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Highlights

- Over 6000 cannabis cultivators from 11 countries completed our web survey
- It was more difficult to recruit cannabis cultivators in English-speaking countries
- Growing practices were strikingly similar regardless of recruitment mode
- Meaningful engagement with the target population improves data quality and quantity
- Research participant anonymity is constrained by mass digital surveillance

Lessons from conducting trans-national internet-mediated participatory research with hidden populations of cannabis cultivators

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1

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2

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Abstract

Background: Internet-mediated research methods are increasingly used to access hidden populations. The International Cannabis Cultivation Questionnaire (ICCQ) is an online survey designed to facilitate international comparisons into the relatively under-researched but increasingly significant phenomenon of domestic cannabis cultivation. The Global Cannabis Cultivation Research Consortium has used the ICCQ to survey over 6,000 cannabis cultivators across 11 countries. In this paper, we describe and reflect upon our methodological approach, focusing on the digital and traditional recruitment methods used to access this hidden population and the challenges of working across multiple countries, cultures and languages.

Methods: Descriptive statistics showing eligibility and completion rates and recruitment source by country of residence.

Results: Over three quarters of eligible respondents who were presented with the survey were included in the final sample of n=6,528. English-speaking countries expended more effort to recruit participants than non-English-speaking countries. The most effective recruitment modes were cannabis websites/groups (33%), Facebook (14%) and news articles (11%). While respondents recruited through news articles were older, growing practice variables were strikingly similar between these main recruitment modes.

Conclusion: Through this process, we learnt that there are trade-offs between hosting multiple surveys in each country versus using one integrated database. We also found that although perceived anonymity is routinely assumed to be a benefit of using digital research methodologies, there are significant limits to research participant anonymity in the current era of mass digital surveillance, especially when the target group is particularly concerned about evading law enforcement. Finally, we list a number of specific recommendations for future researchers utilising internet-mediated approaches to researching hidden populations.

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3

Introduction

Internet-mediated research methods have become more popular within the social sciences as both access to, and use of, the internet have become increasingly unremarkable aspects of everyday life. Internet-mediated research methods may include interactions between researchers and participants through digital communications (e.g., surveys, interviews, discussion forums), as well as utilising the digital traces of existing online interactions as data (see Hewson, 2014, for a review). Such methods have many advantages compared to face-to-face, postal or telephone research: large and geographically diverse samples can be accessed with relative ease; responses can be gathered relatively quickly; costs and other resource demands are relatively low; transcription and data-entry is automated; and flexibility and convenience are enhanced for both respondents and researchers (Hewson & Laurent, 2008; Kays, Keith, & Broughal, 2013; Tuten, 2010; van Gelder, Bretveld, & Roeleveld, 2010). At the same time, internet-mediated research methods are subject to criticism, with questions around sample representativeness and veracity of data collected, and concerns over privacy in the online environment (Hewson & Laurent, 2008; Tuten, 2010). There is also the risk that the apparent ease of conducting internet surveys masks the necessity for, and complexity of, participatory engagement that may distinguish successful from unsuccessful studies with hard-to-reach groups (Barratt et al., 2012; Barratt & Lenton, 2010).

Internet-mediated research methods have been particularly useful in gathering data from hidden populations, such as drug users and drug dealers (Coomber, 2011; Kalogeraki, 2012; Miller & Sønderlund, 2010; Potter & Chatwin, 2011; Temple & Brown, 2011). However, the criticisms, especially around sample representativeness, also become more acute (see Barratt, Ferris, & Lenton, 2014). In our experience, internet-mediated research methods are worthy of serious consideration by researchers of hidden populations, so long as (a) suitable care is taken with survey design and recruitment strategies and (b) limitations and concerns are suitably acknowledged and accounted for in both the analysis of data and the interpretation and application of findings, particularly how they may or may not be generalisable beyond the sample population (see also Barratt & Lenton, 2014).

The Global Cannabis Cultivation Research Consortium (GCCRC) was created in 2009 at a meeting of the International Society for the Study of Drug Policy, after scholars from different countries presented their work on domestic cannabis cultivation (domestic meaning cannabis grown in the same country that it is consumed), and found that they had broad aims in common (Barratt et al., 2012). The GCCRC developed an online survey designed to facilitate international comparisons into the relatively under-researched but increasingly significant phenomenon of

4

domestic cannabis cultivation (Decorte, Potter, & Bouchard, 2011; United Nations Office on Drugs and Crime, 2014). We chose to use internet-mediated research methods to facilitate dialogue with online groups of anonymous cannabis cultivators, access large numbers of cannabis cultivators anonymously from diverse locations, and enable global collaboration with limited project funding: objectives which could not have been achieved through alternative methods. Our International Cannabis Cultivation Questionnaire (ICCQ) has been successfully run in eleven industrialised countries producing a dataset of 6,528 completed responses. As demonstrated in this special issue, it has provided important insights not only into the characteristics of cannabis growing and cannabis growers in these countries but also into the design and execution of online surveys aimed at hidden populations.

Here we reflect on our experiences in survey design and sample recruitment. In particular, we discuss our efforts to improve the data collected through techniques aimed at increasing sample size and response rates, ensuring greater quality of survey responses, and our attempts to assess potential biases in our final dataset resulting from our recruitment and data-collection methods. As such, this paper has two aims. First, we document and analyse our own experiences of the ICCQ, which complements our earlier methodological report (Barratt et al., 2012) and provides background to our various articles in this volume (Hakkarainen et al., 2014; Lenton et al., 2014; Nguyen et al., 2014; Paoli et al., 2014; Potter et al., 2014). Second, we provide recommendations to assist the planning of future trans-national internet-mediated research with hidden populations.

The article proceeds with a brief overview of internet-mediated research methods as used in drug research. We then outline the ICCQ project with a short discussion of the background and rationale to our research and a more detailed outline of our own methodology. We introduce some analyses undertaken to attempt to understand potential sampling biases within our approach. In the ensuing discussion, we propose methodological techniques that can help maximise both the number of respondents and the quality of data provided by them in online surveys, and argue that such approaches are not only valid but valuable additions to our attempts to find out more about hidden populations such as cannabis growers. Our conclusions bring together a number of recommendations and observations that have emerged from our own experiences and that we feel are useful to share with other researchers seeking to engage with internet mediated methods targeting hidden populations.

Internet-mediated research with hidden populations

Internet-mediated research methods are increasingly utilised within the health and social sciences (Lee, Fielding, & Blank, 2008; van Gelder et al., 2010). Their

5

established advantages pertinent to those researching sensitive topics or hidden populations include: being able to offer enhanced anonymity, privacy and safety; the opportunity to participate when and where convenient and comfortable; and the reduction of fears and suspicions related to participation in the research (Kays et al., 2013; Miller & Sønderlund, 2010). Internet-mediated research into drug issues dates back to the mid-1990s when Coomber (1997) opted for an online method as a way of persuading dealers to provide information about their illegal activities. While the most commonly used online method in drugs research is the survey (as reviewed by Kalogeraki, 2012; Miller & Sønderlund, 2010), approaches also encompass qualitative online interviewing (e.g., Barratt, 2012; van Hout & Bingham, 2013), textual analysis of website content (e.g., Daniulaityte et al., 2013; Kjellgren, Henningsson, & Soussan, 2013; van Hout, 2014), and internet-based recruitment of traditionally hidden populations through specialist websites, discussion forums and online communities (as reviewed by Barratt & Lenton, 2010; Potter & Chatwin, 2011).

Despite the increasing use and advantages of internet-mediated research methods there are a number of concerns and criticisms to be considered. While levels of access to, familiarity with and (regular) use of the internet have increased rapidly in recent years to the point of near universality, at least in many of the World's most developed countries (see http://www.internetworldstats.com/stats.htm), some people still do not have access to the internet and so will be excluded from online studies. Many more may not use the internet regularly or may choose not to respond to online research requests. As such, researchers still need to consider whether those who do not respond to internet surveys (for whatever reason) are notably different from those who do (Couper, 2000). Coverage error may be of concern for research with populations likely to make limited use of the internet (Potter & Chatwin, 2011). However, this situation is not far removed from that facing large-scale face-to-face, school, postal or telephone surveys, especially household surveys that exclude people with no fixed address from their sampling frame. Furthermore, these more traditional methods are increasingly less effective at reaching young, mobile populations, due to the increase in mobile-only households (Livingston et al., 2013). Further undermining of sample representativeness occurs due to self-selection bias (Miller, Johnston, McElwee, & Noble, 2007) or the volunteer effect (Couper, 2000).

Other concerns around the data generated by online surveys have also been raised. Reliability issues include the possibility of: respondents reporting erroneous responses whether deliberately or through misunderstanding questions, incomplete responses, fake responders, and receiving multiple responses from the same person (Bowen, Daniel, Williams, & Baird, 2008; Coomber, 1997; Rhodes, Bowie, & Hergenrather, 2003); ethical issues include allowing minors to participate in research without

6

parental consent (Rhodes et al., 2003); and the problems of recording IP addresses of respondents (Miller et al., 2007) which may breach their anonymity.

In addition, a growing tension exists between the perceptions of anonymity that are associated with digital technologies and the mass surveillance that they also facilitate. Research with young ecstasy users found that while some reported trust in the use of anonymising strategies such as use of pseudonyms to facilitate online drug discussions, others avoided such discussions for fear of being tracked and identified (Barratt, 2011). This fear is not unfounded in light of recent revelations of mass surveillance of digital communications (Lyon, 2014). It has also been argued that the increasingly public and traceable nature of online communications has fuelled the development of drug trading and discussions on the 'dark net', where participants can (again) act relatively anonymously (Barratt, Lenton, & Allen, 2013). This tension has implications for the conduct of internet-mediated research on sensitive topics, and is explored more fully in this paper.

The global cannabis cultivation study

Rationale

Our trans-national study aimed to better understand who is involved in small-scale cultivation, the diversity in cultivation practices and motivations, cultivators' experiences with and involvement in other criminal activities, and their interaction with different cannabis control policies. Accessing people for research purposes who cultivate cannabis is difficult: by remaining hidden, they avoid potential legal and social consequences that could result from their activities being revealed to others, especially law enforcement. We were aware through previous research projects (e.g. Potter & Chatwin, 2011) that some cannabis cultivators used the internet to share information and form communities. We designed a survey tool for online administration which was refined using a participatory approach facilitated by anonymous internet communications. Internet-mediated research methods suited our project because they enabled us to: engage with hidden populations of cannabis cultivators without revealing their identity, and reach a large number of cultivators globally in a cost effective way.

Content and design

The ICCQ is a 35-item survey designed to measure patterns of small-scale cannabis cultivation (Decorte et al., 2012). It was developed using both the content and methodology previously employed in Belgium, Denmark, and Finland (Athey, Bouchard, Decorte, Frank, & Hakkarainen, 2013; Decorte, 2010; Hakkarainen, Frank,

7

Perälä, & Dahl, 2011), and the study was expanded to include the United States, Canada, Australia, the United Kingdom, Germany, Austria, Switzerland, and the Netherlands. A 'rest of world' survey was also conducted, but this dataset has not been included in the current analyses. The questionnaire includes items on cannabis growing experience, methods and scale of growing operations, reasons for growing, participants' personal use of cannabis and other drugs, participation in cannabis and other drug markets, contacts with the criminal justice system, participants' involvement in other illegal activities, and demographic characteristics (all of which are reported by Potter et al., 2014). The ICCQ also includes items to screen for eligibility and recruitment source, and a final comments text box. Individual countries also added their own additional items or modules to the ICCQ (e.g., Hakkarainen et al. on medicinal cannabis use, Lenton et al. on attitudes towards regulation of cannabis, Paoli et al. on harms related to cannabis cultivation and Nguyen et al. on career transitions and grower networks, as described across this special issue). The questionnaire design drew from Dillman's Tailored Design method (Dillman, 2007), which involves treating the questionnaire as a conversation between respondent and researcher. The design of the ICCQ, including trade-offs to increase rewards, reduce perceived cost, and establish trust, is outlined in Barratt et al. (2012).

As noted previously, the process of participatory engagement was also part of our project design. Meaningful engagement of participant groups in health and medical research can be difficult to practically achieve when working with populations who must identify themselves with a stigmatised activity in order to participate. Participatory online research (see Barratt & Lenton, 2010; Potter & Chatwin, 2011; Temple & Brown, 2011) makes this process possible, given the need for the cultivators to remain anonymous. An important contribution of this process occurred when, during an online chat session facilitated by an Australian online cultivation community, a grower stated that he could not see a good reason to complete the survey as it would simply 'fill in unknown gaps for authorities'. As this view was shared by other growers during piloting, the team decided to include the following statement in the ICCQ: 'The general community typically has a very unrealistic view about people who grow cannabis. We want you to help set the record straight by completing this questionnaire.' As detailed below, the Australian team engaged with mainstream media, including radio, to promote the survey. During these instances, we attempted to honour our statement by continuing to describe the diversity of people who cultivated cannabis in Australia according to our emerging data. In this way, our research involved an ongoing online dialogue between growers and ourselves.

8

Governance, funding and ethics approval

The GCCRC team met annually in-person and as needed via conference calls or video conferencing. Funding was secured for in-person team meetings in Helsinki and Copenhagen. After deciding to conduct a comparable survey across multiple countries, our teams regularly met to plan the study details, using a collaborative style to come to agreements. Our Belgium team received external funding, our US/Canada team accessed an internal grant, and the remaining countries ran the project as part of their usual activities (see acknowledgements for funding details). Ethics approvals were obtained by Australia (Curtin Human Research Ethics Committee NDRI-01-2012), Belgium (Ethical Commission of the Faculty of Law of Ghent University), Denmark (Danish Data Protection Agency, J.no. 2012-54-0190), Finland (Ethical Committee of THL – Finland's National Institute for Health and Welfare), North America (Institutional Review Board at California State University, Long Beach; Approval #PHS 12 – 205), and UK (London South Bank University research ethics committee). Our Dutch and German research teams followed the same ethics protocols as the other sites, although they did not apply for formal ethics approval.

Participants recruited

Participants were recruited using the online participatory engagement approach. As described in Barratt et al. (2012), this approach involved constructing and maintaining a project website which included a blog (www.worldwideweed.nl) and a Twitter account, and engaging cannabis user groups through forum discussions and social media. The ICCQ drew on both the content and methodology previously employed in Belgium, Denmark, and Finland (Athey et al., 2013; Decorte, 2010; Hakkarainen et al., 2011), and expanded the study to include the United States, Canada, Australia, the United Kingdom, Germany, Austria, Switzerland, and the Netherlands. Table 1 summarises the data collection that occurred over an 18-month period in 2012–2013. A total of 8,423 eligible responses were collected from individuals who reported to be: 18 years or over, residents in the country of the survey, and reported having grown cannabis. Over three-quarters of these responses were included in the final sample for analysis.

[Insert Table 1 about here]

Table 1 demonstrates that it was much harder to recruit cannabis growers in the Anglophone countries than elsewhere, with the exception of the Netherlands. Belgium, Finland, and Denmark kept their surveys open for a shorter duration and have smaller populations than the US and UK, but were more successful at recruiting eligible respondents and had higher ratios in the included sample. The differences observed could not be solely attributed to lower effort expended by Anglophone

9

countries: for example, in Finland, the researchers promoted the survey on 3 local websites only (with no other active recruitment activities), while in Australia, a large number of labour-intensive strategies were employed. Although Finland's population is less than a quarter of Australia's, they recruited over twice as many participants in a shorter timeframe. The relative success of Belgium, Finland and Denmark may be explained by the established strong relationships between these researchers and their respective cannabis cultivation communities through their previous surveys; and although the German team had not conducted a prior survey with growers, they had successfully recruited drug users for other online research topics (Werse & Morgenstern, 2012) and had well-established contacts to important German-speaking cannabis and drug policy activists. It is also possible that surveys hosted by researchers who share the same unique national identity and language are better tolerated, or that growers in English language countries suffer from research survey fatigue (Witte, 2009) at a greater rate, given the higher relative number of English language research projects. The difference may also reflect differing levels of distrust regarding cannabis issues or research more generally.

Our researchers in the Netherlands tried a wide range of recruitment methodologies with relatively low success. The smaller Dutch sample may reflect the relatively negative publicity about cannabis cultivation (Wouters, 2013) and new stricter coffeeshop rules implemented during this survey period (van Ooyen-Houben, Bieleman, & Korf, 2014). It may also be the case that the Dutch have a relatively low prevalence of cultivation due to Holland's unique history of provision of cannabis through coffeeshops, although we are unable to test this proposition without access to comparative prevalence data on rates of cannabis growing.

Recruitment methods

Table 2 shows the methods used to recruit eligible respondents by country. The most important recruitment method was engagement with cannabis or cannabis cultivation groups, usually through their websites and online forums. Facebook, news articles, and referral from friends were the other main sources of recruitment. In this section, we describe our various recruitment efforts, their relative success and the kinds of issues we encountered.

[Insert Table 2 about here]

Online groups/websites

Overall, discussions and advertisements through online groups/websites accounted for about 40% of our included sample, with cannabis, cannabis cultivation and other drug groups/websites accounting for almost all of these. US/Canada relied most heavily

10

upon cannabis website/forum recruitment (61%), while close to half of the Finland and German samples were recruited through this route. Australia and Denmark were the most likely to recruit through other drug (not specifically cannabis) websites/forums, while UK and the Netherlands were most likely to recruit specifically through drug law reform websites/forums. Specialist medical cannabis websites/forums formed a very small proportion of the overall sample, having the highest reach in Finland (0.8%). Various methods were used, including: posting discussion threads about the project, requesting the inclusion of information in e-newsletters to group members, and creation of banners hosted at these websites. Researchers approached forum administrators and webmasters to ask them whether they would be willing to support the project and help promote it. While in many cases we were supported by administrators and webmasters and allowed to post our material to access their readers and communities, we were also often declined. For example, five out of the seven websites/forums approached by the US/Canada researchers did not respond to requests to promote the survey, despite numerous contact attempts, and our Netherlands team found that the webmaster of an important cannabis cultivation forum was also not interested in supporting the study. Research teams with a stronger history of conducting similar research were less likely to be declined.

When websites supported us, we invited discussions on their forum pages about the project and remained available to answer questions and concerns. In the main the project was positively received, but there were times when group members remained sceptical of us and our study, with concerns such as whether the promises of anonymity could be trusted and whether the study would be used to undermine cannabis cultivation and law reform. In some cases other group members defended the research by reference to the need for more basic understanding of cannabis cultivation and referring to previous research published by the research team that indicated our approach. In one example, a Danish respondent was offended by an ICCQ item which asked 'Have you sold any drugs other than cannabis or cannabis products in the last 12 months?', because she felt that we were assuming that cannabis growers obviously sell cannabis. This respondent posted these concerns within online discussions and others within these threads supported her, and advised others not to participate in this 'biased' and 'prejudiced' research. The Danish team responded that they regretted any offence and would make changes to avoid these concerns (described below). In this example, one person's negative interpretation of our questionnaire had an amplified effect through online discussions and it was very helpful for the researchers to respond promptly to prevent further escalation. Other issues we experienced as a result of interactive online recruitment efforts could be categorised as abusive. Researchers described receiving 'hate mail', sexually explicit emails and posts with sexual undertones directed at them (female research members

11

only) (see also Beusch, 2007), and some comments directed at researchers were described as aggressive, insulting and rude. These kinds of interactions were, however, a very small proportion of a generally positive reception.

Facebook

Facebook is increasingly used to recruit research participants into substance use research through targeted paid advertising (e.g., Bauermeister, Zimmerman et al., 2012; Ramo, Rodriguez, Chavez, Sommer, & Prochaska, 2014). It has also been used for active recruitment by researchers entering Facebook groups to discuss their project and/or creating their own pages to promote projects via Facebook users' existing social networks (e.g., Baltar & Brunet, 2012; Brickman Bhutta, 2012). In this study, we did not pay for Facebook advertising, mainly because it would be difficult for an effective advert to be crafted which met Facebook's content policy (see Ferner, 2014), and we were also concerned about the potential for tracking of people who clicked on this advert given the nature of the topic. Instead, we engaged with Facebook groups where cannabis was discussed. Some 14% of the included sample heard about the survey through Facebook. Unfortunately it is impossible to disentangle exactly how this recruitment occurred, as Facebook may be operating as an extension of word-of-mouth where friendship networks directly recruit through Facebook, or friends post articles which then act to recruit, or more like specific online groups (see above), where cannabis cultivators are members and information was posted directly by a researcher to those groups. Teams from Denmark, Australia, Belgium, Germany and the Netherlands posted the survey to a variety of Facebook groups covering cannabis cultivation, law reform, activism, medical use, etc. (with permissions from group moderators, see above), or members of these groups posted it on their Facebook sites by themselves. Although teams in Finland and the UK did not actively recruit using Facebook, a relatively high proportion of respondents from those countries reported first hearing about the study through Facebook.

Mainstream media

Mainstream media (including news articles, radio and television) accounted for how 10% of the included sample found out about the study, although these proportions varied considerably by country. Australia and Denmark were the most successful in using mainstream media for recruitment: Australia's eligible sample included 20% recruited through news articles and 17% from radio, while Denmark's included 39% through news articles and 3% through radio. The Australian team used media releases timed with specific events likely to increase uptake. These media releases included interim findings, after we found that the first media release, just about the study itself, attracted very little interest. Including interim findings gave the researchers something

12

to discuss, but may have affected the composition of the sample in favour of particular kinds of growers related to the published interim findings. For example, the Australian team generated widespread media coverage of the interim finding that half of the sample reported growing for medical reasons ("Backyard pot grown for health: survey," 2012). A Pearson's chi square analysis indicated that the growers the Australian team recruited who reported finding out about the survey through news articles or radio in the week following this story ($n = 80$) were more likely to report growing for medical reasons (64% vs 49% of rest of sample; $n = 492$, $chi^2 = 6.17$, $p = .013$). Other teams who sent out press releases or contacted news media to promote the study were usually unsuccessful, except for the Danish team who secured coverage in local and national newspapers.

Alternative news websites and specialist publications

Alternative news websites (e.g. Reddit, i09, Christiania.dk) played a minor role in overall recruitment, but a major role in the recruitment for US/Canada. Reddit is a website where group members post content they believe is of interest to other members and people's posts are voted up or down affecting the member's online credibility rating. The sub-reddit (or specific group) related to cannabis growing posted our survey, and we only became aware of it because of a spike in website hits recorded by Google Analytics (see later), which was then evident in recruitment question responses. Some countries promoted the survey through grower magazines (or online equivalents). This strategy had the most success in Germany where their local cannabis magazine strongly supported the research.

Google advertising and searching

After the success described by Temple and Brown (2011) in recruiting cannabis users through paid advertising on Google, we also tried using Google adverts. Unfortunately there was no way of determining whether respondents encountered the survey through a Google search or whether they clicked on a paid advert while using Google. The first campaign was conducted by the Australian team and ran for one month in August 2012. This team encountered some difficulties, including that Google would not initially run adverts with the term 'cannabis' in them due to their advert content policy (see Ferner, 2014). Some creative attempts at advertising the survey without using the term 'cannabis' can be seen at Figure 1 ('Screen of Green' or 'ScrOG' is a cannabis cultivation method or 'gardening style'). A further problem was that the price of the best keywords was very high. For example, click-throughs were charged at over $1 AUD each. In other cases, good keyword phrases (e.g., 'growing cannabis', 'growing marijuana', 'indoor gardening', 'grow hydroponic', 'grow room') were well sought after, meaning that the advert was not shown on the

13

first page of the search due to budget restrictions. In the Australian campaign, respondents were directed straight to the front page of the Australian survey. Google Analytics shows that 111 'new users' were recruited to this webpage from this campaign and stayed an average of 1:14 minutes on the site, in comparison to the website average of 9:18. No more than 21 eligible respondents could have begun the survey according to their self-reported recruitment source, which was somewhat disappointing.

When the majority of surveys were online, we launched a Google ad campaign which directed respondents to the international website, see Figure 1. We also promoted a YouTube clip at this time, which was a home-made video of the first author pitching the international study, available at https://www.youtube.com/watch?v=YU4RJ0Tbcu0 . Over a fortnight period in November 2012, there were 23 clicks on this international Google ad from search terms and 158 from display networks (these are networks of affiliated websites that display Google ads). The most useful keywords were 'growing cannabis', 'growing marijuana' and 'indoor gardening'. These keywords were notably less expensive when reaching an international audience than an Australian one (where there may be more competition for a set amount of targeted space). There were 494 views of the YouTube clip through advertising on YouTube, resulting in 69 clicks through to worldwideweed.nl. Google Analytics on worldwideweed.nl revealed that referrals from Google adverts stayed on the website an average of 7 seconds whereas YouTube referrals stayed an average of 3:44 minutes. However, only 7 of the total included sample nominated YouTube as their referral source.

<div align="center">[Insert Figure 1 about here]</div>

Google search/adverts were more successful in some countries than others. Targeted country-specific Google ad campaigns were only conducted in Australia, and the international campaign was only conducted in English. Its relative success in the UK may be because that country was the last to close their survey and so the survey itself might have arisen in searches more readily (the website itself or the numerous online references to the project). At only 3% of the overall included sample, this method was not as successful as we had originally hoped.

Twitter

Varying success has been reported at recruiting participants into health research using Twitter (Close et al., 2013; O'Connor, Jackson, Goldsmith, & Skirton, 2014). As part of our online participatory engagement approach, we created a Twitter account (@Wor1dWideWeed) which we used to post announcements about the project and which was visible from our website. Belgium, Germany and the Netherlands also used

14

Twitter to promote their respective surveys in their own languages. In late 2012, when most country's surveys were open, we used the main Twitter account to target Twitter users who discussed cannabis, as it was difficult to find people who discussed cannabis cultivation only. TweetAdder software was used to scan Twitter for cannabis related content, automatically follow these accounts, and automatically message them with an invitation to complete the survey only if that account 'followed back' Wor1dWideWeed. While it was impossible to know the demographic characteristics of this sample, they were all posting English-language tweets which may explain why the bulk of the Twitter recruited sample was from the English-speaking countries. Again, as per Facebook, it was not possible to disentangle the effect of our deliberate efforts on Twitter from the word-of-mouth effects. While Twitter was relatively unsuccessful here (0.7% of the included sample), TweetAdder software could be fully automated and run over a longer period of time, and could therefore provide a reasonably efficient way of recruiting respondents. While full automation is possible, it would still be important for a real person to actually respond promptly to tweets and messages asking questions about the project (see Sibona & Walczak, 2012). Also, Twitter had a relatively low ratio of included respondents from eligible (65.7%), meaning more people had to be reached to result in the same number of completed responses compared with other methods. Twitter may not be the most time effective online recruitment tool; for example, in one study of parents, Twitter was the least time effective method (Close et al., 2013).

Other recruitment methods

Belgium's most effective recruitment method was their flyer/poster campaign. In the summertime, flyers were distributed and posters hung at festivals, in universities, colleges, pubs, libraries, cinemas, theatres, concert halls, art academies and cultural centres. Overall, some 4,000 posters and 10,000 flyers were distributed in Belgium (Decorte et al., 2014; see also Paoli et al., 2014). The distribution process involved in-person contact with potential participants, which facilitated the building of trust and rapport, and allowed interested participants to ask questions directly of the research group. While other countries (Australia, Denmark, Germany and the Netherlands) also distributed flyers, posters or cards to individuals and also to growshop, headshop or coffeeshop owners, only the Belgium team had dedicated funding to support the resources required to engage large numbers of the target population in-person one-on-one. This key difference may explain why flyers/posters were not an effective recruitment method outside of Belgium; however, it is difficult to know whether some of the people who heard about the survey 'through friends/family/associates' were actually given these paper materials by their networks.

15

Recruitment through snowballing (friends/families/associates) was the fourth most effective recruitment method (8% of included sample). Interestingly, snowballing contributed more substantially to the Belgian, Finnish and Danish samples, the three countries that had history conducting surveys with this community. Online chat, specifically Internet Relay Chat (IRC), was mentioned as a recruitment method by a small proportion of mainly Finnish respondents. As Finland did not engage directly in IRC discussions, we can assume that IRC recruitment was an equivalent of word-of-mouth recruitment.

Testing recruitment biases

In Table 3, we have provided selected descriptive statistics to explore differences in demographic, drug use and growing characteristics of the global sample categorised by 5 recruitment sources; three were the most popular (cannabis/cultivation websites/groups, Facebook, news articles) and two were of interest due to their novel use as recruitment tools (Google, Twitter).

[Insert Table 3 about here]

The gender ratios of the samples were similar across recruitment sources. News article, Google and Twitter samples were older than for cannabis groups and Facebook. In keeping with the older age, news article and Twitter (but not Google) respondents were more likely to report having grown more than 5 crops over their lifetimes, but this increased reporting of 'ever' variables did not hold for police contact which was not greater among the older samples. Cannabis groups and Facebook respondents were more likely to report recent use of other drugs, perhaps also explained by their younger age. We might expect a greater difference between the online recruitment methods and news articles with regard to the proportion of respondents who report communicating with other growers online (that they 'have not met face-to-face'); however, this split is complicated by the fact that much mainstream news media is now consumed online, and there was no way to separate out respondents who found out about the survey through digital or analogue media.

The last five variables shown in Table 3 relate to cannabis cultivation patterns. Despite other subsample differences, the proportion of current growers and the typical numbers of plants per crop, yield per crop, and space used to cultivate cannabis were remarkably similar across recruitment modes. The similarity of these variables should give us some confidence that recruitment source has not played a major role in determining the growing patterns of our sample. We did find, however, that a lower proportion of respondents recruited through news articles reported typically growing cannabis indoors compared with cannabis groups, Google and Twitter.

16

There are limitations to this analysis. We have not controlled for differences by country of residence which may account for differences between recruitment sources. Similarly, any measures which relate to ever having done something are more likely to have occurred in older groups, but we have not controlled for age. A more detailed analysis is beyond the scope of this paper, but would be helpful in future trans-national online survey studies to tease out these differences.

Merging, cleaning and translation

Comparative survey methods encounter various challenges: when the aim is to create comparable datasets, one must also be sensitive to different cultural responses to survey procedures and translated items (Harkness, 2008). Here we describe the data preparation procedures we implemented and the issues encountered.

Eight distinct datasets were created through the surveys. Different research teams had access to different survey software packages: Australia, Denmark and the UK used Qualtrics, the Netherlands and US/Canada used Survey Monkey, Belgium used SurveyGizmo, Finland used Webropol, and Germany (including the Swiss and Austrian samples) used LimeSurvey. Three of eight datasets were collected in English, while the remaining five surveys were first translated into local languages by the research teams. In these cases, text-based other responses required translation back into English before merging. The use of different survey packages and different languages necessitated a complex procedure to accurately stitch the master dataset together. We documented each variable, noting its merged and original variable names and which countries included a fully compatible variable or a variable that could be recoded to be fully compatible. Recodes included standardisation of measurements (imperial/metric) and recoding of continuous responses to match ordinal response categories. Checks on each question were conducted to inspect for problems like large amounts of missing data, numbers without corresponding value labels, or any other unusual looking data.

Once the datasets were merged, we ran various cleaning and coding procedures. We tested for incompatible responses, for example if respondents stated that they began growing cannabis at an age older than their reported current age. We standardised the treatment of nested questions, which was a problem mainly due to the wide variety of data structures resulting from the use of multiple survey software packages. Responses that were collected using numeric continuous scales required cleaning, for example, yield, proportion of cannabis consumed/sold, etc. Nine questions in the ICCQ offered a text response option for the 'other' field. Responses that could be coded into existing categories were recoded, responses that were not valid were recoded to zero or missing, popular true other responses were recoded into new

17

response categories, and unique other responses were left as 'other'. Research teams were consulted during this process to tease out the meaning of translated other responses and to determine the best way to represent these responses in the recodes.

We also dealt with outliers on a variable-by-variable basis. One such variable was typical yield per plant. The dataset contained one respondent claiming 1000+ ounces per plant, seven respondents claiming between 250 and 370 ounces per plant, and eight more claiming 100+ ounces per plant. While it is indeed possible to grow very large plants, this question asks about typical yield. The research team agreed that it was very unlikely that these claims were true typical yields and much more likely that they were either mistakes or exaggerations (the other data from these respondents were also checked and did not appear to be incongruent or incoherent). Therefore, we recoded these values to missing while keeping the cases in the final dataset.

Another issue, which we described in part earlier, was incompatible questions that resulted from responding to participant concerns. As noted above, the Danish team changed the structure of their questionnaire in response to a formal complaint from one respondent who read the question as assuming that growers obviously sell cannabis, when this was not the intent of the question, and nor did it spark this concern for any other countries. As a result of this change, the Danish data were not comparable with the main dataset on this question, because only respondents who had reporting selling cannabis in an earlier question were asked about selling other drugs.

A procedure that is often recommended to remove duplicate cases from web surveys is to screen out additional responses from the same IP address, especially if other details are the same (Bauermeister, Pingel et al., 2012; Bowen et al., 2008). We were aware that our target population required a more robust guarantee of anonymity if they were to complete the questionnaire, so we did not collect IP addresses. We considered it unlikely that any more than a few respondents would complete the survey on more than one occasion, especially as we offered no extrinsic incentives (lotteries, prizes, payments) for participation. Nevertheless, we scanned the dataset of eligible cases for duplicates using SPSS Duplicates command (IBM Corporation, 2012), matching cases on the following variables: country, age of first grow, time since last grow, number of crops grown, number of times failed before succeeding, number of people grown with, number of people who knew about growing, communication with growers online, typically growing indoors or outdoors, number of mature plants typically grown, typical weight of crop, age and sex. This analysis identified 8 possible duplicate cases or 0.1% of the included sample (n=6,528). As we could not exclude that these cases involved different individuals and because including these cases had no effect on the substance of the results, these cases were not excluded from the sample.

18

Discussion

This project was successful in recruiting the largest known global sample of cannabis growers. Comparable questions were asked across multiple countries and in multiple languages, allowing the comparison of growing practices (Potter et al., 2014), policy attitudes (Lenton et al., 2014) and medical cannabis cultivation (Hakkarainen et al., 2014) trans-nationally. Here we reflect on two issues where we contend that our experiences can assist other teams who are planning international online surveys, and then conclude with some recommendations for future practice.

Conducting trans-national online surveys

The use of internet research tools enables comparable online surveys to be run across multiple countries and in different languages; however, such trans-national survey research involves multiple challenges (Harzing, Reiche, & Pudelko, 2013). One consideration when designing a trans-national online survey is whether to have multiple surveys hosted by each research group nationally or whether to use a single standardised questionnaire that could be shown in different languages. We chose to conduct multiple surveys across eight different research groups in 11 countries. Through this approach, each individual team could develop and launch their survey in the appropriate language(s) at a time of their choice based on their workloads and preferences (see Table 1). Individual countries who had already built trust with their growing communities could utilise this trust via directly hosting the survey, and they were also able to react quickly to local community concerns about survey items (as in the Danish experience described above). The freedom available through this approach meant that different countries were able to work together on a comparable survey while still taking their own path on some issues important to them. For example, to enable the specific quantitative analysis to be conducted to test their hypotheses of interest (see Nguyen et al., 2014) the US/Canada team employed continuous response scales for some items although the group as a whole had otherwise decided that those items would be best presented with ordinal categories after piloting indicated a degree of fatigue using continuous response. The use of multiple surveys allowed US/Canada to present the items this way, while their data could still be recoded to match the ordinal categories of other countries in the merged dataset.

There were, however, some serious challenges associated with multiple surveys and datasets. As described above, much work was required to merge eight datasets with different structures and languages into one, and while there were rigorous checks in place, the existence of this extra process may have introduced error into the dataset. Different dataset structures meant that different kinds of metadata were collected which restricted comparability of datasets. For example, start time and end time were

19

not routinely collected so we could not accurately report on the length of time taken to complete the survey. Although it was useful for individual countries to have freedom to amend their surveys from the original ICCQ, in some cases items were incompatible with the standardised questions (e.g. employment status asked as singular or multiple response). In other cases, such as the ICCQ item on recruitment source, some countries' movement of the item from the beginning of the questionnaire to the end affected the comparability of the results (see Table 2). Some of these problems could have been dealt with at the time by having a greater focus across the research groups on checking surveys for comparability before launch.

While many such issues would be resolved through use of a single database with in-built translation, building and maintaining this data structure would require a (funded and qualified) programmer and data manager. We did not have access to funds to resource this position. Issues around storage and ownership of data would also become more complex using a single database. For example, agreements may be needed between multiple universities to facilitate one main university hosting the survey and ensuring the intellectual property rights of all research group members. Nevertheless, working through these issues and obtaining funding for a dedicated database developer and data manager would dramatically reduce the amount of time needed to process data from a survey of this nature and would avoid some of the comparability problems we encountered. Working towards agreements about fundamental trade-offs in survey design would be required for research groups who take this more standardised option.

The limits of anonymity under mass surveillance

A key aspect of digital research methods often cited as appealing when used to study sensitive topics is anonymity (Kays et al., 2013; Miller & Sønderlund, 2010). The respondent may complete the questionnaire without having to engage with the researcher in-person, and if the questionnaire is designed to be anonymous, they are also not required to provide any identifying information. However, the anonymity of online research participants is more complex than is reflected in this account. We increasingly live in an era of mass surveillance, especially mass digital surveillance, where IP addresses of visitors to websites are routinely tracked and stored to inform targeted advertising but also as a method of detecting and tracking individuals (Lyon, 2014). Concern about government surveillance has increased after the release of documents outlining the activities of the NSA (US National Security Agency) by Edward Snowden (Larson, Perlroth, & Shane, 2013). In this context, cannabis cultivators may doubt that any researcher can protect them from surveillance while they reveal incriminating information through an online survey, making the oft-cited benefit of anonymity through digital methods obsolete.

20

We were aware of this legitimate concern during construction of the ICCQ and decided not to collect IP addresses from questionnaire respondents. We also included the statement 'for added protection participants are welcome to use an anonymiser (e.g. Tor)' in our introductory information. The Australian team received positive feedback from participants when the researchers acknowledged that they understood that although they had taken every step possible to protect participants they could not control mass surveillance by third parties, and encouraged participants to utilise anonymising software if they were concerned about this. However, other countries (Germany, Finland) removed this statement from the participant information because they believed that the statement could cause undue suspicion. This concern was also why some countries did not use Google Analytics (GA) on their survey front pages.

The main project website, and some of the survey front pages, used GA to track which promotion methods worked and which websites were promoting the project. While GA uses IP addresses to track how website visitors get to websites and how long they stay, the researchers do not have access to this information and it cannot be matched to the information collected by the survey clients. The GA data would have been a lot more useful if all countries had used GA as a gateway to their questionnaires (resolvable if we had used one database, see above); however, it was still very useful to identify websites that were promoting our survey without our knowledge, which prompted us to join these conversations in a timely fashion. During the data collection period, some respondents from Finland and UK identified that we were using GA on the website and asked how we reconciled this use with our statement that we did not collect IP addresses. Although we were not directly collecting IP addresses, we were allowing Google to do so. These tensions are important for researchers designing future international online projects to consider: that in a world of increasing online surveillance, there are trade-offs associated with the collection of metadata online and the perception of (and actual) technical anonymity of respondents. One option may be to host research surveys within the Tor hidden services network so that respondents' IP addresses are automatically masked. A problem with this approach is that we can never be entirely certain that Tor will be or currently is completely secure (Mansfield-Devine, 2014). Furthermore, in 2014, it was reported that the NSA are targeting individuals who use privacy software including email encryption and Tor hidden services (von Appelbaum et al., 2014). By directing participants towards these tools, we may guide them into a more dangerous situation of being digitally targeted. We would also unduly limit the scope of our samples to exclude any individuals who are not willing to use Tor.

21

Conclusions: expanding participatory research

In addition to the two major lessons detailed in the above discussion, our experiences allow us to share a number of recommendations and observations with future researchers wishing to conduct comparative trans-national internet-mediated research targeting hidden populations:

1. Piloting with a group of the target population should not be undervalued and can be facilitated by a participatory approach using digital technologies. In this case, the pilot feedback greatly improved the validity and acceptability of the questionnaire.

2. It is crucial to have a researcher on the project in each country throughout the survey period to respond to critical comments, and engage in online discussions, in order to reduce the spread of negative attitudes towards the survey. Careful monitoring of online discussions and interjection where necessary is required and can be assisted by tracking technology, such as GA.

3. When researching hidden populations who are concerned about the possibility of being identified, the utmost care should be taken to preserve anonymity, including by not collecting IP addresses. Related to point 2 is that there is a tension between monitoring online discussions and collecting identifying information about discussants that needs to be carefully managed, especially when dealing with incriminating information.

4. Internet-mediated recruitment can take on a life of its own, snowballing in online communities beyond those targeted by researchers. This phenomenon further emphasises the need for careful monitoring, see point 2.

5. There is much promise in a variety of internet-mediated recruitment modes, but in our case, Twitter and Google Ads performed poorly. There is much still to be learned about how to optimise the use of social media to recruit samples whether through paid targeted advertising or through online participatory engagement.

6. Different methods of recruitment did not produce hugely different sample characteristics, especially when comparing key cultivation characteristics. It is essential in projects like these that a question item measuring where the respondent found out about the survey is included, to facilitate such testing of sample biases.

7. Elsewhere in this volume, Barratt & Lenton (2014) compare the online purposive sample of Australian cannabis growers with a matched sub-sample accessed from a general population survey, finding that the samples did not differ by key characteristics of age, employment and daily cannabis use, although the online sample was significantly more male. From this analysis and our experiences described above, we recommend that researchers consider

22

employing a broad-based recruitment strategy that includes both targeted digital engagement with specialist websites, mainstream media coverage, and in-person fieldwork.

8. Mirroring our recommendations regarding the optimal ways to recruit research participants, it has also been our experience that working together as a team works best when relationships are maintained in-person as well as through digital communication technologies.

An underlying theme here is of *participatory research* (Barratt & Lenton, 2010) – full and meaningful engagement with the target research population as a means of improving both the quantity and quality of data to be obtained. At the stage of designing a questionnaire, participatory research can help to maximise the advantages of utilising Dillman's Tailored Design approach (Dillman, 2007); engaging with existing cannabis groups allowed us to develop a questionnaire that was attractive to the target audience as well as to the research team. During the initial recruitment phase, participatory approaches allowed us not just to access a broad range of cannabis growers, but to successfully encourage many of them to participate. Ongoing monitoring of – and participation with – the various (online and offline) groups who promoted us allowed us to deal with queries, criticisms and other problems as they arose, and there was much evidence that this ongoing participation further increased our overall response levels. Similarly, disseminating research results among target populations can also help recruitment and participation in the future: our Australian team noted a peak in survey responses after disseminating some interim findings, and those European teams with known previous research into cannabis cultivation seemed to recruit more easily. It is also worth mentioning, although not discussed here (or in any of the other papers in this volume reporting on the ICCQ), the wealth of qualitative data that is generated through online discussion forums and responses to open-ended survey questions, much of which is also in response to researchers' participatory engagement with their target population (see Potter & Chatwin, 2011, 2012). In short, the participatory approach (conducted both on and offline) in combination with internet-mediated research methods is successful in engaging otherwise hidden populations in large-scale survey research.

Acknowledgements

23

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29

Table 1: Summary of recruitment period, methods and totals

Dataset	Opening date	Closing date	Months open	Online recruitment strategies	Traditional recruitment strategies	Total eligible respondents	Total included respondents	Included /eligible (%)
United States / Canada	3/05/2012	13/02/2013	10	Yes	No	1038	708	68.2
United States						943	645	68.4
Canada						95	63	66.3
Belgium	1/06/2012	15/12/2012	7	Yes	Yes	1454	1065	73.2
Australia	13/07/2012	28/02/2013	8	Yes	Yes	574	491	85.5
Finland	24/09/2012	24/03/2013	6	Yes	No	1284	1179	91.8
Denmark	1/10/2012	31/03/2013	6	Yes	Yes	884	813	92.0
United Kingdom	18/10/2012	15/10/2013	12	Yes	No	704	418	59.4
Germany / Austria / Switzerland	27/11/2012	29/05/2013	6	Yes	Yes	2067	1577	76.3
Germany						1743	1347	77.3
Austria						187	129	69.0
Switzerland						137	101	66.3
The Netherlands	11/12/2012	12/08/2013	8	Yes	Yes	418	277	66.3
All countries	3/05/2012	15/10/2013	18	Yes	Yes	8423	6528	77.5

Note. Respondents were eligible if they (a) resided in the country of the survey, (b) reported to be 18 years of age or older, and (c) reported they had grown cannabis at least once in their lifetime. Only eligible respondents were presented with the complete survey. Eligible respondents were included in the final sample if they (a) reported growing cannabis in the previous 5 years, and (b) had completed 50% of more of 22 survey items asked of all respondents.

Table 2 – Methods of recruiting eligible cannabis growers by country

Recruitment source[a]	Percentage of eligible sample recruited through this method								Total Eligible	Exclude: 5yr + since grow[b]	Exclude: <50% complete	Total Included	Ratio Include/ Eligible	% Included sample
	US/CA	BE	AU	FI	DK	UK	DE/AT/CH	NL						
Cannabis/cultivation website/forum	61.3	6.9	21.6	49.0	1.5	11.8	42.1	27.0	2568	310	122	2136	83.2	32.7
Facebook	0.0	12.2	13.8	10.0	19.0	18.3	19.3	1.7	1087	151	52	884	81.3	13.5
News article (print/online)	0.0	9.6	19.9	1.0	38.9	13.8	6.9	2.9	862	109	38	715	82.9	11.0
Through friend/family/associate	1.8	11.3	5.1	12.8	9.8	3.7	3.0	3.1	564	53	16	495	87.8	7.6
Flyer/Poster	3.8	0.0	10.1	5.1	1.4	3.3	11.3	0.0	432	67	38	327	75.7	5.0
Other drug website/forum	0.0	21.5	0.0	0.1	1.7	0.6	0.4	1.4	346	24	3	319	92.2	4.9
Alternative news website (Reddit, io9, christiania.dk)	18.8	0.3	1.2	0.0	1.7	6.0	0.0	0.0	264	34	24	206	78.0	3.2
Google search/advert	4.2	2.7	3.7	4.4	1.2	9.8	1.4	1.4	274	41	30	203	74.1	3.1
Grower Magazine	0.0	0.2	0.5	1.1	1.1	1.8	8.6	0.2	221	21	10	190	86.0	2.9
Radio	0.0	0.3	16.7	0.2	2.9	0.1	0.0	0.0	130	9	0	121	93.1	1.9
Email/e-newsletter	0.0	4.3	2.3	0.3	0.2	1.1	1.5	4.1	138	24	2	112	81.2	1.7
Drug law reform/user website/forum	0.0	0.0	0.2	0.2	0.0	5.3	0.2	6.5	71	4	8	59	83.1	0.9
Through the University	0.0	1.0	0.7	1.2	1.7	0.7	0.4	0.0	63	6	0	57	90.5	0.9
Twitter	1.0	0.5	1.0	0.0	0.0	4.1	0.4	1.7	67	17	6	44	65.7	0.7
Magazine	3.2	0.3	0.2	0.1	0.2	0.1	0.4	0.7	54	16	4	34	63.0	0.5
Online chat	0.0	0.0	0.0	1.9	0.0	0.1	0.0	0.0	27	3	0	24	88.9	0.4
Growshop/headshop/coffeeshop	0.0	0.1	0.3	0.0	0.9	0.0	0.0	3.6	27	3	0	24	88.9	0.4
Medical cannabis/patient website/forum	0.0	0.0	0.0	0.8	0.2	0.0	0.3	0.0	19	1	0	18	94.7	0.3

Television	0.0	0.3	0.7	0.2	0.5	0.3	0.0	0.2	19	2	2	15	78.9	0.2
YouTube	0.1	0.3	0.0	0.1	0.0	0.0	0.0	0.0	7	0	0	7	100.0	0.1
Other online referral, not elsewhere classified [c]	0.0	0.1	0.0	1.1	15.0	7.8	0.5	0.0	214	19	4	191	89.3	2.9
Other, not elsewhere classified [c]	0.0	0.1	0.2	0.0	0.1	0.6	0.0	0.0	7	1	0	6	85.7	0.1
I don't know [d]	NA	NA	0.5	1.8	0.5	1.6	0.6	1.0	58	15	4	39	67.2	0.6
I don't want to answer [d]	NA	NA	1.0	4.0	0.9	4.3	1.4	1.2	129	41	10	78	60.5	1.2
Missing [e]	5.9	28.2	0.3	4.6	0.5	4.8	1.2	43.3	775	252	299	224	28.9	3.4
Total N	1038	1454	574	1284	884	704	2067	418	8423	1223	672	6528	77.5	100

[a] Respondents were asked 'How did you first find out about this survey?' and chose from a list of responses or provided a text response. [b] Respondents were excluded if they reported it was 5 years or more since their last grow, or if they did not know or did not want to answer or skipped this question ('How long ago did you last grow cannabis?'). [c] Other text fields were translated and recoded into other categories where possible. In the cases of Denmark and UK which recorded relatively high unclassified other responses, these countries provided an option to respondents which could not be further categorised, e.g. 'online forum discussion' and 'uncategorised website'. [d] North America and Belgium did not provide don't know or refuse options; all other countries did. [e] The unusually high proportion of missing data for Belgium and the Netherlands can be explained by the placement of this item near the end of the survey by these countries, by which time a larger proportion of respondents had dropped out of the survey. All other countries placed the item immediately after the eligibility questions at the beginning of the survey.

Table 3 – Demographic, drug use and cannabis cultivation profile of respondents recruited through cannabis/cultivation websites, Facebook, news articles, Google search/ads and Twitter

		Cannabis/cultivation websites/groups	Facebook	News article (print or online)	Google search/ads	Twitter
Sex (male)	%	94	87	92	89	90
	Total valid N	2045	847	703	187	42
Age	Median (IQR)	27 (22-35)	27 (22-36)	31.5 (24-45)	30 (23-39)	37 (32-45)
	Total valid N	2075	841	696	192	40
Daily cannabis user (last month)	%	18	29	28	28	38
	Total valid N	2112	864	705	200	42
Recent other drug user[a] (last 12 months)	%	37	41	24	33	18
	Total valid N	2127	877	708	203	44
More than 5 crops grown (ever)	%	36	37	47	37	50
	Total valid N	2040	843	688	195	40
Communicates with other growers online[b]	%	56	43	32	34	56
	Total valid N	2059	854	702	196	41
Police contact re cannabis cultivation (ever)	%	15	19	13	21	10
	Total valid N	2084	855	699	194	42

Current grower (last 12 months)	%	78	71	78	72	73
	Total valid N	2136	885	715	204	44
Typically grows indoors	%	59	43	38	58	57
	Total valid N	2126	876	702	197	44
Typical number of mature plants per crop	Median (IQR)	5 (2-10)	4 (2-9)	4 (2-10)	4 (2-8)	5 (2.5-7)
	Total valid N	1931	810	686	179	41
Typical yield of usable dry cannabis per crop (ounces)	Median (IQR)	7 (3-16)	8 (4-18)	7 (4-18)	8 (4-18)	8 (3-12)
	Total valid N	1427	667	595	119	33
Typical space used to cultivate cannabis (m^2)	Median (IQR)	2 (1-4)	2 (1-5)	3 (1-6)	2 (1-5)	2 (1-6)
	Total valid N	1826	778	646	186	38

[a] Reports use of illicit drugs other than cannabis, hash, or synthetic cannabis in the past 12 months. [b] Responds 'yes' to the question 'Do you communicate with other cannabis growers online that you have not met face-to-face?'.

Figure 1. Google Adverts.

Global Cultivation Survey
Help us break stereotypes through
this anonymous online survey
www.worldwideweed.nl

Screen of Green (ScrOG)
Tell us about your gardening method
at our 15-minute anonymous survey
www.worldwideweed.nl

Do you grow?
Curtin Uni seeks growers for
15-minute anonymous survey
ndri.curtin.edu.au/research/grow/

Growing guide
Guide us about your growing methods
- complete our 15-minute survey
ndri.curtin.edu.au/research/grow/