>Reference</i>	
HBC-General	112 (35.8%)	1.20 (0.98 to 1.47)	0.077	1.17 (0.97 to 1.42)	0.108
HBC-Complex/Intensive	47 (26.7%)	1.14 (0.88 to 1.48)	0.322	1.08 (0.85 to 1.39)	0.523
Permanent care	6 (12.8%)	0.49 (0.20 to 1.21)	0.122	0.58 (0.25 to 1.37)	0.213
Residential	247 (44.1%)	1.47 (1.25 to 1.73)	<0.001	1.18 (1.00 to 1.39)	0.048
Public housing tenant prior leaving OHC	173 (35.9%)	1.00 (0.87 to 1.16)	0.936	-	-

Notes: IRR=Incidence Rate Ratio; OHC=Out-of-home care; HBC=Home-based care; CI=Confidence Interval

Discussion

Homelessness prevalence and predictors of homelessness

This study is significant because it focuses on a particularly vulnerable group of young people going through significant developmental (social, physical, emotional, and cognitive) changes whilst transitioning to adulthood as well as transitioning from OHC. This is the first study globally, to determine the prevalence and diversity of homelessness types

experienced by young people leaving OHC utilising retrospective linked data and applying the ETHOS framework (Edgar & Meert, 2005). The homelessness definition extends beyond the literal definition of rough sleeping or rooflessness to the different forms, which include housing where there is no security or tenure and where the risk of ending up on the streets is high (Busch-Geertsema, 2010). The multiple linked datasets provided background and personal characteristics associated with homelessness (Chikwava et al., 2021; Jutte et al., 2011) and the large sample size allowed for more accurate prediction of estimates.

Using the ETHOS framework, the study shows a significantly higher prevalence of homelessness and housing instability (60%) among young people leaving OHC compared to young people (15-24 years old) in Victoria (40%) during the same time period (AIHW, 2020). This could be an under-estimation of the true prevalence of homelessness. Our study provides a more sensitive measure of homelessness. The authors acknowledge that homelessness among young people is likely to be underestimated in the Census statistics (Australian Bureau of Statistics, 2018), for instance, young people who are homeless and 'couch surfing', would have a usual residence reported on census night. Higher prevalence of homelessness was reported among those young people: aged 15-16 years when they left care (64%), who are of Indigenous descent (78%), from regional areas (63%), and whose last placement was residential care (74%). The results further suggest a diversity of homelessness experienced by young people ranging from rough sleeping, which had a prevalence of 27%, to less severe forms. The most common forms include living in temporary or transitional supported housing (40%), institutional housing (38%), insecure housing (41%), and housing where there is threat of eviction (34%).

Homelessness and mental health

The prevalence of homelessness among those young people with a mental health disorder was over 20% higher (63%) compared with those without a mental health disorder

(39%). The highest risk of homelessness was found to be among those who had a dual diagnosis of mental health and substance use disorders (85%), self-harm (80%), anxiety (80%), substance use disorders (83%), and psychosis (84%).

Our research provides compelling evidence of a strong relationship between mental health and homelessness. In addition to experiencing homelessness, care-leavers may be leaving care with diagnosed or undiagnosed mental health issues, including trauma. Substance use disorder, history of substance use, and dual diagnosis of substance use and mental health disorders emerged as significant predictors of homelessness. Young people with a dual diagnosis of mental health and substance use disorder often have complex and multifaceted needs. Some of the factors associated with dual diagnosis include longer homelessness duration, suicide attempts, engaging in risky sexual behaviour, and experiencing sexual and physical victimisation (Salomonsen-Sautel et al., 2008).

Furthermore, mental health and substance use disorders often interact to exacerbate each other. Alcohol and drugs are potentially taken as coping strategies among young people experiencing homelessness and among those who face high levels of adversity. The mental health of young people in care and transitioning from care requires sustained efforts to address complex health needs, support for young people to access health services and ongoing support for the management and treatment of mental health disorders.

Other predictors of Homelessness

Other significant predictors included being Indigenous, having a history of residential care or home-based care placement, prior criminal justice involvement, those who experienced psychological or physical assault, having a history of substance abuse, and being a tenant in public housing prior to leaving care. Most of these results are consistent with previous research on risk factors for homelessness (Baidawi et al., 2014; Kelly, 2020; Nilsson et al., 2019).

Indigenous young people experienced disproportionately high levels of homelessness with a 2.24 times greater risk of homelessness than non-Indigenous care leavers. Given the over-representation of Indigenous children in care, this should be seen as a priority issue for Indigenous young people transitioning from care. The results accord with those in the AIHW Homelessness report which recognises that Indigenous Australians continue to be over-represented in the homelessness population, as well as special homelessness services clients (AIHW, 2020). Indigenous Australians are already recognised as a national priority group in the National Housing and Homelessness Agreement (2018) and given that 78% of Indigenous care leavers in this cohort experienced homelessness, this should be recognised as a critical priority group for child protection and leaving care services.

Policy or service delivery directions

While the study findings confirm the role of individual risk factors associated with pathways into homelessness, there is a need for policies and interventions to address structural factors that worsen individual risks and create barriers to exiting homelessness. To reduce the transiency and short-term housing problems, systems should be put in place to improve access and links to more sustainable and affordable longer term housing support where good quality standards can be maintained (Sun, 2012). This requires effective coordination and collaboration among service providers. Young people often face long waiting lists to be approved for public housing (Johnson Guy et al., 2009). The government needs to identify multiple approaches to increase funding and housing stock by developing a long-term, sustainable framework.

Service providers should try and minimise placement instability so that young people can build and maintain relationships with their carers while they are still in care. Our findings indicate that young people in kinship care arrangements had lower homelessness risk compared with those in residential care placement or home-based care placements, thereby

supporting the notion that extended family support can reduce homelessness risk. For young people without kinship support, involving the young person in comprehensive transition planning is essential to imbue firm education and housing options as they transition from care (Stein, 2006).

Our study demonstrated a significantly higher prevalence of homelessness and housing instability among young people who left care at 15-16 years old compared to young people who left care at 17-18 years of age. A number of countries have either implemented or made commitments to implement policies and programs to extend the care of young people beyond 18 years of age (Courtney, 2019; Mendes & Rogers, 2020). Extending the age of leaving care from 18 to 21 years old prevents young people from facing housing instability or becoming homeless and also leads to improvements in education, employment and training outcomes (Courtney, 2019; Courtney M E et al., 2005).

Our findings highlight the complex needs of young people transitioning from care who have mental health issues and are at risk of homelessness. Service providers need to work collaboratively to provide holistic, co-ordinated and trauma informed care to address homelessness and mental health among young people transitioning from care. Integration of services is important, particularly in providing support for young people with a dual diagnosis of mental health and substance use. While this has been provided in most states in Australia, it is reported that service provision is ad-hoc and therefore there needs to be a more consistent and sustained approach in the service provision (Brackertz et al., 2018).

Due to heterogeneity among OHC leavers, a variety of programs which cater for specific needs of young people should be designed that integrate mental health and homelessness, including drug rehabilitation programs. Programs that can be adopted include the Housing First initiative, which have been successful in reducing the burden of homelessness, particularly among those with serious mental health problems (Kertesz &

Johnson, 2017; Tsemberis, 2011). Early intervention is necessary to prevent the need for further services and the exacerbation of mental health and substance use challenges. Some programs have been shown to be effective in reducing hospital admissions, length of hospital stay and generating government cost savings (Brackertz et al., 2018; Dunt et al., 2017). Central to all this, service providers should work collaboratively with the young person and their carers when planning interventions (Corrigan & Manley, 2009).

Future Research

The relationship between mental health and homelessness has been studied extensively, however, there is still a lack of evidence regarding the bidirectional relationship between mental health and homelessness and its potential mediating or moderating factors, particularly among young people transitioning from care. While young people may have mental health issues before becoming homeless, some mental health conditions may develop or worsen once they become homeless. Due to heterogeneity among this population group, further research is required to identify groups of young people in care who have pre-existing mental health conditions prior to their transition from care and compare their homelessness and mental health pathways to those young people who have no identified mental health conditions. This would provide greater evidence and understanding of the bi-directional relation between homelessness and mental health conditions in this high-risk group of young people (Bollen & Curran, 2006). In addition, a person-centred approach to the analysis may provide a better understanding of various sub-groups of young people transitioning from care, including those who are resilient.

Future research should investigate protective factors related to homelessness, such as having good relationships with families/ carers and social support. Moreover, it is also important to improve the evidence base for interventions that address mental health and homelessness issues that would result in improved outcomes for both Indigenous and non-

Indigenous young people transitioning from care. Further research should ensure they use multiple data sources to augment or validate administrative data (Chikwava et al., 2021). For instance, by conducting face-to-face interviews where young people could use a life event calendar to document places they lived, including the duration or time spent in those housing conditions and their quality of life (Fowler et al., 2011).

Limitations

This study has some limitations that could be addressed by future research. The homelessness data collection used in this study is a valuable source of longitudinal information, but only captures young people who may have been referred for services or those who attended services where homelessness was considered to have contributed to their mental health disorders. Therefore, we may have under-estimated the prevalence of homelessness, particularly for less visible homelessness such as couch surfing and insecure housing.

The mental health issues identified were those in which there was a diagnosis of a mental health condition or substance use disorder. This may have under-estimated mental health prevalence as young people in or transitioning from care may not have received a diagnosis or may be demonstrating symptoms of trauma which does not receive a diagnosis. By including variables such as abuse types, assault and exposure to family and domestic violence we hoped to capture the complexity of adversity which these young people may have been exposed to. While self-harm emerged as a significant predictor of homelessness, the findings should be interpreted with caution, given that some cases may not be accurately categorised (Robinson et al., 2020).

While the study identified risk factors related to homelessness among young people transitioning from care, there are key protective factors which could not be analysed from this study due to absence of variables in the linked datasets such as social support, connection to

an adult, family re-unification after OHC, education and employment status (Kelly, 2020). Other risk factors associated with homelessness which are not in our linked datasets include running away from OHC placements (Kelly, 2020) and placement instability (Crawford et al., 2015; Shah et al., 2017). These additional factors are important to include in future research.

Conclusions

The homelessness data collection and the multiple linked datasets provided housing, health, personal and background characteristics for the 1,848 young people who transitioned from care in the state of Victoria, Australia. The data allowed us to map the housing information against the 13 ETHOS homelessness categories and allowed us to report on the different forms of housing instability experienced by our population cohort, and so map their homelessness risk profiles. We determined the various mental health disorders that were associated with various levels of homelessness risk, including identifying dual diagnosis of mental health and substance use as the most significant predictor of homelessness.

Findings were consistent with previous studies; however, our study was able to determine the prevalence and diversity of homelessness among young people transitioning from care and the risk of homelessness associated with mental health disorders. There is clearly a need for policy makers and service providers in multiple sectors to work together to find lasting solutions for housing instability including offering integrated health services for this heterogeneous group of young people with multiple and complex health and social needs. This is a high priority given the impact of COVID-19 on young people obtaining affordable housing which has become scarce in recent years. Future research should determine longitudinally the bidirectional relationship between mental health disorders and homelessness and its potential mediators and moderators.

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Supplementary Information

SI Table iv

List of explanatory variables and outcomes for the study

Variable	Description	Data Source
Demographic		
atsi	As recorded at birth. 1=Aboriginal, 0=non-Aboriginal	Child Protection
sex	As recorded at birth. 1=male, 2=female	Child Protection
region	1=Major cities, 2=regional/remote	Child Protection
ageatindex_cat	Age when one left OHC: 15=15-16 years, 17=17 – 18 years	Child Protection
Maltreatment/abuse		
sexualabuse	1=Sexual abuse, 0=not recorded	Child Protection
psychharm	1=Psychological abuse, 0=not recorded	Child Protection
physdevharm	1=Physical development harm, 0=not recorded	Child Protection
childabandoned	1=Child abandoned, 0=not recorded	Child Protection
fmh_assault	Assault/ Maltreatment: As recorded using ICD-10 codes X85* X86* X87* X88* X89* X90* X91* X92* X93* X94* X95* X96* X97* X98* X99* Y0* T74* R456 Z61* Z62*	Victorian admitted episodes, Victorian emergency management and Clinical mental health datasets
Recent OHC Placement type		
recent_place_type2	Recent placement type: 0=Kinship care, 3=Home-based care general, 4=Home-based care complex/intensive, 7=Permanent care, 8=residential care, 99=not available/ not stated	Child Protection
Violence		
pre_fvperpetrator	1=Perpetrator of family violence prior leaving care, 0=not recorded	Family violence
Alcohol and drug use		
preadis_user	1=Had alcohol and drug treatment services prior leaving care, 0= not recorded	Alcohol and Drug information system
Youth Justice involvement		
yjcustodialbeforeindex	1=Had custodial justice recorded before leaving care, 0= not recorded	Youth Justice
yjcommunitybeforeindex	1=Had community justice recorded before leaving care, 0= not recorded	Youth Justice
housingappprimarybeforeindex	1=Had public housing application as a dependant or tenant prior leaving care, 0=not recorded	Housing Integrated Information Program
Mental Health Disorders		
fmh_com_psych	Schizophrenia and psychoses	Victorian admitted episodes, Victorian emergency management and Clinical mental health datasets
fmh_com_dev	Psychological development or behavioural and emotional disorders with onset usually occurring in childhood and adolescence	Victorian admitted episodes, Victorian emergency management and Clinical mental health datasets
fmh_stress	Severe stress-related disorders (including ptsd)	
fmh_anxiety	Anxiety related disorders	
fmh_depress	Mood or Depressive Disorders	

Variable	Description	Data Source
fmh_person	Personality Disorders	
fmh_disab	Intellectual Disability	
fmh_selfharm	Self-harm	
fmh_substdep	Substance use Disorder	
fmh_substotherEX	Other Substance Use not stated above	
Mental Health Disorders		
fmh_depress	Mood or Depressive Disorders	Victorian admitted episodes, Victorian emergency management and Clinical mental health datasets
fmh_person	Personality Disorders	
fmh_disab	Intellectual Disability	
fmh_selfharm	Self-harm	
fmh_substdep	Substance use Disorder	
fmh_substotherEX	Other Substance Use not stated above	
fmh_depress	Other Mental Health including eating disorder and organic disorder	
fmh_any	Any Mental Health (1=any mental health disorder incl. substance abuse, 0=no mental health recorded)	
fmh_cormobid	Mental Health: 2=any mental health, 1=substance abuse only, 0=No mental health recorded	
Homelessness Outcome		
homeless_all (binary)	1=homeless, 0=Homelessness not recorded	Homelessness Data Collection, Victorian admitted episodes, Victorian emergency management and alcohol and drug use information systems
tot_1rough_cat, tot_2emerg_cat, tot_3temp_cat, tot_6institution_cat, tot_7support_cat, tot_8insecure_cat, tot_9eviction_cat, tot_10violence_cat	Total Episodes of each homelessness type: Categorical variable: 0=No episodes recorded, 1=Only 1 episode recorded, 2+=2 or more episodes recorded	Homelessness Data Collection, Victorian admitted episodes, Victorian emergency management and alcohol and drug use information systems
homeless_outcome (continuous)	Product of total episodes and risk scores	Derived from above
homeless_outcome_CAT3 (categorical)	Categorical variable: 3=score of 37-222 (High) 2=score of 16-36 (Medium) 1=score of 3-15 (Low) 0=not homeless	Derived from above
Housing Instability		
	Movement from one unstable homelessness type to another: Count variable (From 0=no movement to 46)	

SI Table v

Mapping of Housing Type variables to ETHOS Framework

ETHOS				LINKED DATA SOURCE			
	Operational Category		Living Situation		Homelessness Data Collection	ADIS Data (Variable: accommodation status)	Emergency Dept. Data (Variable: Type of usual accommodation)
ROOFLESS	1	People Living Rough	1.1	Public space or external space	a. Housing situation: Homeless - No shelter or improvised/inadequate dwelling b. Residential type: No dwelling/street/park/in the open c. Residential type: Motor vehicle	a. Public place/temporary shelter/homeless	a. Public Place (Homeless)
	2	People in emergency accommodation	2.1	Night Shelter	a. Residential type: Emergency accommodation b. Tenure type: Emergency accommodation/night shelter/women's refuge/youth shelter	No data	Shelter/Refuge Other Than Homeless Shelter
HOUSELESS	3	People in accommodation for people experiencing homelessness	3.1	Homeless Hostel	a. Housing situation: Homeless - Short term temporary accommodation b. Tenure type: Transition towards independent living/ boarding/rooming house c. Residential Type: Boarding/ rooming house/hotel/motel/boarding school/ residential college	a. Short-term crisis, emergency, or transitional accommodation facility b. Boarding house/private hotel	a. Homeless persons shelter b. Boarding/rooming/hostel
			3.2	Temporary Accommodation			
			3.3	Transitional supported accommodation			
	4	People in women's shelter	4.1	Women's shelter accommodation	No data	No data	No data
	5	People in accommodation for immigrants	5.1	Temporary accommodation/ reception centres	No data	No data	No data
			5.2	Migrant workers accommodation	No data	No data	No data
6	People due to be released from institutions	6.1	Penal institutions	a. Housing situation: At risk of homelessness - Institutional settings b. Residential type: Hospital/ Psychiatric unit/ Rehabilitation/ Adult correctional facility/ Youth/juvenile justice correctional centre c. Reason for seeking assistance: Transition from: custodial arrangements/ foster care and child safety residential placements/ other care arrangements	a. Institutional setting (includes Residential aged care & Psychiatric/mental health community care) a. Alcohol and Drugs Treatment Residence b. Prison/remand centre/youth training centre	a. Psychiatric hospital/ Other hospital setting/ prison/remand/ youth training centre	
		6.2	Medical institutions				
		6.3	Children's institutions/ homes				

ETHOS				LINKED DATA SOURCE			
	Operational Category		Living Situation		Homelessness Data Collection	ADIS Data (Variable: accommodation status)	Emergency Dept. Data (Variable: Type of usual accommodation)
	7	People receiving longer-term support (due to homelessness)	7.1	Residential Care for older people experiencing homelessness	a. Residential type – Aged care facility/ Disability support	a. Independent unit within retirement village b. Supported accommodation or supported living facility NOT including Alcohol and Drug Treatment Residence	Residential Aged Care Facility/
			7.2	Supported accommodation for people experiencing former homelessness			
INSECURE	8	People living in insecure accommodation	8.1	Temporarily with family/ friends	a. Housing situation: Homeless - House, townhouse or flat - couch surfer or with no tenure b. Reason for seeking assistance: Itinerant	No data	No data
			8.2	No legal (sub) tenancy			
			8.3	Illegal occupation of land			
	9	People living under threat of eviction	9.1	Legal orders enforced (rented)	a. Reason for seeking assistance: financial difficulties/housing affordability stress/ housing crisis (eviction)/ previous accommodation ended/ unemployment/ problem gambling	No data	No data
			9.2	Re-possession orders (owned)			
	10	People living under threat of violence	10.1	Police recorded incidents	a. Reason for seeking assistance: sexual abuse/ domestic and family violence/ non-family violence.	No data	No data
INADEQUATE	11	People living in temporary/ non-conventional structures	11.1	Mobile Homes	b. Residential type: tent/ caravan/ cabin/ boat/ improvised building c. Tenure type: caravan park d. Reason for seeking assistance: Inadequate or inappropriate dwelling conditions	No data	No data
			11.2	Non-conventional building			
			11.3	Temporary Structure			
	12	People living in unfit housing	12.1	Occupied dwellings unfit for habitation	No data	No data	No data

SI Table vi

Prevalence of Mental Health Disorders (Diagnosis and Hospital Admissions Data)

Mental Health Disorder	Total Cohort		No Mental Health Admission/ Diagnosis N (%)	CMH or ED Diagnosis only N (%)	One Mental Health Hospital Admission N (%)	Two or more Mental Health Hospital Admissions N (%)	Total Hospital Length of Stay Median (SD)
	N	(%)					
Mental health or substance use	1,132	(61.3%)	716 (38.7%)	477 (25.8%)	265 (14.3%)	390 (21.1%)	5 (58.8)
Psychosis	226	(12.2%)	1,622 (87.8%)	102 (5.5%)	49 (2.7%)	75 (4.1%)	14 (67.8)
Psychological development	567	(30.7%)	1,281 (69.3%)	391 (21.2%)	83 (4.5%)	93 (5.0%)	5 (24.7)
Substance use disorder	586	(31.7%)	1,262 (68.3%)	244 (13.2%)	211 (11.4%)	131 (7.1%)	2 (20.5)
Mood or depression	465	(25.2%)	1,383 (74.8%)	236 (12.8%)	120 (6.5%)	109 (5.9%)	7 (23.1)
Anxiety	321	(17.4%)	1,527 (82.6%)	193 (10.4%)	81 (4.4%)	47 (2.5%)	5 (37.0)
Stress and adjustment	463	(25.1%)	1,385 (75.0%)	235 (12.7%)	127 (6.9%)	101 (5.5%)	4 (22.4)
Personality	350	(18.9%)	1,498 (81.1%)	157 (8.5%)	98 (5.3%)	95 (5.1%)	6 (51.8)
Intellectual disability	105	(5.7%)	1,743 (94.3%)	38 (2.1%)	40 (2.2%)	27 (1.5%)	5 (16.6)
Self-harm	576	(31.2%)	1,272 (68.8%)	254 (13.7%)	174 (9.4%)	148 (8.0%)	3 (48.5)
Substance abuse (other)	415	(22.5%)	1,433 (77.5%)	182 (9.9%)	160 (8.7%)	73 (4.0%)	2 (11.6)
Mental Health (Other ¹)	233	(12.6%)	1,615 (87.4%)	169 (9.1%)	53 (2.8%)	11 (0.6%)	4 (9.1)

Notes

CMH: Victorian Clinical Mental Health Data

ED: Victorian Emergency Department data

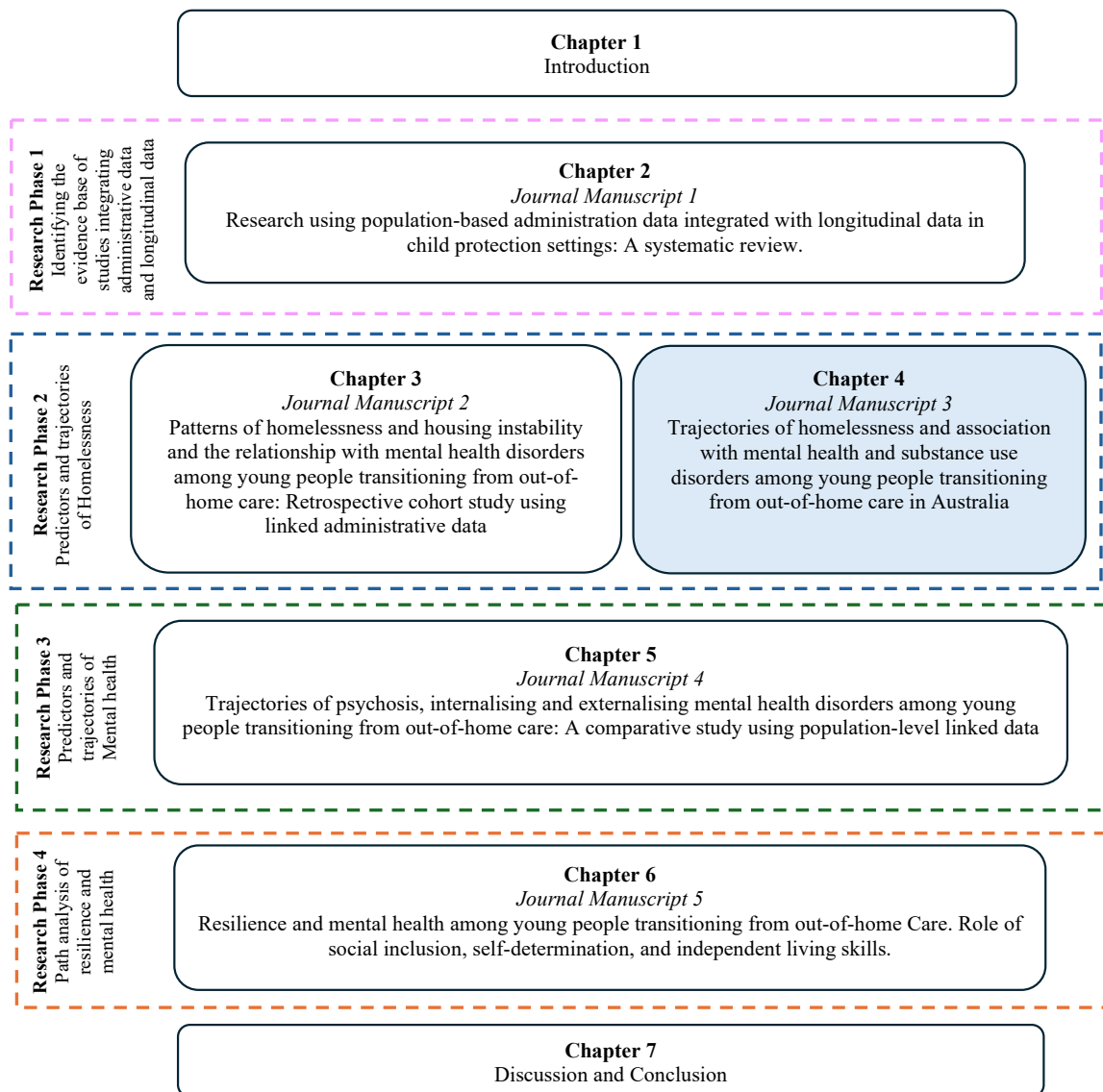
¹ Behavioural syndrome associated with physiological disturbances and physical factors

SI Table vii

Mental Health Disorders and ICD10 Codes

	Mental Health Disorder	Sub-category	ICD 10-Codes	N¹ (% of Total)	Sub-category
1	Schizophrenia and psychoses	Substance use-psychosis related	F105 F106 F107 F115 F116 F117 F125 F126 F127 F135 F136 F137 F145 F146 F147 F155 F156 F157 F165 F166 F167 F175 F176 F177 F185 F186 F187 F195 F196 F197	226 (12%)	61 (3%)
		Schizophrenia Manic/ Bipolar	F20* F21* F22* F23* F24* F25* F26* F27* F28* F29* F30* F31*		183 (10%) 76 (4%)
2	Psychological development or behavioural and emotional disorders with onset usually occurring in childhood and adolescence	Psychological development Child-hood behavioural and emotional	F80* F81* F82* F83* F84* F85* F86* F87* F88* F89* F90* F91* F92* F93* F94* F95* F96* F97* F98*	567 (31%)	110 (6%) 539 (29%)
3	Anxiety and Stress-related disorders	PTSD or stress -related (Reactions to severe stress, and adjustment disorders) Anxiety (including anxiety disorders, panic disorder, obsessive compulsive disorder)	F43* F40* F41* F42*	608 (33%)	463 (25%) 321 (17%)
4	Mood or Depressive Disorders	Depressive episode, recurrent depressive disorder, persistent mood (affective disorder), other mood (affective) disorder, unspecified mood (affective disorder)	F32* F33* F34* F38* F39*	465 (25%)	
5	Personality Disorders		F60* F61* F62* F68* F69*	350 (19%)	
6	Intellectual Disability		F70* F71* F72* F73* F74* F75* F76* F77* F78* F79*	105 (6%)	
7	Self-harm		X6* X7* X80* X81* X82* X83* X84* Z915 R4581	576 (31%)	
8	Substance use Disorder		(F10* F11* F12* F13* F14* F15* F16* F17* F18* F19*) less substance use psychosis	586 (32%)	
9	Substance Use_Other		Z721 Z722 X41* X42* X45* Y11* Y12* Y15* T40* T41* T42* T43* T509 T51*	415 (23%)	
10	Organic		F00* F01* F02* F03* F04* F05* F06* F07* F08* F09*	33 (2%)	
11	Eating Disorders		F50*	32 (2%)	
12	Other Mental Health		F44* F45* F48* F51* F52* F53* F54* F55* F56* F57* F58* F59* F63* F64* F65* F66* F67* F99*	198 (11%)	
13	Any Mental Health or substance abuse		F0* F1* F2* F3* F4* F5* F6* F7* F8* F9* X6* X7* X80* X81* X82* X83* X84* Z915 R4581	1,132 (61%)	

Chapter 4 Trajectories of Homelessness



Chapter 4, the second part of Phase 3 of the study on predictors and trajectories of homelessness, utilised the same dataset as Chapter 3. It is the first study to identify sub-groups of homelessness among young people transitioning from OHC. As recommended in Chapter 2, complex longitudinal data analysis using growth mixture modelling was conducted to identify three sub-groups of young people with varying levels of homelessness risk. These findings support the development of more nuanced interventions for individuals transitioning from OHC. As highlighted in the review in Chapter 2, the study applied

weighting procedures to account for any sample selection biases and missing data was addressed by fitting models using maximum likelihood estimation. The manuscript was accepted for publication in *Child Abuse and Neglect* on March 19, 2024, and has since been published.

Author Contribution Statement: Chapter 4

As co-authors of the paper entitled, “*Trajectories of homelessness and association with mental health and substance use disorders among young people transitioning from out-of-home care in Australia*”, we confirm that Fadzai Chikwava has been the principal researcher and has made the following contributions:

- Conceptualisation and design of the research;
- Data collection, analysis, and interpretation;
- Writing the manuscript and critical appraisal of the findings;
- Corresponding author for communication with the journal

My contribution to the paper was consistent with co-author and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data analysis and interpretation; and
- Review and editing of the manuscript.

Signed:

Eduwin Pakpahan

Date:

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data analysis and interpretation; and
- Review and editing of the manuscript.

Signed:

Reinie Cordier

Date: 10.09.2024

Signed:

Anna Ferrante

Date: 10.09.2024

Signed:

Melissa O’Donnell

Date: 10.09.2024

Journal Manuscript 3

Trajectories of homelessness and association with mental health and substance use disorders among young people transitioning from out-of-home care in Australia

Fadzai Chikwava^{a,b,*}, Reinie Cordier^{c,a,d}, Anna Ferrante^e, Melissa O'Donnell^{f,g},
Eduwin Pakpahan^h

- a. Curtin School of Allied Health, Curtin University, Perth, Western Australia, Australia
- b. Mental Health Commission, Perth, Western Australia, Australia
- c. Department of Social Work, Education and Community Wellbeing, Northumbria University, Newcastle upon Tyne, United Kingdom
- d. Department of Health & Rehabilitation Sciences, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa
- e. Curtin School of Population Health, Curtin University, Perth, Western Australia, Australia
- f. Australian Centre for Child Protection, University of South Australia, Adelaide, South Australia, Australia
- g. Telethon Kids Institute, University of Western Australia, Nedlands, Western Australia, Australia
- h. Department of Mathematics, Physics & Electrical Engineering, Northumbria University, Newcastle upon Tyne, United Kingdom

Abstract

Background: Researchers have examined sub-groups that may exist among young people transitioning from OHC using various theoretical models. However, this population group has not been examined for trajectories of homelessness risk.

Objectives: To examine whether different subtypes of homelessness risk exist among young people transitioning from care and whether these trajectories of homelessness are associated with mental health and substance use disorders.

Participants and Setting: A retrospective population-based cohort study was conducted from a population of 1,018 young people (aged 15-18 years) who transitioned from out-of-home in 2013 to 2014 in the state of Victoria, Australia, with follow-up to 2018.

Methods: Latent Class Growth Analysis was conducted using linked data from homelessness data collections, child protection, mental health information systems, alcohol and drug use, and youth justice information systems.

Results: Three sub-groups of young people were identified. The ‘*moving on*’ group (88%) had the lowest levels of homelessness, with the slope of this trajectory remaining almost stable. The ‘*survivors*’ (7%) group started off with a high risk of homelessness, followed by a sharp decrease in homelessness risk over time. The ‘*complex*’ (5%) group started off with a low risk of homelessness but faced sharp increases in the risk of homelessness over time.

Conclusions: Our study demonstrates that subgroups of young people transitioning from care exist with distinct longitudinal trajectories of homelessness, and these classes are associated with different risk factors. Early intervention and different approaches to tackling homelessness should be considered for these three distinct groups before transitioning from care and during the first few years after leaving care.

Keywords

Cohort study, Out-of-home care, Trajectory analysis, Homelessness, Linked data.

Introduction

Out-of-home care (OHC) involves placing children and young people with foster or kinship caregivers due to abuse, neglect, or receiving inadequate care from their primary carers (AIHW, 2022; Department of Education, 2020). In 2021, 46,200 children were in OHC in Australia, and the rate has remained relatively stable at 8 per 1000 children over the past five years. The discharge rate from OHC was highest for young people aged 15-17 years at 4 per 1,000 children (AIHW, 2022). Young people in OHC often face quicker and unplanned transitions to adulthood compared with their peers in the general population (Mendes, 2021; OECD, 2022).

Young people often lack the emotional and/or financial support to transition smoothly from OHC to adulthood (Courtney & Heuring, 2005; Mendes et al., 2011). This lack of support results in significant challenges such as homelessness, housing instability, substance misuse, and poor mental health (Brackertz et al., 2018). The transition to adulthood presents psychological stress, risk, and uncertainty about what the future holds for these young people. Despite this understanding, little is known about the trajectory of housing instability or homelessness, how it varies across individuals, and how it interacts with mental health issues and substance misuse.

Young people transitioning from OHC experience homelessness at a higher rate compared with young people in the general population (AIHW, 2020; Fowler et al., 2017; Harris & Udry, 2022). The rate of young people transitioning from OHC accessing homelessness services in the state of Victoria was 3.6 per 10,000 compared with 2.5 per 10,000 people for the general population across Australia (AIHW, 2020). Globally, some studies have reported homelessness rates of between 26% to 36% among young people leaving out-of-home care compared to rates of less than 10% of young people in the general population (Bender et al., 2015; Dworsky et al., 2013; Kelly, 2020; Sanders et al., 2021). Due

to high homelessness rates among young people transitioning from care, research is required to understand the different patterns of homelessness, how young people go through the various pathways, their experiences of homelessness and, ultimately, the factors contributing to these pathways over time.

Definition of homelessness

Homelessness or housing instability is a much broader concept than just visible homelessness or rooflessness (Brändle & García, 2015; Fitzgerald et al., 2001). However, many studies on homelessness frequently do not offer a more nuanced definition of homelessness and thus potentially underestimate the prevalence of homelessness among OHC young people (Fowler et al., 2017). In addition, some authors acknowledge that census estimates on homelessness may potentially exclude young people who may be “couch surfing” on census night (Australian Bureau of Statistics, 2018). The ETHOS overcomes some of these issues and provides a more nuanced definition of homelessness (Brändle & García, 2015; Busch-Geertsema et al., 2016). The framework has four conceptual and thirteen operational definitions which encompass visible homelessness, lack of tenure, housing insecurity, housing inadequacy, and housing instability.

Predictors of homelessness

Risk factors for homelessness among young people transitioning from care are a mix of pre-care and in-care experiences. These include being male (Dworsky et al., 2013), Indigenous (AIHW, 2020; Martin et al., 2021), experiencing family violence (Sznajder-Murray et al., 2015), child maltreatment (Kelly, 2020), poor parenting relationships (M. B. van den Bree et al., 2009), and mental health and substance abuse problems (Chikwava et al., 2022; Martin et al., 2021). In-care experiences include placement instability (Fowler et al., 2009), living in residential settings (Fowler et al., 2009) and criminal justice involvement (Shah et al., 2017). Factors such as having good relationships with a carer (Sznajder-Murray

et al., 2015), receiving leaving care support until the age of 21 years (Mendes, 2021), high school completion, and access to various supports (Courtney et al., 2019) reduce the odds of being homelessness.

Relationship between mental health and homelessness

Mental health issues and substance misuse have been shown to be highest among people with chronic housing instability or those who are homeless compared with those who are housed (Bevitt Andrew et al., 2014; Mallett et al., 2005). A long history of research has identified mental health and substance misuse as some of the strongest predictors of homelessness (Giano et al., 2020). Young people in OHC who end up homeless often have histories of mental health issues or substance use dependence (Greeno et al., 2018; Hodgson et al., 2013; Lippert & Lee, 2015; Martijn & Sharpe, 2006; Pumarino et al., 2017). Moreover, young people experiencing homelessness are exposed to an accumulation of risk factors such as worsening mental health issues compared with young people with stable housing (Adair et al., 2017; Dworsky et al., 2013; Spicer et al., 2015). A history of poor mental health not only increases a young person's likelihood of experiencing homelessness but can also reinforce and lengthen their episodes of homelessness (Fowler et al., 2009, 2011).

Regarding trajectory analysis, previous studies have not examined the association between homelessness and the dual diagnosis of mental health and substance misuse. Some studies identified mental health (Chu et al., 2020; Courtney et al., 2012; Fowler et al., 2011) and substance misuse problems (Courtney et al., 2012; Hernandez & Lee, 2020; Keller et al., 2007) in describing various latent classes; however, there is no evidence of associations between homelessness and the dual diagnosis of mental health and substance misuse. As such, there is a need to understand the extent to which dual diagnosis of mental health and substance misuse increases the risk of homelessness among this population group.

Person-centred and variable-centred techniques

Our study takes an integrative approach that combines both person-centred and variable-centred approaches to understanding the trajectories of sub-groups of homelessness experienced by young people transitioning from care and the factors associated with these trajectories. These approaches will allow us to identify sub-groups of individuals who share similar characteristics (Courtney et al., 2012; Keller et al., 2007; Laursen & Hoff, 2006) and how they differ based on their patterns of homelessness risk.

The theory of resilience of OHC youth developed by Stein (Stein, 2008) provides the framework for our study. The framework is based on research studies on the resilience of OHC youth spanning 25 years (1983 – 2008). Stein's framework posits three distinct groups of young people leaving OHC: a '*moving on*' group, a '*survivors*' group, and a '*struggling*' group. Stein mentions homelessness as one of the negative outcomes experienced by young people in the '*survivors*' and '*struggling*' groups. However, given that the term '*struggling*' may be deemed inappropriate, this term will be referred to as '*complex*' from hence forward (Munro et al., 2022). Several authors who have conducted fixed mixture modelling among young people transitioning or those who have left OHC have found evidence of similar groups of young people as reflected in Stein's work (Fowler et al., 2011; Keller et al., 2007; Miller et al., 2017; Rebbe et al., 2017).

These works provide a framework for understanding the trajectories of young people transitioning from out-of-home care. In addition, the framework applies to this study since homelessness is one of the factors contributing to the resilience of young people and leading to the identification of the three distinct groups of young people as they transition to adulthood. The largest group identified by these authors was the '*moving on*' group (>35%). By and large, these young people achieved better outcomes when they transitioned from care and had better in-care experiences than other groups. They successfully transitioned from

care with less housing instability (Fowler et al., 2011; Hernandez & Lee, 2020; Keller et al., 2007). The second group, ‘*survivors*’, faced some challenges during care, and experienced more instability compared to the ‘*moving on*’ group. They relied on government assistance for housing, financial, and personal support (Hernandez & Lee, 2020; Stein, 2008). The third group, ‘*complex*’, faced the most instability while in care, often experienced multiple mental health and substance misuse challenges, and faced homelessness or housing instability when they left OHC (Fowler et al., 2011; Hernandez & Lee, 2020; Stein, 2008).

Although these studies provide evidence of heterogeneity in describing young people transitioning from care, they have several limitations which our study aims to address. For example, most of the studies only focussed on young people who stayed in foster care (Fowler et al., 2011; Keller et al., 2007; Miller et al., 2017; Rebbe et al., 2017), yet outcomes experienced by young people leaving care may be influenced by different types of living arrangements they had while in care. Additionally, the studies focused primarily on measurements at one specific time point (Courtney et al., 2012; Miller et al., 2017), thus limiting our understanding of the influence of covariances on changes in outcomes over time. Furthermore, retrospective self-reporting of life events, such as adverse childhood events, may introduce recall bias (Fowler et al., 2011; Keller et al., 2007; Rebbe et al., 2017). This can be overcome by utilising administrative data from child protection records. Another limitation was the definition of homelessness used in some of these studies, which was restricted to rooflessness or houselessness and did not consider broader experiences of homelessness over time (Courtney et al., 2012; Fowler et al., 2017). Our study offers a more nuanced categorisation of homelessness, encompassing all forms of homelessness, from the most severe form of rough sleeping to the less severe form of extreme overcrowding (Brändle & García, 2015; Busch-Geertsema et al., 2016). In addition, another strength of our study is

that the data has five years follow-up time post young people leaving care, which offers a better understanding of trajectories after leaving care.

Latent Class Growth Analysis

A longitudinal study design is necessary to determine causality and the trajectories experienced by sub-groups of young people to inform the timing, type, and extent of support and interventions for young people transitioning from care and entering adulthood. While latent class growth analysis has gained popularity for longitudinal studies (Muthen & Muthen, 2000; Nagin, 1999), there is a lack of studies examining the trajectories of homelessness among young people transitioning from OHC and how mental health and dual diagnosis of mental health and substance misuse are associated with different trajectories (Fowler et al., 2011).

Purpose of study

There is limited evidence to determine the trajectories of homelessness risk that may exist among the population of young people transitioning from OHC. Our study adds to the knowledge around trajectories of homelessness, by introducing dual diagnosis of mental health and substance use disorders, which has not been investigated in previous studies. While previous research has determined various characteristics associated with homelessness, our analysis will add to the current understanding of resilience pathways of young people and the impact of mental health and substance use on the homelessness trajectories for young people transitioning from care.

The period when young people immediately transition from care is a very critical time since most supports start to diminish from that point forward. To address these gaps in the literature, the present study aims to address the following research questions:

1. What is the evidence for, and characteristics of, subgroups of young people that follow distinct trajectories of homelessness risk from the time when young people transition from OHC to early adulthood (RQ1)?
2. To what extent is a history of mental health or substance misuse (prior leaving care) and dual diagnosis of mental health and substance misuse associated with the latent class trajectories of young people transitioning from OHC (RQ2)?

Methodology

Procedure

We conducted a retrospective population-based cohort study using linked records from administrative datasets of the state of Victoria, Australia. Data linkage was undertaken by the CVDL using secure, high-quality data linkage infrastructure (Flack & Smith, 2019). De-identified datasets with a unique identification number for each study participant were provided to the researchers.

Participants

The study comprised a retrospective cohort of 1,848 young people aged 15-18 years who left the Victorian OHC system in 2013-2014, with follow-up until the end of 2018. Out of the 1,848 young people, 1,547 participants had records of homelessness data from the Victorian Homelessness data collection. The analysis was conducted among 1,018 participants with at least three of the five-year follow-up data, which is a key requirement when conducting latent class growth analysis (Wickrama et al., 2016).

Measures

Socio-demographic characteristics. These were obtained from child protection data, and they included participants' age of leaving care, gender, Indigenous status, and geographical location classified as either regional or urban area.

Homelessness status. A continuous housing status dataset was created by integrating data from the homelessness data collection (AIHW, 2020), hospital patient data, emergency department, and alcohol and drug use data collections (Centre for Victoria Data Linkage, 2009). The homelessness risk variable was derived using the ETHOS framework (Busch-Geertsema et al., 2016). The ETHOS framework is comprised of four conceptual definitions (“rooflessness”, “houselessness”, “insecure housing” and “inadequate housing”), each of which was expanded to 13 operational definitions ranging from the most severe to the least severe form of homelessness. The variables from our study that mapped to these 13 operational definitions included housing situation at present, residential type, tenure type and reasons for seeking homelessness services (SI Table v).

The homelessness risk score was calculated based on the level of severity of homelessness experienced in a 60-day period. We then assigned a risk score for each level of homelessness based on their ETHOS category (i.e., a score of 13 for rough sleeping, a score of 12 for emergency housing, all the way through to the least severe form of housing (i.e., a score of 1 for overcrowding). We then added up the total number of episodes experienced by each homeless category and multiplied this by its risk score. The final homelessness risk score for each year was then added up to obtain a continuous homelessness risk score, whereby the higher the score, the higher the risk profile of homelessness (SI Table viii). Chronic homelessness was defined as homelessness experienced in two of the five follow-up times. A detailed mapping of the homelessness data using the ETHOS framework is described in a recent article (Chikwava et al., 2022).

Mental Health disorders. Information about mental health disorders were obtained from inpatient and outpatient records from the Victorian Admitted Episodes (hospital admissions) data, the Victorian Emergency Department data, and the Clinical Mental Health data (Centre for Victoria Data Linkage, 2009). The data do not include private outpatient

records. These sources contain diagnostic information based on the WHO International Classification of Diseases (ICD 10), recorded for each episode of care (SI Table ix). Mental health disorders were determined prior to leaving OHC to determine a history of mental health before leaving OHC (4 years before leaving OHC). The variables were coded as either Yes (having any mental health disorder) or No (not having any mental health disorder).

Child Protection Involvement. The data included information on the last placement type, allegations, substantiations, and information on care placements for all closed cases. Substantiated child maltreatment allegations (any harm) included physical, sexual, psychological, and neglect. Placement types included kinship care, residential care, general home-based care, complex or intensive home-based care, and permanent care. In Australia, residential care involves a child placed into a home staffed by carers, while kinship care refers to the placement of a child with relatives (kin). Home-based care refers to care provided for a child placed in the home of a carer, who is reimbursed for that child's care cost (foster care). The difference between general and complex home-based care is that complex placements are highly resourced, consisting of specific service responses and individualised interventions. Following amendments to the Children, Youth and Families Act in 2014, permanency in OHC through permanent care orders was established to facilitate pro-activeness about future care arrangements for children in OHC and to promote permanency of those arrangements beyond 18 years of age (Victoria State Government, 2022). The difference between permanent care and kinship care or foster care is that permanent care provides long-term security for the child, whereas with kinship or foster care, the child may move from one placement type to another, and permanency is not guaranteed (Victoria State Government, 2022).

Substance misuse. The data for substance misuse was obtained from four data sources i.e. the Victorian Admitted Episodes (hospital admissions) data, the Victorian Emergency

Department data, the Clinical Mental Health data (Centre for Victoria Data Linkage, 2009) and the Victorian Alcohol and Drug Information System (ADIS) (Victoria State Government, 2018). The ADIS data contains data on assessment, treatment and support services provided to adults and young people who have alcohol and/or drug use problems. Two variables were constructed from these data sources based on a diagnosis using the ICD10 classification and use of ADIS services to determine substance misuse i.e. (i) a history of substance misuse, which involved use of substances prior to leaving care (4 years before leaving OHC). The variable was coded as either Yes (having any substance misuse) or No (not having any substance misuse). (ii) a dual mental health and substance misuse variable was constructed to determine chronic mental health and substance misuse for the total follow-up time after leaving OHC: chronic=2 to 5 years; not chronic=0 to 1 year.

Youth Justice. The youth justice dataset contains information on all criminal court orders in the youth justice system in Victoria. Variables extracted and used were custodial or community justice involvement prior to leaving care. Any recorded instance of youth justice involvement from this data was coded as one and zero if there was no recorded instance.

Statistical Analysis

Due to selection of a sub-sample of 1,018 participants with at least three of the five-year follow out of a population of 1,800 participants, we had to assess any potential bias and ensure that this sub-sample was still representative of the total population, by conducting chi-square tests to determine differences in key socio-demographic characteristics among our sample and that of the total population. A probability-based weighting method was applied to the data to remove any bias that might result from having different kinds of people represented in the wrong proportion. This method involves weighting each case by the inverse of its probability of selection, which would remove any bias that might occur from having different kinds of people represented in the wrong proportion. The method also

ensured that the sample was representative of the total population of young people in out-of-home care in Victoria (Richiardi & Pizzi, 2015). We then analysed the data in two stages. *First*, we conducted growth mixture modelling to identify groups of young people with similar risk trajectories of homelessness over the study's five years. *Second*, we evaluated participant demographic characteristics, social and environmental risk factors, and mental health diagnosis as potential predictors of group membership.

RQ1: Heterogeneity was initially checked in the data by conducting Latent Growth Curve Modelling (LGCM). Exploratory analysis was then conducted to determine the best model fit to our data by examining the Latent Class Growth Analysis (LCGA), Growth Mixture Model with class-invariant (constrained) variances and covariances (GMM-CI), and the Growth Mixture Model with class-varying (free estimation) variances and covariances (GMM-CV) (Feldman et al., 2009; Nagin, 2014; Wickrama et al., 2016). Latent class growth analysis (LCGA) was then selected as the best-fitting approach and was used to identify sub-groups of individuals who had a homogeneous trajectory. Bivariate analyses were then conducted using chi-square tests of association to determine associations of covariates with latent class membership. Post-hoc analysis was conducted using the Bonferroni correction to limit the possibility of getting a statistically significant result, where more than two groups are being compared. LCGA analysis was conducted to test for the presence of distinct longitudinal patterns of homelessness risk. LCGA has been used in the homelessness or housing instability literature to examine trajectories of homelessness over time (Fowler et al., 2009; Tevendale et al., 2011).

Four criteria were evaluated to determine the ideal number of latent classes to include in our models (Muthen & Muthen, 2000). The sample size adjusted Bayesian information criterion (SSABIC) was used to determine the relative fit across models; a low value indicates a well-fitting model (Nylund et al., 2007; Wickrama et al., 2016). The classification

quality (“entropy”) was examined by reviewing posterior probabilities of class membership; these estimates reflect the average likelihood of membership in the determined latent class. A value closer to one indicates a good fit. The Lo-Mendell-Rubin likelihood ratio test (LMR-RT) and the Bootstrapped likelihood ratio test (BLRT) were conducted to assess whether the fit of a given model was significantly better than the fit of an identical model with one less class (Lo et al., 2001; Muthen & Muthen, 2000; Nylund et al., 2007; Wickrama et al., 2016). Next, we considered the usefulness and interpretability of our latent classes. Models were tested, and absolute and relative fit indices were compared to choose the most parsimonious and conceptually and empirically valid and well-differentiated model (Nylund et al., 2007).

RQ2 : In the second stage, we conducted a multinomial logistic regression analysis and the likelihood ratio test to choose the most parsimonious model in the conditional models (El-Habil, 2012). We controlled for the following covariates: gender, region, age of leaving care, involvement with the criminal justice system, history of psychological harm and out-of-home care placement type. We also tested if placement type modified the association between chronic mental health and substance misuse and class membership. The four criteria were utilised to determine the best-fitting model. Full Information Maximum Likelihood (FIML) was used in *Mplus* Version 8.8 which allows cases with missing values on some variables (Muthen & Muthen, 2000).

Ethics

Ethical approval for this study was granted by the Curtin Human Research Ethics Committee (Ethics number HRE2021-0151), and as per usual practice with linked datasets, the need for consent was waived by the ethics committee because of the anonymised nature of the linked administrative data used.

Results

In total 1,018 participants out of 1,800 study participants were eligible for the LCGA since they had homelessness data for at least three of the five data points, which is a key requirement for conducting LCGA. There were 58% females and 42% males who were included in the dataset, and this distribution had a borderline significant difference from the total population of young people who exited the out-of-home care system. ($\chi^2=3.76$; $p=0.05$). The dataset consisted of 23% Indigenous young people compared with 77% non-Indigenous young people, and the distribution was significantly different to that of the total young people who left the OHC system ($\chi^2 =11.4$; $p=0.001$). As a result of this imbalance, a sample size adjusted weight based on gender and Indigenous status was used for the descriptive analysis and latent class growth analysis.

Unconditional Growth Models

Initially, the adequacy of fit of a one-class latent growth model with both a linear and quadratic growth factor was tested. Fit indices improved after the addition of the quadratic term, though there were still some statistically significant variances of growth factors. The latent growth curve model performed poorly on relative fit indices, indicating that more than one class was present, thus necessitating the use of growth mixture modelling ($\chi^2 = 20.49$, $p<0.001$, CFI=0.94, TLI=0.90, RMSEA=0.05, SRMR=0.04). Exploratory analysis was conducted for the unconditional models to determine the most parsimonious model with fewer convergence issues among the LCGA, the GMM-CI and the GMM-CV models.

The LCGA was selected as the best approach since it had less convergent issues and no class had less than 1% minimum sample size for each of the classes. The entropy values were consistent and high for the 2-, 3-, and 4- class models (0.87-0.91), indicating high classification accuracy across all models (Bakk & Kuha, 2021). In comparison, the GMM-CI and GMM-CV models had lower entropy values compared to the LCGA models (SI Table x).

The 4- and 5- class models of the GMM-CV model failed to converge even after increasing the number of random starting values and constraining the negative variances to be zero (Ram & Grimm, 2009). For each of the three approaches, we evaluated fits of 2-, 3-, 4-, and 5-class models, and determined that the 3-class solution provided the best fit to the data (SI Table x). While the 4-class model had the lowest AIC and SSABIC values, we opted for the 3-class model since it had a higher entropy value (0.904) and higher classification probabilities compared to the 4-class model (0.871). In addition, the 3-class model was selected because graphically, it had clear class separations compared to the 4-class model. Lastly, based on theory and previous literature, the 3-class model provided a better fit to the data.

Consistent with Stein's resilience theory (Stein, 2008), the three groups of young people that were determined from the LCGA were (C1: '*moving on*'; 88%), (C2: '*survivors*'; 7%), and (C3: '*complex*'; 5%) group. The main characteristics used to describe the three groups were demographic characteristics and risk factors of homelessness, which included youth justice involvement, history of abuse and maltreatment, history of alcohol or drug use, history of any mental health disorder, most recent placement type and chronic mental health and substance misuse.

In the bivariate analysis using chi-square test of association, the '*complex*' group had a significantly higher proportion of Indigenous young people (38%) compared to the '*survivors*' (28%) and '*moving on*' groups (22%). Overall, there was a greater number of young people aged 17 to 18 years old in the '*moving on*' group (86%) compared to the other two groups. Other significant covariates included involvement with the criminal justice system, out-of-home care placement type, history of substance misuse involvement, history of mental health, chronic mental health, and substance misuse (Table 13). In addition, mental

health, and substance misuse across the five time periods significantly differed across the three groups, with the highest rates reported among the '*complex*' group.

Post-hoc comparisons revealed statistically similar proportions in indigenous status, involvement with justice, history of mental health, history of substance misuse, chronic mental health and substance misuse, kinship care and residential care among the '*survivors*' and '*complex*' groups of young persons. Similar proportions were also found in the age of leaving care, involvement with justice, history of mental health problems, and kinship care among the '*moving on*' and '*complex*' groups of young persons. The '*moving on*' and '*survivors*' groups had similar proportions of indigenous status.

Table 13

Characteristics of study population and class membership

Characteristic	Class 1: <i>Moving on</i> (N=895)		Class 2: <i>Survivors</i> (N=67)		Class 3: <i>Complex</i> (N=56)		Total (N=1,018)		Chi Square test/ Fischer Exact Test (<i>p-value</i>) ^a	Bonferroni post-hoc test adjustment ^b		
	N	%	N	%	N	%	N	%		Class 1 vs. Class	Class 1 vs.	Class 2 vs. Class
										2 test (<i>p-value</i>) ^a	Class 3 test (<i>p-value</i>) ^a	3 test (<i>p-value</i>) ^a
Gender												
Male	373	41.7	33	49.3	19	33.9	425	41.8	2.96	1.47	1.31	2.93
Female	522	58.3	34	50.8	37	66.1	593	58.3				
Indigenous Status												
Not Indigenous	698	78.0	48	71.6	35	62.5	781	76.7	8.11*	1.44	7.16*	1.16
Indigenous	197	22.0	19	28.4	21	37.5	237	23.3				
Geographic location												
Major Cities	536	59.9	42	62.7	40	71.4	618	60.7	3.06	0.20	2.94	1.05
Regional/remote	359	40.1	25	37.3	16	28.6	400	39.3				
Age of leaving care												
15-16 years	527	58.9	27	40.3	35	62.5	589	57.9	9.35**	8.81*	0.29	6.01*
17-18 years	368	41.1	40	59.7	21	37.5	429	42.1				
Youth justice involvement												
No	654	73.1	37	55.2	36	64.3	727	71.4	11.20**	9.81*	2.04	1.04
Yes	241	26.9	30	44.8	20	35.7	291	28.6				
History of any harm												
No	57	6.4	1	1.5	3	5.4	61	6.0	0.32	2.62	0.09	1.45
Yes	838	93.6	66	98.5	53	94.6	957	94.0				
History of psychological harm												
No	353	39.4	23	34.3	14	25.0	390	38.3	5.13	0.68	4.64	1.26
Yes	542	60.6	44	65.7	42	75.0	628	61.7				

Characteristic	Class 1: <i>Moving on</i> (N=895)		Class 2: <i>Survivors</i> (N=67)		Class 3: <i>Complex</i> (N=56)		Total (N=1,018)		Chi Square test/ Fischer Exact Test (<i>p-value</i>) ^a	Bonferroni post-hoc test adjustment ^b		
										Class 1 vs. Class 2 test (<i>p-value</i>) ^a	Class 1 vs. Class 3 test (<i>p-value</i>) ^a	Class 2 vs. Class 3 test (<i>p-value</i>) ^a
History of mental health disorders												
No	503	56.2	24	35.8	23	41.1	550	54.0	14.43**	10.45*	4.88	0.36
Yes	392	43.8	43	64.2	33	58.9	468	46.0				
History of substance misuse												
No	634	70.8	28	41.8	29	51.8	691	67.9	31.16***	24.51**	9.06*	1.23
Yes	261	29.2	39	58.2	27	48.2	327	32.1				
Chronic mental health and substance misuse disorders												
0-1 year	801	89.5	52	77.6	34	60.7	887	87.1	44.74***	8.76*	40.77**	4.14
2-5 years	94	10.5	15	22.4	22	39.3	131	12.9				
Most recent placement												
Kinship care	284	31.7	7	10.5	10	17.9	301	29.6	17.46***	13.38**	4.75	1.41
Home based care or permanent care	283	31.6	19	28.4	13	23.2	315	30.9	1.97	0.31	1.74	0.41
Residential care	328	36.7	41	61.2	33	58.9	402	39.5	25.09***	15.89**	11.11*	0.06

Notes

a. Chi-square test for significant difference among the 3 latent class groups; significance level: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; OHC = Out-of-home care

b. post-hoc comparisons using chi-square tests of the three groups based on an alpha of $0.05/3=0.0167$: * $p \leq 0.0167$; ** $p \leq 0.001$

Conditional Growth Models

The conditional growth model was run using LCGA and included the covariates that were identified in the bivariate analysis. The LMR-LRT indicated that the two- and three-class models were preferable to the baseline and two-class models respectively (Table 14). To distinguish between 2-, 3-, 4- class models, AIC and SSABIC indices were used. The AIC and SSABIC values were smaller for the 4- class model compared to the 3- class model. The BLRT was significant for all classes and therefore was not used to determine the best fitting class. Figure 6 shows clear class separations for the 3-class model compared to the 4-class model. In addition, the 3-class model had classes which were clearly interpretable and consistent with theory (Stein, 2006, 2008). Thus the 3-class model was accepted as the best fitting model.

As shown in Figure 6, the largest group (C1: '*moving on*') included those who had the lowest homelessness risk when they left care and gradually faced increases in homelessness risk, with the slope of this trajectory remaining almost stable across 5 years (mean homelessness risk from 3.3 to 7.0). The second group (C2: '*survivors*') started off with a high risk of homelessness and the homelessness risk sharply decrease over time (mean homelessness risk from 31.5 to 10.3). The third group (C3: '*complex*'), started off with low risk of homelessness but faced sharp increases in the risk of homelessness over time (mean homelessness risk from 7.2 to 47.3). A subsequent analysis comparing trajectories of young people who left care at 15-16 years and those who left care at 17-18 years showed a similar number of latent classes, further supporting the claim of three distinct subgroups; however, there was delayed homelessness risk for those aged 15-16 years. During the first year of leaving care, young people aged 17-18 years had a significantly higher mean homelessness risk score compared to young people who left care at 15-16 years old (Mean score 7.03 vs 4.51 respectively, $t=4.05$; $p=0.0001$; see SI Table xi). This finding might be explained by

those leaving care at a younger age being re-unified with their parents (Delfabbro et al., 2014); however, we do not have the data to substantiate this as a possible explanation.

Figure 6

Latent class growth trajectories

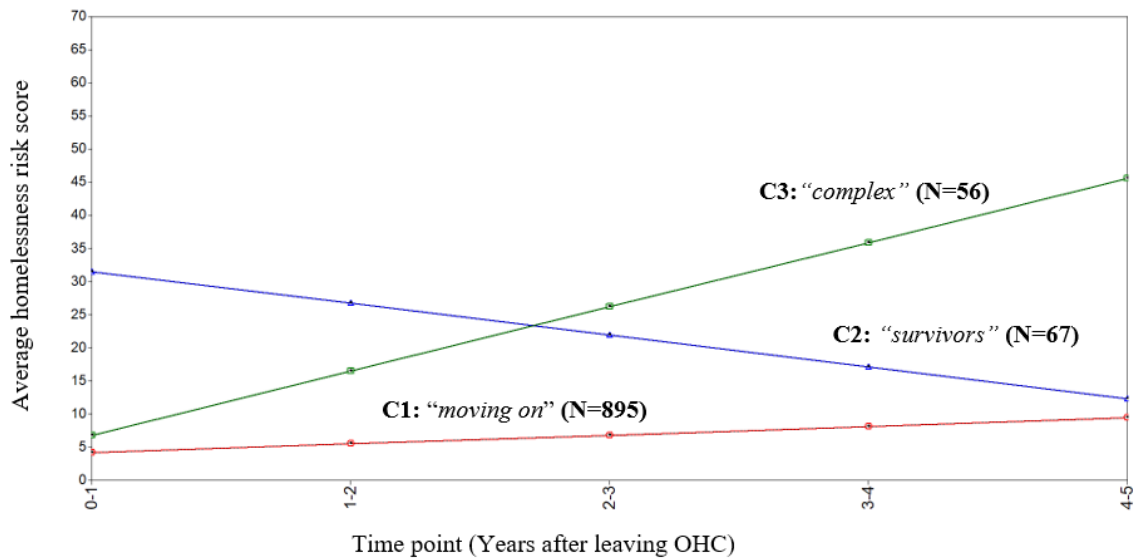


Table 14

Fit Indices of trajectory classes for conditional LCGA model

Model Fit Statistics	2 classes	3 classes	4 classes	5 classes
AIC	32286.10	31987.92	31902.25	31840.60
BIC	32581.64	32446.01	32522.88	32623.77
SSABIC	32391.08	32150.63	32122.69	32118.77
LL (No. of parameters)	16083.05 (60)	-15900.96 (93)	-15825.12(126)	-15761.30 (159)
Adj. LMR-LRT (<i>p</i>)	601.33 (0.006)	376.55 (0.04)	171.73 (0.367)	-1.377 (0.103)
BLRT (<i>p</i>)	603.96 (<0.001)	378.20 (<0.001)	172.48 (<0.001)	190 (<0.001)
Entropy	0.912	0.904	0.886	0.928
Group size (%)				
C1	923 (91%)	895 (88%)	834 (82%)	856 (84%)
C2	95 (9%)	67 (7%)	100 (10%)	53 (5%)
C3	-	56 (5%)	43 (4%)	44 (4%)
C4	-	-	41 (4%)	41 (4%)
C5	-	-	-	24 (2%)

Parameter estimates for 3-class model			
Mean of growth factors	Class 1 (n=895)	Class 2 (n=67)	Class 3 (n=56)
Intercept factor	1.331	1.242	-5.520
Linear factor	-0.128	-2.681	8.880

Notes

LCGA = Latent Class Growth Analysis

LL = Log-Likelihood value.

No. of Parameters = Number of estimated (freed) parameters.

AIC = Akaike Information Criteria.

BIC = Bayesian Information Criteria.

SSABIC = Sample Size Adjusted BIC.

LMR-LRT = Lo-Mendell-Rubin Likelihood Ratio Test.

Adj. LMR-LRT = Adjusted Lo-Mendell-Rubin Likelihood Ratio Test.

BLRT = Bootstrap Likelihood Ratio Test.

p = *p*-value.

The adjusted associations (adjusted risk ratio: ARR) between baseline participants' characteristics and the probability of following each homelessness risk-trajectory profile are presented in Table 15: The *cl*: 'moving on' homelessness risk profile was the reference group for the model. In the analysis, young people who left care at an older age (ARR: 1.83; 95%CI: 1.07-3.14), or those who lived in home-based or permanent care (ARR: 2.39; 95%CI: 0.98-5.87), or stayed in residential care (ARR: 3.55; 95%CI: 1.52-8.30) or had a history of substance misuse (ARR: 2.13; 95%CI: 1.19-3.82) were more likely to be members of the 'survivors' group than the 'moving on' group. While age of leaving care explains the trajectories of young people up to 4 or 5 years after leaving care, these trajectories may change, say 7 to 10 years later, due to other factors.

In addition, young people who were Indigenous (ARR: 2.13; 95%CI: 1.17-3.87) or stayed in residential care (ARR: 2.41; 95%CI: 1.11-5.23), or who had chronic mental health and substance misuse after leaving care (ARR: 4.17; 95%CI: 2.21-7.87) were more likely to be members of the 'complex' group than the 'moving on' group. Further sensitivity analysis to explore predictors of group membership (multivariate analysis) for the two age groups, showed similar results from the original model with all young people (SI Table xii). Placement type did not modify the association between chronic mental health and substance misuse and class membership (SI Table xii). While our study did not investigate all in-care experiences that may be associated with homelessness trajectories, some in-care experiences are shown to be significantly associated with class membership i.e., criminal justice involvement, placement type and mental health or substance misuse prior leaving care.

Table 15

Adjusted associations (Relative-risk ratio RR) of mental health and substance misuse with homelessness risk trajectory group profiles for OHC study participants over 5 years follow-up

Characteristic	Class 2: 'Survivors' (N=67)		Class 3: 'Complex' (N=56)	
	RR (95% CI)	p-value	RR (95% CI)	p-value
Gender				
Male	Reference		Reference	
Female	0.91 (0.53-1.56)		1.63 (0.88-3.04)	
Indigenous Status				
Not Indigenous	Reference		Reference	
Indigenous	1.29 (0.72-3.21)		2.13 (1.17-3.87) *	
Location				
Major Cities	Reference		Reference	
Regional/remote	1.01 (0.59-1.73)		0.62 (0.33-1.16)	
Age of leaving care				
15-16 years	Reference		Reference	
17-18 years	1.83 (1.07-3.14) *		0.84 (0.46-1.54)	
Criminal justice involvement	1.04 (0.58-1.88)		1.12 (0.57-2.20)	
Psychological harm victim	1.11 (0.64-1.93)		1.56 (0.81-2.99)	
History of substance misuse	2.13 (1.19-3.82) *		1.57 (0.83-2.98)	
History of mental health disorders	1.41 (0.80-2.48)		0.91 (0.49-1.71)	
Chronic mental health and substance misuse	1.84 (0.95-3.55)		4.17 (2.21-7.87) ***	
Recent placement type				
Kinship care	Reference		Reference	
Home based/ permanent care	2.39 (0.98-5.87) *		1.48 (0.62-3.52)	
Residential care	3.55 (1.52-8.30) **		2.41 (1.11-5.23) *	

Notes

Multinomial logistic regression significance level: *p<0.05; **p<0.01; ***p<0.001

Reference Group: Class 1 'Moving on' group.

Discussion

Trajectories of homelessness among sub-groups of young people

Previous studies utilising growth mixture models have tested the hypothesis that sub-groups may exist among young people transitioning from OHC; however, to date, the trajectories of homelessness risk have not been examined in this population group. In this retrospective longitudinal study, we examined trajectories of homelessness risk of young

people (15-18 years) over a five-year period after leaving OHC. Overall, findings suggest that there are three distinct groups with different trajectories of homelessness risk. The findings are consistent with prior research indicating that young people transitioning from OHC may comprise three distinct sub-group populations; the *'moving on'*, *'survivors'*, and *'complex'* groups (Bengtsson et al., 2020; Stein, 2008). We also examined factors associated with the various trajectories of these young people.

The largest group, the *'moving on'* group (88%), had the lowest levels of homelessness risk. This group initially faced low levels of homelessness risk, but the risk gradually increased over time. The group had a significantly higher proportion of young people who were non-Indigenous, those not involved in the criminal justice system, and those who resided in kinship or home-based care. This group also had the lowest proportion of young people with a history of mental health or substance misuse and the lowest rates of chronic mental health and substance misuse disorders compared to the other groups. A similar profile was found in other studies (Courtney et al., 2012; Fowler et al., 2011; Hernandez & Lee, 2020; Keller et al., 2007). While this group had the lowest rates of homelessness, the trajectory suggests gradual increases of homelessness risk within five years, and previous research determines that if young people do not get the necessary supports post leaving care (Bengtsson et al., 2020), the homelessness trajectory could change with sharp increases over time.

The second group, the *'survivors'* group (7%), initially started with high levels of homelessness risk, which declined significantly over time. This group was associated with having a history of substance misuse disorders and staying in residential or home-based care compared to the *'moving on'* group. This could explain the initial high levels of homelessness risk the first year after leaving care. A history of substance misuse and mental health difficulties has also been shown to elevate levels of homelessness during the first few years

after young people leave care (Courtney et al., 2012; Keller et al., 2007). The risk of homelessness among young people aged 17-18 years was higher in this group compared to the *'moving on'* group. This is because of the high initial levels of homelessness risk experienced by young people aged 17-18 years during the first year of leaving care, compared to young people aged 15-16 years. Young people who leave care at a young age (15-16 years) may have re-united with their families or carers, hence the reason why they faced lower rates of homelessness compared to older youth (17-18 years old) in the first few years after leaving care. Previous studies have shown that re-unification usually occurs during the first year after leaving care, with declining re-unification rates over time (Delfabbro et al., 2014; Hines et al., 2006). This is an important finding, given ongoing campaigns to extend the age of leaving care from 18 to 21 years among young people in OHC (Mendes & Rogers, 2020).

The third group, the *'complex'* group (5%), started with low homelessness risk but faced sharp increases in homelessness risk over time. While this group had the lowest proportion of young people leaving care, the sharp increase in rates of homelessness risk over time is concerning. The increase in homelessness risk may be the result of a lack of support provided to this group of young people. The risk of homelessness among Indigenous young people was higher in this group compared to the *'moving on'* group. This finding is consistent with previous literature where young people of indigenous background are over-represented in the OHC system and have poorer outcomes, regardless of care experience (AIHW, 2020). In addition, the risk was higher among young people who stayed in residential care compared to those in the *'moving on'* group, an indication of inconsistent support offered to young people when they leave care (Miller et al., 2017). Prior research has shown that young people with a history of staying in residential care settings have poorer outcomes, such as mental health difficulties and homelessness, when they exit care (Kelly, 2020). The study has also

shown that chronic mental health and substance misuse increases the risk of homelessness over time, particularly for this group.

This result shows that providing integrated mental health and substance misuse services is crucial for this high-risk group who faces increased homelessness risk over time. Policies alone aimed at improving homelessness may be insufficient to significantly reduce homelessness in this group. Further support may be required, such as giving young people opportunities to further their studies or training, ultimately leading to better employment prospects and the ability to secure stable accommodation (Stein, 2006).

Support for Stein's Theory

The findings from our study provide strong support for Stein's Theory, elucidating three distinct groups based on homelessness and housing instability patterns over time and how certain factors contribute to these. While the '*moving on*' group had the lowest levels of homelessness, the upward trajectory is of concern, especially if there is a lack of extended care and housing support. Consistent with Stein's Theory, the '*survivors*' group were more likely to experience instability, including periods of homelessness after leaving care. We could speculate that the declining homelessness trajectory could be because of a higher proportion of young people leaving care at an older age and possible support they received while leaving care.

Our findings support the notion that mental health and substance misuse interventions could contribute to reducing the trajectory of homelessness among this group since this group was associated with higher levels of substance misuse problems prior to leaving care. The '*complex*' group showed steep increases in homelessness over time, which was mostly associated with chronic mental health and substance misuse problems. This shows that further support should include programs focussing on dual mental health and substance misuse diagnosis. While our study supports Stein's theory, more information may be required

on in-care and pre-care experiences to understand the different trajectories of young people leaving care. These may include relationships and support from carers, placement stability, age of entry into care, education, planning for leaving care, and supports received while in and after having left care (Courtney & Heuring, 2005; McGuire et al., 2018; Stein, 2008). This theory should be tested in future research.

Implications for practice, legislation, and policy

The findings provide evidence for developing a more nuanced approach to interventions for people leaving OHC. The results suggest that policymakers may need to have different approaches for each of these three groups. The low levels of homelessness among the *'moving on'* group could represent the impact of engaging with services or supports on homelessness. Slight adjustments are required for the *'moving on'* group, given that homelessness is slightly increased over time. In addition, given that this is the largest group, and they start from a very low level of risk, it likely does not warrant large amounts of resources.

Given the downward trajectory of homelessness over time, some lessons could be learnt from the *'survivors'* group. Clearly, some interventions seemed to have worked for this group that started off with the highest levels of homelessness with a steep decline over time. This group may require resources and support for the first two years after leaving care, after which fewer resources may be needed to maintain the downward trajectory of homelessness.

New approaches to interventions may be needed for the *'complex'* group. We need to learn from the *'moving on'* group, combined with new innovative ways to reduce homelessness risk for the *'complex'* group, which may involve trauma-informed care and culturally sensitive programs responsive to the needs of Indigenous young people (Mayer, 2019). The interventions have to focus on creating safe spaces for young people to access services without fear of being judged and to build trust and relationships with indigenous

young people, acknowledging the trauma that these young people have experienced in their lives (Brooks et al., 2018; M. Van den Bree et al., 2009).

The low level of homelessness in the *'moving on'* group is reassuring; however, it is clear for the other two groups, the high rate of homelessness could be reduced post leaving care. Evidence has shown that extending support for care leavers could reduce homelessness rates (Mendes & Rogers, 2020). This could potentially result in halving the rate of homelessness among young people leaving care (Mendes & Rogers, 2020). If partnership agreements are to be fulfilled and targets to reduce homelessness and housing stress are to be met in Australia, policymakers would need to have an integrated and coordinated effort in tackling homelessness among the diverse groups of young people in OHC (Johnson et al., 2015).

Recommendations for future research

This study has identified distinct homelessness and housing instability trajectories among young people leaving care and the factors associated with these. Chronic mental health and substance misuse emerged as a significant predictor of increasing homelessness rates, pointing to a potential bidirectional association between mental health and homelessness, which should be explored in future research.

Future studies should collectively and, perhaps, cumulatively determine which factors (before and during placement in OHC) are strong predictors in identifying future homelessness trajectory group membership. These factors may include in-care characteristics such as the age of entry into care, the type of OHC placement with the most extended duration, placement instability, planning for independent living, carer and agency supports and cumulative abuse (Courtney & Heuring, 2005; McGuire et al., 2018; Stein, 2008). This study showed strong predictors of homelessness trajectories, such as comorbid mental health

and substance use after leaving care; however, it is critical to explore how comorbid mental health and substance use before leaving care would influence homelessness trajectories.

In addition, future research could explore how other resilience factors, such as life course agency, could help young people plan for the future (Bengtsson et al., 2020), including planning for independent living (Höjer & Sjöblom, 2013). Other factors include having positive and lasting relationships with carers (Mendes & Purtell, 2020) or exposure to various housing support programs (Tsemberis, 2011), which could further enhance our understanding of the three trajectories that were identified in this study.

Previous studies have shown strong associations between homelessness and employment status and education (Fowler et al., 2011; Hernandez & Lee, 2020) for young people in OHC, which should be explored in future research. The attribution of various housing or mental health interventions on the trajectories of homelessness warrants further research. While this study showed distinct trajectories among the OHC group, it would be valuable to have comparison groups at a population level to determine the type of trajectories that exist among young people who had child protection contact but never lived in OHC or among those who never had contact with the child protection system. All these variables are important in longitudinal research as they may potentially influence how young people adapt to changing situations and functioning over time. The three groups are complex, and there is a need for further research to improve data collection and reporting in child protection systems.

Limitations

Linked administrative data contain measures used for administrative purposes and may therefore lack outcome data for research (Johnson & Nelson, 2013). The data may therefore need to be augmented with self-reported data. However, the benefits of using administrative data are well documented and outweigh the limitations, particularly for research among hard-

to-reach population groups such as young people transitioning from out-of-home care (Hurren et al., 2017; Tew et al., 2017).

As discussed in previous research (Chikwava et al., 2022), the homelessness data from the Victorian homelessness collection only identifies young people who were referred to or attended homelessness services, thus potentially underestimating the true prevalence of homelessness. Further, those who are chronically homeless may not use homelessness services due to stigma or barriers to accessing these services (Randolph et al., 2002). However, by using a more nuanced measure of homelessness in this study, we have tried to capture all forms of homelessness from the least to the most severe.

The mental health and substance misuse measures reported in this study are from public inpatient and outpatient records, and they exclude private outpatient records, thus potentially excluding the less severe forms of mental health disorders. This information may be captured in community-based settings or through interviews with young people who do not access healthcare. Some in-care and pre-care variables that could predict homelessness risk, such as the age of entry into care and placement type with the most extended duration, were unavailable in these datasets.

Conclusions

Our findings are consistent with previous studies on sub-groups of young people leaving care (Fowler et al., 2011; Keller et al., 2007; Stein, 2008); however, our study demonstrates that subgroups of young people transitioning from care exist with distinct longitudinal trajectories of homelessness, and these classes are associated with different risk factors. The multiple linked datasets used in this study provided a comprehensive set of variables that were used to determine the homelessness trajectories among a group of young people leaving care in one part of Australia. We examined the factors contributing to the homelessness trajectories, including chronic mental health and substance misuse disorders.

While the study showed that not all young people transitioning from OHC are at increased risk of homelessness, the increased risk among the '*complex*' group is a notable finding and worthy of consideration as the basis for targeted interventions. It is critical that policymakers and service providers provide early intervention and different approaches to tackling homelessness for these three distinct groups before transitioning from care and during the first few years after leaving care to improve trajectories and promote positive outcomes (Healey & Fisher, 2011).

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Supplementary information

SI Table viii

Calculation of Homelessness risk score

Homelessness risk score =

$$\frac{(\text{Tot_R} * 13) + (\text{Tot_E} * 12) + (\text{Tot_H} * 11) + \dots + (\text{Tot_O} * 1)}{N}$$

N

Key

*Tot_R = Total episodes of **rough sleeping***

*Tot_E = Total episodes of **emergency shelter housing***

*Tot_H = Total episodes of **accommodation for the homeless***

.....

.....

*Tot_O = Total episodes of **extreme overcrowding***

N = Total number of time periods (years) when homelessness was recorded

Rough sleeping = Score of 13 (The highest form of homelessness) vs.

Extreme overcrowding = Score of 1 (Least form of homelessness)

SI Table ix

Mental Health Disorders (WHO ICD-10 Codes)

Mental Health Disorder	Sub-category	ICD 10-Codes
Substance use Disorder		F10* F11* F12* F13* F14* F15* F16* F17* F18* F19* Z721 Z722 X41* X42* X45* Y11* Y12* Y15* T40* T41* T42* T43* T509 T51*
Psychological development or behavioural and emotional disorders with onset usually occurring in childhood and adolescence	Psychological development Child-hood behavioural and emotional	F80* F81* F82* F83* F84* F85* F86* F87* F88* F89* F90* F91* F92* F93* F94* F95* F96* F97* F98*
Anxiety and Stress-related disorders	PTSD or stress -related (Reactions to severe stress, and adjustment disorders) Anxiety (including anxiety disorders, panic disorder, obsessive compulsive disorder)	F43* F40* F41* F42*
Mood or Depressive Disorders	Depressive episode, recurrent depressive disorder, persistent mood (affective disorder), other mood (affective) disorder, unspecified mood (affective disorder)	F32* F33* F34* F38* F39*
Personality Disorders		F60* F61* F62* F68* F69*
Intellectual Disability		F70* F71* F72* F73* F74* F75* F76* F77* F78* F79*
Self-harm		X6* X7* X80* X81* X82* X83* X84* Z915 R4581
Organic		F00* F01* F02* F03* F04* F05* F06* F07* F08* F09*
Eating Disorders		F50*
Other Mental Health		F44* F45* F48* F51* F52* F53* F54* F55* F56* F57* F58* F59* F63* F64* F65* F66* F67* F99*
Schizophrenia Manic/ Bipolar		F20* F21* F22* F23* F24* F25* F26* F27* F28* F29* F30* F31*

SI Table x

Fit Statistics for unconditional GMMs and LCGAs ($n=1,018$)

Model Fit Statistics	2 classes	3 classes	4 classes	5 classes
<i>LCGA</i>				
AIC	32474.77	32197.22	31996.16	32002.16
BIC	32524.02	32261.25	32074.97	32095.75
SSABIC	32492.26	32219.96	32024.15	32035.40
LL (No. of parameters)	-16227.38 (10)	-16085.61 (13)	-15982.08 (16)	-15982.08 (19)
Adj. LMR-LRT (p) "Tech11"	498.93 (0.01)	270.52 (0.04)	197.55 (0.02)	0 (0.48)
BLRT (p): "Tech14"	522.94 (<0.001)	283.54 (<0.001)	207.06 (<0.001)	0 (1.00)
Entropy	0.913	0.904	0.871	0.561
Group size (%)				
C1	942	883	810	450
C2	76	85	125	336
C3	-	50	46	48
C4	-	-	37	145
C5	-	-	-	38
<i>GMM-CI</i>				
AIC	32341.71	32149.17	31996.20	31920.74
BIC	32405.74	32227.99	32089.79	32029.11
SSABIC	32364.45	32177.17	32029.44	31959.23
LL (No. of parameters)	-16157.85 (13)	-16058.59 (16)	-15979.10 (19)	-15938.37 (22)
Adj. LMR-LRT (p) "Tech11"	338.29 (0.04)	189.41 (0.04)	151.67 (0.08)	77.72 (0.06)
BLRT (p): "Tech14"	354.57 (<0.001)	198.53 (<0.001)	158.97 (<0.001)	81.46 (<0.001)
Entropy	0.915	0.858	0.869	0.861
Group size (%)				
C1	66	842	815	786
C2	952	142	126	123
C3	-	34	40	56
C4	-	-	37	38
C5	-	-	-	15
<i>GMM-CV</i>				
AIC	30735.82	30497.08		
BIC	30814.63	30605.45		
SSABIC	30763.81	30535.58		
LL (No. of parameters)	-15351.91 (16)	-15226.54 (22)		
Adj. LMR-LRT (p) "Tech11"	1920.25 (<0.001)	244.84 (0.001)		

Model Fit Statistics	2 classes	3 classes	4 classes	5 classes
BLRT (p): "Tech14"	1966.46 (<0.001)	250.73 (<0.001)		
Entropy	0.756	0.743		
Group size (%)				
C1	636	662		
C2	382	216		
C3	-	140		
C4	-	-		
C5	-	-		

Growth Parameters across the Three Optimal Models (3-CLASS MODEL)

	Intercept		Slope		Factor Covariance
	Mean	Variance	Mean	Variance	
LCGA					
C1	7.563***		-3.646***		
C2	2.771**		4.341***		
C3	8.879***		7.000***		
GMM-CI					
C1	7.995***	1.136	13.314***	4.198***	1.119
C2	16.741***	1.136	-0.904	4.198***	1.119
C3	17.050***	1.136	-6.454***	4.198***	1.119
GMM-CM					
C1	13.398***	5.86***	1.892	6.06***	5.772***
C2	8.599***	0.004	12.751***	0.726	0.109
C3	16.900***	5.660***	-1.670	1.15	5.245***

SI Table xi

Trajectories of homelessness by age of leaving care

5.1 Average homelessness risk

Age Group	T1	T2	T3	T4	T5
15–16-year-old	4.51	9.18	10.17	10.31	9.67
17 – 18-year-old	7.03	9.42	11.80	12.26	9.83
t-tests	<i>t</i> = -4.05, <i>p</i>=0.0001	<i>t</i> = -0.36, <i>p</i> =0.72	<i>t</i> = -1.72, <i>p</i> =0.09	<i>t</i> = -2.10, <i>p</i>=0.04	<i>t</i> = -0.23, <i>p</i> =0.82

5.2 Class sample sizes

Class	15-16 years old	17-18 years old
1	497	383
2	55	35
3	37	11
Total	589	429

5.3 Residential placement type by age of leaving care.

Placement	15-16 years		17-18 years	
	N	%	N	%
Residential placement	239	40.6	163	38.0
Not residential	350	59.4	266	62.0
Total	589	100	429	100

Pearson $\chi^2(1) = 0.69$; *p*-value=0.41

5.4 Placement type by age of leaving care

Age of Leaving Care	Placement type		
	Kinship Care N (%)	Residential Care N (%)	Home-based/ permanent care N (%)
15 – 16 years	192 (32.6%)	239 (40.6%)	158 (26.8%)
17 – 18 years	109 (25.4%)	163 (38.0%)	157 (36.6%)

SI Table xii

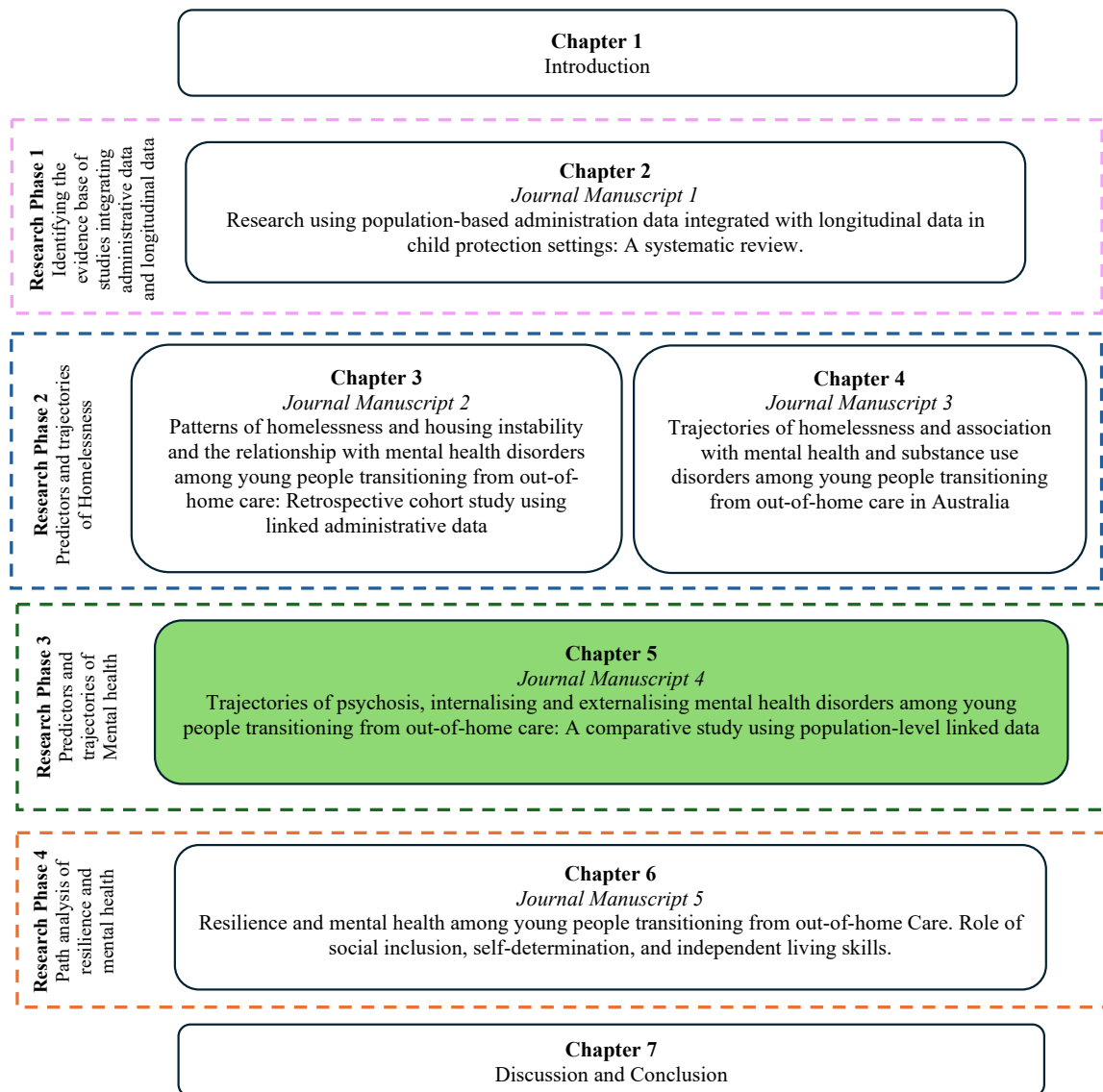
Test for interaction of chronic mental health and substance use and placement type

	Class 2: "Survivors" (N=67)			Class 3: "Complex" (N=56)		
	RR	95% CI		RR	95% CI	
Gender						
Male	<i>Reference</i>			<i>Reference</i>		
Female	0.90	0.52	1.54	1.59	0.85	2.99
Indigenous Status						
Not Indigenous	<i>Reference</i>			<i>Reference</i>		
Indigenous	1.32	0.73	2.37	2.19*	1.20	4.00
Region						
Major Cities	<i>Reference</i>			<i>Reference</i>		
regional/remote	1.02	0.60	1.75	0.62	0.33	1.16
Age of leaving care						
15-16 years	<i>Reference</i>			<i>Reference</i>		
17-18 years	1.85*	1.08	3.18	0.86	0.47	1.59
Criminal justice involvement	1.02	0.56	1.85	1.10	0.56	2.16
Psychological harm victim	1.12	0.65	1.95	1.59	0.83	3.07
History of mental health	1.42	0.81	2.51	0.93	0.49	1.77
History of substance use	2.14*	1.19	3.85	1.53	0.80	2.91
Chronic mental health and substance use	1.42	0.16	12.58	2.15	0.41	11.12
Recent placement type						
Kinship care	<i>Reference</i>			<i>Reference</i>		
Home based/ permanent care	2.51	0.96	6.56	1.42	0.54	3.70
Residential care	3.22*	1.28	8.10	1.81	0.74	4.42
Chronic mental health and substance use * home-based care	0.66	0.05	9.62	1.18	0.14	10.06
Chronic mental health and substance use * residential care	1.69	0.17	17.05	2.75	0.45	16.80

Notes:

Significant associations: *p≤0.05; **p≤0.01; ***p≤0.001

Chapter 5 Trajectories of Mental Health disorders



Chapter 5 involves using linked administrative data from a birth cohort of young people born in Western Australia to study predictors and trajectories of mental health disorders among young people transitioning from OHC. Trajectories of internalising, externalising, and psychotic mental health disorders were examined among three groups: (i) young people in OHC, (ii) young people with Child Protection (CP) contact, and (iii) young people without CP contact. Following recommendations from the systematic review in Phase 1, complex longitudinal analysis was conducted using group-based trajectory modelling.

Distinct sub-groups of young people were identified for each of the three types of mental health disorders, underscoring the importance of targeted and person-centred interventions in tackling the variability and timing of these mental health disorders. As recommended in Chapter 2, a description of data linkage methods was provided, detailing the collaboration among the researchers at Curtin University and the WA Data Linkage Branch within the Department of Health. Additionally, missing data was addressed by fitting models using maximum likelihood estimation. The manuscript was submitted to a journal and is currently undergoing peer review.

Author Contribution Statement: Chapter 5

As co-authors of the paper entitled, *‘Trajectories of psychosis, internalising and externalising mental health disorders among young people transitioning from out-of-home care: A comparative study using population-level linked data’*, we confirm that Fadzai Chikwava has been the principal researcher and has made the following contributions:

- Conceptualisation and design of the research;
- Data collection, analysis and interpretation;
- Writing the manuscript and critical appraisal of the findings;
- Corresponding author for communication with the journal

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data analysis and interpretation; and
- Review and editing of the manuscript.

<i>Signed:</i>	Reinie Cordier	Date: 10.09.2024
<i>Signed:</i>	Anna Ferrante	Date: 10.09.2024
<i>Signed:</i>	Melissa O’Donnell	Date: 10.09.2024

Journal Manuscript 4

Trajectories of psychosis, internalising and externalising mental health disorders among young people transitioning from out-of-home care: A comparative study using population-level linked data

Fadzai Chikwava^{a,b}, Reinie Cordier^{c,a,d}, Anna Ferrante^e, Melissa O'Donnell^{f,g}

- a. Curtin School of Allied Health, Curtin University, Perth, Western Australia, Australia
- b. Mental Health Commission, Perth, Western Australia, Australia
- c. Department of Social Work, Education and Community Wellbeing, Northumbria University, Newcastle upon Tyne, United Kingdom
- d. Department of Health & Rehabilitation Sciences, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa
- e. Curtin School of Population Health, Curtin University, Perth, Western Australia, Australia
- f. Australian Centre for Child Protection, University of South Australia, Adelaide, South Australia, Australia
- g. Telethon Kids Institute, University of Western Australia, Nedlands, Western Australia, Australia

Declarations of interest: none

Abstract

Background. Young people transitioning from out-of-home care (OHC) often face poorer long-term mental health and substance misuse outcomes compared with their peers in the general population. Despite this awareness, there is a notable gap in understanding the trajectories and variability of mental health disorders within this population, along with associated factors.

Objectives. This study aims to examine the trajectories of mental health disorders (internalising, externalising and psychotic episodes) in a cohort of young people in OHC. The study seeks to compare these trajectories with those of young people with Child Protection (CP) contact and those without CP involvement while identifying factors influencing these trajectories.

Methods: Utilising a retrospective population-based approach, we investigated a birth cohort comprising 414,746 individuals born in Western Australia between 1993 and 2008. Group-based trajectory modelling was conducted using linked data from birth registrations, hospitals, emergency departments, housing, child protection, mental health information systems, and family connections data.

Results: Our study revealed two distinct sub-groups for all mental health disorders: Group 1 “*low stable*” (>85%), exhibited consistently low levels of internalising, externalising, and psychotic trajectories. In contrast, Group 2 “*high increasing*” (<15%) displayed escalating mental health disorders over time, with more pronounced peaks observed in the OHC subgroup. Females had higher rates of internalising disorders compared to males, while males experienced externalising disorders at an earlier age compared to females. Moreover, males and young people of Aboriginal descent demonstrated higher levels of psychotic disorders compared to females and non-Aboriginal counterparts, respectively. A combination of socio-demographic, environmental and placement

characteristics, including substance misuse, emerged as predictors for diverse mental health trajectories.

Conclusions: Our study is the first to delineate distinct trajectories of internalising, externalising and psychotic episodes within a population birth cohort encompassing three groups of young people (OHC, CP contact and no CP contact). Additionally, our findings reveal the time-varying impact of substance misuse on the trajectories of internalising and externalising mental health episodes in these diverse population groups. The results underscore the imperative for integrated, holistic, and person-centred approaches in addressing the needs of young people transitioning from OHC.

Keywords

Cohort study, Out-of-home care, Child Protection, Group-based Trajectory Modelling, Mental health, psychosis, substance misuse, linked administrative data.

Introduction

Out-of-home care (OHC) involves placing children and young people in alternative care settings such as foster, kinship or residential care (Campo & Commerford, 2016). This may be due to various forms of neglect and abuse or when parents cannot provide adequate care for their children (AIHW, 2022). Evidence shows an increase in the number of children and young people having child protection experiences, including OHC (AIHW, 2022; OECD, 2022; Statistics UK, 2022).

There is overwhelming evidence that young people who transition from out-of-home care (OHC) have poorer long-term outcomes in various areas, including mental health and substance misuse compared with their peers in the general population (Berridge et al., 2020; OECD, 2022). Despite this, there is little understanding of the trajectories and variability of mental health disorders among this population group, and the associated risk factors.

A developmental pathways approach provides an accepted framework for modelling young people's onset and persistence of mental health disorders (Cicchetti & Rogosch, 2002; Gilliom & Shaw, 2004; Gutman et al., 2019). Group-based trajectory modelling allows us to investigate the developmental course of mental health outcomes among population sub-groups with different kinds of child protection experiences (Nagin, 2014).

Internalising mental health disorders are typically characterised by problems within the self, such as anxiety, depression, social withdrawal, or somatic problems (Bolger & Patterson, 2002; Davis et al., 2014; Yoon, 2017). Studies have shown high comorbidity of anxiety, stress, and depressive disorders; hence, these can be examined as one group of internalising mental health disorders (West et al., 2021). Additionally, these disorders often share similar symptoms and are often associated with negative emotions (Yoon, 2017). However, based on developmental psychology, it is important to recognise individual variation in internalising mental disorders among young people (Rutter & Sroufe, 2000). In

line with this, there is heterogeneity in trajectories of internalising disorders among young people, with evidence of between 3 – 6 distinct groups (Davis et al., 2014; Gilliom & Shaw, 2004; Gutman & Codioli McMaster, 2020; Sterba et al., 2007).

A combination of social, environmental and familial risk factors have been shown to be associated with various trajectories of internalising problems, and these include maternal or paternal mental health and/ or substance misuse disorders (Allen et al., 2010; Davis et al., 2014; Hussong et al., 2008; O'Donnell et al., 2015), various forms of child abuse and maltreatment (Melchior et al., 2014; Yoon, 2017) and poor housing or homelessness (Kim et al., 2023; Lansford et al., 2006). Placement types and placement instability are two prominent factors that may influence the trajectories of internalising mental health disorders (McGuire et al., 2018; Paine et al., 2021; Proctor et al., 2010). Substance misuse is also associated with increasing trajectories of internalising mental health disorders (Gutman & Codioli McMaster, 2020). Trajectories of internalising mental health disorders have been consistently shown to differ by gender (Gutman & Codioli McMaster, 2020; Sterba et al., 2007), with more elevated risk among females compared to males. While these studies use longitudinal data, most of them did not use linked population-level administrative data where comparison groups could be extracted for analysis.

Externalising mental health disorders are characterised by different aspects of externalising behaviour including physical aggression, antisocial behaviour, disruptive behaviour, and hyperactivity and, in some cases, substance misuse (Broidy et al., 2003; Fernandez Castelao & Kroner-Herwig, 2014; Kjeldsen et al., 2021). Given similar risk profiles of these specific behaviours, previous studies grouped externalising disorders together (Broidy et al., 2003; Lansford et al., 2018). Heterogeneity is reportedly present in externalising behaviours among various population groups of young people (Fernandez Castelao & Kroner-Herwig, 2014; Kjeldsen et al., 2021; Miller & Votruba-Drzal, 2017).

In most studies, three classes of severity of externalising disorders have been found, often classified as low, moderate, and high; however, the shape of the trajectories differ across different studies (Allen et al., 2010; Fernandez Castelao & Kroner-Herwig, 2014; Kjeldsen et al., 2021). Trajectories of externalising mental health disorders are associated with similar risk factors as for internalising mental health disorders (Barboza et al., 2017; Fernandez Castelao & Kroner-Herwig, 2014). Conversely, males have a higher likelihood of engaging in externalising behaviours compared to females (Cleverley et al., 2012; Fernandez Castelao & Kroner-Herwig, 2014; Lansford et al., 2006). Family conflict and harsh parenting practices have also been shown to increase the trajectories of externalising mental health disorders (Odgers et al., 2008; Tremblay et al., 2004).

Psychosis includes a range of substance-related disorders, bipolar affective disorder, schizophrenia, and schizoaffective disorders (Geng et al., 2013; Gynther et al., 2019; Mackie et al., 2011; Morgan et al., 2022). Unlike internalising and externalising mental health disorders, psychosis presents in late adolescent years (Gynther et al., 2019). While the prevalence of psychosis in the general population of young people is low, the persistence of psychotic disorders into adulthood is concerning (Murphy et al., 2014). Trajectories of psychosis or psychotic symptoms ranging from 3 to 4 classes have been identified among different population groups (Geng et al., 2013; Mackie et al., 2011; Morgan et al., 2022).

Trajectories of psychosis are associated with similar risk factors to internalising and externalising mental health disorders, and these include housing instability or homelessness, substance misuse (Mackie et al., 2011; Rimvall et al., 2020), victimisation (Mackie et al., 2011; Morgan et al., 2022) high socio-economic disadvantage (Bjorkenstam et al., 2017; Morgan et al., 2022) and parental mental health or psychotic experiences (Wigman et al., 2011). Previous studies have shown higher risk of psychosis among males compared to females (Coughlan et al., 2022). Additionally, young people of Aboriginal and Torres Strait

Islander background (hereinafter referred to as Aboriginal) have been shown to have elevated levels of psychosis compared to non-Aboriginal young people (Gynther et al., 2019; Mirza et al., 2022).

Substance misuse is associated with increase in the severity of mental health symptoms over time (Gutman & Codioli McMaster, 2020; Lawler et al., 2021). Substance misuse has a critical role in shaping trajectories of mental health because as children transition from a young age to adolescence, they begin spending more time with peers outside of the control of their parents or caregivers, exposing them to opportunities to engage in high risk behaviours, including substance misuse (Glaser et al., 2010).

This study utilises linked administrative data from Western Australia. Given the range of mental health disorders among young people in Australia, disorders are grouped according to internalising, externalising and psychotic disorders. In addition, given the over-representation of Aboriginal young people in OHC, it is important to unpack and understand differences in mental health disorders by Aboriginal status.

The different types of OHC placements are included as a factor in this study. In Australia, residential care involves a child being placed into a home staffed by carers, while kinship care is where the caregiver is a family member or a person with a pre-existing relationship with the child other than the parents (AIHW, 2022). Foster care is where care is provided in the private home of a substitute family, which receives payment that is intended to cover the child's living expenses (AIHW, 2022). Prospective adoptive placement involves making an application to a licensed child-placing agency or clinical social worker or the department for approval. It also involves the placement of a foster child for whom the permanency plan is adoption. Lastly, self-select care refers to a young person who has elected to move to an unendorsed placement i.e., a placement not approved by the Department of Communities (AIHW, 2022).

As reflected above, there is abundant evidence of studies examining trajectories of internalising, externalising and psychotic mental health disorders among young people; however, there is limited research examining trajectories using large population level linked data. Secondly, no study has examined the trajectories of mental health for young people transitioning from OHC compared to trajectories among young people CP contact or those with no CP contact.

Thirdly, it has been shown that as young people transition from OHC, tracking their outcomes becomes challenging (OECD, 2022), hence our study uses population-level linked data to examine trajectories from birth up to the age of 27 years. This approach offers much longer follow-up than studies that have examined trajectories of mental health from childhood up to adolescent age (Burstein et al., 2010; Lansford et al., 2006; Proctor et al., 2010). Fourthly, our study allows us to examine early life predictors of mental health and trajectories at different developmental stages, including the transition to adulthood of young people in OHC.

Based on our review of the available literature, we hypothesise that several factors including OHC placement, CP involvement, family violence, experiences of housing instability or homelessness, parents' mental health or substance misuse, or psychotic disorders are likely associated with trajectory group membership for internalising, externalising or psychotic mental health disorders. We also hypothesise that various forms of maltreatment among OHC and CP contact groups, placement instability and living in residential settings among the OHC group, are likely associated with trajectories that are characterised by higher levels of internalising, externalising or psychotic episodes.

We further hypothesise that there will be gender differences in trajectories of internalising or externalising mental health disorders (i.e., females would be associated with higher levels of internalising disorders compared to males and conversely males would have

higher levels of externalising disorders compared to females) (West et al., 2021). Given that young people from Aboriginal backgrounds have higher prevalence of psychosis, we predict Aboriginal young people will have an increasing trajectory of psychosis. Conversely, lower levels of internalising, externalising or psychotic disorders would be associated with young people without CP contact.

Investigation of the mental health trajectories of young people with different OHC experiences & CP involvement will facilitate understanding of the factors associated with these different pathways. It will also provide valuable information on clinically relevant data and points of critical intervention. Analysis of three comparison groups will give us a better understanding of differing levels of vulnerabilities and how these vary for high-risk groups of young people (OHC & CP contact).

The study's overall goal is to provide a holistic analysis of the trajectories of internalising, externalising and psychotic disorders amongst three discrete population groups. Specifically, the following objectives were addressed:

1. Describe the mental health (internalising, externalising and psychotic episodes) trajectories of young people in OHC cohort, comparing these with the trajectories of young people with CP contact and no CP contact.
2. Determine the factors (socio-demographic, environmental and placement characteristics) associated with the mental health trajectories and how these vary across the three population groups.
3. Determine the time-varying effect of substance misuse in trajectories of internalising and externalising disorders for each of the three population groups.
4. Determine gender differences in the trajectories of internalising and externalising mental health disorders.

Methodology

Study population

We conducted a retrospective population-based study of a cohort of 414,746 young people born in WA from 1993 to 2008. For this cohort, data was obtained from birth until December 2021. To address the study objectives, three sub-cohorts were identified: 1) Young people who had lived in OHC for at least six months (OHC cohort); 2) Young people who had a record of child notifications for child maltreatment but did *not* have a history of OHC (CP contact cohort); and 3) Young people who had never had any record of child protection contact (No CP contact cohort).

Data Sources

The data was accessed through Western Australia (WA)'s Social Investment Data Resource (SIDR), a whole-of government, linked, administrative population database (Ferrante et al., 2020). De-identified data for each person was obtained from the WA Department of Communities (DoC) and the Department of Health (DoH). The health data included information from WA's Hospital Morbidity Data Collection, (HMDC), Mental Health Information System (MHIS), Midwives Notification System (MNS), the WA Birth Register (BR) and Mortality Register. Probabilistic data linkage was conducted by both the Data Linkage Branch within the DoH and the Centre for Data Linkage at Curtin University (Ferrante et al., 2022). The WA Data Linkage branch also maintains the WA Family Connections System (Glasson et al., 2008) which identifies mother-child relationships and father-child relationships using the BR and MNS. The MNS and BR were used to select the study cohort which contain birth information, including maternal characteristics.

The DoC data contains child protection and housing data. The child protection data comprised information on concerns for child wellbeing, notification and substantiations of maltreatment allegations, and care placements. This dataset was used to classify the OHC

cohort and the CP contact cohort. The housing data contains applications for public housing, including tenancies, incomes, and warnings.

The WA Health Data comprised the MHIS, the HMDC and the Emergency Department Data Collection (EDDC). The MHIS records information on inpatient (public and private) and outpatient (public) psychiatric episodes, while the HMDC records hospitalisations (public and private hospitals). The EDDC is a comprehensive data set of all presentations to emergency departments at public hospitals in WA. It includes symptom, diagnosis, and cause information where available for each presentation, along with departure and referral information. These three datasets were used to identify study participants and parents' contact with Mental Health services, including for substance misuse.

Ethics

Ethics for conducting the study was provided by Curtin University Human Research Ethics Committee (Ethics number (HRE2021-0151), the Western Australia Department of Health, Human Ethics Review Committee (project #2014/10) and the Western Australian Aboriginal Health Ethics Committee (project #533). The data custodians reviewed and approved requests for linked data. As per usual practice with linked datasets, the need for consent was waived by the ethics committee because of the anonymised nature of the linked administrative data used.

Study Measures

The analysis comprised participants' socio-demographic characteristics, factors, and mental health outcome variables. The following measures were used in the study:

Socio-demographic characteristics. The study participants' gender, age at the end of the study, geographic location, socio-economic status, and the mother's age at the time of birth were obtained from the Birth register and MNS datasets. The Aboriginal status variable was obtained from the health data and derived using algorithms from multiple linked datasets

to improve this variable's completeness and accuracy (Christensen et al., 2016). The Australian Bureau of Statistics (ABS)'s Index of Relative Socio-economic advantage and disadvantage 2016 data (SEIFA) was used as a proxy measure of socio-economic disadvantage (Australian Bureau of Statistics, 2018), as this was the closest in time to the data extraction date. The SEIFA variable was collapsed into five categories, ranging from 1 (most disadvantaged) to 5 (least disadvantaged), while the geographic location was collapsed into three categories (city, regional and remote).

The following factors were identified in the literature as increasing the risk of internalising, externalising and psychotic disorders and were therefore used in the analysis:

Child Protection Factors

Notifications and substantiations. These included notifications of family and domestic violence, child neglect, and physical, sexual, or emotional abuse. Other reported concerns included mental health problems, family relationship problems and child behavioural concerns such as running away from home, and antisocial-behaviour or school problems. Substantiated reports were recorded for physical, emotional, and sexual abuse and neglect.

Longest placement type. This was the placement in which the young person had the longest stay throughout their OHC stay, which included kinship care, residential care, foster care, self-select care and prospective adoptive placement.

Placement instability. Placement instability was determined by counting the total number of distinct placement changes (e.g. movement from foster carer A to kinship carer B and back to foster carer A will be counted as two distinct placements) multiplied by the number of placement types, thus avoiding double counting, and dividing by the total duration in care (Asif et al., 2024; Wulczyn & Chen, 2017) (Figure 7). Duration of time in OHC was considered by examining the number of placement changes per 1000 person-care days

(Wulczyn & Chen, 2017). Based on the distribution of the continuous placement instability variable, four categories were created for analysis i.e., (low=0 to 4.9), (medium = 5 to 19.9) and (high=more than 20). The formula is shown in Figure 7 below.

Figure 7

Calculation of Placement Instability

$$\frac{\text{Number of } \textit{distinct} \text{ placement changes} \times \text{Number of placement types}}{\text{Total duration in care} \div 1000}$$

Contextual Factors

Homelessness. Two data sources were used to determine homelessness or unstable housing. Homelessness was reported as one of the child protection concerns in the child protection data, while the housing application data was used to determine reported homelessness or unstable housing as a reason for a public housing application. A categorical variable was created for the number of times a person or his household applied for public housing. In addition, a binary variable was created for any instance of homelessness or unstable housing from the Housing or Child Protection data.

Person Factors

Substance misuse. We obtained data pertaining to mental and behavioural disorders due to substance misuse, drug dependence disorders and poisoning due to substance misuse from the HMDS, MHIS and ED data using the WHO ICD 8, 9 and 10; (SI Table xiii). The following two variables were created for the study cohort: (i) any use of substances prior to any mental health diagnosis (binary variable), and (ii) total number of episodes of substances used from birth as a time-varying covariate (count variable). Parental substance misuse was also evaluated for its relationship to the young person’s mental health. It was coded as a

binary variable for the presence or absence of substance misuse. The variables excluded any forms of drug-induced psychosis.

Mental health outcomes

The HMDC, ED and MHIS contain diagnostic information based on the WHO ICD 8, 9 and 10, recorded for each episode of care for children from 1993 to 2021 and their parents from 1969 to 2021. For this study, we considered the mental health diagnosis for parents from birth up to the first mental health diagnosis of the child. SI Table xiii lists these mental health disorders and corresponding ICD codes. ICD-8 was used from 1970 to 1978, ICD-9 from 1979 to June 1999, and ICD-10 from July 1999 to 2021.

Self-report measures of internalising, externalising and psychotic experiences may be inaccurate due to the perceived stigma associated with mental health (Murphy et al., 2014), hence our study offers an alternative and arguably more reliable method of determining a clinical diagnosis of internalising, externalising and psychotic disorders based on the WHO ICD. Mental health disorders were determined from the three data sources. Any mental health episodes in any given month were counted once from any of the three data sources to avoid double counting. The total number (count) of mental health episodes was recorded at (0-3 years; 3-6 years; 6-9 years; 9-12 years; 12-15 years; 15-18 years; 18-21 years and 21-29 years). The three outcome variables were derived from diagnostic information on the following disorders:

1. **Externalising mental health disorders** consisted of attention-deficit hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), conduct disorder (CD), hyperkinetic disorders, antisocial personality disorder (ASPD) and habit and impulse disorders.

2. **Internalising mental health disorders** consisted of mood (affective) and depressive disorders, obsessive-compulsive disorders, stress and anxiety disorders, and intentional self-injury; and
3. **Psychotic disorders** included drug-induced psychotic disorders, schizophrenia, manic and bipolar disorders.

Statistical Analysis

Group-based trajectory modelling (GBTM) in STATA TRAJ (Jones & Nagin, 2013; Wickrama et al., 2016) was used to identify discrete groups of young people following distinct trajectories of internalising, externalising or psychotic disorder episodes as a function of age measured in years (0-3 years; 3-6 years, and so on). GBTM is a specialised form of finite mixture modelling and has an extended application history in modelling developmental outcomes trajectories (Kerner, 2005; Nagin, 1999). GBTM has the advantage of not making any prior assumptions about the distribution of the unobserved heterogeneity in the data since group classification may be influenced by random variation (Nagin, 2014).

Objective 1 & 4: Zero-inflated Poisson (ZIP) regression models were fitted to determine the best-fitting solution, by running a sequence of one, two, three or four group models for each of the mental health outcomes (Jones & Nagin, 2013). The presence of heterogeneity was determining by comparing the one-group to the two group models using likelihood ratio tests. The ZIP modelling approach was selected to allow for the excess zeros in the data, and the modelling was done in two parts, that is, the count or Poisson modelling part and the zero-inflation part, which predicts the probability of predicting excess zeros in the data (Wickrama et al., 2016). The GBTM was conducted for participants with at least one mental health episode recorded across the follow-up period, except for psychotic episodes where the whole sample was included among the OHC and CP Cohorts.

To establish the best-fitting solution, we evaluated linear and quadratic models. The models with quadratic terms were estimated based on prior evidence that internalising trajectories may be curvilinear (Bongers et al., 2003). In addition, a range of fit indicators was examined, including the lowest absolute Bayesian Information Criterion (BIC) and Akaike information criterion (AIC), the average posterior probability (APP) of group membership (with 0.70 regarded acceptable) (Kerner, 2005). Models with entropy values closer to 1 were selected as they represented higher classification accuracy (Jung & Wickrama, 2007). We also ensured adequate sample sizes in each group (minimum 30), reasonably narrow confidence intervals in the estimates and graphical outputs with distinct groups and clear group separation (Kerner, 2005). In addition to the statistical considerations for model selection, we considered the theoretical expectations, substantive meaning and interpretability of each group solution, and the need for parsimony (Kerner, 2005).

Objective 2: The second research question was addressed by fitting multinomial logistic regression models. This involved calculating relative risk ratios (RRR) to determine factors associated with trajectory group membership. Initially, we ran a series of bivariate logistic regression models to determine the variables (one at a time) that were significantly associated with each group membership. We then selected the variables that had significance in the bivariate analysis ($p < 0.10$) to be included in the multivariate regression analysis. For all final multivariate models, the level of significance was set at a *p-value* of 0.05 and 95% confidence intervals for all estimates.

Objective 3: Lastly, the effect of substance misuse was assessed as a time-varying covariate in separate models involving the trajectories for internalising and externalising disorders. ZIP regression modelling was conducted, and estimates, confidence intervals, and significance levels were determined from the model outputs.

Missing Data

Missing data was addressed by fitting models using maximum likelihood estimation, which is a key feature of GBTM. The models generated asymptotically unbiased parameter estimates, assuming the data were missing at random.

Results

Descriptive Analysis

Table 16 shows the description of the total cohort by child protection status. Out of the whole cohort of 414,746 young people, 6,816 (1.6%) were in the OHC cohort, 82,541 (19.9%) had CP contact, and 325,390 (78.5%) had no CP contact. The OHC cohort had a higher proportion of young people with at least one internalising, externalising, substance misuse, and psychotic disorder compared with the CP and no CP cohorts. The results in Table 16 show that young people in the OHC cohort had consistently poorer outcomes, such as earlier age of first mental health diagnosis, homelessness, or housing instability, family and domestic violence, parental mental health or substance misuse, socio-economic disadvantage and remoteness compared with the CP and no CP cohorts. As expected, the results showed an over-representation of young people of Aboriginal descent in OHC (41%) compared to those with CP (22%) or no CP contact (2%). Additionally, there was a higher proportion of young people in the OHC cohort with various forms of unsubstantiated and substantiated childhood allegations compared to the CP cohorts.

Table 16*Descriptive characteristics of the cohort by child protection status*

Characteristics	OHC (N=6,815)		CP Contact (N=82,541)		No CP Contact (N=325,390)	
	N	%	N	%	N	%
Internalising disorders	1,739	25.5	13,904	16.8	16,383	5.0
Substance misuse disorders	1,414	20.7	10,978	13.3	14,053	4.3
Externalising disorders	728	10.7	3,481	4.2	2,402	0.7
Psychotic disorders	215	3.2	1,424	1.7	1,375	0.4
Age first mental health (years)						
0-11	987	43.4	4,843	27.9	5,680	26.2
12-15	691	30.4	5,085	29.3	5,597	25.9
16-18	348	15.3	3,909	22.5	5,188	24.0
19-27	246	10.8	3,518	20.3	5,178	23.9
Gender						
Males	3,463	50.8	41,297	50.0	168,008	51.6
Females	3,352	49.2	41,244	50.0	157,380	48.4
Aboriginal status						
Aboriginal	2,790	41.3	18,248	22.2	7,155	2.2
Non-Aboriginal	3,969	58.7	64,097	77.8	317,992	97.8
Remoteness						
Cities	4,256	62.8	48,575	58.9	230,418	70.9
Regional	1,532	22.6	22,068	26.8	68,704	21.1
Remote	990	14.6	11,853	14.4	25,891	8.0
Socio-economic status (quintiles)						
1st (Most disadvantaged)	3,181	46.9	31,471	38.2	58,796	18.1
2	1,619	23.9	21,174	25.7	67,766	20.9
3	1,027	15.2	14,317	17.4	65,135	20.1
4	634	9.4	10,125	12.3	69,654	21.4
5th (Least disadvantaged)	315	4.6	5,392	6.5	63,471	19.5
Substance misuse (prior mental health diagnosis)	1,362	20.0	10,642	12.9	13,783	4.2
Homelessness or unstable housing	2,048	30.1	8,085	9.8	1,512	0.5
Family & domestic violence	1,844	27.1	7,985	9.7	842	0.3
Mother's age at birth (years)						
Less than 20	1,398	21.1	12,299	14.9	9,286	2.9
20-29	3,764	56.8	46,755	56.8	143,770	44.3
30-39	1,373	20.7	21,960	26.7	162,904	50.1
40 and above	88	1.3	1,321	1.6	8,909	2.7
Mother's mental health status						
No mental health or substance misuse	3,269	48.0	57,941	70.2	292,317	89.8
Mental health only	967	14.2	9,714	11.8	18,105	5.6
Substance misuse only	929	13.6	6,216	7.5	6,403	2.0
Mental health and substance misuse	756	11.1	4,791	5.8	4,562	1.4
Psychotic disorders	894	13.1	3,879	4.7	4,003	1.2
Father's mental health status						
No mental health or substance misuse	4,766	69.9	64,274	77.9	298,199	91.6
Mental health only	404	5.9	5,007	6.1	9,279	2.9
Substance misuse only	732	10.7	6,865	8.3	10,645	3.3
Mental health and substance misuse	439	6.4	3,595	4.4	4,019	1.2
Psychotic disorders	474	7.0	2,800	3.4	3,248	1.0

Characteristics	OHC (N=6,815)		CP Contact (N=82,541)		No CP Contact (N=325,390)	
	N	%	N	%	N	%
Child protection allegations (unsubstantiated)						
Neglect	5,505	80.8	11,429	13.8	n/a	n/a
Emotional	4,395	64.5	14,523	17.6	n/a	n/a
Physical	4,219	61.9	13,972	16.9	n/a	n/a
Sexual	2,990	43.9	16,402	19.9	n/a	n/a
Family relationship problems	621	9.1	1,458	1.8	n/a	n/a
Substance abuse	155	2.3	381	0.5	n/a	n/a
Behavioural problems	139	2.0	310	0.4	n/a	n/a
Mental health	112	1.6	307	0.4	n/a	n/a
Child protection abuse (substantiated)						
Neglect	4,830	70.9	3,645	4.4	n/a	n/a
Emotional	3,272	48.0	5,821	7.1	n/a	n/a
Physical	2,365	34.7	3,935	4.8	n/a	n/a
Sexual	1,227	18.0	4,488	5.4	n/a	n/a
Longest placement type						
Adoptive	325	4.8	n/a	n/a	n/a	n/a
Foster	1,939	28.5	n/a	n/a	n/a	n/a
Kinship	3,450	50.6	n/a	n/a	n/a	n/a
Residential	571	8.4	n/a	n/a	n/a	n/a
Self-select	527	7.7	n/a	n/a	n/a	n/a
Placement Instability						
Low (0-4.9)	3,943	58.0	n/a	n/a	n/a	n/a
Medium (5-19.9)	2,103	30.9	n/a	n/a	n/a	n/a
High (20+)	756	11.1	n/a	n/a	n/a	n/a
Internalising disorders Mean (SD)	3.6 (4.7)		2.9 (2.9)		2.4 (2.4)	
Substance misuse Mean (SD)	2.4 (3.1)		1.8 (2.0)		1.4 (1.4)	
Externalising disorders Mean (SD)	2.8 (2.8)		2.2 (1.7)		1.8 (1.2)	
Psychotic disorders Mean (SD)	4.0 (4.7)		3.8 (4.8)		3.3 (3.8)	

Notes

SD: Standard deviation

n/a: Not applicable

Trajectory group analysis

After evaluating the 2-, 3-, and 4-group models, GBTM indicated that a two-group model was the best fit for all mental health disorders. Most models achieved the best fit after adding a quadratic term to the linear models; after evaluating a few models, the best fit was achieved by adding a cubic term (SI Tables xvi, xvii, and xviii). The one-group model performed poorly on relative fit indices, indicating that more than one group was present, thus necessitating more than one GBTM being used across all cohorts. The best solution was selected based on high classification probabilities, low BIC and AIC values, and high entropy values. In addition, the two-group model provided clear class separations and was more

parsimonious than other models. The best fitting GBTMs for each of the three cohorts are shown in Figures 8, 9 and 10. The 2-group models follow similar patterns comprising Group 1 (G1 “*low stable*”) and Group 2 (G2 “*high increasing*”).

Trajectory groups of internalising mental health disorders

As Figure 8 shows, two trajectory groups were identified for each of the three cohorts. For each cohort, most of the sample was in G1 “*low stable*”, which comprised individuals with a low rate of internalising episodes across the follow-up time (>90%). G2 “*high increasing*” consisted of individuals who started with a low rate of internalising episodes (below the age of 9 years) but faced sharp increases, particularly among the OHC cohort, where the highest peak was reached at 15-18 years of age. For the CP and no CP cohorts, internalising episodes peaked at a later age of 18-21 years. For all cohorts, rates of internalising episodes in the G2 group declined after the age of 21 years. Females had higher rates of internalising disorders among G2 (7%) compared with males (3%), and males experienced moderate and almost stable rates over time (Figure 8).

Trajectory groups of externalising mental health disorders

Figure 9 shows each cohort's best-fitting trajectories for externalising mental health episodes. As with internalising disorders, two trajectory groups were identified for each cohort, whereby most of the cohort was in G1 (>90%) with low, stable rates of externalising episodes across the follow-up time. However, G2 had different trajectories across the three cohorts. For the OHC cohort, G2 “*high increasing*” (7%) started with low levels of externalising disorders, but rates increased at an earlier age compared to the CP (6%) and no CP (7%) cohorts. In addition, the peak for the OHC cohort was at ages 15-18 years, whereas the CP and no CP cohorts did not peak over time (Figure 9).

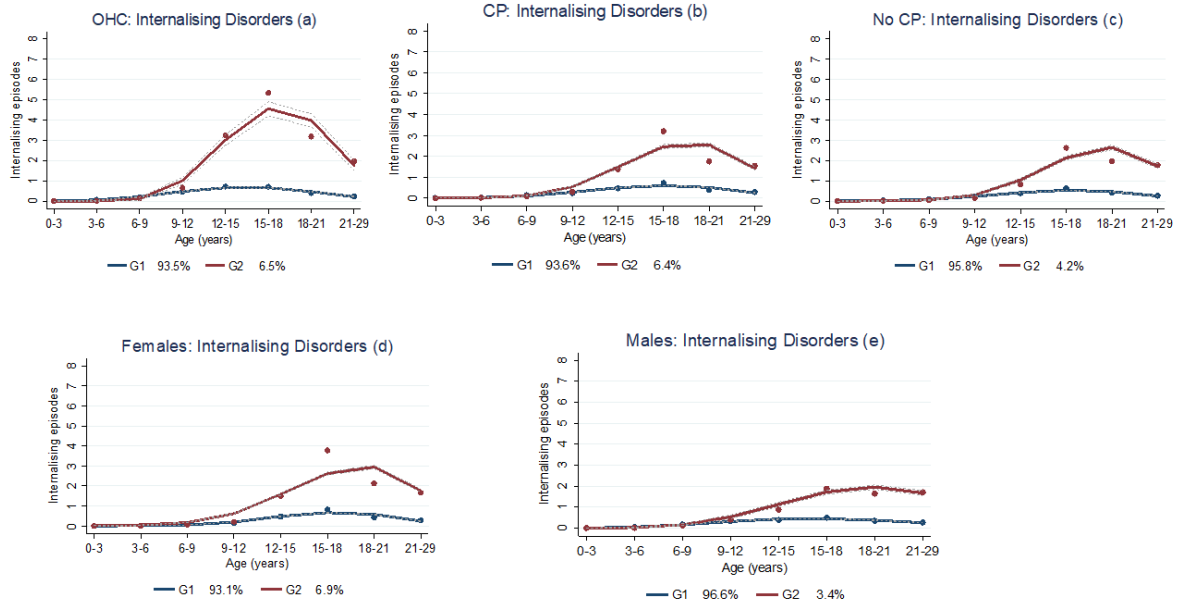
Females and males had similar rates of externalising disorders; however, the trajectory shapes for them were different. Females experienced externalising disorders at a later age but faced sharp increases for G2 from the age of 9-12 years, peaked at 15-18 years, and then sharply declined after this age. Males experienced externalising disorders at a very young age, and there were steady increases across the two groups over time, with no sudden increases or decreases. The highest rates of externalising disorders for males were observed around the ages of 9-12 years for both groups, G1 and G2 (Figure 9).

Trajectory groups of psychotic mental health disorders

Figure 10 shows the best-fitting trajectories for psychotic episodes for each cohort. It was notable that for each of the three cohorts, psychotic episodes were negligible below the age of 15 years. Two trajectory groups were found for psychotic episodes for each of the three cohorts. G1 “*low stable*” psychotic episodes started with low episodes, and remained stable across time, while G2 started with low episodes but faced sharp increases from the ages of 15-18 years, particularly for the OHC and CP cohorts. Unlike the internalising and externalising episodes, the trajectories for psychosis for G2 showed persistent increases over time, for all cohorts.

Figure 8

Trajectories of internalising episodes by child protection involvement and gender

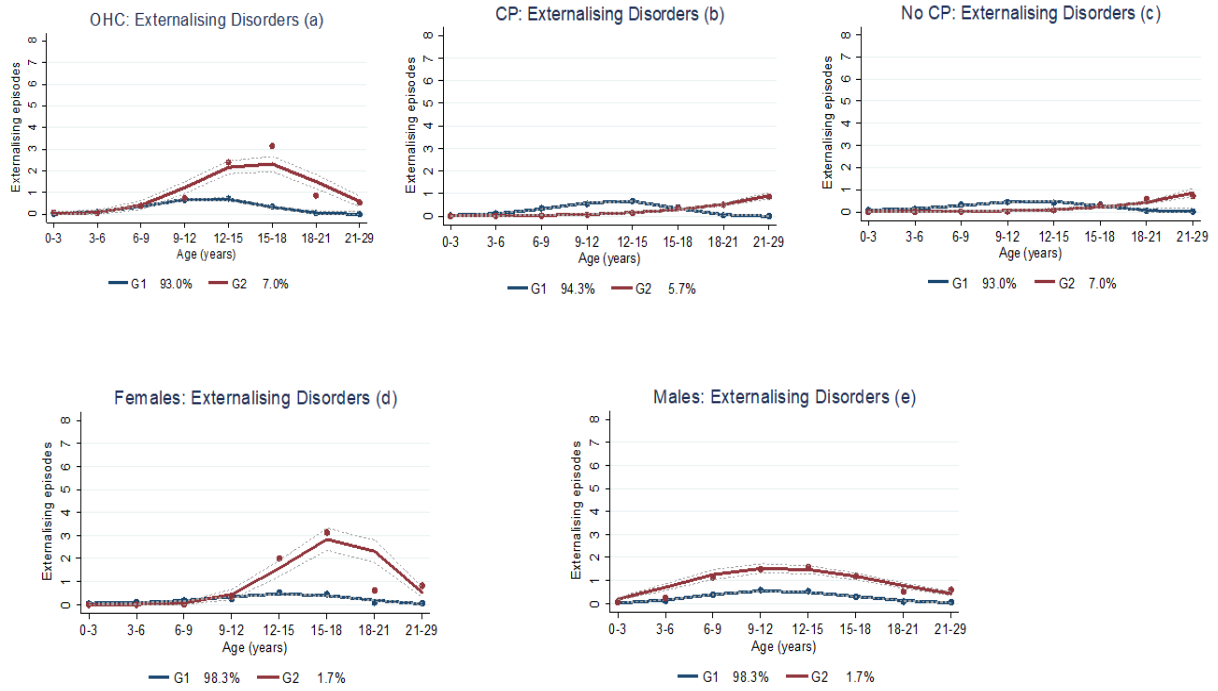


Notes

Continuous lines indicate estimated trajectories; large dots show observed data.

Figure 9

Trajectories of externalising episodes by child protection involvement and gender

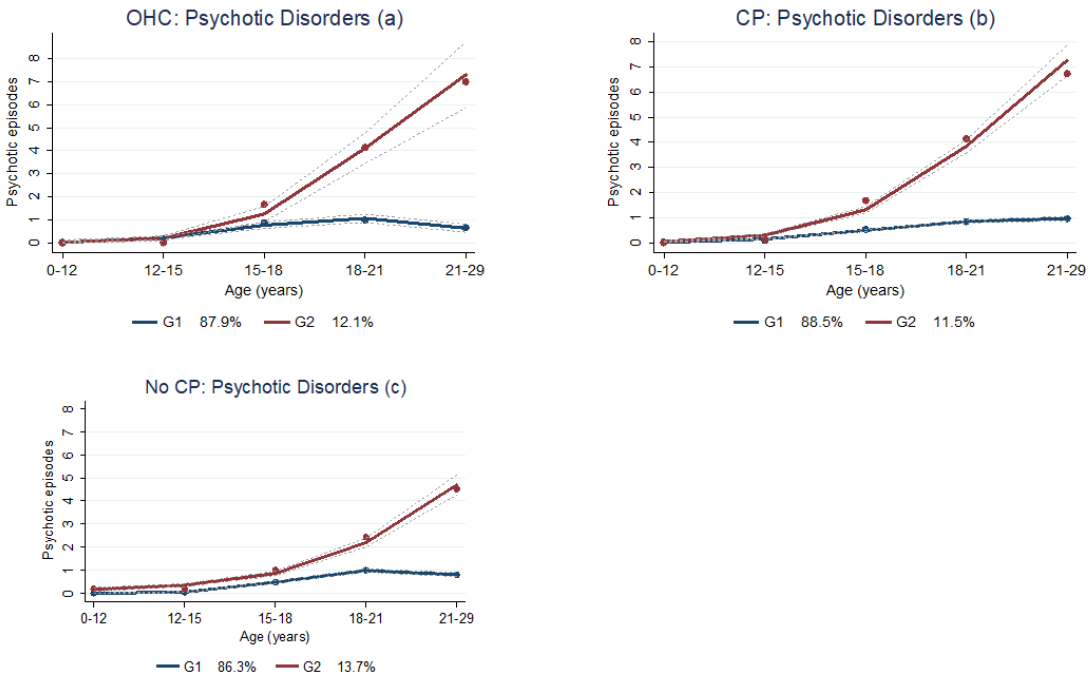


Notes

Continuous lines indicate estimated trajectories; large dots show observed data.

Figure 10

Trajectories of psychotic episodes by child protection involvement



Notes

Continuous lines indicate estimated trajectories; large dots show observed data.

Risk factors associated with trajectory group membership

Tables 17, 18, 19 show the results of the multinomial regression analysis used to examine risk factors associated with trajectory group membership for the mental health episodes for each cohort and SI Table xiv and SI Table xv show multinomial regression analysis by gender. When conducting the analysis, the baseline or reference group (G0) comprised young people with no mental health episodes for each cohort. The RRRs indicate the likelihood that an individual with a particular risk factor would be associated with membership in G1 and G2 compared to G0 for each cohort.

Risk factors for internalising mental health episodes

OHC Cohort. Young people among the OHC cohort in G1 were more likely to be females, young people of Aboriginal descent, living in remote areas, have mothers with a history of psychotic disorders and fathers with a history of mental health disorders (Table 17). The young people in G1 also had a history of mental health and sexual abuse concerns and substantiated sexual abuse compared to G0. G1 members were more likely to have been assigned to residential placements, had a history of substance misuse, and experienced medium or high placement instability while in care compared to G0. Compared to G0 and slightly different to G1, G2 members were more likely to be female, non-Aboriginal, have parents with a history of psychotic disorders, mental health disorders, sexual abuse concerns, and substance misuse and experience medium or high placement instability when compared to those with no internalising episodes group (G0). The RRRs were highest in G2 for history of substance misuse (RRR = 20.77, 95% CI: 12.75 to 33.84), mental health concerns (RRR = 12.18, 95% CI: 5.52 to 16.88), and high placement instability (RRR = 3.04, 95% CI: 1.69 to 5.47).

CP Cohort. Young people with CP contact in G1 were more likely to be female, identified as Aboriginal and living in remote areas, have both parents experiencing mental

health, substance misuse and psychotic disorders, and experienced multiple forms of child protection concerns, including substantiated sexual and physical abuse (Table 17). G1 members also had a history of substance misuse, homelessness or housing instability, and experienced family and domestic violence compared to G0. G2 members were more likely to be female, non-Aboriginal young people who lived in the cities and had a higher likelihood of being affluent. Their parents were more likely to be older, their mothers had mental health or psychotic disorders, while the fathers had dual mental health and substance misuse and psychotic disorders. G2 members also had a history of mental health, sexual abuse, substance misuse, and family relationship concerns, and substantiated sexual and physical abuse. The RRRs were highest in G2 for young people with a history of substance misuse (RRR = 23.39, 95% CI: 20.23 to 27.03), having mental health concerns (RRR = 18.19, 95% CI: 11.38 to 21.07), females (RRR = 2.87, 95% CI: 2.44 to 3.36) and those with mothers with psychotic disorders (RRR = 2.10, 95% CI: 1.64 to 2.71).

No CP Cohort. Young people with no CP contact in G1 were more likely to be female, have younger mothers, and both parents having mental health, substance misuse and psychotic disorders. They also had a higher likelihood of having a history of substance misuse, and experienced homelessness or housing instability and family and domestic violence compared to G0 (Table 17). Similar risk factors were found for G2 compared to G0. The RRRs were highest for G2 for substance misuse (RRR = 56.20, 95% CI: 47.96 to 65.84), homelessness or housing instability (RRR = 4.29, 95% CI: 2.50 to 7.37), psychotic disorders for mothers (RRR = 3.20, 95% CI: 2.20 to 4.66) and females (RRR = 2.84, 95% CI: 2.44 to 3.36).

Gender differences. Both males and females had a higher likelihood of young people in OHC and CP cohorts belonging to G1 and G2 than G0 (SI Table xiv). In addition, both genders had a higher probability of being non-Aboriginal and living in cities than G0. Males

in G2 were also more likely to have lived in remote areas compared to G0. For females, there was a more apparent distinction among G1 of belonging to the less disadvantaged socio-economic class compared to G0, whereas for males, this distinction was not noticeable. There was higher substance misuse for both genders in G2 compared to G0, and the RRR was higher for females compared to males. Homelessness patterns were similar, while family and domestic violence was only significant for G1 among males compared to G0.

Risk factors for externalising mental health episodes

OHC Cohort. Young people in the OHC cohort in G1 were more likely to be male, identified as Aboriginal and living in remote areas, had younger mothers and fathers with psychotic disorders, and had a history of mental health and sexual abuse concerns compared to G0 (Table 18). In addition, this group were more likely to have a history of substance misuse, lived in residential placements, and experienced medium to high placement instability while in care. G2 members were more likely to be male, non-Aboriginal, had a history of mental health concerns, substance misuse, and experienced high placement instability when compared to G0. The RRR was higher in G2 compared to G1 for having a history of substance misuse (RRR = 14.88, 95% CI: 7.16 to 20.92).

CP Cohort. Young people with CP contact in G1 were more likely to be male, non-Aboriginal, had mothers with mental health, substance misuse and psychotic disorders and fathers with psychotic disorders compared with G0 (Table 18). They also experienced multiple forms of child protection concerns, including neglect, mental health, sexual abuse, physical abuse, and family relationship problems. They had experienced substantiated sexual and physical abuse. In addition, G1 members had a history of substance misuse and homelessness or housing instability. G2 were more likely to be male, had fathers with psychotic disorders, and had a history of substance misuse and homelessness or housing

instability. The RRR was higher in G2 compared to G1 for a history of substance misuse (RRR = 26.06, 95% CI: 18.65 to 36.42).

No CP Cohort. Young people with no CP contact in G1 were more likely to be male, non-Aboriginal, lived in the cities, had younger mothers, and had both parents experiencing mental health, substance misuse and psychotic disorders (Table 18). They were also more likely to have a history of substance misuse and homelessness, or housing instability compared to G0. Like the CP cohort, G2 were more likely to have had a history of substance misuse (RRR = 37.03, 95% CI: 26.99 to 50.80) and homelessness or housing instability (RRR = 5.23, 95% CI: 2.05 to 13.38) compared to G0 and the RRRs were higher in G2 compared to G1 for these two predictors.

Gender differences. Both males and females had a higher likelihood for young people in OHC and CP cohorts to belong to G1 and G2 compared to G0 (SI Table xv). In addition, both genders had a higher probability of being non-Aboriginal and living in cities compared to G0. The main differences between males and females are that males in G1 were more likely to have lived in the most disadvantaged areas compared to G0, and males had a higher likelihood of having younger mothers in G1 compared to group G0. Both genders in G1 and G2 had higher rates of substance misuse (G2 Males RRR = 9.85, 95% CI: 6.16 to 15.74 and Females RRR = 26.99, 95% CI: 12.69 to 37.41) compared to G0, and RRRs were higher for G2 members compared to G1. There was a higher likelihood for a history of homelessness and housing instability in G1 for females, whereas both G1 and G2 males had a higher likelihood of homelessness and housing instability compared to G0.

Risk factors for psychotic mental health episodes

OHC Cohort. Young people in the OHC cohort in G1 or G2 were more likely to be male, of Aboriginal descent, had a history of mental health concerns, substance misuse, and medium-high placement instability compared to the G0 (Table 19).

CP Cohort. The main predictors for group membership for G1 or G2 were being male, identified as Aboriginal, both parents having a history of psychosis, substance misuse and mental health concerns compared to the G0.

No CP Cohort. Young people with no CP contact in G1 were more likely to be male, of Aboriginal descent, both parents having mental health or psychotic disorders and a history of substance misuse. Compared to G0, G2 members were associated with being male, having a history of substance misuse and homelessness or housing instability, and their fathers had mental health or psychotic disorders.

Time-varying effect of substance misuse on internalising mental health episodes

The results of the time-varying effect of substance misuse for the three population groups are shown in SI Table xix and SI Table xx.

OHC Cohort. There was a 0.16 mean increase in the rate of internalising episodes across the follow-up time for one unit increase in substance misuse episodes among young people in G1 ($est = 0.16$, 95% CI: 0.15 to 0.18, $p < 0.001$), the effect was stronger among young people in G2 with a 0.21 mean increase in internalising episodes for a one unit increase in substance misuse episodes ($est = 0.21$, 95% CI: 0.20 to 0.23, $p < 0.001$) (SI Table xix).

CP Contact. Young people who had CP contact showed a similar effect of substance misuse on the rate of internalising episodes. There was a small (0.08) mean increase in the rate of internalising episodes across the follow-up time for one unit increase in substance misuse episodes among young people in G1 ($est = 0.08$, 95% CI: 0.07 to 0.09, $p < 0.001$). There was a larger mean increase in the rate of internalising episodes due to substance misuse for young people in G2 ($est = 0.45$, 95% CI: 0.43 to 0.47, $p < 0.001$).

No CP Contact. Young people who did not have CP contact showed a similar effect of substance misuse on the rate of internalising episodes. There was a 0.10 mean increase in

the rate of internalising episodes across the follow-up time for one unit increase in substance misuse episodes among young people in G1 (*est* = 0.10, 95% CI: 0.09 to 0.11, $p < 0.001$).

There was a larger mean increase in the rate of internalising episodes due to substance misuse episodes for young people in G2 (*est* = 0.55, 95% CI: 0.53 to 0.56, $p < 0.001$).

Table 17

Risk factors associated with group membership for internalising episodes by child protection

	OHC (N=6,815)		CP Contact (N=82,541)		No CP Contact (N=325,390)	
	G1-Low (N=1,626)	G2-Increasing (N=113)	G1-Low (N=13,009)	G2-Increasing (N=895)	G1-Low (N=15,690)	G2-Increasing (N=693)
	RRR (95%CI)	RRR (95%CI)	RRR (95%CI)	RRR (95%CI)	RRR (95%CI)	RRR (95%CI)
Females						
Aboriginal	1.12 (0.98, 1.27)	1.93** (1.22, 3.05)	1.39*** (1.33, 1.44)	2.87*** (2.44, 3.36)	1.43*** (1.38, 1.48)	2.84*** (2.41, 3.36)
Females*Aboriginal	0.72*** (0.62, 0.83)	0.61* (0.37, 0.99)	0.75*** (0.71, 0.80)	0.63*** (0.51, 0.78)	0.98 (0.88, 1.09)	0.57 (0.32, 1.02)
Remoteness	1.26 (0.98, 1.62)	1.01 (0.42, 2.46)	1.05 (0.96, 1.16)	1.31 (0.84, 2.03)	1.08 (0.89, 1.33)	0.75 (0.24, 2.36)
Major city	<i>Ref</i>		<i>Ref</i>		<i>Ref</i>	
Regional	0.86 (0.73, 1.01)	0.88 (0.52, 1.49)	0.89*** (0.85, 0.94)	0.82* (0.69, 0.97)	0.96 (0.92, 1.00)	0.86 (0.70, 1.05)
Remote	1.31** (1.08, 1.59)	1.04 (0.53, 2.05)	0.96	0.66** (0.90, 1.02)	0.99 (0.93, 1.05)	0.66* (0.47, 0.92)
Remoteness * Aboriginal Status						
Regional * Aboriginal	1.33 (0.96, 1.84)	0.84 (0.27, 2.58)	0.91 (0.80, 1.04)	0.97 (0.62, 1.52)	1.04 (0.79, 1.37)	0.23 (0.0, 1.89)
Remote * Aboriginal	1.75* (1.09, 2.79)	6.21 (0.66, 32.32)	1.18* (1.03, 1.36)	0.54* (0.32, 0.91)	0.99 (0.78, 1.25)	0.57 (0.17, 2.02)
Socio-economic status (quantiles)						
1st (Most disadvantaged)	<i>Ref</i>		<i>Ref</i>		<i>Ref</i>	
2	1.09 (0.93, 1.28)	1.56 (0.93, 2.63)	1.02 (0.97, 1.07)	1.23* (1.02, 1.47)	0.91*** (0.86, 0.96)	0.94 (0.75, 1.19)
3	0.98 (0.81, 1.18)	1.66 (0.93, 2.99)	0.98 (0.93, 1.04)	1.22* (1.00, 1.50)	0.92*** (0.88, 0.97)	0.86 (0.68, 1.10)
4	1.22 (0.97, 1.52)	1.10 (0.48, 2.51)	0.93 (0.87, 1.00)	1.30* (1.05, 1.62)	0.81*** (0.77, 0.86)	0.78 (0.61, 1.00)
5 (Least disadvantaged)	0.80 (0.57, 1.14)	0.92 (0.29, 2.86)	0.97 (0.89, 1.05)	1.44** (1.10, 1.89)	0.76*** (0.71, 0.80)	0.85 (0.65, 1.09)
Mother's age at birth (years)						
30 and above	<i>Ref</i>		<i>Ref</i>		<i>Ref</i>	
20-29	0.94 (0.80, 1.10)	1.53 (0.86, 2.73)	1.03 (0.98, 1.08)	0.81** (0.69, 0.94)	1.09*** (1.06, 1.13)	1.00 (0.85, 1.17)
less than 20	1.13 (0.93, 1.36)	1.74 (0.88, 3.44)	1.03 (0.96, 1.10)	0.66** (0.52, 0.83)	1.17*** (1.07, 1.28)	1.07 (0.72, 1.58)
Mother's mental health status						
No mental health or substance misuse	<i>Ref</i>		<i>Ref</i>		<i>Ref</i>	
Mental health only	1.16 (0.96, 1.39)	1.43 (0.79, 2.59)	1.43*** (1.35, 1.52)	1.31* (1.06, 1.60)	1.82*** (1.72, 1.93)	1.78*** (1.38, 2.31)
Substance use only	1.00 (0.82, 1.22)	1.12 (0.59, 2.13)	1.13*** (1.05, 1.22)	0.88 (0.66, 1.17)	1.50*** (1.36, 1.65)	1.04 (0.64, 1.71)
Mental health and substance misuse	1.13 (0.92, 1.38)	0.56 (0.23, 1.38)	1.57*** (1.45, 1.69)	1.27 (0.96, 1.67)	2.02*** (1.82, 2.24)	2.38*** (1.63, 3.50)
Psychotic disorders	1.28* (1.06, 1.55)	2.11* (1.18, 3.76)	1.77*** (1.63, 1.93)	2.10*** (1.64, 2.71)	2.42*** (2.18, 2.69)	3.20*** (2.20, 4.66)
Father's mental health status						
No mental health or substance misuse	<i>Ref</i>		<i>Ref</i>		<i>Ref</i>	
Mental health only	1.53** (1.20, 1.97)	1.24 (0.52, 2.96)	1.30*** (1.20, 1.40)	1.18 (0.90, 1.55)	1.67*** (1.54, 1.81)	1.64* (1.16, 2.31)
Substance misuse only	0.77 (0.62, 1.95)	0.98 (0.48, 2.02)	1.02 (0.95, 1.10)	0.88 (0.67, 1.15)	1.29*** (1.19, 1.40)	0.97 (0.65, 1.46)
Mental health & substance misuse	1.05 (0.82, 1.36)	1.50 (0.72, 3.16)	1.31*** (1.20, 1.44)	1.52** (1.14, 2.03)	1.75*** (1.56, 1.96)	1.82* (1.15, 2.88)

	OHC (N=6,815)			CP Contact (N=82,541)			No CP Contact (N=325,390)		
	G1-Low (N=1,626)	G2-Increasing (N=113)	RRR (95%CI)	G1-Low (N=13,009)	G2-Increasing (N=895)	RRR (95%CI)	G1-Low (N=15,690)	G2-Increasing (N=693)	RRR (95%CI)
Psychotic disorders	1.19	(0.93, 1.50)	2.41*	1.24***	(1.12, 1.38)	1.66**	1.74***	2.39***	(1.53, 3.72)
Child protection allegations (unsubstantiated)									
Neglect	1.11	(0.86, 1.42)	1.37	0.88	(0.81, 1.94)	0.68	n/a	n/a	n/a
Emotional	0.97	(0.81, 1.18)	0.78	0.89	(0.83, 1.12)	0.85	n/a	n/a	n/a
Substance abuse	0.71	(0.46, 1.09)	0.19	1.14	(0.87, 1.50)	0.98	n/a	n/a	n/a
Mental health	3.09***	(1.95, 4.87)	12.18***	6.36***	(4.88, 8.27)	18.19***	n/a	n/a	n/a
Sexual	1.32***	(1.14, 1.54)	2.66**	1.28***	(1.21, 1.35)	1.83***	n/a	n/a	n/a
Physical	1.18	(1.00, 1.39)	1.06	1.20***	(1.12, 1.28)	1.05	n/a	n/a	n/a
Behavioural problems	1.43	(0.95, 2.15)	1.87	1.62**	(1.21, 2.16)	0.62	n/a	n/a	n/a
Family relationship problems	0.99	(0.80, 1.23)	1.02	1.30***	(1.13, 1.50)	1.69*	n/a	n/a	n/a
Child Protection abuse (substantiated)									
Emotional	0.89	(0.75, 1.06)	0.97	0.95	(0.86, 1.05)	1.19	n/a	n/a	n/a
Sexual	1.49***	(1.24, 1.78)	1.82*	1.41***	(1.29, 1.54)	1.56***	n/a	n/a	n/a
Physical	1.09	(0.93, 1.28)	1.24	1.15*	(1.03, 1.27)	1.53*	n/a	n/a	n/a
Neglect	0.78	(0.63, 1.15)	0.48	0.94	(0.83, 1.05)	0.73	n/a	n/a	n/a
Substance misuse	4.61***	(4.00, 5.32)	20.77***	6.01***	(5.73, 6.29)	23.39***	10.27***	56.20***	(47.96, 65.84)
Homelessness or unstable housing	1.12	(0.98, 1.29)	1.24	1.14***	(1.07, 1.22)	1.09	1.53***	4.29***	(2.50, 7.37)
Family & domestic violence	1.03	(0.88, 1.21)	0.79	1.12**	(1.03, 1.21)	0.83	1.64***	0.94	(0.29, 3.09)
Longest placement type									
Adoptive	<i>Ref</i>								
Foster	1.59	(0.88, 2.87)	0.88	n/a	n/a	n/a	n/a	n/a	n/a
Kinship	1.44	(0.80, 2.61)	0.48	n/a	n/a	n/a	n/a	n/a	n/a
Residential	3.06***	(1.65, 5.67)	4.38	n/a	n/a	n/a	n/a	n/a	n/a
Self-select	1.77	(0.96, 3.28)	0.80	n/a	n/a	n/a	n/a	n/a	n/a
Placement Instability									
Low (0-4.9)	<i>Ref</i>								
Medium (5-19.9)	1.49***	(1.29, 1.72)	1.74*	n/a	n/a	n/a	n/a	n/a	n/a
High (20+)	2.58***	(2.12, 3.14)	3.04***	n/a	n/a	n/a	n/a	n/a	n/a

Notes

Baseline Group 0 "No internalising episodes" Sample Sizes: OHC (N=5,076); CP Contact (N=68,637); No CP (309,007)

Multinomial logistic regression for significant difference with baseline group: *p≤0.05; **p≤0.01; ***p≤0.001

OHC =Out-of-home care cohort; CP=Child Protection Contact cohort; No CP = No Child Protection Contact Cohort. G1=Trajectory Group 1; G2=Trajectory Group 2; RRR=Relative Risk Ratio

Table 18

Risk factors associated with group membership for externalising episodes by child protection status

	OHC (N=6,815)		CP Contact (N=82,541)		No CP Contact (N=325,390)	
	G1-Low (N=677)	G2-Increasing (N=51)	G1-Low (N=3,282)	G2-Increasing (N=199)	G1-Low (N=2,234)	G2-Increasing (N=168)
	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)
Males	2.32*** (1.93, 2.80)	1.96* (1.02, 3.75)	2.15*** (1.99, 2.32)	2.63*** (1.93, 3.58)	1.81*** (1.66, 1.98)	1.21 (0.89, 1.64)
Aboriginal	0.71** (0.58, 0.87)	0.32** (0.14, 0.70)	0.51*** (0.46, 0.58)	0.88 (0.59, 1.30)	0.72* (0.53, 0.98)	0.65 (0.23, 1.85)
Males*Aboriginal	1.19 (0.82, 1.74)	0.65 (0.15, 0.56)	0.90 (0.73, 1.11)	0.42 (0.21, 1.11)	0.81 (0.45, 1.47)	2.08 (0.21, 16.45)
Remoteness						
Major city	Ref		Ref		Ref	
Regional	0.74** (0.59, 0.92)	1.07 (0.52, 2.19)	0.76 (0.69, 0.83)	0.84 (0.59, 1.19)	0.80*** (0.72, 0.89)	0.91 (0.61, 1.36)
Remote	0.60** (0.44, 0.81)	0.53 (0.16, 1.77)	0.64 (0.55, 0.73)	0.89 (0.56, 1.41)	0.65*** (0.54, 0.78)	0.97 (0.55, 1.71)
Remoteness * Aboriginal Status						
Regional * Aboriginal	1.05 (0.66, 1.67)	0.59 (0.09, 3.97)	1.01 (0.79, 1.31)	1.36 (0.60, 3.09)	0.54 (0.24, 1.22)	No convergence
Remote * Aboriginal	3.11* (1.23, 7.84)	No convergence	0.77 (0.58, 1.02)	1.01 (0.39, 2.61)	0.61 (0.31, 1.19)	2.70 (0.25, 28.74)
Socio-economic status (quantiles)						
1st (Most disadvantaged)	Ref		Ref		Ref	
2	0.96 (0.77, 1.19)	1.85 (0.88, 3.89)	1.02 (0.93, 1.12)	1.33 (0.93, 1.90)	0.85* (0.75, 0.97)	0.78 (0.48, 1.26)
3	0.86 (0.66, 1.13)	1.63 (0.67, 3.96)	1.02 (0.92, 1.13)	1.19 (0.79, 1.79)	0.88* (0.77, 1.00)	1.06 (0.67, 1.68)
4	1.07 (0.78, 1.45)	0.82 (0.22, 3.07)	1.00 (0.89, 1.13)	0.84 (0.49, 1.44)	0.83* (0.73, 0.95)	1.00 (0.62, 1.60)
5 (Least disadvantaged)	0.92 (0.59, 1.45)	1.40 (0.34, 5.85)	1.10 (0.95, 1.27)	1.47 (0.84, 2.57)	0.78*** (0.68, 0.90)	0.75 (0.43, 1.28)
Mother's age at birth (years)						
30 and above	Ref		Ref		Ref	
20-29	1.04 (0.83, 1.30)	2.11 (0.84, 5.29)	0.94 (0.86, 1.02)	0.74 (0.54, 1.02)	1.21*** (1.10, 1.32)	1.03 (0.75, 1.40)
less than 20	1.29* (0.99, 1.68)	1.95 (0.66, 5.74)	1.02 (0.91, 1.14)	0.70 (0.44, 1.11)	1.43*** (1.16, 1.76)	0.40 (0.13, 1.30)
Mother's mental health status						
No mental health or substance misuse	Ref		Ref		Ref	
Mental health only	1.23 (0.96, 1.58)	0.96 (0.39, 2.36)	1.67*** (1.51, 1.84)	0.61 (0.36, 1.05)	2.22*** (1.95, 2.53)	1.28 (0.73, 2.22)
Substance use only	0.97 (0.74, 1.27)	0.53 (0.16, 1.69)	1.10 (0.95, 1.27)	1.01 (0.60, 1.69)	1.26 (0.96, 1.64)	1.30 (0.56, 2.99)
Mental health & substance misuse	1.00 (0.74, 1.34)	1.67 (0.64, 4.30)	1.62*** (1.42, 1.84)	0.97 (0.55, 1.69)	2.03*** (1.60, 2.59)	1.83 (0.85, 3.97)
Psychotic disorders	1.29 (0.99, 1.66)	1.67 (0.69, 4.08)	1.57*** (1.36, 1.81)	1.27 (0.74, 2.18)	3.02*** (2.42, 3.77)	1.65 (0.67, 4.07)
Father's mental health status						
No mental health or substance misuse	Ref		Ref		Ref	
Mental health only	1.18 (0.83, 1.67)	1.30 (0.39, 4.32)	1.14 (0.99, 1.31)	1.46 (0.88, 2.42)	1.64*** (1.35, 1.98)	1.80 (0.94, 3.43)
Substance misuse only	0.89 (0.66, 1.21)	2.19 (0.90, 5.33)	1.01 (0.89, 1.15)	0.50 (0.26, 0.99)	1.30* (1.06, 1.59)	1.60 (0.84, 3.07)

	OHC (N=6,815)			CP Contact (N=82,541)			No CP Contact (N=325,390)		
	G1-Low (N=677)	G2-Increasing (N=51)	G1-Low (N=3,282)	G2-Increasing (N=199)	G1-Low (N=2,234)	G2-Increasing (N=168)	G1-Low (N=2,234)	G2-Increasing (N=168)	
	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	RRR (95% CI)	
Mental health & substance misuse	1.00 (0.71, 1.42)	0.50 (0.11, 2.34)	1.10 (0.94, 1.30)	1.41 (0.79, 2.51)	1.67*** (1.28, 2.18)	2.00 (0.87, 4.60)			
Psychotic disorders	1.60** (1.19, 2.16)	2.07 (0.77, 5.58)	1.24* (1.04, 1.48)	1.86* (1.06, 3.25)	1.35 (0.97, 1.88)	2.17 (0.88, 5.34)			
Child protection allegations (unsubstantiated)									
Neglect	1.19 (0.85, 1.66)	1.65 (0.60, 4.56)	1.21*** (1.07, 1.36)	0.75 (0.40, 1.39)	n/a	n/a	n/a	n/a	n/a
Emotional	1.18 (0.91, 1.54)	1.49 (0.59, 3.81)	0.86 (0.76, 1.27)	0.50 (0.26, 1.17)	n/a	n/a	n/a	n/a	n/a
Substance abuse	1.54 (0.96, 2.46)	0.56 (0.06, 5.07)	1.30 (0.87, 1.95)	1.17 (0.16, 8.82)	n/a	n/a	n/a	n/a	n/a
Mental health	3.00*** (1.89, 4.78)	3.46* (1.03, 11.54)	5.86*** (4.42, 7.78)	No convergence	n/a	n/a	n/a	n/a	n/a
Sexual	1.47*** (1.20, 1.80)	1.50 (0.66, 3.38)	1.52*** (1.39, 1.67)	0.91 (0.58, 1.42)	n/a	n/a	n/a	n/a	n/a
Physical	1.24 (0.98, 1.57)	1.39 (0.60, 3.18)	1.52*** (1.36, 1.69)	1.21 (0.74, 2.00)	n/a	n/a	n/a	n/a	n/a
Behavioural problems	1.41 (0.85, 2.31)	0.52 (0.06, 4.61)	1.27 (0.82, 1.97)	No convergence	n/a	n/a	n/a	n/a	n/a
Family relationship problems	1.06 (0.80, 1.40)	1.22 (0.50, 2.96)	1.75*** (1.43, 2.13)	0.65 (0.16, 2.68)	n/a	n/a	n/a	n/a	n/a
Child Protection abuse (substantiated)									
Emotional	0.92 (0.73, 1.17)	0.91 (0.40, 2.09)	0.98 (0.83, 1.15)	0.54 (0.17, 1.74)	n/a	n/a	n/a	n/a	n/a
Sexual	1.12 (0.88, 1.43)	2.10 (0.96, 4.62)	1.22* (1.05, 1.42)	1.23 (0.58, 2.60)	n/a	n/a	n/a	n/a	n/a
Physical	1.03 (0.83, 1.27)	0.71 (0.34, 1.48)	1.30*** (1.11, 1.52)	1.11 (0.48, 2.57)	n/a	n/a	n/a	n/a	n/a
Neglect	0.78 (0.59, 1.03)	0.42 (0.18, 1.05)	0.80 (0.67, 1.17)	1.50 (0.60, 3.74)	n/a	n/a	n/a	n/a	n/a
Substance misuse	2.69*** (2.23, 3.25)	14.88*** (7.16, 20.92)	3.74*** (3.46, 4.05)	26.06*** (18.65, 36.42)	6.04*** (5.45, 6.70)	37.03*** (26.99, 50.80)			
Homelessness or unstable housing	0.91 (0.75, 1.11)	1.49 (0.79, 2.80)	1.21*** (1.07, 1.37)	1.64* (1.07, 2.52)	2.81*** (2.00, 3.96)	5.23*** (2.05, 13.38)			
Family & domestic violence	0.76 (0.60, 1.17)	0.13 (0.03, 1.10)	0.98 (0.85, 1.14)	0.83 (0.45, 1.53)	1.58 (0.93, 2.69)	No convergence			
Longest placement type									
Adoptive	Ref	Ref	Ref	Ref	Ref	Ref			
Foster	2.03 (0.79, 5.24)	0.20 (0.02, 1.95)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Kinship	1.20 (0.47, 3.11)	0.16 (0.02, 1.52)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Residential	3.76** (1.43, 9.88)	2.39 (0.26, 22.00)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Self-select	1.49 (0.56, 3.96)	0.06 (0.00, 1.15)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Placement Instability									
Low (0-4.9)	Ref	Ref	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Medium (5-19.9)	1.33** (1.09, 1.64)	1.95 (0.90, 4.23)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
High (20+)	3.32*** (2.60, 4.25)	2.91* (1.22, 6.95)	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Notes

Baseline Group 0 "No externalising episodes" Sample Sizes: OHC (N=6,087); CP Contact (N=79,060); No CP contact (N=322,988)

Multinomial logistic regression for significant difference with baseline group: *p<0.05; **p<0.01; ***p<0.001

OHC =Out-of-home care cohort; CP=Child Protection Contact cohort; No CP = No Child Protection Contact Cohort. G1=Trajectory Group 1; G2=Trajectory Group 2; RRR=Relative Risk Ratio

Table 19

Risk factors associated with group membership for psychotic episodes by child protection status

	OHC (N=6,815) G1/G2 Increasing (N=215)		CP Contact (N=82,541) G1/G2 Increasing (N=1,424)		No CP Contact (N=325,390) G1-Low (N=1,187)		G2-Increasing (N=188)	
	RRR	(95%CI)	RRR	(95%CI)	RRR	(95%CI)	RRR	(95%CI)
Males	2.32***	(1.53, 3.53)	1.52***	(1.36, 1.71)	1.39***	(1.24, 1.57)	2.05***	(1.51, 2.79)
Aboriginal	1.92**	(1.24, 2.96)	1.28**	(1.11, 1.48)	1.73***	(1.30, 2.31)	1.65	(0.83, 3.09)
Males * Aboriginal	0.82	(0.36, 1.87)	1.10	(0.87, 1.40)	1.78	(0.99, 3.21)	0.68	(0.21, 2.23)
Remoteness								
Major city	Ref		Ref		Ref			
Regional	1.36	(0.87, 2.15)	0.90	(0.79, 1.03)	0.95	(0.82, 1.11)	1.22	(0.85, 1.76)
Remote	0.83	(0.47, 1.49)	0.86	(0.73, 1.03)	0.95	(0.77, 1.18)	1.08	(0.64, 1.81)
Socio-economic status (quantiles)								
1st (Most disadvantaged)	Ref		Ref		Ref			
2	0.98	(0.61, 1.57)	1.07	(0.93, 1.23)	0.92	(0.77, 1.10)	1.10	(0.72, 1.69)
3	0.52	(0.26, 1.06)	1.06	(0.91, 1.25)	0.99	(0.82, 1.19)	0.84	(0.52, 1.35)
4	1.84	(1.00, 3.39)	1.12	(0.93, 1.34)	1.01	(0.84, 1.21)	1.07	(0.68, 1.69)
5 (Least disadvantaged)	1.14	(0.42, 3.07)	0.98	(0.76, 1.26)	0.93	(0.77, 1.14)	1.14	(0.71, 1.84)
Mother's age at birth (years)								
30 and above	Ref		Ref		Ref			
20-29	1.15	(0.68, 1.95)	1.11	(0.97, 1.26)	1.02	(0.90, 1.15)	1.23	(0.91, 1.66)
Less than 20	1.28	(0.71, 2.32)	1.11	(0.93, 1.32)	1.04	(0.77, 1.40)	0.75	(0.34, 1.69)
Mother's mental health status								
No mental health or substance misuse	Ref		Ref		Ref			
Mental health only	1.20	(0.66, 2.17)	1.09	(0.93, 1.30)	1.43**	(1.17, 1.75)	1.07	(0.61, 1.86)
Substance use only	1.42	(0.84, 2.41)	0.98	(0.80, 1.20)	1.19	(0.85, 1.68)	1.78	(0.94, 3.38)
Mental health & substance misuse	1.25	(0.67, 2.36)	1.03	(0.83, 1.29)	1.53*	(1.09, 2.14)	0.79	(0.29, 2.18)
Psychotic disorders	1.25	(0.70, 2.22)	1.95***	(1.61, 2.37)	2.94***	(2.22, 3.90)	1.93	(0.89, 4.18)
Father's mental health status								
No mental health or substance misuse	Ref		Ref		Ref			
Mental health only	0.61	(0.23, 1.61)	1.22	(0.99, 1.51)	1.36*	(1.03, 1.79)	1.54	(0.80, 2.95)
Substance misuse only	0.46	(0.21, 1.09)	1.01	(0.83, 1.22)	1.29	(0.99, 1.68)	1.63	(0.90, 2.96)
Mental health & substance misuse	0.87	(0.41, 1.81)	0.98	(0.76, 1.28)	0.94	(0.60, 1.46)	2.17*	(1.04, 4.53)
Psychotic disorders	1.51	(0.83, 2.72)	1.74***	(1.38, 2.18)	2.38***	(1.70, 3.32)	2.73*	(1.26, 5.92)

	OHC (N=6,815)		CP Contact (N=82,541)		No CP Contact (N=325,390)	
	G1/G2 Increasing (N=215)	(95%CI)	G1/G2 Increasing (N=1,424)	(95%CI)	G1-Low (N=1,187)	G2-Increasing (N=188)
	RRR		RRR		RRR	
Child protection allegations (unsubstantiated)						
Neglect	0.96	(0.47, 1.94)	0.94	(0.77, 1.15)	n/a	n/a
Emotional	1.06	(0.63, 1.78)	0.70	(0.57, 1.17)	n/a	n/a
Substance abuse	0.54	(0.18, 1.64)	2.24**	(1.39, 3.63)	n/a	n/a
Mental health	2.99*	(1.25, 7.16)	2.58***	(1.58, 4.20)	n/a	n/a
Sexual	1.04	(0.67, 1.62)	1.08	(0.93, 1.27)	n/a	n/a
Physical	1.22	(0.74, 2.00)	0.94	(0.78, 1.14)	n/a	n/a
Behavioural problems	1.01	(0.30, 3.32)	0.92	(0.42, 1.99)	n/a	n/a
Family relationship problems	0.98	(0.51, 1.89)	1.04	(0.71, 1.51)	n/a	n/a
Child Protection abuse (substantiated)						
	<i>Ref</i>		<i>Ref</i>		<i>Ref</i>	
Emotional	0.55	(0.33, 1.11)	0.82	(0.59, 1.13)	n/a	n/a
Sexual	0.76	(0.44, 1.34)	1.21	(0.94, 1.54)	n/a	n/a
Physical	0.70	(0.44, 1.11)	1.24	(0.92, 1.66)	n/a	n/a
Neglect	0.60	(0.33, 1.07)	0.89	(0.64, 1.22)	n/a	n/a
Substance misuse	22.05***	(12.96, 37.53)	16.95***	(15.06, 19.08)	29.45***	(26.18, 33.13)
Homelessness or unstable housing	1.21	(0.81, 1.80)	1.17	(0.99, 1.38)	1.39	(0.80, 2.44)
Family & domestic violence	1.96	(0.99, 3.90)	0.72	(0.56, 1.12)	0.99	1.33
Longest placement type						
Adoptive	<i>Ref</i>					
Foster	0.81	(0.10, 6.86)	n/a	n/a	n/a	n/a
Kinship	1.03	(0.12, 8.60)	n/a	n/a	n/a	n/a
Residential	1.99	(0.23, 17.05)	n/a	n/a	n/a	n/a
Self-select	1.63	(0.19, 14.01)	n/a	n/a	n/a	n/a
Placement instability						
Low (0-4.9)	<i>Ref</i>					
Medium (5-19.9)	1.60*	(1.00, 2.54)	n/a	n/a	n/a	n/a
High (20+)	1.79*	(1.06, 3.02)	n/a	n/a	n/a	n/a

Notes

Baseline Group 0 "No Psychosis" Sample Sizes: OHC (N=6,600); CP (N=81,117); No CP (N=324, 015)

Multinomial logistic regression for significant difference with baseline group: *p<0.05; **p<0.01; ***p<0.001

OHC =Out-of-home care cohort; CP=Child Protection Contact cohort; No CP = No Child Protection Contact Cohort. G1=Trajectory Group 1; G2=Trajectory Group 2; RRR=Relative Risk Ratio

Time-varying effect of substance misuse on externalising mental health episodes

OHC Cohort. There was a 0.14 mean increase in the rate of externalising episodes across the follow-up time for one unit increase in substance misuse episodes among young people in G1 ($est = 0.14$, 95% CI: 0.13 to 0.20, $p < 0.001$), the effect was stronger among young people in G2 with a 0.24 mean increase in externalising episodes for a one unit increase in substance misuse episodes ($est = 0.24$, 95% CI: 0.22 to 0.26, $p < 0.001$) (SI Table xx).

CP Contact. Young people who had CP contact showed a similar effect of substance misuse on the rate of externalising episodes. There was a 0.07 mean increase in the rate of externalising episodes across the follow-up time for one unit increase in substance misuse episodes among young people in G1 ($est = 0.07$, 95% CI: 0.04 to 0.10, $p < 0.001$). There was a larger effect on the rate of externalising episodes due to substance misuse for young people in G2 ($est = 0.20$, 95% CI: 0.17 to 0.23, $p < 0.001$).

No CP Contact. Young people who did not have had CP contact showed a similar effect of substance misuse on the rate of externalising episodes. There was a 0.05 mean increase in the rate of externalising episodes across the follow-up time for one unit increase in substance misuse episodes among young people in G1 ($est = 0.05$, 95% CI: 0.0 to 0.07, $p = 0.04$). There was a larger effect on the rate of externalising episodes due to substance misuse for young people in G2 ($est = 0.29$, 95% CI: 0.26 to 0.32, $p < 0.001$).

Discussion

To the best of our knowledge, this study is the first to examine trajectories of internalising, externalising and psychotic disorders from birth among a population of young people with varying levels of child protection involvement. The present study was theoretically driven, based on the hypothesis that socio-demographic, environmental and placement characteristics were likely to predict group membership for internalising,

externalising or psychotic mental health disorders. We further hypothesised that there would be gender differences in the trajectories of internalising, externalising and psychotic mental health disorders.

Overall, there was strong support for our hypotheses; we found two sub-groups (i.e., G1 “*low stable*”, and G2 “*high increasing*”) of internalising, externalising, and psychotic disorders among young people across the three cohorts (OHC, CP and No CP). Young people in OHC experienced more elevated peaks across all mental health disorders compared to the other two cohorts. Our study is the first study to show gender differences in trajectories of externalising episodes since birth. Furthermore, it stands as the first investigation into the influence of substance use as a time-varying predictor of internalising and externalising mental health disorders. Moreover, our study breaks new ground by examining how placement instability has an impact on the trajectories of internalising, externalising, and psychotic mental health disorders.

Trajectories of internalising, externalising and psychotic disorders

Our study shows that heterogeneity in the trajectories of internalising, externalising and psychotic disorders extends into early adulthood. While there were two distinct trajectory groups for internalising and externalising mental health disorders, we found that the shape of the trajectories differed for each cohort, whereby young people in OHC had elevated peaks for the “*high increasing*” group and experienced earlier onset of mental health disorders compared to the CP and no CP cohorts. For internalising episodes, females (Gutman & Codioli McMaster, 2020) had more elevated peaks in their trajectories compared to males. For externalising episodes, the CP and No CP cohorts had similar trajectories, indicating similar risk profiles for the two cohorts, and the externalising episode rates remained low for both groups. The two main trajectories for externalising episodes among these cohorts were G1 “*low decreasing*” and “*low increasing*”.

Consistent with previous studies, the rates for externalising episodes were higher for males compared to females, particularly below the age of nine years (Boeldt et al., 2012; Reinke et al., 2012). To the best of our knowledge, our study is the only one that shows gender differences in trajectories since birth, which is important since externalising symptoms present earlier in life, particularly for males. Interestingly, there were sharp increases in the rates of externalising episodes from the age of 12 years, and a sharp decline from 18 years onwards for females in the “*low increasing*” group. This may be a small cohort of females, but it shows the importance of targeting specific sub-groups of young people with appropriate support at various stages of their development.

Trajectories of psychosis were found to differ from internalising and externalising episodes in that psychosis tends to start at a later age (from about 12-15 years) (Bourgeois et al., 2021; Mackie et al., 2011). For each of our cohorts, our study found two groups of psychosis G1 “*low increasing*”, where rates were low, with slower increases compared to G2 “*increasing*”, which showed an increasing trajectory from 12-15 years and sharp increases into adulthood. These findings are consistent with previous research on trajectories in the two groups (Mackie et al., 2011). Early intervention among the most vulnerable is important once the first episode of psychosis is identified to avoid persistence or to limit the severity of psychotic disorders in adulthood (Alvarez-Jimenez et al., 2011; O'Donoghue et al., 2023). The decline in the G1 trajectory from 21 years old across all the cohorts suggests that less intensive support is needed from this age onwards. This finding is important and highlights one of the strengths of our study of looking at trajectories of psychosis into adulthood.

Risk factors associated with trajectory group membership

Substance misuse before being diagnosed with a mental health diagnosis (Andrew Rothenberg et al., 2020; Bourgeois et al., 2021; Gutman & Codioli McMaster, 2020) emerged as the most significant risk factor for trajectories of the mental health episodes. .

Family relationship problems and domestic violence have been identified previously as being associated with increasing trajectories of internalising episodes (Davis et al., 2014; Fernandez Castelao & Kroner-Herwig, 2014). Our study is the first study that has examined the effect of substance use as a time-varying predictor of internalising and externalising mental health disorders.

Sexual abuse (Bourgeois et al., 2021; Yoon, 2017), mental health concerns and physical abuse were the most significant factors related to child protection that predicted mental health trajectories (Mackie et al., 2011; Mirza et al., 2022). Childhood maltreatment is a traumatic experience that has immediate and long-term impacts on a child's social, emotional, and cognitive development (Yoon, 2017). Consistent with previous research, parental mental health, substance misuse and psychosis have a strong influence on the trajectories of each mental health disorder (Allen et al., 2010; Davis et al., 2014). This may be due to a combination of parenting behaviours in addition to an increased chance of young people developing mental health disorders based on their genetic predisposition. (Goodman & Gotlib, 1999).

Homelessness or housing instability is a significant risk factor for mental health (Chikwava et al., 2022), and it has been shown in previous research to influence trajectories of internalising, externalising and psychotic disorders (Kim et al., 2023). While previous studies have shown positive associations between placement instability and poor mental health (Dregan & Gulliford, 2012; McGuire et al., 2018; Proctor et al., 2010; Villodas et al., 2016), this is the first study that has examined how placement instability is associated with the trajectories of internalising, externalising and psychotic mental health disorders. This study showed that young people who have been in OHC had worse mental health trajectories compared to young people in CP contact or no CP contact. A previous history of living longest in residential placement significantly predicted increasing trajectories of internalising

or externalising mental health disorders in young people in OHC. This may be because children are placed in residential care due to having complex needs, including emotional and behavioural difficulties, which require support from a larger staff team with more specialist skills (AIHW, 2022; Statistics UK, 2022). Without adequate support, these children may continue to face more mental health challenges as they transition from OHC into adulthood (Ainsworth & Hansen, 2014).

Consistent with previous research among young people, males (Cleverley et al., 2012; Coughlan et al., 2022; Goghari et al., 2013; Lansford et al., 2006) were significantly associated with low or increasing externalising episodes. Our study also showed that males (Bourgeois et al., 2021; Mirza et al., 2022) and Aboriginal young people (Gynther et al., 2019; Mirza et al., 2022) had higher rates of psychosis compared to non-Aboriginal young people. Previous research has determined escalating rates of suicide and mental health among Aboriginal young people and, quite often, this is impacted by inter-generational trauma experienced among Aboriginal communities (Darwin L et al., 2023; Westerman, 2021). Trauma-informed and culturally sensitive assessments and interventions are important in addressing psychosis among Aboriginal young people (Vicary & Andrews, 2001; Westerman, 2021).

Implications for practice, legislation, and policy

While contextual differences may exist among various countries, the challenges facing young people transitioning from care share remarkable similarities (OECD, 2022). Therefore, even though our findings are based on WA (Australia) data, many of the results reaffirm previous findings from other cohorts and, as such, many of the recommendations can be applied to other countries and systems. The findings suggest that service providers and policymakers may need different approaches for tackling mental health problems for each of the identified three cohorts and for sub-groups within each cohort. The baseline group, who

had no contact with services, may be at low risk of developing mental health problems and given that this was the largest group across the three mental health disorders, it likely does not warrant the investment of significant resources for prevention.

Even though the “*low increasing*” G1 is also low risk, the increasing trajectories in mental health episodes suggest more resources need to be provided to this group, as their mental health symptoms may worsen if early intervention is not provided. The third group, G2 “*high increasing*”, is clearly the group that needs more targeted and intensive support, particularly for the OHC group that was most at risk. A combination of clinical and psychosocial support is required, including active follow-up of referrals to provide more intensive care. Earlier intervention is necessary, particularly for young people who present with externalising disorders in childhood (Stormont, 2002). While psychotic disorders may emerge during adolescent years, it is important to treat and provide intensive support during the first episodes to prevent relapse and worsening of symptoms (Randall et al., 2015).

Highly significant risk factors such as substance misuse, childhood maltreatment, homelessness, family and domestic violence, and placement instability if children are placed in OHC, warrant attention for targeted interventions. Where possible, service providers in OHC need to place young people with the same carer and extend support for care leavers (Mendes & Purtell, 2020; OECD, 2022). It is important to address mental health and substance misuse problems in a family context, as this evidently has an impact on the mental health outcomes of young people (Dominguez Vazquez et al., 2023). Additionally, it is important to support young people using creative, non-traditional methods of engagement and identification of treatment goals since substance misuse can have damaging and negative impacts affecting young people’s wellbeing, maintaining housing, gaining employment, and advancing education (Adair et al., 2017; Heerde et al., 2018).

Due to the complex and intersecting vulnerabilities of mental health, substance misuse, and homelessness faced by young people transiting from OHC, there is a need for enhanced policies among government agencies to strengthen care coordination during this critical period. This includes integrated housing pathways (Johnson et al., 2015), increased opportunities for training and employment, and integrated care, including mental health and substance misuse healthcare (Holmen et al., 2023; Mendes & Rogers, 2020). For young people of Aboriginal descent, there needs to be improved trauma-informed and sensitive care to address mental health and substance misuse (Jongen et al., 2023; Vicary & Andrews, 2001; Westerman, 2021). A person-centred approach has been shown to be effective in personal recovery, empowering young people to be involved in their care, making decisions, and identifying personal strengths (MacDonald-Wilson et al., 2013).

Recommendations for future research

This study has identified distinct trajectories of mental health disorders among three population groups and factors associated with the trajectories. Important pre-care and in-care experiences have been examined, such as substance misuse, placement instability, type of OHC placement, child protection concerns and familial risk factors. Future research should explore how protective factors such as resilience (Daining & DePanfilis, 2007; Kairyte et al., 2023), social inclusion (van Harmelen et al., 2016) and self-determination (Perlman et al., 2018) may mediate or moderate young people's mental health outcomes.

While this study is a large population study utilising administrative datasets, it is essential to integrate this data with longitudinal self-report studies so that measures that cannot be collected administratively can be obtained from the individual (Chikwava et al., 2021; Teyhan et al., 2019). It is important to determine the impact or effectiveness of individual and collective supports and extended care models as protective factors of mental health or substance misuse among young people transitioning from OHC (Anglicare, 2021;

Mendes & Chaffey, 2023). Future studies should investigate the impact of cultural diversity and supports in improving mental health and wellbeing and the perceived barriers to accessing health services on the various trajectories of mental health disorders (Gopalkrishnan, 2018; Vicary & Andrews, 2001; Westerman, 2021). Some studies have identified that parents' or caregivers' normalisation of aggression as a way of disciplining children or young people may predict trajectories of externalising behaviour over time (Lansford et al., 2018).

Limitations

Beyond the analysis of distinct mental health trajectories, our study was one of the first to test directly at a population level for associations between mental health and various levels of exposure to the child protection system. The linked datasets allowed us to examine the mental health pathways of young people and the multiple factors associated with the mental health trajectories. The mental health and substance misuse episodes are from public inpatient and outpatient records, which potentially excludes young people who may be accessing private outpatient records or young people with less severe mental health or substance misuse problems who do not access any mental health services. However, linked data provides population-level estimates, which may be difficult to accurately calculate using survey data, particularly involving hard-to-reach populations such as young people transitioning from OHC (Chikwava et al., 2021; Tew et al., 2017).

Young people may disengage from services at times when symptoms are absent; however, capturing mental health re-presentations in 30-day intervals allowed us to provide a conservative estimate of mental health episodes in this population. Although the trajectories identified in our study may not be directly comparable to those identified in previous studies due to differences in sample sizes, representativeness of the sample, follow-up time, and different measures used (Barboza et al., 2017; Hatoum et al., 2018), our findings nevertheless

confirm heterogeneity in the trajectories of internalising (Davis et al., 2014; Hussong et al., 2008; Yoon, 2017), externalising (Fernandez Castelao & Kroner-Herwig, 2014; Kjeldsen et al., 2021) and psychotic disorders (Goghari et al., 2013; Mackie et al., 2011) among young people.

Conclusions

Our study is the first to identify distinct trajectories of internalising, externalising and psychotic episodes among a population birth cohort comprising three groups of young people (OHC, CP contact and no CP contact). In addition, it is the first study to demonstrate the time-varying effect of substance misuse on the trajectories of internalising and externalising mental health episodes among these population groups. The population-based linked datasets allowed us to examine the socio-demographic, environmental and placement characteristics associated with the mental health trajectories among these three cohorts.

While the study showed that not all young people transitioning from OHC are at increased risk of mental health disorders, the increased risk and variability of internalising, externalising and psychotic disorders for specific sub-groups is notable and requires a holistic, person-centred approach to providing support for young people who have child protection contact. The findings clearly demonstrate that a multi-pronged approach to addressing social, environmental, and behavioural risk factors that contribute to severe mental illness is needed.

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Supplementary Information

SI Table xiii

Mental Health and Substance Misuse Disorders (WHO ICD 9 and 10 Codes)

Mental Health or Substance Misuse Disorder	Specific Disorder	Sub-category	ICD 10-Codes	ICD 9-Codes
Internalising Disorders	Mood or Depressive Disorders	Depressive episode, recurrent depressive disorder, persistent mood (affective disorder), other mood (affective) disorder, unspecified mood (affective disorder) <i>(excluding episodes with psychotic symptoms)</i>	F32* F33* F34* F38* F39*	300.4 296.90 296.99 311 293.83 293.84 300.0 300.2 300.3 300.8 308 309 300 300.8 300.5 309.21 309.24 309.28 313.8 313.21 313.22 313.0 313 E95
	Anxiety and Stress-related disorders	Anxiety (including anxiety disorders, panic disorder, obsessive compulsive disorder, PTSD, or stress -related (Reactions to severe stress, and adjustment disorders)	F40* F41* F42* F43*	
	Other neurotic disorders	Neurasthenia, Depersonalization-derealization syndrome, Neurotic disorder, unspecified	F48*	
	Emotional disorders with onset specific to childhood		F93*	
	Intentional self-injury	Intentional self-poisoning, intentional self-harm	X6* X7* X80* X81* X82* X83* X84* Z915	
Externalising Disorders	Attention-deficit hyperactivity disorder	Hyperkinetic disorders	F90*	314 314.2 314.8 314.9 313.81 312 312.81 312.82 312.89 312.33 312.32 799.22
	Conduct disorders	Unsocialised, socialised conduct disorders, Oppositional defiant disorder (ODD)	F91*	
	Mixed disorders of conduct and emotions	Depressive conduct disorder, other mixed disorders of conduct and emotions	F92*	
	Dissocial (Antisocial) personality disorder	personality disorder (ASPD)	F60.2	
	Habit and impulse disorders	Pathological fire-setting (pyromania)	F63.1	
Pathological stealing (kleptomania)		F63.2		
Psychotic Disorders	Schizophrenia & persistent delusional disorders		F20* F21* F22* F23* F24* F25* F26* F27* F28* F29*	291 292 295 296 297 298 299
	Manic/ Bipolar		F30* F31*	

Mental Health or Substance Misuse Disorder	Specific Disorder	Sub-category	ICD 10-Codes	ICD 9-Codes
	Recurrent depressive disorder, current episode severe with psychotic symptoms, Severe depressive episode with psychotic symptoms		F32.3 F33.3	
	Mental and behavioural disorders due to use of substances <i>“Psychotic-related”</i>		F105 F106 F107 F115 F116 F117 F125 F126 F127 F135 F136 F145 F146 F147 F155 F156 F157 F165 F166 F167 F175 F176 F177 F185 F186 F187 F195 F196 F197	
Substance misuse	Substance misuse		F1* F55* Z721 Z722 X41* X42* X45* Y11* Y12* Y15* T40* T41* T42* T43* T50* T51* E24.4 G31.2 G62.1 G72.1 I42.6 K29.2 K29.20 K29.21 K70* K85.2 K86.0 R78* Y90* Y91* T52* T53* X46* X47* Y16* Y17* T39* X40 Y10 T36* T37* T38* T44* T45* T46* T47* T48* X43 X44 Y13 Y14	291 303 305 357.5 425.5 535.30 535.31 571.0 571.1 571.2 571.3 E860 T51 V11.3 E947.3 980 790.3 977.3 425.5 292 304 304.40 304.41 304.42 304.43 305.70 305.71 305.72 305.73 304.30 304.31 304.32 304.33 305.20 305.21 305.22 305.23 304.20 304.21 304.22 304.23 305.60 305.61 305.62 305.63 968.5 E938.5 304.50 304.51 304.52 304.53 305.30 305.31 305.32 305.33 969.6 E854.1 E939.6 305.50 305.51 305.52 305.53 965 965.01 965.02 965.09 E850.0 E935.0 304.10 304.11 304.12 304.13 305.40 305.41 305.42 305.43 304.60 304.61 304.62 304.63 304.80 304.81 304.82 304.83 304.90 304.91 304.92 304.93 305.9 648.3 V654.2 T41 T43 R78.2 965 969 970.81 965.01

SI Table xiv

Risk factors associated with group membership for Internalising Episodes by gender

	Females (N=201, 976)				Males (N=212,768)			
	G1-Low (N=17,181)		G2-Increasing (N=1,270)		G1-Low (N=13,113)		G2-Increasing (N=462)	
	RRR	(95%CI)	RRR	(95%CI)	RRR	(95%CI)	RRR	(95%CI)
Child Protection Status.								
No CP Contact	<i>Ref</i>				<i>Ref</i>			
OHC	3.09***	(2.80, 3.42)	3.98***	(3.03, 5.23)	3.79***	(3.43, 4.19)	8.78***	(6.11, 12.63)
CP Contact	2.65***	(2.54, 2.75)	3.18***	(2.78, 3.63)	2.56***	(2.44, 2.67)	3.72***	(2.98, 4.65)
Aboriginal	0.79***	(0.74, 0.85)	0.78*	(0.64, 0.95)	0.72***	(0.67, 0.77)	0.45***	(0.32, 0.64)
Remoteness								
Major city	<i>Ref</i>				<i>Ref</i>			
Regional	0.95*	(0.91, 0.99)	0.81*	(0.70, 0.94)	0.91***	(0.87, 0.95)	0.85	(0.67, 1.07)
Remote	1.00	(0.94, 1.06)	0.70**	(0.56, 0.87)	1.07*	(1.01, 1.14)	0.72	(0.50, 1.04)
Socio-economic status (quantiles)								
1st (Most disadvantaged)	<i>Ref</i>				<i>Ref</i>			
2	1.02	(0.97, 1.07)	1.03	(0.88, 1.21)	0.93*	(0.89, 0.98)	1.05	(0.81, 1.36)
3	0.97	(0.92, 1.02)	0.94	(0.78, 1.12)	0.95*	(0.89, 1.00)	1.25	(0.96, 1.64)
4	0.85***	(0.81, 0.90)	1.00	(0.83, 1.20)	0.87***	(0.82, 0.92)	0.93	(0.68, 1.28)
5 (Least disadvantaged)	0.79***	(0.74, 0.84)	0.94	(0.77, 1.16)	0.82***	(0.77, 0.88)	1.21	(0.87, 1.69)
Mother's age at birth (years)								
30 and above	<i>Ref</i>				<i>Ref</i>			
20-29	1.07***	(1.03, 1.11)	0.94	(0.83, 1.07)	1.09***	(1.05, 1.14)	1.01	(0.82, 1.24)
less than 20	1.04	(0.97, 1.11)	0.75	(0.60, 1.13)	1.20***	(1.12, 1.29)	1.27	(0.92, 1.74)
Mother's mental health status								
No mental health or substance misuse	<i>Ref</i>				<i>Ref</i>			
Mental health only	1.58***	(1.49, 1.67)	1.36***	(1.13, 1.64)	1.65***	(1.56, 1.76)	2.57***	(1.99, 3.31)
Substance use only	1.26***	(1.17, 1.37)	0.99	(0.76, 1.28)	1.24***	(1.14, 1.36)	1.61*	(1.11, 2.35)
Mental health & substance misuse	1.71***	(1.57, 1.86)	1.75***	(1.38, 2.22)	1.65***	(1.51, 1.80)	1.85**	(1.26, 2.73)
Psychotic disorders	1.96***	(1.80, 2.14)	2.42***	(1.92, 3.04)	1.91***	(1.74, 2.09)	2.67***	(1.88, 3.80)
Father's mental health status								
No mental health or substance misuse	<i>Ref</i>				<i>Ref</i>			

	Females (N=201, 976)				Males (N=212,768)			
	G1-Low (N=17,181)		G2-Increasing (N=1,270)		G1-Low (N=13,113)		G2-Increasing (N=462)	
	RRR	(95%CI)	RRR	(95%CI)	RRR	(95%CI)	RRR	(95%CI)
Mental health only	1.49***	(1.38, 1.60)	1.62***	(1.29, 2.04)	1.50***	(1.39, 1.63)	1.38	(0.93, 2.04)
Substance misuse only	1.07	(0.99, 1.15)	0.88	(0.68, 1.13)	1.14**	(1.05, 1.23)	1.04	(0.71, 1.52)
Mental health & substance misuse	1.41***	(1.28, 1.55)	1.63***	(1.24, 2.14)	1.54***	(1.39, 1.70)	1.34	(0.85, 2.11)
Psychotic disorders	1.32***	(1.19, 1.47)	1.64***	(1.24, 2.17)	1.47***	(1.31, 1.65)	2.76***	(1.92, 3.97)
Substance misuse	9.31***	(8.92, 9.70)	39.47***	(34.90, 44.63)	6.89***	(6.58, 7.22)	13.73***	(11.34, 16.61)
Homelessness or unstable housing	1.16***	(1.08, 1.26)	1.39***	(1.12, 1.73)	1.09*	(1.00, 1.20)	1.43*	(1.02, 2.01)
Family & domestic violence	1.07	(0.98, 1.18)	0.84	(0.64, 1.11)	1.15**	(1.04, 1.27)	0.98	(0.64, 1.51)

Notes

Baseline Group 0 "No internalising episodes" Sample Sizes: Females (N=183,527); Males (N=199,193)

Multinomial logistic regression for significant difference with baseline group: *p<0.05; **p<0.01; ***p<0.001

OHC =Out-of-home care cohort; CP=Child Protection Contact cohort; No CP = No Child Protection Contact Cohort. G1=Trajectory Group 1; G2=Trajectory Group 2; RRR=Relative Risk Ratio

SI Table xv

Risk factors associated with group membership for Externalising Episodes by gender

	Females (Total=201, 976)				Males (N=212,768)			
	G1-Low (N=2,307)		G2-High increasing (N=39)		G1-Low (N=4,191)		G2-Steady increasing (N=74)	
	RRR	(95%CI)	RRR	(95%CI)	RRR	(95%CI)	RRR	(95%CI)
Child Protection Status								
No CP Contact	<i>Ref</i>				<i>Ref</i>			
OHC	7.89***	(6.60, 9.44)	18.97***	(14.06, 21.53)	10.57***	(9.26, 12.06)	31.52***	(37.84, 62.21)
CP Contact	4.06***	(3.67, 4.49)	3.00*	(1.28, 7.05)	4.62***	(4.29, 4.98)	20.58***	(9.35, 45.28)
Aboriginal	0.65***	(0.56, 0.75)	0.41	(0.14, 1.20)	0.54***	(0.49, 0.61)	0.21***	(0.09, 0.51)
Remoteness								
Major city	<i>Ref</i>				<i>Ref</i>			
Regional	0.76***	(0.69, 0.85)	0.68	(0.29, 1.59)	0.80***	(0.74, 0.87)	0.67	(0.38, 1.21)
Remote	0.67***	(0.56, 0.79)	0.51	(0.11, 2.25)	0.72***	(0.63, 0.81)	0.54	(0.19, 1.56)

	Females (Total=201, 976)				Males (N=212,768)			
	G1-Low (N=2,307)		G2-High increasing (N=39)		G1-Low (N=4,191)		G2-Steady increasing (N=74)	
	RRR	(95%CI)	RRR	(95%CI)	RRR	(95%CI)	RRR	(95%CI)
Socio-economic status (quantiles)								
1st (Most disadvantaged)	<i>Ref</i>				<i>Ref</i>			
2	1.01	(0.90, 1.14)	1.08	(0.45, 2.60)	0.96	(0.88, 1.04)	0.53	(0.28, 1.02)
3	1.00	(0.88, 1.14)	1.09	(0.42, 2.81)	0.95	(0.86, 1.04)	0.84	(0.45, 1.59)
4	1.03	(0.90, 1.18)	0.97	(0.33, 2.87)	0.88*	(0.79, 0.97)	0.40	(0.15, 1.04)
5 (Least disadvantaged)	1.01	(0.86, 1.18)	1.54	(0.50, 4.75)	0.82***	(0.73, 0.93)	0.99	(0.44, 2.24)
Mother's age at birth (years)								
30 and above	<i>Ref</i>				<i>Ref</i>			
20-29	1.00	(0.91, 1.10)	2.14	(0.94, 4.88)	1.11***	(1.04, 1.20)	1.13	(0.66, 1.96)
less than 20	1.07	(0.92, 1.25)	1.82	(0.56, 5.94)	1.27***	(1.14, 1.42)	1.00	(0.45, 2.21)
Mother's mental health status								
No mental health or substance misuse	<i>Ref</i>				<i>Ref</i>			
Mental health only	1.83***	(1.62, 2.07)	0.76	(0.26, 2.22)	1.72***	(1.57, 1.89)	1.46	(0.76, 2.77)
Substance use only	1.14	(0.95, 1.37)	0.00	No convergence	1.23***	(1.07, 1.40)	0.71	(0.25, 2.01)
Mental health & substance misuse	1.72***	(1.45, 2.04)	0.59	(0.14, 2.55)	1.56***	(1.36, 1.78)	1.40	(0.62, 3.17)
Psychotic disorders	1.78***	(1.49, 2.12)	1.05	(0.35, 3.16)	1.77***	(1.55, 2.03)	0.75	(0.26, 2.15)
Father's mental health status								
No mental health or substance misuse	<i>Ref</i>				<i>Ref</i>			
Mental health only	1.24*	(1.04, 1.48)	0.00	No convergence	1.41***	(1.24, 1.61)	0.66	(0.21, 2.12)
Substance misuse only	0.99	(0.83, 1.17)	1.42	(0.49, 4.17)	1.09	(0.96, 1.23)	0.46	(0.14, 1.48)
Mental health & substance misuse	1.12	(0.90, 1.39)	0.57	(0.08, 4.29)	1.30***	(1.12, 1.52)	0.74	(0.23, 2.39)
Psychotic disorders	1.26*	(1.01, 1.57)	3.07*	(1.15, 8.26)	1.41***	(1.19, 1.66)	2.08	(0.93, 4.65)
Substance misuse	6.15***	(5.61, 6.73)	26.99***	(12.69, 37.41)	4.32***	(4.01, 4.65)	9.85***	(6.16, 15.74)
Homelessness or unstable housing	1.24**	(1.06, 1.45)	0.96	(0.36, 2.60)	1.34***	(1.18, 1.51)	2.10*	(1.09, 4.02)
Family & domestic violence	1.02	(0.84, 1.22)	0.49	(0.11, 2.13)	0.94	(0.81, 1.09)	0.63	(0.22, 1.78)

Notes

Baseline Group 0 "No Externalising episodes" Sample Sizes: Females (N=199,630); Males (N=208,503)

Multinomial logistic regression for significant difference with baseline group: *p≤0.05; **p≤0.01; ***p≤0.001

OHC =Out-of-home care cohort; CP=Child Protection Contact cohort; No CP = No Child Protection Contact Cohort. G1=Trajectory Group 1; G2=Trajectory Group 2; RRR=Relative Risk Ratio

SI Table xvi

Group-based Trajectory Models for Internalising Episodes

No. of groups	Number of latent categories		BIC1	BIC2	AIC	Log-likelihood	Entropy	Average Posterior Probabilities (per Group)		
	Poisson	Zero-inflation						1	2	3
OHC										
1	1	0	-11,933.37	-11,930.25	-11922.06	-11919.06	N/A	N/A	N/A	N/A
1	2	0	-11,399.20	-11,395.05	-11384.12	-11380.12	N/A	N/A	N/A	N/A
2	2,2	0	-10,642.53	-10,634.21	-10612.37	-10604.37	0.849	0.969	0.892	
2	2,2	1 1	-10,631.43	-10,619.99	-10589.96	-10578.96	0.839	0.966	0.915	
2	2,2	2 2	-10,487.17	-10,451.67	-10451.67	-10438.67	0.905	0.982	0.913	
2	2,2	3	-10,496.84	-10,485.41	-10455.37	-10444.37	0.856	0.973	0.878	
3	2,2,2	0	-10,452.27	-10,439.80	-10407.03	-10395.03	0.630	0.803	0.791	0.891
3	2,2,2	1,1,1	-10,417.94	-10,400.27	-10353.85	-10336.85	0.670	0.859	0.860	0.877
3	2,2,2	2	-10,400.97	-10,386.41	-10348.19	-10334.19	0.718	0.900	0.802	0.925
CP										
1	1	0	-80,406.63	-80,403.52	-80392.21	-80389.21	N/A	N/A	N/A	N/A
1	2	0	-76,954.43	-76,950.27	-76935.2	-76931.2	N/A	N/A	N/A	N/A
1	2	2	-75,553.05	-75,546.81	-75524.19	-75518.19	N/A	N/A	N/A	N/A
2	2,2	0	-74,359.49	-74,351.17	-74321.01	-74313.01	0.787	0.955	0.832	
2	2,2	1 1	-73,417.49	-73,406.06	-73364.59	-73353.59	0.524	0.879	0.820	
2	2,2	2 2	-72,923.32	-72,909.80	-72860.79	-72847.79	0.598	0.903	0.823	
2	2,2	3	-73,019.08	-73,007.64	-72966.17	-72955.17	0.812	0.963	0.863	
3	2,2,2	0	-72,837.65	-72,825.17	-72779.93	-72767.93	0.637	0.838	0.844	0.834
3	2,2,2	1,1,1	-71,983.80	-71,966.13	-71902.04	-71885.04	0.583	0.755	0.916	0.818
3	2,2,2	3	-72,744.27	-72,728.68	-72672.13	-72657.13	0.756	0.841	0.926	0.752
No CP										
1	1	0	-83,504.28	-83,501.16	-83489.6	-83486.6	N/A	N/A	N/A	N/A
1	2	0	-80,623.94	-80,619.78	-80604.37	-80600.37	N/A	N/A	N/A	N/A
1	2	2	-79,224.97	-79,218.73	-79195.62	-79189.62	N/A	N/A	N/A	N/A
2	2,2	0	-78,231.47	-78,223.15	-78192.34	-78184.34	0.834	0.966	0.836	
2	2,2	1 1	-77,055.82	-77,044.39	-77002.01	-76991.01	0.551	0.850	0.876	
2	2,2	2	-77,018.70	-77,008.30	-76969.78	-76959.78	0.840	0.972	0.819	
2	2,2	2 2	-76,185.83	-76,172.31	-76122.24	-76109.24	0.624	0.848	0.892	
3	2,2,2	2	-76,092.13	-76,077.58	-76023.65	-76009.65	0.596	0.786	0.828	0.863
3	3,3,3	2	-75,441.07	-75,423.39	-75357.91	-75340.91	0.669	0.800	0.894	0.918
4	2,2,2,2	3	-74,764.10	-74,744.35	-74671.16	-74652.16	0.666	0.694	0.957	0.866
FEMALES										
1	1	0	-104,626.52	-104,623.40	-104611.67	-104608.67	N/A	N/A	N/A	N/A
1	2	0	-99,389.89	-99,385.73	-99370.09	-99366.09	N/A	N/A	N/A	N/A
2	2,1	0	-95,227.43	-95,220.15	-95192.77	-95185.77	0.866	0.978	0.834	
2	2,1	1	-94,544.38	-94,536.06	-94504.77	-94496.77	0.890	0.982	0.858	
3	2,1,1	0	-94,240.3	-94229.86	-94190.74	-94180.74	0.572	0.795	0.754	0.865
MALES										
1	1	0	-71,317.49	-71,314.37	-71303.09	-71300.09	N/A	N/A	N/A	N/A
1	2	0	-69,216.19	-69,212.04	-69197	-69193	N/A	N/A	N/A	N/A
2	2,1	0	-67,955.89	-67,948.62	-67922.31	-67915.31	0.846	0.9690	0.8385	
2	2,1	1	-68,883.19	-68,874.87	-68844.8	-68836.8	0.557	0.8957	0.7864	
2	2,1	3	-66,919.41	-66,909.02	-66871.44	-66861.440	0.831	0.9687	0.8302	
3	2,1,1	0	-67,905.96	-67,895.56	-67857.98	-67847.98	0.834	0.9551	0.6362	0.8297

Notes:
AIC = Akaike Information Criteria.; BIC = Bayesian Information Criteria.

SI Table xvii

Group-based Trajectory Models for Externalising Episodes

No. of groups	Number of latent categories		BIC1	BIC2	AIC	Log-likelihood	Entropy	Average Posterior Probabilities (per Group)		
	Poisson	Zero-inflation						1	2	3
OHC										
1	1	0	-4391.48	-4388.36	-4381.47	-4378.47	N/A	N/A	N/A	N/A
1	2	0	-4,031.34	-4,027.18	-4018	-4014	N/A	N/A	N/A	N/A
2	2,1	0	-3,912.04	-3,904.77	-3888.7	-3881.7	0.924	0.988	0.896	
2	2,1	1	-3,908.72	-3,900.40	-3882.04	-3874.04	0.943	0.991	0.910	
2	2,2	0	-3,871.69	-3,863.37	-3845.01	-3837.01	0.828	0.969	0.869	
2	2,2	1	-3,871.03	-3,861.67	-3841.01	-3832.01	0.862	0.976	0.875	
2	3,2	1	-3870.93	-3860.54	-3837.58	-3827.58	0.869	0.975	0.882	
3	2,2,1	3	-3,831.21	-3,816.65	-3784.52	-3770.52	0.800	0.945	0.777	0.889
3	2,1,2	1	-3,837.03	-3,824.55	-3797.01	-3785.01	0.880	0.966	0.889	0.878
3	3,1,1	1	-3,890.60	-3,878.12	-3850.58	-3838.58	0.943	0.987	0.838	0.941
CP										
1	1	0	-17795.85	-17792.74	-17783.5	-17780.5	N/A	N/A	N/A	N/A
1	2	0	-16,565.74	-16,561.58	-16549.27	-16545.27	N/A	N/A	N/A	N/A
2	1,1	1	-17,322.69	-17,315.42	-17293.87	-17286.87	0.81	0.961	0.829	
2	1,1	3	-16,344.81	-16,335.45	-16307.75	-16298.75	0.88	0.979	0.814	
2	2,1	1	16,303.26	-16,294.94	-16270.32	-16262.32	0.848	0.978	0.715	
2	1,3	1	-16,260.99	16,251.63	-16223.93	-16214.93	0.826	0.906	0.968	
3	3,1,1	1	16,188.82	-16,176.35	-16139.42	-16127.42	0.871	0.959	0.915	0.918
No CP										
1	1	0	-10944.84	-10941.72	-10933.04	-10930.04	N/A	N/A	N/A	N/A
1	2	0	-10,505.83	-10,501.67	-10490.11	-10486.11	N/A	N/A	N/A	N/A
2	3,1	3	-10,374.13	-10,362.70	-10330.88	-10319.88	0.785	0.955	0.907	
2	1,1	1	-10,932.07	-10,924.79	-10904.54	-10897.54	0.865	0.736	0.976	
2	1,1	3	-10,461.42	-10,452.06	-10426.04	-10417.04	0.906	0.99	0.89	
2	2,1,1	1	-10,386.14	-10,374.70	-10342.89	-10331.89	0.840	0.957	0.928	0.707
3	3,1,1	1	10,380.55	-10,368.07	-10333.37	-10321.37	0.802	0.938	0.903	0.827
3	2,1,2	1	-10,173.19	-10,160.71	-10126.00	-10114.00	0.72	0.774	0.945	0.898
FEMALES										
1	1	0	-10972.8	-10969.68	-10961.04	-10958.04	N/A	N/A	N/A	N/A
1	2	0	-10,419.32	-10,415.16	-10403.64	-10399.64	N/A	N/A	N/A	N/A
2	1,1	0	-10,835.18	-10,828.94	-10811.66	-10805.66	0.844	0.972	0.844	
2	1,1	1	-10,516.32	-10,509.04	-10488.88	-10481.88	0.876	0.820	0.978	
2	2,1	3	-10,141.23	-10,130.84	-10102.03	-10092.03	0.910	0.853	0.985	
2	2,2	3	-10,094.85	-10,083.41	-10051.73	-10040.73	0.929	0.989	0.842	
3	2,1,1	3	-10,057.26	-10,043.75	-10006.3	-9993.3	0.625	0.662	0.934	0.800
MALES										
1	1	0	-22852.72	-22849.6	-22840.06	-22837.06	N/A	N/A	N/A	N/A
1	2	0	-20,703.48	-20,699.32	-20686.6	-20682.6	N/A	N/A	N/A	N/A
2	1,1	0	-22,060.56	-22,054.32	-22035.24	-22029.24	0.867	0.982	0.805	
2	2,1	3	-20,329.92	-20,319.52	-20287.73	-20277.73	0.894	0.862	0.880	
3	2,1, 1	3	-20,235.03	-20,221.52	-20180.19	-20167.19	0.496	0.523	0.450	0.51

Notes:

AIC = Akaike Information Criteria.

BIC = Bayesian Information Criteria.

SI Table xviii

Group-based Trajectory Models for Psychotic Episodes

No. of groups	Number of latent categories		BIC1	BIC2	AIC	Log-likelihood	Entropy	Average Posterior Probabilities (per Group)		
	Poisson	Zero-inflation						1	2	3
OHC										
1	1	0	-1246.01	-1243.6	-1238.54	-1235.54	N/A	N/A	N/A	N/A
1	2	0	-1,201.64	-1,198.42	-1191.68	-1187.68	N/A	N/A	N/A	N/A
2	2,1	0	-1,143.95	-1,138.31	-1126.52	-1119.52	0.726	0.938	0.860	
2	2,1	1 1	-1,135.15	-1,127.10	-1110.24	-1100.24	0.851	0.966	0.936	
2	2,1	2 1	-1,136.16	-1,127.30	-1108.77	-1097.77	0.875	0.977	0.914	
3	2,1,2	1 2 1	-1,142.92	-1,129.24	-1100.59	-1083.59	0.740	0.881	0.927	0.879
3	2,2,1	1	-1,121.07	-1,111.41	-1091.19	-1079.19	0.707	0.885	0.874	0.924
3	2,2,1	3	-1,126.8	-1115.49	-1091.9	-1077.9	0.721	0.876	0.887	0.931
CP										
1	1	0	-7880.2	-7877.79	-7869.9	-7866.9	N/A	N/A	N/A	N/A
1	2	0	-7,683.37	-7,680.15	-7669.63	-7665.63	N/A	N/A	N/A	N/A
2	2,2	0	-7,003.99	-6,997.55	-6976.51	-6968.51	0.803	0.958	0.870	
2	2,2	1 1	-6,941.69	-6,932.83	-6903.9	-6892.9	0.850	0.966	0.919	
2	2,2	2 1	-6,918.31	-6,908.65	-6877.08	-6865.08	0.864	0.973	0.902	
2	2,1	2 1	-6,913.87	-6,905.02	-6876.08	-6865.08	0.864	0.973	0.902	
3	2,1,2	3	-6,844.71	-6,833.45	-6796.62	-6782.62	0.724	0.857	0.902	0.929
3	2,1,1	2	-6,873.04	-6,863.38	-6831.82	-6819.82	0.770	0.696	0.932	0.867
3	3, 3, 3	3	-6,810.10	-6,795.61	-6748.26	-6730.26	0.697	0.872	0.896	0.840
3	3, 2, 2	4	-6,795.89	-6,782.21	-6737.49	-6720.49	0.717	0.889	0.823	0.918
No CP										
1	1	0	-6898.67	-6896.26	-6888.42	-6885.42	N/A	N/A	N/A	N/A
1	2	0	-6,714.54	6,711.32	-6700.87	-6696.87	N/A	N/A	N/A	N/A
2	2,2	0	-6,388.40	-6,381.96	-6361.05	-6353.05	0.793	0.955	0.885	
2	2,2	1 1	-6,197.61	-6,188.76	-6160.01	-6149.01	0.760	0.951	0.872	
2	2,2	2	-6,189.27	-6,181.22	-6155.09	-6145.09	0.796	0.955	0.899	
2	2,2	2 2	-6,182.81	-6,172.35	-6138.38	-6125.38	0.804	0.959	0.904	
2	2,1	3	-6,160.40	-6,152.35	-6126.22	-6116.22	0.797	0.957	0.892	
3	2,1,2	2	-6,136.57	-6,126.11	-6092.14	-6079.14	0.805	0.912	0.891	0.917
3	2,2,1	3	-6,124.66	-6,113.40	-6076.81	-6062.81	0.789	0.899	0.897	0.901
3	3,1,2	3	-6,088.29	-6,076.22	-6037.03	-6022.03	0.768	0.942	0.826	0.921
3	3,3,2	3	-6,090.82	-6,077.13	-6032.71	-6015.71	0.759	0.920	0.850	0.920

Notes:

AIC = Akaike Information Criteria.

BIC = Bayesian Information Criteria.

SI Table xix

Time-varying effect of substance misuse on internalising mental health episodes

Group Parameter	OHC group				CP Contact				No CP Contact			
	Estimate	SE	95% CI	P-value	Estimate	SE	95% CI	P-value	Estimate	SE	95% CI	P-value
Group 1												
Intercept	-1.18	0.27	(-0.65, -1.71)	0.00	-5.63	0.75	(-4.17, -7.10)	0.00	-1.42	0.12	(-1.18, -1.65)	0.00
Linear	0.68	0.11	(0.90, 0.45)	0.00	2.14	0.22	(2.57, 1.71)	0.00	0.77	0.05	(0.86, 0.68)	0.00
Quadratic	-0.08	0.01	(-0.06, -0.11)	0.00	-0.17	0.02	(-0.13, -0.20)	0.00	-0.09	0.00	(-0.08, -0.10)	0.00
Substance misuse	0.16	0.01	(0.18, 0.15)	0.00	0.08	0.00	(0.09, 0.07)	0.00	0.10	0.00	(0.11, 0.09)	0.00
Group 2												
Intercept	-3.17	0.58	(-2.04, -4.31)	0.00	-1.10	0.12	(-0.87, -1.33)	0.00	-13.64	0.83	(-12.01, -15.27)	0.00
Linear	1.55	0.19	(1.93, 1.18)	0.00	0.67	0.05	(0.77, 0.58)	0.00	4.23	0.24	(4.70, 3.77)	0.00
Quadratic	-0.13	0.02	(-0.10, -0.16)	0.00	-0.08	0.00	(-0.08, -0.09)	0.00	-0.30	0.02	(-0.27, -0.33)	0.00
Substance misuse	0.21	0.01	(0.23, 0.20)	0.00	0.45	0.01	(0.47, 0.43)	0.00	0.55	0.01	(0.56, 0.53)	0.00
Zero-inflation (G1)												
Alpha0	6.05	0.35	(6.72, 5.37)	0.00	4.42	0.18	(4.77, 4.06)	0.00	3.96	0.18	(4.31, 3.62)	0.00
Alpha1	-2.08	0.16	(-1.77, -2.38)	0.00	-0.24	0.12	(-0.01, -0.48)	0.04	0.04	0.11	(0.27, -0.18)	0.70
Alpha2	0.17	0.02	(0.20, 0.13)	0.00	-0.24	0.03	(-0.19, -0.29)	0.00	-0.28	0.02	(-0.23, -0.33)	0.00
Alpha3	n/a	n/a	n/a	n/a	0.02	0.00	(0.03, 0.02)	0.00	0.03	0.00	(0.03, 0.02)	0.00
Zero-inflation (G2)												
Alpha0	10.48	1.27	(12.97, 7.99)	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Alpha1	-3.46	0.45	(-2.59, -4.34)	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Alpha2	0.28	0.04	(0.35, 0.20)	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Notes:

SE: Standard Error

CI: Confidence Interval

SI Table xx

Time-varying effect of substance misuse on externalising mental health episodes

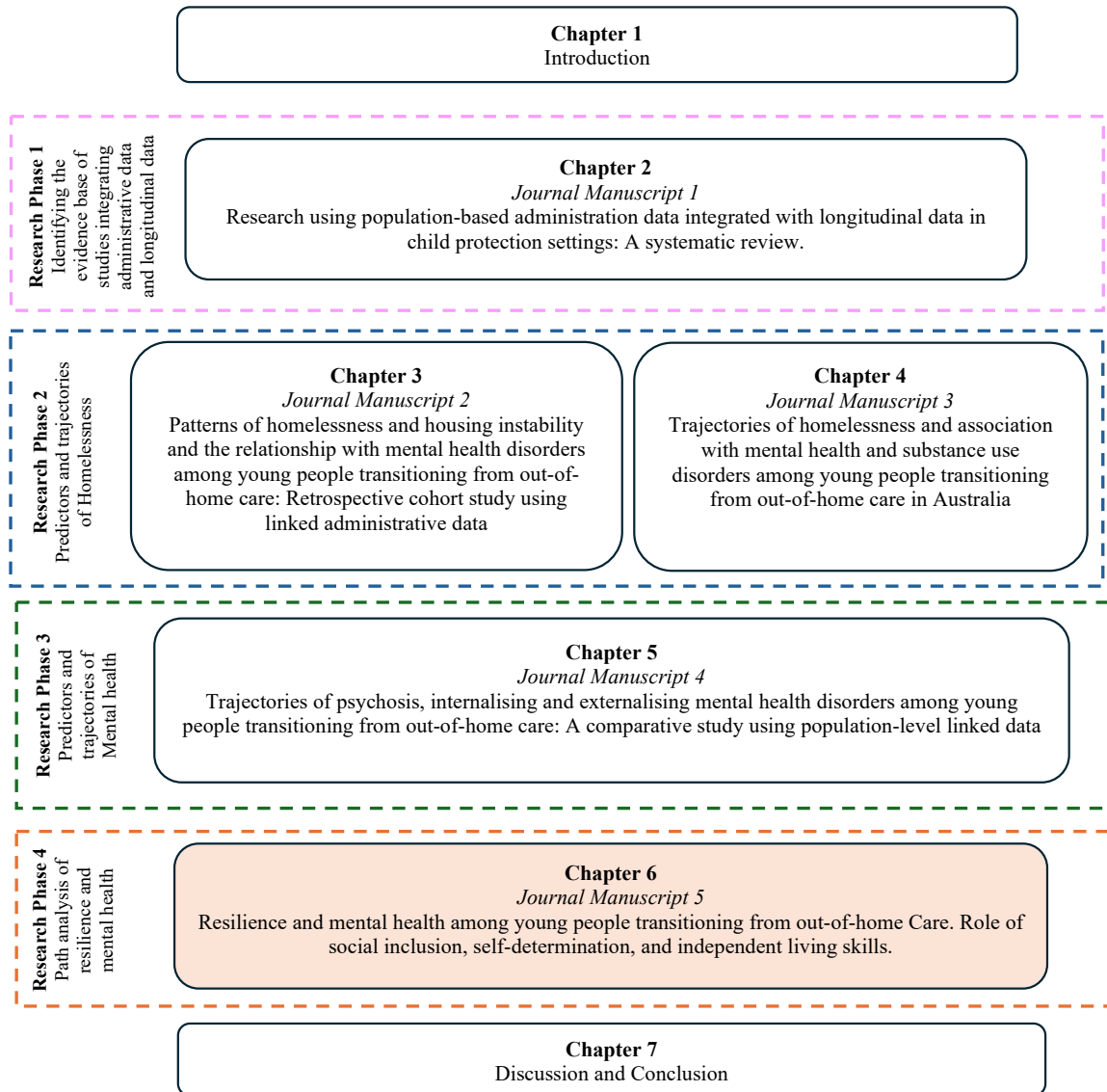
Group	OHC group				CP Contact				No CP Contact				
	Parameter	Estimate	SE	95% CI	P-value	Estimate	SE	95% CI	P-value	Estimate	SE	95% CI	P-value
Group 1													
Intercept	-1.31	1.23	(1.11, -3.73)	0.29	-2.35	0.70	(-3.71,-0.97)	0.00	-0.17	0.70	(1.21, -1.55)	0.81	
Linear	-0.03	0.82	(1.58, -1.63)	0.98	1.30	0.31	(0.700,1.900)	0.00	-0.35	0.52	(0.67, -1.36)	0.50	
Quadratic	0.28	0.18	(0.62, -0.07)	0.12	-0.17	0.03	(-0.23,-0.10)	0.00	0.20	0.12	(0.43, -0.03)	0.09	
Cubic									-0.03	0.01	(-0.01, -0.04)	0.00	
Substance misuse	0.14	0.02	(0.20, 0.13)	0.00	0.07	0.02	(0.10, 0.04)	0.00	0.05	0.02	(0.00, 0.07)	0.04	
Group 2													
Intercept	-3.86	0.41	(-3.05, -4.67)	0.00	1.63	0.25	(2.11, 1.14)	0.00	-7.53	1.47	(-4.65, -10.42)	0.00	
Linear	2.21	0.18	(2.57, 1.86)	0.00	-0.10	0.05	(0.00, -0.20)	0.04	0.94	0.20	(1.33, 0.55)	0.00	
Quadratic	-0.29	0.02	(-0.26, -0.33)	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Substance misuse	0.24	0.01	(0.26, 0.22)	0.00	0.20	0.01	(0.17,0.23)	0.00	0.29	0.01	(0.32, 0.26)	0.00	
Zero-inflation (G1)													
Alpha0	2.65	0.31	(3.26, 2.04)	0.00	2.39	0.92	(4.18, 0.59)	0.01	5.77	1.03	(7.79, 3.74)	0.00	
Alpha1	-0.66	0.08	(-0.50, -0.82)	0.00	0.75	0.67	(2.07, -0.57)	0.26	-3.62	1.03	(-1.60, -5.63)	0.00	
Alpha2	n/a	n/a	n/a	n/a	-0.55	0.16	(-0.25, -0.86)	0.00	1.09	0.32	(1.72, 0.45)	0.00	
Alpha3	n/a	n/a	n/a	n/a	0.05	0.01	(0.08, 0.03)	0.00	-0.12	0.03	(-0.05, -0.18)	0.00	

Notes:

SE: Standard Error

CI: Confidence Interval

Chapter 6 Moderators and Mediators of Mental Health and Perceived Resilience



Chapter 6 involved integrating administrative and longitudinal self-report data from WA to determine moderators and mediators in the association of ACEs and care status with mental health and perceived resilience. ILS, self-determination and social inclusion emerged as significant moderators and mediators in the Path analysis models, underscoring the importance of incorporating supportive mechanisms among young people while they are still

in care. This study addressed the limitation that was highlighted in Chapter 2, by utilising a SEM framework to model complex pathways and relationships. A detailed description of data linkage methods was provided, detailing the collaboration among researchers at Curtin University and the WA Data Linkage Branch within the Department of Health.

Additionally, this chapter addressed most of the limitations highlighted in the systematic review in Chapter 2, and demonstrated the strengths of integrating the two data sources which include: (i) addressing missing values by imputing data from one source to another and conducting sensitivity analysis (ii) leveraging constructs of maltreatment from both data sources to reduce measurement error, address recall bias, and minimize exposure to sensitive questions regarding ACEs, and (iii) incorporating mental health constructs from Strong Souls survey and mental health diagnoses from administrative health data. The manuscript was submitted to a journal and is currently being peer reviewed.

Author Contribution Statement: Chapter 6

As co-authors of the paper entitled, '*Mental health and perceived resilience among care leavers: Role of social inclusion, self-determination, independent living skills*', we confirm that Fadzai Chikwava has been the principal researcher and has made the following contributions:

- Conceptualisation and design of the research;
- Data collection, analysis, and interpretation;
- Writing the manuscript and critical appraisal of the findings;
- Corresponding author for communication with the journal

Our contribution to the paper was consistent with the role of supervisors and involved the following contributions:

- Assistance with conceptualisation and design of the research;
- Assistance with data analysis and interpretation; and
- Review and editing of the manuscript.

Signed: Reinie Cordier Date: 10.09.2024

Signed: Anna Ferrante Date: 10.09.2024

Signed: Melissa O'Donnell Date: 10.09.2024

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Mental health and perceived resilience among care leavers: Role of social inclusion, self-determination, and independent living skills

Fadzai Chikwava^a, Reinie Cordier^{b,a,c}, Anna Ferrante^d, Melissa O'Donnell^{e,f}

- a. Curtin School of Allied Health, Curtin University, Perth, Western Australia, Australia
- b. Department of Social Work, Education and Community Wellbeing, Northumbria University, Newcastle upon Tyne, United Kingdom
- c. Department of Health & Rehabilitation Sciences, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa
- d. Curtin School of Population Health, Curtin University, Perth, Western Australia, Australia
- e. Australian Centre for Child Protection, University of South Australia, Adelaide, South Australia, Australia
- f. Telethon Kids Institute, University of Western Australia, Nedlands, Western Australia, Australia

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Abstract

Objective: Young people transitioning from out-of-home care (OHC) frequently experience poor mental health and resilience due to adverse childhood experiences. However, there is limited understanding of the factors that mediate and moderate these outcomes. This study investigated how placement stability, independent living skills (ILS), social inclusion, and self-determination mediate and moderate the association between adverse childhood experiences and care status on mental health and perceived resilience.

Method: We integrated retrospective linked datasets with a prospective self-report longitudinal study involving 122 young people aged 15 to 25 transitioning from OHC between April 2019 and May 2022. Path analysis was used to model complex relationships involving moderators and mediators.

Results: Our findings partially supported our study hypotheses; ILS moderated the association between adverse childhood experiences (ACEs) and perceived resilience. Social inclusion, self-determination and mental health mediated the effects of care status and maltreatment exposure on perceived resilience. Placement stability independently influenced mental health outcomes.

Conclusions: This is the first study to use integrated linked and longitudinal data to show how validated measures of social inclusion, self-determination, and ILS mediate and moderate the impacts of adverse childhood experiences and care status on the mental health and perceived resilience of care-experienced young people. Findings support early intervention, strength-based approaches, and trauma-informed support to enhance mental health and resilience in young people leaving OHC.

Keywords

Out-of-home care, structural equation model, path analysis, mental health, resilience, linked data, longitudinal data.

Introduction

Young people in out-of-home care (OHC) often face accelerated transitions to adulthood, resulting in poorer outcomes in areas such as physical and mental health, housing instability, homelessness, and involvement with the criminal justice system (Berridge et al., 2020; OECD, 2022). In addition, pre-care exposures to maltreatment and trauma, placement instability, limited support, and poor social networks can create further challenges during the transition stage (McGuire et al., 2018). While young people leaving OHC face multiple challenges, some overcome those difficulties and adapt and cope with living independently (Daining & DePanfilis, 2007; Ungar, 2019; van Breda, 2022).

In young people, resilience is defined as a socio-ecological process and, more recently, a multisystemic process that involves the following three key interrelated dimensions: (i) risk exposure, (ii) promotive and protective factors and processes (PPFP), and (iii) effect on outcomes (Masten & Barnes, 2018; Ungar, 2019; van Breda, 2022). The enablers of an individual's resilience are found less within the person themselves and more within their social environment and the interactions that occur within it (Elder, 1998; Sulimani-Aidan, 2017; Ungar, 2019). The various stressors, which may include adverse childhood experience (ACEs), have an impact on how young people cope or adapt to difficult circumstances such as change, adversity, and trauma, and quite often, young people in OHC may need to be supported to develop resilience (Stein, 2008; Wadi et al., 2020). Additionally, the severity or chronicity of these stressors impact young people in different ways (Elder, 1998). Several factors, identified in the literature as PPFP include internal and external resources across various systems as articulated in Bronfenbrenner's ecological systems theory and life course theory (Elder, 1998; Ungar, 2019). These factors are associated with overcoming adverse childhood experiences (ACEs) among OHC leavers. These include stability in care or at school (Brady & Gilligan, 2018; Stein, 2008; Ungar, 2019), success in

education, developing and maintaining relationships, social support networks (Jones, 2012; Masten & Barnes, 2018; Ungar, 2019), receiving peer support (Afifi & Macmillan, 2011; Elder, 1998; van Breda, 2022), establishing identity in the form of self-knowledge (Daining & DePanfilis, 2007; Kelly et al., 2023), self-esteem, and self-efficacy (Brady & Gilligan, 2018; Refaeli, 2017). Literature, therefore, highlights that resilience is a dynamic process that is influenced by an interplay of personal, cultural, social and environmental factors (Elder, 1998; Hu et al., 2015; Morgan et al., 2021). The outcomes resulting from potential mediators and moderators can encompass a range of areas, including biological effects, psychological wellbeing such as improved self-esteem or mental health, social outcomes, and environmental impacts that promote community safety (Masten & Barnes, 2018; Ungar, 2019). Therefore, an understanding of the multi-layered factors that influence resilience and the associated outcomes is required.

Some longitudinal and cross-sectional studies showed that increased resilience is positively associated with reduced mental health problems (Kairyte et al., 2023; Sumskis et al., 2017), and likewise, young people with mental health problems are less likely to be resilient compared with their peers (Stein, 2008). ACEs are stressful events that occur during childhood, and these include various forms of abuse, maltreatment, and violence (Mishra et al., 2020). Research has determined a negative association between ACEs and resilience (Morgan et al., 2021), while resilience mediates the association between ACEs and poor health outcomes among OHC young people (Hu et al., 2015). Some standardized tools have been developed to measure resilience among different population groups (Connor & Davidson, 2003; Rossouw et al., 2019; Smith et al., 2008). The Connor-Davidson Resilience Scale (CD-RISC) is a validated tool, measuring perceived resilience and encompassing multiple aspects of resilience, such as adapting to change, dealing with stress or unpleasant feelings, and staying focused (Connor & Davidson, 2003; Gonzalez et al., 2016).

Fostering resilience in young people involves meaningful participation, which, in turn, can enhance their sense of connectedness, belonging, and feeling valued (Oliver et al., 2014). Social inclusion is a theoretical concept, equated to the PFP that includes measures of participation, connectedness, a sense of belonging, and citizenship (Cordier & Martin, 2021). Factors that are included in this concept have been shown to be protective and positively associated with mental health or resilience (Cordier & Martin, 2021; Morgan et al., 2021).

The Social Inclusion Scale encompasses eight domains: economic participation, education and training, social training, spiritual participation, cultural participation, connections to family and friends, and connections to the broader community (Cordier et al., 2017). Previous research has evaluated the relationship between these factors and mental health or resilience (Westerman, 2021). While these factors have been shown to be associated with resilience, no studies have determined the role of social inclusion in moderating or mediating the association between ACEs and resilience or mental health in young people transitioning from OHC (van Harmelen et al., 2016; Yang & Wild, 2022).

Self-determination and cultural connection shape young people's identities, especially for young people of Aboriginal background, leading to increased resilience and improved health and wellbeing outcomes (Perlman et al., 2018; Verbunt et al., 2021). Self-determination theory (SDT) outlines three constructs: autonomy, competence, and relatedness (Ryan et al., 2007). SDT provides a framework whereby individuals' self-determination can impact their mental health (Ryan et al., 2007). In addition, SDT lends itself to the causal agency theory, which emphasizes individuals' power to set goals and be agents of their own lives (Shogren et al., 2015). While previous studies have explored how self-determination relates to mental health and resilience (Perlman et al., 2018), they have not thoroughly examined its mediating or moderating role for young people transitioning from OHC.

While young people in OHC receive various forms of social support, they often face independence alone when transitioning to adulthood (Paulsen & Berg, 2016; Stein, 2008). Independent living skills (ILS) are an essential element that supports young people in navigating their transitions to adulthood (Furey & Harris - Evans, 2021; Stein, 2008). Young people need basic life skills such as cooking, managing finances, housing, employment, and maintaining relationships. Quite often, young people who leave OHC lack maturity and the necessary ILS (Stein, 2008). Developing these skills has been linked to improved mental health outcomes (Jana et al., 2014).

Placement instability affects the mental health and resilience of young people transitioning from OHC (Asif et al., 2024; Cashmore & Taylor, 2022). When children move frequently while they are in care, they lose the attachment and relationships they would have developed if they had stayed with the same carer or lived in the same care environment for a substantial amount of time (Asif et al., 2024; Cashmore & Taylor, 2022). No studies have examined placement stability as a mediating factor between ACEs and mental health or resilience.

The age by which the state's legal responsibility ceases affects how young people navigate the complexities of life (Mendes & Rogers, 2020). When young people leave care, they often lack the support they previously received (Paulsen & Berg, 2016). Understanding the outcomes experienced by young people in and after OHC, as well as the pathways to these outcomes, is crucial for this study.

No studies have examined the roles of social inclusion, ILSs, self-determination, and placement stability as resilience processes in the associations between ACEs, resilience, and mental health. This study will investigate these factors, which are important for young people's resilience and mental health outcomes. Although several studies have generated findings supportive of the role of sub-domains of social inclusion as buffering the effect of

poor mental health, most focused only on a few dimensions of social inclusion and did not consider all sub-domains that will be evaluated in this study (Moore & N. Ramirez, 2015; van Harmelen et al., 2016). This will be the first study to use integrated survey and linked administrative data to explore these associations and predict mental health and perceived resilience outcomes for care leavers transitioning to adulthood (Paulsen & Berg, 2016).

We hypothesized that, after controlling for whether individuals were still in care or had left care, the effect of ACEs on perceived resilience would be negative but vary according to placement stability, ILSs, social inclusion, or self-determination. We further hypothesized that the effect of ACEs on mental health would be positive. This study aimed to test these hypotheses and address the following research questions:

1. RQ1. Is there an association between ACEs and poor mental health, and is this association moderated or mediated by perceived resilience, social inclusion, ILS, self-determination, and placement stability?
2. RQ2. Is there an association between ACEs and the secondary outcome of perceived resilience, and is this association moderated or mediated by social inclusion, ILS, self-determination, mental health, and placement stability?
3. RQ3. Are there differences in perceived resilience and mental health outcomes among young people still in care (14-17.9 years) and those who have left care (18-25 years)?

Methods

Integrated Study

We conducted a retrospective and prospective integrated study (Chikwava et al., 2021) from the “*Navigating Through Life*” (NTL) project, a longitudinal population-based project consisting of three studies (Parsons et al., 2020). This paper utilized data from two NTL studies (Studies 1 and 2). Study 1 is a population-level analysis of outcomes for young people in and transitioning from OHC using retrospective linked Western Australia (WA)

administrative records. Study 2 is a longitudinal, prospective self-report study of a subset of young people transitioning from OHC (15 to 25 years), followed for two years with five waves of data collection (baseline, 6, 12, 18, 24 months). This paper used integrated Study 1 and baseline Study 2 data. The Curtin Data Linkage Trusted Research Environment (CDL TRE) team conducted data integration.

Data Sources

Retrospective administrative data (Study 1)

The retrospective data was accessed through WA's Social Investment Data Resource (SIDR) - a linked but de-identified administrative population database (Ferrante et al., 2020). Probabilistic data linkage was conducted by the Centre for Data Linkage (CDL) at Curtin University in partnership with the Data Linkage Branch at the WA Department of Health (DoH) (Ferrante et al., 2022). The WA Department of Communities (DoC) supplied child protection (CP) and housing data. The CP data was used to classify our cohort. It included child wellbeing concerns, maltreatment notifications and substantiations, and care placements. The housing data included public housing applications, tenancies, incomes, and warnings.

Health-related data was sourced from several DoH data collections (Appendix D.1): WA's HMDC, MHIS, EDDC, and MNS. The WA Birth Register (BR) data is used to create the WA Family Connections System (Glasson et al., 2008), identifying mother, father and sibling relationships using the BR and MNS. The MNS and BR were used to select the study cohort, including birth and maternal information.

The MHIS records inpatient and outpatient psychiatric episodes, while the HMDC records hospitalizations. The EDDC includes symptoms, diagnoses, and causes of emergency department visits. These three datasets were used to identify study participants and parents' mental health and substance misuse service contacts.

Prospective data (Study 2)

Study 2 data came from the NTL study's first wave (baseline). The NTL study includes five waves of qualitative interviews and a quantitative survey of standardized measures to understand young people's experiences transitioning from OHC. Baseline data was collected face-to-face and online from April 2019 to May 2022, covering demographic characteristics and standardized outcome measures.

Study Participants

Study participants were recruited through their leaving care service and the DoC. A sample of 122 participants was selected from a cohort of 2,151, meeting these criteria: (i) lived in OHC for at least six months, (ii) aged 15-25 at the time of the survey, and (iii) born in WA between 1993 and 2008.

Ethics

Ethics for conducting the study was provided by Curtin University Human Research Ethics Committee (Ethics number (HRE2021-0151), the WA DoH Human Ethics Review Committee (project #2014/10) and the WA Aboriginal Health Ethics Committee (project #533). The data custodians reviewed and approved requests for linked data. Study participants provided consent for the longitudinal study and for linking their data to other datasets. As per usual practice with linked datasets, the need for consent was waived by the ethics committee because of the anonymized nature of the linked administrative data used.

Study Measures

The analysis comprised participants' socio-demographic characteristics, in-care experiences, and standardized outcome measures of mental health, perceived resilience, social inclusion, ILS, and self-determination. The following measures were used:

Socio-demographic characteristics

The study participants' gender, age at the baseline study, geographic location based on postcode, and Aboriginal status were obtained from Study 2 data and used in the analysis as independent variables. Missing socio-demographic data from Study 2 were completed using Study 1 data. Aboriginal status was derived from health data using algorithms from linked datasets (Christensen et al., 2016). Geographical location was classified using the Australian Statistical Geography Standard (ASGS) remoteness structure, which divides Australia into Major Cities, Inner Regional, Outer Regional, Remote, and Very Remote areas (Australian Bureau of Statistics, 2022). These were collapsed into two categories: major city or inner regional (1) and outer regional, remote, or very remote (2).

Factors (Study 1)

The following factors were identified in the literature as associated with mental health and resilience outcomes and, therefore, used in the analysis:

Child Protection Factors

Care status. This variable was used as an independent variable to determine the association between being in/out of care and mental health or perceived resilience. Two categorical variables were created: (i) in care or left care at the time of the interview, and (ii) in care, left care within the past two years, or left care more than two years ago.

CP notifications and substantiations. Each CP notification may encompass up to eight types of concerns, including family and domestic violence, behavioural issues, substance misuse, mental health, child neglect, physical, sexual, and emotional abuse. Substantiated reports confirm concerns such as physical, emotional, sexual abuse and neglect. Two binary variables, based on the concerns reported across all notifications, were utilized as independent variables: (i) High CP notifications (8 – 20) vs Low CP notifications (1 – 7) and (ii) High CP concern *types* (4 – 8) vs Low CP concern *types* (1 - 3). CP concern *types* count

the different types of child concerns, while CP notifications count the *frequency* of notifications for any type of CP concern. As emphasised by (Ungar, 2019), understanding the severity and frequency of risk exposure is crucial for assessing its impact on mental health or perceived resilience.

Age of entry into care. This was used as a potential risk factor for mental health and analyzed both as a continuous and a categorical variable.

The first age of CP notification. This is the age when the initial report was made to the DoC. This variable is known to be associated with mental health outcomes in young people in OHC. It was analyzed as a continuous variable.

Placement type. This was assessed using two variables: (i) the longest placement type (the type where the young person stayed the longest during OHC), and (ii) the last placement type (the most recent placement at the time of the interview). Placement types included kinship care, residential care, foster care, independent living and self-select care.

Placement stability. Placement stability was assessed by calculating the total number of separate placement changes (e.g. movement from foster carer A to kinship carer B and back to foster carer A will be counted as two *distinct* placements) multiplied by the number of placement types and dividing by the total time in OHC (Asif et al., 2024; Wulczyn & Chen, 2017). To standardize the calculation, the total duration in care was divided by 1,000 person-care days (Wulczyn & Chen, 2017). Both a continuous and a categorical variable were used in the analysis. The categorical variable had two categories based on the distribution of the continuous variable: (i.e., low score 0.5 to 3.9 and high score above 3.9). The formula is shown in Figure 7.

Number of placements. Alongside the placement stability indicator, a binary variable was created to measure care instability based on total number of distinct placements (low = <15 placements vs. high \geq 15 placements).

Contextual Factors

Homelessness or unstable housing. A binary variable was created to indicate instances of homelessness or unstable housing based on the Housing or CP data. Homelessness was documented as a concern in the CP data, and applying for public housing due to homelessness or unstable housing was noted in the housing data. Additionally, the number of public housing tenancies by the young person was also used as an indicator of housing instability.

Person Factors

Mental health or substance misuse. Data on mental and behavioural disorders related to substance misuse, drug dependence disorders and poisoning were obtained from Study 1 HMDS, MHIS and EDDC data using the WHO (ICD 9 and 10) codes; SI Table xxi). A comorbid diagnosis variable was created for participants and their parents, categorized as: (i) no mental health or substance misuse, (ii) mental health only (without substance misuse), (iii) substance misuse only and (iv) mental health and substance misuse.

Any maltreatment. Evidence of maltreatment, including physical abuse, psychological abuse, sexual abuse, neglect, and adverse life events was obtained from Study 1 HMDS, MHIS and EDDC data, using WHO (ICD 9 and 10) codes (SI Table xxi). A binary variable was created to indicate whether individuals experienced any form of maltreatment.

Standardized outcomes (Study 2)

Standardized outcome measures (Appendix C.3) from the baseline survey included perceived resilience and mental health, used as mediating and dependent variables in separate models. Other variables served as potential moderators and mediators. These measures were validated in the past except for social inclusion and independent living skills, which were validated during the NTL study. Psychometric properties are detailed in SI Table xxii, confirming satisfactory internal consistency ($\alpha \geq 0.60$) for Path analysis (Taber, 2017).

- (1) **Perceived resilience.** *Connor-Davidson Resilience Scale 25 (CD-RISC-25)*. This is a brief 25-item self-rated assessment tool, based on feelings over the past month (Connor & Davidson, 2003) and measures the individual's perception of their capacity to cope with adversity. Items were measured on a 5-point scale, with higher scores indicating higher perceived resilience.
- (2) **Mental health and wellbeing** (*Strong Souls*). This is a brief 25-item validated tool which assesses the social and emotional wellbeing (SEWB) among Indigenous young people (Thomas et al., 2010). Responses were recorded on a 4-point scale, with higher scores indicating poorer mental health.
- (3) **Self-determination** (*AIR self-determination scale*). This validated tool assesses participants' self-determination based on self-determined learning theory (Wolman et al., 1994). It contains 24 self-rated items, each measured on a 5-point scale. Higher scores indicate higher perceived self-determination.
- (4) **Social Inclusion.** This questionnaire measures young people's social inclusion and participation opportunities. Initially comprising 37 items drawn from three scales (Huxley et al., 2012; Magson et al., 2014), it was refined to 28 items through factor analysis (Cordier & Speyer, 2024b). Each item is rated on a 5-point scale, assessing participation in various areas and connections to family, friends, and community. Higher scores indicate higher perceived social inclusion.
- (5) **Adverse Childhood Experiences (ACEs).** This simplified ACE tool, adapted from the WHO's recommended version, focusses on early childhood trauma and abuse (up to age 18) (Felitti et al., 1998; Murphy et al., 2014). To alleviate participant distress, items based on known childhood experiences (from administrative data) were excluded. The ACEs questionnaire consists of ten items rated on a 3-point scale (Yes/No/Do not remember). Higher scores indicate a greater exposure to adverse childhood experiences (ACEs).

(6) *Independent Living Skills (ILS)*. This questionnaire, developed by the NSW Government Department of Communities and Justice, assesses skills necessary for independent living (Government of New South Wales, 2019). After factor analysis, the final measure was reduced from 42 to 28 items across eight subdomains: financial management, accessing supports, managing housing, education planning, job seeking, health risk management, daily living skills and managing relationships (Cordier & Speyer, 2024a). Higher scores indicate greater proficiency in independent living skills.

Statistical Analysis

To address the three research questions, we initially analyzed socio-demographic characteristics descriptively and assessed the distribution of continuous variables using histograms. Outliers were identified using boxplots, and the Shapiro-Wilk Test determined normality; a *p-value* below 0.05 indicated non-normal distribution. T-tests compared means for normally distributed data, while non-parametric Mann-Whitney *U*-Tests were used for non-normal distributions. Categorical variables were derived from continuous variables as needed or for testing moderation (Strasheim, 2014). Sensitivity analysis compared weighted and unweighted regression results to account for differences in key socio-demographic variables within the sample compared to the overall cohort of young people.

We then assessed correlations among the standardized measures using scatterplots, Pearson correlations, and Spearman's correlations as needed to determine the strength and direction of linear relationships between variables. Correlations exceeding 0.90 indicated multicollinearity among variables in the path analysis (Hooper et al., 2007). Where non-linearity existed, we transformed the data using z-scores. Simple linear regression was conducted to examine relationships between each dependent variable and potential predictors. Tests for interactions were conducted to identify potential moderators, which were further explored in the path analysis.

Finally, we conducted path analysis, a simplified version of SEM (Streiner, 2005). This was applied to our data since we only modelled observed variables, while SEM allows the modelling of both observed and latent variables. In addition, due to various “chains” of influence in our data, path analysis allowed us to model those complex relationships involving moderators and mediators. Variables significant in the simple linear regression analyses were included in the path analysis, adjusting for gender and Aboriginal status in each model. Given our small sample size, bootstrapped confidence intervals were used to reduce bias in our estimates (Carpenter & Bithell, 2000).

To test the model fit, the following tests were used: X^2 test, Tucker-Lewis index (TLI), Comparative Fit Index (CFI), Standardized Root Mean Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA) (Hu & Bentler, 1999). A low chi-squared value with a non-significant p -value ($p > 0.05$), indicates a good fit. RMSEA values < 0.06 and SRMR values < 0.08 suggest a good fit, while CFI/TLI values closer to 1 or > 0.95 indicate a good model fit (Hu & Bentler, 1999).

We reported estimates and statistical significance for direct, indirect, and total effects with significance set at $p < 0.05$ for all models. Mediation strength was assessed as the ratio of indirect to total effects. Additionally, Cohen’s d was used to interpret effect size, classified as negligible ($d < 0.2$), small ($d = 0.2$), medium ($d = 0.5$) or large ($d \geq 0.8$) (Chen et al., 2010). The data was analyzed using Mplus Version 8.10.

Missing Data

Missing data was addressed in multiple ways to reduce bias. Firstly, missing socio-demographic data from Study 2 were replaced with data from Study 1 and vice versa. Second, missing data on standardized outcome measures were imputed using average scores for each item (Kang et al., 2009). Third, for variables with more than 10% missing data, a separate category was included in the regression analysis (missing indicator method)

(Karahalios et al., 2012). Lastly, path models were fitted using maximum likelihood estimation (MLE), which generates asymptotically unbiased parameter estimates, assuming the data were missing at random (Muthén & Muthén, 2017).

Sensitivity analysis was then conducted to determine the extent to which regression models with missing data approximated the models with full data. This involved comparing regression coefficients and significance levels between the two models (Henderson & Page, 2007; Teyhan et al., 2019).

Results

Participants characteristics

In total, 121 care-experienced young people participated from a total cohort of 2,151 (Table 20). The average age of respondents was 18.8 years, with more females (57.9%) than males (41.3%). Young people of Aboriginal background made up 31.4%, while 66.9% were of non-Aboriginal background. Most participants lived in major cities or inner regional areas (74.6%). There were significant differences in the distribution of gender and Aboriginal status among the study sample compared to the overall cohort of young people (Table 20). These differences were accounted for in the regression model by using a weighted sample.

The young people entered care at an average age of 6.5 years and lived in OHC for an average of 10.2 years (Table 20). These findings were consistent with the overall cohort. The longest placement was kinship care (40.5%). Nearly half had experienced mental health or substance misuse problems during their lifetime. Over 85% had a history of different forms of substantiated abuse. Young people experienced a high prevalence of homelessness (41.3%) and placement instability (34.2%).

Table 20*Participants' socio-demographic and placement characteristics*

Characteristic	Sample (N=121)		Cohort (N=2,151)		<i>p-value</i>
	Mean	SD	Mean	SD	
Age @ baseline	18.85	2.46	19.23	19.23	0.42
Age entered care	6.53	5.42	6.69	6.69	0.65
Total years in care	10.20	5.24	9.64	9.64	0.35
	N	%	N	%	
Area					
Metro	84	74.6	1448	67.4	0.31
Regional or remote	32	20.5	702	32.7	
Missing	5	4.9			
Gender					
Female	70	57.9	1033	48.0	0.03
Male	50	41.3	1118	52.0	
Intersex	1	0.8	0	0.0	
Aboriginal status					
Aboriginal	38	31.4	943	43.8	0.02
Non-Aboriginal	81	66.9	1208	56.2	
Missing	2	1.6			
Age group					
15-17.9 years	49	40.5	853	39.7	0.85
18-25.0 years	72	59.5	1298	60.3	
Longest placement type					
Foster Care	49	36.4	574	27.0	0.02
Kinship Care	44	40.5	743	34.5	
Residential Care	28	23.1	356	16.6	
Number of CP concern types					
Low (1-3)	83	68.0			
High (4-7)	39	32.0			
Frequency of CP notifications					
Low (1-7 notifications)	97	80.2			
High (8-20 notifications)	24	19.8			
Participant's mental health status					
No mental health or substance misuse	59	48.4			
Substance misuse only	10	8.3			
Mental health only	27	22.3			
Mental health and substance misuse	25	20.7			
Substantiated abuse					
Physical	55	45.5			
Sexual	35	28.9			
Emotional	66	54.5			
Neglect	80	66.1			
Any maltreatment	25	20.5			
Homelessness/ housing instability	50	41.3			
Placement instability					
Low (Score 0-3.9)	79	65.8			
High (Score 4+)	41	34.2			
Care status					
In-care	49	40.5			
Left OHC (0-2 years)	36	29.7			
Left care (More than 2 years)	36	29.7			

Notes: SD: Standard deviation; OHC: Out-of-home care; CP: Child Protection

Description of standardized outcome measures

There was variability in the average scores and standard deviations of the standardized measures due to different scoring methods used for each measure (Table 21). At

the 95% level, ACEs ($p=0.03$) and Strong Souls ($p<0.001$) deviated from a normal distribution. These variables were z-transformed for regression and path analysis. Sensitivity analysis with missing data yielded identical results (SI Table xxiii), so the imputed data results are presented below.

Table 21

Summary of Standardized Outcome Measures

Standardized Measure	N	Mean	SD	Median	IQR	Range	Shapiro–Wilk test (<i>p-value</i>)
Adverse Childhood Experience (ACEs)	121	11.99	4.53	12.00	5.00	(0.00, 20.00)	0.03
Independent living skills (ILS)	121	115.01	13.14	114.00	19.06	(80.00, 140.00)	0.65
Social inclusion	121	113.86	18.89	115.50	23.00	(56.00, 157.00)	0.14
Self-determination	121	87.67	17.06	88.00	21.00	(46.00, 120.00)	0.57
Mental health (Strong souls)	120	49.93	15.45	47.50	21.00	(26.00, 91.00)	0.00
Perceived resilience (CDRS-25)	121	68.77	14.94	70.00	19.00	(28.00, 100.00)	0.24

Notes: IQR: Inter-quartile range; SD: Standard deviation.

Table 22 below shows correlations among the study measures. There were significant correlations among pairs of variables, ranging from 0.21 to 0.71, except for pairs involving ACEs. The only significant correlation with ACEs, though not particularly strong, was with Strong souls ($\rho =0.26$). There was no evidence of multicollinearity since all correlations were below 0.90. Sensitivity analysis with missing data yielded identical results (SI Table xxiv), so the imputed data results are presented below (Table 22).

Table 22*Correlations among standardized outcome measures*

Correlation Matrix		1	2	3	4	5	6
1	Adverse Childhood Experiences (ACEs)	1.00					
2	Independent living skills (ILS)	<u>-0.04</u>	1.00				
3	Social inclusion	<u>-0.06</u>	0.38***	1.00			
4	Self-determination	<u>0.04</u>	0.40 ***	0.63***	1.00		
5	Mental health (Strong souls)	<u>0.26***</u>	<u>-0.21*</u>	<u>-0.46***</u>	-0.46***	1.00	
6	Perceived resilience (CDRS-25)	<u>-0.01</u>	0.46***	0.54***	0.71***	-0.44***	1.00

Notes: Pearson and Spearman's test for correlations: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

Regression Analysis

We conducted simple linear regression analyses to identify variables associated with each dependent variable. Sensitivity analysis showed no significant differences between weighted and unweighted models; therefore, unweighted data were used.

Perceived resilience. The results of the simple linear regression analysis with missing and imputed data were identical; hence, we present the imputed data results (SI Table xxv). Self-determination, social inclusion, and ILS emerged as significant predictors of positive perceived resilience. Living in kinship care compared to other placements was also positively associated with perceived resilience. Negative predictors included poor mental health, having left care, high CP notifications, high CP concern types, and any maltreatment. Potential moderators, identified through interactions with ACEs, included ILS, self-determination, and social inclusion. These significant predictors and moderators were included in the path analysis models.

Mental health. Similar to the perceived resilience model, significant predictors of mental health included self-determination, social inclusion, ILS, perceived resilience, and ACEs. Having left care for two or more years was significantly associated with poorer mental health compared to being in care or within two years of leaving OHC. Other predictors of poor mental health included having resided longest in residential care or self-selected

placement, high placement instability, multiple placements, high CP notifications, any maltreatment, and comorbid mental health and substance misuse (SI Table xxvi). Protective factors included having resided longest in kinship care compared to other placement types. ILS was the only significant moderator identified.

Path Analysis Models

Significant predictors of mental health or perceived resilience were included in the final path models. The final models included ILS as a moderator of the association between ACEs and each dependent variable. The models involving self-determination, social inclusion or placement instability exhibited poor model fit indices and were consequently excluded as moderators in the analysis. Self-determination and social inclusion were analyzed separately due to poor model fit and potential multicollinearity when entered in one model. The models were controlled for gender and Aboriginal status, excluding variables with poor model fit for the final analysis.

Path Analysis for Perceived Resilience

Model 1. The initial path analysis model featured perceived resilience as the dependent variable and ILS as a moderator between ACEs and perceived resilience. Independent variables included care status, any maltreatment, and high CP concern *types*. Social inclusion and mental health served as serial mediators. The final model demonstrated excellent fit: $X^2(3) = 4.67$ ($p = 0.32$), RMSEA = 0.04, SRMR = 0.02, CFI = 0.99 and TLI = 0.98 (Figure 11, Table 23). This model explained 50% of the variance in perceived resilience, 26% in social inclusion, and 31% in mental health (Table 23). The interaction between ILS and ACEs accounted for an additional 2% of perceived resilience variance, indicating modest ILS moderation.

The direct paths that were significantly associated with perceived resilience were care status ($\beta = -0.16$, $p = 0.04$), ILS ($\beta = 0.45$, $p < 0.001$), social inclusion ($\beta = 0.26$, $p = 0.004$), mental

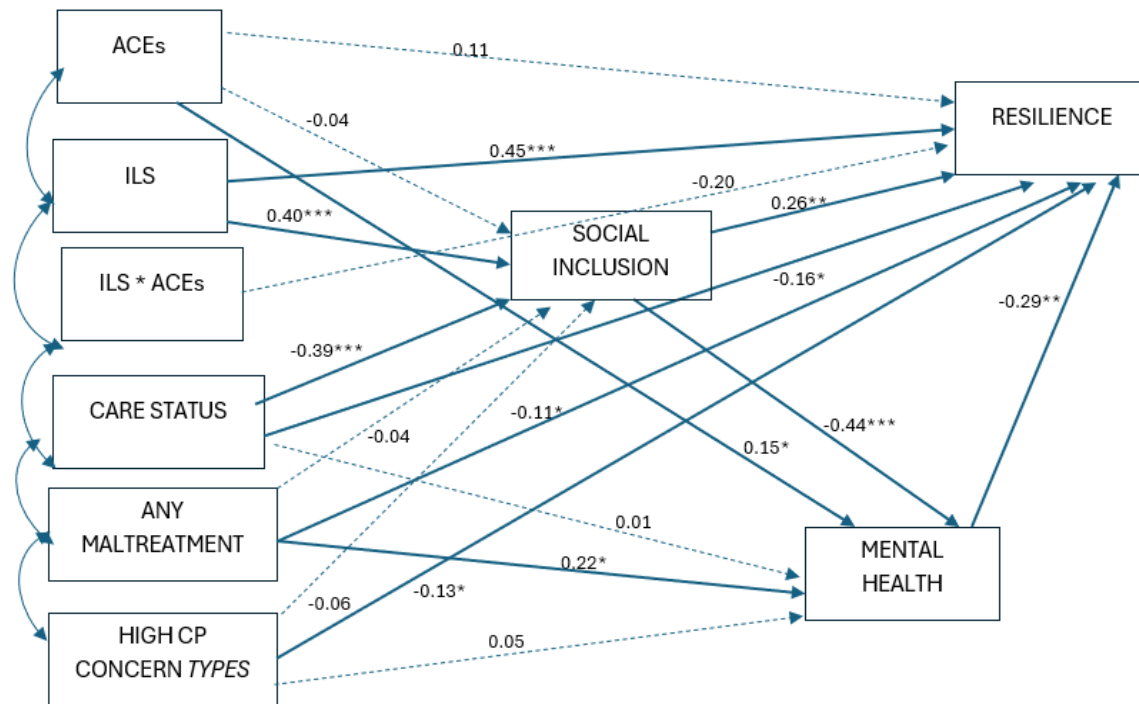
health ($\beta=-0.29, p=0.002$), any maltreatment ($\beta=-0.11, p=0.03$) and high CP concern *types* ($\beta=-0.13, p=0.02$) (SI Table xxvii). The effect sizes were large for social inclusion ($d=1.18$), medium for mental health ($d=0.70$), any maltreatment ($d=0.52$) and care status ($d=0.42$), and small for ILS ($d=0.30$) and high CP concern *types* ($d=0.27$).

The direct paths that were significantly associated with social inclusion were care status ($\beta=-0.39, p<0.001$) and ILS ($\beta=0.40, p<0.001$), and both predictors had medium effect sizes ($d>0.60$). The direct paths associated with mental health were social inclusion ($\beta=-0.44, p<0.001$), any maltreatment ($\beta=0.22, p=0.004$) and borderline significance for ACEs ($\beta=0.15, p=0.05$). The effect sizes were large for social inclusion ($d=0.85$) and medium for any maltreatment ($d=0.60$) and ACEs ($d=0.56$).

The total significant effects on perceived resilience were observed for care status ($\delta=-0.10, p<0.001$) and any maltreatment ($\delta=-0.07, p=0.003$), while total indirect effects were significant for care status only ($\delta=0.05, p=0.003$) (SI Table xxvii). The specific indirect effect of care status on perceived resilience through social inclusion was significant ($\gamma=-0.03, p=0.01$). In other words, social inclusion significantly mediated the relationship between care status and perceived resilience (mediation proportion: 31.2%). Additionally, the indirect effect of care status on perceived resilience through serial mediators' social inclusion and mental health was significant ($\gamma=-0.02, p=0.01$, mediation proportion: 15.6%). Mental health also mediated the relationship between any maltreatment and perceived resilience significantly ($\gamma=-0.03, p=0.04$, mediation proportion: 34.7%).

Figure 11

Path diagram and estimates for the moderating role of ILS, the mediating role of social inclusion and mental health in the association between ACEs, care status, any maltreatment, High CP concern types and perceived resilience



Notes: Bold lines indicate significant paths. * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$. Curved arrows indicate correlations among all pairs of independent variables.

Model 2. The second path model for perceived resilience featured similar predictors to the first model, with self-determination serving as the mediator. The final model demonstrated excellent fit indices, $X^2(3) = 3.47$ ($p = 0.32$), RMSEA = 0.04, SRMR = 0.02, CFI = 1.00 and TLI = 0.98 (Figure 12, Table 23). The model explained 61% of the variance in perceived resilience, 27% in self-determination, and 30% in mental health (Table 23). The interaction between ILS and ACEs contributed an additional 2% to perceived resilience variance, indicating weak ILS moderation.

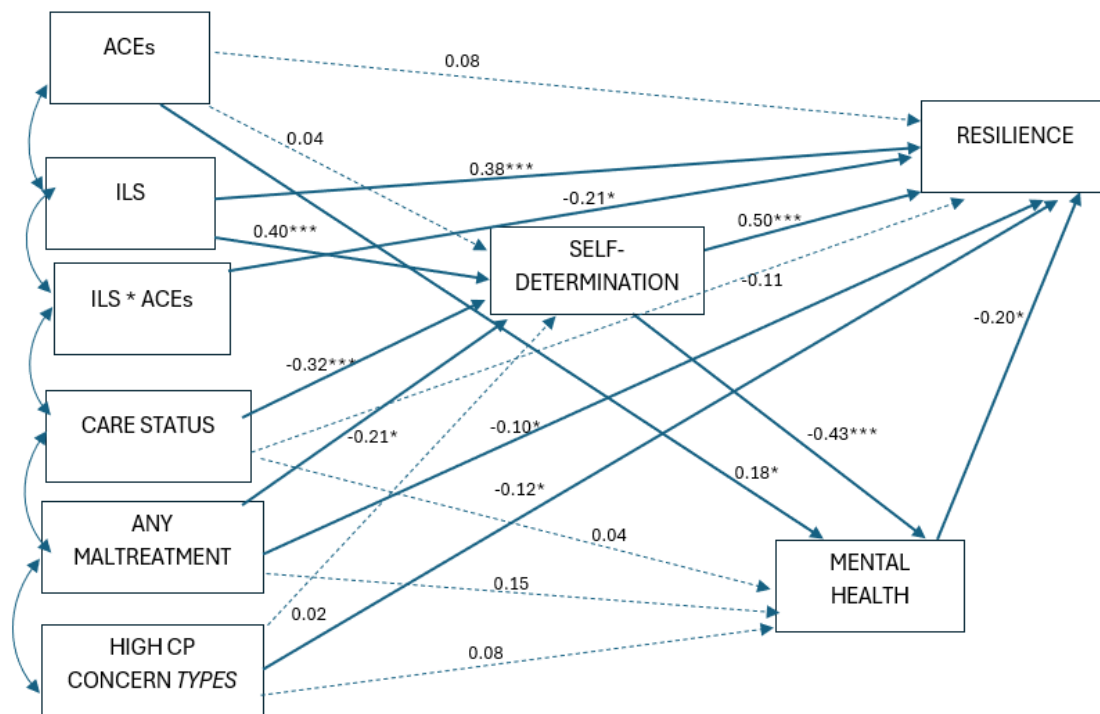
The direct paths significantly associated with perceived resilience were similar to those in the first model, except for the significant interaction between ILS and ACEs ($\beta = -0.21$, $p = 0.03$), indicating some moderation by ILS (SI Table xxvii). Additionally, any

maltreatment was a significant predictor of low self-determination ($\beta=-0.21, p=0.01$), and ACEs predicted mental health significantly ($\beta=0.18, p=0.02$). Unlike the first model, care status was not significantly associated with perceived resilience. Effect sizes were large for self-determination ($d=1.45$), medium for mental health ($d=0.70$) and any maltreatment ($d=0.52$), and small for care status ($d=0.42$), ILS ($d=0.30$), and high CP concern *types* ($d=0.27$).

The total indirect effect of any maltreatment on perceived resilience remained significant, unlike in the first model ($\beta=-0.06, p=0.005$), while the total effect from high CP concern *types* to perceived resilience was not significant in this model (SI Table xxvii). Similar to the first model, self-determination emerged as a significant mediator, except for the indirect effect of any maltreatment on perceived resilience through mental health, which was not significant. Paths involving self-determination as a significant mediator included associations between care status and perceived resilience (mediation proportion: 51.6%), serial mediation involving care-status, self-determination, and mental health (mediation proportion: 8.6%) and the association between any maltreatment and perceived resilience (mediation proportion: 41.7%).

Figure 12

Path diagram and estimates for the moderating role of ILS, the mediating role of self-determination and mental health in the association between ACEs, care status, any maltreatment, High CP concern types and perceived resilience



Notes. Bold lines indicate significant paths. * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$. Curved arrows indicate correlations among all pairs of independent variables.

Path Analysis for Mental health (Strong souls)

Model 3. The third model focused on mental health as the dependent variable, with ILS acting as a moderator between ACEs and mental health. Perceived resilience served as the mediating variable and social inclusion was included as one of the covariates (Figure 13, SI Table xxviii). The final model demonstrated a good fit to the data, $X^2(4)=11.22$ ($p=0.13$), RMSEA=0.07, SRMR=0.06, CFI=0.97, and TLI=0.92 (Figure 13, Table 23). Overall, the model explained 49% of the variance in mental health and 36% in perceived resilience (Table 23). The interaction between ILS and ACEs accounted for an additional 4% of the variance in mental health, indicating moderate ILS.

The significant direct paths associated with mental health included having left care two or more years ago ($\beta=0.16, p=0.03$), ACEs ($\beta=0.20, p=0.003$), ILS ($\beta=-0.23, p<0.001$), social inclusion ($\beta=-0.23, p<0.001$), perceived resilience ($\beta=-0.31, p<0.001$), any maltreatment ($\beta=0.15, p=0.002$), and high CP notifications ($\beta=0.14, p=0.001$). The interaction between ILS and ACEs was significant ($\beta=-0.29, p=0.003$), indicating a degree of moderation by ILS (SI Table BB). Effect sizes were large for social inclusion ($d=0.85$) and perceived resilience ($d=0.80$), medium for any maltreatment ($d=0.66$) and small for care status ($d=0.28$), ILS ($d=0.35$), and high CP notifications ($d=0.16$).

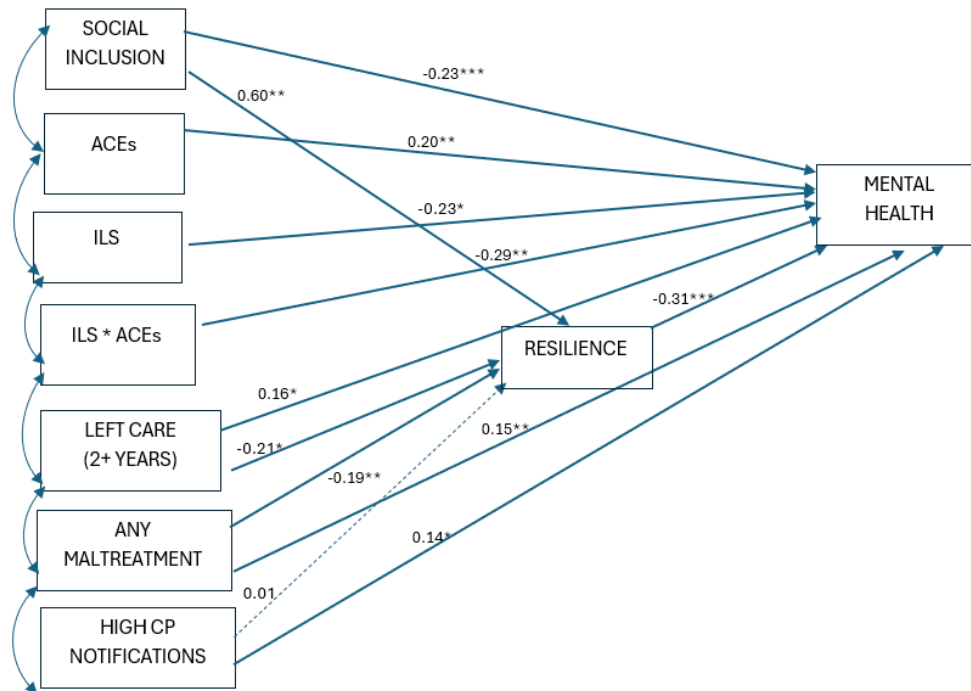
The significant direct paths associated with perceived resilience were social inclusion ($\beta=0.60, p<0.001$), leaving care two or more years ago ($\beta=-0.21, p=0.01$), and any maltreatment ($\beta=-0.19, p=0.003$). Effect sizes were large for social inclusion ($d=1.18$) and medium for care status ($d=0.42$) and any maltreatment ($d=0.52$).

The total and total indirect effects of ACEs on mental health were significant ($\delta=0.06, p=0.004$) and ($\delta=0.01, p<0.001$), respectively. Similarly, the total and total indirect effects of any maltreatment on mental health were significant ($\delta=0.08, p<0.001$) and ($\delta=0.02, p=0.005$), respectively. Additionally, the total effects of high CP notifications on mental health were significant ($\delta=0.06, p=0.009$).

The specific indirect effect of care status on mental health through perceived resilience was significant ($\gamma=-0.07, p=0.02$; mediation proportion 67%). Additionally, perceived resilience significantly mediated the relationship between any maltreatment and mental health ($\gamma=0.02, p=0.005$; mediation proportion 28.4%).

Figure 13

Path diagram and estimates for the moderating role of ILS, the mediating role of perceived resilience in the association between ACEs, care status, any maltreatment, social inclusion, High CP notifications and mental health



Notes. Bold lines indicate significant paths. * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$. Curved arrows indicate correlations among all pairs of independent variables.

Model 4. This model mirrored the third model on mental health, but with self-determination replacing social inclusion as one of the independent variables (Figure 14, SI Table xxviii). The final model fit the data well, $X^2(4) = 11.73$ ($p = 0.16$), RMSEA=0.06, SRMR=0.04, CFI=0.98 and TLI=0.95 (Figure 14, Table 23). Overall, the model explained 47% of the variance in mental health and 52% in perceived resilience (Table 23). The interaction between ILS and ACEs accounted for an additional 3% of the variance in mental health, indicating a degree of moderation by ILS.

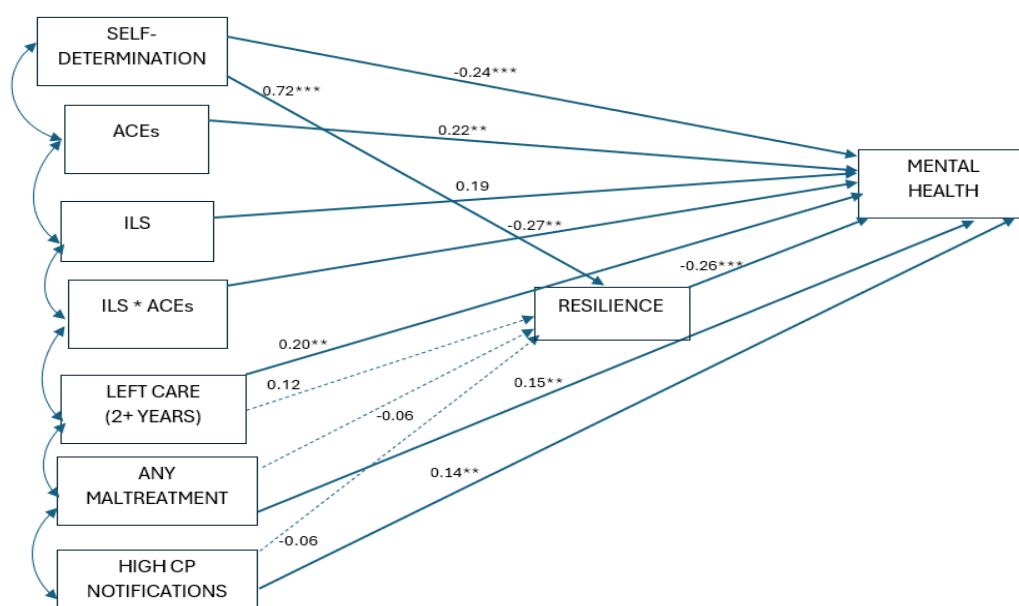
As in the previous model, all direct paths were significantly associated with mental health, with ILS showing borderline significance ($\beta = -0.19$, $p = 0.05$). The interaction between

ILS and ACEs was significant ($\beta=-0.27, p=0.004$), indicating a degree of moderation by ILS (SI Table xxviii). The effect size was large for self-determination ($d=0.80$).

Self-determination was the only significant direct path associated with perceived resilience ($\beta=0.72, p<0.001$), showing a large effect size ($d=1.45$). The total and total indirect effects from ACEs on mental health were significant ($\delta=0.07, p=0.001$) and ($\delta=0.01, p<0.001$), respectively. Unlike the first model, care status also showed significant total effects on mental health ($\delta=0.02, p=0.005$), while other total indirect effects from care status and any maltreatment on mental health were not significant. Specific indirect effects of each predictor on mental health via perceived resilience were also not significant, indicating no evidence of mediation through perceived resilience. The potential bidirectional associations between mental health and perceived resilience were confirmed by significant direct paths in both directions.

Figure 14

Path diagram and estimates for the moderating role of ILS, the mediating role of perceived resilience in the association between ACEs, care status, maltreatment, self-determination, High CP notifications and mental health



Notes. Bold lines indicate significant paths. * $p\leq 0.05$; ** $p\leq 0.01$; *** $p\leq 0.001$. Curved arrows indicate correlations among all pairs of independent variables.

Table 23*Model fit of the Hypothetical Models for perceived resilience and mental health.*

Model Fit Statistics	Model 1: Perceived Resilience + Social Inclusion	Model 2: Perceived Resilience + Self-Determination	Model 3: Mental Health + Social	Model 4: Mental Health + Self-Determination
Chi-square (<i>p-value</i>)	4.67 (0.32)	3.47 (0.32)	11.22 (0.13)	11.73 (0.16)
RMSEA (<i>p-value</i>)	0.04 (0.47)	0.04 (0.45)	0.07 (0.28)	0.06 (0.34)
CFI	0.995	0.997	0.966	0.977
TLI	0.976	0.980	0.917	0.946
SRMR	0.02	0.02	0.06	0.04
R-square <u>Moderated model</u>	Estimate (S.E.)	Estimate (S.E.)	Estimate (S.E.)	Estimate (S.E.)
Perceived resilience	0.50 (0.07)***	0.61 (0.06)***	0.36 (0.08)***	0.52 (0.06)***
Social inclusion	0.26 (0.07)***	-	-	-
Self-determination	-	0.27 (0.07)***	-	-
Mental health	0.31 (0.08)***	0.30 (0.07)***	0.49 (0.06)***	0.47 (0.07)***
R-square <u>Not-moderated</u>				
Perceived resilience	0.48 (0.07)***	0.59 (0.06)***	0.36 (0.08)***	0.52 (0.06)***
Social inclusion	0.26 (0.07)***	-	-	-
Self-determination	-	0.27 (0.07)***	-	-
Mental health	0.31 (0.08)***	0.30 (0.07)***	0.45 (0.06)***	0.44 (0.07)***

Notes. Significant associations: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$. SE: Standard Error

Discussion

To our knowledge, this is the first study to use linked administrative data integrated with longitudinal data to examine the associations among ACEs, social inclusion, ILSs, self-determination, and placement stability in predicting mental health and perceived resilience among young people transitioning from OHC. We hypothesized that controlling for care status, ACEs would negatively affect perceived resilience but vary according to placement stability, ILSs, social inclusion, or self-determination. We further hypothesized that the effect of ACEs on mental health will be positive. Our findings partially supported these hypotheses; ILS moderated the association between ACEs and perceived resilience, while social inclusion, self-determination and mental health mediated the effects of care status and maltreatment exposure on perceived resilience.

Consistent with previous research, young people leaving care face multiple challenges, including mental health and resilience issues (OECD, 2022). Our study illustrates

how a combination of risk and protective factors, spanning system, contextual and person dimensions predicts perceived resilience and mental health outcomes. From a strength-based perspective, positive mental health is influenced by factors such as resilience, self-determination, and social inclusion (Gloria & Steinhardt, 2016; Rutten et al., 2013; Ungar, 2019).

Direct associations

Aligned with previous research, our study found significant associations between ACEs, multiple forms of maltreatment, and poor mental health among young people transitioning from care (McGuire et al., 2018; Mishra et al., 2020). Additionally, we identified direct associations between mental health and perceived resilience, highlighting how mental health can impact coping and recovery from adverse life events such as ACEs (Tseliou & Ashfield-Watt, 2022). Furthermore, our study addressed recommendations from previous research emphasizing that maltreatment or ACEs cannot be adequately measured using a single construct or one data source (McGuire et al., 2018) and that risk exposure should account for the severity or chronicity of negative life experiences (Ungar, 2019). Hence, using the three constructs of ACEs from the survey and linked data helps mitigate measurement error and assesses the differential impact of ACEs on mental health (Ungar, 2019).

Placement stability independently influenced mental health outcomes. This finding aligns with previous research indicating that placement stability did not act as a mediator or moderator in the relationship between different forms or severity of maltreatment and mental health or perceived resilience (McGuire et al., 2018; Newton et al., 2000).

The moderating role of ILS

This study is the first to show the moderating effect of ILS as a PFP on the association between ACEs and perceived resilience or mental health in young people

transitioning from OHC (Masten & Barnes, 2018) ILS minimally moderated the effect of ACEs on perceived resilience. Models with the interaction term of ILS and ACEs showed slightly better fit than those without it. Prior research has underscored the importance of supporting young people in acquiring ILS, as they may not be adequately prepared for the transition from care to adulthood. This support can potentially enhance their mental health and perceived resilience (Rice & O'Connor, 2023; Stein, 2008; Ungar, 2019).

The mediating role of social inclusion

Our study found a significant association between social inclusion and both mental health and perceived resilience. Social inclusion significantly mediated the association between leaving care and perceived resilience. The sequential mediation from mental health suggests that improved mental health among young people who left care may enhance perceived resilience. This highlights the potential risks and lack of opportunities and supports faced by young people who have left care compared to those still within the care system (Butterworth et al., 2017; Elder, 1998; Kelly et al., 2023; Stein, 2008).

Previous research affirms the mediating role of social inclusion, encompassing contextual or environmental factors in mental health and perceived resilience (Su et al., 2022; Ungar, 2019). Although social inclusion did not significantly mediate the association between ACEs and mental health, the indirect association with care status represents a novel finding deserving attention. This highlights the vulnerabilities experienced by young people upon leaving care and reinforces the advocacy for extending the age of leaving care support for these individuals (Mendes & Rogers, 2020).

The mediating role of self-determination

Our study is the first to show that self-determination mediates the association between leaving care and perceived resilience, as well as the association between any maltreatment and perceived resilience. Self-determination, like social inclusion, mediated the association

between leaving care and perceived resilience, with a stronger mediation effect (51.6% vs 31.2%). Encouragement and support from caregivers or schools in fostering independence, decision-making, and setting goals for the future enhances mental health and perceived resilience among young people (Atkinson & Hyde, 2019; Shogren et al., 2015). Often, young people in care lack opportunities to plan for their future (Butterworth et al., 2017; OECD, 2022). This study reinforces the importance of supporting young people with self-determination strategies to improve their mental health and wellbeing (Oliver et al., 2014).

The mediating role of mental health

Our study found a significant association between mental health and perceived resilience in both social inclusion and self-determination models. Mental health strongly mediated the association between any maltreatment and perceived resilience (mediation proportion: 34.7%) and served as a moderately strong sequential mediator in models involving care status, social inclusion, self-determination, and perceived resilience. This finding aligns with previous research showing strong links between mental health and adverse childhood experiences (Su et al., 2022).

Implications for policy and practice

Interventions aimed at enhancing self-determination and coping skills can improve mental health outcomes for young people transitioning from OHC (Hyde & Atkinson, 2019; Ungar, 2019). Therapeutic and trauma-informed approaches are crucial for addressing mental health issues in this group (Vicary & Andrews, 2001). Our study highlighted the protective influence of kinship care on perceived resilience and mental health, emphasizing the importance of prioritizing placements with kin when young people enter OHC (Rubin et al., 2008). Our study underscores the complex interplay of social inclusion, self-determination, ILS, and perceived resilience, thereby advocating for the incorporation of supportive mechanisms into prevention and treatment plans within child protection settings.

Practitioners from the health, child protection and education sectors should collaborate to continually explore strategies to support young people and their caregivers, foster stronger relationships, and empower them to take an active role in their health and wellbeing (Paxman et al., 2014). Transitioning from OHC poses challenges for care leavers, including difficulties navigating the transition between child and adult mental health services, necessitating active collaboration among stakeholders (Matthews & Sykes, 2012; Paxman et al., 2014).

Recommendations for future research

The models examined associations between child-related factors (e.g., ACEs, any maltreatment or placement characteristics) and mental health or perceived resilience outcomes. However, since the standardized outcome measures of self-determination, social inclusion, ILS, mental health, and perceived resilience were all administered in wave one of the study, causal relationships could not be inferred.

Future studies should longitudinally investigate how changes in one measure influence outcomes in subsequent study waves (Tremblay et al., 2004). Bidirectional associations can only be confirmed through such studies (Kraiss et al., 2024). Incorporating perspectives from mental health practitioners, social workers, and caregivers would enhance our understanding of young people's mental health and resilience. (Paxman et al., 2014).

Strengths and limitations

The study has substantial strengths, including integrating data from two sources. The advantages of utilizing both data sources include: (i) addressing missing values by imputing data from one source to another, (ii) leveraging constructs of maltreatment from both data sources to reduce measurement error, address recall bias, and minimize exposure to sensitive questions regarding ACEs, and (iii) incorporating mental health constructs from Strong Souls survey and mental health diagnoses from administrative health data.

While data integration has multiple benefits, it is important to note that the mental health diagnostic information from administrative records only captures young people who attended the health services. This limitation may potentially lead to an underestimation of the true prevalence of mental health issues among this population group (Chikwava et al., 2022).

Despite some missing data, we employed various methods to mitigate this issue. Moreover, our sensitivity analysis revealed no significant differences between the findings when analysing the data with and without missing data. The small sample size may have impacted the significance and precision of our estimates and interpretation of findings. To counteract this limitation, we utilized bootstrapped confidence intervals to minimize bias in our estimates (Muthén & Muthén, 2017). Employing Bayesian methods could further address the challenges posed by small sample sizes (McNeish, 2016; Miocevic et al., 2017).

Conclusions

This is the first study to demonstrate how validated measures of social inclusion, self-determination, and ILS mediate and moderate the impacts of adverse childhood experiences and care status on the mental health and perceived resilience of care-experienced young people. Our findings underscore the pivotal role of ILS in shaping the relationship between ACEs and perceived resilience. Furthermore, self-determination and social inclusion facilitate the association between ACEs and perceived resilience. Importantly, our study highlights the heightened vulnerability of young people leaving care to poor mental health and perceived resilience, emphasizing the need for extended support as they transition from OHC to adulthood.

The findings support early intervention, strength-based approaches, and trauma-informed care to enhance the mental health, wellbeing, and perceived resilience of young people leaving OHC. Integrating multiple linked datasets with longitudinal data allowed us to explore a wide range of variables from both data sources by identifying the variables that

were significant predictors of mental health and perceived resilience. Furthermore, exposure to multiple data sources helped enhance completeness in reporting outcomes.

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Supplementary Information

SI Table xxi

Mental Health, Substance Misuse and Maltreatment Disorders (ICD 9 and 10 Codes)

Diagnosis	ICD 10-Codes	ICD 9-Codes
Any mental health disorder	F0* F2* F3* F4* F5* F6* F7* F8* F9* X6* X7* X80* X81* X82* X83* X84* Z915	290 293 294 295 297 298 299 296.0 296.1 296 300.4 296.90 296.99 311 293.83 300.0 300.2 300.3 300.8 308 309 309.8 301 317 318 319 312 299 307.2 307.3 307.6 307.7 313 314 315 E95 300.1 300.5 300.6 300.7 300.9 310 316 302 306 307.1 307.4 307.5 307.8 307.9
Substance misuse	F1* F55* Z721 Z722 X41* X42* X45* Y11* Y12* Y15* T40* T41* T42* T43* T50* T51* E24.4 G31.2 G62.1 G72.1 I42.6 K29.2 K29.20 K29.21 K70* K85.2 K86.0 R78* Y90* Y91* T52* T53* X46* X47* Y16* Y17* T39* X40 Y10 T36* T37* T38* T44* T45* T46* T47* T48* X43 X44 Y13 Y14	291 303 305 357.5 425.5 535.30 535.31 571.0 571.1 571.2 571.3 E860 T51 V11.3 E947.3 980 790.3 977.3 425.5 292 304 304.40 304.41 304.42 304.43 305.70 305.71 305.72 305.73 304.30 304.31 304.32 304.33 305.20 305.21 305.22 305.23 304.20 304.21 304.22 304.23 305.60 305.61 305.62 305.63 968.5 E938.5 304.50 304.51 304.52 304.53 305.30 305.31 305.32 305.33 969.6 E854.1 E939.6 305.50 305.51 305.52 305.53 965 965.01 965.02 965.09 E850.0 E935.0 304.10 304.11 304.12 304.13 305.40 305.41 305.42 305.43 304.60 304.61 304.62 304.63 304.80 304.81 304.82 304.83 304.90 304.91 304.92 304.93 305.9 648.3 V654.2 T41 T43 R78.2 965 969 970.81 965.01
Any maltreatment (Physical, emotional, sexual, neglect, other forms of trauma and abuse)	R45.6 T74 T74.0 - T74.9 Y06, Y06.0 - Y06.9, Y07, Y07.0 - Y07.9 Z04.4, Z61 Z61.0 Z61.1 - Z61.9, Z62, Z62.0 - Z62.9	995.5 995.51 995.52 995.53 995.54 995.55 995.59 995.8 995.81 995.82 995.83 995.84 995.85 V71.81 785.5 V71.5

SI Table xxii

Standardised measures psychometric properties

Measure Name, <i>Dimension measured</i>	Number of items; Response Scale	Psychometrics
Resilience <i>Connor-Davidson Resilience Scale (CD-RISC)</i>	25 items; 5-point scale	<u>Internal consistency: $\alpha = 0.89$</u>
Self-determination <i>American Institutes for Research (AIR) Self-Determination Scale</i>	24 items; 5-point scale	<u>Internal consistency: split-half correlations = 0.95</u> <u>Test-retest reliability over 3-months: $r = 0.74$</u>
Social and emotional wellbeing <i>Strong Souls</i>	25 items; 4-point scale	<u>Internal consistency: $\alpha = 0.70$</u> <u>Structural validity: 4 factor structure</u>
Adverse Childhood Experiences <i>(ACEs) Questionnaire</i>	10 items; 3-point scale	<u>Internal consistency: $\alpha = 0.88$</u>
Independent living skills <i>Independent Living Skills Questionnaire</i>	28 items; 5-point scale	Internal consistency: $\alpha = 0.90$ (<i>determined from this study</i>)
Social inclusion <i>Social Inclusion Questionnaire</i>	32 items; 5-point scale	Internal consistency: $\alpha = 0.92$ (<i>determined from this study</i>)

SI Table xxiii

Summary of standardised measures (measures with missing values)

Standardised Measure	N	Mean	SD	Median	IQR	Min	Max	Shapiro–Wilk test (<i>p</i> -value)
Adverse Childhood Experiences (ACEs)	103	12.86	3.98	13.00	6.00	2.00	20.00	0.16
Independent living skills (ILS)	91	115.58	13.62	114.00	22.00	80.00	140.00	0.47
Social inclusion	91	116.78	17.27	117.00	20.00	61.00	157.00	0.17
Self-determination	111	87.68	17.23	89.00	23.00	46.00	120.00	0.62
Mental health (Strong Souls)	120	49.93	15.45	47.50	21.00	26.00	91.00	0.00
Perceived resilience (CDRS-25)	117	68.65	15.08	70.00	19.00	28.00	100.00	0.25

SI Table xxiv

Correlations among standardised outcome measures (measures with missing values)

Correlation Matrix		1	2	3	4	5	6
1	Adverse Childhood Experience (ACEs)	1.00					
2	Independent living skills (ILS)	<u>-0.11</u>	1.00				
3	Social inclusion	<u>-0.27</u>	0.44***	1.00			
4	Self-determination	<u>-0.10</u>	0.47 ***	0.66***	1.00		
5	Mental health (Strong Souls)	<u>0.33***</u>	<u>-0.25*</u>	<u>-0.43***</u>	<u>-0.46***</u>	1.00	
6	Perceived resilience (CDRS-25)	<u>-0.10</u>	0.56***	0.51***	0.72***	-0.44***	1.00

Notes: Pearson and Spearman's test for correlations: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

SI Table xxv

Simple linear Regression Analysis: Perceived resilience as dependent variable

Factor	Analysis with imputed data				Analysis with missing data			
	N	β	95% CI	t-statistic	N	β	95% CI	t-statistic
Females	70	0.00	(-0.06 to 0.05)	-0.02	67	0.00	(-0.06 to 0.06)	-0.06
Aboriginal	39	0.00	(-0.06 to 0.06)	-0.07	36	0.00	(-0.06 to 0.06)	-0.06
Area								
Outer regional/ remote	31	<i>Reference</i>			29	<i>Reference</i>		
Major city/inner regional	84	-0.01	(-0.08 to 0.05)	-0.38	82	-0.02	(-0.08 to 0.05)	-0.53
ACEs	121	0.00	(-0.03 to 0.03)	-0.08	99	-0.07	(-0.22 to 0.08)	-0.95
ILS	121	0.73***	(0.48 to 0.99)	5.67	88	0.89***	(0.61 to 1.18)	6.20
Social inclusion	121	0.73***	(0.53 to 0.94)	7.15	88	0.65***	(0.41 to 0.88)	5.44
Self-determination	121	0.74***	(0.61 to 0.88)	10.88	108	0.74***	(0.60 to 0.88)	10.64
Mental health (Strong Souls)								
-	121	-0.47***	(-0.62 to -0.32)	-6.07	115	0.48***	(-0.64 to -0.32)	-5.95
Perceived resilience (CDRS)	121	n/a	n/a	n/a	117	n/a	n/a	n/a
Age of entry into OHC	121	0.00	(-0.01 to 0.00)	-0.03	116	0.00	(-0.01 to 0.00)	-0.16
Care status								
In care	49	<i>Reference</i>			47	<i>Reference</i>		
Left care	72	-0.06*	(-0.11 to -0.01)	-2.27	69	-0.07*	(-0.13 to -0.01)	-2.48
Time since leaving care (0-2 years)	36	-0.06*	(-0.12 to 0.00)	-2.13	35	-0.06*	(-0.12 to 0.00)	-2.09
Time since leaving care (2+ years)	36	-0.01	(-0.07 to 0.05)	-0.33	34	-0.02	(-0.08 to 0.04)	-0.54
Longest placement type								
Foster care	49	-0.05	(-0.10 to 0.01)	-1.72	47	-0.05	(-0.11 to 0.00)	-1.91
Residential	28	-0.03	(-0.09 to 0.04)	-0.81	27	-0.03	(-0.10 to 0.04)	-0.93
Kinship	44	0.07*	(0.01 to 0.12)	2.48	42	0.07*	(0.02 to 0.13)	2.59
Last placement type								
Foster care	17	-0.07	(-0.15 to 0.00)	-1.89	17	-0.07	(-0.15 to 0.01)	-1.83
Residential	12	0.05	(-0.04 to 0.14)	1.15	11	0.07	(-0.03 to 0.16)	1.39
Kinship	44	0.07*	(0.02 to 0.12)	2.54	41	0.07*	(0.02 to 0.13)	2.58
Independent living	19	-0.02	(-0.09 to 0.05)	-0.53	19	-0.02	(-0.09 to 0.06)	-0.49
Self-select	15	-0.08	(-0.16 to 0.00)	-1.89	15	-0.08	(-0.16 to 0.01)	-1.83
Placement stability (continuous)	120	0.00	(0.00 to 0.00)	0.50	115	0.00	(0.00 to 0.00)	0.65

Factor	Analysis with imputed data				Analysis with missing data			
	N	β	95% CI	t-statistic	N	β	95% CI	t-statistic
Placement stability								
Low (Score 0.05-3.99)	79	<i>Reference</i>			76	<i>Reference</i>		
High (Score 4+)	41	0.01	(-0.05 to 0.06)	0.19	39	0.00	(-0.05 to 0.06)	0.12
Number of placements								
<15 placements	86	<i>Reference</i>			83	<i>Reference</i>		
15+ placements	35	-0.03	(-0.09 to 0.03)	-0.92	33	-0.02	(-0.09 to 0.04)	-0.80
Age of first CP notification								
	121	0.00	(-0.01 to 0.01)	0.29	116	0.00	(-0.01 to 0.01)	-0.09
Number of CP concern types								
Low (1-3)	82	<i>Reference</i>			80	<i>Reference</i>		
High (4-5)	39	-0.04*	(-0.10 to 0.01)	-1.49	37	-0.04*	(-0.10 to 0.02)	-1.36
Frequency of CP notifications								
Low (1-7)	97	<i>Reference</i>			94	<i>Reference</i>		
High (8 - 20)	24	-0.02	(-0.09 to 0.05)	-0.60	22	-0.02	(-0.09 to 0.05)	-0.48
Any maltreatment (health data)								
	22	-0.10**	(-0.16 to -0.03)	-2.86	21	-0.10**	(-0.17 to -0.03)	-2.70
Participant mental health status								
No mental health or substance use	59	<i>Reference</i>			57	<i>Reference</i>		
Mental health only	27	0.01	(-0.05 to 0.08)	0.43	27	0.02	(-0.05 to 0.08)	0.48
Substance use only	10	0.06	(-0.04 to 0.15)	1.16	9	0.06	(-0.04 to 0.17)	1.18
Mental health and substance use	25	-0.03	(-0.09 to 0.04)	-0.76	23	-0.03	(-0.10 to 0.04)	-0.90
Mother mental health status								
No mental health or substance use	50	<i>Reference</i>			49	<i>Reference</i>		
Mental health only	28	-0.04	(-0.11 to 0.02)	-1.35	26	-0.05	(-0.11 to 0.02)	-1.37
Mental health and/or substance use	29	0.04	(-0.02 to 0.10)	1.32	28	0.05	(-0.02 to 0.11)	1.50
Psychosis	13	0.07	(-0.02 to 0.16)	1.60	12	0.08	(-0.01 to 0.17)	1.84
<i>Missing</i>	14	-0.01	(-0.10 to 0.07)	-0.29	14	-0.02	(-0.11 to 0.06)	-0.57
Father mental health status								
No mental health or substance use	67	<i>Reference</i>			63	<i>Reference</i>		
Mental health only	10	-0.03	(-0.13 to 0.07)	-0.59	10	-0.03	(-0.13 to 0.07)	-0.56
Mental health and/or substance use	30	-0.03	(-0.09 to 0.04)	-0.86	30	-0.03	(-0.09 to 0.04)	-0.79
Psychosis	17	-0.01	(-0.09 to 0.06)	-0.36	17	-0.01	(-0.09 to 0.07)	-0.31
<i>Missing</i>	14	-0.01	(-0.10 to 0.07)	-0.29	14	-0.02	(-0.11 to 0.06)	-0.57
Public housing tenancies								
0	53	<i>Reference</i>			53	<i>Reference</i>		
1	33	0.01	(-0.05 to 0.08)	0.35	32	0.01	(-0.05 to 0.08)	0.43
2+	35	0.03	(-0.03 to 0.10)	1.08	32	0.04	(-0.02 to 0.11)	1.25

Factor	Analysis with imputed data				Analysis with missing data			
	N	β	95% CI	t-statistic	N	β	95% CI	t-statistic
Homelessness/ housing instability	50	-0.04	(-0.09 to 0.02)	-1.29	47	-0.03	(-0.09 to 0.02)	-1.16
Interaction terms								
ILS * ACES	121	0.07*	(0.01 to 0.13)	2.31	76	0.08*	(0.02 to 0.14)	2.50
Social inclusion* ACES	121	0.18*	(0.02 to 0.33)	2.26	74	0.05	(-0.15 to 0.25)	0.47
Self-determination* ACES	121	0.24**	(0.10 to 0.38)	3.50	94	0.26**	(0.09 to 0.42)	3.05
Placement stability * ACES	120	0.00	(0.00 to 0.00)	0.37	98	0.00	(0.00 to 0.00)	0.29

Notes: Simple linear regression for significant associations: *p<0.05; **p<0.01; ***p<0.001. CI=Confidence interval

SI Table xxvi

Simple linear Regression Analysis: Mental health (Strong souls) as dependent variable

Factor	Analysis with imputed data				Analysis with missing data			
	N	β	95% CI	t-statistic	N	β	95% CI	t-statistic
Female	70	0.03	(-0.03 to 0.08)	0.95	68	0.03	(-0.03 to 0.09)	1.05
Aboriginal	39	-0.03	(-0.09 to 0.03)	-1.11	38	-0.03	(-0.10 to 0.03)	-1.12
Area								
Outer regional/ remote	31	<i>Reference</i>			31	<i>Reference</i>		
Major city/inner regional	84	0.01	(-0.05 to 0.08)	0.43	83	0.01	(-0.06 to 0.07)	0.29
ACES	121	0.08**	(0.03 to 0.14)	3.05	103	0.21**	(0.06 to 0.36)	2.85
ILS	121	-0.34*	(-0.63 to -0.05)	-2.32	90	-0.39*	(-0.73 to -0.05)	-2.28
Social inclusion	121	-0.65***	(-0.87 to -0.43)	-5.85	89	-0.60***	(-0.87 to -0.33)	-4.39
Self-determination	121	-0.51***	(-0.68 to -0.34)	-5.82	111	-0.49***	(-0.67 to -0.31)	-5.40
Mental health (Strong Souls)		n/a	n/a	n/a		n/a	n/a	n/a
Perceived resilience (CDRS)	121	-0.50***	(-0.67 to -0.34)	-6.07	115	-0.50***	(-0.66 to -0.33)	-5.95
Age of entry into OHC	121	0.00	(-0.01 to 0.01)	0.03	119	0.00	(0.00 to 0.01)	0.12
Care status								
In care	48	<i>Reference</i>			48	<i>Reference</i>		
Left care	71	0.04	(-0.01 to 0.10)	1.55	70	0.04	(-0.01 to 0.10)	1.46
Time since leaving care (0-2 years)	36	-0.05	(-0.11 to 0.01)	-1.80	36	-0.06	(-0.12 to 0.00)	-1.86
Time since leaving care (2+ years)	36	0.10**	(0.04 to 0.16)	3.52	35	0.10**	(0.05 to 0.16)	3.50
Longest placement type								
Foster care	49	0.00	(-0.06 to 0.05)	-0.11	48	0.00	(-0.06 to 0.05)	-0.15

Factor	Analysis with imputed data				Analysis with missing data			
	N	β	95% CI	t-statistic	N	β	95% CI	t-statistic
Residential	28	0.07*	(0.01 to 0.14)	2.17	28	0.07*	(0.01 to 0.14)	2.26
Kinship	44	-0.05	(-0.11 to 0.00)	-1.85	43	-0.06	(-0.11 to 0.00)	-1.89
Last placement type								
Foster care	17	0.03	(-0.05 to 0.11)	0.68	16	0.02	(-0.06 to 0.11)	0.59
Residential	12	0.04	(-0.05 to 0.13)	0.90	12	0.05	(-0.05 to 0.14)	0.96
Kinship	44	-0.08**	(-0.14 to -0.02)	-2.84	43	-0.08**	(-0.14 to -0.02)	-2.80
Independent living	19	0.01	(-0.07 to 0.08)	0.14	19	0.01	(-0.07 to 0.08)	0.18
Self-select	15	0.11*	(0.02 to 0.19)	2.57	15	0.11*	(0.02 to 0.19)	2.58
Placement instability (continuous)	119	0.00*	(0.00 to 0.01)	2.00	119	0.00	(0.00 to 0.01)	1.79
Placement instability								
Low (Score 0.05-3.99)	79	<i>Reference</i>			77	<i>Reference</i>		
High (Score 4+)	41	0.07*	(0.01 to 0.12)	2.31	41	0.07*	(0.01 to 0.12)	2.23
Number of placements								
<15 placements	86	<i>Reference</i>			84	<i>Reference</i>		
15+ placements	35	0.09**	(0.03 to 0.15)	2.89	35	0.09**	(0.03 to 0.15)	2.98
Age of first CP notification	121	0.00	(-0.01 to 0.01)	0.46	119	0.00	(-0.01 to 0.01)	0.40
Number of CP concern types								
Low (1-3)	82	<i>Reference</i>			83	<i>Reference</i>		
High (4-5)	39	0.03	(-0.03 to 0.08)	0.85	37	0.03	(-0.03 to 0.09)	0.88
Frequency of CP notifications								
Low (1-7)	97	<i>Reference</i>			96	<i>Reference</i>		
High (8 - 20)	24	0.10**	(0.03 to 0.16)	2.78	23	0.10**	(0.03 to 0.17)	2.93
Any maltreatment (health data)	22	0.12***	(0.05 to 0.18)	3.59	22	0.12***	(0.05 to 0.18)	3.60
Participant mental health status								
No mental health or substance use	59	<i>Reference</i>			58	<i>Reference</i>		
Mental health only	27	0.02	(-0.05 to 0.08)	0.48	26	0.02	(-0.05 to 0.08)	0.44
Substance use only	10	-0.01	(-0.11 to 0.09)	-0.20	10	-0.01	(-0.11 to 0.10)	-0.10
Mental health and substance use	25	0.07*	(0.00 to 0.13)	1.93	25	0.06	(-0.01 to 0.13)	1.82
Mother mental health status								
No mental health or substance use	50	<i>Reference</i>			49	<i>Reference</i>		
Mental health only	28	0.00	(-0.07 to 0.06)	-0.08	28	0.00	(-0.07 to 0.06)	-0.11
Mental health and/or substance use	29	-0.02	(-0.09 to 0.04)	-0.74	28	-0.02	(-0.09 to 0.05)	-0.63
Psychosis	13	-0.08	(-0.17 to 0.01)	-1.84	12	-0.08	(-0.18 to 0.01)	-1.79
Missing	14	-0.01	(-0.10 to 0.08)	-0.27	14	-0.01	(-0.10 to 0.07)	-0.25

Factor	Analysis with imputed data				Analysis with missing data			
	N	β	95% CI	t-statistic	N	β	95% CI	t-statistic
Father mental health status								
No mental health or substance use	67	Reference			65	Reference		
Mental health only	10	0.03	(-0.07 to 0.13)	0.66	10	0.03	(-0.07 to 0.13)	0.55
Mental health and/or substance use	30	0.01	(-0.06 to 0.07)	0.20	30	0.01	(-0.06 to 0.07)	0.19
Psychosis	17	-0.01	(-0.09 to 0.07)	-0.26	17	-0.01	(-0.09 to 0.07)	-0.30
Missing	14	-0.01	(-0.10 to 0.08)	-0.27	14	-0.01	(-0.10 to 0.07)	-0.25
Public housing tenancies								
0	53	Reference			53	Reference		
1	33	-0.06	(-0.12 to 0.01)	-1.71	33	-0.06	(-0.12 to 0.01)	-1.70
2+	35	-0.06	(-0.12 to 0.01)	-1.80	34	-0.06	(-0.12 to 0.01)	-1.71
Homelessness/ housing instability	50	0.02	(-0.04 to 0.08)	0.65	49	0.02	(-0.04 to 0.08)	0.73
Interaction terms								
ILS * ACES	121	0.03***	(0.02 to 0.05)	3.65	79	0.03***	(0.02 to 0.05)	3.66
Social inclusion* ACES	121	0.00	(-0.16 to 0.16)	-0.01	76	0.09	(-0.14 to 0.31)	0.77
Self-determination* ACES	121	-0.05	(-0.20 to 0.10)	-0.67	96	-0.03	(-0.21 to 0.14)	-0.38
Placement stability * ACES	120	0.00	(0.00 to 0.00)	0.73	98	0.00	(0.00 to 0.00)	0.62

Notes

Simple linear regression for significant associations: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$. CI=Confidence interval

SI Table xxvii

Perceived resilience Path analysis models

PERCEIVED RESILIENCE MODEL 1: SOCIAL INCLUSION AND MENTAL HEALTH AS MEDIATORS				PERCEIVED RESILIENCE MODEL 2: SELF-DETERMINATION AND MENTAL HEALTH AS MEDIATORS			
Covariate	Estimate	S.E.	Cohen's <i>d</i>	Covariate	Estimate	S.E.	Cohen's <i>d</i>
Perceived resilience ON				Perceived resilience ON			
Care status: Left care vs in care	-0.16*	0.08	0.42	Care status: Left care vs in care	-0.11	0.07	0.4
ACEs	0.11	0.07	0.10	ACEs	0.08	0.07	0.1
ILS	0.45*	0.10	0.30	ILS	0.38***	0.08	0.3
ILS * ACEs	-0.20	0.11	<i>n/a</i>	ILS * ACEs	-0.21*	0.10	<i>n/a</i>
Social inclusion	0.26*	0.09	1.18	Self-determination	0.50***	0.06	1.4
Mental health (Strong Souls)	-	0.09	0.70	Mental health (Strong Souls)	-0.20*	0.08	0.7
Any maltreatment vs no maltreatment	-0.11*	0.05	0.52	Any maltreatment vs no maltreatment	-0.10*	0.04	0.5
High vs low CP concern types	-0.13*	0.06	0.27	High vs low CP concern types	-0.12*	0.05	0.2
Social inclusion ON				Self-determination ON			
ACEs	-0.04	0.09	0.15	ACEs	0.04	0.08	0.0
Left care vs in-care	-	0.07	0.65	Left care vs in-care	-0.32***	0.08	0.5
ILS	0.40*	0.08	0.62	ILS	0.40***	0.08	0.5
Any maltreatment vs no maltreatment	-0.04	0.10	0.16	Any maltreatment vs no maltreatment	-0.21*	0.08	0.4
High vs low CP concern types	-0.06	0.08	0.04	High vs low CP concern types	0.02	0.08	0.0
Mental health ON				Mental health ON			
ACEs	0.15*	0.08	0.56	ACEs	0.18*	0.08	0.5
Left care vs in-care	0.01	0.09	0.14	Left care vs in-care	0.04	0.09	0.1
Social inclusion	-	0.09	0.85	Self-determination	-0.43***	0.08	0.8
Any maltreatment vs no maltreatment	0.22*	0.08	0.60	Any maltreatment vs no maltreatment	0.15	0.08	0.6
High vs low CP concern types	0.05	0.08	0.16	High vs low CP concern types	0.08	0.08	0.1
Effects from ACEs on perceived resilience				Effects from ACEs on perceived resilience			
Total	0.01	0.02	<i>n/a</i>	Total	0.01	0.02	<i>n/a</i>
Total indirect	-0.01	0.01	<i>n/a</i>	Total indirect	0.00	0.01	<i>n/a</i>
Specific indirect 1				Specific indirect 1			
Perceived resilience-social inclusion-ACEs	0.00	0.01	<i>n/a</i>	Perceived resilience-self-determination-ACEs	0.00	0.01	<i>n/a</i>
Specific indirect 2				Specific indirect 2			
Perceived resilience-mental health-ACEs	-0.01	0.01	<i>n/a</i>	Perceived resilience-mental health-ACEs	-0.01	0.00	<i>n/a</i>
Specific indirect 3				Specific indirect 3			
Perceived resilience-mental health-SI-ACEs	0.00	0.00	<i>n/a</i>	Perceived resilience-mental health-SD-ACEs	0.00	0.00	<i>n/a</i>

PERCEIVED RESILIENCE MODEL 1: SOCIAL INCLUSION AND MENTAL HEALTH AS MEDIATORS

Covariate	Estimate	S.E.	Cohen's d
<u>Effects from care status (left care) on perceived resilience</u>			
Total	-	0.02	<i>n/a</i>
Total indirect	0.05*	0.02	<i>n/a</i>
Specific indirect 1			
Perceived resilience-social inclusion-care status	-0.03*	0.01	<i>n/a</i>
Specific indirect 2			
Perceived resilience-mental health-care status	0.00	0.01	<i>n/a</i>
Specific indirect 3			
Perceived resilience-mental health-SI-care status	-0.02*	0.01	<i>n/a</i>
<u>Effects from any maltreatment on perceived resilience</u>			
Total	-	0.03	<i>n/a</i>
Total indirect	-0.03	0.02	<i>n/a</i>
Specific indirect 1			
Perceived resilience-social inclusion-any maltreatment	0.00	0.01	<i>n/a</i>
Specific indirect 2			
Perceived resilience-mental health-any maltreatment	-0.02*	0.01	<i>n/a</i>
Specific indirect 3			
Perceived resilience-mental health-SI-any maltreatment	0.00	0.01	<i>n/a</i>
<u>Effects from High CP concern types on perceived resilience</u>			
Total	-	0.02	<i>n/a</i>
Total indirect	-0.01	0.01	<i>n/a</i>
Specific indirect 1			
Perceived resilience-SI-high CP concern types	-0.01	0.01	<i>n/a</i>
Specific indirect 2			
Perceived resilience-mental health-high CP concern	0.00	0.01	<i>n/a</i>
Specific indirect 3			
Perceived resilience-mental health-SI-high CP concern types	0.00	0.00	<i>n/a</i>

PERCEIVED RESILIENCE MODEL 2: SELF-DETERMINATION AND MENTAL HEALTH AS MEDIATORS

Covariate	Estimate	S.E.	Cohen's d
<u>Effects from care status (left care) on perceived resilience</u>			
Total	-0.09***	0.02	<i>n/a</i>
Total indirect	-0.06***	0.02	<i>n/a</i>
Specific indirect 1			
Perceived resilience-self-determination-care status	-0.05**	0.01	<i>n/a</i>
Specific indirect 2			
Perceived resilience-mental health-care status	0.00	0.01	<i>n/a</i>
Specific indirect 3			
Perceived resilience-mental health-SD-care status	-0.01*	0.00	<i>n/a</i>
<u>Effects from any maltreatment on perceived resilience</u>			
Total	-0.10***	0.02	<i>n/a</i>
Total indirect	-0.06**	0.02	<i>n/a</i>
Specific indirect 1			
Perceived resilience-self-determination-any maltreatment	-0.04*	0.02	<i>n/a</i>
Specific indirect 2			
Perceived resilience-mental health-any maltreatment	-0.01	0.01	<i>n/a</i>
Specific indirect 3			
Perceived resilience-mental health-SD-any maltreatment	-0.01	0.00	<i>n/a</i>
<u>Effects from High CP concern types on perceived resilience</u>			
Total	-0.04	0.02	<i>n/a</i>
Total indirect	0.00	0.02	<i>n/a</i>
Specific indirect 1			
Perceived resilience-SD-high CP concern types	0.00	0.01	<i>n/a</i>
Specific indirect 2			
Perceived resilience-mental health-high CP concern types	-0.01	0.01	<i>n/a</i>
Specific indirect 3			
Perceived resilience-mental health-SD-high CP concern types	0.00	0.00	<i>n/a</i>

Notes

Significant associations: *p≤0.05; **p≤0.01; ***p≤0.001.

Cohen's d significance: Negligible (d<0.2); Small (d=0.2); medium (d=0.5); Large (d=0.8)

S.E: Standard Error; CP: Child Protection. SD: Self-determination; SI: Social inclusion; ILs: Independent living skills. ACEs: Adverse childhood experiences.

SI Table xxviii

Mental Health (Strong Souls) Path analysis models

MENTAL HEALTH MODEL 3: SOCIAL INCUSION AS INDEPENDENT VARIABLE				MENTAL HEALTH MODEL 4: SELF-DETERMINATION AS INDEPENDENT VARIABLE			
Covariate	Estimate	S.E.	Cohen's d	Covariate	Estimate	S.E.	Cohen's d
Mental health (Strong souls) ON				Mental health (Strong souls) ON			
Care status: Time since left care (2+ years)	0.16*	0.07	0.28	Care status: Time since left care (2+ years)	0.20**	0.07	0.28
ACEs	0.20**	0.07	0.56	ACEs	0.22**	0.07	0.56
ILS	-0.23*	0.10	0.35	ILS	-0.19*	0.10	0.35
ILS * ACEs	-0.29**	0.10	n/a	ILS * ACEs	-0.27**	0.09	n/a
Social inclusion	-0.23***	0.04	0.85	Self determination	-0.24***	0.04	0.83
Perceived resilience (CDRS)	-0.31***	0.05	0.80	Perceived resilience (CDRS)	-0.26***	0.05	0.80
Any maltreatment vs no maltreatment	0.15**	0.05	0.66	Any maltreatment vs no maltreatment	0.15**	0.05	0.66
High vs low number of CP notifications	0.14**	0.05	0.16	High vs low number of CP notifications	0.14**	0.05	0.16
Perceived resilience ON				Perceived resilience ON			
Social inclusion	0.60***	0.08	1.18	Self determination	0.72***	0.05	1.45
Time since left care (2+ years)	-0.21*	0.09	0.42	Time since left care (2+ years)	0.12	0.07	0.42
Any maltreatment vs no maltreatment	-0.19**	0.07	0.52	Any maltreatment vs no maltreatment	-0.06	0.06	0.52
High vs low number of CP notifications	0.01	0.08	0.11	High vs low number of CP notifications	-0.06	0.06	0.11
<u>Effects from ACES to Mental health</u>				<u>Effects from ACES to Mental health</u>			
Total	0.06**	0.02	n/a	Total	0.07**	0.02	n/a
Total indirect	0.01***	0.00	n/a	Total indirect	0.01***	0.00	n/a
<u>Effects from care status to Mental health</u>				<u>Effects from care status to Mental health</u>			
Total	0.10	0.09	n/a	Total	0.06*	0.03	n/a
Total indirect	-0.07*	0.03	n/a	Total indirect	-0.01	0.01	n/a
Specific indirect 1				Specific indirect 1			
Mental health-perceived resilience-care status	-0.07*	0.03	n/a	Mental health-perceived resilience-care status	-0.01	0.01	n/a
<u>Effects from any maltreatment to Mental health</u>				<u>Effects from any maltreatment to Mental health</u>			
Total	0.08***	0.02	n/a	Total	0.06**	0.02	n/a
Total indirect	0.02**	0.01	n/a	Total indirect	0.01	0.01	n/a
Specific indirect 1				Specific indirect 1			
Mental health-perceived resilience-any maltreatment	0.02**	0.01	n/a	Mental health-perceived resilience-any maltreatment	0.01	0.01	
<u>Effects from high CP notifications to Mental health</u>				<u>Effects from high CP notifications to Mental health</u>			
Total	0.06**	0.02	n/a	Total	0.06**	0.02	n/a

MENTAL HEALTH MODEL 3: SOCIAL INCUSION AS INDEPENDENT VARIABLE				MENTAL HEALTH MODEL 4: SELF-DETERMINATION AS INDEPENDENT VARIABLE			
Covariate	Estimate	S.E.	Cohen's <i>d</i>	Covariate	Estimate	S.E.	Cohen's <i>d</i>
Total indirect	0.00	0.01	<i>n/a</i>	Total indirect	0.01	0.01	<i>n/a</i>
Specific indirect 1				Specific indirect 1			
Mental health-perceived resilience-high CP notifications	0.00	0.01	<i>n/a</i>	Mental health-perceived resilience-high CP notifications	0.01	0.01	<i>n/a</i>

Significant associations: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$. *Cohen's d* significance: negligible ($d < 0.2$); small ($d = 0.2$); medium ($d = 0.5$); Large ($d \geq 0.8$)

S.E: Standard Error; CP: Child Protection. SD: Self-determination; SI: Social inclusion; ILS: Independent living skills. ACEs: Adverse childhood experiences

Chapter 7 Discussion

I was motivated to undertake this thesis because of a desire to contribute to the evidence-base on outcomes affecting young people transitioning from care. I was particularly drawn to the opportunity to investigate these outcomes using linked administrative and longitudinal self-report data. The datasets and methods allowed me to expand my knowledge and enhance my statistical analysis skills in investigating these outcomes. Analysis of integrated data enables the creation of a rich evidence-base, addressing the gap in reporting on outcomes for young people transitioning from OHC at a population level.

The goal of programs and services for young people transitioning from OHC is to improve outcomes in dealing with challenges they often face and to provide an understanding of the role and impact of several critical factors, including: 1) personal factors - understanding the unique person-centred factors that determine the outcomes and trajectories experienced by each individual; 2) the immediate environment (micro-system) such as family, friends and carers and the interactions with the child and the broader environment (meso-system); 3) evaluating both formal and informal structures (exo-system) that serve as supportive systems for the child's development and their influence on the immediate environment; 4) the broader societal factors such as policies, culture, values and norms that shape a child's development (macro-system); and 5) developmental transitions - acknowledging the transitions or changes a child undergoes during their developmental stages (chrono-system).

The thesis also examined how young people's lives changed over time within social, historical and cultural contexts. As introduced in Chapter 1, both life course theory and Bronfenbrenner's ecological systems theory provided frameworks for examining and understanding contexts and change over time. Life course theory was considered to be interwoven within each level of Bronfenbrenner's ecological systems theory, with

developmental transitions, trajectories and outcomes into early adulthood operating as part of a sequence of events at various levels of Bronfenbrenner's ecological systems theory before, during and after OHC (Bronfenbrenner, 1994; Elder, 1998). Using this approach, the thesis was able to examine and understand the impacts of developmental transitions at the different levels.

This thesis not only confirms evidence on the factors associated with adverse outcomes experienced by young people transitioning from OHC but also expands current knowledge by examining interactions of factors over the life course and trajectories of mental health and homelessness among sub-groups of young people. The thesis explores interactions of various systems and provides evidence of critical times when policymakers and service providers can intervene at different stages of these young people's lives.

This thesis was conducted in response to a critical need to address the growing number of children placed in OHC and the poor outcomes for those transitioning to independence. Additionally, the thesis addressed the current gaps in existing studies, which were often small-scale and lacked a comprehensive understanding of young people's outcomes as they transitioned from OHC at a population level. The thesis provides a strong theoretical base for utilising and integrating population-level retrospective and prospective data to inform developmental pathways and outcomes of young people leaving OHC. Utilising the theoretical underpinnings, the thesis was able to: 1) examine current statistical techniques and identify methodological gaps among studies involving integrated linked and longitudinal data sets in child protection settings; 2) explore homelessness patterns and trajectories and their association with mental health and substance misuse disorders among sub-groups of young people transitioning from OHC; 3) investigate the trajectories of internalising, externalising and psychotic disorders among young people transitioning from care; and 4) investigate risk and protective factors associated with mental health and

perceived resilience, focussing on the role of placement stability, social inclusion, self-determination and independent living skills.

The thesis revealed various layers in understanding the risk and protective factors, as well as the trajectories of homelessness, mental health and perceived resilience among young people transitioning from OHC. These layers align with both ecological systems theory and life course theory, so this section explores how these theories provide a framework for interpreting the research findings. The ecological systems theory provided a framework for understanding the multiple interacting environmental systems influencing an individual's development. Similarly, life course theory emphasises the concept of linked lives, which considers the influence of social and historical contexts and the individuals' role in adapting to adverse life events. The timing, environmental context and process are also critical for understanding developmental trajectories (Elder, 1998). Both theories highlight the young person's role as an active agent in shaping their interactions with their environment and developmental outcomes (Brady & Gilligan, 2018; Elder, 1998; Norman et al., 2012; White & Wu, 2014). The analysis and findings in this thesis integrate aspects of both theories by examining how ACEs, individual-level factors, and broader social determinants influence homelessness, mental health, and perceived resilience over time. The significance of the findings and excellent model fit indices indicate that the statistical models effectively capture the complex interplay of these factors.

Synthesis of findings utilising Bronfenbrenner's ecological systems theory and life course theory

Figure 15 presents a synthesised framework illustrating the factors associated with each outcome of homelessness, mental health and perceived resilience using the two theories. The figure also depicts the broader exo-systemic and macro-systemic factors, such as the policies and cultural norms that influence micro-systems and person-related factors. While

these broader factors were not evaluated in this thesis, they significantly impact the outcomes, trajectories, and interactions experienced at the lower system levels.

Supplementary Figures 1, 2 and 3 show the framework for each separate outcome, detailing the specific factors that were significantly associated with each outcome and trajectory.

1. **Person-related factors:** A key principle of both theories is that individuals are active agents within their micro-systems, which influence interactions and developmental outcomes across the life course (Brady & Gilligan, 2018; Elder, 1998; Kelly et al., 2023; Kuh et al., 2003). This thesis examined characteristics such as demographic traits, behavioural tendencies, and personal histories contributing to homelessness, perceived resilience, mental health, and the trajectories of these outcomes at various life course stages. The inner-most circle depicts the personal characteristics influencing mental health, homelessness, and perceived resilience outcomes (Figure 15, SI Figures i, ii and iii).
2. **Micro-system:** This thesis examined the individual's immediate environment (i.e., the micro-system), which is composed of the individual's environment and interactions with family, peers, or school and how these influence the developmental outcomes of the young person (Bronfenbrenner, 1994). Factors identified in this thesis at the micro-system level are depicted in Figure 15, SI Figures i, ii and iii. These include risk and protective factors such as ACEs and parental mental health and substance misuse, how they influenced outcomes, and their trajectories. These factors were identified at different life course stages of the individual.
3. **Meso-system.** The meso-system involves the interaction of various factors from different micro-systems, influencing a child's developmental outcomes, such as the interplay between the family environment and school or community justice systems (Bronfenbrenner, 1994). This thesis explored the influence of multiple linked factors

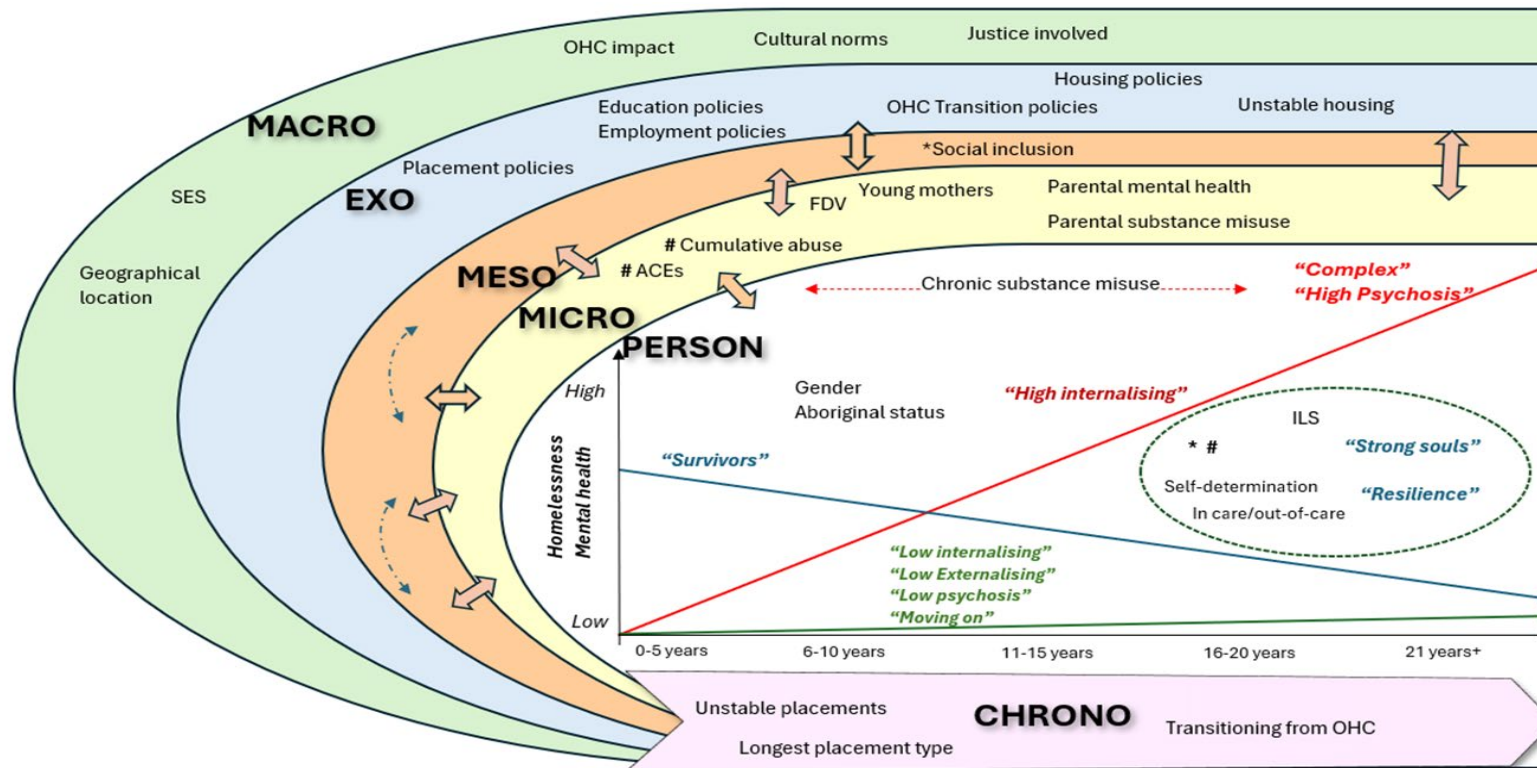
across different systems and how these factors shaped the trajectories and outcomes experienced by young people. The meso-system is depicted as the inner-most circle in Figure 15 and SI Figures i, ii, and iii.

4. **Exo-system:** The role of various forms of formal and informal support and how these may have contributed to young people's outcomes was examined, including the role of social inclusion and policies impacting young people transitioning from OHC. The second outer-most circle depicts the exo-system (Figure 15, SI Figures i, ii and iii).
5. **Macro-system:** The thesis examined the influence of culture, beliefs and norms shaped by the environment within which the child is raised, as well as the impact of the broader systemic environment. These influences are depicted in the outer circle in Figure 15, SI Figures i, ii and iii.
6. **Chrono-system:** The chrono-system involves the influence of temporal changes and transitions and their impact on outcomes (Bronfenbrenner, 1994). This thesis examined the life course transitions and the interaction of factors at various life stages of the young person (Bronfenbrenner, 1994; Colman & Atallahjan, 2010). The chrono-system and life course of the young person is illustrated as the arrow at the bottom of the diagram from birth to early adulthood (Figure 15).

In the sections that follow, we highlight the new evidence generated by this thesis and its implications. Policy and program implications of the thesis are discussed. The chapter concludes by examining the thesis's limitations and recommendations for future research.

Figure 15

Adapted Model of Bronfenbrenner's ecological systems theory and life course theory based on Thesis findings



Notes

- The double-headed brown arrows depict the interactions of different systems at the meso-system level.
- The dotted green circle depicts moderating and mediating factors in the association between ACEs, leaving care and perceived resilience.
- ACEs=Adverse childhood experiences, ILS = independent living skills, OHC = out-of-home care, SES = socio-economic status, FDV = family and domestic violence.

Person-related factors

Person-related factors have been studied in relation to homelessness, mental health, and resilience, but they have not been fully examined among populations of young people transitioning from OHC. The person-related factors are not inherent risks; rather, social and structural factors within the ecosystem may contribute to certain groups' vulnerability to poor outcomes. These influences operate across various systemic levels, ranging from individual interactions (micro) to broader societal structures (macro) (Brady & Gilligan, 2018). As depicted in Figure 15, the person-related factors identified in this thesis include gender differences, Indigenous status, substance-misuse, self-determination, independent living skills and the mediating roles of mental health and perceived resilience.

Gender differences

Chapter 5 outlines how trajectories of mental health disorders varied significantly by gender. Gender differences in the prevalence and trajectories of internalising and externalising mental health disorders highlight the intersection of individual and contextual factors (Gutman & Codioli McMaster, 2020; Reinke et al., 2012). The timing of exposure to risk and protective factors significantly impacts outcomes (Dunn et al., 2018; Hutchison, 2005). The new evidence in this thesis demonstrates the difference in the timing of the early onset of externalising and internalising mental health disorders by gender.

Males experienced externalising disorders at younger ages (9-12 years), while females peaked later (15 – 18 years; Chapter 5). This gender difference underscores the importance of the timing of adverse experiences in shaping mental health trajectories. The gender differences can be attributed to gender-specific socialisation processes and the differential impact of stressors and protective factors across genders (Verma et al., 2011).

The risk of psychotic mental health disorders was higher among males than females, consistent with previous studies (Coughlan et al., 2022). The new evidence from this thesis

(Chapter 5) is that we demonstrated trajectories of psychosis from birth among both males and females, with follow-up until early adulthood. The life course theory states that risk and outcomes will change over time, as evidenced by this thesis (Colman & Ataullahjan, 2010).

Aboriginal status

Findings from this thesis showed that young people of Aboriginal background were more likely to fall into high-risk homelessness (Chapter 4) and mental health (Chapter 5) groups. The heightened risk and persistence of psychosis into adulthood among young people of Aboriginal background has been noted elsewhere and is concerning (Gynther et al., 2019; Mirza et al., 2022). Consistent with prior research, many cases of psychotic disorders were substance-induced cases. The findings from Chapter 3 demonstrate that young people of Aboriginal background face a higher risk of homelessness compared to their non-Aboriginal peers and provide further rationale for the need for targeted and culturally appropriate interventions for specific sub-groups of young people transitioning from care.

Furthermore, these findings illustrate the impact of different factors on the mental health and homelessness outcomes of young people of Aboriginal background at various levels of Bronfenbrenner's theory. At the macro-system level, this interaction underscores the impact of colonisation, including intergenerational trauma among young people of Aboriginal descent, and its subsequent influence on individual outcomes (Bingham et al., 2019). Additionally, this context can limit young people of Aboriginal backgrounds in making informed decisions and choices, potentially affecting their overall wellbeing (Elder, 1998).

This thesis indicates that young people of Aboriginal background and males are significantly associated with the high-risk group for psychotic disorders (Chapter 5). Chapter 4 reveals that psychosis is a factor that is linked to the “*complex*” homelessness group. Consequently, the research enables us to identify a sub-population of young people with complex outcomes using multiple linked data sources.

Substance misuse

This thesis repeatedly underscores the significant influence of substance misuse on mental health and homelessness outcomes. According to Bronfenbrenner's theory, peer relationships significantly impact young people's development. Peer pressure and the social associations a young person engages in strongly influence substance misuse (Glaser et al., 2010). This shows interactions between the micro-system (peer influences) and person-related systems (substance misuse) according to Bronfenbrenner's theory (Bronfenbrenner, 1994). This can reinforce substance misuse as a coping mechanism and may lead young people to distance themselves from positive peer groups and support networks, which can affect their social and emotional development. As articulated in life course theory, individuals' interactions with their environment influence the outcomes and trajectories they experience ((Brady & Gilligan, 2018; Colman & Atallahjan, 2010; Elder, 1998).

As shown in Chapter 5, substance misuse is linked to an increased risk of internalising, externalising, and psychotic mental health disorders (Gutman & Codioli McMaster, 2020; Lawler et al., 2021). Additionally, a history of substance misuse before leaving care exemplifies cumulative disadvantages, increasing the risk of housing instability and homelessness (Chapter 3, Chapter 4). These adversities set a trajectory towards higher vulnerability (Chapter 4, Chapter 5).

Furthermore, Chapter 4 revealed that chronic mental health issues and substance misuse were associated with trajectories leading to high-risk homelessness. These findings underline the importance of addressing the structural issues to improve the long-term outcomes for young people and empower them to effect positive life changes. Additionally, the findings suggest a potential bidirectional relationship that merits exploration in future research. Notably, this thesis is the first to highlight substance misuse as a time-variant predictor of mental health trajectories.

Self-determination

This is the first thesis to establish that self-determination mediates the link between leaving care and perceived resilience (Chapter 6, SI Figure iii). Consistent with life course theory, self-determination is an important aspect that advocates for individuals to make choices and decisions that shape their life course (Brady & Gilligan, 2018; Elder, 1998; Lee et al., 2018; Powers et al., 2012). Previous research has also determined that placing children of Aboriginal background with carers and service providers from the same background positively affects their self-determination and wellbeing (Creamer et al., 2022; Western Australia Government, 2010). These findings underscore the importance of cultural connection and supporting young people in developing skills of hope and empowerment as well as addressing other structural and system factors to build resilience (Western Australia Government, 2010).

Independent living skills

The role of ILS as a moderator suggests that broader systemic supports help buffer the effects of ACEs on perceived resilience. However, since the moderation effect of ILS was modest, it indicates that a combination of supportive environments and individual factors significantly contribute to resilience. In line with Bronfenbrenner's theory, a holistic approach that considers the interaction of various systems is essential for understanding and enhancing the development of mental health and resilience in young people (Bronfenbrenner, 1988).

These findings not only add to the current body of evidence around the protective factors of self-determination and ILS but also provide evidence from research with greater methodological rigour. This is the first study that used linked administrative data integrated with self-report data to examine the protective factors of social inclusion, ILS and self-determination on mental health and perceived resilience (Chapter 6, SI Figure iii).

Mediation of mental health

Mental health strongly mediated the association between ACEs and perceived resilience, indicating that addressing mental health issues is crucial for improving resilience in individuals who have experienced ACEs (Chapter 6, SI Figure iii). Enhancing mental health support can bolster resilience and reduce the negative impact of ACEs (Kairyte et al., 2023). The findings show that while maltreatment detrimentally affects mental health, fostering resilience can mitigate some of these adverse effects. Supportive interventions that enhance resilience can improve mental health outcomes for young people (Elder, 1998; Kairyte et al., 2023).

Non-homogenous groups

Consistent with previous research, Chapters 4 and 5 have demonstrated that young people transitioning from care are not a homogenous group (Miller et al., 2017; Rebbe et al., 2017; Stein, 2008). In Chapter 4, three distinct groups with varying trajectories of homelessness risk were identified among young people leaving care (i.e., “*moving on*”, “*survivors*”, and “*complex*” groups). These findings align with Stein’s Theory, which suggests that factors such as adverse childhood experiences, placement type and substance misuse predict homelessness outcomes (Stein, 2008).

In Chapter 5, two distinct groups of young people with different trajectories of mental health were identified: (i.e. the “*high-risk*” and “*low-risk*” groups). Consistent with life course theory, the pathways and trajectories of young people leaving care vary based on their early life circumstances and the environments they were exposed to (Brady & Gilligan, 2018; Elder, 1998; Lindert et al., 2014; White & Wu, 2014). Chapter 2 emphasises that previous studies lacked sophisticated analytical methods to evaluate outcomes associated with integrated linked and longitudinal self-report data (Chikwava et al., 2021). In this thesis,

advanced methods of analysis incorporating person-centred and variable-centred techniques were employed to predict trajectories of homelessness and mental health outcomes.

Micro-system

The individual's immediate environment, such as the family, school and peer interactions, plays a crucial role in the child's development (Bronfenbrenner, 1994). The thesis emphasises how adverse conditions in the micro-system, such as unstable home environments encompassing child abuse and maltreatment (Yoon, 2017), parental mental health issues and substance misuse (Maclean et al., 2019), young mothers, and family violence (Stone & Jackson, 2021), directly influence children's mental health, resilience and homelessness trajectories (Figure 15).

Child abuse and maltreatment

Adverse conditions such as child abuse and maltreatment within the home environment significantly influence children's mental health trajectories (Yoon, 2017). As shown in Chapter 5, the high prevalence of childhood abuse among the OHC cohort indicates a complex interplay between family dysfunction and systemic interventions, further affecting mental health trajectories. Cumulative maltreatment increases the risk of homelessness, poor mental health, and resilience outcomes.

Parental factors

Parental mental health issues and substance misuse are critical factors that affect children's development (Maclean et al., 2019). Children in these environments are more likely to experience neglect and lack of support, exacerbating mental health problems and increasing vulnerability to homelessness. Individuals with young mothers were more likely to belong to the high-risk internalising mental health trajectory group (Chapter 5, SI Figure ii). This finding aligns with previous research indicating that the lack of life skills and maturity of young mothers may affect their ability to provide nurturing relationships with their

children, thus influencing their children's long-term mental health outcomes (Maclean et al., 2019). This supports the need for education on family planning methods among females in OHC and for supporting young mothers in caring for their children.

Family violence

Exposure to family violence severely impacts a child's sense of security and wellbeing, contributing to poor mental health outcomes (Stone & Jackson, 2021). This instability often sets a trajectory towards higher vulnerability. As reflected in Chapter 5, the significant influence of family violence on mental health trajectories points to the need for supportive relationships within the micro-system.

Meso-system

Interactions between different micro-systems, such as the relationship between family, school, and community environments, are essential at the meso-system level. A lack of supportive connections between family and care institutions may increase vulnerability among young people. Social inclusion is recognised as a meso-system factor that was evaluated in this thesis (Figure 15). Social inclusion buffered the effect of having left care and perceived resilience (Chapter 6), suggesting that external social systems play a crucial role in the development and wellbeing of young people transitioning from care (Masten & Barnes, 2018; Ungar, 2019). Social inclusion involves exposure to multiple environments and opportunities to participate in community, school, health, social and cultural settings. Social inclusion also involves satisfaction with relationships with friends and families (Cordier et al., 2017; Kaasinen et al., 2023).

Young people experiencing homelessness or housing instability were more likely to have higher rates of externalising and psychotic disorders (Chapter 5, SI Figure ii). This suggests that the interconnectedness of lives and shared environments plays a crucial role in shaping outcomes and trajectories. Additionally, the higher homelessness risk among those

with a history of public housing tenancy or involvement with the justice system underscores the complex interplay of various micro-systems (Crawford, 2020).

Chapter 6 highlights the direct and indirect paths from care status, ACEs, ILS and social inclusion to mental health and perceived resilience, demonstrating the interconnected nature of these systems. This aligns with Bronfenbrenner's theory, emphasising the interaction of micro-systems and exo-systems in determining resilience and mental health outcomes (Bronfenbrenner, 1988). Additionally, these findings highlight key themes of life course theory, including the idea that individuals' lives are influenced by historical context and interconnected through social relationships (Alwin, 2012; Brady & Gilligan, 2018; Elder, 1998). This thesis underscores the importance of examining the meso-system to understand how various social and environmental interactions contribute to resilience, mental health, and the risk of homelessness.

Exo-system

The exo-system refers to the broader social system that an individual does not engage with directly but still influences their immediate environment (Bronfenbrenner, 1994; Crawford, 2020). Although not specifically evaluated in this thesis, policies and legislation significantly impact young people in care. These may include policies and legislation related to housing, education and employment, placement practices, care plans, extending the age of leaving care, as well as family reunification and permanency after leaving OHC.

If implemented correctly, these policies can improve the quality of care, promote resilience, mental health, and wellbeing, and reduce homelessness when young people transition from care. Thus, the exo-system's influence is evident in how external supports and policies can either mitigate or exacerbate challenges faced by individuals, impacting their housing, resilience, and mental health outcomes.

Macro-system

Bronfenbrenner's macro-system influences homelessness, mental health, and resilience outcomes by encompassing broader societal and cultural contexts that shape the conditions and experiences of individuals (Crawford, 2020). The thesis found several factors aligned to the macro-system level, including socio-economic status, cultural factors, geographical location, involvement with the justice system, and impact of OHC (Figure 15).

Socio-economic status and cultural factors

Females from higher socio-economic status were more likely to be in the high-risk group for internalising disorders (Chapter 5), suggesting that females from higher socio-economic backgrounds may be more likely to face increased pressure to achieve academically and socially, leading to stress and anxiety (Gutman & Codioli McMaster, 2020). This indicates that cultural and societal norms at the macro-system level can have a significant impact on mental health. Young people from Indigenous backgrounds faced double the odds of homelessness risk (Chapter 3, SI Figure i), reflecting the impact of systemic inequalities and cultural factors at the macro-system level, highlighting broader societal and historical contexts can create vulnerabilities for some populations (Elder, 1998; Ling & Kwok, 2017).

Geographical location

Young people living in regional or remote areas were more likely to belong to high-risk groups for both internalising and externalising mental health disorders (Chapter 5), reflecting inequitable healthcare services based on geographical location. The macro-system includes regional disparities that influence access to care and support. Remote and regional areas often lack adequate healthcare infrastructure, leading to limited availability of mental health services (Kavanagh et al., 2023).

The geographical inequity results in young people not receiving the necessary support to address their mental health needs. Regional and remote areas can have different cultural norms and economic conditions that affect mental health. In Australia, Indigenous status and geography are closely linked, with regional differences often reflecting variations in Indigenous backgrounds and the historical impacts on communities (Page et al., 2022). Therefore, in Chapter 5, Indigenous status was considered to understand how geographical location affects mental health over time, using interaction tests. Financial hardships and limited job opportunities can increase stress and lead to externalising behaviours (Kavanagh et al., 2023). This underscores how economic and structural factors at the macro-system level can shape individual behaviours and outcomes.

Involvement with the justice system

Previous research has indicated that young people transitioning from care are more likely to be involved with the justice system compared with their peers in the general population (OECD, 2022). Justice-involved young people are more likely to experience a strain in family or caregiver relationships (Folk et al., 2020), leading to support system breakdowns and potential evictions or homelessness. Furthermore, their education and employment opportunities may be disrupted, reducing economic stability and potentially leading to homelessness and housing instability (Osgood et al., 2010). Housing policies, such as restrictions on public housing for those with criminal records, can exacerbate homelessness among justice-involved youth (Osgood et al., 2010). Justice involvement negatively impacts multiple systems, from the micro-system to the macro-system (Bronfenbrenner, 1988). At the macro-system level, societal stigma limits their employment and housing opportunities (Osgood et al., 2010).

In this thesis, the findings that young people's involvement with the justice system increased their vulnerability to homelessness (Chapter 3 and Chapter 4) and mental health

(Chapter 5) indicates the system level issues that impact on young people's outcomes. Effective intervention requires addressing these multi-layered and interacting factors at various ecological levels to support reintegration, reduce stigma and improve access to stable housing and supportive services (Roth & Pierce, 2019).

Impact of Out-of-home care

This is the first thesis to demonstrate the impact of being in OHC on the mental health trajectories of young people by comparing those in OHC with young people who were not in OHC but had CP contact and those with had no CP contact at a population level. Across the three mental health disorder categories of internalising, externalising and psychotic disorders, young people in OHC had an elevated risk of mental health issues, and they experienced an earlier onset of mental health issues compared to young people in other settings (Chapter 5). These findings support earlier research showing that young people in OHC experience worse mental health outcomes compared to their peers in the general population (OECD, 2022). However, young people in OHC may be more likely to have been referred for diagnosis or treatment while being case-managed by the Department of Communities compared with their peers in the general population.

These findings illustrate how the macro-system, through socio-economic status, systemic inequalities, geographical disparities, and broader cultural and societal norms, influences the risk of homelessness, mental health disorders, and resilience outcomes. Understanding these influences can help inform policies and interventions to address these broader systemic issues and improve outcomes for young people transitioning from care.

Chrono-system

Bronfenbrenner's chrono-system considers the dimension of time in an individual's development, focusing on the impact of transitions and changes over the life course, similar to life course theory (Brady & Gilligan, 2018; Bronfenbrenner, 1994; Elder, 1998; Hutchison,

2005; Kelly et al., 2023). Key transitional points, such as the age of entry into OHC, placement changes and transitioning from OHC to independent living (Figure 15), play a critical role in determining future outcomes (Brady & Gilligan, 2018; Elder, 1998; Hutchison, 2005; Kelly et al., 2023). Additionally, late adolescence and early adulthood are sensitive periods for the onset of psychotic disorders. These transitions are critical because they often involve significant changes in a young person's environment, responsibilities, and support systems.

This thesis focussed on a cohort of young people transitioning from OHC between the ages of 15 and 25 years. This period encompasses significant developmental changes (social, physical, emotional, and cognitive) as these individuals transition to adulthood and, simultaneously, transition from OHC. The following factors were found to influence outcomes at a chrono-system level.

Transitioning age

Prior research has shown that the transition from care is marked by significant challenges, requiring young people to adapt to new roles and responsibilities without the consistent support they previously had (OECD, 2022; Stein, 2008). Consistent with this, the thesis found that young people who had left care experienced high homelessness risk (Chapter 4), poor mental health, and poor resilience outcomes in the first two years after leaving OHC (Chapter 6). These findings underscore the crucial need for intervention during the initial years post-OHC, particularly for highly vulnerable sub-groups of young people (Stein, 2008).

Furthermore, this finding emphasises the crucial need for ongoing support during the transition period to promote mental health, resilience, and housing stability. According to life course theory, identifying these vulnerable periods provides opportunities to intervene with targeted support for young people during these critical times (Brady & Gilligan, 2018; Elder,

1998; Hutchison, 2005). The theory stresses the significance of timely interventions to enhance outcomes during key transitional phases.

Unstable placements

Life course theory suggests that both planned transitions (e.g., moving from primary to high school) and unplanned transitions (e.g., placement changes) significantly impact a young person's development (Elder, 1998; Hutchison, 2005). Each transition alters the dynamics of the micro-system, heightening stress levels and influencing the relationships and support systems available to young people. The literature underscores unstable placements as contributing to poor mental health outcomes (McGuire et al., 2018). This thesis found that high placement instability was associated with poorer mental health (Chapter 6) and increased trajectories of poor mental health (Chapter 5), illustrating how unstable placements in the chrono-system directly affect children's mental wellbeing.

Type of OHC Placement

Literature has established that the type of OHC placement where young people reside for the longest duration significantly influences their mental health, resilience, and housing outcomes (McGuire et al., 2018; Paine et al., 2021). This thesis confirmed that young people who spent most of their time in residential care placement or complex home-based care were more likely to experience poorer mental health (Chapter 5) and homelessness or housing instability (Chapters 3 and 4) compared to those who lived in foster or kinship care. The chrono-system perspective highlights the importance of considering the timing and nature of transitions in a young person's life to effectively address their needs and improve long-term outcomes.

Limitations

As with any study, this thesis's findings should be interpreted within the context of its limitations. This section will discuss the limitations and potential strengths of the thesis.

Different data sources

Homelessness outcomes were assessed using data from the state of Victoria, Australia (Chapters 3 and 4), while mental health and resilience outcomes were evaluated using integrated self-report and linked datasets from Western Australia (Chapter 5 and Chapter 6). A key limitation of using two separate data sources to assess different outcomes is the potential for different biases, which could affect the results and lead to misinterpretation of the findings. For example, the Victorian data did not encompass the entire birth cohort of young people transitioning from care, thus limiting the homelessness research's ability to address the complex interplay of risk and protective factors before and during care that may influence homelessness trajectories.

Additionally, the Victorian data did not provide a population-level cohort of all young people in Victoria, precluding comparisons of homelessness outcomes at a population level. Generalising findings for young people transitioning from OHC across Australia based on two data sources with differing study periods can be challenging. The two states have similar social, economic and policy environments impacting young people transitioning from OHC although there are some differences which can mean generalising findings can be an issue.

Despite these limitations, studying distinct outcomes using two separate data sources has yielded valuable insights and a more comprehensive understanding of complex issues like homelessness and concomitant mental health and substance misuse. Furthermore, the more extensive housing data available from Victoria compared to Western Australia facilitated the mapping of homelessness constructs using the ETHOS framework – a feat not achieved previously.

Data quality and reliability

The systematic review (Chapter 2) included papers that excluded unpublished and non-English studies, potentially introducing selection bias and limiting generalisability.

Using linked health or homelessness data posed challenges as the data only pertained to individuals accessing services, potentially excluding those who do not seek services or have less severe forms of mental health or substance misuse disorders (Chapter 3, Chapter 4 and Chapter 5). There was a risk of underestimating the true prevalence of homelessness in the homelessness data collections, as the thesis focused on young people using services, potentially excluding the less visible forms of homelessness or chronically homeless individuals who avoid engaging with services due to stigma or barriers. However, these limitations were counteracted by employing a nuanced measure of homelessness using the ETHOS framework to map various housing pathways and homelessness variables from multiple data sources (Busch-Geertsema et al., 2016).

Excluding private outpatient records and less severe cases can lead to an underestimation of mental health or substance misuse issues in health administrative datasets. Such information may be captured in community-based settings or through self-reported data from young people who do not seek healthcare. However, using the ICD10 WHO classification system for mental health issues provides the advantage of a common language for recording, reporting and monitoring these issues. While young people may disengage from services when symptoms are absent, tracking mental health re-presentations at 30-day intervals enabled a conservative estimate of mental health episodes within this population (Player et al., 2020). It is important to interpret the finding that self-harm emerged as a significant predictor of homelessness with caution, as some cases may not be accurately classified (Robinson et al., 2020).

One of the primary strengths of this thesis was the utilisation of a birth cohort from Western Australia's population-based linked administrative data, which helped mitigate potential recall and selection bias. Linked data enables population-level estimates that can be challenging to achieve with survey data, especially when studying hard-to-reach populations

such as young people transitioning from OHC (Tew et al., 2017). The large sample sizes allowed for population-level inferences, whereas previous studies often had smaller sample sizes or relied on qualitative methods (Carol et al., 2020; Narendorf, 2017).

The birth cohort, which was followed up until early adulthood, enabled the use of advanced statistical techniques involving longitudinal data, including latent class growth analysis and group-based trajectory modelling (Muthen & Muthen, 2000). Beyond analysing distinct mental health trajectories, this thesis pioneered examining various levels of child protection involvement at a population level, focusing on growth factors and predictive relationships (Chapter 5).

Furthermore, the thesis utilised parent-child linked data to explore the impact of maternal and paternal factors on young people's mental health outcomes (Chapter 5), given their recognised significance as mental health risk factors (Maclean et al., 2019). The integration of self-report data and linked administrative data in Chapter 6 allowed for the inclusion of individuals regardless of whether they were accessing the services, providing a broader perspective on resilience and mental health.

Linked administrative data contain measures used for administrative purposes and may, therefore, lack the outcome data needed for research purposes (Johnson & Nelson, 2013). Chapter 5 of this thesis classified individuals with various mental health diagnoses into three categories: internalising, externalising, and psychotic mental health disorders. Although risk factors may be similar within each group, it may be fruitful for future research to investigate trajectories for each specific diagnosis, as each diagnosis is associated with distinct symptoms and challenges (see next section). In Chapter 3 and Chapter 4, risk factors related to homelessness were identified; however, other key protective factors, such as relationships with carers, social support, placement stability, education and employment, which are associated with homelessness, were not available (Kelly, 2020; Shelton et al.,

2009). As highlighted in Bronfenbrenner's meso-system, these contextual factors are important. For instance, interactions among carers, teachers, or peers with parents can serve as potential resilience resources for young people (Bronfenbrenner, 1988).

While the study on homelessness did not encompass all protective factors, Chapter 5 and Chapter 6 investigated certain protective factors to understand resilience and mental health outcomes. This is the first thesis to use validated measures of social inclusion, self-determination, and independent living skills to investigate mental health and perceived resilience outcomes in young people leaving care. The longitudinal use of these measures would deepen our understanding of resilience and mental health outcomes across various contexts (Gartland et al., 2019).

One of the strengths of this thesis is the use of SEM to test multiple relationships between variables within a single comprehensive model. Additionally SEM accounted for measurement error in the data, increasing the accuracy of parameter estimates (Cole & Maxwell, 2003). Previous studies utilising integrated data in child protection settings often failed to account for systematic or random errors (Chikwava et al., 2021). This study allowed the testing of a complex model with multiple paths, including mediation, moderation, and indirect effects, which offered insights into the underlying mechanisms and processes influencing mental health and perceived resilience outcomes (Chapter 6).

Biases and reporting

The self-report component of this thesis may lead to social desirability bias, which occurs when individuals present themselves in a favourable light on the questionnaires (Van de Mortel, 2008). Although the questions were designed to minimise bias, some respondents might have avoided discussing undesirable behaviours or experiences. Additionally, the retrospective recall of ACEs may be inaccurate. Some participants may have struggled to

express their feelings and thoughts effectively due to mental health issues or poor communication and social skills, potentially limiting the interpretation of the data.

Integrating self-reported and linked administrative data addressed the limitations above, enhancing data quality and reliability. The data integration allowed for the correlation of self-reported findings with administrative data. Additionally, missing values were addressed by imputing data from one source to another, and the thesis minimised exposure to sensitive questions regarding ACEs by leveraging multiple constructs of maltreatment from both data sources to reduce measurement error. This included the frequency of child protection notifications and the number of child protection types. Constructs of mental health were incorporated from two data sources.

The small sample size in the integrated data may have impacted the significance and precision of our estimates and interpretation of findings. To address this limitation, bootstrapped confidence intervals were used to reduce bias in the estimates (Muthén & Muthén, 2017). Additionally, employing Bayesian methods could further mitigate the challenge of small sample sizes (McNeish, 2016).

Multiple informants

Biases can arise when interviewing young people who have experienced significant trauma, as they may be reluctant to disclose sensitive information about ACEs or discuss their mental health issues due to stigma. While integrating self-report and linked data helps address this issue, it could be further mitigated by including multiple informants during interviews, such as parents, carers, teachers, social workers, and peer workers. Gathering balanced views from multiple informants is essential to prevent both under-reporting or over-reporting (Pecora et al., 2009). Additionally, input from multiple informants is essential, as they assist young people in developing resilience skills. Their perspectives are also vital for

designing effective programs and implementing policy changes that support successful transitions from OHC.

Acknowledging and addressing these limitations through careful methodological design and ethical considerations can greatly strengthen research on homelessness, resilience, and mental health.

Recommendations for future research

This thesis identified distinct trajectories of mental health disorders and homelessness among various sub-groups of young people, as well as the factors associated with these trajectories. Important personal and environmental characteristics were examined. However, future research should focus on explore several areas, prioritised as follows: evaluating the impact or effectiveness of targeted interventions, determining bi-directional associations, integrating protective factors, conducting qualitative interviews, and establishing the impact of broader influences. These are discussed in the section that follows.

Impact evaluations of targeted interventions

At the macro-system level, assessing the impact of extended care models on mental health, resilience, and homelessness is crucial (Anglicare, 2021; OECD, 2022). Future studies should investigate how cultural supports enhance mental health and wellbeing, and examine barriers to accessing health services (Vicary & Andrews, 2001). Moreover, strengthening the evidence base for interventions aimed at specific sub-groups of young people, including those from Indigenous and non-Indigenous backgrounds, is essential. The attribution of various housing or mental health interventions to the trajectories of homelessness requires further research. At the exo-system level, evaluating the effectiveness of housing support programs in improving mental health and housing stability is crucial (Tsemberis, 2011).

Bi-directional associations

Potential bi-directional associations should be investigated in future longitudinal studies. Chapters 3 and 4 of this thesis determined that a history of mental health issues or substance misuse was associated with homelessness and that chronic mental health and substance misuse were associated with trajectories of homelessness. This finding supports evidence suggesting a potential bidirectional association between mental health, substance misuse and homelessness. Additionally, Chapter 5 identified strong associations between mental health and resilience, indicating potential bi-directional associations of these two outcomes. This would provide greater evidence and understanding of the bi-directional relation between homelessness, resilience, and mental health outcomes among this high-risk group of young people (Bollen & Curran, 2006).

Conducting longitudinal data analysis with multiple waves of the study will enable a rigorous evaluation of the directionality of significant paths. By temporally separating risk factors, mediators, moderators and outcomes, this approach will provide clearer insights into how these elements interact over time (Kraiss et al., 2024; Tremblay et al., 2004). Additionally, to gain a holistic understanding of young people transitioning from OHC, distal outcomes such as quality of life and suicide should be investigated. Life course theory extends beyond young adulthood, necessitating effective monitoring and evaluation systems to track young people who leave care for further follow-up research (Dunn et al., 2018). From a life course perspective, a cross-lagged panel design is crucial as it assesses the direction of effects between risk factors, mediators, and short- and long-term outcomes, while also enabling the testing of causal relationships.

Integrating protective factors and qualitative interviews

This thesis explored the mediating and moderating roles of protective factors such as social inclusion, self-determination, and independent living skills in the relationship between

ACEs and perceived resilience. Future research should explore additional resilience factors, such as family reunification, placement with siblings (James, 2004), employment, training, and education (Stein, 2008) to further enrich our understanding of the mental health and homelessness trajectories that were identified in this thesis and their long-term impacts (Fowler et al., 2011; Hernandez & Lee, 2020). Social inclusion mediated the association between having left care and perceived resilience. Further analysis should identify specific social inclusion sub-domains associated with resilience, enabling more targeted interventions. Additionally, using life event calendars in future studies to document housing conditions will provide deeper insights into housing pathways (Fowler et al., 2011).

This thesis highlights the substantial benefits of integrating self-reported quantitative data with linked administrative data. By integrating quantitative data with qualitative data, we can achieve a more comprehensive understanding of complex issues. Incorporating diverse perspectives in the study design significantly deepens our understanding of young people's mental health, resilience, and family environments (Paxman et al., 2014; Stone & Jackson, 2021). Exploring family resilience is essential for gaining a deeper understanding of these issues (Zhuo et al., 2022). Interviewing mental health practitioners, teachers, social workers, and caregivers offers a well-rounded and comprehensive perspective on the factors influencing young people's mental health and resilience (Antony, 2022; Gronholm et al., 2015).

Broader influences

Broader influences beyond the micro-system should be considered in future studies. Exploring exogenous events like COVID-19, policy changes, and cultural shifts provides additional opportunities to study periods that are developmentally sensitive across the life course (Townsend et al., 2022). Conducting before and after analyses could yield valuable insights into the impact of exogenous events on young people's mental health and wellbeing.

Understanding these effects allows for more strategic timing of psychosocial interventions for children facing adversity, thereby maximising their effectiveness and ensuring timely support.

At the exo-system level, the influence of mass media and social media may be relevant in determining the impact of media exposure on young people's mental health and resilience outcomes (Raudsepp & Kais, 2019). Children seek out online social support groups to share their issues with others, simultaneously developing skills such as conflict resolution and self-efficacy. However, excessive screen and media use is associated with an increase in depressive symptoms among young people (Houghton et al., 2018). It is important to disentangle these broader influences and determine which ones are developmentally harmful or therapeutic for young people. Some authors have debated whether media and culture, typically situated in the macro-system, should be embedded within the micro-system as important bidirectional influences (Houghton et al., 2018; Raudsepp & Kais, 2019).

Program and Policy Implications

By applying Bronfenbrenner's ecological systems theory and life course theory, the policy and program recommendations aim to create a holistic and integrated approach to support the mental health, resilience and housing stability of young people transitioning from OHC. Recognising the importance of timing in interventions and support at the chrono-system level is essential. Policies should prioritise critical periods, such as the transition from care to independence, to optimise positive outcomes. Targeted supports during these key moments can significantly enhance the mental health and resilience of young people.

The policy and program recommendations discussed in this section encompass early intervention for young people, holistic support systems, equitable mental health care, integrated services, and addressing cultural and societal norms. Importantly,

recommendations are provided to enhance reporting and accountability, strengthening monitoring and evaluation systems.

Early intervention for distinct sub-groups of young people leaving OHC.

The findings from this thesis make a powerful argument for the need to develop more nuanced approaches to interventions that target sub-groups of young people. Specifically, early intervention and tailored approaches are required for sub-groups defined by their level of risk of homelessness and mental health outcomes.

These early intervention programs must not only address person-related factors but also confront the systemic and structural factors that increase vulnerability of individual risk (Johnson et al., 2015). These programs cater to the specific needs of sub-groups of young people during critical transitional periods (i.e., before, during and the first few years after leaving care). The profiles and characteristics of these sub-groups can be used to develop targeted interventions and identify critical times for intervention. Transitional support should encompass peer mentorship, education support, financial support, stable housing, access to training and employment, and trauma-informed care (Stein, 2008). Many of these programs have already proven successful in helping young people transitioning from OHC (Anglicare, 2021; Victoria State Government, 2022).

Other interventions cited in the literature include “*Critical Time Interventions*” (CTI), which are time-limited and individual-level interventions aimed at reducing the risk of homelessness and other adverse outcomes during challenging life course transitions (Herman et al., 2007; Manuel et al., 2023). Additionally, the “*complex*” homelessness and “*high-risk*” mental health groups may benefit more significantly from more intensive, trauma-informed approaches such as “*Housing First*” support services (Kertesz & Johnson, 2017; Tsemberis, 2011), which has been successful in reducing homelessness among those with severe mental health problems.

The range of interventions mentioned has been shown to have the potential to buffer the negative impact of adverse childhood experiences. Service providers must create safe, stable, and supportive environments that foster positive relationships for young people in care, acknowledging that these individuals often face challenges with attachment (McLaughlin, 2016). By doing so, these environments can enhance young people's resilience and overall wellbeing.

The thesis showed that placement instability is a risk factor for poor mental health (Stein, 2008). Services should, therefore, minimise the movement of young people from one placement to another, as this disrupts the environment, relationships, and trust that would have been built with carers (Mendes & Purtell, 2020). Offering targeted support for both carers and young people during times of relationship challenges and potential placement breakdowns is essential to minimising the risk of placement disruption. Transition planning should be conducted more systematically, involving young people at all stages of the process (Campo & Commerford, 2016; Stein & Dixon, 2006).

As of November 2022, all Australian states and territories committed to extending care for young people until the age of 21 years (Create Foundation, 2022; Mendes & Rogers, 2020). However, the frequency and extent of leaving care support vary depending on the policies and practices of each state's child welfare system. Providing support until the age of 21 is now common in many states. This thesis has underscored the significantly worse outcomes faced by young people who have left care compared to those who remain, highlighting the critical need for continuous support throughout their transition to independence.

The vulnerabilities experienced by care leavers reinforce the critical need to extend the age of care support and ensure that young people have ample opportunity to plan and prepare for their future. Implementing such measures can profoundly improve their long-term

outcomes (Kaasinen et al., 2023; Stein, 2008). The consequences of failing to adequately support the transition to independence may outweigh the costs of preventative measures (Flatau et al., 2015). It is therefore vital to develop models that are both efficient and cost-effective, ensuring the best possible outcomes for these young people.

Holistic support systems

Bronfenbrenner's theory highlights the interplay among different ecological systems. The thesis demonstrated how these systems interact to influence outcomes, underscoring the need for coordinated support across multiple service-provider levels. While person-related factors like resilience are crucial, they must be supported by conducive micro, meso, and exo environments (Bronfenbrenner, 1994). For instance, family support, positive school environments, and community resources all contribute to building and sustaining mental health and resilience. Government policies and initiatives that support youth development, such as funding for education and life skills training, are vital in ensuring that young people have access to the necessary resources to cultivate ILS (WA Department of Communities, 2023).

Consistent with previous research, this thesis reinforces the critical role of extended family support in mitigating homelessness and alleviating poor mental health outcomes (Sakai et al., 2011). Building family resilience involves addressing issues such as family and domestic violence, mental health challenges, and substance misuse within the family context to prevent adverse outcomes (Dominguez Vazquez et al., 2023). From a preventative perspective, it is crucial to support both parents and children through targeted interventions in the initial stages of ACEs. This strategy has the potential to transform parent or caregiver relationships with their children, significantly enhance wellbeing, boost their confidence, and improve their caregiving abilities.

Access to community resources and services, such as life skills training programs and mentorship, can help mitigate the effects of ACEs (Anglicare, 2021). These supports provide young people with the tools needed to navigate challenges and foster resilience. Effective coordination between micro-systems is crucial at the meso-system level to create a cohesive support network. Policies should actively promote collaborative approaches and ensure seamless information sharing among these entities.

Service providers should use available data and information to gain a deeper understanding of the profiles of young people leaving care. For example, a detailed analysis of the “*survivors*” group highlighted in Chapter 4 could reveal key factors contributing to the decline in homelessness over time.

Equitable mental healthcare

The thesis illustrated poorer mental health outcomes among young people from lower socio-economic backgrounds and those living in regional and remote areas, emphasising the necessity for fair and equal access to healthcare across diverse geographical regions. Policies should also encompass broader societal and cultural factors. Service providers and policymakers must prioritise addressing geographic disparities in healthcare access by investing in mental health infrastructure in regional and remote areas. Efforts must focus on destigmatising mental health issues and encouraging help-seeking behaviours across all socio-economic groups. Additionally, economic policies providing a safety net for vulnerable populations can alleviate stress and significantly improve health outcomes (OECD, 2022).

Integrated health, housing, and social services

At the exo-system level, broader social systems indirectly support young people, such as healthcare, education, social services, and housing (Bronfenbrenner & Evans, 2002). Policies should facilitate access to resources and remove service barriers (OECD, 2022). The thesis identified complex and intersecting vulnerabilities among young people leaving care,

who faced a high risk of mental health and substance misuse issues, were homeless and were involved with the justice system. Similarly, housing instability and homelessness were associated with high-risk groups for mental health disorders. .

Transition points and movements across different systems and institutions must be acknowledged , with robust mechanisms established to ensure smooth referrals and transfers across child protection, health and justice systems, including transitioning from child to adult mental health services (Havlicek et al., 2013). Enhanced collaboration between policymakers and service providers is essential to creating integrated care models that address the multifaceted needs and intersecting vulnerabilities of young people (Connolly et al., 2024; OECD, 2022). These models should combine mental health services, justice services, substance misuse treatment, and stable housing solutions, all tailored to support those with complex needs effectively.

Address cultural and societal norms

The thesis found that access to mental health services and homelessness services was limited for the OHC population, possibly due to stigmatising attitudes towards these young people. Attitudes and stigma towards mental health and homelessness must be addressed at the societal level to eliminate barriers to care and service access. Governments and service providers should invest in communication strategies that promote attitudes that reduce stigma and improve service access (Latha et al., 2020). Policies that broadly champion diversity, equity and inclusion must be actively implemented, particularly for marginalised groups such as young people from culturally and linguistically diverse (CALD) backgrounds, people with disabilities, refugees, and young people of Aboriginal background (Moreno & Chhatwal, 2020).

Staff and carers across various agencies and services must undergo ongoing training to effectively engage with young people from diverse backgrounds , enabling them to provide

culturally sensitive and trauma-informed care (Moreno & Chhatwal, 2020). Understanding how to effectively engage with young Aboriginal people from regional and remote areas is crucial, as acknowledging and involving community and Aboriginal elders and partnering with Aboriginal Community Controlled Organisations to enhance community cohesion and improve outcomes (Viscogliosi et al., 2020).

Improved monitoring, evaluation, reporting and data linkage standards

The systematic review identified poor reporting on data linkage methods, highlighting the need for greater coordination and enhanced data linkage processes and reporting standards to ensure consistency and reliability in research (Benchimol et al., 2015). At a policy or institutional level, this can be achieved by developing guidelines for data linkage reporting, enhancing training for researchers, and incentivising collaborative efforts among government agencies and research institutions.

At the system level, it is crucial to implement more effective and efficient monitoring and evaluation systems to ensure thorough tracking and follow-up of young people as they transition from OHC. Service providers must utilise comprehensive data from multiple sources to fully understand the profiles of young people transitioning from OHC. This approach is critical, as it can help address the significantly worse outcomes these young people often face when they transition from OHC. Additionally, it is important to evaluate strategies and interventions aimed at improving outcomes for young people so that service providers can tailor-make their services to interventions that have the most impact on outcomes that are cost-effective and efficient for young people. .

Conclusions

Integration of Bronfenbrenner's ecological systems theory and life course theory provides a comprehensive framework for understanding the multifaceted and complex

interplay of individual, familial, social, and systemic factors influencing resilience, mental health and homelessness trajectories among young people transitioning from OHC.

The systematic review in Chapter 2 underscored a critical need for methodological improvements in studies integrating administrative and longitudinal data within child protection settings. The review revealed a substantial gap in the reporting of linkage quality and application of advanced statistical techniques. This thesis directly addresses this gap by fostering stronger collaboration between researchers and data custodians, leading to improved reporting and utilisation of linked data.

Furthermore, this thesis effectively bridges previous gaps by utilising a range of advanced longitudinal and linked data analysis methods to investigate mediating and moderating factors and account for missing data and sample selection biases through frequency weights. The use of growth mixture modelling techniques to analyse trajectories of homelessness and mental health, alongside a SEM framework to explore mediating and moderating factors of mental health and resilience demonstrates a comprehensive and innovative approach to understanding these complex issues. Prior to this thesis, the existing evidence regarding factors associated with the adverse outcomes experienced by young people transitioning from OHC was promising but lacked robust population-level data and longitudinal assessments.

Prior research on predictors of homelessness and their association with mental health disorders had either small sizes or were purely qualitative and often only focused on one dimension of homelessness, therefore potentially underestimating homelessness. The thesis offers crucial insights into homelessness and housing instability among young people transitioning from OHC in Victoria, Australia (Chapter 3). The multiple linked datasets provided comprehensive information on housing, health, and personal characteristics, allowing for a more nuanced construct of homelessness mapped using the ETHOS

framework. By applying the ETHOS framework, the study meticulously mapped different forms of housing instability and revealed that a dual diagnosis of mental health and substance misuse significantly predicts homelessness.

To further enhance the evidence on homelessness risk and variability of mental health trajectories, Chapter 4 delved deeper into the trajectories of homelessness and identified distinct sub-groups of young people transitioning from care. This is the first thesis to determine trajectories of homelessness risk and its association with dual diagnoses of mental health and substance misuse disorders among this population.

Chapter 5 determined distinct trajectories of young people with internalising, externalising and psychotic mental health disorders using a whole-of-population birth cohort linked administrative data. The unique design compared outcomes for young people transitioning from OHC with those of young people with CP contact and those with no CP contact. The findings further reinforced previous research, demonstrating that young people in OHC have poorer outcomes than their peers in the general population. This study was pioneering in its demonstration of the time-varying effects of substance misuse on mental health trajectories.

Chapter 6 of this thesis provided groundbreaking insights into how social inclusion, self-determination, and ILS act as mediators and moderators in the relationship between associations of ACEs, transitioning OHC, and outcomes in resilience and mental health. The thesis underscores the importance of providing extended support to young people as they transition from OHC to adulthood.

A person-centred and comprehensive approach that considers the interactions of the micro, meso, exo, macro and chrono systems is essential for understanding and enhancing the development of mental health and resilience in young people. Using Bronfenbrenner's chrono-system and life course theory underscores the importance of timing and transitions in

the development of young people, particularly those transitioning from OHC. Identifying vulnerable periods and providing targeted, timely interventions can significantly improve outcomes related to homelessness, mental health, and resilience.

Understanding the chrono-system's impact on the micro-system dynamics and relationships can guide the design of effective support systems that cater to the evolving needs of young people during critical life transitions. Addressing macro-systems of cultural norms, economic conditions, and systemic structures requires comprehensive policies and practices to create equitable and supportive environments for all individuals.

These studies highlight intersecting vulnerabilities, risks, and protective factors across homelessness and mental health outcomes, identifying distinct sub-groups of young people. This underscores the importance of tailored approaches to address homelessness, mental health, and substance misuse problems for specific sub-groups of young people targeted at critical time points during their life course.

This thesis highlights several avenues for future research, with the primary focus being evaluating the impact of interventions targeting young people transitioning from OHC. By integrating diverse data sources and applying advanced analytical techniques, future studies can build on these findings to better address the complex needs of this vulnerable population.

Overall, these findings highlight the urgent need for targeted interventions and policy reforms to address the unique challenges faced by these vulnerable populations. These interventions should be multi-layered, promoting individual agency, fostering supportive relationships, enhancing community interactions, considering broader socio-cultural contexts, and addressing critical life transitions. Recognising cumulative disadvantage and the significance of the timing of life events can inform more effective policies and support systems to mitigate homelessness risk and better support the mental health and resilience of

care-experienced young people throughout their life course. The sub-groups of young people transitioning from OHC identified in this thesis would benefit greatly from holistic and trauma-informed approaches that comprehensively address the complex and intersecting challenges of mental health, substance misuse and homelessness.

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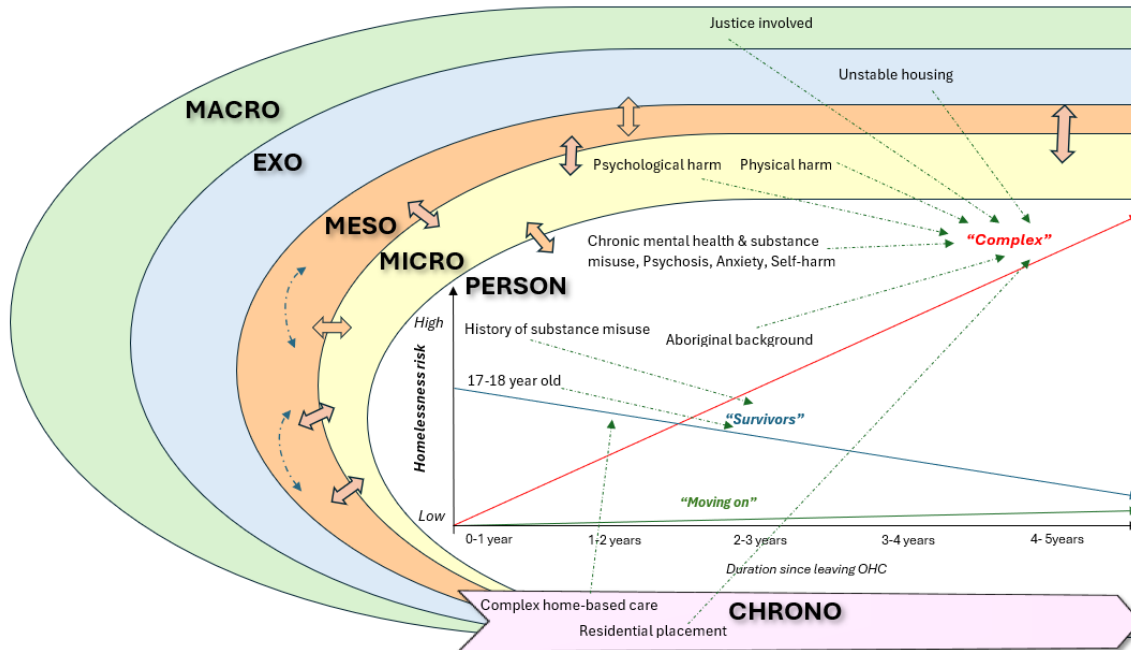
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Supplementary information

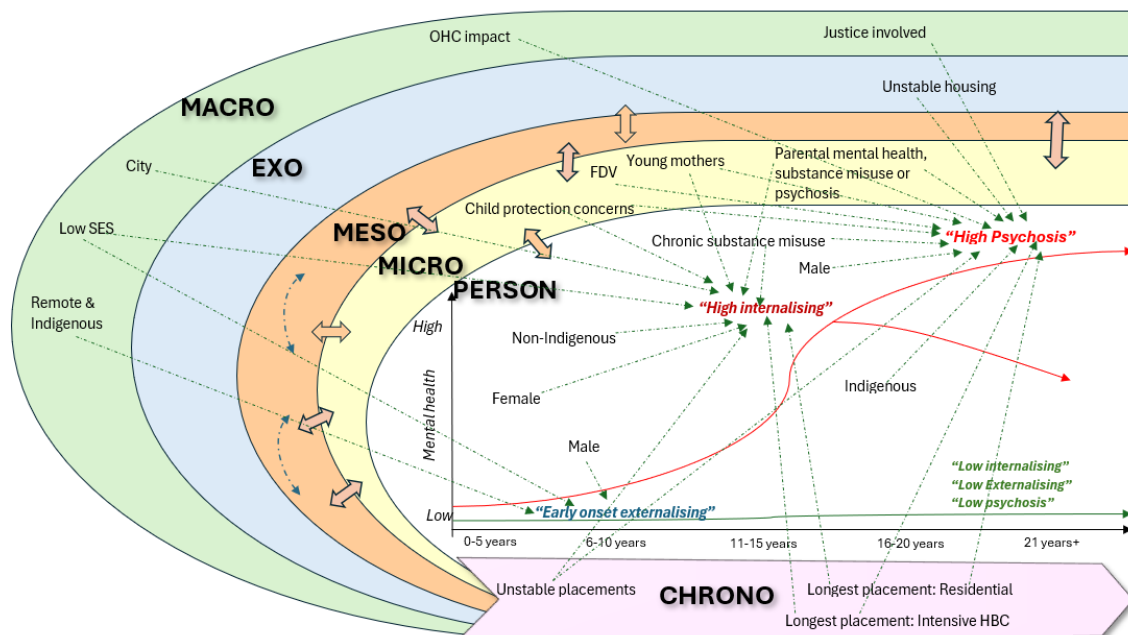
SI Figure i

Adapted Model of Bronfenbrenner's ecological systems theory and life course theory applied to Homelessness outcomes



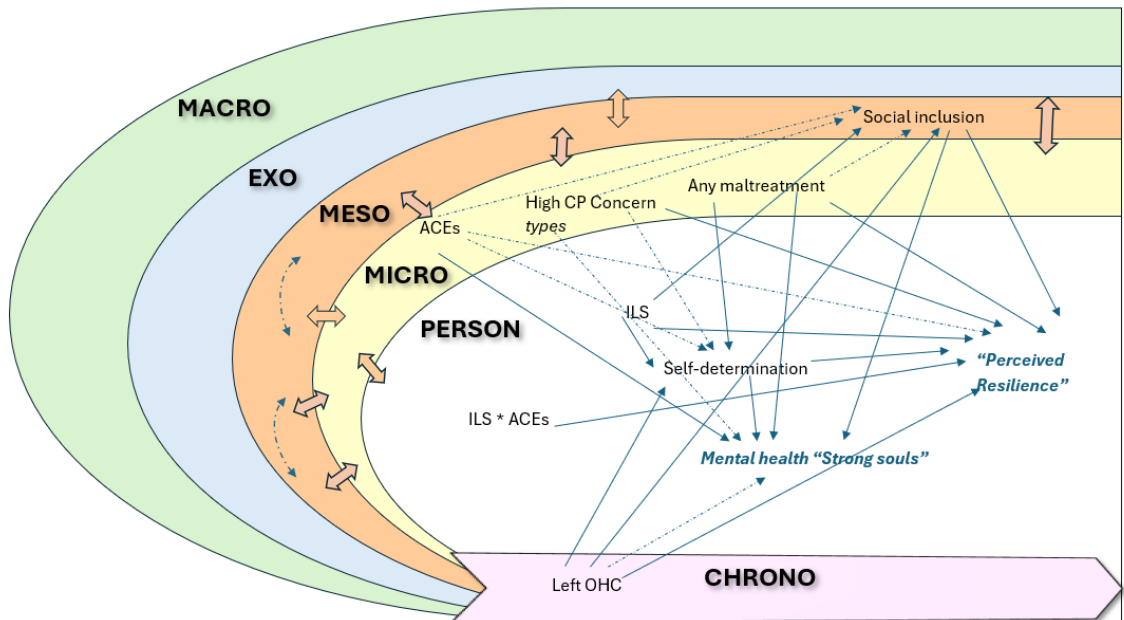
SI Figure ii

Adapted Model of Bronfenbrenner's ecological systems theory and life course theory applied to Mental Health outcomes



SI Figure iii

Adapted Model of Bronfenbrenner's ecological systems theory and life course theory applied to perceived resilience and Mental Health outcomes



Appendix A. Human Research Ethics Committee approval



Research Office at Curtin

GPO Box U1987
Perth Western Australia 6845

Telephone +61 8 9266 7863
Facsimile +61 8 9266 3793
Web research.curtin.edu.au

20-May-2019

Name: Reinie Cordier
Department/School: School of Occ Therapy, Social Work and Speech Path
Email: Reinie.Cordier@curtin.edu.au

Dear Reinie Cordier

RE: Amendment approval
Approval number: HRE2018-0170

Thank you for submitting an amendment request to the Human Research Ethics Office for the project **Longitudinal prospective mixed methods study of youth in and transitioning out of OHC.**

Your amendment request has been reviewed and the review outcome is: **Approved**

The amendment approval number is HRE2018-0170-05 approved on 20-May-2019.

The following amendments were approved:
Additional investigator: Fadzai Chikwava

Any special conditions noted in the original approval letter still apply.


Standard conditions of approval

1. Research must be conducted according to the approved proposal
2. Report in a timely manner anything that might warrant review of ethical approval of the project including:
 - proposed changes to the approved proposal or conduct of the study
 - unanticipated problems that might affect continued ethical acceptability of the project
 - major deviations from the approved proposal and/or regulatory guidelines
 - serious adverse events
3. Amendments to the proposal must be approved by the Human Research Ethics Office before they are implemented (except where an amendment is undertaken to eliminate an immediate risk to participants)
4. An annual progress report must be submitted to the Human Research Ethics Office on or before the anniversary of approval and a completion report submitted on completion of the project
5. Personnel working on this project must be adequately qualified by education, training and experience for their role, or supervised
6. Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, that bears on this project
7. Changes to personnel working on this project must be reported to the Human Research Ethics Office
8. Data and primary materials must be retained and stored in accordance with the [Western Australian University Sector Disposal Authority \(WAUSDA\)](#) and the [Curtin University Research Data and Primary Materials policy](#)
9. Where practicable, results of the research should be made available to the research participants in a timely and clear manner
10. Unless prohibited by contractual obligations, results of the research should be disseminated in a manner that will allow public scrutiny; the Human Research Ethics Office must be informed of any constraints on publication
11. Ethics approval is dependent upon ongoing compliance of the research with the [Australian Code for the Responsible Conduct of Research](#), the [National Statement on Ethical Conduct in Human Research](#), applicable legal requirements, and with Curtin University policies, procedures and governance requirements

12. The Human Research Ethics Office may conduct audits on a portion of approved projects.

Should you have any queries regarding consideration of your project, please contact the Ethics Support Officer for your faculty or the Ethics Office at hrec@curtin.edu.au or on 9266 2784.

Yours sincerely



Amy Bowater
Ethics, Team Lead



10-Sep-2020

Name: Anna Ferrante
Department/School: School of Occ Therapy, Social Work and Speech Path
Email: A.Ferrante@curtin.edu.au

Dear Anna Ferrante

RE: Amendment approval
Approval number: HRE2019-0234

Thank you for submitting an amendment request to the Human Research Ethics Office for the project **Enhancing the coordination of housing supports for individuals leaving institutional settings**.

Your amendment request has been reviewed and the review outcome is: **Approved**

The amendment approval number is HRE2019-0234-05 approved on 10-Sep-2020.

The following amendments were approved:
Addition of project personnel:
Chikwava, Fadzai

Special Condition of Approval:
It is the responsibility of the Chief Investigator to ensure that any activity undertaken under this project adheres to the latest available advice from the Government or the University regarding COVID-19.

Any special conditions noted in the original approval letter still apply.

Standard conditions of approval

1. Research must be conducted according to the approved proposal
2. Report in a timely manner anything that might warrant review of ethical approval of the project including:
 - proposed changes to the approved proposal or conduct of the study
 - unanticipated problems that might affect continued ethical acceptability of the project
 - major deviations from the approved proposal and/or regulatory guidelines
 - serious adverse events
3. Amendments to the proposal must be approved by the Human Research Ethics Office before they are implemented (except where an amendment is undertaken to eliminate an immediate risk to participants)
4. An annual progress report must be submitted to the Human Research Ethics Office on or before the anniversary of approval and a completion report submitted on completion of the project
5. Personnel working on this project must be adequately qualified by education, training and experience for their role, or supervised
6. Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, that bears on this project
7. Changes to personnel working on this project must be reported to the Human Research Ethics Office
8. Data and primary materials must be retained and stored in accordance with the [Western Australian University Sector Disposal Authority \(WAUSDA\)](#) and the [Curtin University Research Data and Primary Materials policy](#)
9. Where practicable, results of the research should be made available to the research participants in a timely and clear manner
10. Unless prohibited by contractual obligations, results of the research should be disseminated in a manner that will allow public scrutiny; the Human Research Ethics Office must be informed of any constraints on publication
11. Ethics approval is dependent upon ongoing compliance of the research with the [Australian Code for the Responsible Conduct of Research](#), the [National Statement on Ethical Conduct in Human Research](#), applicable legal requirements, and with Curtin University policies, procedures and governance requirements
12. The Human Research Ethics Office may conduct audits on a portion of approved projects.

Should you have any queries regarding consideration of your project, please contact the Ethics Support Officer for your faculty or the Ethics Office at hrec@curtin.edu.au or on 9266 2784.

Yours sincerely

Amy Bowater
Ethics, Team Lead



Approval Letter

Date: 10/05/2021

Dear Professor Chung

HREC Reference number: 1046

Project title:

Transitioning from out-of-home care: A longitudinal population-based study

Thank you for submitting the above research project for ethics approval. The research project was considered by the WA Aboriginal Health Ethics Committee (WAAHEC) at the meeting held on 07/05/2021. I am pleased to advise that the WAAHEC has reviewed and approved the following documents submitted for this project:

Document(s):

WAAHEC Application_DCSigned
201906.03_Application_for_Data_V7_feedback_rev0820
WAAHEC - Values And Ethics Statement 180121
DYHSAC In Principle Support Transition from out-of-home care longitudinal study Dec 2020
Response to WAAHEC



The WAAHEC has granted approval of this research project from <date of the meeting held>, pending your agreement of the following conditions:

Conditions

- The WAAHEC will be notified in writing, giving reasons, if the project is discontinued before the expected date of completion.
- The Chief Investigator will provide a Progress Report by 30 June each year in the specified format. This form can be found on the AHCWA website (www.ahcwa.org.au).
- The approval for research projects is three years. Research projects should commence and conclude within that period of time. Projects must be resubmitted if extension over three years becomes necessary.
- Information about publications and/or conference presentations may be incorporated into Progress and Final Reports. This enables the WAAHEC to maintain a record of publications. Researchers can contact the WAAHEC if they require support or feedback prior to publication.
- Aboriginal and Torres Strait Islander communities are formally acknowledged for their contribution to this research project.
- If amendments to the research project become necessary, these should be submitted using the form provided on the AHCWA website (www.ahcwa.org.au).

Please contact ethics@ahcwa.org if you have any queries about the WAAHEC's consideration of your project.

The WAAHEC wishes you every success in your research.

Kind regards



Erica Lewin

For, Vicki O'Donnell
Chairperson, WAAHEC



Appendix B.1. Navigating Through Life Project: Participant Consent Form

CONSENT FORM: YOUNG PERSON

HREC Project Number:	HRE2018-0170
Project Title:	Transitioning from out of home care: A longitudinal population-based study
Chief Investigator:	Associate Professor Reinie Cordier
Version Number:	4
Version Date:	9/01/2019

By signing below I agree to the following:

- I have been told about what I will do with the researchers
- I know I can ask questions
- I know I can stop at any time
- If I stop, researchers can use the information I have already given
- I know my interviews will be audio-recorded
- Researchers can contact me again every 6 months for my next appointments.
- Researchers can access my information at Department of Communities
- Researchers can link my data from other Government departments
- I know my name will not be used
- I know this project has been approved by Curtin University

yes no I give consent for my carer to answer questions about me as part of this study

Carer name: _____

Phone number: _____

Email: _____

yes no I give consent for the researchers to contact me about other related studies

Participant Name	
Participant Signature	
Date	

Appendix B.2. Navigating Through Life Project: Participant Information

Statement

PARTICIPANT INFORMATION STATEMENT

What is the Project About?

- We know getting support from family, friends and the community is hard for young people who are leaving out of home care.
- Right now we do not know enough about where and when young people need help.
- In this project we want to understand the experiences of young people as they to begin adulthood, and find out what helps a successful transition from care.
- We hope the information from the study will improve the lives for young people as they begin their adult lives.

Who is doing the Research?



The project is being done by researchers from Curtin University, Monash University, The University of Western Australia, and Wanslea Family Services.

This research is led by Associate Professor Reinie Cordier (reinie.cordier@curtin.edu.au)



This research project is funded by the Australian Research Council, the Department of Communities, and Wanslea Family Services.



Why am I being asked to take part?

You have been asked because you are living in care or have recently left care.

What how long will it take?

Each appointment will last about 90 minutes. You will fill out some surveys on paper or an iPad and an interview with the researcher.



There will be no costs to you. You will be offered a gift voucher at each appointment for your time in this project.

The first voucher will be for \$40. The vouchers will go up by \$20 each time for the next four appointments.

What will I have to do?



- You will be asked to come to 5 appointments with the researchers. The first one will happen when you join the study. The rest will happen every 6 months for the next two years.
- The appointments can happen where you live, or somewhere in the community where you feel safe. You will be asked to bring someone with you to support you.
- We will ask you questions about how prepared you feel/felt for leaving care, your plans around housing, education and work, and your connections with family, carers and friends.
- If any of the questions upset you, you do not need to answer them. If you get very upset, your support person can help you and we let you know other places where you can get more help if you need.
- We will make a digital audio recording of your answers so we can concentrate on what you are saying. After the interview we will make a written copy of the recording.
- We will also give you some question forms to fill out on paper or an iPad. The forms will ask about your strengths and difficulties, your social connections, significant events in your life, your resilience and your self-determination.
- If you are in care right now, we would also like to give your carer some question forms to fill out about their relationship with you.
- We don't expect that there to be risks for you to answer the questions, but if you did get upset then we can find someone that you can talk to about why you were upset.

We would like your OK to get some information from your records at Department of Communities. Information we would collect is:



- Date of Birth
- Gender
- Indigenous status
- Cultural and Linguistically Diverse status
- Living arrangements
- Details about placements (e.g., dates)
- Viewpoint responses
- Needs Assessment Tool responses
- Care Plan (if you have one)



This research will also be linking information from Government records (such as Department of Health, Department of Education, Department of Transport) about all young people in WA aged 15-21 years. We would like to ask if it is OK to do this for your records.

Other research projects

We are also conducting other research studies in this area and would like to ask if it is OK to contact you about being in that research too.

Do I have to be in the research project?



You can choose if you want to be in the project or not. If you don't want to be in the project you don't have to – it won't have an impact on your relationship with the Department of Communities, Wanslea or any other community organisation.

If you change your mind and want to stop, that is OK. Just let the researchers know at any time.

If you chose to stop, we would like your OK to still use the information you have given us to that point.

Who will see my information?

In most cases, only the researchers will know your answers. We will remove your name from your information. All of your information will be treated as confidential and used only in this project. The only time when researchers can't keep your information confidential is if you tell us about any abuse or illegal activity that hasn't already been reported. The researchers may present the project at conferences or write a report, but you will not be named.

What if I have questions?

If you have questions or would like more information, you can contact Amy Pracilio or Lauren Parsons:

Phone: (08) 9266 5861 (Amy)

Phone: (08) 9266 3829 (Lauren)

Email: navigating@curtin.edu.au

This information sheet is for you to keep.

Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number HRE2018-0170). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.au.

Appendix B.3. Navigating Through Life Project: Adverse Events Protocol

Adverse Events Protocol

Researchers will follow the protocols below before, during and after interviews to: 1) minimize the risk of participants becoming distressed during interviews with researchers, and 2) manage participants who demonstrate signs of upset, distress, or aggravation, or who disclose illegal activity or past trauma or abuse.

Prior to commencing the interview

- Invite participants to have a support person present at meetings with the researchers.
- Notify other members of the research team of your arrival and anticipated departure time from the interview (e.g., call or send text message on arrival at interview location).
- Provide participants an orientation to the interview. Explain the types of topics to be covered and how they will be covered (i.e. outcome measures or open-ended questions).
- Explain that for some people, some topics could be upsetting or unsettling and provide some examples of possible topics that could be upsetting (e.g., talking about family or being in care).
- Ask if participants have a sense that any of the topics to be covered could be distressing or unsettling for them. If the answer is 'yes', respectfully explore how the person is feeling about continuing the interview and negotiate how to "check in" during the interview to make sure they are okay.
- Regardless of whether the answer to the above is yes or no, ask about what participants normally do if they feel unsettled and who they turn to. If a young person cannot identify anyone or anything that may be a support, explore their service delivery connections and if they do not have these, talk about possible supports (using the attached List of Resources that participants can take away after the interview).
- Ask participants if they would feel okay to use the strategies mentioned or speak to the person/people they noted if they were to have a response during the interview.

During the interview

- Monitor participants for signs of withdrawal, upset, unease or aggravation.
- If someone appears quiet, withdrawn, upset or uneasy during the interview, stop and respectfully enquire how the person is and if they wish to take a break or cease the interview.
- Enlist the help of the participant's support person if they are present, or call the support person if they do not calm after stopping the interview.

- If someone discloses illegal activity, confer with the support person after the session to get another point of view and check for misunderstanding. Confer with the Chief Investigator who will assist in taking the appropriate action.
- If someone discloses trauma or abuse, Follow Research Disclosure Protocol provided by Department of Communities

After the interview

- Check in as to how participants found the interview and if they have had a response.
- Clarify participants' support strategies and people, making sure they feel comfortable to engage these.
- If distress is noted by the researcher or participant at any time in the interaction, offer to follow them up, either later that day or the next day.

Appendix C.1. Navigating Through Life Project: Demographics Form

Confidential

DoC Case File Variables and Longitudinal Data Capture
Page 1

Demographics

Record ID

(Record ID is the DoC Identifier)

Age at study start

District Office

- Armadale
- Cannington
- East Kimberley
- Fremantle
- Goldfields
- Great Southern
- Joondalup
- Midland
- Mirrabooka
- Murchison
- Peel
- Perth
- Pilbara
- Rockingham
- Southwest
- West Kimberley
- Wheatbelt

Date of Birth

Date Deceased

Current Primary Address Postcode

Current Primary Address Start Date

Gender

- Female
- Male
- Intersex

Is the young person Aboriginal or Torres Strait Islander?

- Aboriginal but not TSI
- Both Aboriginal and TSI
- Either Aboriginal or TSI
- Neither Aboriginal nor TSI
- TSI but not Aboriginal

21.07.2020 14:59

projectredcap.org



Language spoken by the young person	<input type="radio"/> Aboriginal Language <input type="radio"/> Afghani <input type="radio"/> Amharic <input type="radio"/> Arabic <input type="radio"/> Dinka <input type="radio"/> English <input type="radio"/> Kirundi <input type="radio"/> Not Recorded <input type="radio"/> Shona <input type="radio"/> Tagalog
-------------------------------------	--

Is the person from a culturally or linguistically diverse background?	<input type="radio"/> No <input type="radio"/> Unknown <input type="radio"/> Yes
---	--

Country of Birth	<input type="radio"/> Not Recorded <input type="radio"/> Tanzania <input type="radio"/> Afghanistan <input type="radio"/> Australia <input type="radio"/> Burundi <input type="radio"/> China <input type="radio"/> Egypt <input type="radio"/> Ethiopia <input type="radio"/> Ghana <input type="radio"/> India <input type="radio"/> Liberia <input type="radio"/> Not Specified <input type="radio"/> New Zealand <input type="radio"/> Other <input type="radio"/> Philippines <input type="radio"/> Samoa <input type="radio"/> Sierra Leon <input type="radio"/> Sth Africa <input type="radio"/> Sth Korea <input type="radio"/> Sudan <input type="radio"/> Uganda <input type="radio"/> UK <input type="radio"/> Unknown <input type="radio"/> USA <input type="radio"/> Viet Nam
------------------	--

In Towards Independent Living Trial?	<input type="radio"/> No <input type="radio"/> Disengaged <input type="radio"/> Withdrawn <input type="radio"/> Yes
--------------------------------------	--

Family ID	<hr/>
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Appendix C.2. Navigating Through Life Project: Adverse Events

Questionnaire

Confidential

DoC Case File Variables and Longitudinal Data Capture
Page 1

Adverse Events Baseline

Record ID

_____ (Record ID is the DoC Identifier)

This survey asks some sensitive questions about things that sometimes happen while people are growing up.

If you feel comfortable, answer the questions by choosing the option that matches what has happened in your life.

Date form completed

Age ACEs form was completed

Were your parents living together as a couple when you were born?

- Yes
 No

Were your parents ever separated or divorced?

- Yes
 No
 I don't remember because I was too young, but other people have told me it happened

Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?

- Yes
 No
 I don't remember because I was too young, but other people have told me it happened

Was a household member depressed or mentally ill or did a household member attempt suicide?

- Yes
 No
 I don't remember because I was too young, but other people have told me it happened

Did a household member go to prison?

- Yes
 No
 I don't remember because I was too young, but other people have told me it happened

Was your mother or stepmother:
Often pushed, grabbed, slapped, or had something thrown at her?

- Yes
 No
 I don't remember because I was too young, but other people have told me it happened

OR

Sometimes or often kicked, bitten, hit with a fist, or hit with something hard?

OR

Ever repeatedly hit over at least a few minutes or threatened with a gun or knife?

<p>Did you often feel that... No one in your family loved you or thought you were important or special? OR Your family didn't look out for each other, feel close to each other, or support each other?</p>	<p><input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> I don't remember because I was too young, but other people have told me it happened</p>
<p>Did a parent or other adult in the household often... Push, grab, slap, or throw something at you? OR Ever hit you so hard that you had marks or were injured?</p>	<p><input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> I don't remember because I was too young, but other people have told me it happened</p>
<p>Did a parent or other adult in the household often... Swear at you, put you down, or humiliate you? OR Act in a way that made you afraid that you might be physically hurt?</p>	<p><input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> I don't remember because I was too young, but other people have told me it happened</p>
<p>Did you often feel that... You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? OR Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?</p>	<p><input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> I don't remember because I was too young, but other people have told me it happened</p>
<p>Did an adult or person at least 5 years older than you ever... Touch or fondle you or have you touch their body in a sexual way? OR Try to or actually have oral, anal, or vaginal sex with you?</p>	<p><input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> I don't remember because I was too young, but other people have told me it happened</p>
<p>Total ACE Score</p>	<p>_____</p>

Appendix C.3. Navigating Through Life Project: Standardised Measures

Social Inclusion

These questions ask you about ways that you participate in society and how connected you feel to the people around you.

Think about each statement in relation to your life situation now. Tick the box that **matches how much you agree with the statement.**

Economic Participation

If you are working: I am satisfied with my current job.

Strongly disagree Unsure Strongly agree

Disagree Agree

If you are not working: I am satisfied not having a job.

Strongly disagree Unsure Strongly agree

Disagree Agree

I am satisfied with the opportunities I have to find suitable work in my local area.

Strongly disagree Unsure Strongly agree

Disagree Agree

I have a range of opportunities to secure additional income.

Strongly disagree Unsure Strongly agree

Disagree Agree

Participation in Education and Training

I am satisfied with the support I receive to achieve at school/university/TAFE.

Strongly disagree Unsure Strongly agree

Disagree Agree

I am satisfied with my current attendance at school/university/TAFE.

Strongly disagree Unsure Strongly agree

Disagree Agree

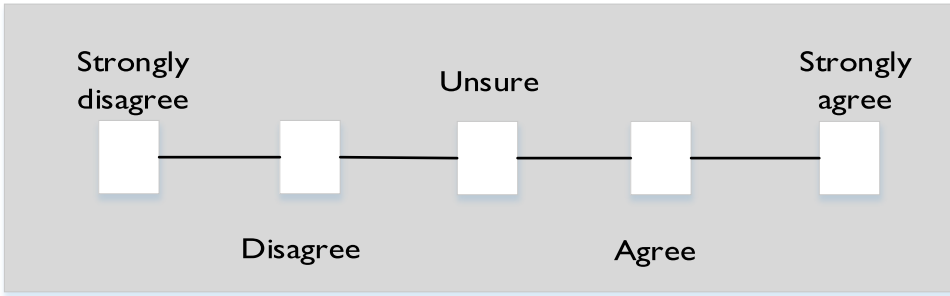
It is important for me to further my education.

Strongly disagree Unsure Strongly agree

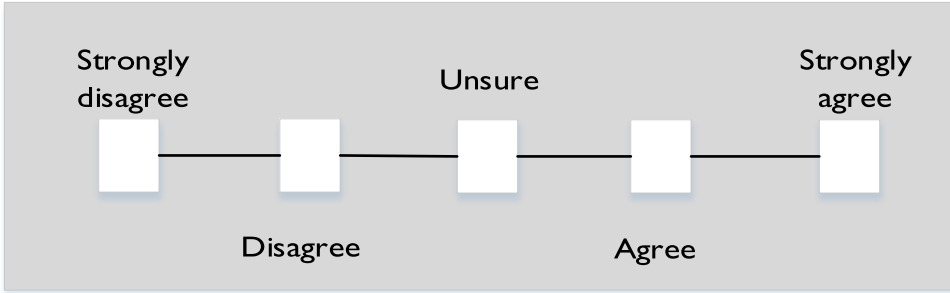
Disagree Agree

Social Participation

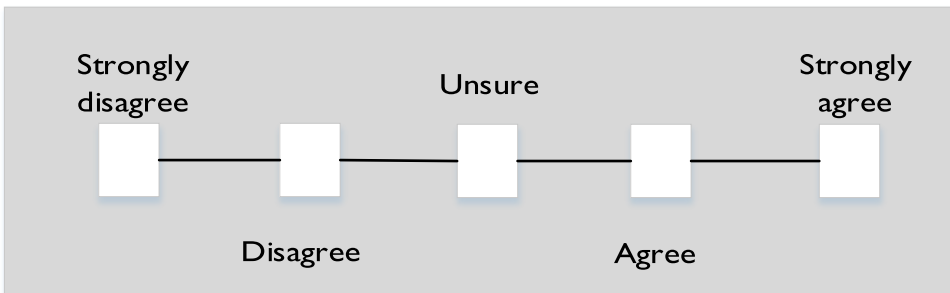
I am satisfied with the available opportunities for leisure or sports in my area. (e.g., play sports, watch live sports, attend local groups)



I am satisfied that I can participate in social activities (e.g., eating out, hanging out with friends)

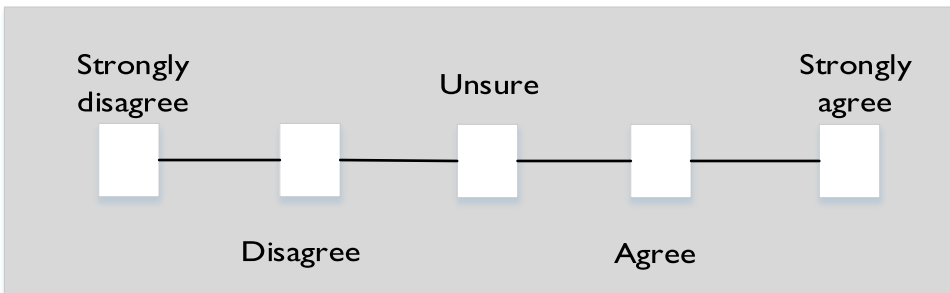


I am satisfied with the available opportunities for entertainment in my area (e.g., go to cinema, go to theatre or concert).



Spiritual Participation

I have opportunities to attend services or meetings at a place of worship.



I have opportunities to talk to someone about my spirituality or beliefs.

Strongly disagree Unsure Strongly agree

Disagree Agree

Spirituality is important to me.

Strongly disagree Unsure Strongly agree

Disagree Agree

Cultural Participation

I am satisfied with my opportunities to find out more about my culture.

Strongly disagree Unsure Strongly agree

Disagree Agree

I feel connected to my culture.

Strongly disagree Unsure Strongly agree

Disagree Agree

I am satisfied with my opportunities to participate in cultural activities.

Strongly disagree Unsure Strongly agree

Disagree Agree

Connections to Family Think about these statements in relation to your biological family:

I am satisfied with the relationship I have with my mother.

Strongly disagree Unsure Strongly agree

Disagree Agree

I am satisfied with the relationship I have with my father.

Strongly disagree Unsure Strongly agree

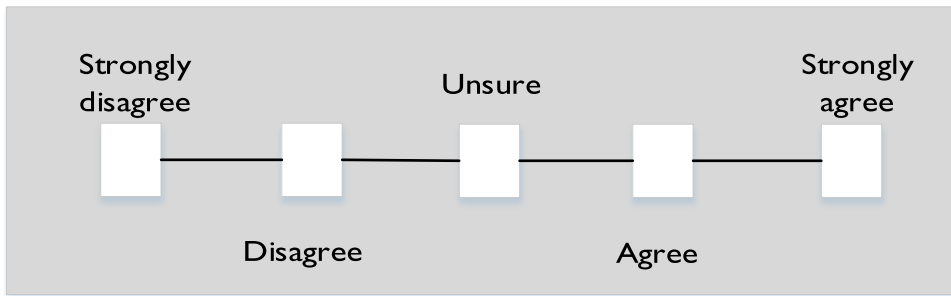
Disagree Agree

I am satisfied with the relationship I have with my siblings.

Strongly disagree Unsure Strongly agree

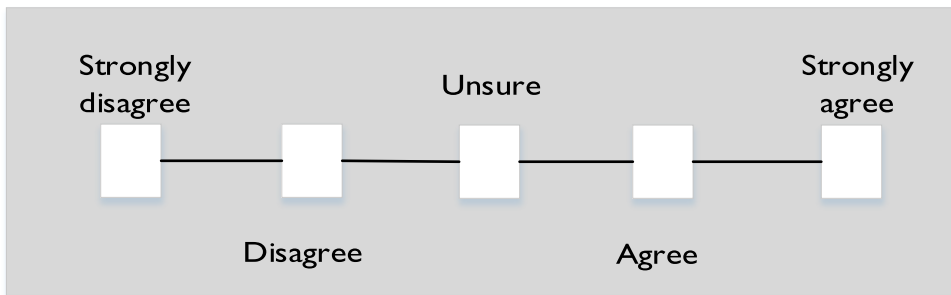
Disagree Agree

I am satisfied with the amount of contact I have with my family.

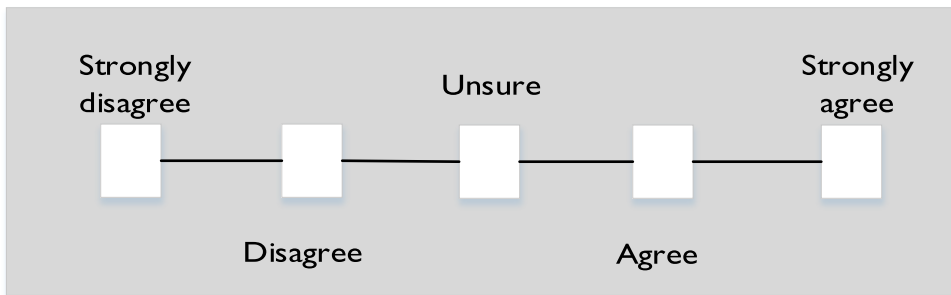


Connections to Friends

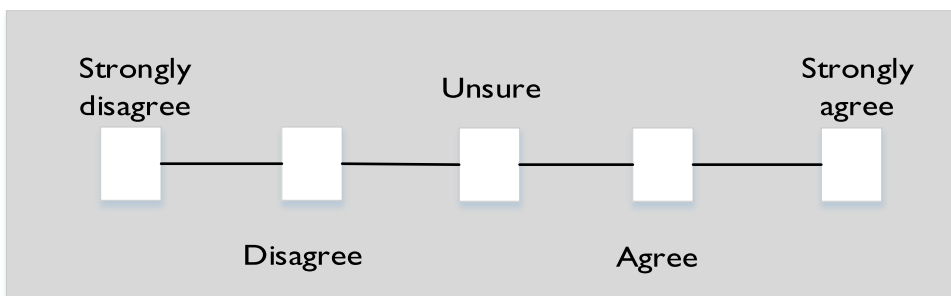
I am satisfied with the relationships I have with my friends.



I am satisfied with the opportunities I have to make new friends.



I am satisfied with the opportunities I have meet with my friends in person.



Connections to your Broader Community

Thinking about the local area in which you currently live; I am satisfied to continue living in this area.

Strongly disagree Unsure Strongly agree

Disagree Agree

I am satisfied with the range of opportunities that are available to me in my local area.

Strongly disagree Unsure Strongly agree

Disagree Agree

I feel connected to the people living in my local community.

Strongly disagree Unsure Strongly agree

Disagree Agree

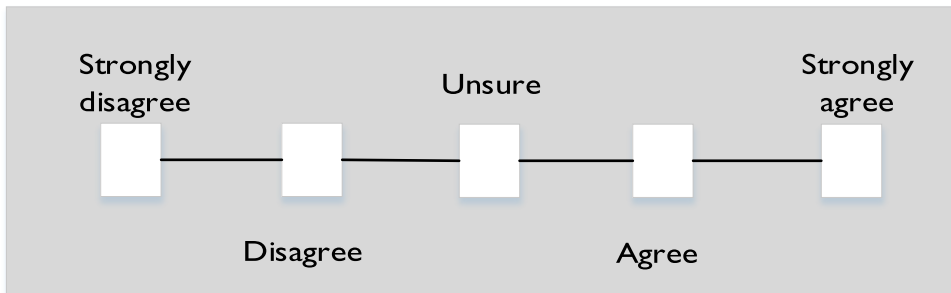
Political

I have enough opportunities to discuss local or national politics.

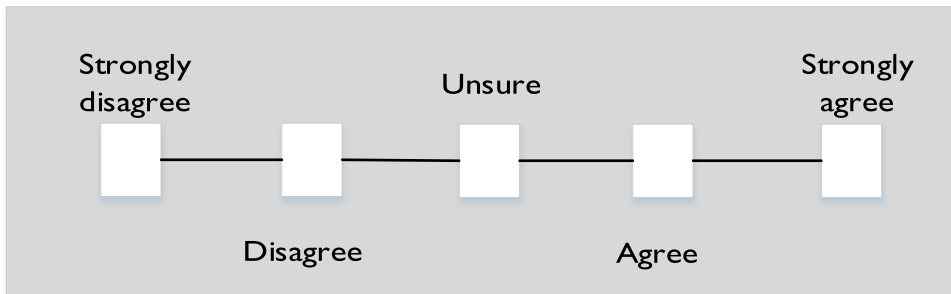
Strongly disagree Unsure Strongly agree

Disagree Agree

I participate in petitions for causes that I believe in.

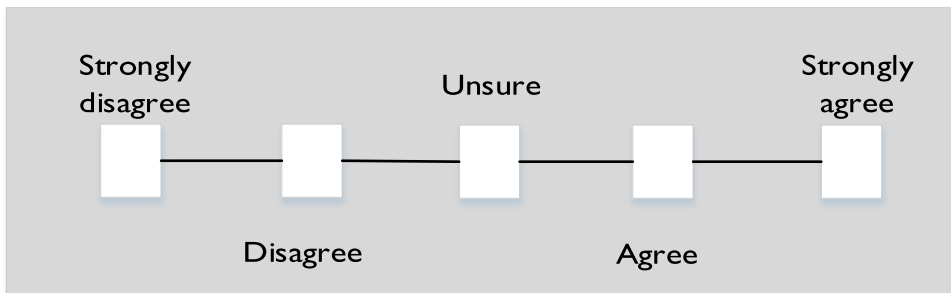


I keep informed about issues in current affairs that are important to me.

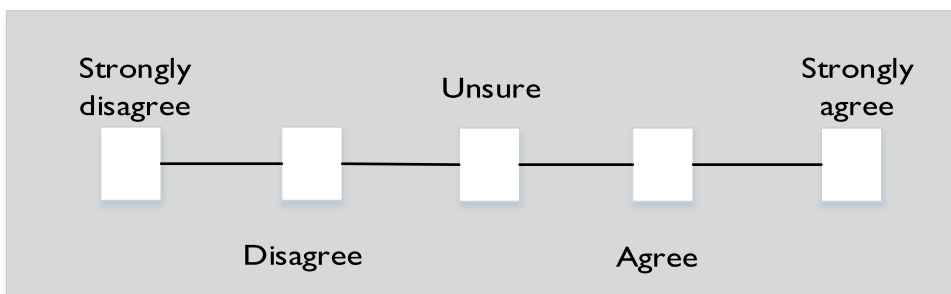


Humanity

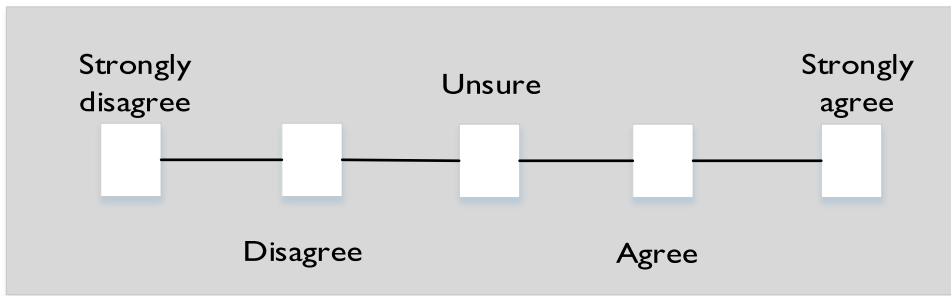
I am satisfied with the range of opportunities to volunteer.



I often help out my family or friends without being asked to do so.

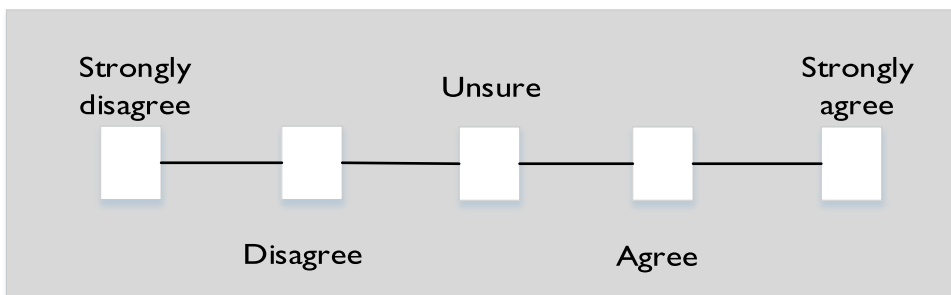


I do voluntary or charity work in my local community.

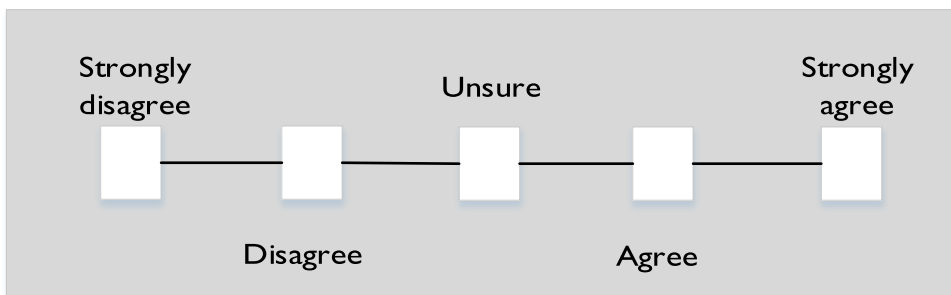


Community Engagement

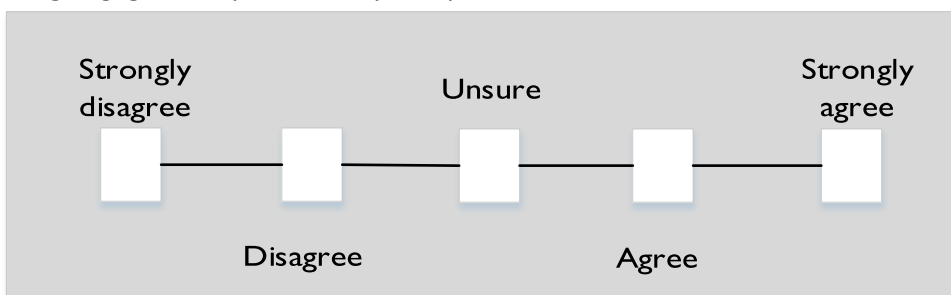
I am satisfied with the opportunities I have to participate in community groups or events (e.g., fetes, local music festivals, sporting events).



I am satisfied with how connected I feel to my community.

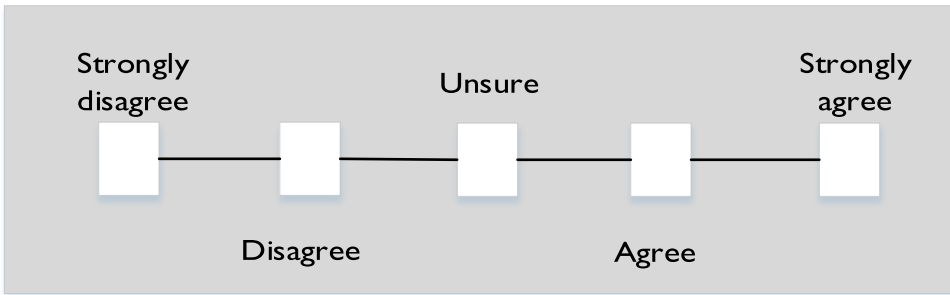


Being engaged in my community is important to me.

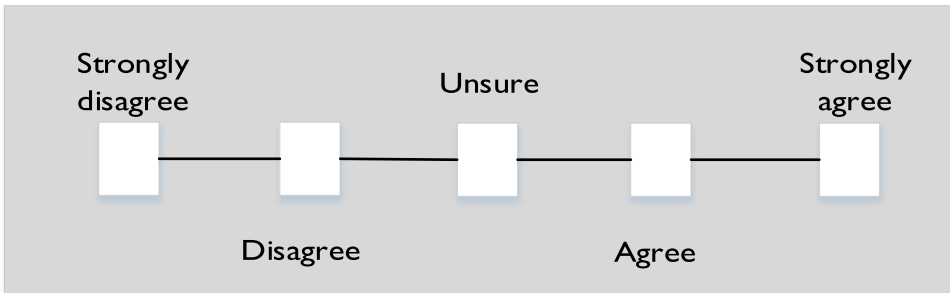


Access to Community Services

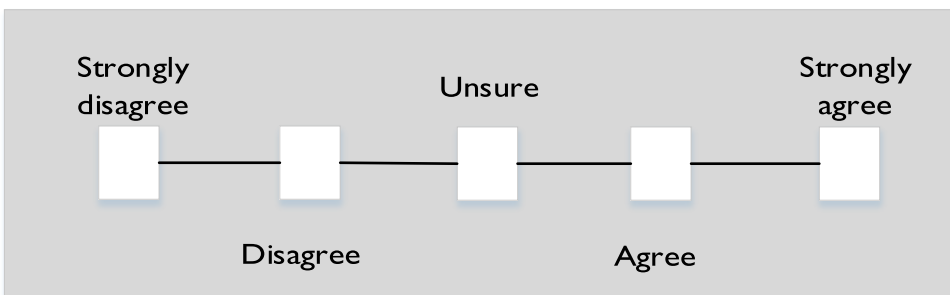
I am satisfied with my opportunities to access physical health care services.



I am satisfied with my opportunities to access mental health care services.



I am satisfied with the community services that help me plan for my future (e.g., Case Worker, school guidance counsellor, Wanslea, Crossroads).



Independent Living Skills

These questions ask you about skills you need to live on your own.

Think about each statement in relation to your life situation, and tick the box that **matches how much you agree with the statement.**

Money

I understand how credit/debit cards work.

Strongly disagree Unsure Strongly agree

— — — —

Disagree Agree

I understand the consequences of not paying bills.

Strongly disagree Unsure Strongly agree

— — — —

Disagree Agree

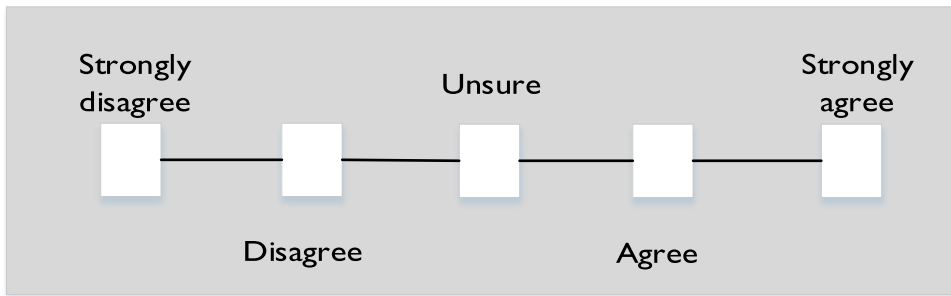
I know the different ways to borrow money and the advantages and disadvantages of each (e.g., friends, family, pawn shops, bank loans, student loans)

Strongly disagree Unsure Strongly agree

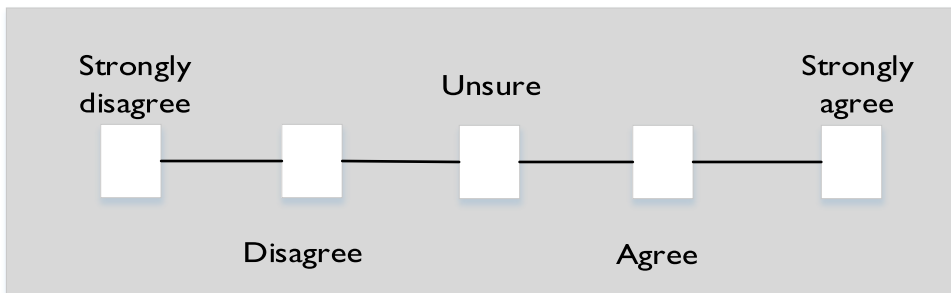
— — — —

Disagree Agree

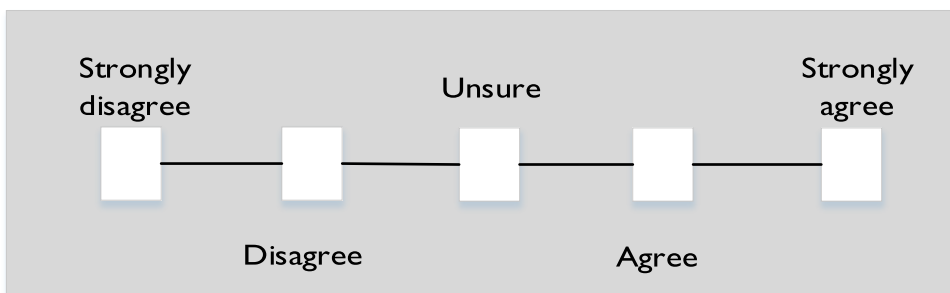
I feel confident budgeting to cover my fortnightly expenses so that I don't run into debt.



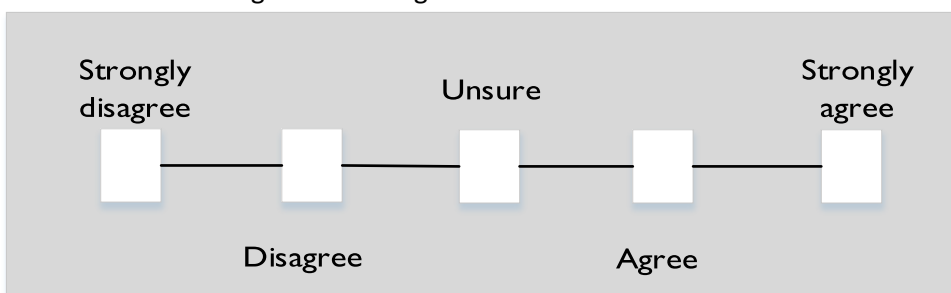
I feel confident finding out if I'm eligible and to apply for TILA (Transition to Independent Living Allowance):



I feel confident finding out if I'm eligible and to apply for help from Centrelink (e.g., Youth Allowance)



I feel confident finding out if I'm eligible for rental assistance.



Housing

I can fill in a rental application form, rental agreement or lease.

Strongly disagree Unsure Strongly agree

Disagree Agree

I know where to get help if there is a problem with the landlord.

Strongly disagree Unsure Strongly agree

Disagree Agree

I understand the cost of setting up a tenancy (e.g., payment of bond, advance rent, utilities connection).

Strongly disagree Unsure Strongly agree

Disagree Agree

I know how to find emergency housing assistance.

Strongly disagree Unsure Strongly agree

Disagree Agree

Education and Training

I understand what education or training is needed for the job I want.

Strongly disagree Unsure Strongly agree

Disagree Agree

I know how to match my education and training options to my current level of educational achievement.

Strongly disagree Unsure Strongly agree

Disagree Agree

I have opportunities to discuss my educational or training plans with my Case Manager, career advisors or counsellors at school, TAFE, University or Centrelink.

Strongly disagree Unsure Strongly agree

Disagree Agree

I know how to find out if I'm eligible and to apply for help from Centrelink while studying.

Strongly disagree Unsure Strongly agree

Disagree Agree

Employment

I know how to get help from government agencies to find a job or apply for an allowance while I'm looking for work.

Strongly disagree Unsure Strongly agree

Disagree Agree

I know how to use newspaper ads, internet and job placement agencies to find a job.

Strongly disagree Unsure Strongly agree

Disagree Agree

I can confidently put together a resume and cover letter and know how to complete a job application.

Strongly disagree Unsure Strongly agree

Disagree Agree

I know how to prepare for a job interview including what to wear.

Strongly disagree Unsure Strongly agree

Disagree Agree

Health and Wellbeing

I practice good personal hygiene (eg brush teeth and shower or bathe regularly, wash hands after using the bathroom, before eating and regularly when sick).

A horizontal Likert scale with five white square markers on a grey background. The markers are connected by a thin black line. The labels are: 'Strongly disagree' above the first marker, 'Disagree' below the second marker, 'Unsure' above the third marker, 'Agree' below the fourth marker, and 'Strongly agree' above the fifth marker.

I understand the health risks of using drugs, alcohol and smoking.

A horizontal Likert scale with five white square markers on a grey background. The markers are connected by a thin black line. The labels are: 'Strongly disagree' above the first marker, 'Disagree' below the second marker, 'Unsure' above the third marker, 'Agree' below the fourth marker, and 'Strongly agree' above the fifth marker.

I understand the risks of sexually transmitted infections (STIs) and how to prevent them.

A horizontal Likert scale with five white square markers on a grey background. The markers are connected by a thin black line. The labels are: 'Strongly disagree' above the first marker, 'Disagree' below the second marker, 'Unsure' above the third marker, 'Agree' below the fourth marker, and 'Strongly agree' above the fifth marker.

I know the birth control options, where to get contraception and options for pregnancy.

A horizontal Likert scale with five white square markers on a grey background. The markers are connected by a thin black line. The labels are: 'Strongly disagree' above the first marker, 'Disagree' below the second marker, 'Unsure' above the third marker, 'Agree' below the fourth marker, and 'Strongly agree' above the fifth marker.

I have a Medicare card and know how to make a Medicare claim.

Strongly disagree Unsure Strongly agree

Disagree Agree

Daily Living Skills

I know how to care for clothes including cleaning according to instructions on labels, using a washing machine, clothes dryer, laundromat and iron.

Strongly disagree Unsure Strongly agree

Disagree Agree

I know how to use most kitchen utensils and appliances.

Strongly disagree Unsure Strongly agree

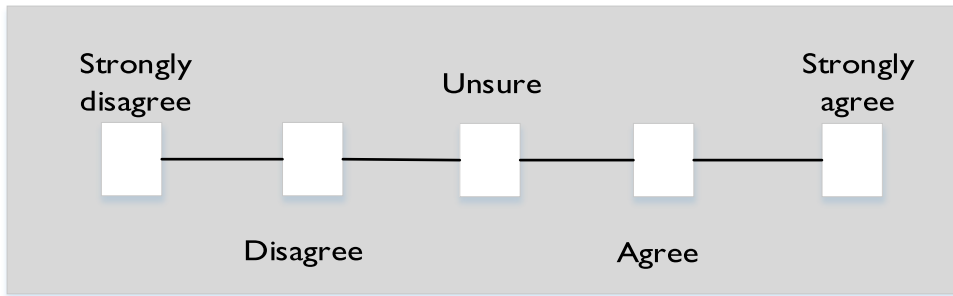
Disagree Agree

I can cook a meal including following a recipe.

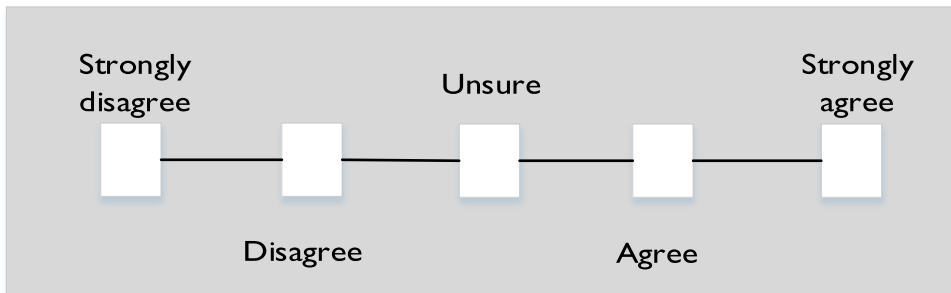
Strongly disagree Unsure Strongly agree

Disagree Agree

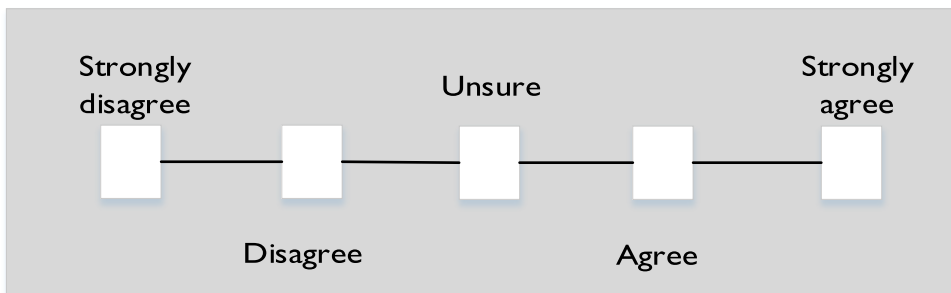
I can read a bus, train, or ferry timetable, plan a trip on public transport involving several transfers and travel independently.



I know how to get a driver's licence.

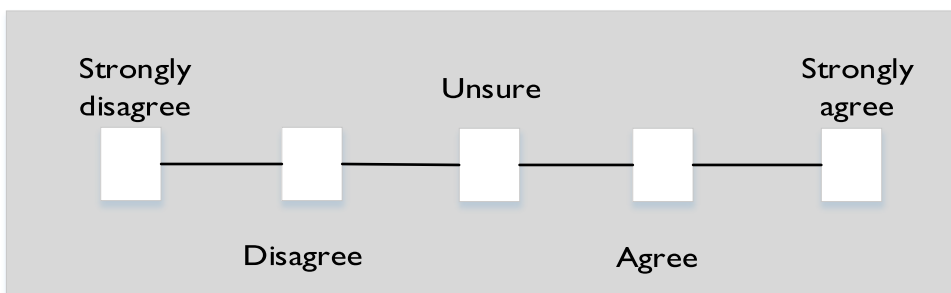


I know how to get the internet connected and set up a free email account.



Personal and Social Development

I know how to convey respect, caring, honesty and trustworthiness (eg saying thank you, not being rude, tone of voice, valuing others opinions, not keeping people waiting, being inclusive, accepting responsibility for a mistake).



I know how to manage conflict and keep my cool.

Strongly disagree Unsure Strongly agree

Disagree Agree

I can identify and avoid relationships that may be dangerous or unhealthy and can say 'no' to my friends.

Strongly disagree Unsure Strongly agree

Disagree Agree

I know how to get help in making contact with members of my birth family or other people I have been close to.

Strongly disagree Unsure Strongly agree

Disagree Agree

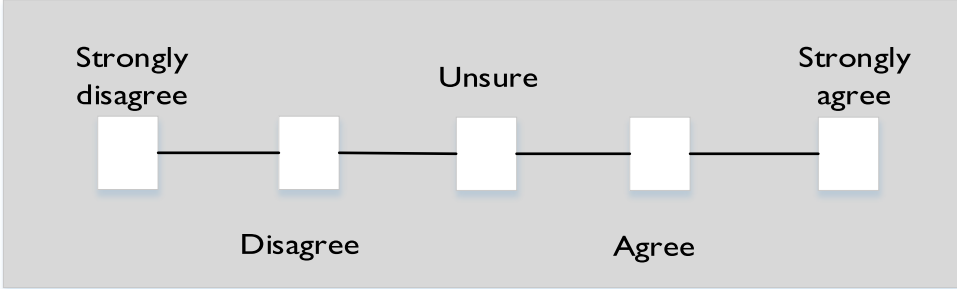
Legal Rights and Responsibilities

I know how to get help from my caseworker or foster care agency if I need certificates or other papers to prove who I am.

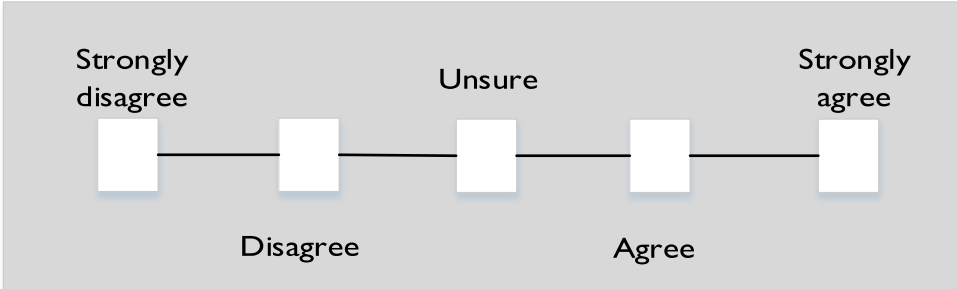
Strongly disagree Unsure Strongly agree

Disagree Agree

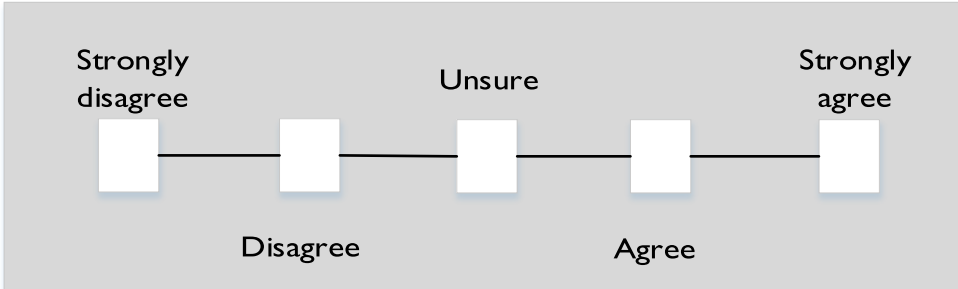
I know what my rights are if I'm arrested and who to call.



I know where to get free legal services if I am a victim of crime or are charged with an offence.

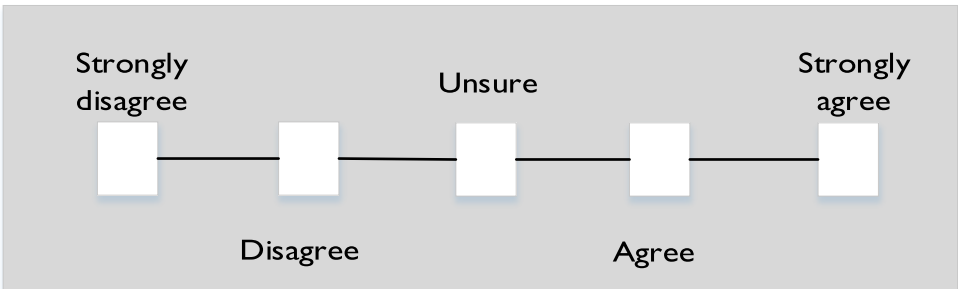


I have spoken to my caseworker about my Leaving Care Plan and know who to contact and how to do it if I have problems after I have left care.

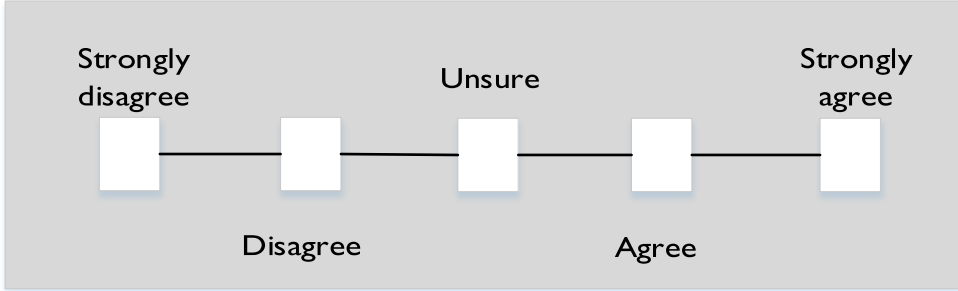


Safety

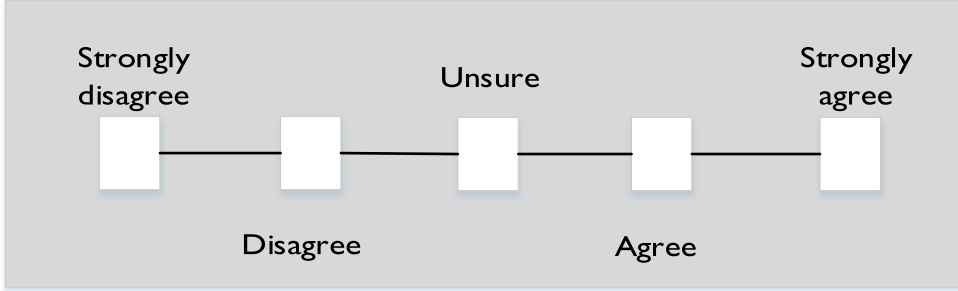
I know how to stay safe in the area that I live.



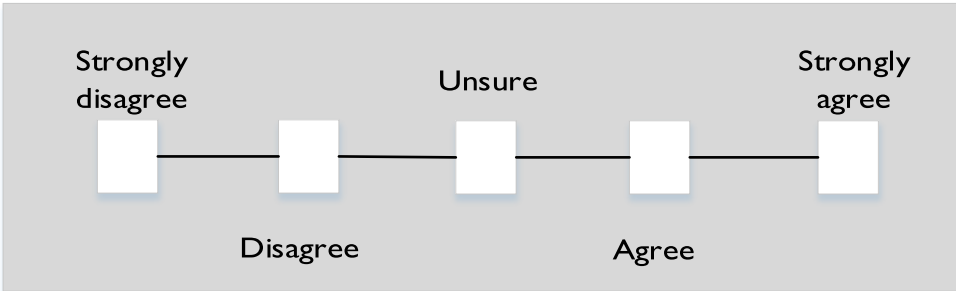
I feel safe on a day to day basis.



I worry about how my friends or people around me could affect my safety.



I know how to protect my identity, personal information and financial details on the Internet and phone.



Connor Davidson Resilience Scale

These questions ask about how you deal with challenges and reaching your goals.

Think about **how true each question is for you** for the past month. Tick the box that is the best match.

1. I am able to adapt when changes occur.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
	Rarely True		Often True	

2. I have at least one close and secure relationship that helps me when I am stressed.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
	Rarely True		Often True	

3. When there are no clear solutions to my problems, sometimes fate or God can help.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
	Rarely True		Often True	

4. I can deal with whatever comes my way.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
	Rarely True		Often True	

10. I give my best effort no matter what the outcome may be.

Not true at all Sometimes True True nearly all the time

————— ————— ————— —————

Rarely True Often True

11. I believe I can achieve my goals, even if there are obstacles.

Not true at all Sometimes True True nearly all the time

————— ————— ————— —————

Rarely True Often True

12. Even when things look hopeless, I don't give up.

Not true at all Sometimes True True nearly all the time

————— ————— ————— —————

Rarely True Often True

13. During times of stress/crisis, I know where to turn for help.

Not true at all Sometimes True True nearly all the time

————— ————— ————— —————

Rarely True Often True

14. Under pressure, I stay focused and think clearly.

Not true at all Sometimes True True nearly all the time

————— ————— ————— —————

Rarely True Often True

15. I prefer to take the lead in solving problems rather than letting others make all the decisions.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
		Rarely True	Often True	

16. I am not easily discouraged by failure.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
		Rarely True	Often True	

17. I think of myself as a strong person when dealing with life's challenges and difficulties.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
		Rarely True	Often True	

18. I can make unpopular or difficult decisions that affect other people, if it is necessary.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
		Rarely True	Often True	

19. I am able to handle unpleasant or painful feelings like sadness, fear, and anger.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
		Rarely True	Often True	

20. In dealing with life's problems, sometimes you have to act on a hunch without knowing why.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
		Rarely True		Often True

21. I have a strong sense of purpose in life.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
		Rarely True		Often True

22. I feel in control of my life.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
		Rarely True		Often True

23. I like challenges

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
		Rarely True		Often True

24. I work to attain my goals no matter what roadblocks I encounter along the way.

Not true at all		Sometimes True		True nearly all the time
<input type="checkbox"/>	—	<input type="checkbox"/>	—	<input type="checkbox"/>
		Rarely True		Often True

25. I take pride in my achievements.

Not true at all Sometimes True True nearly all the time

Rarely True Often True

AIR Self Determination Scale

These questions ask about how you go about getting what you want or need.

Think about how often you do the things in the questions. Choose the answer that is the best match for you. There are no right or wrong answers.

THINGS I DO

1. I know what I need, what I like, and what I'm good at.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. I set goals to get what I want or need. I think about what I am good at when I do this.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. I figure out how to meet my goals. I make plans and decide what I should do.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. I begin working on my plans to meet my goals as soon as possible.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. I like to begin working on my plans right away.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. I like to check on how well I'm doing in meeting my goals.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. I am willing to try another way if it helps me to meet my goals.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

WHAT HAPPENS AT HIGH SCHOOL/WORK

13. People at school/work listen to me when I talk about what I want, what I need, or what I'm good at.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. People at school/work let me know that I can set my own goals to get what I want or need.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. At school/work, I have learned how to make plans to meet my goals and to feel good about them.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. People at school/work encourage me to start working on my plans right away.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. I have someone at school/work who can tell me if I am meeting my goals.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. People at school/work understand when I have to change my plan to meet my goals. They offer advice and encourage me when I'm doing this.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

WHAT HAPPENS AT HOME

19. People at home listen to me when I talk about what I want, what I need, or what I'm good at.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. People at home let me know that I can set my own goals to get what I want or need.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. At home, I have learned how to make plans to meet my goals and to feel good about them.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. People at home encourage me to start working on my plans right away.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. I have someone at home who can tell me if I am meeting my goals.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. People at home understand when I have to change my plan to meet my goals. They offer advice and encourage me when I'm doing this.

Never	Almost Never	Sometimes	Almost Always	Always
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please write your answers to the following questions

Give an example of a goal you are working on

What are you doing to reach this goal?

How well are you doing in reaching this goal?

Strong Souls

These are questions about things that sometimes happen to people.

Think about how often these things happened to you in the past few months. Choose the answer that is the best match.

1. Have trouble sleeping?

Not much	Sometimes	Fair bit	Lots of times
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Get angry or wild real quick?

Not much	Sometimes	Fair bit	Lots of times
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Hard to focus. Thinking all over the place.

Not much	Sometimes	Fair bit	Lots of times
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Had too many bad moods?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Felt pretty lonely much of the time?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Have you felt so sad that nothing could cheer you up?

Not much	Sometimes	Fair bit	Lots of times
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Have you felt so worried you start to shake?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Have you felt so worried it was hard to breathe?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. Have you felt so worried you got really sweaty?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. Have you been so worried you felt sick in the guts?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. Have you felt so worried you got dizzy?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. Got angry or wild and stayed that way for a long time?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. Felt like giving up - no point in trying?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. Have you wished you were dead?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. Felt like hurting yourself?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Have you felt like killing yourself?

Not really	Little bit	Fair bit	Lots
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

How much is this like you?

17. You have a strong family who help each other.

Always	Most times	Sometimes	Not really
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. You know lots about white fella ways.

Always	Most times	Sometimes	Not really
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. You know someone who is a really good person.

Lots of peopla	Fair few	Not many	No one
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. You laugh and make jokes a lot.

Lots	Fair bit	Little bit	Not much
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. You are really into something (like music, cars, clothes, football, fishing, computers, etc).

Lots	Fair bit	Little bit	Not much
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. You are a good son or daughter to your family.

Always	Most times	Sometimes	Not really
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23. You got an older person looking out for you.

Always	Most times	Sometimes	Not really
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

24. You got lots of friends

Lots	Fair few	Not many	None
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. When you are upset, you can usually talk to someone about it (parents or friends).

Always	Fair bit	Little bit	Never
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ACEs Questionnaire

These questions ask about unpleasant things that sometimes happen to people while they are growing up.

If you feel comfortable, you can answer the questions by ticking the box (YES or NO) that matches what has happened to **during your first 18 years of life**:

1.	Were your parents ever separated or divorced?	<table><tr><td>Yes</td><td>No</td></tr><tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></table>	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
Yes	No					
<input type="checkbox"/>	<input type="checkbox"/>					
2.	Did a parent or other adult in the household often wear at you, put you down, or humiliate you? OR Act in a way that made you afraid that you might be physically hurt?	<table><tr><td>Yes</td><td>No</td></tr><tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></table>	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
Yes	No					
<input type="checkbox"/>	<input type="checkbox"/>					
3.	3. Did a parent or other adult in the household often push, grab, slap, or throw something at you? OR Ever hit you so hard that you had marks or were injured?	<table><tr><td>Yes</td><td>No</td></tr><tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></table>	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
Yes	No					
<input type="checkbox"/>	<input type="checkbox"/>					
4.	Did you often feel that no one in your family loved you or thought you were important or special? OR Your family didn't look out for each other, feel close to each other, or support each other?	<table><tr><td>Yes</td><td>No</td></tr><tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></table>	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
Yes	No					
<input type="checkbox"/>	<input type="checkbox"/>					
5.	Did you often feel that you didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? OR Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?	<table><tr><td>Yes</td><td>No</td></tr><tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></table>	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
Yes	No					
<input type="checkbox"/>	<input type="checkbox"/>					
6.	Was your mother or stepmother often pushed, grabbed, slapped, or had something thrown at her? OR Sometimes or often kicked, bitten, hit with a fist, or hit with something hard? OR Ever repeatedly hit over at least a few minutes or threatened with a gun or knife?	<table><tr><td>Yes</td><td>No</td></tr><tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></table>	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
Yes	No					
<input type="checkbox"/>	<input type="checkbox"/>					
7.	Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?	<table><tr><td>Yes</td><td>No</td></tr><tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></table>	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
Yes	No					
<input type="checkbox"/>	<input type="checkbox"/>					
8.	Was a household member depressed or mentally ill or did a household member attempt suicide?	<table><tr><td>Yes</td><td>No</td></tr><tr><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></table>	Yes	No	<input type="checkbox"/>	<input type="checkbox"/>
Yes	No					
<input type="checkbox"/>	<input type="checkbox"/>					

9.	Did a household member go to prison?	Yes	No
		<input type="checkbox"/>	<input type="checkbox"/>

10.	Did an adult or person at least 5 years older than you ever touch or fondle you or have you touch their body in a sexual way? OR Try to or actually have oral, anal, or vaginal sex with you?	Yes	No
		<input type="checkbox"/>	<input type="checkbox"/>

Appendix D.1. Western Australia linked datasets

Data custodian	Dataset	Dates	Data description
Registrar of Births, Deaths, and Marriages	Birth Registrations	1990-2019	All registered births in WA.
Department of Communities	Child Protection and Family Support	1990-2019	Notifications of child maltreatment, investigations, substantiations, and periods of out-of-home care.
	Housing customers, applications, households, tenancies	1990-2019	Applications for public housing made in WA and tenancies in public housing properties.
Department of Health	Hospital Morbidity Data Collection (HMDC)	1990-2019	Patients admitted to public and private hospitals, including dates of admission and separation, principal diagnosis, other diagnosis & external cause codes (ICD-9 & 10).
	Emergency Department Data Collection (EDDC)	2002-2019	Patients presenting at hospital emergency departments, including date of presentation, principal diagnosis, other diagnosis & external cause codes (ICD-9 & 10).
	Midwives Notification System (MNS)	1990-2019	Information on all births in WA, including maternal demographics, infant characteristics, and pregnancy, labour and birth information
Department of Education	School enrolments	1990-2019	Students enrolled in WA public schools, including details of school enrolments, attendance rates, and school suspension records.
	School attendance and suspensions	2008-2019	
WA Police Force	Offences	2007-2019	Crime incidents are reported to the police and associated offences and offenders.
Department of Justice	Custodial stays	Juvenile: 2001-2019; Adult: 2008-2019	Custodial stays within the juvenile and adult justice systems.

Appendix D.2. Victoria linked datasets

Data custodian	Dataset	Dates	Data description
Department of Health	Victorian Admitted Episodes (VAED)	2011-2018	Patients admitted to public and private hospitals, including dates of admission and separation, principal diagnosis, other diagnosis & external cause codes (ICD-9 & 10).
	Victorian Emergency Management Dataset (VEMD)	2011-2018	Patients presenting at hospital emergency departments, including date of presentation, principal diagnosis, other diagnosis & external cause codes (ICD-9 & 10).
	Alcohol and Drug use Information System (ADIS)	2011-2018	Patient presenting with alcohol and drug use problems for assessment, treatment and support services.
	Clinical Mental Health Information System (CMI/ODS)	2011-2018	Records information on all clinical public mental health services provided in Victoria, both inpatient and within the community
	Mental Health Community Support Services (MHCSS)	2011-2018	Patients presenting at Community Support services for those with severe mental illness and psychiatric disability
Department of families and children	Child Protection Dataset	2011-2018	Notifications of child maltreatment, investigations, substantiations, and periods of out-of-home care.
	Family Services (IRIS)	2013-2018	Records information on the provision of services to vulnerable children, young people and their families.
	Family Violence (IRIS)	2013-2018	Records information on services provided to both victims and perpetrators of family violence.
	Sexual Assault Support Services (IRIS)	2013-2018	Records information on services provided to both victims and perpetrators of sexual violence
	Housing Integrated Information Program (HIIP)	2011-2018	Records information on public housing including applications for housing, tenancies, funding support for tenancies, and income sources used to pay rent.
	DHHS Homelessness Data Collection	2015-2018	Records information on individuals either homeless or at risk of homelessness.
Department of Justice and Community Safety	Youth Justice Data Collection	2011-2018	Records information on all criminal court orders in the youth justice system in Victoria.