

**Centre for International Health**

**Development, implementation and evaluation of pictorial health  
education for  
low- literacy, low-resource communities**

**Jeremy Christopher Barrett**

**This thesis is presented for the Degree of  
Master of Philosophy (International Health)  
of  
Curtin University**

**March 2017**

## **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.

**Human Ethics** (For projects involving human participants/tissue, etc) 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 March 2014. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number #SON&M5-2003

Signature:

Date: 5<sup>th</sup> March 2017

## Abstract

Rural and remote communities often face significant challenges to maintaining their health and well-being. In developing countries these challenges are further compounded by:

1. limited access to clean water
2. ineffective sanitation
3. low education and literacy levels
4. wide-spread unawareness that simple personal hygiene practices can reduce the risk of transmitting communicable infectious diseases.

Existing health education materials distributed within such communities are often presented in a traditional written format, making them inaccessible to people with low literacy levels. Evidence supports, however, an alternative approach to communicating health promotion messages using picture-based materials rather than the conventional written formats.

This research has assessed the effectiveness of a cartoon-based pictorial educational tool (CBPET) to communicate key messages about hygiene and bacteria contained within:

5. the environment, such as soil, water, and sewage
6. bodily fluids, such as blood, saliva, and nasal secretions.

The tools developed have been tested in a Tanzanian village environment representative of a low literacy and resource poor community. The research has found that the CBPET was effective in the delivery of information to this representative community. It is possible that other vital healthcare education may be able to be communicated in a similar fashion.

## Acknowledgements

A number of parties have greatly assisted in the completion of this thesis. I am extremely grateful, firstly, for the guidance and support provided by my primary supervisor, Professor Jaya Dantas, in the International Health Programme, School of Nursing, Midwifery and Paramedicine, Curtin University. I also appreciate the feedback and direction provided by my co-supervisor, Professor Mark Jones, these have been invaluable.

Professor Mark Jones saw something in me that no one else had noticed. He recognised that I had the potential to contribute towards society in a way that many others had not; although he did not know it at the time a chance visit to an art shop led to a 'Pygmalion' moment that has changed both of our lives and for which I will always be in his debt.

My wife, Rowena, and my two boys, Dante and Arlo, have all contributed to my work; they have supported me during those episodes of self-doubt and thoughts of quitting this study. The boys have accepted my absence from family life and allowed me to finalise my thesis. And lastly to my Dad, Chick Barrett, Rest in Peace and thank you for everything you have taught me

With the time, input and sheer skill of a friend and great artist, Ian Coate (<http://www.iancoate.com/>), my visual tool would have been a pathetic sheet of paper with badly drawn stick figures scrawled over them. Ian has the uncanny ability to understand my erratic thought process and create images that have a multitude of actions imbedded into them. I still feel that the image content and quality of any future design of any picture based education system will require an illustrator of similar skill.

A special thanks to Brian and Annette Kent. In the early years of 'First Aid in Pictures' Brian triggered my long repressed urge to transfer my knowledge of life saving skills to those in our community that do not possess the textual literate skills to be able to read it in the thousands of books related to the subject. Brian's work with, and later introduction to, the Elders of the Noongar people led me to understand the great requirement for such basic education on my own doorstep here in Perth and out to the various communities in remote Western Australia.

## Table of contents

<b>Abstract .....</b>	<b>iii</b>
<b>Acknowledgements .....</b>	<b>iv</b>
<b>List of Figures .....</b>	<b>9</b>
<b>List of Abbreviations .....</b>	<b>13</b>
<b>Table of Appendices.....</b>	<b>14</b>
<b>Prologue .....</b>	<b>15</b>
<b>CHAPTER 1 .....</b>	<b>16</b>
<b>Introduction and Overview .....</b>	<b>16</b>
1.1 Introduction.....	16
1.2 Professional Context of the Research .....	17
1.3 Background to the Research .....	20
1.3.1 Use of pictures, symbols and cartoons in early communication – A form of Visual literacy .....	20
1.3.2 The use of icons and symbols.....	22
1.3.3 The use of pictures in healthcare .....	25
1.3.4 Development of my cartoon-based pictorial educational tool (CBPET) .....	26
1.4 Aim and Objectives of the Research .....	27
1.5 The Research Process .....	27
1.6 The Significance of the Study.....	28
1.7 The Thesis.....	29
1.8 Summary .....	30
<b>CHAPTER 2 The Context of the Study: Tanzania (health and human indicators).....</b>	<b>31</b>
2.1 Introduction.....	31
2.2 Regional Con Information.....	31
2.2.1 Tanzania.....	31
2.2.2 Pwani Region.....	33
2.2.3 Kisaware District .....	34
2.2.4 Mlegele and Masanganya Village .....	34
2.3 Human Development Indicators (HDI): Tanzania .....	35
2.3.1 Multidimensional Poverty Index (Salami, Stampini, Kamara, Sullivan, & Namara): Tanzania.....	36

2.3.2	The health status: Tanzania.....	37
2.3.3	The education status: Tanzania.....	37
2.3.4	Millennium Development Goals and Tanzania.....	37
2.4	The Village Hierarchy in Tanzania.....	42
2.4.1	Community health system.....	42
2.5	Summary.....	46
<b>CHAPTER 3 Literature Review .....</b>		<b>48</b>
3.1	Introduction.....	48
3.2	Pictorial Communication and literacy Skills.....	48
3.3	Picture-based Learning.....	51
3.4	Health literacy and Basic Hygiene.....	54
3.5	Basic Hygiene.....	59
3.6	HIV.....	61
3.7	Burns.....	64
3.8	Summary.....	67
<b>CHAPTER 4 Study Design and Methods.....</b>		<b>68</b>
4.1	Introduction.....	68
4.2	Study Design.....	68
4.3	Phase One (Development of the cartoon-based pictorial education tool).....	69
4.4	Phase Two (Implementation).....	71
4.4.1	Questionnaire design.....	74
4.4.2	Data collection.....	75
4.5	Phase Three (Data analysis).....	80
4.6	Ethical Issues.....	80
4.7	Quality Criteria.....	82
4.8	Summary.....	84
<b>CHAPTER 5 The Tool Development.....</b>		<b>85</b>
5.1	Tool Design Concept.....	85
5.2	Design of Human Images.....	89
5.3	Design of Phlegm Bug.....	91
5.4	Design of Blood Bug.....	92
5.5	Design of Water Bug.....	92

5.6	Design of Poo Bug .....	93
5.7	Design of Mud Bug.....	94
5.8	Design and Layout of Tool Content .....	94
5.9	Design of Tool Icon and Logo.....	97
5.10	Summary .....	100
<b>CHAPTER 6 Results of Phase 2 Demographics and Participant Characteristics .....</b>		<b>102</b>
6.1	Introduction.....	102
6.2	Demographic Data .....	102
6.2.1	Gender.....	102
6.2.2	Age .....	103
6.2.3	Marital status .....	103
6.2.4	Number of children.....	103
6.2.5	104	
6.2.6	Religion.....	104
6.2.7	Education level .....	104
6.2.8	Profession.....	105
6.2.9	Access to government supplied health services.....	106
6.2.10	Access to traditional healers .....	106
6.3	Participants' Hygiene Knowledge .....	107
6.3.1	Participants' knowledge of infection cause, infection transmission and hygiene practice .....	107
6.3.2	Participants' knowledge of germs.....	107
6.3.3	Participants' knowledge of where germs live.....	109
6.3.4	Participants' knowledge of germ transmission.....	111
6.3.5	Participants' knowledge of germ infection .....	114
6.3.6	Participants' previous education experience in hand washing.....	117
6.3.7	Participants' understanding of importance of hand washing with soap 118	
6.3.8	Participants' access to soap.....	120
6.3.9	Participants' frequency of hand washing .....	121
6.3.10	Indicators that prompted hand washing.....	122
6.3.11	Participants' access to water.....	123
6.4	Type of Container Used to Wash Hands .....	124
6.4.1	Does soap and water kill germs? .....	124

6.4.2	Impact of the Educational Tool.....	126
6.4.3	Literacy.....	127
6.4.4	Hygiene.....	127
6.4.5	Transmission of germs.....	128
6.4.6	Participants' comments on the tool.....	129
6.5	Summary.....	130
<b>CHAPTER 7 Discussion, Recommendations, Significance and Conclusion.....</b>		<b>131</b>
7.1	Introduction.....	131
7.2	Brief Overview of Research Design.....	132
7.3	Discussion: Response to the Research Objectives and Questions.....	134
7.4	Outputs from the Study.....	136
7.5	Recommendations from the Study.....	138
7.5.1	Recommendations for community organisations.....	140
7.5.2	Recommendations for community health workers.....	140
7.5.3	Recommendations for the design of future health care education publications.....	141
7.5.4	Recommendations for future research.....	142
7.6	Significance of the Study.....	142
7.7	Concluding Comment.....	143
<b>References.....</b>		<b>144</b>

## List of Figures

Figure 1-1	A hierarchy of technological tasks (Kenna, 1985) .....	22
Figure 1-2	The international symbol for 'No'.....	23
Figure 1-3	The international symbol for 'On/Off' .....	23
Figure 1-4	The international symbol for 'Do not iron' .....	24
Figure 1-5	The original traffic signal designed by Margaret Calvert.....	25
Figure 1-6	My universal symbol for hand washing with soap.....	25
Figure 2-1	The United Republic of Tanzania.....	32
Figure 2-2	Map of the Pwani region, including the villages of Masanganya and Masaki	33
Figure 2-3	Regions of Tanzania by Human Development Indicators (World Health Organization, 2013).....	35
Figure 2-4	Poster produced by Tanzanian Health Department advising on malaria precautions, displayed in the Masanganya Dispensary building.....	40
Figure 2-5	Map of the village political hierarchy .....	42
Figure 2-6	Tanzanian Administration hierarchical structure (Venugopal & Yilmaz, 2010)	43
Figure 2-7	Emergency lighting in the medical clinic.....	44
Figure 2-8	Kisaware Hospital ambulance bay .....	46
Figure 3-1	Multi agency health information poster communicating malaria information .....	64
Figure 3-2	Health information poster communicating malaria information using the CBPET format.....	64
Figure 4-1	Study group participant completing the questionnaire.....	73

Figure 4-2	The visual tool explained by a translator .....	74
Figure 4-3	Study group participant showing off his pocket sized CBPET .....	77
Figure 4-4	Typical village shop in the study group of the community.....	79
Figure 4-5	Researcher with study group participants .....	80
Figure 5-1	Medical visual aid translator used in conflict areas.....	88
Figure 5-2	Folding design of a visual aid translator .....	88
Figure 5-3	Original artwork of the family group for Australian Aboriginal version .	89
Figure 5-4	Reconfigured artwork of the family group for African version .....	90
Figure 5-5	Streptococcus bacteria (left) and the phlegm bug .....	91
Figure 5-7	Hepatitis A virus (left) and the water bug.....	92
Figure 5-8	Escherichia coli bacteria (left) and the poo bug.....	93
Figure 5-9	Mixture of Pseudomonas and Escherichia coli bacteria (left) and the mud .....	94
Figure 5-10	Visual flow chart making up the final page of the CBPET.....	96
Figure 5-11	Folding design of the CBPET .....	96
Figure 5-12	Initial first aid in pictures logo .....	98
Figure 5-13	CBPET logo to symbolise hand washing with soap.....	98
Figure 5-14	Concept art for FAIP logo.....	99
Figure 5-15	Final development of the CBPET cover .....	100
Figure 6-1	Participant age of the study group participants <b>Error! Bookmark not defined.</b>	
Figure 6-2	Number of children of the study group participants <b>Error! Bookmark not defined.</b>	

Figure 6-3	Chart indicating religion of the study group participants .....	104
Figure 6-4	Chart indicating religion of the study group participants <b>Error! Bookmark not defined.</b>	
Figure 6-5	Chart indicating education level of participants .....	105
Figure 6-6	Chart indicating profession of the study group participants .....	105
Figure 6-7	Chart indicating participants knowledge of germs before CBPET.....	107
Figure 6-8	Chart indicating participants knowledge of germs post CBPET.....	108
Figure 6-9	Pleghm bug .....	108
Figure 6-10	Chart indicating pre and post-CBPET comparison .....	109
Figure 6-11	Chart indicating participants knowledge of where germs live before CBPET	110
Figure 6-12	Chart indicating participants knowledge of where germs live after CBPET	110
Figure 6-13	Comparative chart indicating participants' knowledge of where germs live	111
Figure 6-14	Chart indicating participants knowledge of germ transmission .....	112
Figure 6-15	Chart indicating participants knowledge of germ transmission in detail pre-test	112
Figure 6-16	Chart indicating participants knowledge of germ transmission in detail post-test	113
Figure 6-17	Chart indicating participants knowledge of germ transmission pre-test and post-test.....	114
Figure 6-18	Chart indicating participants knowledge of germ infection in detail pre-test	115
Figure 6-19	Chart indicating participants knowledge of germ infection detail post-test	116

Figure 6-20	Chart indicating participants knowledge of germ infection pre-test and post-test	117
Figure 6-21	Chart indicating participant education in hand washing pre-CBPET	118
Figure 6-22	Chart indicating participant education in hand washing post-CBPET	118
Figure 6-23	Chart indicating why participants understand the importance of hand washing with soap pre-CBPET	119
Figure 6-24	Thematic chart indicating participants understanding of importance of hand washing with soap post-CBPET (infection control)	120
Figure 6-25	Study group with the translator, with bars of soap following the study	121
Figure 6-26	Chart indicating hand washing frequency – pre-CBPET	122
Figure 6-27	Chart indicating intended hand washing frequency – post-CBPET	122
Figure 6-28	Chart indicating type of hand washing device	124
Figure 6-29	Chart indicating participants understanding of the effectiveness of soap and water in killing germs pre-CBPET	125
Figure 6-30	Chart indicating participants understanding of the effectiveness of soap and water in killing germs post-CBPET	126
Figure 6-31	CBPET improved literacy and comprehension	127
Figure 6-32	CBPET improved knowledge of hygiene practices	128
Figure 6-33	CBPET improved awareness of increased transmission of germs	129
Figure 6-34	Chart indicating participants comments on the CBPET	129

## List of Abbreviations

ARC	Australian Resuscitation Council
CALD	Culturally and Linguistically Diverse
CBPET	Cartoon-based Pictorial Educational Tool
COSTECH	Tanzania Commission for Science and Technology
CPR	Cardio Pulmonary Resuscitation
DRS ABCD	Danger, Response, Send for help, Airway, Breathing, CPR, Defibrillation
DAC	Development Assistance Committee
FAiP	First Aid in Pictures
fMRI	Functional Magnetic Resonance Imaging
GHAWA	Global Health Alliance Western Australia
HELP	Health Education & Learning in Pictures
HDI	Human Development Index
HIV	Human immunodeficiency virus
LMICs	Low and Middle Income Countries
MDGs	Millennium Development Goals
MPI	Multidimensional Poverty Index
UN	United Nations
UNDP	United Nations Development Programme
MDG	Millennium Development Goals
MOHSW	Ministry of Health and Social Welfare
PET	Positron Emission Tomography
TANAPA	Tanzania National Parks Authority
WASH	Water, sanitation and hygiene

## Table of Appendices

Appendix 1	Curtin University Ethics Approval .....	160
Appendix 2	Letter to Masanganya Chairman Seeking Permission to Conduct Study 161	
Appendix 3	Letter from Masanganya Chairman Granting Permission to Conduct Study 162	
Appendix 4	COSTECH Ethics Application.....	163
Appendix 5	COSTECH Research Permit .....	166
Appendix 6	COSTECH Research Permit document.....	167
Appendix 7	Participant Information Sheet (English version).....	169
Appendix 8	Participant Information Sheet (Swahili version) .....	170
Appendix 9	Pre-intervention Questionnaire .....	173
Appendix 10	Post-intervention Questionnaire .....	175

# Prologue

**“Comics are a gateway drug to literacy.”**

Art Spiegelman, (Gorman, 2008)

Prior to the reader evaluating this thesis I thought it might enhance appreciation of the subject if I reveal the motives behind developing this tool and subsequently researching its effectiveness. I am not an academic, I struggled at school and did not find the experience particularly enjoyable nor, I dare say, did my teachers. I did not excel in any subject, however I did find enjoyment in books and reading; the two subjects that attracted me were military history and traditional medicine. On leaving school, I was employed in the local hospital as an orderly, a blue-collar manual job that did not require any academic skills. It was no great shock to anyone that at the age of 17 I joined the British Armed Forces Reserve Territorial Army unit in my local town as an infantry soldier; my school results indicated that I was not officer material. With my natural passion for healthcare I began my journey into the world of medical prevention and education by training to be a medic in my Territorial Infantry unit; this training involved medical science, anatomy and physiology and clinical nursing skills.

At this stage I found myself using pictures in my notes to record the academic study required in order to pass my exams. I have never been able to take detailed notes on a subject, and this played a part in my struggle at school. My passion for providing compassion for people in their time of need proved to be an asset; wasted as an infantry private, I transferred to the Royal Army Medical Corps. My army career took me to foreign countries, my role as a medic enabled me to interact with alien cultures, however my interest in traditional medicine had not declined. I became fascinated with historical methods of employing first aid techniques, interacting with different cultures and engaging with non-English speaking populations. For the first time I felt education was a privilege of the Western world; it seemed that I had taken for granted my knowledge of life-saving techniques was only such because I had the ability to read and extract information from books. The problem I faced was that I lacked the ability to transfer my knowledge back into writing; I had, however,<sup>7</sup> found a way of using pictures to collectively record and transcribe my studies that could then be translated by people who struggled with literacy.

# CHAPTER 1

## Introduction and Overview

**“I like this. This is the way we used to pass on messages before the white mob came along. We used to draw pictures and symbols to pass on information to others...”**

Marie Taylor (Taylor, 2013) personal conversation with Noongar Elder

### 1.1 Introduction

Chapter 1 provides an introduction and overview into the use of icons, symbols and visual media in education, especially health education and as a method of communicating. Whilst the use of visual aids was used as personal communication between members of our earliest ancestral population, its use declined rapidly with the invention of the alphabet system. It is evident that poor literacy rates in developing countries is a concern, however it is also evident that this trait is no longer reserved for developing countries with poor education systems.

Recent studies report the level of literacy is falling in developed countries such as the United States, the United Kingdom and Australia (Cutilli & Bennett, 2009; Lassetter et al., 2015; Prior, 2013; Smith, 2014) and this is not always associated with lower social and economic groups. The ease of global travel, an increased global economy and changing migration trends are also introducing environments where vital health and safety instructions must adopt a multilingual, multicultural approach in the effort to communicate the message to the target audience (Tone, Skitmore, & Wong, 2009).

This chapter provides a brief review of how the use of icons and pictures in literature is used to enhance the written word in various facets or ultimately to replace words as a form of communication. This chapter also introduces the aim and objectives of my research with a summary in conclusion.

## **1.2 Professional Context of the Researcher**

On leaving the British Army, I began studying to become an operating theatre technician, a qualification that required a great deal of academic input and culminating in a vigorous examination period. More and more, I found that by converting lectures and practical demonstrations into pictures and cartoons, I could equal my peer students' note recording requirements to a level that enabled me to refer back to them for reference prior to exams.

The course also required that we complete an end of curriculum project; I had been inspired by one particular doctor who delivered an outstanding demonstration of cardiopulmonary resuscitation (CPR). After his lecture, I felt that his instruction should be 'bottled' and used across the hospital. In 1989, before the popular use of personal computers and PowerPoint presentations, most facilitators relied on the use of overhead transparency visual aids or clunky VHS video presentations to enhance lessons and allow some interaction with the students. This method of instruction could not be uniformly replicated, as it required the skill of the presenter to deliver the information. To repeat this lesson across the hospital would require the facilitating doctor to spend a great deal of his clinical time just teaching CPR to the staff, which would be time consuming and also deprive the hospital of his clinical input.

I had the idea of filming this CPR lesson, but also adding special effects that could demonstrate the practical applications of the doctor's lesson. I used this idea and it resulted in an instructional video that incorporated a guide to demonstrate CPR practice as well as graphic special effects to demonstrate the effectiveness of the CPR techniques on the human body; a combination of graphics and video. This video was later endorsed by the Berkshire Health Authority in the United Kingdom and used as the chief instructional aid to all nursing and medical staff undergoing their yearly resuscitation training.

The second part of my project was a poster to be displayed in the clinical area; this poster was a step-by-step guide to resuscitation on the ward. I felt that in a resuscitation situation, where the team had to act without delay, it was no good having the protocols written on a sheet of paper. My inability to read instructions under pressure gave me the notion that this was also true of many people; therefore, I felt that having the protocol transferred into a number of pictures would assist in the rapid interpretation of information for the nursing staff. Too many photos

on a poster would look confusing, so I had to convert the protocol into fewer stages and then replicate the actions necessary into a photo to demonstrate the procedure; additional notes were added to supplement detail next to each photo. This poster was a great success and won first prize at the 1990 National 'Johnson & Johnson' award, later to be replicated and used around hospitals in Berkshire, Buckinghamshire, Bedfordshire and Surrey. Upon graduation from the operating theatre technician course in England I travelled to India where I hoped to experience medical practice in a resource poor environment. I spent a great deal of time living in the local community, fascinated by the methods employed to transmit health care information to communities with poor literacy rates.

In particular, I was impressed by a book originally published in 1977 by David Werner called "Where there is no Doctor" (Werner, 1977). This English version of the book had been translated from Spanish "*Donde no hay doctor*" and adapted for distribution by the Voluntary Health Association of India (Werner, 1977 1992). This book was aimed at lay people with normal reading skills, however the text was supported with hand drawn pictures to engage those with poor literacy skills. I noticed that this approach did attract the non-literate members of the community who enjoyed looking at the pictures. I realised at this point that health education via pictures was a very effective form of engaging people with poor literacy skills.

Since then I have been active in the facilitation of health care education throughout my 27 year career, gaining experience in using practical demonstration techniques to teach subjects such as basic life support to semi-literate hospital auxiliary workers in the Sultanate of Oman to educating Indigenous workers and Torres Strait Islanders in basic first aid skills. I migrated to Australia in 2003 from the United Kingdom, initially gaining work in the operating theatre as an anaesthetic technician, working as a locum but eventually settling down into a full time position as a senior technician in a teaching hospital in Perth, Western Australia. At the pinnacle of this career I found myself elected as President of the regional professional body, the Western Australian Society of Anaesthetic Technicians (WASAT). I took this opportunity to promote continual education to the membership.

In 2005, I transferred my clinical skills to pre-hospital medicine and joined the private emergency medical system (EMS) contracted by the State Government to provide emergency care in WA. I mapped my previous skills and qualifications across and started working as a paramedic in Perth, providing emergency treatment and

transport to the seriously ill and traumatised patients that called emergency services for assistance. During this time, I became associated with some of the lower socio-economic groups within the community in Perth and it became apparent to me that a sizable proportion of our own society struggled with basic healthcare information. This was possibly my first introduction into the subject of health literacy as opposed to the traditional association of the word, as people could not understand basic medical instruction issued by their health care provider. It was also clear to me that some communities would benefit from medical information and instruction in a visual format rather than a written format. This would introduce me to visual literacy and literacy as terms to distinguish between the various mediums of communication.

In 2007, I began developing a concise resource to teach basic first aid skills into a book, using pictures alone as the educational medium; this concept project was named 'First Aid in Pictures'. Initially I found it difficult to promote this concept to potential backers. I could not compare this new concept with anything else on the market to try and explain the system; there was no other product like it on the marketplace. I found that the closest product that I could find to attempt to compare the system to was the early learning books that my young children had used to start reading, books often in the form of pictures and not words.

A global search and review indicated that there are no medical or health education books published in this format so even this comparison fell short of the mark when trying to demonstrate and promote the system to potential backers. It seemed that the only way I could demonstrate this system was to produce an example. The first module developed considered 'basic hygiene' through a sequence of pictures depicting the 'chain of infection' in its most basic format. This design also incorporated the introduction of a number of disease-causing pathogens or 'bugs' in order to establish a visual connection between pathogens and the causation of ill health and disease.

Ultimately this 'basic hygiene visual educational tool' was to form the basis of my research into the concept of educating resource poor, low literate communities by the use of a cartoon-based pictorial education based tool (CBPET). This is where my journey began and in 2012 I enrolled in a Masters of Philosophy in International Health at Curtin University, Perth WA.

### **1.3 Background to the Research**

My research sought to investigate methods to improve the health and well-being of populations that may lack basic literacy skills needed to read and comprehend the vast amount of health promotion publications produced to deliver vital healthcare information. To attempt such improvement I have developed a tool to capture the attractiveness and acceptability of a cartoon (Eulie, 1969; Khalid Hamidon, 2010; Piaw, 2012) and combined it with a professional visual configuration to allow its use in delivering quite complex healthcare information to a resource poor, low literate environment.

To test the effectiveness of this tool, I developed pre and post-delivery questionnaires to assess any improvement in knowledge within my study group in basic hygiene concepts, awareness of disease transmission and use of hand washing with soap and water following the introduction of my visual tool. These questionnaires were designed to allow me the opportunity to gather data on my study participants, allowing me to analyse and trend participant demographics and characteristics. Further description and explanation of the tool is described in chapter 5.

My tool proved very effective and is further discussed in the results and discussion later in the thesis; one of the most encouraging results showed that 92.3% of the study group indicated they now knew washing with soap and water could kill germs. This is most significant in that washing hands with soap and water has proven to benefit communities in reducing morbidity and mortality in many developing countries (Cairncross, 2003; Cairncross et al., 2010; Val Curtis & Cairncross, 2003a, 2003b; V. A. Curtis, Danquah, & Aunger, 2009; Fan & Mahal, 2011; Grayson et al., 2009; Luby, Halder, Huda, Unicomb, & Johnston, 2011; Amy J. Pickering, Boehm, Mwanjali, & Davis, 2010; Rabbi & Dey, 2013; Savolainen-Kopra et al., 2012)

Though the literature supporting the use of pictures to communicate a message is discussed in detail in chapter 2 I feel it would prove useful to briefly introduce the key concepts associated with the study in the next section.

#### **1.3.1 Use of pictures, symbols and cartoons in early communication – A form of Visual literacy**

One of the earliest forms of communication used by human beings that we have discovered is in the form of symbols, icons and pictures. For instance, if tribesmen

over 6,000 years ago, had not recorded hunting prey by herding gazelles into a dead end canyon and slaughtering them with improvised weapons in what is now present day Syria the historical event would be lost. These events were recorded with cave art possibly to pass on the technique for following generations but also allowing anthropologists to account for the discovery of mounds of fossilised remains in a particular area. Here in Australia, the Aboriginal people used cave art as a visual communication tool; we have found evidence of their well-preserved cave art around the country (Bullen, 2013; Mulvaney, 2013; Roger Maynard in, 2003) dating back well over 4,000 years.

A lack of literacy amongst the general population during much of our early history elevated the skills of reading and writing to the clergy and academic scholars. In such times, script was often highly decorated and ornate (Geneva, 1995; Hurlburt & Voas, 2011) and often difficult to read. It wasn't until Gutenberg perfected the printing process that uniformity could be reproduced in a standardised format. The decorated script not only formed part of the descriptive nature of this work; but also added decoration and visual enhancement.

The origins of the cartoon were probably derived from the satirical Punch illustration ridiculing the amateurish attempts to sketch frescoes entered into the contest sponsored by Prince Albert in 1843 (McDermott, 1989). The origin of the word 'cartoon' can be traced back to the Italian word *cartone* meaning a large sheet of paper; even the past masters such as Raphael and Da Vinci referred to the word *cartone* as any line drawing or unfinished work that they may have produced prior to finalising a painting.

The comics or graphically illustrated novels that we recognise today may possibly originate from the mid-1830s in Japan, when a Swiss school teacher named Rodolphe Töpffer used his sketches to keep students amused (Kunzle, 2007). Alternatively, they may have been derived from the Japanese art of 'Manga' (Sales, 2003), that uses art icons to enhance written text. These comic stories transform a storyline into a multimedia language that blends actions, words and expression into a panel-to-panel narrative.

Since the mid-1830s script with associated pictures or graphic content has been used to either enhance the subject by means of visual attraction or to engage the reader directly via art-based association. Despite the large amount of research and

development in this field, it appears that art and visual interface have been used extensively to enhance the written word but rarely to replace it. A degree of textual and visual literacy is still a required factor to understand the direct message associated with this visual adjunct in most educational settings otherwise the purpose of the message may become confused or wrongly interpreted; the purpose of my educational tool is to provide the message with pictures alone with minimal use of text to support the subject matter rather than the other way round.

### 1.3.2 The use of icons and symbols

The Greek word 'eikon' (icon) can be translated as "image, picture, portrait or representation" (Kenna, 1985) and this single word has become associated with a single image being used to portray a task or function. An icon can represent either a single action (a unique icon for a specific task) or a complex task (constant icons that span several applications); however to be understood the icon does need to express the task that it is supposed to be representing not just merely associate with it. A good example of this is when generic clip art is associated with a function; unless that clip art is specific in nature it can be easily misinterpreted into a wrong association or task.

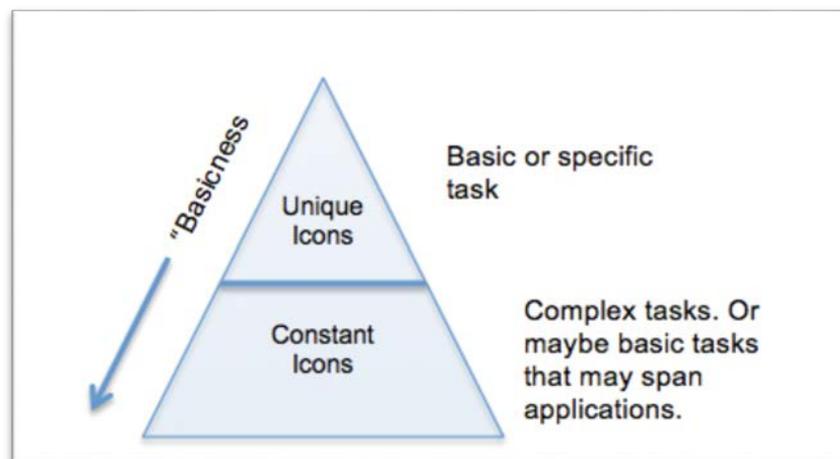


Figure 0-1 A hierarchy of technological tasks (Kenna, 1985)

Currently there are no international set standards or uniformity for health or safety icon design. Some industry groups such as information technology has begun to mandate standardised icon design using the guidelines established by the International Organisation for Standardisation (ISO). A common example of this approach is ISO 18035:2003 (information technology – icon symbols and functions

for controlling multimedia software applications), commonly found on TV controllers for the identification of play, rewind and pause commands.

The use of a circle with a diagonal line struck through it to mean means 'NO' to whatever element is inside the circle. For example if a picture of a cat was inside the circle with a diagonal line through then it would indicate 'No cats'.



Figure 0-2 The international symbol for 'No'.

The ISO standard icons commonly represent technical tasks such as the power 'ON' or 'OFF' functions normally associated with electrical items (Gurak, 2003). The use of this generic icon to represent a function historically reserved for a word has allowed it to be used internationally without the requirement of translation.



Figure 0-3 The international symbol for 'On/Off'

This ability to use one single icon to represent a multilingual task is the precursor for more complex design applications. Just as a word can be strung into a sentence with many other words to explain a series of actions, icons or pictures may be harnessed together to replicate letters and words in communicating the same content. Just as the most appropriate word must be used in order to communicate an action, then so must the most appropriately designed icon symbol or graphic be used to communicate a designated task to a non-literate person.

As icons evolve into representing more than a basic strand of information the complexity of the icon must also increase. An example of this design is the universal

symbol for an iron. The icon may be self-explanatory and may just include a graphic depicting the representation of the object alone; this would assume that this object is universally recognisable across a large section of the community. In this case, an iron has a fairly recognisable shape.

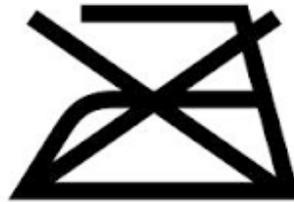


Figure 0-4 The international symbol for 'Do not iron'

The iron may be a photograph or a clip-art graphic resembling the generic features of an iron but this will not communicate the task associated with that iron, which needs to be a co-graphic. Within the clothing industry the internationally adopted icon for 'Do not iron' is an icon of an iron with a cross through it, effectively two instantly recognisable icons (the iron and the cross) combined into a hybrid icon used to communicate a basic task. When human actions need to be represented, however, the icon must symbolise the complexity of a human task, and that requires a great deal of research and design as well as a good artist to construct it. A well-researched and designed symbol may easily fail if a competent artist or graphic designer does not transfer it into a physical design.

A good example for a universal symbol depicting a physical act that also features 'a human figure' in a range of environments without words is the development of the traffic road sign. In the late 1950s, Margaret Calvert designed a set of universal traffic road signs in response to a call to make the new road system in the United Kingdom safer (Rawlinson, 2015). Calvert used colour and imagery as the basic building blocks when developing the new visual information system, in some instances using pictures of herself and her brother as templates. The resulting traffic road signs that Calvert designed have been universally adopted as the template for most other road signs around the world, with little international con variation.



Figure 0-5 The original traffic signal designed by Margaret Calvert

It was this system of instantly recognisable signs that prompted me to design an icon that could be recognised as a symbol of hand washing with soap by people with poor literacy as easily as it would by a literate person. My CBPET design incorporates a combination of icons, symbols and cartoon figures in order to provide a simple visual format.



Figure 0-6 My universal symbol for hand washing with soap

Although constructed with a simple format, the combined design must be robust enough to be able to communicate the complex healthcare message portraying the chain of infection while communicating the simple message that washing hands with soap and water kills germs.

### 1.3.3 The use of pictures in healthcare

Although pictures and images of clinical instruments and medical procedure have been discovered amongst the well-preserved hieroglyphics of Egyptian tombs (Gordetsky & O'Brien, 2009; Martinet et al., 1998) they were more likely to be symbolic rather than intending any form of instruction or communication of a task. Comic-form pictures and images began to appear in medical instructions in the later part of the last century; in their 1978 paper Rowell and Van Kirk recommend that instruction of forbiddingly dense and boring (healthcare) subjects be lightened up by the use of cartoons (Rowell, 1978).

Since then, and with the realisation that a lack of health literacy is a fundamental stumbling block on healthcare outcomes (Nokes et al., 2007; Pleasant & McKinney, 2011; Wolf, Feinglass, Thompson, & Baker, 2010) pictures, illustrations, cartoons and icons have appeared more frequently in health care instruction. The majority of these examples seem to be more for general decoration and 'eye candy' than to attempt a visual translation of a message, but advances have been made in the communication relating to the application of prescribed medicine. A more comprehensive review of this is presented in chapter 3.

#### **1.3.4 Development of my cartoon-based pictorial educational tool (CBPET)**

I felt that a system of pictures and icons, combined in a structured and educated format, may be effective in communicating complex health care messages to pre-school children or to communities with a low literacy rate. The present day cartoon has developed from a static based paper design into a multimedia tool generated by powerful computer generated image (CGI) technology. This technology potentially offers a mechanism to delivering entire healthcare messages via a non-verbal format; low-literate groups however do require the technology to deliver it to the end user and this is rarely the case in many resource poor environments. The location and demographics of my proposed study group dictated that my design needed to be of a simple nature with a low technology delivery system in order to prove successful in transferring the key learning points. This isn't to say that the basic form of static art may not be able to be enhanced to another format to enhance its visual effect to communities that may have higher technology available to them.

Any tool that I developed had the potential to be used as a reference tool as well as an educational tool: a stand-alone guide to reinforce any facilitation of healthcare information within the community. It was my experience that many such information posters were used to display healthcare messages throughout community environments, but they all required some amount of textual literate ability to understand the message. It was my intent that my tool could double up as a communal poster following any educational use.

A more detailed description of the development of my design is detailed in chapter 5. The tool that I designed and developed was successfully tested in a resource-poor, low-socio-economic, low-literate group with positive results; this data is available in chapter 6.

#### **1.4 Aim and Objectives of the Research**

The aim of my research was to first develop and then evaluate the effectiveness of a picture based educational tool to communicate complex healthcare information to a sample group of low textual literate adults, in a low-resource environment. The health care subject chosen was hygiene and the 'chain of infection'. This subject remains a foundation unit of any healthcare program that may be promoted; it also serves as possibly the most important adjunct to improving health and well-being in developing communities.

The following objectives were developed to address the aim and to help guide the research study. Within a group of low textual literate participants located in the resource poor community of Mlegele village, Kisaware District (Tanzania), the study intended to:

1. document existing personal hygiene knowledge, practices and motivators
2. determine community perceptions of the cause and transmission of disease and capture existing awareness of common pathogens
3. design and develop a cartoon-based picture education tool (CBPET) with facilitator notes in English to communicate key messages regarding common pathogens, where they are commonly found, their transmission routes, and the importance of hand washing with soap
4. implement and trial the CBPET to a cross-sectional representative sample group with low literacy skills to members of the Masanganya community
5. evaluate personal perception of hand washing (with soap) practice following implementation of the CBPET and the comprehension of basic pathogens transmission and effects of infection within the sample group.

#### **1.5 The Research Process**

I undertook the research with the assistance of a local translator and community liaison person to assist in the field trials and data collection phase. The research process was conducted in three separate phases. The first phase was completed between April, 2012, and February, 2013. During this time a comprehensive literature review was undertaken. The pre and post-interview questionnaires were developed and perfected and the ethics approval process from Curtin University and the Tanzanian authorities was completed.

Some elements of the ethical approval process were not finalised until a short time prior to my departure to conduct the fieldwork and implement the health education

program due to communication issues with key stakeholders in Tanzania. Many of these later tasks were associated with travel and visa requirements and required time and patience to achieve the desired result. Additional data acquisition tools were developed and reviewed, including a word association matrix intended to capture and score key words and phrases gathered from study participants.

## **1.6 The Significance of the Study**

Trachoma is recognised as a leading cause of blindness globally (Mariotti, Pascolini, & Rose-Nussbaumer, 2009) with poor face washing identified as a major contributory factor (Roger et al., 2011). If poor hygiene and lack of hand washing is a major risk factor of trachoma then it is reasonable to assume that an educational tool to promote awareness and increase hand washing frequency could contribute to the prevention of trachoma. The effect of this hypothetical cascade would be to save billions of dollars in healthcare provision as well as improving the quality of life for large communities of people in developing countries. With respect to Tanzania, the country has some of the most trachoma affected communities in Africa (Rog et al., 2011). Empowering people to understand the concept of infection, how it spreads and what can be done to reduce the likelihood of infection, would surely improve the quality of life for key areas of the population.

The UNICEF report on Water, Sanitation and Hygiene states that handwashing with soap and water has the potential to reduce the disease transmission cycle by about 47%; this simple process alone has the highest impact on reducing faecal/ oral transmissible disease such as diarrhoea. The limiting factor in breaking this cycle and increasing hand hygiene is a general lack of awareness regarding the chain of infection (UNICEF, 2011).

Although this tool was based on the subject of hygiene, recognition of common pathogens and the spread of infection, the potential application of this picture-based format are limitless. It is estimated that one third of child mortality in Tanzania for children below the age of 5 is related to poor hygiene, including preventable diarrhoea and upper respiratory infection.

Any critical element of fundamental health related knowledge that is normally delivered via the traditional written format can be potentially delivered via this cartoon-based pictorial educational tool. Such subjects can be driven from health statistics and epidemiological data in target areas where community education and

comprehension is needed. The findings of this present study indicate that should vital health information be translated into a picture-based format it would assist in educating the vast numbers of people in both developing and developed countries lacking the general textual literacy skills required to comprehend this information.

This tool will be an important addition to the tools already available, although pictures are commonly used to SUPPLEMENT text in health education, there are few examples of pictures REPLACING entirely text in such publications. Even in health education using pictures to supplement text the reader MUST have a degree of textual literacy. The developed tool is a universal tool that can be used globally in settings where people are illiterate. In chapter 7 of this thesis I have described the evolution of work currently undertaken with Professor Fiona Wood and her global burns education foundation to design a burns first aid module based on my CBPET tool.

## **1.7 The Thesis**

The seven chapters of this thesis presents the main findings and subsequent recommendations derived from a pre and post-delivery qualitative assessment undertaken in the resource-poor, low- textual literate community of Mlegele village (United Republic of Tanzania). Following the initial introduction in the first chapter, the second chapter presents background information on the geographical environment of the study group. The United Republic of Tanzania forms part of the area known as sub-Saharan Africa. Much of the literature concerning hand washing with soap and premature morbidity and mortality cited in this research has reviewed sub-Saharan Africa.

The research methodology is described in the third chapter. The fourth chapter concentrates on the study design and the methods employed to gather the data from the study group. The chapter highlights the selection criteria used for the study, both geographical location and participant characteristics.

Chapter five documents and describes the lengthy chronological process of the CBPET development and how it culminated into an education tool able to cross literacy and socio-economic boundaries.

Chapter six discusses the characteristics of the study group participants together with analysis of the data gained from the pre and post-interview questionnaires.

Chapter seven discusses further recommendations of this research work, its significance in the global campaign of not only hygiene based criteria but of general communication of vital healthcare issues in resource-poor and low- textual literate areas.

## **1.8 Summary**

As will become evident in the following chapters, education in basic hygiene practice and promoting increased hand washing with soap could be the single most and cheapest intervention to reduce overall morbidity and mortality on a global scale. The challenges associated in translating healthcare messages into dialects and language groups are more readily met when universal communication is available. The use of pictures, icons and cartoons to deliver these messages has rarely been harnessed in a coordinated and harmonised manner. Resource-poor communities are often associated with lower socio-economic groups, who in turn often display low literacy scores (Bynum et al., 2013; Ciampa et al., 2012; Prior, 2013; Wilson, 2003; Wolf et al., 2010; Zoellner et al., 2011). These are often the communities where human resources and technology are at their most scarce, with reliance on community education vital and important. This thesis describes a primarily qualitative research process with an intervention aimed at assessing the value and effectiveness of a unique cartoon-based picture education tool to deliver basic education in hygiene to a resource poor, low textual literate community.

## **CHAPTER 2**

### **The Context of the Study: Tanzania (health and human indicators)**

**“We remain a highly complex visually orientated species, but human kind took an interesting deviation along the path of modern storytelling, and we’re only beginning to re-emerge as visual storytellers.” (Hurlburt & Voas, 2011, p4)**

#### **2.1 Introduction**

This chapter presents literature supporting the choice for my study group. In accordance with the research design, this review process continued during the data collection and analysis stages of the research and during the thesis writing stages. Literature reviewed during these latter stages is presented in the following chapters to support my findings. The chapter commences with detailed con information regarding the village of Mlegele and its environment. The community living in Mlegele village is strongly linked with and supported by the slightly larger population of Masanganya. I only became aware of this satellite community on a random health check during my initial visit; the village had a much smaller population than the larger Masanganya community and presented as a better fit for my smaller-scale study.

#### **2.2 Regional Con Information**

##### **2.2.1 Tanzania**

The United Republic of Tanzania is located in East Africa, bordered by Kenya and Uganda to the north, Rwanda, Burundi and the Democratic Republic of the Congo to the west and Zambia, Malawi and Mozambique to the south. Seeking independence from the British in 1961, Tanzania has remained a stable political environment, however the economy has declined since the late 1970s.



Figure 2-1 The United Republic of Tanzania

Tanzania is rich in natural resources such as bentonite, kaolin, calcite cement and precious gem stones including diamonds; deposits of other rare elements such as cobalt, copper, nickel, titanium and natural gas are also known to occur. One unique resource found only in Tanzania is a precious gem stone called tanzanite, a blue or violet gem found only in the Mererani Hills in the north of the country. In 2011 Tanzania was the fifteenth largest producer of gold in the world. The Public Expenditure for the Ministry of Health and Social Welfare for the period of 2012/2013 was 298,228,037,000 shillings (AU\$199,790,942) out of a total budget of 7,714,814,767,000 shillings (Parliament of Tanzania, 2013), therefore public funds are available for health education.

Textual literacy rates in 2010 indicated that approximately 72% of women and 82% of men were literate in Tanzania; this has not altered a great deal since a study conducted in 2004 indicated that 67% of women and 80% of men were literate (Tanzania 2010: Results from the Demographic and Health Survey, 2012). The same report also indicated, however, that the illiteracy rate (the proportion of the

population that cannot read at all) in women aged 45-49 and men aged 30-39 was approximately 40%; literacy rates in urban areas were higher than rural districts. Literacy rates for both women and men were proportional to wealth (Tanzania 2010: Results from the Demographic and Health Survey, 2012).

More recent data extracted from the Millennium Development Goals are presented later in this chapter, however the data supports low literacy in some areas as well as the disparity between male and female groups. In the mid-1970s, local government was scrapped and replaced with direct control from the central government in Dar es Salaam, but re-established in 1980 when rural councils and rural authorities were re-installed. Politically, Tanzania is divided into 30 regions; 24 on the mainland and 5 on the neighbouring island of Zanzibar. There are also 169 districts, or local government authorities. Of these 169 districts, 34 are urban units with direct communication with central government. The non-urban authorities are autonomous district councils subdivided into village councils.

### 2.2.2 Pwani Region



Figure 2-2 Map of the Pwani region, including the villages of Masanganya and Masaki

The Pwani (Swahili) or Coastal Region (Figure 1) is one of 30 administrative regions in Tanzania; it is located to the west of Dar es Salaam region and covers a size of 32,407 square kilometres. The region is further divided into six districts for

administrative purposes, with the district of Kisaware being the fifth largest by population.

### **2.2.3 Kisaware District**

The district of Kisaware is divided into 15 wards and was the setting of the study. In 2012, I visited the area whilst setting up a medical intervention project sponsored by the not-for-profit group Global Health Alliance Western Australia (GHAWA). In the course of this work, I visited several locations with the intention of establishing a study group to collect data for my research; the criteria I had established for this location was that it needed to represent a resource-poor environment with a low level of literacy amongst the general population. I became aware of the small enclave of Mlegele during this time and was alarmed to witness people boiling muddy water in an effort to render it potable. It was common knowledge that dirty water must be boiled prior to consumption, however the primary message that this water needed to undergo a filtration process before being boiled was not known among the community.

### **2.2.4 Mlegele and Masanganya Village**

The village of Mlegele is a small village located in the District of Kisaware of the Pwani or Coastal Region of Tanzania (figure 2). Approximately 15,000 people inhabit Mlegele; it shares close ties with, and is logistically supported by the larger village of Masanganya. Masanganya is located 327 metres above sea level in the coastal region of Tanzania; it is approximately 12 kilometres away from Mlegele; connected by a single unsealed road with steep drops either side falling away to dense undergrowth. This main supply route follows the topographical features of the terrain and is often unusable by normal vehicles due to damage caused by rain or landslide; the main form of transport is either motorbike (pikipiki) or on foot.

A Toyota Landcruiser ambulance was supplied by GHAWA to the dispensary at Masanganya on my previous visit in 2012, offering the ability to support the Mlegele community from the medical dispensary at Masanganya. The chairman of both villages lives just outside Masanganya on the road leading to Mlegele; he played a pivotal role in the broadcast of information about my study and assisted in the selection of the study group.

The population of Mlegele is largely Islamic with a smaller community of Christians cohabiting peacefully; this mix was replicated in the demographics of the study group used to assess the pictorial health educational tool.

### 2.3 Human Development Indicators (HDI): Tanzania

The HDI is a measure for assessing long term progress in three basic dimensions of human development, these being: a long and healthy life, access to knowledge and a 'decent' standard of living (United Nations Development Programme, 2013). Tanzania dropped several positions in the United Nations Development Programme (UNDP) 2014 HDI ranking to rank 159 out of 187 countries (United Nations Development Programme, 2014). With a HDI score of 0.488 it falls into the bottom-most quartile of countries with the lowest level of human development. This is a drop of seven places from its position in previous years.

Within Tanzania itself some individual regions fared better than others, however none of the 30 administrative regions reached a score comparable to the first two categories of HDI development (high or very high). As is visible in Figure 2-3, only three administrative regions reached a score admitting them into the medium human development group; they were Arusha, Kilimanjaro and the capital, Dar es Salaam. The Pwani region of Tanzania, location of the study group for this research, is placed in the low human development group.

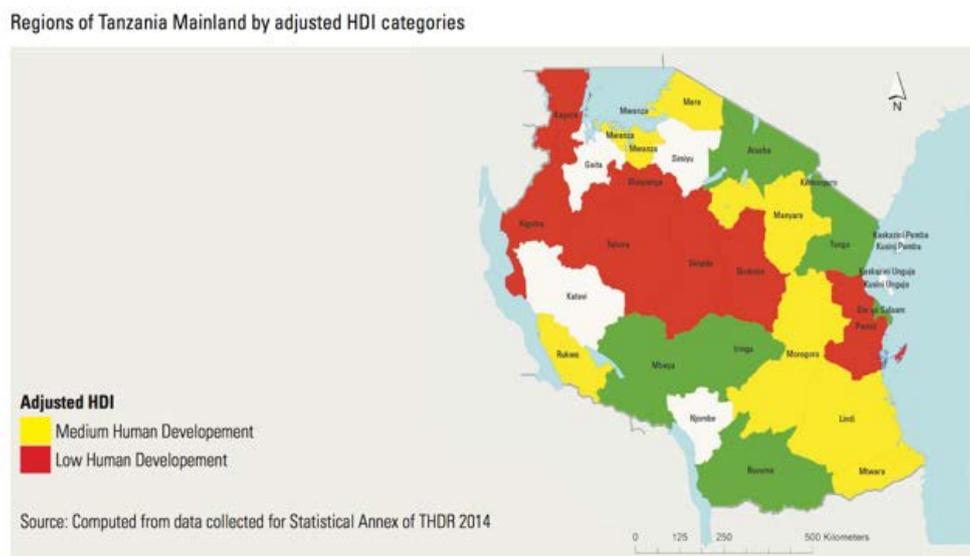


Figure 2-3 Regions of Tanzania by Human Development Indicators (World Health Organization, 2013)

### 2.3.1 Multidimensional Poverty Index (Salami, Stampini, Kamara, Sullivan, & Namara): Tanzania

Whereas the HDI is a measure for assessing long term progress in three basic dimensions of human development, the MPI identifies multiple deprivations in the same household (United Nations Development Programme, 2013). Introduced in 2010 the MPI uses two key indicators to assess the education and health components and a further six to evaluate the standard of living. The MPI is now a popular alternative to the HDI for measuring poverty within a demographic area. All the indicators needed to calculate the MPI are taken from the same household survey and the most recent survey data available for calculating the MPI score for Tanzania come from a census collected in 2010. In that census, 65.6% of the population lived in multidisciplinary poverty with 33.4% in severe poverty.

Table 2.4: Multidimensional Poverty Index of Tanzania

The MPI data below is taken from the 2013 Human Development Report.

United Republic of Tanzania					
Population		Contribution to overall poverty (%)			
Vulnerable to poverty (%)	In severe poverty (%)	Below income poverty line (%)	Health	Education	Living Standards
21	33.4	67.9	26.4	18.3	55.3

The 2010 census gathered data from both urban and rural environments to determine the level of poverty within the community. It noted that 67% of households in Tanzania live in dwellings with floors constructed from earth, sand or animal dung. During my two visits to Masanganya and the surrounding villages this was a constant reminder of the quality of life that these communities must endure on a daily basis. The only buildings I noticed that had concrete floors were the hospitals and health care dispensaries that I visited.

The report also noted that 63% of the households surveyed have no direct access to piped drinking water; Masanganya only had a bore well-constructed in 2012 prior to my first visit. The bore well was delivered by the Australian non-government organisation GHAWA and was not a government incentive. In the smaller village of Mlegele, where the present study was conducted, there was no reliable source of potable water available and women had to explore for local fresh ground water. The

poverty profile from the 2010 census suggests that living standards were worse off in the rural areas.

### **2.3.2 The health status: Tanzania**

Although the indication from the HDR is that Tanzania has a declining poverty score compared to its neighbouring countries, the general health score in the country has improved. Poverty is regarded as a key factor in the health of the population, and it was estimated that 44.8 million Tanzanians were living in poverty in 2010. Tanzania was ranked at 201 out of 229 other countries in terms of capita per GDP (Gideon et al., 2012). Despite poverty being a key consideration, life expectancy rose from 51 years of age in a 2002 report to 61 years of age ten years later in 2012 (United Nations Development Programme, 2013). Infant mortality also declined from 68 deaths per 1,000 live births in 2005 to 45 deaths per 1,000 in 2010, thus on the way to meeting the Millennium Development Goals. Health care in the rural areas, however, remains an issue.

### **2.3.3 The education status: Tanzania**

Recent reports into the status of ensuring universal education values against the Millennium Development Goals set in 2000 seem to suggest that they will fail to meet their targets set for 2015 (see Millennium Development Goals and Tanzania below). Overall 27.5% of adult Tanzanians are unable to read and write in any language, with more women (34%) than men (20%) affected. Although there seems near parity in the enrolment of boys and girls in school, performance has dropped in year VII girls (final year of schooling in Tanzania) with their average pass rates in school-leaving examinations an average of 48% compared with 59% for boys. The retention of female students after year IV has also declined. Overall school attendance rates in Tanzania have actually dropped in primary school students enrolling in year I to completing year VII from 78% in 2006 to 64% in 2011 (Millennium Development Goals Report, 2014).

### **2.3.4 Millennium Development Goals and Tanzania**

The Millennium Development Goals (MDGs) are a series of development goals established at the United Nations summit of 2000 to enhance the quality of life by improving health, education and to assist in alleviating poverty. Tanzania has a current population of 53 million people with a per capita income of only US\$584 (Millennium Development Goals Report, 2014). The following eight goals were to be met by 2015.

### **1. To eradicate extreme poverty and hunger**

With the poverty rate considered high at 65.6%, one third of the population live below the poverty line. According to the 2013 World Health Organization this figure is despite a high economic growth for the nation since 2001 (World Health Organization, 2013); slow growth in the agricultural market remains the fundamental cause for this as it effects most rural areas that rely on agriculture for income. To counter this, the Tanzanian government has initiated the Kilimo Kwanza (agriculture first) and Southern Growth Corridor of Tanzania as a means to promote agriculture to internal and external markets. Tanzania is also a pilot nation under the MDA Acceleration Framework to focus on reducing hunger (Millennium Development Goals Report, 2014).

### **2. To achieve universal primary education**

The Millennium Development Goal targets set for ensuring that children of both sexes will be able to complete a full course of primary schooling seem to have been met as there is near parity in school enrolment. The data displayed in 2.3.3 suggests that the proportion of pupils starting Year 1 reaching the last grade of primary year VII has dropped and textual literacy rates of 15-24 year olds have decreased (Millennium Development Goals Report, 2014).

### **3. To promote gender equality**

The Millennium Development Goals (MDGs) Report (2014) documents that in 2011 the reported ratio of male and female students in primary school was 1-1, meeting the MDG; however by 2007 this ratio had declined to 80% by the time the students attained secondary school level. Marriage at a young age and early pregnancies account for many female students dropping out of secondary school before completion. Tanzania's 'Law of Marriage Act' sanctions the marriage of girls as children and approximately 25% of all 15–19 year old girls are married (Ezer, Kerr, Major, Polavarapu, & Tolentino, 2006). Representation in politics in the Tanzanian parliament has increased to 36% following the elections in 2010 from only 18% in 1990 (AfDb, 2014).

### **4. To reduce child mortality**

The MDGs Report (2014) documents that Tanzania is set to meet this target of improving child mortality; under five mortality rate has dropped from 191 per 1,000 births in 1990 to 81 in 1,000 in 2010 (World Health Organization, 2013). The most significant contribution to this is mortality connected to malaria (Janson, 2007).

Although vaccination rates have increased slightly in the past few years the increased promotion and control measures set in place by the government to promote positive education in acute respiratory infections, diarrhoea, water treatment and personal hygiene (washing with soap and water) has made a huge difference. Malnutrition remains as the underlying cause of death for up to 50% of child deaths in Tanzania and this is linked to poverty especially in the rural areas of the nation.

#### **5. To improve maternal health**

According to the MGDs report (2014), maternal mortality rates have improved from 2005 when the 529 maternal deaths were recorded down to 454 in 2010 and only contribute 2.3% of total mortality in Tanzania (World Health Organization, 2013). It is estimated that over 50% of women give birth at home, with a lack of trained birthing assistance and no access to emergency obstetric care (Gideon et al., 2012). Poor maternal health and malnutrition are also causative factors in maternal mortality (World Health Organization, 2013).

#### **6. To combat HIV/AIDS, malaria, and other diseases**

The MDGs Report (2014) also highlights that the adult HIV rate in Tanzania has almost halved (from 9.4% in 2000 to 5.1% in 2012) and the MDG target met, with the greatest reduction in prevalence rate for men (dropping from 6.8% to 3.8%). The HIV prevalence among youth has also declined dramatically from 4% to 2.7% in girls aged 15-24 and from 3.6% to 1.1% in boys in the same age group. Key contributing factors to this decline in infection rates is the knowledge of HIV transmission, the availability of condoms and increasing education programs aimed at minimising the culture of high-risk behaviour. Once again, the ability to communicate complex healthcare information via an understandable system seems key to meeting these targets. A more effective preventative cognitive regime has also been introduced in Tanzania to prevent malaria (see Figure 2.5), based largely on posters and public information, however this is limited by the ability to read and write. More children under five years of age increasingly sleep under nets from 21% in 1999 to 64% in 2010 (World Health Organization, 2011).



Figure 2-4 Poster produced by Tanzanian Health Department advising on malaria precautions, displayed in the Masanganya Dispensary building.

### 7. To ensure environmental sustainability

Recent data indicates that the natural environment is being damaged at an alarming rate; the area of natural forest has decreased from 46% in 2005 to 36% in 2007. This could be explained by the increased requirement to access land for agriculture to sustain employment and halt the decline into poverty; the rate of deforestation is estimated at 412,000 hectares per year. The government does try to regulate sustainability via the Tanzania National Parks Authority or TANAPA. This body is responsible for all national parks, game reserves, and conservation and forest areas (Millennium Development Goals (MDGs) Report 2014).

### 8. To develop a global partnership for development

With 7% economic growth, 12.1% inflation rate, 11.7% unemployment rate and a 2.9% population growth, Tanzania is a nation dependent on foreign aid. External resource inputs increased from about US\$1.1 billion in 2000 to about US\$2.4 billion in 2011 from Development Assistance Committee (DAC). Tanzania has implemented a number of core policies and structural reforms including: trade and exchange rate liberalisation, public service reforms, investment promotion, tax reforms, financial sector reforms, legal sector and local governance reforms as well as the national anti-corruption strategy. These have improved confidence on the economy, and one consequence is the improvement in the flow of Official

Development Assistance and Foreign Direct Investments (Organisation for Economic Co-operation and Development, 2013). In 2012 and into 2013 Tanzania made important governance advances by being voted among the top 10 best-governed nations in Africa (according to the Mo Ibrahim Index) (Millennium Development Goals (MDGs) Report 2014).

## **9. Transition from the Millennium Development Goals to Sustainable Development Goals**

The Millennium Development Goals ended in 2015, and were replaced by the Sustainable Development Goals. These new goals were designed as a plan of action to strengthen universal peace and promote increased freedom, seeking a collaborative approach by the global community to prevent poverty across the planet. These goals and targets aim to stimulate action over the next fifteen years in areas of critical importance for humanity and the planet. There are 17 Sustainable Development Goals and 169 targets in total, seeking to end world poverty and empower females to gain equality by 2030. Out of the 17 sustainable targets goal 3 and goal 4 are of particular relevance.

### **Goal 3: Ensure healthy lives and promote well-being for all at all ages**

This goal will try and establish health promotion to all communities, and enable individuals to maintain their own health and wellbeing. This thesis has attempted to establish the strong link between health literacy and the wellbeing of an individual. Not only must we try and achieve better education for developing area's (goal 4) but my research has attempted to show that health education material should be published in a format that is universal to all. Visual literacy is an area that should be looked at to develop this resource, together with better medical diagnosis and treatment for visual issues that may prevent individuals from accessing any visual message that may be developed.

### **Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.**

This target extends the issue of literacy above and beyond just health literacy alone. By the year 2030 these goals aim to ensure that there is gender and age equality in school and education programs. This would allow greater promotion of health and wellbeing issues across communities and eradicate literacy as a roadblock to disease and infection. It may not be an achievable goal to educate the world's population by 2030 to allow the empowerment of textual literacy but it may be

achievable to translate existing education into a format to allow visual literate comprehension.

## 2.4 The Village Hierarchy in Tanzania

As described earlier in this chapter, Tanzania only started to restore its reliance on regional and local governance in 1980 following the collapse of the direct centralised political control experiment. By the time I arrived in Tanzania to identify a suitable study population the organisational structure was better established (figure 2-6). Tanzania is divided into 30 regions, further divided into 169 districts. Within each district local councils manage local resources, budgets, amenities and infrastructure. A council chairman leads the village councils; this position is an elected position within the local area with permanent residents having the ability to elect their own preferred spokesperson via a voting system. The Village Chairman of Masanganya-Kisarawe council was a gentleman named Jumanne A-Magomba. As head of the local council Mr A-Magomba granted permission for me to trial my tool and collect data from the local population surrounding Mlegele; he also assisted in the canvassing of the local population to recruit my study group.

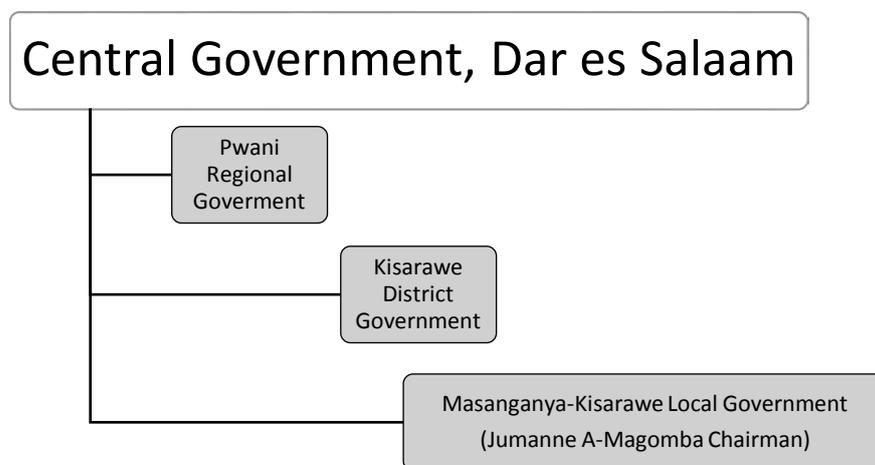


Figure 2-5 Map of the village political hierarchy

### 2.4.1 Community health system

The Pwani region of Tanzania is located in the coastal region catchment area west of the capital Dar es Salaam, and covers a large area of approximately 32,407 square kilometres. Although at independence in 1961 Tanzania committed to develop a national health system, the expansion of rural population forced the government to adopt a multi-tiered system that allowed people to have access to

local point of care facilities with the option of referral up the line to more specialised levels if required (see Figure 2-7).



Figure 2-6 Tanzanian Administration hierarchical structure (Venugopal & Yilmaz, 2010)

It is widely acknowledged that within this structure a large proportion of the community seek the services of traditional healers nonetheless. The Tanzanian Ministry of Health and Social Welfare (MOHSW) estimates that approximately 60% of people in a rural environment seek their first medical or healthcare advice from traditional healers. Currently, 53% of all live births are delivered in the home environment with traditional birth care attendants rather than nursing or midwifery staff (Stangeland, Dhillon, & Reksten, 2008). The policy of reducing the number of healthcare workers by almost a third in the early 1990s has resulted in an overall decline in trained staff available to deliver care. This staff crisis has been slow to rebound; in 2007 the Ministry of Health and Social Welfare estimated that an additional 184,100 healthcare workers are required by 2017.

The village of Mlegele where my study group was located relied on the outreach service from Masanganya for their medical requirements, immunisations and health checks. More acute requirements had to be managed on a local scale until the patient could be transported to the dispensary at Masanganya. The availability of the doctor at the dispensary depended on many factors and there were occasions during my visit when no doctor was available. In such cases the nursing staff on

duty at the dispensary facilitated all routine health checks, wound care management and essential consults as well as providing an emergency obstetric service for those home births that proved difficult. There was no electricity at the Masanganya dispensary for medical interventions and all clinical procedures carried out after dusk had to be managed by the light of kerosene lamps.



Figure 2-7 Emergency lighting in the medical clinic

A small generator was donated to the dispensary by GHAWA for the sole use of powering the pump used to draw water from the newly sunk bore; this was the first time the dispensary had access to a manageable local water source. This basic arrangement for essential infrastructure did not seem atypical for the region; a number of other such dispensaries were visited and seemed to be on par with the dispensary located at Masanganya.

This dispensary did contain several rooms that could be utilised as patient rooms, although this depended on availability of beds and equipment to allow this arrangement. There was one clinical room set aside for obstetric intervention, however this only catered for normal vaginal deliveries. Any obstetric emergency or trauma had to be referred to the next healthcare facility up the line. Transport out of the dispensary relied on a private vehicle being made available or, more often than not, on the back of a motorcycle. Kisaware hospital did not often dispatch their ambulance vehicle to either Masanganya or Masaki due to the distance, the lack of vehicles and drivers. The next healthcare facility up the line from Masanganya was the small hospital located in the village of Masaki, approximately 18 kilometres along a unsealed dirt road. This main supply road was in several stages of disrepair and suffered from the deluge of water in the wet season and the high degree of traffic on a daily basis.

Masaki hospital did have access to electricity and a water supply, however these services were frequently suspended due to infrastructure failure. The hospital did have the ability to care for low acuity inpatients but had no facilities for acute interventions. Masaki displayed an example how disjointed some non-government aid program interventions can be; a recent addition to the hospital had been funded by a major U.S. non-for-profit organisation. An operating theatre had recently been constructed in a building adjacent to the main building; this room remained locked and unused despite the donation of an operating table due to a lack of suitable anaesthetic equipment or doctors skilled in surgery or anaesthetics. Patients requiring extended in-hospital care or surgical interventions had to be transported the 24 kilometres on dirt roads to the district hospital in Kisaware. Kisaware hospital had an emergency care capability and wards to cater for gynaecological and obstetric, paediatric, medical and surgical patients. The journey from Masaki would take between 30–40 minutes depending on road conditions, traffic and type of vehicle.

Tanzania does not possess an organised ambulance service. Many private operators are located in the capital, Dar es Salaam, but most are based in the private hospitals located within the area. Ambulance transport based in government hospitals or outside of the capital do not have advanced pre-hospital care services and merely serve as transport to and from major facilities. The ambulances based at Kisaware hospital were in a rundown condition and services were dependent on a small pool of drivers on a 24-hour basis. These vehicles would not travel to the out-reach health facilities of Masaki or Masanganya due to distance and availability of drivers who knew the route. The closest acute intervention facility from Kisaware hospital is the Muhimbili government hospital, approximately 40 kilometres from Masaki. This journey would take between 60–90 minutes depending on traffic and road conditions.



Figure 2-8 Kisaware Hospital ambulance bay

## 2.5 Summary

Africa has a rich history of storytelling (Reitmaier, Bidwell, & Marsden, 2011). Using imagery and pictures is a culturally accepted method of communication. With its large rural population, its documented issue with literacy within the population and the government's desire to extend healthcare projects it made Tanzania an ideal environment to test my picture based visual tool.

Whilst goals and objectives to improve health and education standards in Tanzania have been discussed in this chapter it is also important to consider the significance of the hygiene issue. The UNICEF 'Water, Sanitation and Hygiene report indicate that:

- 80% of Tanzanians do not wash their hands with soap and water before preparing food.
- 84% of schools lack functional hand washing facilities.
- 4% of schools had access to hand washing facilities for children with disabilities.
- 20% of children under 5 yrs old die from diarrhoea, transmitted through lack of hand hygiene.
- > 5 children a day die every hour due to poor hygiene and sanitation

This data was gathered in the school settings where children spend significant periods of time, and despite the ongoing health risks associated with poor hand hygiene this lack of adequate hygiene and sanitation also leads to declining attendance, retention and educational performance (UNICEF, 2011).

Although these issues are well known and documented the problem still exists. As UNICEF is a leading advocate for child rights in Sub Saharan Africa they have been collaborating with the Government of Tanzania to assist in sustainable improvement solutions within Tanzanian schools with particular focus on delivering the WASH program, in particular (UNICEF, 2011):

**WASH in emergencies;** During any man made or natural disaster a major and immediate risk to public health is normally the breakdown in hand hygiene and sanitation. UNICEF maintains stocks of vital supplies such as soap, jerry cans and buckets for distribution to area's in need.

**Scaling up WASH in schools:** Liaising with Ministries of Health & Social Welfare, Education & Vocational Training, Water and Local Government UNICEF representatives assist in the drafting of documentation to support a national framework for cooperating and relative responsibilities regarding WASH initiatives in schools.

**Resource mobilization for school WASH:** Approximately 50 schools and 25,000 children are in a pilot model to assess the school WASH package that is aimed at providing minimum standards in water, sanitation and hygiene standards in schools.

**Addressing household sanitation, hygiene and water quality:** With up to 5 children an hour dyeing in Tanzania due to poor hygiene and sanitation UNICEF are collaborating with the Tanzanian government to provide a household package to promote improved hand washing, hygiene and sanitation standards.

**Impact with equity:** Providing a coordinated and harmonised response for increased coverage and improved equality of appropriate WASH facilities for all children.

The next chapter will document an extensive literature review based on the root subjects that form the basis of my research. Although my study group was based in rural Tanzania the multi-faceted phenomenon of low literacy, low literacy, resource-poor environments coupled with poor population health and preventable mortality from disease is a common global statistic.

# CHAPTER 3

## Literature Review

### 3.1 Introduction

This chapter seeks to outline the literature reviewed in the preliminary stage of the literature review process for this thesis. In accordance with the research design, this review process continued during the data collection and analysis stages of the research and well into the final edit. Research on picture-based literacy is becoming quite topical due to recent natural disasters and pathogenic pandemics in developing countries, as is the requirement to disseminate basic health care information to the displaced population affected. Literature reviewed during these latter stages will be presented in the following chapters as applicable in support of my findings.

### 3.2 Pictorial Communication and literacy Skills

Prior to the introduction of the written word during the Mesopotamian era information was often communicated between individuals in the community using pictographs (Martin, 1994). Indigenous communities have shared life experiences and skills throughout history by using pictographs and stories rather than the written word (Martin, 1994; Sugiyama, 2001). In fact Martin (1994) goes on to highlight that the Dogon people from the Central Regions of Mali in Western Africa often still feel the need to draw before they explain verbally; they attest to the importance of drawing over speech on many occasions. This method of communication has survived for many generations and dates back to Indigenous rock art found in the Northern Territories of Australia. It is widely recognised that the art found on the wall of caves and rocks are a form of narrative, using images as method of communicating a story to the generations that followed (Bullen, 2013; Hurlburt & Voas, 2011).

This method of pictorial communication on rock and the inside of caves is not indicative of Australia alone; similar evidence of preserved rock art has been found in Africa (van Rooyen, 2012) and Northern Chile (Sepulveda, Laval, Cornejo, & Acarapi, 2012) indicating that this form of communication was commonly used by our ancestors to pass on important historical information prior to the development of the written word.

Five thousand years ago Sumerian scribes discovered the potential in the human brain that makes it possible to convey language visually (Bullen, 2013; Dehaene, 2010). In her article detailing rock art and its narrative meaning Margaret Bullen explains that recent research using PET (positron emission tomography) scans and fMRI (functional magnetic resonance imaging) in humans identified that the area of the brain we use to recognise and translate words was the left occipito-temporal, the same region that we use for object recognition and symbols. This research highlights that the human brain engages the left occipito-temporal area of the brain as a primal reflex when dealing with pictures or images, which is a totally different pathway used when attempting to read words (Bullen, 2013).

From pictures into icons, icons into patterns and patterns into hieroglyphics, the use of symbols and hieroglyphics into a visual language communication tool took time to evolve. We can trace early writing back to 3000 BC where Sumer, Hittite and Egyptians used a form of hieroglyphics and Cretan Minoans used pictographic script to communicate (Geneva, 1995; Ken Fenn, 2011) but it wasn't until the Western alphabet emerged about 1500 BC that a common form of script was used as a communication tool. This original template was the basis for all other styles of alphabetical writing (Geneva, 1995) and proved so important as a cultural tool that the origins are depicted in various religious scriptures (Geneva, 1995).

In a paper on illustrated books Geneva (1995) describes how both the Bible and the Koran suggest that the alphabet was given to Adam by God; in a different religion, Indian legend has it that the elephant god, Ganesh, invented writing by breaking off a tusk and using it as a pen. The origin of writing as we know it is still not clear, however its theoretical source is referenced in many religious scriptures. The adoption of a common alphabet and the ability to use that medium to communicate with the masses in the form of a set of commandments or to record a biblical event for generations to behold, seems to be as old as the religion itself. The one issue that was as true as it was then as it is now is the issue of literacy; without the ability to decipher the script or to read the written word this medium of letters, words and sentences are ineffective as a medium of communication. In days gone by it was only the academic elite, monastic scholars or the nobility that had the power of literacy; common people often did not possess the skills and they were never taught.

A lack of literacy in any community is a barrier to participating effectively as a productive citizen because the inability to read limits the ability to identify rules,

regulations or public health notices (Freebody, 2007). It has been found that using pictorials or images can be effective at delivering information at all age levels within the community regardless of textual literacy competence. This process starts at early pre-school age and presents as a useful adjunct later in life (Ellis et al., 2011; Leishman, 2004). Pictorials have been shown to engage and captivate a broad range of the population regardless of gender or age (Delp & Jones, 1996; Dirr & Katz, 1989; McDermott, 1989; Osborne, 2006), the popularity of adult cartoons and comics being testament to that. The US Department of Defense has used cartoon-based material for use in equipment maintenance manuals for many years (Delp & Jones, 1996) to overcome the multicultural diversity and low literacy within its personnel ranks (Gatto, 2012).

In his 1989 paper describing the use of cartoons in health education McDermott (1989) explains the historical use of pictorials to enhance understanding of health education. McDermott describes the use of cartoons and comical drawings in an instructional context for medical and allied health professions students as well as paediatric and adult patients in a hospital setting. This artistic and comical approach has also shown to be effective with healthcare professionals. Several recent papers identify cartoon-based visual aids as being able to enhance the level of absorption amongst medical students (Green, 2013; Green & Myers, 2010; Vaccarella, 2013; Williams, 2012).

Health related subjects that are of great importance to the community can fail to be delivered to the majority due to the communication process, the design of the message being key. The textual literate ability of the community must dictate the medium for communicating health care messages if they are to be widely absorbed and adopted. The subjects of basic hygiene and infection control are foundation elements of most health education systems (Ward, 2011), an understanding of infection control and the ability to break the chain of infection by the simple act of hand washing with soap and water could possibly be the most powerful primal health action in the prevention of any and all infections that are passed on via the faecal-oral route.

The death rate from disease and infection in many African countries seems unacceptably high, with infants and women amongst the most susceptible. This is a global issue as HIV and communicable infections such as cholera, diarrhoea, dysentery, influenza and sexually transmitted disease play a major role in this

mortality rate (Ester, Torres, Freire, Hernandez, & Gil, 2011). A recurrent theme to the spread of infection seems to suggest a lack of basic textual literacy skills as being the root cause (Kickbush, 2001; Van Rompay et al., 2008). If this is the case and a tool can be developed to communicate these educational messages, it would suggest these deaths may be preventable.

### **3.3 Picture-based Learning**

In storytelling, the use of both script and art is referred to as 'twice told tales' or independent story telling (Agosto, 1999) by which one form of medium is thought to support the other. The human brain seems to work in such a way as to conjure up a storyline; even if there does not appear to be one and picture stories or comics appear to take advantage of this phenomenon (Williams, 2012).

This literature review identified many studies that used pictorials or pictographs as an aid to delivering health care advice (Choi, 2011; Green, 2013; Green & Myers, 2010; Houts, Doak, Doak, & Loscalzo, 2006; McDermott, 1989; Treitler, Kim, & Hunter, 2008) however most of these reviews concentrated on either patient discharge instructions from hospital (Choi, 2011; Treitler et al., 2008) or assisting people with low textual literacy skills with medication dosing (Cordasco et al., 2009; Evangelista et al., 2010; Katz, Kripalani, & Weiss, 2006; Kripalani et al., 2007; Weiss & Coyne, 1997).

Outside of the health delivery area there is evidence to support the use of symbols, signs and pictographs in the construction industry. An example of this has been adopted by a large construction business in the United Kingdom; they employed a large foreign workforce with limited comprehension of English and had a legal requirement to abide by mandatory Occupational Health and Safety rules delivering health and safety information (Bust, Gibb, & Pink, 2008). Adapting safety instructions into photos was a solution to cut through translation and literacy issues. A similar approach has been taken by international airlines in the translation of safety instructions. These cards are to be found in every seat and must be understood by every passenger in case of an emergency landing; info-graphics (the use of pictures) have taken the place of multi translation material to explain the actions to take if required.

The appeal of pictorial comics seems universal, popular with both adult and children alike (Green & Myers, 2010; Williams, 2012). Cartoons cross cultural and language

barriers; they are a common communication tool within communities globally. Pictorials, pictures and cartoons have historically been used with great affect to assist in the delivery of information in many different formats (McDermott, 1989). The only reason that this form of communication has not been employed in the mainstream public health system is because doctors are yet to be convinced of the merits of this type of communication media (Green & Myers, 2010).

Although public health education is well established in many developed global communities, the main delivery system used to deliver that information is through written manuals, reports and circulars. It then becomes unavailable to communities with low literacy levels (Osborne, 2006). In general, the amount of information available to textual literate people in the community is vast, with government agencies and medical bodies disseminating public health information on a local scale and some clinics often producing their own material to educate and instruct the local population.

Depending on the creativity of the author, such material may include some pictures or sketches in an attempt to add more descriptive features; these drawings or pictorials need not be elegant to be effective (Osborne, 2006). For example, Delp and Jones (1996) studied the use of cartoons in delivering wound care information to patients receiving treatment in the emergency room within a U.S. health care facility.

The Delp and Jones sample group was not chosen for its literacy level as such but subsequent data analysis revealed that out of the 234 people enrolled in the study, the 57 who had less than a high school education complied with the instructions and showed great satisfaction with the format of the tool. In the same study the parents of children under 14 years of age were equally “very satisfied” with the children’s ability to understand and comply with the cartoon-based regime compared to the normal written format used previously. The ability to read the written word empowers people from any community to discover new skills and educate themselves by utilising written material readily available from multiple sources. In some instances this material has been adapted to suit the target audience, the instructional material adapted to make it more applicable to the reader.

An example of this is the basic first aid courses that have been developed to appeal to many different stages of maturity and educational levels. An example was produced by St Katharine’s Church of England primary school in the United

Kingdom (Dean, 2010) where the course content has been conised to deliver the standard first aid performance criteria to the educational level of primary school children.

The review I conducted for this research project identified a gap in the literature and research in the area of delivery of health education using not only pictures to supplement text but also to replace it, hence the impetus for this study. A comprehensive literature review has failed to identify any major examples of health care education in the form of pictures alone.

The initial inspiration for producing such a tool came from an Indian produced publication, "Where There is no Doctor" (Werner, 1980) discovered by the researcher during a sabbatical in India in the late 1980s. This book provided detailed medical and hygiene information for remote communities with drawings to accompany the detailed medical text. The majority of the pictures used in the book were added to supplement the text and this book could not be utilised entirely without adequate reading skills due to the large amount of text. Although it has been shown that any type of picture or graphic accompanying text makes it more attractive to the reader (Osborne, 2006) the accompanying graphic must portray the text accurately if it is to be of considerable benefit.

In more recent years, there has been a requirement to communicate medical information to local populations in areas of conflict. One method employed to communicate basic medical terminology has been to translate basic medical words and phrases into a pictograph format to create a visual communication tool (Stillman, 2007). The tool has been employed successfully to communicate with culturally and linguistically diverse (CALD) communities from Iraq to Afghanistan by the military forces in those areas of conflict. Although this tool uses pictures alone to replace words, but in a simplified format, it is more of a flash card system rather than a stand-alone health care message and must be facilitated in order to communicate a message.

The absence of any significant research on conising basic hygiene information or first aid skills into a format that can readily be understood by low literacy communities (such as a pictorial based program) suggests there is a identifiable gap. Journal references indicate low health literacy is a global problem and not just isolated to the African subcontinent or isolated areas (Bynum et al., 2013;

Caremark, 2014; Ciampa et al., 2012; Gamelli, Mykychack, Kushnir, Driscoll, & Fuzaylov, 2015; Lassetter et al., 2015; Don Nutbeam, 2008; Pleasant & McKinney, 2011; Prior, 2013; Salami et al., 2014; Torpy, 2011; Wilson, 2011; Zarcadoolas, 2006; Zoellner et al., 2011). Both common literacy and health literacy is seen to be a global problem that affects adults in well developed countries such as United States (Osborne, 2006; Parikh, Parker, Nurss, Baker, & Williams, 1996) (Dreger & Trembeck, 2002) (Timmins, 2002) and Australia (Lawrence, 1990; Nutbeam, 2008), not just developing countries.

### **3.4 Health literacy and Basic Hygiene**

During my literature review it became clear that the issue of 'Health literacy' was a distinct sublevel of literacy that I had previously been unaware of. 'Health literacy' refers to a person's ability to understand healthcare information. The phenomenon of a specific literacy skill set dedicated to health material was not introduced into the United States' healthcare system until the early 1990s (Chinn, 2011; Cutilli & Bennett, 2009). Early interest in investigating literacy skills particular to healthcare related subjects came from nationwide functional literacy surveys conducted in the United States in 1992 (Parikh, Parker, Nurss, Baker, & Williams, 1996). Since then health literacy research and assessment tools have expanded at a rapid rate, resulting in a large increase in the number of journal articles produced between 1997 and 2007 (Chinn, 2011).

Health literacy is the cognitive and social skills which determine the motivation and ability of individuals to understand and use information in ways which promote and maintain good health (Zarcadoolas, 2006). Health literacy is not necessarily directly related to a person's general literacy or academic intelligence (Zarcadoolas, 2006); the United Nations Educational Scientific and Cultural Organization (UNESCO) defines general illiteracy as "someone who cannot, with understanding, both read and write a short, simple statement on his everyday life".

The Institute of Medicine and National Library of Medicine defines Health literacy as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Wolf et al., 2010). More simply - Health literacy refers to "a person's ability to understand and use health information, often in print form" (Zarcadoolas, 2006). In his recent book, Zarcadoolas (2006) explains that a person may have a high level of fundamental literacy but a poor level of health literacy; for

example a college graduate with a degree in physics may not understand that taking multiple over-the-counter medications at once could be harmful, or a retired librarian not understanding how the Medicare system operates.

Health literacy (HL) is also understood to be about empowerment, and takes its lead from health promotion. It is a broader form that considers how people need the literacy to not just read something but to be able to critically process the information in such a way as to overcome structural barriers. Education (information, therefore communication) can only have impact when enabled by context. Health literacy has been defined as the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health. Health literacy means more than being able to read pamphlets and successfully make appointments. By improving people's access to health information and their capacity to use it effectively, health literacy is critical to empowerment. See for example:

<http://www.who.int/healthpromotion/conferences/7gchp/track2/en/>. However for the purpose of this thesis I have used the definition used by Zarcadoolas, (2006).

Out of the many existing literacy assessment tools available to the researcher today (Pleasant & McKinney, 2011) two commonly used tests have been developed to establish levels of health-literacy within a study group. One is the Short Test of Functional Health literacy in Adults (S-TOFHLA), a shortened version of the Test of Functional Health literacy in Adults (TOFHLA). It requires approximately 12 minutes to administer in comparison with the longer version requiring an average of 22 minutes (Wolf et al., 2010).

The Rapid Estimate of Adult literacy in Medicine (REALM) is the other widely used investigation tool to establish health literacy. As its name implies it requires less time to administer and is favoured for use in English as a Second Language (Michael S. Wolf et al., 2010). In their 2010 analysis of the REALM assessment tool, Dowse et al. are critical of the use of this English language based tool as a trusted method to establish adequate health-literacy due to the reliance on pronunciation of words (Dowse, Lecoko, & Ehlers, 2010); this could be prejudicial to groups that have English as a Second Language and therefore could add bias into any such research finding (Liamputtong, 2011). The recommendation of Pleasant and McKinney's (2011) article on gaining consensus on a suitable universal health literacy assessment tool was that both national and international funding should be made

available to support the development of a new approach to defining health literacy. This should include all the various aspects of cultural and ethnic deviation and exclude English as the dominant language.

Health literacy directly affects a person's ability to follow healthcare related instructions such as taking medication, self-management of wound care, understanding disease patterns or adopting preventative measures. An article printed in the *Annals of Internal Medicine* in November 2003 indicates a direct link between health literacy and an individual's health status (Wilson, 2003), more so than their employment status, education level, racial or ethnic group. This and other peer reviewed articles associate low (health) literacy levels with increased chances of dying of a chronic or communicable disease (Caremark, 2014; Kripalani et al., 2007; Nokes et al., 2007; Nutbeam, 2008; Pignone & Dewalt, 2006; Pleasant & McKinney, 2011).

This problem is not just associated with any one health-care issue; the problem is prevalent across the spectrum of health related issues. Although the majority of research into the area of poor health literacy seems to have been concentrated in HIV education and pharmaceutical compliance, recent studies broaden the spectrum. Shieh et al. (2009) investigated the health literacy issues associated with pregnant women attending a pre-natal clinic in Mid-West America and possible barriers to education (Shieh, Mays, McDaniel, & Yu, 2009). This research noted that about 15% of the study group scored low on the S-TOFHLA, were less likely to use educational resources to promote better health outcomes, and more at risk of self-efficacy barriers than those with a high level of health literacy.

A recent article in the *Journal of Cardiac Failure* (Evangelista et al., 2010) acknowledges the impact of health literacy on cardiac failure and related healthcare issues in the United States. It recognises the importance of good patient communication and recommends that relevant patient information should be translated into a medium considered effective for people with poor health literacy levels to achieve the best possible outcomes. It concludes with the key recommendation that timely recognition of low health literacy combined with tailored interventions be integrated into clinical practice.

A recent article in the *Washington Post* (Caremark, 2014) highlights another aspect of a broad lack of health literacy in the population: the increase in medical and

healthcare costs associated with lack of pharmaceutical compliance or medical instruction. A peer reviewed article (Campbell, 2005) refers to a 2004 report commissioned by the US Committee on Health literacy calling 'lack of health literacy' as a silent epidemic that has cost billions of dollars to be lost on avoidable healthcare issues. Campbell from the University of Missouri-Columbia cites more than 300 studies that reveal that health-related materials cannot be understood by most of the people they are intended for.

In their 2015 paper looking at health literacy and obesity among native Hawaiian and Pacific Islanders in the United States (Lassetter et al., 2015) calculated that 36% of adults have inadequate health literacy skills. Low health literacy is not just associated with underdeveloped countries; the literature review for this present research indicates that large communities within both Australia and the United States, indigenous and non-indigenous, have poor adult literacy skills. For example, a paper referencing the US National Adult literacy Survey suggests that 42 million Americans over the age of 16 can't read (Gatto, 2012). literacy rates within Indigenous people of Australia, New Zealand, Canada and United States scored low on the United Nations Human Development Index (HDI) in which literacy skills are examined against social-economic and health indicators (Cooke, Mitrou, Lawrence, Guimond, & Beavon, 2007). Although there have been advances in medical research and health systems, many communities around the world lack the literacy skills required to access basic health care material or first aid information.

Although we have noted that health literacy is not directly related to general textual literacy there is a functional correlation between the two. I have established that just because an individual is academically literate does not necessarily mean that they would be health literate; having poor academic literacy skills would indicate, however, that basic written health care instructions could not be understood. Therefore a poor general literacy rate in a population would indicate a poor level of health literacy.

As noted above poor literacy is not just an issue in developing countries; a recent article in The West Australian newspaper reports the results from an audit conducted by the Australian Bureau of Statistics. It claims that close to half of Australian adults lack the basic reading and writing skills required for everyday living (Hiatt, 2013). The report based on an international assessment conducted in 25

countries reports that 38% of employed adults in Australia were in the lowest band for literacy and numeracy. This report supports other evidence that poor literacy is not just a problem for developing countries.

The 1993 National Adult Literacy Survey in the United States represented 190 million adults over the age of 16. It concluded that 47% of Americans were unable to read a bus timetable or write a brief letter without error ("Social science and the citizen," 1994). A paper aimed at improving comprehension for cancer patients noted that 44 million American adults lacked the basic ability to read or write above the level of a fifth-grade child (Doak, Doak, Friedell, & Meade, 1998) thus lacking the ability to comprehend basic health-care instructions. In Australia recent media articles indicate increasing alarm at the falling levels of literacy; the recent ABC 'Lateline' report entitled "Tasmanian literacy levels alarm school education experts, who call for 'significant change'" report that at least half of Tasmania's population can't read or write properly, with 47% failing minimum standards and lacking the basic ability to read and comprehend a newspaper (Smith, 2014).

An article published in 2007 studied the correlation between the well-being of the Indigenous populations in four leading first world countries against the United Nations Development Programs Human Development Index (Cooke, Mitrou, Lawrence, Guimond, & Beavon, 2007). The HDI index was applied to Indigenous groups from Australia, Canada, the United States and New Zealand. Adult literacy scores formed part of the education index for the adult population and the calculation was then used to measure overall HDI index. Results indicate that between the years 1990–2000 the overall scores of Indigenous groups in the United States and New Zealand have improved whilst those in Australia decreased. A recent 2015 study measured the relationship between health literacy and obesity in Indigenous Hawaiian and Pacific Islanders (Lassetter et al., 2015). Their study demonstrated that 45.3% of their study group of 354 participants showed a limited amount of health literacy, 9.3% higher than the general U.S. population.

Indigenous children in Australia are falling behind in literacy standards; the data extracted from the 2009 National Assessment Program for literacy and Numeracy (NAPLAN) indicate that an average of 30% of indigenous children across all areas tested, failed to meet the basic test standards. The failure rate increased to almost 80% in the Northern Territory, the trend rising with the age of the child (Prior, 2013). This suggests the healthcare system must look at adopting different strategies to

educate the general community in preventative health and hygiene issues to improve the quality of life for the large group of adults and children that does not possess the basic literacy skills required to read existing health care messages.

It is considered a critical human right to have access to literacy skills (Bank, 2014; Janson, 2007), however since the decline of interventions from Western organisations in Tanzania from the mid-1960s access to literacy has declined (Wedin, 2008). Basic hygiene is a foundation of public health and in correlation with health literacy it is shown to have a positive effect on rates of infection (Kickbush, 2001; Roger et al., 2011; Taylor et al., 1989). Hygiene is a vital component in general health and research has shown that identifying routes of transmission in the home setting and community is critical in breaking the chain of infection (Water Supply & Sanitation Collaborative Council, 2012). It is well understood that the lack of sanitation and personal hygiene is of great importance to the general welfare of a community; preventative measures such as hand washing with soap are essential elements in the transmission route of communicable disease such as diarrhoea, respiratory infections and eye conditions. These diseases are the leading causes of child mortality in Africa and South East Asia (Pickering, Boehm, Mwanjali, & Davis, 2010). A holistic approach to educating communities in health subjects is beneficial: it is important to cover subjects that complement each other and enhancing general knowledge about infection control is a way of promoting compliance in a health delivery system.

### **3.5 Basic Hygiene**

Basic hygiene is a foundation of public health and, coupled with health literacy, has been shown to have a positive effect on rates of infection (Cairncross et al., 2010; Kickbush, 2001; Roger et al., 2011; Savolainen-Kopra et al., 2012; Taylor et al., 1989). Further research has identified that hand washing with soap (HWWS) may well be the most cost-effective prevention strategy in preventing infectious disease in developing communities (Curtis et al., 2009; Luby et al., 2011). In her 2009 paper Valerie Curtis et al. attempted to identify key behaviour motivation for HWWS in 11 developing countries (including Tanzania). Curtis reported that only 17% of the study group washed their hands with soap after going to the toilet; their motivation for hand washing was disgust at having dirty hands or the feeling of 'comfort' at having clean hands, not a fear of spreading disease as a motivator for improving hygiene practice. These feelings were later to be replicated in my own study group. The main conclusion was that HWWS should be taught to children from an early age

to develop 'social manners' or to enhance their disgust of 'dirty' hands and thus improve the intrinsic behavioural practice of washing hands following key interventions.

Hygiene is a vital component in general health, and research has shown that identifying routes of transmission in the home setting and community is critical in breaking the chain of infection (Water Supply & Sanitation Collaborative Council, 2012). A large number of researchers have identified that diarrhoeal and respiratory conditions are a leading cause of worldwide morbidity and mortality, in particular child mortality (Cairncross, 2003; Curtis, 2001; Curtis & Cairncross, 2003a, 2003b; Curtis et al., 2009; Fan & Mahal, 2011; Grayson et al., 2009). For example, 62% of all deaths in Africa and 31% of all deaths in South East Asia are the result of infections (Curtis et al., 2009) therefore the simple task of breaking a link in the chain of infection could result in the saving of many lives throughout both the developed and developing world, at minimal cost to the health system.

In their 2009 behavioural study carried out in conjunction with the Global Public-Private Partnership for Hand washing with Soap, Curtis et al. (2009) observed that HWWS was not common practice in the domestic household, with hands being washed on only 5%-15% of key occasions. Similar figures were found in my study group. These findings, however, are not isolated to developing countries; the same study observed that only 43% of mothers in the United Kingdom washed their hands with soap and water after changing a soiled nappy.

Contaminated hands play a key function in the transfer of faecal germs via the hand-mouth route (Cairncross et al., 2010; Pickering, Boehm, et al., 2010; Pickering, Davis, et al., 2010). Pathogens transmitted via this route include *Giardia lamblia*, *Cryptosporidium parvum*, pathogenic *Escherichia coli*, *Shingella*, *Salmonella*, *Vibrio cholera*, *Streptococcus pneumonia*, rotavirus, norovirus and enteroviruses. A recent study to identify the role of water, sanitation and hygiene in reducing schistosomiasis (Grimes, 2015) noted that washing hands with soap and increased hygiene had a role to play in the reduction of this disease since soap is toxic to cercariae, miracidia and fresh water snails. The authors suggested that the use of soap and water may protect against *Schistosoma* infection without any form of immunisation.

In her 2010 Tanzanian study, Amy Pickering et al. successfully identified the correlation between *Escherichia coli* contamination of domestic household drinking water via the faecal-oral route of the study group and poor hand hygiene. Education levels were found to be a major contributory factor in the lack of HWWS practice within the domestic environment, leading to a prevalence of gastrointestinal and respirational symptoms reported. It has been estimated that 85% of faeco-orally transmitted disease in Africa could be prevented by improving water supplies and hand hygiene (Cairncross et al., 2010).

The Global Public-Private Partnership for Hand washing with Soap (<http://globalhandwashing.org/about-handwashing/>) works to save children's lives by promoting hand washing with soap (The Global Public-Private Partnership for Hand washing with Soap (<http://globalhandwashing.org/about-handwashing/>), stating that human faeces are the main cause of diarrhoeal pathogens. The organisation goes further to indicate that diseases such as typhoid, shigellosis and cholera are all associated with poor hand hygiene. There has been considerable research conducted to establish the link between a lack of effective hand hygiene and the spread of disease and poor health issues in developing communities (Curtis, 2001; Curtis & Cairncross, 2003b; Curtis et al., 2009; Ekernas, 2010; Fan & Mahal, 2011; Grayson et al., 2009; McDonald, Bailie, Grace, & Brewster, 2009; Sandora, 2012; Thomas, Boquete-Suter, Koch, Pittet, & Kaiser, 2014). There is an indication that HWWS could prevent approximately 30%–47% of child diarrhoea, and 23% of respiratory infections as well as reducing the infection from HIV in individuals (Curtis et al., 2009). These figures suggest that many lives could be saved from educating the community to wash their hands with soap and water.

It is well understood that sanitation and personal hygiene are of great importance to the general welfare of a community; such controls are essential elements in the transmission route of communicable disease such as diarrhoea, respiratory infections and eye conditions.

### **3.6 HIV**

A 2003 survey (Dagne, 2010) found that HIV/ AIDS infection rate of Tanzania was 8.8% (estimated to rank twelfth highest globally) and HIV/AIDS-related mortality of under-five year old children was 165 deaths per 1,000 live births. A 2013 feasibility study (Kapiga et al., 2013) conducted on women in the northern area of Tanzania recorded a raised level of 16% of the group infected with HIV. During an interview

with a doctor running remote clinical services in the village of Masanganya, Tarimo (2012) was told the HIV rate ranged from a national average of 7% up to 70% in some rural communities. Research indicates that patients with low health literacy follow medical regimes less well than patients with sufficient literacy skills; in many cases treatment is available in these communities but the lower than average textual literacy skills and a reliance on traditional healers hamper the uptake of treatment regimes.

This was the case in my study group, although a Government endorsed medical dispensary was available in Masanganya it offered no diagnostic service and only a very basic pharmacological stock. Transport was also considered a great distractor from attending the dispensary, in some cases this would involve a 2-3 hour walk. In many cases traditional healers lived within the community and were easily available. Literacy does not lead to behaviour change. The facilities are available but people don't use them. This has more to do with motivations (fear of being diagnosed with HIV, perhaps) we know it is not just comprehending the message but having the motivation or the enablers or the self-efficacy to act on it.

A campaign with material that can be understood by all levels of textual literacy within the community would be a cost effective method that contributes to the reduction of infection. Education of risk groups has proven effective in reducing the spread of HIV infection (Bynum et al., 2013; Hunter, 2011; Nokes et al., 2007; Valenti, 2007) however the medium used to facilitate this information must be in a format understandable by all levels of the community.

The literature reveals that both the Bagamoyo District on the east coast of Tanzania and Karagwe in the north west of Tanzania have falling rates of both textual literacy and hygiene (Ngorosho, 2011; Wedin, 2008). My literature review highlights a strong link between health literacy and health outcomes (Houts, Doak, Doak, & Loscalzo, 2006; Pignone & DeWalt, 2006; Treitler et al., 2008), with increasing evidence to support the theory that a general lack of textual literacy skills (mainly in women) contributes towards infant mortality rates (Kickbush, 2001) and HIV infection (Wolf, Davis, Cross, & Marin, 2004). The United Nations considered it a critical human right to have access to literacy skills more than 60 years ago (Dowse et al., 2010).

Communication campaigns based on visual literate medium can be specifically designed to be gender, culture and age neutral; this would allow a broader audience

and may appeal to the wider community. Studies suggest sub-Saharan HIV Infection rates are 1.5 times higher in women than men (Barongo, et al, 1992); this trend does seem to replicate the gender literacy gap in Tanzania (Dagne, 2010; "Tanzania 2010: Results from the Demographic and Health Survey," 2012). The underlying causal route for the spread of HIV is transfer of infected body fluid from the infected reservoir to the susceptible host, in other a lack of understanding regarding the basic chain of infection. Although my CBPET was designed to educate that hand washing with soap can break the chain of infection this knowledge may also be successful in basic infection control.

During my visits to East Africa the one thing that became very obvious to me was the huge loss of life from the mosquito born virus, malaria. This disease is responsible for over 900,000 deaths a year in Africa alone, with children being the most vulnerable, accounting for approximately 25% of deaths in children under five (Stratton, Neill, Kruk, & Bell, 2008). Worldwide malaria affects 300 million people annually, with a further two billion more people susceptible to this global health issue.

According to UNESCO about 26% (one billion people) of the world's population are non-literate with 98% of them living in developing countries and women making up two thirds of the group (International, 2015). That is 26% of the world's population is not able to read the literature and health education materials that form the basis of public health interventions produced by most governments and health agencies. Nkem Dike (Dike et al., 2006) has referred to previous studies that identified mothers of being a pivotal model group in the sub-Saharan African community to influence the recognition and use of malaria information. As women in that group have a higher proportion of non-textural literacy than men, it is a fundamental issue that communication of any preventative measures must be made available to this influential group. Simple precautions to prevent mosquito bites applied within the family unit may have an enormous effect on future health and well-being, with the potential to save millions of dollars in treatment costs, not to mention countless lives. The use of appropriate clothing, with long sleeves and pants, the use of topical insect repellents, sleeping under mosquito nets and removing the stagnant water pits in the local environment that allow the larvae to breed can be simple methods to tackle this global health issue.

Below (figure 3-1 & 3-2) indicate two examples of health care information advising steps to be taken to prevent mosquito borne diseases such as Malaria. The poster in figure 3-1 was an example taken from the wall of the Masanganya dispensary, whilst it has photo's supplementing the text it requires a proficiency in textual literacy to understand the message.

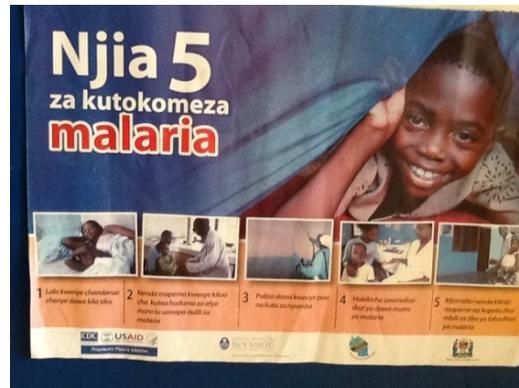


Figure 3-1 Multi agency health information poster communicating malaria information. The image displayed in figure 3-2 is a draft copy of a picture based poster, relying on image alone to communicate the same message.

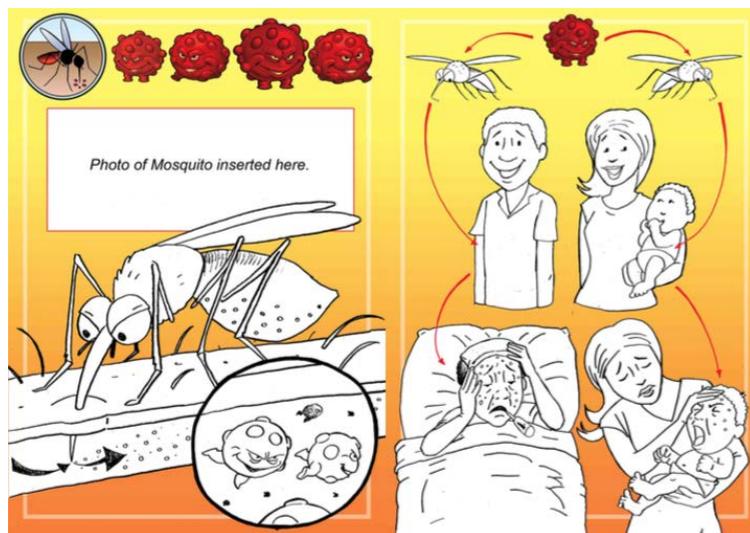


Figure 3-2 Health information poster communicating malaria information using the CBPET format developed by me.

### 3.7 Burns

A recent (2015) study in the Ukraine (Gamelli et al., 2015) targeting burn prevention attempted to evaluate the current level of burns first aid knowledge of parents,

pregnant women, healthcare and day care providers, mainly scalds. A total of 14,456 tests were sent to paediatric clinics, obstetrician clinics and day-care facilities throughout the country to test respondents' knowledge of burn recognition and treatment. Of the 6,120 completed tests returned doctors had the best knowledge of the treatment of scalds (77%) but the knowledge of day care providers was low (only 54%). The reported level of literacy in Ukraine aged 15 and over between 1999-2006 was 98.9% with hardly any gender, gap whereas the literacy rate in 2007 for 15-24 year-olds is recorded at 99.8% (Martin, 2010). From that cohort, 92% of the respondents reported interest in receiving better educational material; the study did not explore the level of health literacy in that group of day care workers as their ability to read and write (literacy) was reportedly high.

As indicated earlier in this work the level of literacy does not necessarily correlate with the level of health literacy (Cutilli & Bennett, 2009; Wolf et al., 2010; Zarcadoolas, 2006). A similar study published in 2010 set in Milas, a province of Mugla in the south west of Turkey, (Karaoz, 2010) also measured the compliance of burn first aid in the domestic setting. Out of 130 families who had children between the ages of 0–14, 53 children had suffered a burn injury. Of those 27 subjects (51%) had received inappropriate treatment for the care of the wound, including the use of yogurt, ice, raw egg, tomato paste and even toothpaste. This use of inappropriate wound care treatment is mirrored in a survey published in 2013 (Davies, Maguire, Okolie, Watkins, & Kemp, 2013) where parents attending emergency and antenatal departments of a university hospital in the United Kingdom answered structured questionnaires requesting parents knowledge of the correct first aid for a burn.

A list of inadequate treatments cited in the survey also included the use of egg whites, butter, ice, frozen peas, grease and toothpaste. Although the study found no relationship between gender and knowledge of appropriate first aid skills it did find a significant relationship between socio-economic status (SES) of the group and comprehension of correct first aid methods. It is not too surprising that a higher SES in the study group correlated with a greater understanding of adequate first aid techniques. The study recommended that a national basic education program was required to improve the level of care applied to burns and reduce the level of morbidity and reduce the use of inappropriate remedies used, in this case mainly to children.

In both U.K. studies (Davies et al., 2013; Graham, Bache, Muthayya, Baker, & Ralston, 2012) cultural issues were an associated factor for the use of inappropriate first aid methods, and both cohorts did include communities of non-English speaking participants. Graham et al. noted that cultural beliefs and superstition did contribute towards the use of inappropriate methods of wound treatment such as the use of toothpaste as a burn treatment. The paper found that previous studies had noted a poor level of burn first aid amongst British Asians (Graham et al., 2012). In order to address some of these issues information posters were designed and translated into a multitude of languages (figure 3-3) including Somali, Urdu, Arabic, Punjabi, Polish and Slavak.



Figure 3-3 Summary poster for Burn First Aid including, from left to right, translations into Somali, Urdu and Arabic

The health information poster was based on words (printed in English) with supplemental use of pictures and icons adjacent to the information and associated with each phrase; the translation was printed in dot format below the body of the

text. This poster was titled 'STOP the burning' with STOP forming a numeric on how to treat a burn.

Firstly the inclusion of a picture, icon or picture graphic into a health information publication does not automatically prove useful to a reader with poor textual literacy skills. Although studies have shown that adding a picture, image or picture graphic can improve comprehension of medical instructions (Katz et al., 2006; Zeng-Treitler, Kim, & Hunter, 2008) pictures that are not directly related to the subject have no beneficial effect on comprehension (Houts, Doak, Doak, & Loscalzo, 2006) and the reader has to guess the meaning of the relationship, often incorrectly. The design of the STOP the burn poster assumes an adequate level of textual literacy to begin with as the visual icons alone did not accurately portray the body of the text, the position of the translation made it seem somewhat disjointed.

Burn injuries have been reported as one of the most traumatic injuries among people of all ages, associated with not only the physical pain and suffering from the wound itself but also the psychological impact of the condition (Duke et al., 2011; Park, Edgar, Wood, Heggie, & Bulsara, 2013). Peck et al. (2009) reports that more than 30,000 people a year die from burn related incidents, and whilst improvements in first aid treatment have significantly improved mortality rates across the globe, the Peck et al. study highlights the disparity between wealthier populations and low and middle income countries.

### **3.8 Summary**

A lack of health literacy within a community is a proven cause of preventable morbidity and mortality (Bynum et al., 2013; Caremark, 2014; Hunter, 2011; Lassetter et al., 2015; Nokes et al., 2007; Pignone & Dewalt, 2006; Valenti, 2007; Zoellner et al., 2011). A comprehensive literature review has shown that there are very little resources available to communicate health care information to low textual literate communities, in developing or developed countries. A well-researched and presented visual tool may effectively educate people of all ages and textual literate ability where more formal methods have failed.

# CHAPTER 4

## Study Design and Methods

### 4.1 Introduction

This chapter outlines the research methodology used for the study. My project began with further development of the cartoon-based educational tool that I had been working on prior to the study. An indepth literature review was conducted in preparation for the candidacy proposal and arrangements made to prepare for in-country trials. Prior to the fieldwork stage, key stakeholders were contacted in Tanzania and various permissions to conduct the research outside of Australia gained from the appropriate establishments. During a previous visit to the Masanganya area proposed for the study, key local facilitators were recruited, including the translator and village hierarchy. The next section details the participants and community selection for the study.

### 4.2 Study Design

The research was conducted in three phases. It used a mixed method approach of semi-structured interviews supporting pre and post-facilitation questionnaires combined with delivery of the CBPET. This approach gathered qualitative data regarding the effectiveness of the CBPET in improving awareness and knowledge of pathogen identification and mode of travel (the chain of infection), personal hygiene, hand washing practice and the use of soap and water in households.

**Phase 1** consisted of increasing the scope and content of my literature review; time spent on this review proved invaluable due to the sheer diversity of the subject. Although the CBPET was essentially based on hand washing with soap the ramifications of a larger community adopting regular practice of this task opened up strands of research into preventable disease in some of the lowest socio-economic communities affected by preventable morbidity and mortality.

This phase also consisted of final development of the intervention or cartoon tool itself, with suitable numbers printed to allow for the final field trial. The pre and post-delivery questionnaires required formatting to allow as much data collection as possible; at this stage the characteristics of the study group were unknown. This data proved invaluable during the data analysis stage. As this field trial impacted on

a human element I obtained ethical approval before I could plan my travel arrangements and final details.

**Phase 2** consisted of recruitment of volunteers into the trial, the implementation and delivery of my cartoon-based pictorial educational tool and correlation of data collected. Prior to phase 2 I was introduced to the village council and key members of the community during the delivery of the ambulances donated by the West Australian government. I facilitated the introduction of the vehicles into the community together with a training package delivered to health care workers associated with the village dispensary. This assisted in introducing myself and aided me in gaining the trust and confidence of the study cohort and allow the free flow of personal information. I felt that without the trust and rapport that I had built during this time I might not have been provided the insight into the personal hygiene habits and psyche of this group.

The pre-delivery questionnaire and post-delivery questionnaire were delivered 24 hours apart to ensure content conveyed through the CBPET was fresh in the study group memory. The purpose of this study was to document any change in understanding the requirement to wash hands with soap and water more often and not to assess any lasting behavioural change.

**Phase 3** of this study was dedicated to the collection, correlation and analysis of data collected in phase 2. Data collected during phase 2 was initially entered in Swahili then translated into English in order for qualitative interpretation and analysis. All translation work was conducted by the GHAWA project manager and translator.

#### **4.3 Phase One (Development of the cartoon-based pictorial education tool)**

Although the basic concept of this tool was in progress prior to commencement of this study there was a period of improvement following additional research. The initial idea to pass on a healthcare message via the use of pictures seemed a simple enough task but the comprehensive literature review made it obvious that I was not re-inventing the wheel with this tool. There are many endorsements of the use of pictures, graphics, cartoons and icons to assist communicating health messages references (Arichi, 2007; Bullen, 2013; Cox, 1991; Kunzle, 2007; Gorman, 2008; Green, 2013; Green & Myers, 2010; Haigh & Hardy, 2011; Hansen, 2004; Houts et

al., 1998; Houts et al., 2006; Houts, Witmer, Egeth, Loscalzo, & Zabora, 2001; Hurlburt & Voas, 2011; Katz et al., 2006; Hamidon, 2010; Liddell, 1997; McDermott, 1989; Piaw, 2012; Videlier, 1992; Wang, Briskie, Chun, Majewski, & Inglehart, 2010; Werner, 1977; Wetton & McWhirter, 1998; Zeng-Treitler et al., 2008).

Some of the reviewed studies concentrate on using graphic interface to communicate health care messages but it was obvious that although the power of the picture medium was imperative to the comprehension of the subject the graphic or picture merely added supplementary information; it did not convey the body of the message. None of the studies cited involved the creation of a word free storyboard capable of communicating an entire message without the use of words. All the studies cited in this study have used pictures to supplement the word; my tool was designed to be the opposite: any use of words would supplement (additional information) the pictures. The salient feature of my design was that the message must be able to be understood by the picture story alone. It was decided to add facilitation notes on the rear of the tool so that additional information could be communicated if required. These notes were to be in plain English and devoid of any medical lingo or complicated words. These facilitation notes were designed to be read out by anyone with basic literacy skills in the community to supplement each page of the tool; consequently the front (visual area) of the tool was purposely void of any writing.

The initial design phase of this educational tool is covered more comprehensively in chapter 5. Common pathogens were developed as key characters. These were *Escherichia coli*, *Streptococcus*, Hepatitis A, and HIV/Hepatitis B. Pictorial characters were designed to represent each pathogen, the design process taking into consideration the physical characteristics of each virus or bacteria in order to develop a suitable icon for each pictorial character. Once introduced into the community these characters may be incorporated into other health promotions to communicate allied health care messages. They may also serve as a key identifier when visualising the danger associated with pathogens within the community.

Once the pictorial characters had been developed they were incorporated into a publication to allow them to be successfully delivered to the study group. The intended printing process that I had available to me dictated the size and orientation of the CBPET. The most economic method of printing this design was to join two folded A1 sheets together to form a four-page publication. This orientation then

dictated that the educational message had to be condensed into the available space. I envisaged that the visual message had to be contained on one side of the publication to ensure ease of use and also to allow the design to double up as an education poster following any facilitation of the subject. To flow additional visual information on to the rear of this design would have given me more space to 'tell the story' but I felt it would have compromised the usefulness of the tool.

When the location and site of my study group was confirmed I then began the ethics approval process at both Curtin University (approval reference SON&M 5-2013, Appendix 1) and the Tanzania Commission for Science and Technology (COSTECH, Appendix 4). The Human Research Ethics Committee approved my research in February 2013 with two conditions.

- Data collection could not commence until written approval to conduct the study was gained from the Masanganya community, with a copy of the letter provided to the Ethics Committee.
- A local support resource was to be made available to support participants if required, with contact details provided on the participant information sheet.

I provided a copy of the information sheet, translated into Swahili, to the Village chairman, who then presented my request at the village council. Permission was granted on July 20<sup>th</sup> 2013, which in turn was provided to the Curtin University Human Research Ethics Committee for final approval for the study to commence. The Participant Information Sheet was updated to include contact details of the translator Bright Aloyce who was knowledgeable about the study and had agreed to act as a local support resource. Bright was available via his mobile phone as this method of communication was judged to be appropriate due to the common use of this device for normal day-to-day communication.

#### **4.4 Phase Two (Implementation)**

The community of Masanganya in the Kisaware District of the Pwani region of Tanzania was identified as my study group. As previously noted, this community has an existing association with the Centre for International Health and School of Nursing at Curtin University.

It was important to identify an appropriate community in which to deliver and analyse the effectiveness of my custom designed CBPET. The site chosen needed to have a population with poor literacy skills as well as being considered resource poor. An

essential aspect of this data collection was the requirement that the study participants needed to feel comfortable. I was aware that any intrusion by an 'outsider' into a close knit community may arouse mistrust and fear that in turn may skew or bias willingness to participate. The decision to undertake the research in the East African country of Tanzania was due to established contacts in the area through the Curtin School of Nursing and the Global Health Alliance Western Australia (GHAWA) project.

I had visited the area the previous year during the WA Health and GHAWA project to deliver ambulances and facilitate training of medical staff in the use of medical equipment. During that time I shunned the recognised pattern adopted by most previous foreign aid and non-government agencies that employed a drive-in, drive-out policy. Instead I insisted that I should live inside the community for the entire duration of my visit, amongst the cohort of people that would eventually make up my study group.

Phase 2 of this study was the implementation of the CBPET to participants of the volunteer cohort; this was combined with pre-test questionnaires to establish the participant's knowledge and practice of basic hygiene both pre and post-delivery of the education tool.

The population identified to participate in the study fitted the criteria and key stakeholders within the community consented to assist facilitate.

- Inclusion criteria: Participation into the study is voluntary; participants must be adults (18+) and have the cognitive ability to understand the process, the study and the delivery medium.
- As this is a visual education tool a precondition of participation is adequate vision. As verbal explanations will accompany the tool adequate hearing is also required as a condition to enter this study.
- Exclusion criteria: Participant below the age of 18 will not be included in this study; participants can choose to withdraw at any stage of this study.

The Village Chairman Mr Jumanne A-Mangomba informed the community of the nature and requirements of the study and discussed any issues during a village meeting held on the evening of August 2nd 2013. Twenty-two people indicated that they would like to participate in the study.

The community offered the use of the newly built community schoolhouse to conduct the study as the building would not be in use on the weekend. The schoolhouse was located 1 kilometre outside Mlegele village, on the outskirts of Masanganya village and provided a convenient central location for participants to meet. It was felt that this location would also offer the least confronting environment for the group as it was essential that participants feel relaxed and not threatened. The room had capacity to seat all participants and the school chairs and tables allowed for easy presentation of the CBPET and completing paperwork.

The following morning all 22 volunteers arrived at the schoolhouse. Following an introduction to the study in native dialect (via the translator) and an opportunity to ask questions we began. Participant details were documented to ensure validity; each participant was then allocated a sequential number for the purpose of identification during the study. The form containing the participant details was secured with the research team as per ethical requirements and only a study reference number was used as identification for all following data collection identification. Participants were reminded of the reference number allocated to them and requested to apply it to any other questionnaire-related documentation they would complete. The number allocated to the participant remained constant throughout the two-day study period to provide continuity for data collection and analysis.



Figure 4-1 Study group participant completing the questionnaire



Figure 4-2 The visual tool explained by a translator

#### 4.4.1 Questionnaire design

A control group was not practical on this occasion due to the limited resources available for the field trial, the ability to recruit eligible participants and time constraints applied on the use of the venue. The village of Mlegele consists of a small population, mainly engaged in manual labour and farming.

A one group 'pre-test, post-test' design was determined to be the best quantitative data collection method for providing the snapshot of data required on this occasion. Such quantitative research methodologies do not require the use of a control group but still enables comparison of pre-knowledge and post- knowledge data for comparison. In this case the comparison was of their knowledge of common pathogens, route and transmission of infection, frequency and motivation of hand washing with soap, and perception my picture based educational tool.

Although the two-stage questionnaire design was largely quantitative in design a combination of both open ended and semi-structured questions incorporated a qualitative element. When measuring the study participants' perception of 'hygiene' or 'cleanliness' it is vital to understand the entirety of the issue faced by a typical resource poor, low textual literate community.

To merely measure clinical statistics from my study group would give insight into the issues faced in day-to-day life and the subsequent meanings and understandings of the messages being delivered. This study is not intended to interpret any psychological conditions relating to the subjectivity of soap and water to kill germs; merely to collect data relating to any improved knowledge of germ transmission and causative elements of disease, understanding of the classic chain of infection model and any demonstrated degree of satisfaction with my picture based instructional

tool. A mutual by-product from this study would also document hand washing frequency and motive within this small community. The qualitative element was to focus on the study participants' interpretation on hygiene and the requirement for washing hands with soap and water. Such information could assist in designing global educational content for similar communities that may benefit from a similar model of health care.

#### **4.4.2 Data collection**

On the first day, following the introduction, participants were asked to complete the pre-test questionnaire. The first section of this questionnaire requested data relating to the participant's marital status, number of children, faith, occupation, age, educational status and the access to traditional and western healthcare. The participants were then required to answer a combination of 15 semi-structured and open questions seeking a response to their understanding of germ (pathogen) identification, location of common germs together with knowledge pertaining to the common methods of transfer. Participants were asked about previous hand washing education, access to soap and water and current frequency of hand washing with soap and water. To culminate the pre-education data collection participants were asked if they thought washing hands with soap and water could actually kill germs.

In most examples each question gave the participant three choices to answer: 'yes', 'not sure' or 'no'. The participant was then given the opportunity to expand on their answer by adding a comment in a space provided. It was hoped that this would give a better qualitative data on the subject. Questions were asked in a direct manner; this method is associated with receiving a more accurate assessment of the participants' knowledge (Kumar, 2011).

Time was taken to ensure all participants understood each question. Due to the varied literacy of the participants the translator read out each question in local Swahili dialect. Following each question the translator visited every participant to ensure that they understood the nature of the question and to answer any doubts. In some cases, clarity of the question was required as some elements of the questionnaire posed difficulty in translation or raised cultural issues. The participation of a locally respected person to assist this phase was essential as local dialect could be translated and participants felt at ease with the presentation.

Following completion of the pre-test questionnaires all copies were collected and isolated from all other documents. A further period for general questions was announced and participants were allowed a small break in order to stretch their legs following the completion of the pre-test questionnaire. Once the study group had resumed their seats the participants were given their own coloured A4 sized copy of the CBPET for reference during the short presentation.

The CBPET was introduced to the study group. The delivery was in English with each sentence translated into local Swahili dialect by the translator. Only the information printed on the rear of the tool was delivered orally; there was no variation from the text. The presentation was delivered from the front of the classroom. The only visual aid used throughout the delivery was an A4 sized copy of the CBPET held up to the study group to indicate the page that related to the additional dictated text.

Following the delivery of the CBPET to the group participants were allowed to depart the testing area. I was mindful that the participants had volunteered their time to attend the trial and all had chores and family duties to attend to. Total time for this first session was approximately 120 minutes, with the actual delivery of the CBPET only taking 10 minutes. The remaining time was taken up with introductions, administration, and conducting the pre-test questionnaire.

They were requested to return to the classroom the following morning to resume the study. On exiting the room, each study group participant was given a smaller A5 sized copy of the CBPET to supplement the A4 sized copy that they were issued for the study (figure 4-3). These proved very popular with the group as once folded into A5 size they fitted the pockets in their garments, unlike the larger A4 version. Following the conclusion of this phase there was no additional information or reinforcement of the subject matter.



Figure 4-3 Study group participant showing off his pocket sized CBPET

The following morning all participants returned to the schoolroom to continue with the study, with one noticeable omission. Overnight, the eldest member of the group (subject 14) voluntarily pulled out claiming that he had work to do. This participant did, however recruit a friend to attend the second day of the study in his place. The withdrawn participant had given his friend his copy of the CBPET and passed on the instruction that he had received the following day. The replacement participant was adamant that he wished to be included in the study and was allowed to participate; however his data was not included in the final results.

Although this situation was disappointing it did demonstrate that the tool was easy to deliver by untrained facilitators with just a basic understanding of the tool. In a small way, this simple act demonstrated a ‘train the trainer’ model that may prove important when rolled out en-masse in any future use. Although the data from the substitute participant was not included in the final data analysis it was interesting to note some of the open comments made in his post-delivery interview. From a basic introduction of the tool, delivered by a participant, the substitute participant notes that germs, “live in homes and in water”, that “germs will make you sick”, they can enter the body “through wounds” and “sneezing”. These are all correct answers and without this substitute participant completing the re-test questionnaire it is mere hypothesis that he gained this knowledge from the introduction of the CBPET.

When asked why washing hands with soap and water is important he answered, “to remove germs and prevent disease”. His response to the question asking if he had learnt anything from the tool was: “help prevent me and my family getting disease”.

Although these comments were not added to the results presented in chapter 6, I feel that they support the use of this tool to promote vital health care information.

Once the group were settled and any minor issues were resolved we conducted the post-delivery questionnaire; this took approximately 60 minutes. Delivery of the questionnaire replicated the pre-delivery phase with each question read out to the study cohort by the translator. Following each question verbally delivered by the translator any issue of translation or interpretation of a word or phrase by participants was explained using the classroom blackboard. The translator would then visit each participant to ensure his or her understanding. It was clear from the questions some of the participants were asking to be clarified that the group had absorbed the subject matter, questions were asked to clarify minor elements of some questions.

One such issue arose during the question relating to frequency and motivations to wash hands. In the question set, the closed question format allowed the participant to record occasions when they may (or may not) wash with soap and water. One question requested the participant to indicate if they washed before sex or after sex. This promoted some internal discussion and resulted in a communal question from the study cohort requesting clarification on “what part of the body to wash in this situation”. This question indicated that the participants were approaching this data collection phase with an open mind. The answer to this question was, “if it is dirty, wash it!”. This created some amusement within the group and many of the participants gestured their understanding.

Following the conclusion of this phase, all documents were collected and kept separate from all other documentation. The translator then asked if there were any questions about the study or if any member of the group wanted to discuss any issues. One man became very vocal. He engaged the translator in dialogue for a length of time. It seems that the man had returned to his family after the first day with the A5 copy of the CBPET in his jacket pocket. His 6-year old son had noticed the colourful characters on the front and continued examining the rest of the tool.

Once finished, the man was reportedly amazed when his son started to explain that he understood about germs and where they came from. He went on to explain that he understood why he had to wash his hands to kill the germs and prevent him from becoming sick. Although ethics approval for this study was for adults only and this

qualitative data cannot be recorded in the study, the anecdote does suggest that this tool is attractive to and easily understood by younger members of the community. Cartoons do appeal to all facets of the population (Green & Myers, 2010; McDermott, 1989; Piaw, 2012). Previously, several members of the group had questioned the availability of soap in their community.



Figure 4-4 Typical village shop in the study group of the community

The single shop that operated in the village (figure 4-4) did not sell hand soap, but did sell the soap commonly used to wash clothing. Hand washing all clothes with laundry soap was the only method employed by the village women, a daily task. There was no electricity in the village and the common source of water was ground water or streams, depending on the season. Hand soap purchased outside the village in the larger town of Kisaware or Dar es Salaam was expensive. The group were happy to discover that laundry soap was as effective at washing hands as the more expensive hand soap. When all documentation was secured the participants were thanked for sacrificing their time to participate in the study. Each participant was given a block of soap as a gift; this item was well received by all participants.



Figure 4-5 Researcher with study group participants

#### **4.5 Phase Three (Data analysis)**

The completed questionnaires were correlated, isolated and secured by the researcher on completion of the study. At this point the questionnaires were completed in Swahili and required translation into English prior to analysis. On return to Dar es Salaam the documents were opened and all answers and comments to the open ended questions translated into English. A spreadsheet was constructed in Microsoft Excel (Mac version) to record all relevant data extracted from the questionnaires. The initial pre-test questionnaire required 29 data fields and the post-test questionnaire 43 data fields in a spreadsheet to record all quantitative and qualitative data. All data from the study documents was entered into the spreadsheet using the unique identification number issued at the time of the study as the participant identifier. This identification number remained constant throughout the pre-test and post-test documentation. The data from the various fields was then converted into various trending and representational charts using the 'charts' function of the Excel software. The data charts and the descriptive statistics and trends are fully represented in chapter 6 of this body of work.

#### **4.6 Ethical Issues**

The ethics of research in healthcare is a contentious area with contractual obligations, company sponsorships and allied funding issues commonly tainting the bias of any findings (Saks, 2007). As such, I maintained a totally neutral position during my research process. This research is without any form of sponsorship or

financial assistance; I had the distinct advantage of working with a design that was developed independently of external commercial influence.

Application for ethical approval for this low risk study was submitted to the Curtin University Office of Research & Development Human Research Ethics Committee in December 2012, using the form 'C' stating the following aims of the study:

1. Within a group of low literacy participants within the Masanganya community in Tanzania: document existing personal hygiene practices, determine the perception of the cause and transmission of disease as well as existing awareness of common pathogens.
2. Design and develop CBPET to communicate key messages regarding common pathogens, transmission routes, and the importance of hand washing.
3. Implement and trial the CBPET to a sample group of low textual literate members of the Masanganya community.
4. Evaluate behavioural change in hand washing practice following implementation of the CBPET and assess the comprehension of basic pathogens within the sample group.

Ethical approval to continue with my research was granted on 15th February 2013, with the approval number SON&M 5-2013 with the following conditions: Data collection cannot commence until written approval is provided from the community of Masanganya in the Kisawari District of the Pwani Region of Tanzania to conduct the study in their community and a copy of the letter provided to the Minimal Risk Coordinator/ Ethics Advisor, School of Nursing and Midwifery, Curtin University and that a local contact in the area to support the student is identified and contact details added to the information sheet issued to participants.

Following this provisional approval a letter addressed to the District Executive Officer of the Kisaware Health Department (Tanzania) was drafted requesting permission to conduct the research in and around the village of Masanganya. As local postal delivery in rural Tanzania is sporadic, this letter was delivered by hand using the local GHAWA communication network; although this letter was dated May 4<sup>th</sup> 2013 it did not reach the District Officer until July 8<sup>th</sup> 2013.

A written reply from the Masanganya Village Chairman was received on 20<sup>th</sup> July 2013, giving permission to conduct the study in the village. The participant

information sheet previously developed for submission to the Curtin University Ethics Committee was updated to include the mobile phone number of Bright Aloyce, a member of the team who had offered to be the local point of contact and answer any questions from study participants. This letter was then translated into Swahili for distribution to the potential study population and sent back to the Village Chairman via the GHAWA communication network.

Application was made to the Tanzanian Commission for Science and Technology (COSTECH) in May 2013 for permission to conduct the research in Tanzania. This was supported by the Dean & Head of the Faculty of Nursing, The Hubert Kairuki Memorial University, Dar Es Salaam, Tanzania; resulting in a Research Permit No. 2013-182-NA-2013-82 issued by COSTECH May 17th 2013.

Despite gaining all the required ethical consent documentation to conduct the study, I felt it was also imperative to gain the support of the local community. Although there was a great deal of vehicle traffic through the village of Masanganya hardly any 'white' people stopped and took any time to communicate with the village occupants. I felt that to successfully engage with this community and gain their respect I must spend time amongst them and to offer what little skills I could to their everyday environment.

I was supported in this endeavour by the non-for-profit Global Health Alliance Western Australia team who required an experienced medic to support their local ambulance project. During this episode I had the opportunity to base myself in the Masanganya Dispensary building for a period of time whilst I facilitated first aid training to the nursing and medical staff of the area following the delivery of the two four wheel drive ambulances donated by the Western Australian Health Department. I had the opportunity to meet a great many local villagers during this time, treating a number of them for minor wounds and transporting one category one obstetric patient to the hospital at Kisaware following foetal distress.

#### **4.7 Quality Criteria**

I was careful to avoid the element of bias in this study; I was essentially testing the functionality and effectiveness of my own design and development. Bias may have been possible in several areas of the pre-test and post-test study design.

- Recruitment and selection bias: I had very little input into the selection of the study participants. All participants volunteered of their own free will following

a communal village meeting, chaired by Mr Jumanne A-Mangomba. The Curtin University Ethics Committee required that an information letter be developed and translated into local Swahili dialect in order for any participant to have local contact details and background of the study. As this study was primarily aimed at a low textual literate group that possibly may not understand the content of the letter Mr A-Mangomba read it out during the meeting. Participants self-selected once they were aware of the selection criteria and presented to the study of their own free will. There was never any indication that any type of reward would be issued for participation in the event.

- Another element of potential bias in the data collection may be perceived as the self selection of the cohort. The participants did self select following a meeting called by the village chairman, however the participation information sheet that was dispersed amongst the group made no mention of the study subject, merely that it was a way to “teach people how to keep them selves healthy and free from illness”. Unfortunately due to the varied and transient nature of the village, time constraints of the field trip and the working environment of the village community it was not practical to detect potential participants using a randomised method, although this would have been a preferred method.
- There was also a larger male to female bias in the self-selected cohort. This was not ideal however may have been due to the large Islamic influence of the community or the willingness of the female element in the community to interact with a Western male such as myself.
- Attrition bias: There was one voluntary withdrawal from the study. The participant involved was the eldest member of the group and I was unaware of his withdrawal until the start of the second day. The participant nominated a replacement to attend the following day and I was informed prior to issuing the post-test questionnaire. This withdrawal has been documented elsewhere in this chapter and the data recovered from the replacement participant was discounted from the final analysis.
- Researcher/participant bias: To eliminate as much researcher influence as possible I allowed the translator to run as much of the group session as practicable. My only involvement was to facilitate the tool to the study group. The delivery of the tool was orchestrated to be as neutral as possible. Only the text on the rear side of the tool was delivered verbatim to the group and strictly adhered to the facilitator notes. This would replicate any future

delivery of the tool, regardless of medical background or training.

Qualitative elements of both questionnaires were independently translated and documented. The translated documents were sealed in an envelope until my return to Australia so as to avoid any possible influence on the translation. These documents were then secured in a safe until such time the data could be extracted and analysed to yield the trends and conclusions of this work. The qualitative element of this study design catered for the vulnerable status of the study cohort. Qualitative research methods can be flexible and fluid; allowing participants to use their own words and phrases to answer questions (Liamputtong, 2011). Any non-literate community that has been denied vital healthcare information must have correct and tangible elements provided to them. The healthcare information delivered in this tool has been verified by professionals within the respected field; only credible and authentic information has been delivered in this process.

#### **4.8 Summary**

Although this study was based on a relatively small study group it was representative of a resource poor community with low levels of literacy in sub-Saharan Africa. The intensity of the data collection was in keeping with the lifestyle and workload of the study participants. Members of the study group were kept informed of all phases of the data collection phase via the traditional method of peer communication and community hierarchical announcements. Ethical standards were paramount at all stages of the study and data collection. The delivery of the study questionnaires was well accepted by all levels of the village. This was the first time an educational event had been delivered within the area. All study group participants vocalised their thanks and gratitude following the culmination of the data collection.

# CHAPTER 5

## The Tool Development

In this chapter my aim is to explain the sequence of events that led to the development of my visual communication tool. From my initial project to create a visual instruction manual to allow people to understand the basic principles of first aid to a visual tool directed at the basic understanding of hygiene the journey has been anything but straightforward. Countless hours have gone into the development of icons, characters and design in the realisation that small improvements may have dramatic effects.

### 5.1 Tool Design Concept

I gained the initial concept for my tool from the countless weekly instalment magazines that my 10-year-old son had taken to ordering from the newsagent. These magazines had a different theme to each edition and included novelty items linked with the subject matter attached to each magazine. These single editions combined to make up a comprehensive reference when combined. My initial intention was to adapt the basic aspects of the first aid curriculum into the first collection; this concept was to be referred to as 'First Aid in Pictures'. Each edition of this 'First Aid in Pictures' collection would potentially include an item of first aid equipment to be used with the accompanying information. For example, the chapter on fractures could have a triangular bandage attached to the cover to provide a readymade and usable resource. As the range of first aid subjects is vast there first needed to be a system of priority of what subjects to cover, and in what order.

In Australia, the curriculum for teaching first aid subjects to an accredited national standard falls to the Australian Resuscitation Council (ARC). The ARC is a voluntary coordinating body that represents all major groups involved in the teaching and practice of resuscitation and first aid subjects. Currently the algorithm used in the application of basic first aid is DRS ABCD (Danger, Response; Send for help, Airway, Breathing, CPR, Defibrillation) (Australian Resuscitation Council, 2011; Grantham & Narendranathan, 2012). This basic algorithm would be the obvious system to use for my tool.

The DRS ABCD approach is endorsed by the health industry (Cummins et al., 1997), however I felt that it did not represent a broad enough spectrum of life saving

first aid techniques for my proposed audience. I felt that this algorithm missed crucial first aid applications such as bleeding, fractures and burns and concentrated on the rapid application of cardiopulmonary resuscitation.

A historic system of treatment prioritisation that I first learned in the mid-1980s and taught by the British Armed Forces was the concept of the 4Bs. This system is still in use today (Adams Safety and Training, 2013) and does incorporate the scope of life saving first aid skills that I felt would be relevant to my target audience. Although there may be several versions of the 4Bs classification system the version that I was familiar with prioritised lifesaving treatment by Breathing, Bleeding, Breaks and Burns. These medical emergencies were considered the most threatening to life, and thus the most important first aid techniques to adopt in times of medical crisis within a military environment.

Since moving to Australia in 2003, I soon came to realise that this did not cover all life threatening emergencies; snakebites, marine envenomation and spiders are a constant hazard in this environment and can result in serious injury or death. With this in mind I decided to add a further 'B' to my index system to cover 'Bites'. This upgraded classification would be identified as the 5Bs. Within a short period of time it became obvious to me that this system was still not as comprehensive as it could be. My experiences overseas in developing communities had taught me that there appeared to be very little educational material available to the general public explaining how important basic hygiene can be. The information and educational resources that were available came in the form of health educational brochures or direct education from health promotion campaigns, thus unreadable by any person with low literacy. In the literature review in chapter 3, I documented how the subject of health literacy hampers any public health campaign attempting to promote better quality of life by improved basic hygiene.

The addition of Bugs (Basic Hygiene) made the sixth 'B' in my upgraded prioritisation system, to be termed as the 6Bs. The system now had a sound theoretical structure and needed a design and development phase to transform it to a physical product. The concept of using pictures or graphics to engage semi-textual literate groups is not a new one. There has been much research in the use of using art to engage low textual literate groups (Agosto, 1999; Eulie, 1969; Greenhoot & Semb, 2008; Gurak, 2003; Hamidon, 2010; Mead, 2008; Piaw, 2012; Ramos, 1999).

My initial idea came from the realisation that as a young boy I could pick up a copy of 'Asterix le Gaulois' (Goscinny, 1961), written in French, and understand the story of how Asterix and his Gallic friends beat the Roman soldiers using magic potion. It was fun to read and it had identifiable characters, recognisable personas with their own identity and characteristics. What becomes important is not only the depth of the storyline but also the quality of the artwork. I believe that well-researched icon design and succinct content are the formula of any future successful educational tool. In isolation these elements do not have the element of attraction that will engage a low- textual literate group successfully: they must be used in a formulated approach.

Unfortunately, I do not possess any great artistic qualities myself; my drawings would not be able to portray the complex messages that would be required for any potential visual tool. I am fortunate enough to have an artist for a friend; Ian Coate is a professional artist and illustrator (<http://www.iancoate.com/>) with a similar passion for helping developing communities. As a talented artist, Ian had the ability to blend different styles of illustration together with his previous involvement with the Aboriginal community here in Western Australia, resulting in the creation of a holistic design with significant cultural identity. Ian had previously designed characters for children's books. These fictional characters had the qualities that I had in mind for use in my CBPET; they were colourful, well drawn, animated and original. I wanted my visual tool to incorporate social values in addition to its primary role of education. Any communication tool would have to be culturally sensitive (Tone et al., 2009). I wanted it to promote family unity and equality as well as communicate a health care message.

During our initial meetings, we discussed the layout and basic characteristics of the icons, together with aspects of the design to allow for its delivery to the harsh environments where I intended it to be used. As the concept for this design originated from my son's magazine collection the first choice of layout for the CBPET was a book or magazine style publication with a traditional cover and pages. This initial design would follow the conventional format for teaching aids as well as being easy to print. However it was thought that this design was not robust enough for the environment for which the tool was proposed. Both magazines and books have a fragile design flaw in the binding method; following a discussion with a publisher it was agreed that this design would not be durable enough for use by the

target audience. Some examples of robust visual translators in use with the U.S. military in the Iraq and Afghanistan campaigns such as the 'Kwikpoint visual language communicator' use stiff weather resistant card to print on. These visual aids incorporate a folding design, similar to a map. They are durable and cheap to print due to the lack of binding process.



Figure 5-1 Medical visual aid translator used in conflict areas

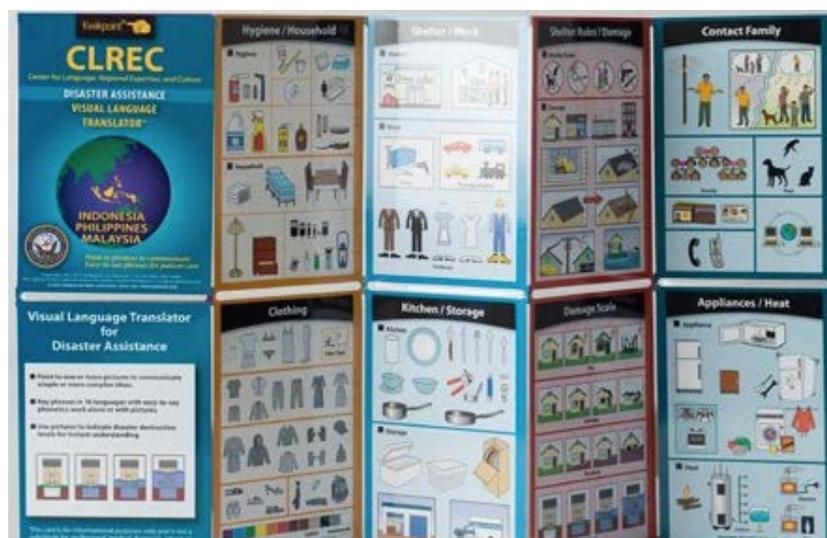


Figure 5-2 Folding design of a visual aid translator

The design of the CBPET was initially proposed to be no more than four pages long. The message that I wished to communicate was to be simple and to the point so as to engage the reader. I felt that having too much detail would detract from the

community that I wished to reach. The cost would also be proportionate to the number of pages in the design.

## 5.2 Design of Human Images

The first characters that were designed for the project were a family group consisting of a husband, wife, small child and infant. These characters would indicate that any member of the family could assist in times of crisis and also to attempt to reinforce community values.



Figure 5-3 Original artwork of the family group for Australian Aboriginal version

The cartoon characters of this family were initially designed to show a resemblance to Aboriginal Australians due to the intended target of the tool. I did not want to get too specific and therefore narrow the scope of my target audience to a particular tribal trait. Skin colour, style of hair or type of clothing would be generalised to offer as little social impact as possible. As the scope of my academic research matured and ethical considerations discussed, I realised that my study group may not be a low- textually literate, resource-poor community within Australia at all. In 2012 I was offered an opportunity to visit the Republic of Tanzania, East Africa, training a small remote community in the use of an ambulance donated by Global Health Alliance Western Australia (GHAWA).

During my visit there, I discovered a small village serviced by the larger community where I was staying and fitting the criteria of my intended study population. On a visit to this village, I noticed that families were boiling muddy water in pots over the fire. When I questioned this practice, I was told that they boiled the muddy water to make the ground water potable. The people of this village had inherited this information via word of mouth and not from any public information source. They had

failed to understand the concept of organic matter in the water making the boiling process ineffective, merely practicing a health care message that had been passed on verbally.

This community was spread out around a mosque. Although a school had been recently constructed on the outskirts of the village the majority of the adults had poor literacy skills, in line with official Tanzanian statistical surveys on literacy within that adult age group (Tanzania 2010: Results from the Demographic and Health Survey, 2012). I asked the village elder if he felt that education about 'bugs' and 'germs' might prove useful to this group of people and he welcomed the idea. As the ethnicity of the study population had now altered from the original concept of an Aboriginal Australian demographic to sub-Saharan Africa, I felt that the design of the human characters needed a slight alteration to allow local acceptance. The concept (Aboriginal Australian) family that I had previously designed underwent a cultural transformation, with skin colour, hair styling and clothing being altered to a generic sub-Sahara African appearance.



Figure 5-4 Reconfigured artwork of the family group for African version

With the subject matter of the module decided, the next stage was to develop the cartoon icons that would represent the various 'bugs' in the CBPET. There was no scientific design to the process of identifying the bugs that I chose to represent 'illness causing germs'. I merely identified environmental germs that I felt were common in the spread of illness and disease within developing communities. I eventually chose five bugs to represent the spectrum of illness-causing germs I wished to refer to; I refer to them as bugs although they were a combination of virus and bacteria.

My literature review indicated that some of the most common illness passed on via the faecal-oral route were respiratory or gastro intestinal (Cairncross, 2003; Cairncross et al., 2010; Curtis & Cairncross, 2003a, 2003b; Dutton, 2011; Ekernas, 2010; Fan & Mahal, 2011; Grayson et al., 2009; Grimes, 2015; Pickering, Boehm, et al., 2010; Pickering, Davis, et al., 2010; Rabbi & Dey, 2013). This prompted me to consider the respiratory transmitted bacteria Streptococcus, water transmitted virus hepatitis A, faecal transmitted bacteria Escherichia coli (E. coli), faecal-oral transmitted hybrid bacteria Escherichia coli and the gram-negative, rod-shaped aerobic bacteria Pseudomonas.

I also felt that to cover this subject comprehensively other infection routes needed to be considered in this 'bug' module. My literature review indicated that the virus transmitted via body fluid that has become a major cause of mortality in developing countries is the human immunodeficiency virus (HIV) (Barongo, Borgdorff, Mosha, Nicoll, Grosskurth, Senkoro, Newell, Chagalucha, Klokke, Killewo, et al., 1992; Bynum et al., 2013; Ciampa et al., 2012; Hunter, 2011; Nokes et al., 2007; Valenti, 2007; Rompay et al., 2008) and this was to become my fifth bug character to design.

I wanted to assign character names to these bug icons in order to establish their various personas and to provide a simple way to refer to them during the story other than refer to them by their scientific names. An Internet search was conducted using the search engine 'Google images'. I was looking for images that represented the physical characteristics' of the virus or bacteria that I had chosen to portray and properties that the artist could capture when designing the icon. I emailed various pictures to the artist, Ian Coate (<http://www.iancoate.com/>), with descriptions of the bug I wished to represent.

### 5.3 Design of Phlegm Bug



Figure 5-5 Streptococcus bacteria (left) and the phlegm bug

The Phlegm Bug was designed to represent the gram-positive bacteria *Streptococcus*. This bacteria is responsible for eye infections, meningitis and pneumonia, however its visual appearance was designed to look like a character that lived in the upper respiratory tract and released from the body by the act of sneezing or coughing. This bug can then represent airborne pathogens commonly found in the upper respiratory tract such as H1N1 virus, flu and the common cold. Recent research has shown that 'flu germs' can live on fingers for as long as 30 minutes if they are not washed off with soap and water (Thomas et al., 2014). The rapid spread of the H1N1 virus could be controlled if basic hygiene precautions were taken.

#### 5.4 Design of Blood Bug



Figure 5-6 Hepatitis B virus (left) and the blood bug

The Blood Bug was based on an image of the hepatitis B virus, a common cause of blood-borne infections in both developed and developing countries. This virus also bears physical similarities to the human immunodeficiency virus (HIV) virus and shares a similar path of infection. Both these viruses are transmitted via the same route and good hand hygiene can break the chain of infection.

#### 5.5 Design of Water Bug

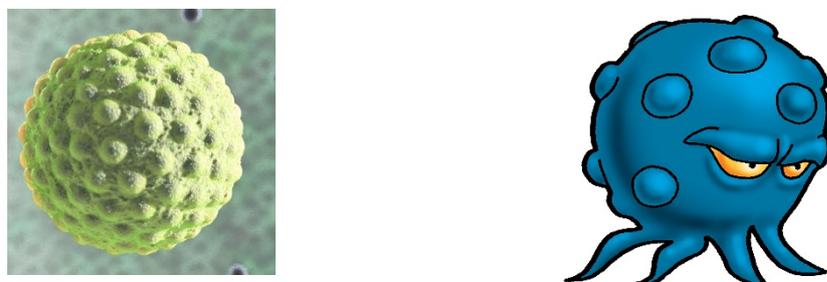


Figure 5-7 Hepatitis A virus (left) and the water bug

The Water Bug represents hepatitis A, a virus commonly spread via the faecal-oral route and found in dirty or contaminated water. This bug is responsible for illness and death in developing countries and is easily destroyed by good hand hygiene or water treatment. This bug icon was designed to symbolise dirty water and not just hepatitis A. Decent sanitation coupled with good hygiene have been found to cut the risk of diarrhoea by 16% but improving the water supply and promoting hand washing with soap cuts this risk by 47% (Curtis & Cairncross, 2003b).

## 5.6 Design of Poo Bug

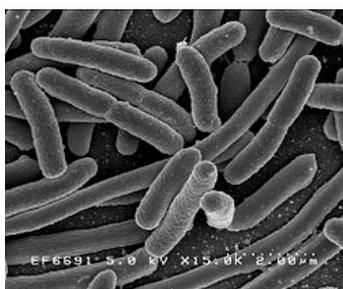


Figure 5-8 Escherichia coli bacteria (left) and the poo bug

The Poo Bug was created to represent Escherichia coli (*E. coli*), a gram-negative rod-shaped bacteria that is commonly found in the lower intestinal tract of warm blooded animals. This bug can cause food poisoning and serious illness and is also transmitted via the faecal-oral route. In developing communities, excrement is often used as a cheap and readily available fertiliser for fruit and vegetable products and can easily contaminate food.

The sanitary conditions and lack of personal hygiene in some developing communities also encourage *E.coli* to cause sickness and ill health; diarrhoea is responsible for the death of 1.87 million children a year, aged less than five years (Grayson et al., 2009) with two thirds of these occurring in Africa. Good personal hygiene, hand washing with soap (HWWS) and correct food preparation prevent contamination from Escherichia coli. In their field study conducted in Tanzania, Pickering et al. (2010) highlighted that the problem remained that people do not wash their hands with soap and water at important times.

## 5.7 Design of Mud Bug



Figure 5-9 Mixture of *Pseudomonas* and *Escherichia coli* bacteria (left) and the mud bug

The last bug to be depicted was a Mud Bug; this would be a hybrid bug to represent the pathogenic bacteria found in soil, mud and dirt. I decided to formulate this bug from a mixture of *Escherichia coli* and the gram-negative, rod-shaped aerobic bacteria *Pseudomonas*. From my experience, this type of bug is a common precursor to wound infection and gastrointestinal illness, transmitted by both the oral and topical routes. Good basic hygiene and food preparation can prevent infections from this bug, and its eradication from a developing community would prevent a wide range of infections.

## 5.8 Design and Layout of Tool Content

With the icon design complete, the design of the storyboard was sketched out in draft and sent to Ian and the module was designed to represent the 'chain of infection' (Classroom Productions, 2010). The model is a graphical depiction of the mode of disease transmission and is represented as a chain containing the infectious agent, the reservoir the portal of exit, the mode of transmission, the portal of entry, and the host as links in the chain of infection. Once a link of that chain has been 'broken' then the transmission route of the disease will be stopped.

My CBPET would aim at educating people using my cartoon characters to depict this chain in a visually friendly and easy to understand format. My belief is that once people understand this concept it will empower them to practice techniques to reduce the amount of disease transmission in their communities. My simple message would be that 'soap and water kills germs', however I would include a graphic depiction of how the germs (the pathogen) exit (the portal of exit) the site of infection (the reservoir), travel (means of transmission) and how they enter the body (portal of entry).

I believed that this single element of education had the potential to reduce infections considerably; not exclusively in developing countries but also developed countries that hosted multicultural and low- textual literate communities. The key take away message that I wished to communicate with my tool was that “washing hands with soap and water killed germs”.

Once the draft storyboard had been finalised, the final design consideration would be the format of the tool, choice of size and layout. As previously mentioned, although the traditional format for this type of tool would be a page style booklet it was decided that a more robust design should be considered. A folding design was deemed to be the most durable design as it eliminated the requirement for a binding process and separate pages; it also allowed the CBPET to be utilised as a poster if attached to a wall when required. The last page of the tool was designed as a summary of the educational content; the page could also be used as an independent poster to display the correct frequency of hand washing with soap. Although it is clearly established when the most appropriate time is to wash hands with soap, I took the recommendations from a 2010 working paper produced by the World Bank-endorsed Water and Sanitation Program (Water and Sanitation Program, 2010). This paper recommends hand washing with soap at critical times such as:

- after faecal contamination (going to the toilet, changing a babies nappy)
- before food related events (before eating, before feeding a child or before cooking or preparing food)
- before handling potable water.



Figure 5-10 Visual flow chart making up the final page of the CBPET

This then became the fourth page of the CBPET. Although the 2010 Water and Sanitation paper makes no direct reference to the pathogens that they were concerned about, my interpretation was that it was aimed at diseases transmitted by the faecal-oral route. To cover all other types of pathogen covered by my CBPET I added two more occasions where hand washing with soap was recommended; these included social interaction and medical (first aid) procedures. The inclusion of these interactions would cover the transmission of HIV, hepatitis B as well as H1N1 virus, influenza and the common cold. As my preferred design of tool was to be a four-page folding book capable of being used as a standalone poster if required, it dictated that the subject matter was required to be displayed on one side of the tool only.

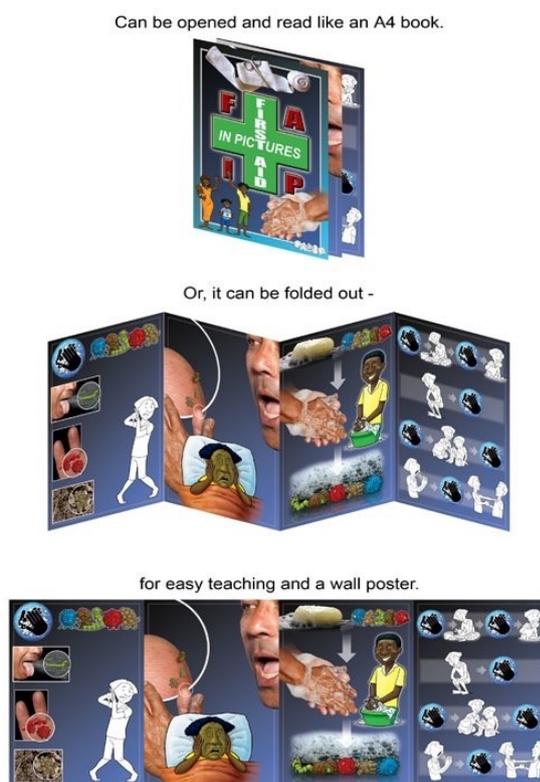


Figure 5-11 Folding design of the CBPET

Although the concept of the CBPET was that the message could be communicated without the requirement for words or comment to allow for use within a low textual literate community, I still felt that additional comment would supplement the design.

There is only so much information a graphic can depict before it becomes too complex; some health care messages can be intricate. It was my experience that although entire communities may suffer from low literacy there may be individuals within the group that may have a higher level of literacy. The person with extended reading skills may be a community nurse, schoolteacher or village chairman. I felt that if I placed basic notes on the rear of the tool in plain English it might allow additional information to be communicated to the audience.

The first section of the facilitator notes was titled 'Introducing Hygiene', followed by 'Introducing the Bugs' (page 1-2), 'Practicing Hygiene' (page 3) and 'Concluding Hygiene' (page 4). This text was written in plain English and provided a simple description of the related page. During the field testing to the study group, I read out the related notes without deviation in order to replicate use of the tool in a real environment.

In addition to the picture-based story on the front of the tool, I formulated a basic set of facilitation notes on the rear. These notes were broken down into basic sections and related to the four pages of information on the front of the tool; the aim was to allow a facilitator to hold the tool up in front of an audience and read aloud the additional information to expand knowledge of the subject. This would also ensure that a consistent message would be communicated to groups, away from personal bias or preference. The uniformity and basic construction of these facilitation notes would, it was hoped, lead to additional awareness of the subject.

## **5.9 Design of Tool Icon and Logo**

The last page to be designed was the first page of the tool and it proved to be more difficult than I had predicted. The cover page of any publication forms the first impression of any publication to the reader, possibly more so than the name. The first impressions of a tool published exclusively for communities with a low rate of literacy needed to stand out and project the subject matter, other than relying on a title. For this purpose I wanted a unique and simple method of instant recognition of the subject; an icon or symbol that would form a descriptive element of the tool. The first design (figure 5-12) featured the First Aid in Pictures (FAiP) logo and this image was designed during the first phase of the project, a time when the perceived audience was to be a local Aboriginal Australian community.



Figure 5-12 Initial first aid in pictures logo

This design was shown to various family members and colleagues for their comment. It was widely felt that the symbol did not work; it was too large and the items of first aid were not appropriate to the subject matter. This led me to review the logos and international symbols covered in my introduction and overview in chapter 1. The use of a simple icon that would denote the subject of the tool became the focus of the design: washing hands with soap and water. Many sketches later, Ian Coate (<http://www.iancoate.com/>) and myself were happy with the new icon. This icon featured colour recognition in the blue (water) background and the suds with the symbolic pair of hands to dominate the design. This logo would also be easy to recognise and simple to reproduce.



Figure 5-13 CBPET logo to symbolise hand washing with soap

The new 'hand washing' icon became the major image in the second version of the cover page, reducing the FAiP logo to the corner of the page. In this version of the cover page we also replaced the items of first aid equipment with an image of the five bugs; this was to serve as an introduction to the new characters as well as denoting the subject matter. It soon became obvious that the FAiP design was self-limiting, only usable in the Australian and Christian context. For any possible multi-cultural use of my tool it was essential that the tool be as culturally neutral as possible, therefore the cross design needed to be redesigned.

At this point it was also felt that the title of the project did not quite fit with its projected use. Following my first visit to Tanzania in 2012 to deliver the ambulance and facilitate medical training I requested feedback from various local stakeholders. It was a common comment that people in the community associated the word (First) AID in the title with the HIV/ AIDS virus that was one of the major mortality issues in the country.

Due to the potential global requirement for my new tool it was felt that the cross could be replaced with an image of the world, with a band-aid attached to add a medical slant. This design had the potential to be culturally neutral as well as symbolise the medical nature of the tool. The image of two hands was added to symbolise harmony and cultural unification. Several variations of hand design and colour were trialled but additional graphics over-complicated the design.



Figure 5-14 Concept art for FAIP logo

Following the introduction of the hand washing logo and reformulation of the First Aid in Pictures symbol I began to question the use of the name of the project. As I had just established in Tanzania, the term 'First Aid in Pictures' seemed to promote negative associations with the HIV/AIDS issue and I did not want that. With the

inclusion of hand washing and basic hygiene in the 6Bs structure I felt that the potential of the project had gone past the first-aid scope of the project. As the title, 'First Aid in Pictures', limited the scope of any future module, I felt that a different name was needed to accommodate the vision of including preventable health care issues. The name Health Education & Learning in Pictures (HELP) seemed to represent the true potential scope of this project: it allowed any health care subject to be communicated using my picture format. The final cover page was completed with the new HELP logo.



Figure 5-15 Final development of the CBPET cover

From an initial concept of translating simple health care messages into a picture based format that would enable communities with low textual literacy to understand the message the process to date has indicated the potential scope of such a project would be huge. Not only would cultural issues require assessment prior to the design and delivery material but also skin tone and design of any characters depicted.

### 5.10 Summary

The development of a unique picture based tool has been a challenge in many ways. For instance, in the beginning it proved difficult to explain the concept to potential financial investors. I was unable to compare my concept tool to any other product on the market, as there is none. There are examples of pictures and graphics used to supplement healthcare text in order to enhance the understanding of the subject but none that uses pictures to supplement text entirely. Modelling the bug characters on scientifically-accurate images has given the design a far more professional context; it was felt that to merely create icons with no basis in reality may alienate the health care providers who may ultimately be the guardian of this

tool. The overall design has proven to be successful in the environment it was designed for. This concept now has the potential to be replicated using other health care messages.

# **CHAPTER 6**

## **Results of Phase 2**

### **Demographics and Participant Characteristics**

#### **6.1 Introduction**

This chapter reports the analysis of the pre and post-intervention questionnaires administered to the 22 participants from Mlegele village on the outskirts of Masanganya Village, Kisaware District, Pwani Region of Tanzania. The questionnaire was administered to the study group on 3<sup>rd</sup> and 4<sup>th</sup> of August 2013 by myself and the local interpreter Bright Aloyce. This questionnaire consisted of 45 questions relating to personal and community demographics, access to healthcare facilities and their knowledge and practice of hygiene, infection control and hand washing. As the educational tool was visual in nature it was important that the participants had adequate vision to allow them to appreciate the icons and pictures in the tool. The study was conducted in the new schoolhouse located just outside of the Mlegele village.

#### **6.2 Demographic Data**

The 22 people who participated in the study were recruited by the village chief who had addressed the community a few days prior to the proposed commencement date. All of the 22 participants who attended on the first day returned to the school the following morning to complete the study, except participant #14, an 80-year-old male who found the experience too much. To his credit, he recruited a friend to attend in his place and passed on the educational tool. The replacement participant was eager to contribute to the study, however his data was excluded from the post-interview analysis as he had not participated in the pre-intervention survey.

##### **6.2.1 Gender**

The gender of the study group was not dictated by any part of the selection process; the four females of the group formed a representative section of the community. Whilst all women in the study group were married (not untypical for the community) two women were Muslims, one female participant stated she was a Catholic and the other described herself as a Christian. Their profession was also typical of the small village community that formed the demographic of the study group; three of the female participants were 'farmers' with one a 'teacher'. Unsurprisingly, the three

female farmers had only received a primary school education with only the teacher reporting a secondary education. The male cohort who formed the majority of the group were largely Muslim in faith, and farmers by trade. The exception to this was one farmer stating he was of the Catholic religion, a single male stating his occupation as a 'driver' and one as a 'worker'.

### **6.2.2 Age**

The youngest participant was a 25-year-old male farmer with a primary school education and the eldest an 80-year-old farmer who reported to have had a secondary education. Although the 80-year old did drop out of the study group, the second eldest had a reported age of 75 and a secondary education. Mean age of the study group of 45.8 years old.

### **6.2.3 Marital status**

All members of the study group were married, with no single adults volunteering to participate. This statistic may be explained by the inclusion criteria of the study group insisting that participants must be over the age of 18. In the remote farming community that supplied the study group both genders of adult tended to marry at an earlier age. This hypothesis is supported by the 2013 comparative study determining age of marriage in sub-Saharan Africa (Ayiga & Rampagane, 2013) which found that the mean age for a first marriage in a lower SES environment was 19.2 years of age in contrast with 28.9 years of age in the higher SES environment.

### **6.2.4 Number of children**

As a great deal of research has indicated that children appear more susceptible to disease and illness via the faecal-oral route (Cairncross et al., 2010; Curtis & Cairncross, 2003; Curtis, Danquah, & Aunger, 2009; Grimes, 2015; Luby, Halder, Huda, Unicomb, & Johnston, 2011; Pickering et al., 2010; Rheinländer, Samuelsen, Dalsgaard, & Konradsen, 2010; Thomas, Boquete-Suter, Koch, Pittet, & Kaiser, 2014) the education of parents seems paramount to the health of the child. The members of the study group reported 102 children between them, which averaged 4.6 children per family group. A schoolteacher with a secondary education had the lowest number of children (1), whereas three farmers with no more than a primary education had the larger number of children (8 children each).

### 6.2.5 Religion

Eighteen (81.8%) members of the group indicated that they were Muslims; this group consisted of both male and female participants with their employment status representative of the group of farmers and teachers. Two members of the group (9%) identified themselves as Catholic with one participant (4.5%) stating they were a Christian; one person declined to answer.

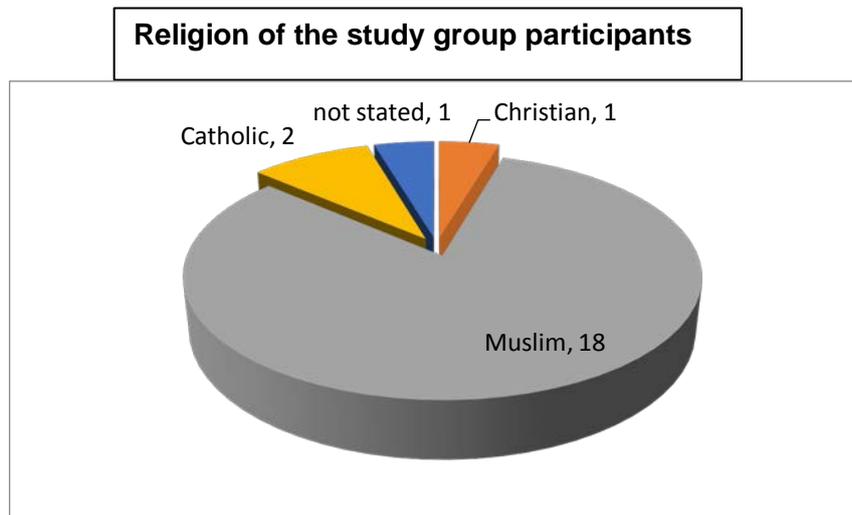


Figure 6-1 Chart indicating religion of the study group participants

### 6.2.6 Education level

The majority of participants in the study group (77.2%) had received primary school education only with only three (13.6%) receiving secondary education. One of the secondary educated group was a teacher at the local school however the other two were the senior members of the farming group with one participant aged 80 and the other 75. This phenomenon may represent the status of the education system that was in place during British rule ending in 1961 when Tanzania won its independence. Following this period of governed rule the education system was organised by local or state government and less structured.

**Education level of the study group participants**

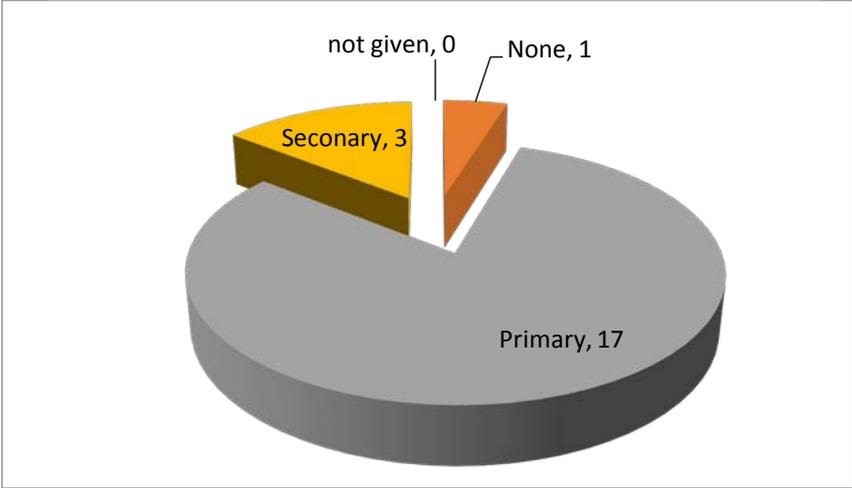


Figure 6-2 Chart indicating education level of participants

**6.2.7 Profession**

Seventeen of the participants indicated that they were farmers; from observational studies during my previous visit to Masanganya and the surrounding villages it seemed that the region relied heavily on small tenement farmers to sustain employment or sufficiency. The two teachers from the school formed part of my study group: one male and one female, as did one of the volunteer ambulance drivers. One participant described himself as a 'worker' and one married, 45 year-old male declined to describe his profession.

**Occupation of the study group participants**

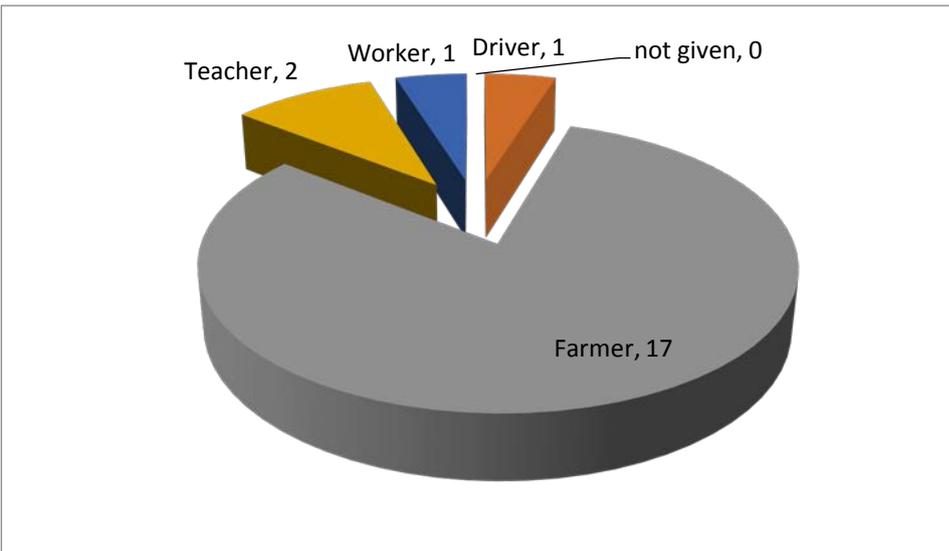


Figure 6-3 Chart indicating profession of the study group participants

### **6.2.8 Access to government supplied health services**

The questionnaire asked if participants had access to health services (Western). All members of the group stated that they had access to a Western medical clinic. The outreach program of the Masanganya Dispensary visited the village of Mlegele on a weekly basis to offer health checks, vaccinations and consultations. Prior to the delivery of the GHAWA ambulances, access to this aid was limited by road conditions, and the ability of the patient to walk or the availability of other forms of transport to the dispensary. A regular communication network between Mlegele and Masanganya allowed family members to travel between the two villages for social visits. Masanganya Dispensary housed a number of female nursing staff and students who were on call for any medical emergency 24 hours a day. Depending on staffing and rosters, the dispensary also had two serving doctors on site who could provide more comprehensive diagnosis and treatment.

### **6.2.9 Access to traditional healers**

The questionnaire asked if the participants used Traditional Services (Medical). Traditional healers form an important part of African society (Gessler et al., 1995; Stangeland, Reksten, & Dhillion, 2008) and provide healthcare advice and treatment outside of the government based system. Traditional medicine is partially accepted in Tanzania. In an effort to try and regulate its use, the Tanzanian government passed 'The Traditional and Alternative Medicine Act' in 2002 in an effort to incorporate its use into mainstream healthcare.

Although all members of the group had access to the government health services from the nearby Masanganya Dispensary, all participants indicated that they had access to other traditional forms of medicine. Most of the nursing staff from the Masanganya Dispensary commented that they visited traditional healers for some areas of healthcare in the past and would continue to do so in the future. The prevalence of traditional healers in the area suggests that they formed part of the community system of that area. The Masanganya doctors reported that many of their patients required treatment after suffering systemic poisoning from the herbal treatments given to them by local healers.

### 6.3 Participants' Hygiene Knowledge

#### 6.3.1 Participants' knowledge of infection cause, infection transmission and hygiene practice

The results and comparison of the pre and post-intervention questionnaires provide quantitative results on the effectiveness of my CBPET within the selected group. The pre intervention questionnaire established a baseline of knowledge before the intervention. The questions were explained in turn by Bright, the translator, with the opportunity for the participants to ask questions should they not understand what was being asked of them.

#### 6.3.2 Participants' knowledge of germs

Participants were asked if they knew what a germ was. They were given three options: yes, not sure and no. If the participants answered 'yes', they were invited to describe a germ in their own words. In the pre-intervention questionnaire 100% of participants declared that they knew what a germ was. Six participants (27.2%) claimed that a germ was a fly, three (13.6%) claimed it to be a mosquito. Two participants (9.09%) stated that a germ was a fly, a mosquito or a tsetse fly and a further four (18.18%) indicated germs to be rodents. Another two members (9.09%) of the group stated that germs lived in dirty water and one member (4.5%) of the group indicated that a germ was a bed bug.

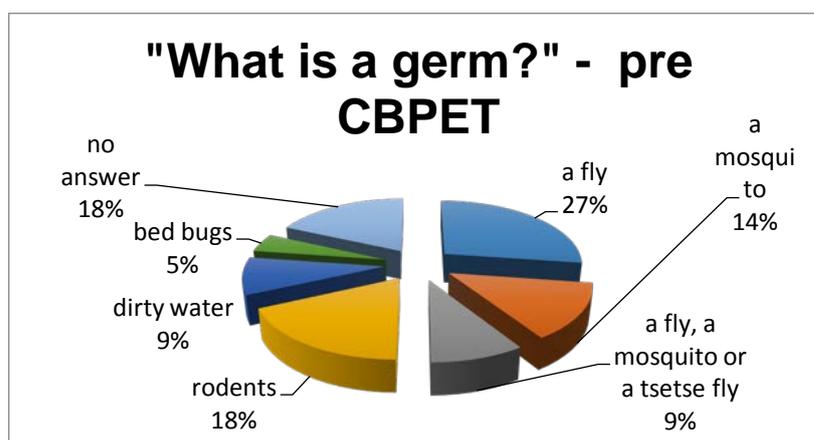


Figure 6-4 Chart indicating participants knowledge of germs before CBPET

Following the CBPET intervention, the same questions delivered before the education session were repeated but with the addition of further questions. The post-intervention results (figure 6-8) reveal a far more diverse range of understanding of what a germ is.

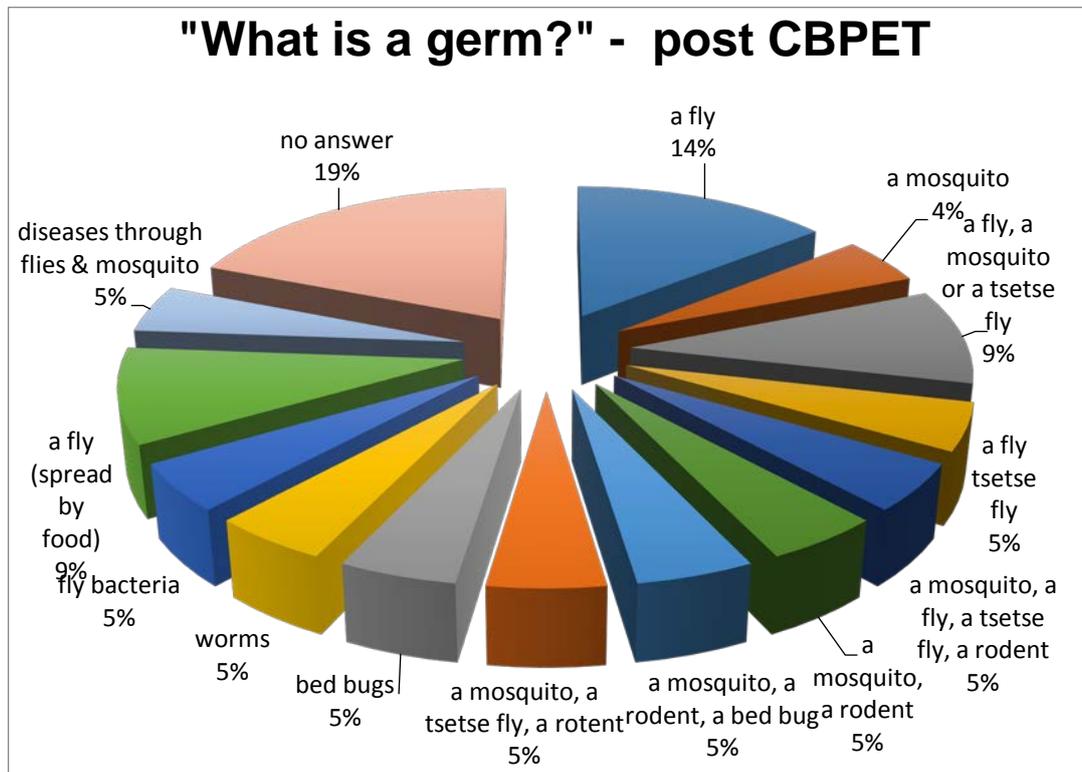


Figure 6-5 Chart indicating participants knowledge of germs post CBPET

The number of participants identifying a fly as a germ halved from 6 (27%) to 3 (14%), but there was no change in the numbers of those who previously identified a fly, tsetse fly or mosquito as a germ (2, 9%) and who chose not to answer (4, 19%). Of interest are the four participants (19%) that now state a germ is “fly bacteria”, “a fly spread by food” or “diseases (caused by) flies or mosquitos”. These responses , are a major leap in understanding and comprehension of bacteria and the spread of disease. The one participant describing a ‘worm’ as a germ may well be trying to describe the “Phlegm bug” (figure 6-9) as a worm; if this was the case it would indicate that the image of the ‘bug’ has prompted an association with a germ and thus gained an understanding of the nature and possible identification of a ‘germ’, ‘bug’ or bacteria.



Figure 6-1 Phlegm bug

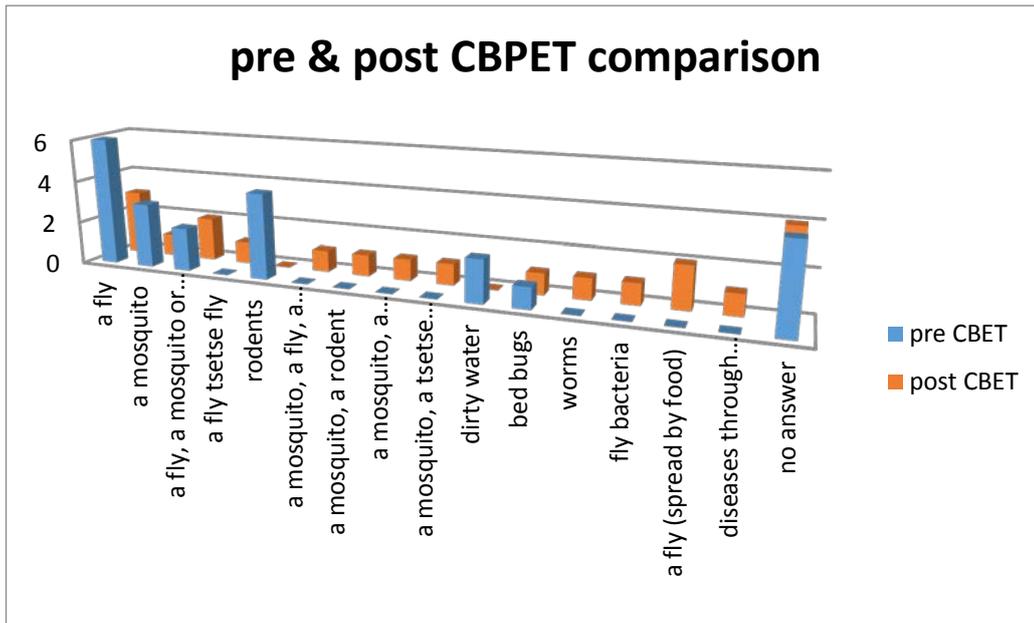


Figure 6-6 Chart indicating pre and post-CBPET comparison

### 6.3.3 Participants' knowledge of where germs live

Participants were asked if they knew where a germ lives and were given the three options of 'yes', 'not sure' and 'no'. If 'yes', they were invited to explain where the germ lived using their own words. Only one participant (4.5%) claimed not to know where germs lived in the pre-intervention questionnaire, with all other participants answering that they did. When asked to explain in their own words where they thought germs lived, the remaining study participants gave the following answers (figure 6-11). Out of the 21 remaining participants that claimed to know where a germ lived 5 (15%) could not explain where and did not answer.

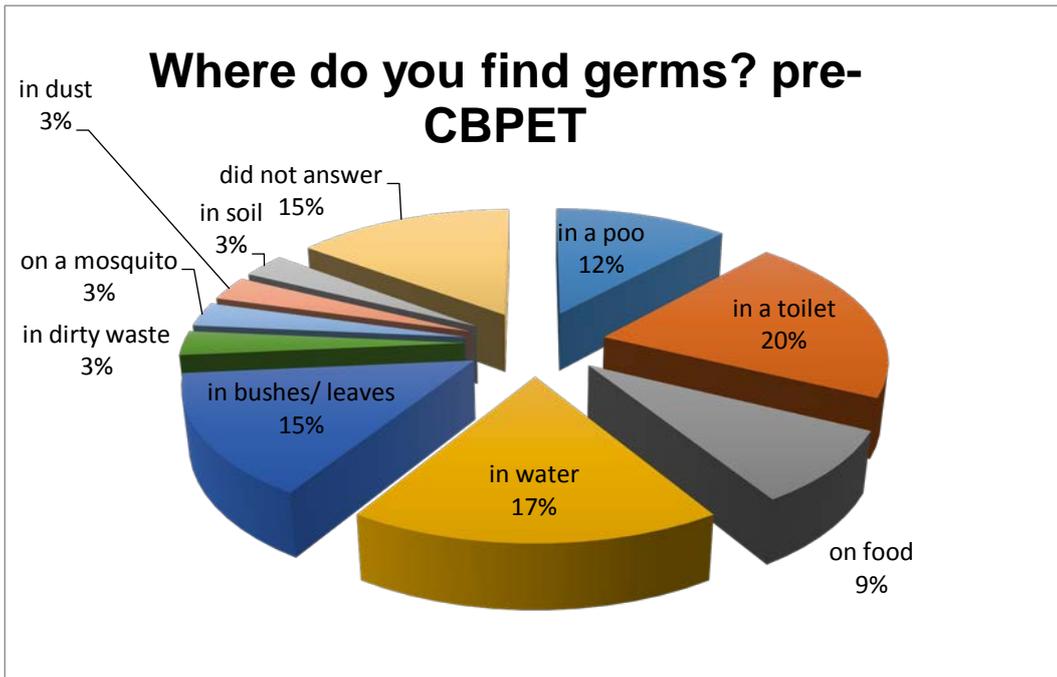


Figure 6-7 Chart indicating participants knowledge of where germs live before CBPET

Following the delivery of the CBPET those that could not explain where a germ lived and did not answer fell to 2 (6%). The location categories of where a germ lived also increased with more of the study participants understanding that germs lived in water.

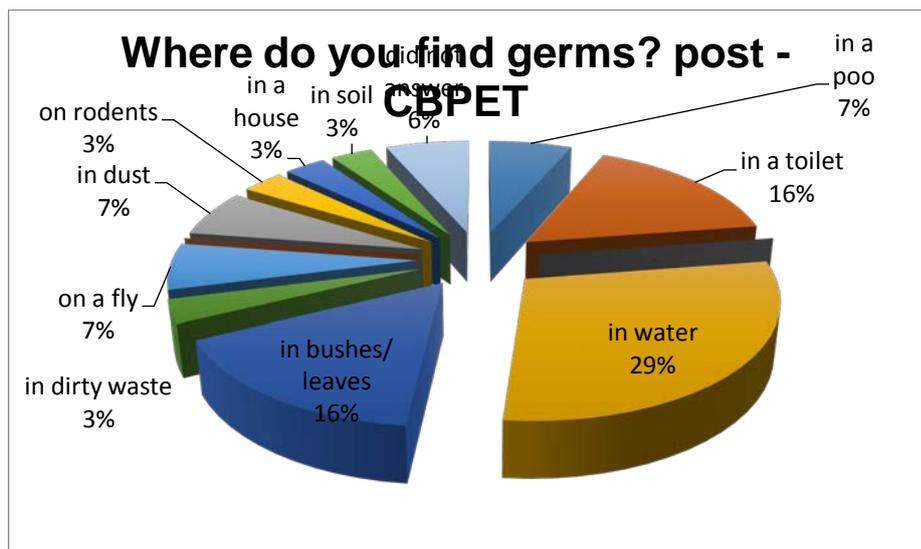


Figure 6-8 Chart indicating participants knowledge of where germs live after CBPET

A comparison of the answers provided by the participants to the question “where do germs live” both pre and post-intervention are charted below (figure 6-13).

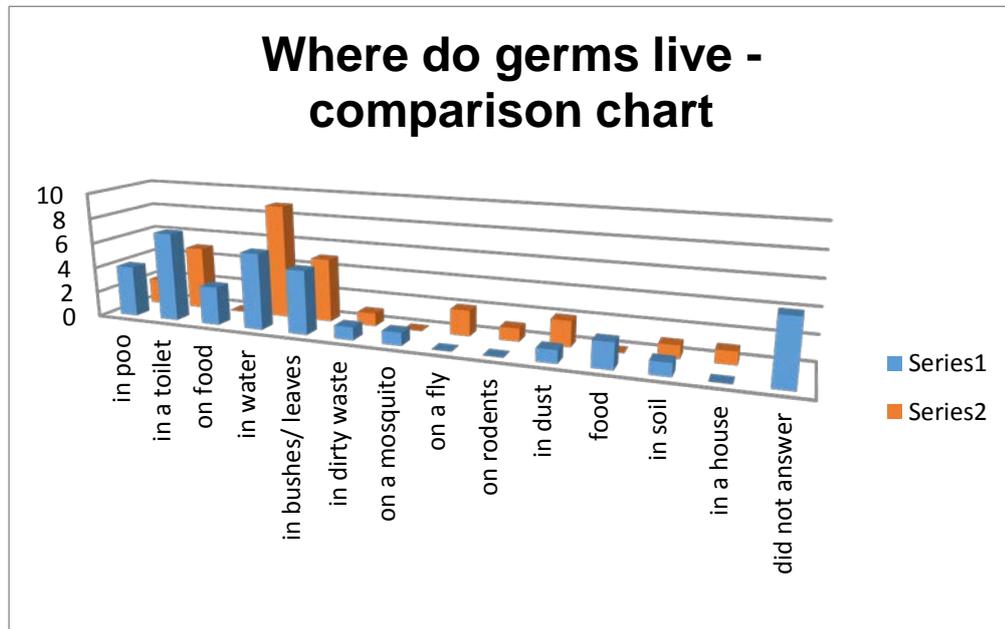


Figure 6-9 Comparative chart indicating participants' knowledge of where germs live

### 6.3.4 Participants' knowledge of germ transmission

A major part in the understanding of the 'chain of infection' is the realisation of germ transfer from reservoir to host and the portal of entry. With this knowledge, the potential host can take precautions to prevent a germ invading the body. Although the data from the pre-CBPET intervention indicates that the participants of the study group had a basic understanding of how germs were transferred between carrier and host, the actual scope of their knowledge was quite small.

Participants were asked if they knew how germs travelled between infected people to other people. Seventeen (77%) of the group stated that they did, 3 (14%) stated they were not sure and 2 (9%) failed to answer. Following the delivery of the CBPET the number of participants answering 'yes' they did know how germs travelled between people increased to 19 (86%).

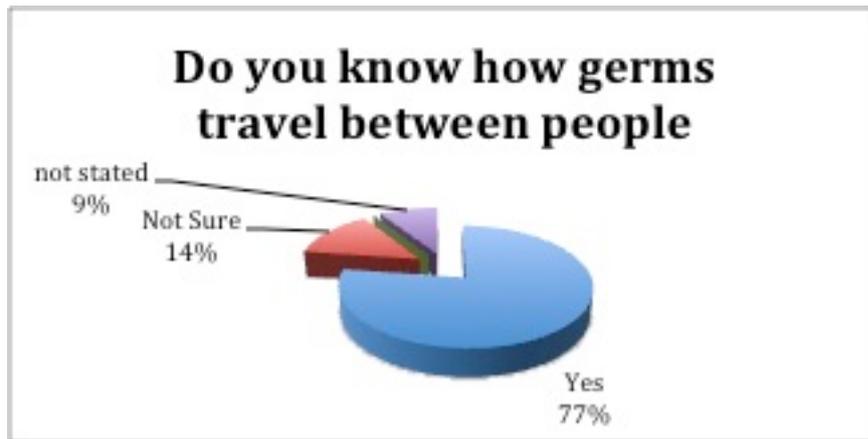


Figure 6-10 Chart indicating participants knowledge of germ transmission

The participants who answered that they were not sure how a germ travelled between infected people and other people were then requested to explain how, in their own words. In the first questionnaire, before the delivery of the CBPET 14 (41%) of the group stated that germs spread through the air, 5 (14%) through sneezing, 4 (12%) through touching hands, 3 (9%) through eating, 2 (6%) through insect bites, 1 (3%) through coughing; five participants (15%) failed to answer (despite indicating that they knew).

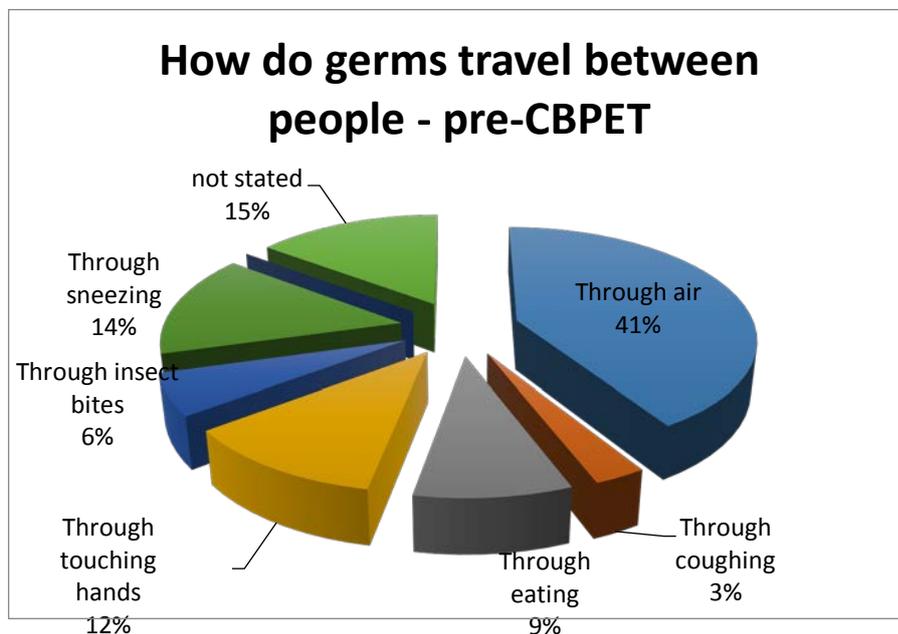


Figure 6-11 Chart indicating participants knowledge of germ transmission in detail pre-test

During the delivery of the CBPET to the study group on the first day, one particular question seemed to raise the interest of all participants, and that was the concept of

washing before and after sex. At first this subject was raised with a simple question from a female participant of what body parts required washing. What followed was a very comprehensive discussion around the 'blood bug' character and how it invades the body. Analysis of the data taken following the delivery of the CBPET seems to indicate that the concept of transmission of blood-borne disease via sex and through wounds had been recognised by some of the group. Five (15%) of this group now stated that germs travel between people via sex, blood or wounds on the body. Five (15%) of this group now stated that germs travel between people via sex, blood or wounds on the body.

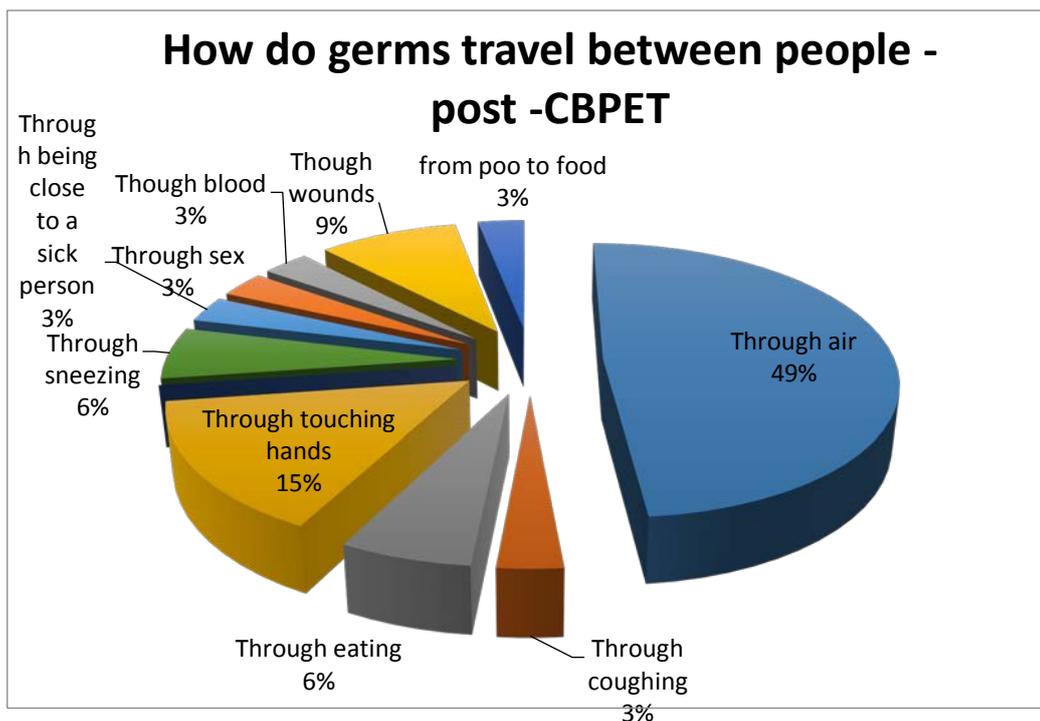


Figure 6-12 Chart indicating participants knowledge of germ transmission in detail post-test

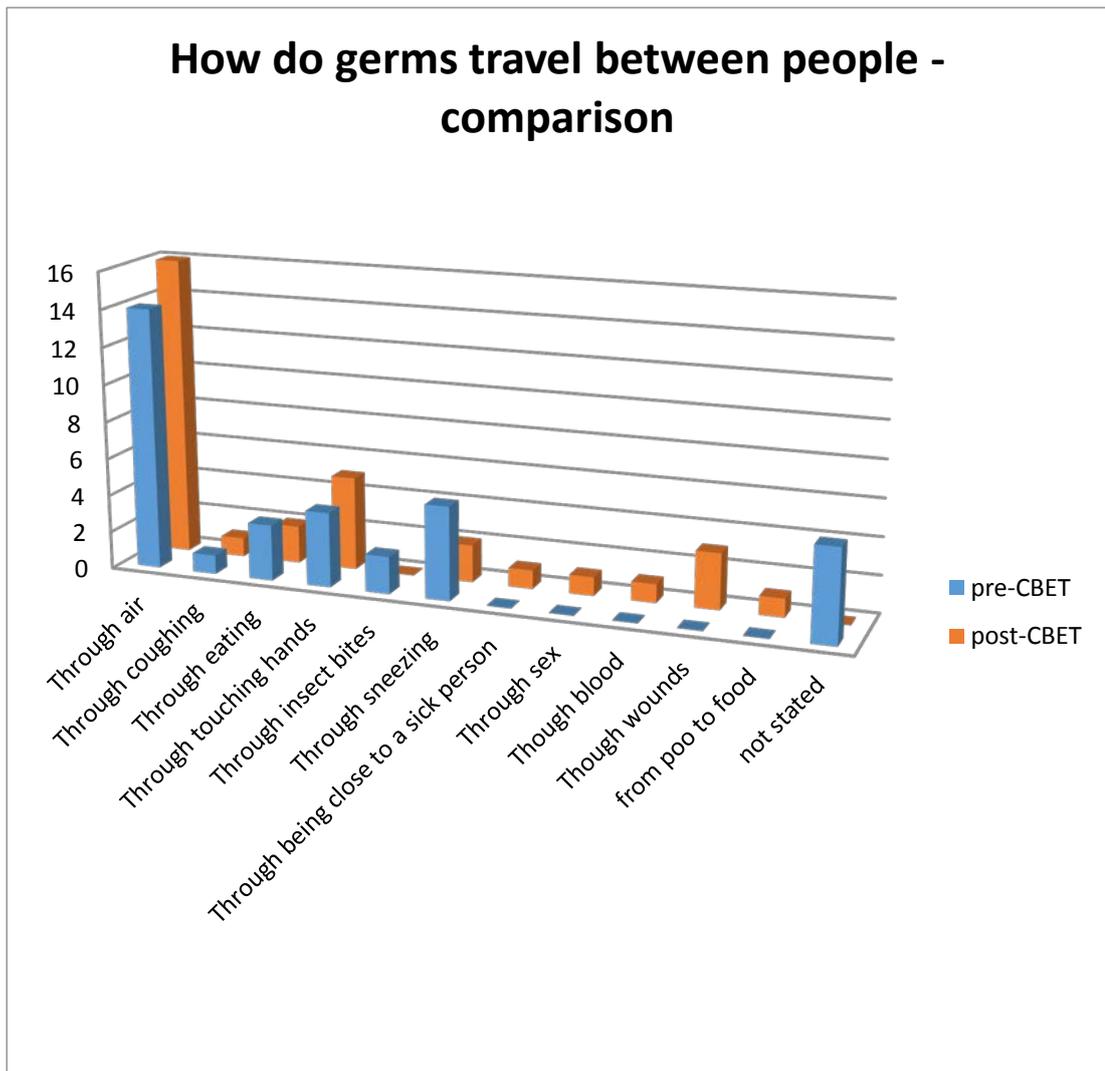


Figure 6-13 Chart indicating participants knowledge of germ transmission pre-test and post-test

### 6.3.5 Participants' knowledge of germ infection

The portal of entry into the body, a vital element of infection control, was explained in the CBPET as how the germ can enter the body. Participants were asked if they knew how germs enter a body. In the pre-CBPET intervention 21 (95%) of the group stated that they did know how germs entered the body with one declining to answer; however all members of the group answered 'yes' following delivery of the CBPET.

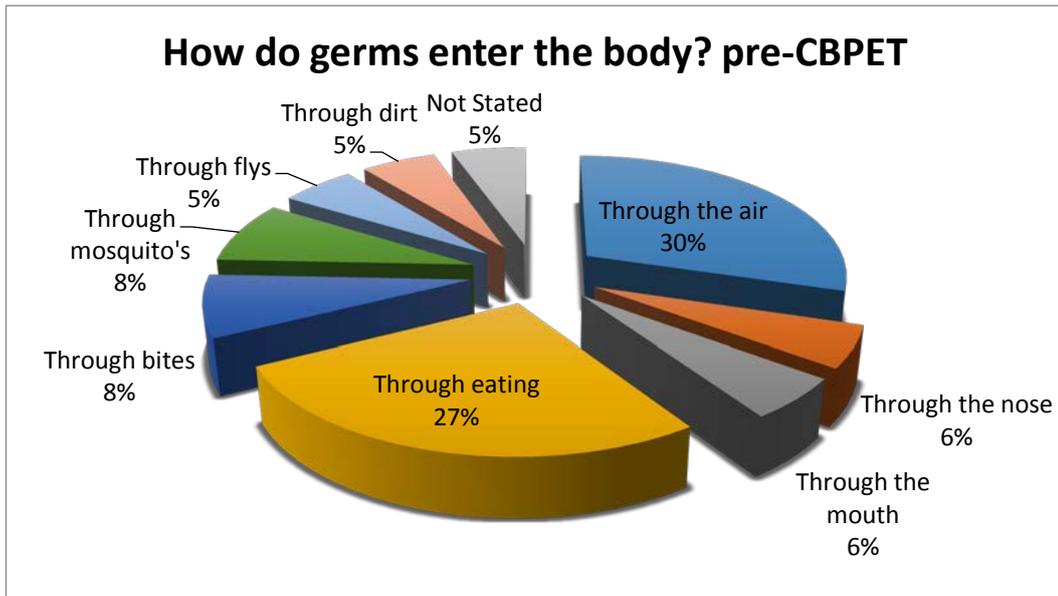


Figure 6-14 Chart indicating participants knowledge of germ infection in detail pre-test

Those participants who answered that they knew how germs enter the body were invited to explain in their own words. Eleven of the group (30%) answered “through the air”, with ten participants (27%) indicating “through eating”. This showed that the majority of participants understood the basic concept of germ transmission via the inhalation or oral route. The majority of other answers suggested that there was some confusion regarding the other routes into the body, with a number of the participants believing that germs entered the body via bites, flies and mosquitos. It is suggested that this may be confused with the transmission of malaria and other types of mosquito-transmitted infections following large public health campaigns throughout the community.

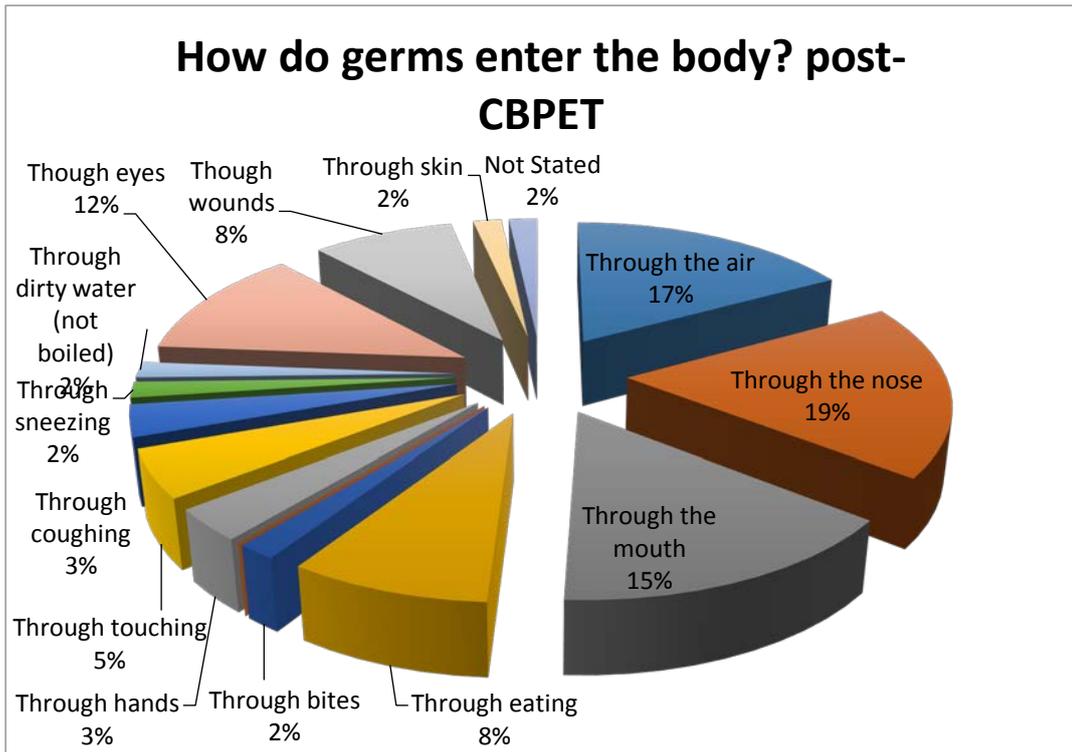


Figure 6-15 Chart indicating participants knowledge of germ infection detail post-test

Following delivery of the CBPET to the study group it appears that their perception of how germs are transferred from reservoir to host, the transfer mechanism, improved with a much wider range of answers provided on the post-intervention questionnaire. Previous to delivery of the CBPET, the group's knowledge seemed to indicate that their awareness of germ transmission centred on oral and airborne transmission with the remainder of the group thinking that germs could be passed on via insects such as mosquito and flies. The delivery of the CBPET seemed to improve the group's understanding quite considerably; instead of answers indicating that germs may be spread via mosquitos and insects the group now seemed to understand that germs may be spread from reservoir to host via "touching", "coughing", "sneezing", "wounds" and drinking dirty water that had not been boiled.

This greatly improves their understanding of the transfer mechanism and instils the core concept of how 'germs' can be transferred from an infected person to the rest of the community. Understanding this concept may be a start to producing a cultural change in regard to community practice and hygiene in the home that may also lead to a hand washing (with soap) culture that may prevent illness, disease and death

(Cairncross, 2003; Cairncross et al., 2010; Curtis & Cairncross, 2003a, 2003b; Fan & Mahal, 2011; Grayson et al., 2009; Luby et al., 2011; Pickering, Boehm, et al., 2010).

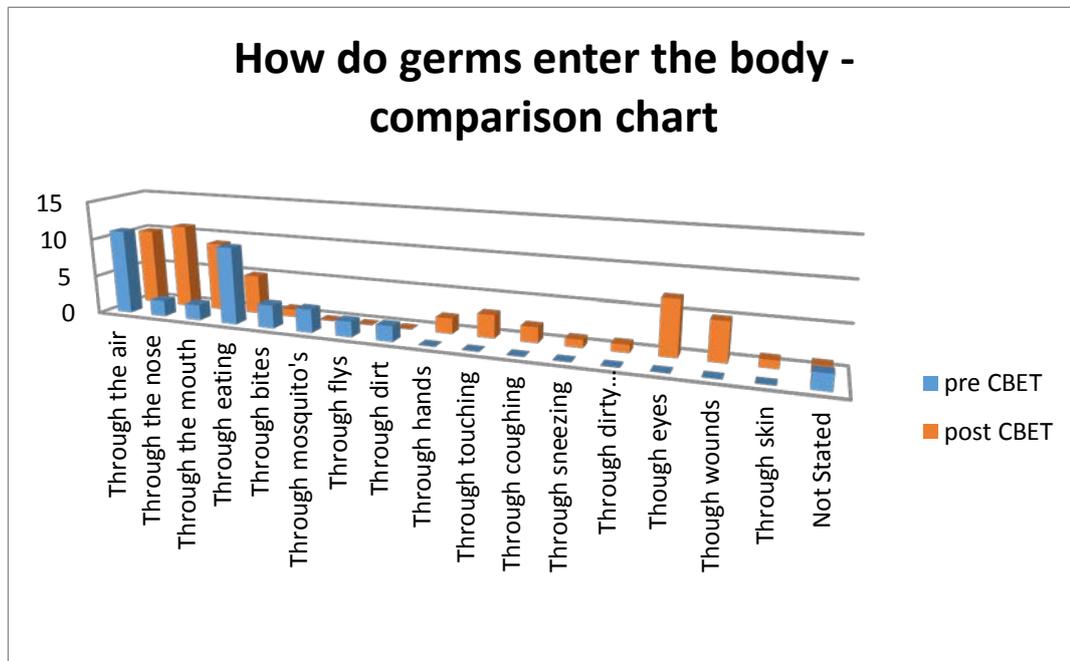


Figure 6-16 Chart indicating participants knowledge of germ infection pre-test and post-test

### 6.3.6 Participants' previous education experience in hand washing

Although the act of immersing hands in water may be deemed as washing hands it is merely an action for getting the hands wet. Although some studies have found that rinsing hands under running water alone is better than nothing at all, and does limit some forms of faecal-oral contamination (Luby et al., 2011), it is widely recognised that hand washing with soap is more effective. Hand washing with soap and its promotion has a massive potential impact on public health (Cairncross, 2003; Cairncross et al., 2010; Curtis & Cairncross, 2003a, 2003b; Luby et al., 2011). Although the CBPET has not been designed to be a specific promotional tool for hand washing with soap it certainly educates people that washing hands with soap and water kills germs.

The participants were asked if they had ever been taught 'how to wash their hands'. Prior to the delivery of the CBPET 13 (59%) of the group stated that they had received instruction on how to wash their hands, although there is no information on

who delivered this instruction. Eight (36%) of the group stated that they had never been taught how to wash their hands and one member of the group was not sure.



Figure 6-17 Chart indicating participant education in hand washing pre-CBPET

On the second day, following the 20-minute presentation of the CBPET to the group there seemed to be a large increase in certainty regarding the requirement for hand washing with soap. Eighteen (82%) of the group were now confident that they had been taught how to wash their hands despite this educational tool not intentionally teaching them 'how': just the 'why'.

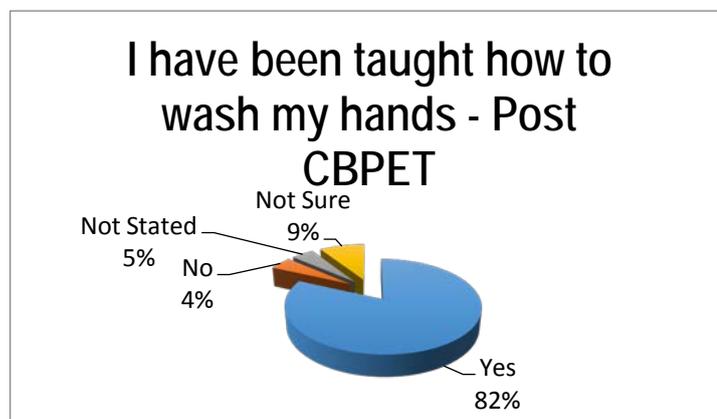


Figure 6-18 Chart indicating participant education in hand washing post-CBPET

### 6.3.7 Participants' understanding of importance of hand washing with soap

The questionnaire asked participants if they thought hand washing was important. Nineteen (84%) indicated that 'yes' it was. Those 19 participants were asked to explain in their own words why hand washing was important. Prior to the introduction of the CBPET there was a varied response with 6 (27%) responding that they washed their hands to avoid spreading disease, 2 (9%) to avoid disease

and only 1 (5%) to kill germs. The other members of the group all seemed to relate hand washing with the removal of dirt or to make their hands look more presentable.



Figure 6-19 Chart indicating participants' understanding of the importance of hand washing with soap pre-CBPET

Following the presentation of the CBPET, all members of the group expressed the opinion that hand washing was important, an improvement from the few who gave this answer in the pre-test questionnaire. The participants were again requested to explain in their own words why they thought hand washing was important. The results implied that this low- textual literate group had fully grasped the importance of hand washing as a vital stage in infection control. Only 2 (9%) still stated that hand washing was to achieve cleanliness, the remaining participants explained that hand washing was important to kill germs, avoid spreading disease and to promote health.

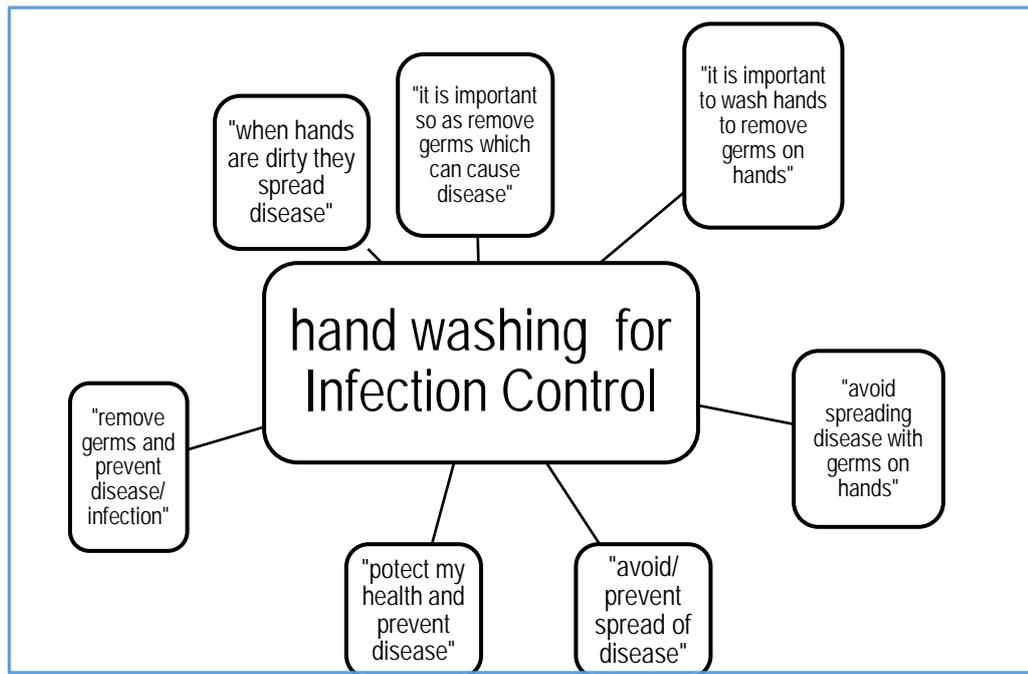


Figure 6-20 Thematic chart indicating participants understanding of importance of hand washing with soap post-CBPET (infection control)

### 6.3.8 Participants' access to soap

Following the completion of the CBPET delivery, a number of the study group wanted soap to be more available now they realised its importance in daily hygiene. This issue had been predicted by my translator, Bright Aloyce, prior to the delivery of the tool. As it had been my intention that the CBPET be linked with availability of soap I had purchased a quantity of laundry soap in Dar es Salaam on my way to Masanganya. This soap was presented to the participants at the end of the data collection. I explained to the group that the laundry soap that the women of the community use to wash the clothing could be used for the purpose of hygiene. This soap is widely available and present in most households due to its frequent use in keeping the family clothing clean.



Figure 6-21 Study group with the translator, with bars of soap following the study

In the pre-delivery questionnaire, all participants were asked if they had access to soap in their daily routine. All 22 participants responded that 'yes' they did have access to soap. In the post-delivery questionnaire there appeared to be some uncertainty, with one participant replying that they did not have access to soap and another participant unsure. On day two, following the delivery of the CBPET to the study group, a number of the participants asked where they could access soap. The participants were then asked what they used to wash clothes at home and they all answered "with laundry soap"; it appeared that the participants were not aware that laundry soap could be used to wash hands.

### **6.3.9 Participants' frequency of hand washing**

In the pre-delivery questionnaire participants were asked, "how many times a day do you wash your hands?" They were given four options: 0, 1-3 times, 4-6 times or more (7+). In the pre-CBPET questionnaire 8 (36%) of the group indicated that they washed their hands 1-3 times a day, 11 (50%) indicated that they washed their hands 4-6 times a day and only 3 (14%) indicated that they washed their hands 7+ times a day.

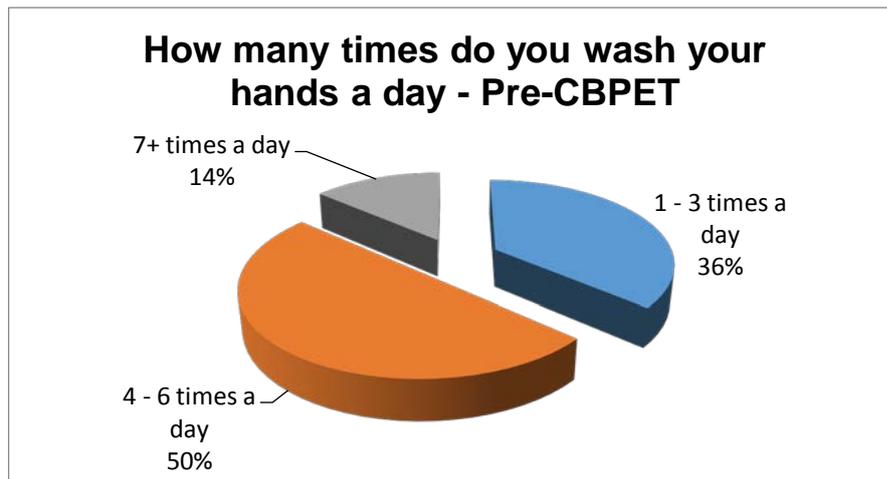


Figure 6-22 Chart indicating hand washing frequency – pre-CBPET

Following their introduction to the CBPET the number of participants stating their intention to wash their hands improved, with 13% of the participants intending to increase the frequency of hand washing to 7+ times a day; most of those came from the group who reported hand washing 1-3 times a day in the pre-test.

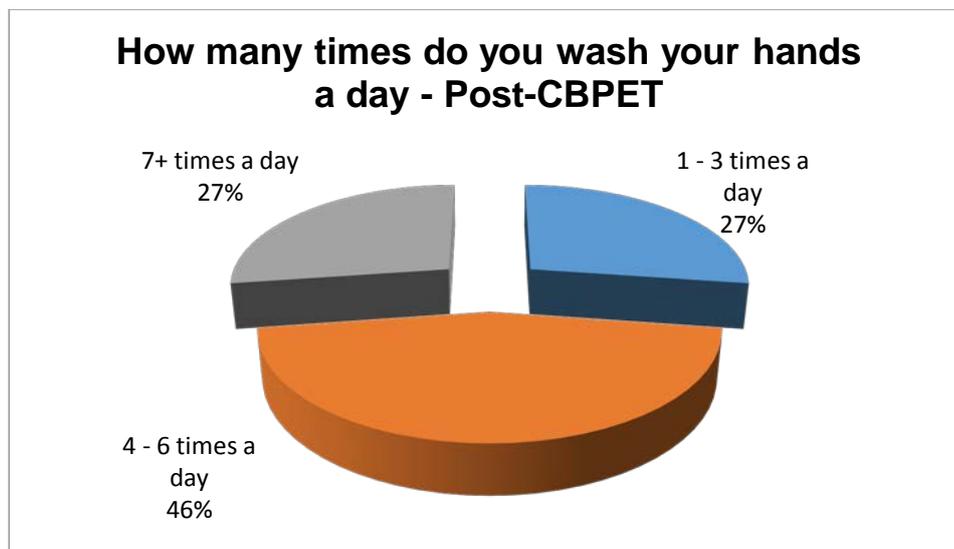


Figure 6-23 Chart indicating intended hand washing frequency – post-CBPET

### 6.3.10 Indicators that prompted hand washing

Analysis from the study group results indicate that a large number of the participants only thought about washing their hands with soap when they appeared visibly dirty, mostly only up to 1-3 times daily. The 2010 report, 'Practical Guidance for Measuring Hand Washing Behavior' (Water and Sanitation Program, 2010) indicated the following critical times to wash hands with soap and water:

- after defecation

- after contact with a child's stool
- after going to the toilet
- before preparing food
- before eating
- before feeding a child
- before handling water for storage.

Both questionnaires asked participants to nominate key events that prompted them to wash hands so that data could be reviewed in a pre-test, post-test analysis. Key events were listed and participants were requested to mark the events that prompted them.

When I wake up in the morning	When I go to bed at night
Before I eat my food	Before I prepare my food
After I eat my food	Before I go to the toilet
After I go to the toilet	Before I touch animals
After I touch animals	Before I touch a wound
After I touch a wound	Before I have sex
After I have sex	When my hands feel dirty
When my hands look dirty	Before I change a baby
After I change a baby	I don't wash my hands

The results to this question were inconclusive as there seemed no correlation between the indicated events that prompted them to wash their hands or the frequency that they self-reported washing hands. This may have been identified if the questionnaire was tested in with a smaller sample group prior to the main study but time constraints of my field trip did not allow this. The participants' explanation of when and why they washed their hands seems to detail better definitive cause to their understanding of the tool and does indicate that they grasped the important key events portrayed in the tool.

### **6.3.11 Participants' access to water**

The village of Mlegele is typical of a rural community in Eastern Tanzania, a principle reason for its choice as a location to gather data. Access to a potable water source is vital to the ability to wash hands with soap and water and prevent infection via pathogenic infection.

A 2009 report indicates that women can walk for five hours a day to collect one bucket of water and that 8% of rural households in Tanzania collect water from a source over 6 kilometres from the dwelling (Taylor, 2009). Providing potable water and basic sanitation to communities is one of the most pressing issues faced by governments across sub-Saharan Africa (Salami et al., 2014), and one of the key targets of the Millennium Development Goals (MDGs) established at the 2000 United Nations Summit (Dill & Crow, 2014).

#### 6.4 Type of Container Used to Wash Hands

Participants were also questioned about the type of device used to hold the water when they washed their hands. The questionnaire offered the following choices: in a sink, in a bowl, in a stream, other (please state) or “I don’t wash my hands”. Fifteen (68%) participants stated that they used a plastic bowl, 4 (18%) named a ‘sink’, 1 (5%) indicated they used a stream and 2 (9%) did not answer the question.

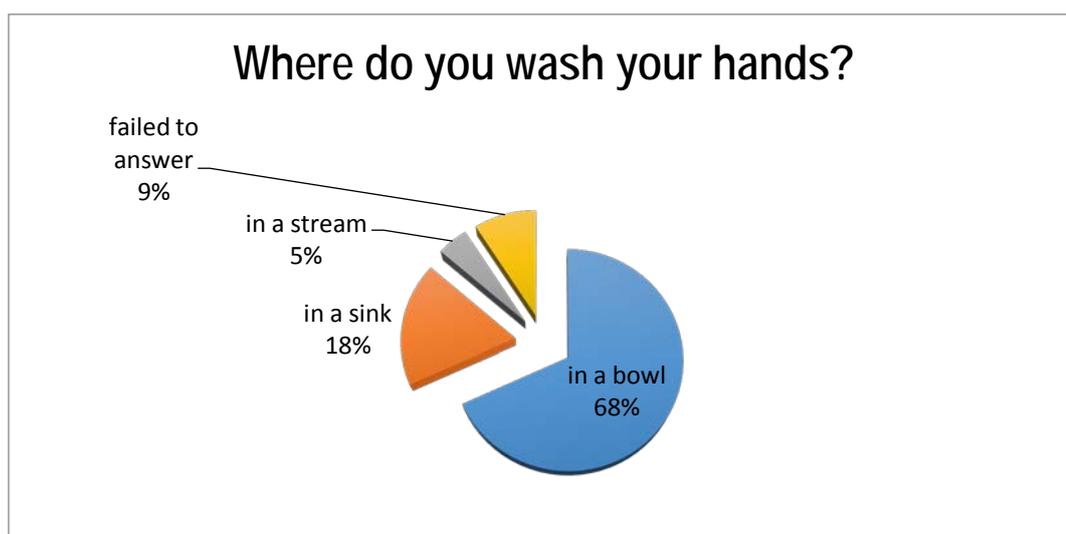


Figure 6-24 Chart indicating type of hand washing device

##### 6.4.1 Does soap and water kill germs?

One of the last questions in the questionnaire prior to delivery of the CBPET was “Does soap and water kill germs?” I believe this to be a fundamental question to ask, in order to modify the hygiene behaviours of any community. If a person has never been educated about the direct link between pathogens and disease, the new awareness can be a quantum leap to connect the two. It wasn’t until 1849 when John Snow connected the faecal contaminant in the Broad Street water pump to the local outbreak of cholera that educated scholars understood this connection. To the

question, “Does soap and water kill germs”, asked before the CBPET intervention, 13 (59%) of the group answered no (i.e., soap and water does not kill germs), 3 (14%) not sure and only 6 (27%) answering yes, being aware of this fundamental hygiene fact.

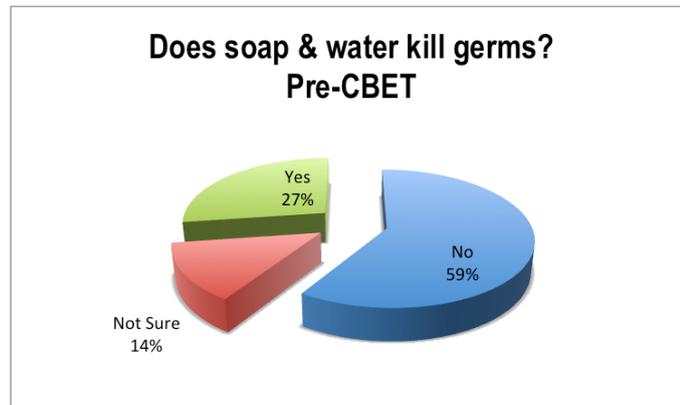


Figure 6-25 Chart indicating participants understanding of the effectiveness of soap and water in killing germs pre-CBPET.

The CBPET was designed to tell the pictorial story of the journey of a germ from the host to the recipient and, at the same time, instill a message that the way to interrupt this process was to break the chain of infection by washing hands with soap and water. It would be a great achievement if a tool could communicate this message to a low-literate, resource-poor environment; this may be the first step in preventing the spread of disease and improving the quality of life for a community unable to take advantage of the wealth of literature and public health promotions due to their inability to read the message. The results of the same question in the post-questionnaire suggests that this simple tool has passed on one crucial concept, washing hands with soap and water kills germs.

The number of participants that stated that soap and water does kill germs increased from 6 (27%) to 19 (86%), an amazing increase. If this pattern was displayed in a larger community the increased hygiene knowledge may prove more effective than many other more prominent public health campaigns. This increase of knowledge is encouraging, but it does not explain whether the delivery of the message or the cartoon based delivery format was responsible. Several other questions were asked to investigate whether the educational tool had impact.

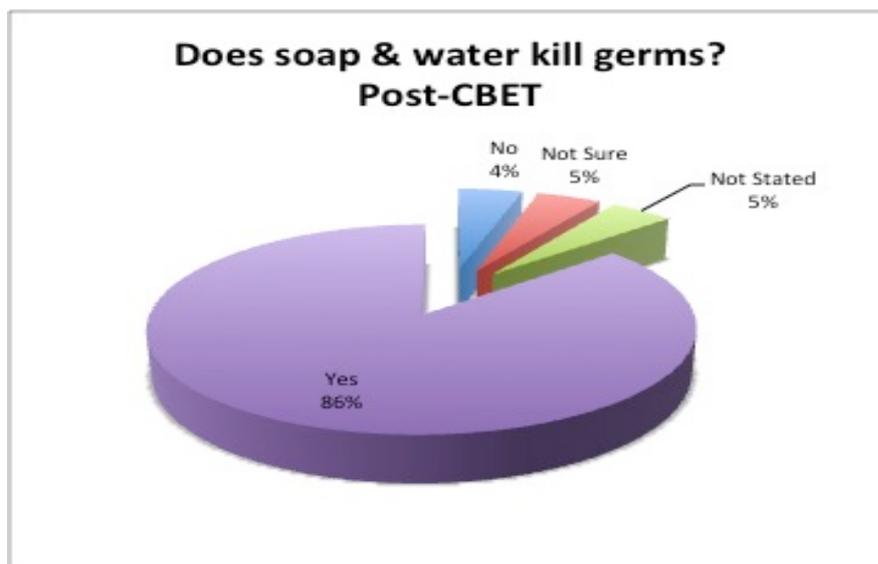


Figure 6-26 Chart indicating participants understanding of the effectiveness of soap and water in killing germs post-CBPET.

#### 6.4.2 Impact of the Educational Tool

Additional questions were asked the morning following the delivery of the CBPET regarding participants' increased perception of hygiene and the impact of the cartoon-based education tool. Behavioural change was always an associated benefit of this educational tool, however the main focus on this research was on information delivery. Participants were asked if the delivery of the CBPET had altered their behaviour when it came to washing hands with soap and water in their own homes. Twenty people (91%) stated that 'yes' it had, with one participant not stating either way.

Hand washing with soap was just one stream of information that was embedded in the educational tool. Other key messages were the introduction of where germs came from and lived, how they travelled from host to recipient, how they gained access to the body and caused infection, and when to wash your hands. Participants were asked if they gained increased knowledge from the tool, and if so to explain in their own words what they had gained. Twenty (91%) of the group answered that they had gained more knowledge from the tool. Further analysis of their explanation revealed three separate thematic streams of new knowledge gained from the cartoon based format of the tool.

### 6.4.3 Literacy

Participants explained that they learned more from pictures than they did from words alone. This finding seems to support the earlier and more extensive research undertaken primarily in the use of pictures to assist understanding of medication and medical treatment (Griffin, 2005; Herndon, Chaney, & Carden, 2011; Houts et al., 1998; Houts et al., 2006; Houts et al., 2001; Kripalani et al., 2007; McDermott, 1989; Piaw, 2012; Weiss & Coyne, 1997).

Some participants were very vocal following completion the delivery of the tool, explaining to me via the interpreter that this had been the first time in their lives that they could understand health related information.

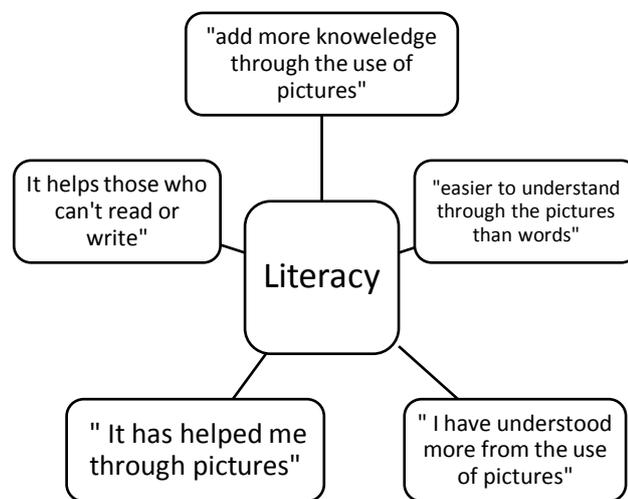


Figure 6-27 CBPET improved literacy and comprehension

### 6.4.4 Hygiene

Another element that was communicated and well received was increased hygiene awareness particularly that washing hands with soap killed germs. The use of soap and increased promotion of hand washing has been found to significantly reduce mortality and morbidity in developing countries (Cairncross, 2003; Cairncross et al., 2010; Curtis & Cairncross, 2003a, 2003b; Curtis et al., 2009; Dutton, 2011; Grayson et al., 2009; Luby et al., 2011; Savolainen-Kopra et al., 2012).

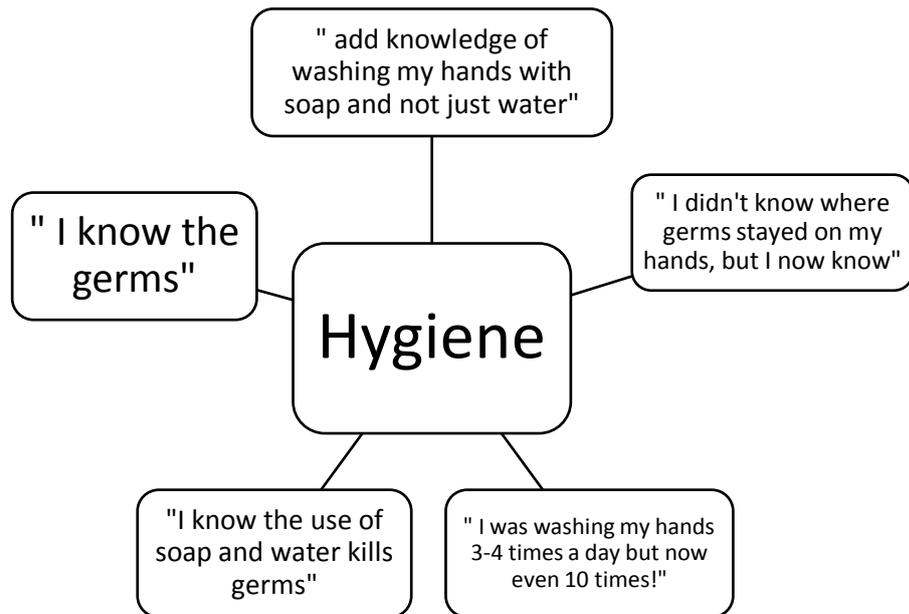


Figure 6-28 CBPET improved knowledge of hygiene practices

#### 6.4.5 Transmission of germs

Possibly the most complex message to communicate via my cartoon educational tool was the transmission route of pathogens from host to recipient. The comments that some participants made indicate that this message was successfully communicated, with several people linking blood-borne contamination with hygiene and washing hands with soap. If this tool can be successful in communicating the route of blood-borne disease in this small study, it may be employed in the fight against HIV and other sexually transmitted diseases across the rest of sub-Saharan Africa. Many studies (Barongo, Borgdorff, Mosha, Nicoll, Grosskurth, Senkoro, Newell, Chantalucha, Klokke, Killewo, et al., 1992; Bynum et al., 2013; Ciampa et al., 2012; Hunter, 2011; Wilson, 2003; Nokes et al., 2007; Valenti, 2007; Kka Van Rompay et al., 2008) have shown the correlation between low textual literate groups and the spread of HIV and other STDs in developing communities. This tool may assist with basic perception of pathogen transmission.

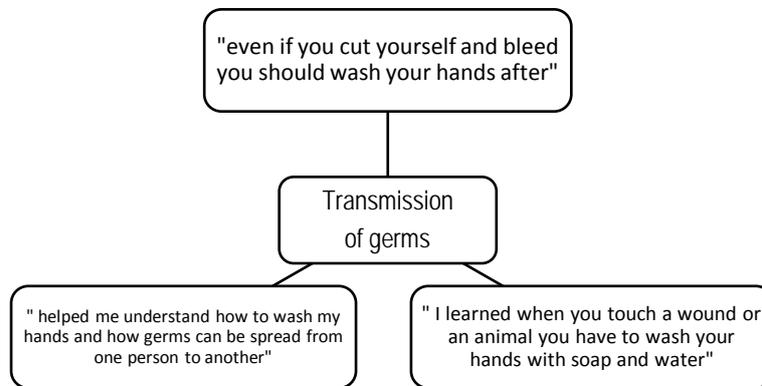


Figure 6-29 CBPET improved awareness of increased transmission of germs

#### 6.4.6 Participants' comments on the tool

The final question on the post-intervention questionnaire asked if any participant had a comment to make regarding the visual tool, and if so to explain in his or her own words. Three themes could be identified from the comments made by 12 participants. Five (42%) requested that the short facilitator notes on the rear of the tool be translated into Swahili so that the more literate members of the community could deliver the tool themselves. Four (33%) wanted the tool distributed across a wider group so that more people could take advantage of the message it communicated and 3 (25%) wanted to see more pictures in the tool.

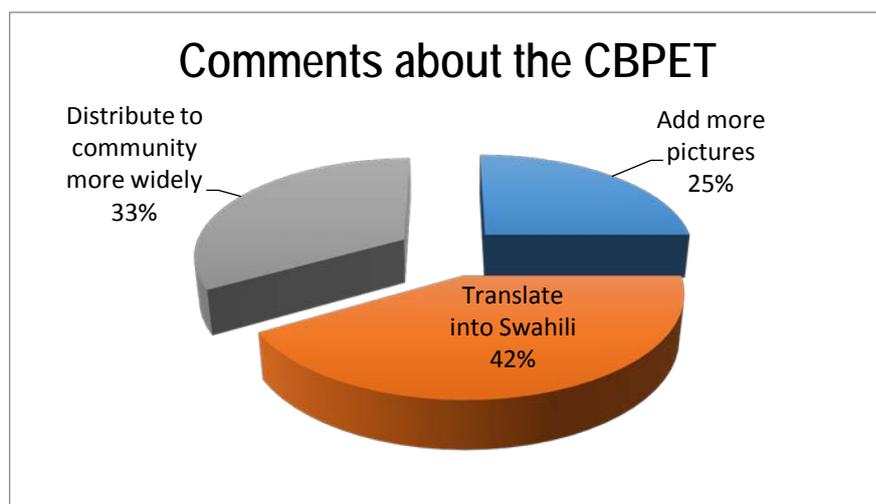


Figure 6-30 Chart indicating participants comments on the CBPET

## **6.5 Summary**

To summarise this chapter it seems that developing communities with little access to literacy aid continue to fall through the public educational gaps. I feel that the results of this study indicate that a suitably designed visual tool will provide the motivation and improved knowledge to improve their hand washing with soap and water.

# CHAPTER 7

## Discussion, Recommendations, Significance and Conclusion

### 7.1 Introduction

This chapter presents an overview of my research on the development, implementation and evaluation of a cartoon-based pictorial educational tool for low-literacy, resource-poor communities, starting from the original concept of replacing words with pictures to the design and eventual data collection of my study group in the Republic of Tanzania. Towards the end of this chapter, I make some recommendations for the future communication of healthcare messages to the community at large, especially illiterate communities, based on my research findings. Whilst conducting the literature research on this subject, I have come to realise that although the issue of poor literacy has been well surveyed and documented in both developing and developed countries, much more effort is required to counter the reported high degree of illiteracy in the area of healthcare among communities in the developing world.

With the current global threat of the Ebola virus dormant, the mosquito born Zika virus is now making headlines as the new possible global threat to public health. These virus pandemics and epidemics have different root causes but contamination factors and their effect on public health systems in all communities remains critical. The one difference between developed and developing countries when it comes to public health is the effectiveness of global awareness campaigns. This is the mode of communication flow to the general population in order to reduce the spread of infectious pathogens within the community. For mass dissemination with financial consideration and logistical requirements for vast deployment, the default method for dispersing public health information is usually printed matter in the form of posters, brochures and newsletters.

As my literature review has highlighted, many of the vulnerable communities that would benefit from public health education have poor literacy rates, making the vast majority of printed matter illegible to a large population of vulnerable people. The subject of health literacy also may need revisiting in the wake of the growing evidence supporting the issue of declining health literacy in higher social-economic

communities. The solution seems simple: return to our earliest form of communication and revisit the delivery of health care information to include more visual media to communicate the message.

## **7.2 Brief Overview of Research Design**

This was a study designed to measure the impact of a new picture-based education tool in improving the frequency of hand washing with soap and water, knowledge of pathogen transfer and causation of faecal-oral illness within a resource poor, low textual literate group. One group pre-test and post-test design was employed to measure the effectiveness of the picture-based tool. It was not feasible to use a control group in this instance due to the small size of the study group and the time constraints of the field trip.

The pre-test questionnaire requested personal details of the participant in order to establish demographic data from the study group; a mixture of multiple choice, closed and open-ended questions provided qualitative and quantitative data for later analysis. The only feature introduced to the study group following the pre-test and prior to the post-test questionnaire was the delivery of the picture based education tool in the controlled environment of the study location.

The post-test questionnaire repeated many questions from the previous test. This can be seen as a possible bias in the design as participants would have knowledge of these questions from the previous test and could have anticipated the answer. The reason for repeating the same questions that appeared in the previous test was to obtain a direct correlation in the participants' uptake of knowledge in the subject following the introduction of the visual tool.

This hypothesis that the tool developed and increased basic health knowledge were co-related, proved correct and qualitative elements of the data collection indicated that the study group showed a better understanding of the 'chain of infection' following the introduction of the picture based education tool. Whilst it was never the intention of the education tool to introduce scientific pathogenic information to participants of the study group, their post-test knowledge of specific 'germs' appears to have increased also.

The village of Mlegele was chosen as the location of the study due to its links with the Global Health Alliance Western Australia Ambulance project based in

Masanganya that I was assisting with during my visit to Tanzania. The Mlegele community met all the criteria of my study proposal and the community was receptive to possible education interventions. Although the numeric size of the study group was relatively small in comparison to more comprehensive literacy projects, the group represented the cultural, age and gender dynamics of the Kisaware region.

The participants completed the questionnaires individually. Due to poor literacy each question was read out by the translator and explained if any member of the group requested any clarification. The only intervention introduced to the group was the picture-based educational tool delivered in English and interpreted by a translator into local dialect. Verbal content of the tool was taken directly from the facilitation notes built into the tool; there was no deviation from the wording of this tool.

The pre-test questionnaire was delivered on day one prior to the delivery of the intervention, whereas the post-test questionnaire was delivered on the morning of day two. Written data was recorded in local Swahili by participants and translated following completion of both phases.

A Microsoft Excel database was constructed and data from both questionnaires entered. Separate spreadsheet pages were constructed to accommodate both pre-test and post-test data, together with the underlying data required to construct the tables and graphic charts used to produce the statistics published in this work. Descriptive statistical analysis was conducted using the data correlated in the spreadsheets. A number of pre-test and post-test comparison bar charts were produced to give a visual indication of knowledge improvement of participants following the introduction of the visual tool. This method was achievable due to the relatively small size of the study group; a larger cohort would have required a statistical software solution such as IBM SPSS or similar. Once data extracted from the questionnaires was entered into an Excel spreadsheet the calculations and percentile representations produced were used to support the findings and are used frequently in this thesis to represent results of this intervention.

### **7.3 Discussion: Response to the Research Objectives and Questions**

#### **Document existing personal hygiene knowledge, practices & motivators.**

The basic intention of the pre-test questionnaire that the participants of the study group completed was to assess their current knowledge of basic hygiene (such as their perception of where pathogens lived, method of transfer and portal of entry of germs into the human body). The questions in the pre-test questionnaire were designed to capture current hand washing practice as well as individual perceptions of the chain of infection and basic hygiene. The pre-test questionnaire used a combination of multiple choice questions and open ended questions to capture quantitative and qualitative data prior to any intervention; it asked the participants when, where and how many times they washed their hands. Perhaps the most crucial point to capture was the concept of soap and water killing germs; the greater majority of the cohort answered that they did not think that washing their hands with soap and water had any effect on germs.

#### **Determine community perceptions of the cause and transmission of disease and capture existing awareness of common pathogens.**

It was evident from the qualitative data received from the study group participants in the pre-test questionnaire that those participants who indicated they had any awareness of pathogen types or method of transmission made the association with flies, mosquitoes or rodents and not with the pathogens contained in dirty water, blood, faeces, phlegm or dirt.

In the post-test questionnaire following the intervention there seemed a far greater variety of answers associated with what a 'germ' was, indicating that the picture based tool had succeeded in delivering additional information. Additional qualitative data concerning what a 'germ' was included:

- fly bacteria
- fly (spread by food)
- diseases through flies and mosquitoes
- worms (the group identified the "Phlegm bug" as a worm).

There was a well-educated understanding of some host locations for 'germs' prior to the intervention including:

- 'In a toilet'

- 'In water'
- 'In poo'
- 'On food'.

However, post-test questionnaire data revealed the study group participants had a wider understanding of possible host locations including 'in soil' and 'in dirty waste'. A large portion (77%) of the cohort volunteered that they knew how 'germs' travelled between people following the intervention. This is deemed a vital stage of understanding for the cognitive ability of understanding how to break the chain of infection. Subsequent comments following the intervention included transmission through:

- sneezing
- coughing
- insect bites
- touching hands
- the air.

The correlation of germ transmission through the airborne and contact pathway is a profound step in the understanding of infection control. Once this route is established as a possible route of infection it then empowers the participant to break the chain of infection by washing hands using soap and water or using preventative techniques to avoid infection. In comparative studies measuring the spread of HIV and other sexually transmitted diseases across the Indian subcontinent a common factor was poor literacy (Valenti, 2007; Van Rompay et al., 2008). A recently published article validates the connection between the inability to comprehend health literature and the rate of HIV infection amongst adults in Mozambique (Tique et al., 2016). Communicating vital healthcare information using pictures would circumvent this literacy challenge, providing educational material to all levels of the community.

**The design and development of a cartoon-based picture education tool (CBPET) with facilitator notes in English to communicate key messages regarding common pathogens, where they are commonly found, their transmission routes, and the importance of hand washing with soap.**

The CBPET was developed and eventually printed prior to the field study stage. The choice to print facilitator notes in English was a design consideration from the start

of the project. In this instance, the facilitator of the study tool was a native English speaker but the overall rationale for printing supplementary information in English was to minimise print versions and maximise availability across most sub-Saharan Africa where English is commonly spoken. Following delivery of the tool the participants of the study group requested that it be translated into native Swahili to enable members of the community with some literacy skills to use the tool to educate more members of the community. The facilitation notes were purposely designed in plain language without medical terminology so that any member of the community with basic literacy skills could reinforce the pictorial content of the educational tool.

#### **Implementation of the CBPET to a representative sample group of the Masanganya community with low literacy skills.**

The visual tool was delivered to and evaluated by a volunteer group of participants from the Masanganya area over a 48-hour period during a weekend (Saturday and Sunday) in a central location, the Mlegele school building.

#### **Evaluate personal perception of hand washing (with soap) practice following implementation of the CBPET within the sample group.**

It has been well established above that the CBPET was successful in communicating key message statements to the participants of the study group regarding the type, location and method of transfer for pathogens identified in the visual tool. Through the use of the pre-test and post-test design of the study, it was established that the participants of the study group did not associate hand washing with soap and water as an action that would kill germs. Prior to the intervention of the visual tool, 59% of the study group participants indicated that washing their hands with soap and water would kill germs. Following the use of the educational tool the number of the group that indicated washing hands with soap and water killed germs increased to 86%. Qualitative data from the questionnaires indicated that the percentage of study group who intended to wash their hands 7 or more times a day following the introduction of the visual tool increased from 14% to 27%. The major challenge then became the availability and affordability of hand washing soap in the community as well as the availability of potable water.

#### **7.4 Outputs from the Study**

It was clear from both the quantitative and qualitative data gathered from this study that there was an increased level of knowledge regarding pathogen reservoir, mode

of transmission and portal of entry within the study group. There was also a reported increase in perception that washing hands with soap and water killed germs and prevented the spread of infection. Prior to the introduction of the visual tool, only 5% of the study group stated that they washed hands with soap and water to kill germs, the common motivation being to make them look clean but increased to 81% following the introduction of the tool. The intended behaviour change indicates that the visual tool had communicated the motivation for the act of washing with soap and water rather than just a dictated action.

Anecdotally following the conclusion of the data collection from the study group in Masanganya several of the participants approached me and, through the translator, requested that the tool be translated into Swahili so that it would allow other members of the community that do have some literate skills to teach a broader audience. This is community 'buy in' and may reflect the influence of using the simplicity of pictures to communicate vital healthcare messages to similar communities.

The impact on this small group has seemed disproportional to the complexity of the tool; as it is a simple comic strip. Comments captured in the post test questionnaire such as "It helps those who can't read or write", "It has helped me through pictures" and perhaps the powerful statement "I have understood more from the use of pictures" underlines the passion that these people feel about gaining knowledge in such a way. Another example of this can be found when the group requested that a copy be attached to the wall of the school room to allow the children to see the tool. Another of the design considerations for my tool was that it had the ability to fold out flat to form an educational poster for such a situation.

From the comments shared by participants, education via pictures alone communicated vital healthcare messages to this group.

- "Easier understanding of pictures than words!"
- "Add more knowledge through the use of pictures!"
- "I have understood more through the use of pictures."
- "Pictures has (have) helped me to understand how to wash hands and how germs can be spread from one person to another."
- "It has helped me mostly through pictures!"

- “Help to prevent me from getting diseases and also from my family!”
- “Learn that when you touch a wound or animals you need to wash hands with soap and water!”
- “I didn't know where germs stays on hands but now I know e.g. under fingers/nails!”
- “Easier to understand through pictures than writing!”
- “It helps those who can't read or write!”
- “I have obtained knowledge through the use of pictures!”

Community Based Education (CBE) in large countries is a challenge; although no reference could be found of recent studies carried out in Tanzania a recently published article conducted in Egypt (Langsten, 2016) found that the quality of education was an issue. This is a global issue and not confined to sub-Saharan countries; to date the most popular method of public health education continues to be via printed matter. A Saudi CBE trial published in the *Journal of Family and Community Medicine* (Ziad et al., 2015) in 2012 did find the education intake in the subjects promoted by the promotion to be 11 times higher following the intervention of a CBE, however literacy still remains a serious issue (Caremark, 2014; Herndon, Chaney, & Carden, 2011; Pignone & Dewalt, 2006; Prior, 2013; Smith, 2014; Valenti, 2007).

Basic hygiene is the cornerstone of public health yet 36% of my study group stated that they had never been taught how to wash their hands prior to my intervention. As discussed in this body of text, the combination of poor literacy skills, multiple dialect or language translation issues and ability to host information sessions within the community have impacted on community based health education within sub-Saharan Africa. If a novel method of CBE can be proven to be effective in communicating basic healthcare messages to a vast audience, then it would have the advantage over print systems. In this limited trial the use of pictures alone to pass on healthcare messages to a low literacy group has been proved effective.

## **7.5 Recommendations from the Study**

There are many examples of pictures and graphics being used to supplement text and content of public health promotions or instructions (Katz, Kripalani, & Weiss, 2006; Kripalani et al., 2007; Weiss & Coyne, 1997; Zeng-Treitler, Kim, & Hunter, 2008). The consequence of patients' inability to follow basic medication instructions

correctly has resulted in an approximate cost of US\$100 billion to US\$300 billion annually in the US alone (Kripalani et al., 2007). The use of pictures alone to communicate healthcare messages is relatively unique; there are few examples of this occurring in healthcare or public health although recent studies into this method of communication has shown it effective in certain socio-economic communities (Green, 2013; Kripalani et al., 2007).

Developers or organisations with the responsibility of delivering education or healthcare advice to vulnerable communities should understand that if they are to supplement or replace text with pictures, these illustrations must be descriptive enough to deliver the message; simple clip art taken 'off the shelf' may not suffice as the picture may reflect different things to different people. Maybe a cohesive approach can be made to agree on accepted picture-graphics within the healthcare industry, much like the recognition of industrial signage (Harrison, 2012; Maksel, 2014). A 2008 article reviewing patient comprehension of hospital discharge instructions highlights the lack of 'approved' picture art available to use in such publications (Zeng-Treitler et al., 2008). The Zeng-Treitler (2008) paper identified the lack of standard or validated pictograph language available to developers who wish to improve the comprehension of their instructional material.

Since the completion of this thesis there have been developments regarding a larger scale data collection and testing of my picture based education tool. I have been working with eminent Professor and Burns surgeon Dr Fiona Wood to modify the existing hygiene module as well as develop a new Burns First Aid module. Should funding become available it has been suggested that trials be conducted in several diverse communities within Western Australia. Planning for this is still in the preliminary stages however it has been proposed that the scope for selecting participants would include an increase in cohort size and diversity, to include gender equality and diversity of indigenous background. It has been proposed that any such pre test, post test design would also include a control group that may be given access to the more traditional literate versions of healthcare related material in order to ascertain the effectiveness of a purely picture based medium.

### **7.5.1 Recommendations for community organisations**

Vulnerable groups have been described as social groups who have an increased relative risk or susceptibility to adverse health outcomes (Liamputtong, 2011). Low-textual literate populations can be classified as a vulnerable group and therefore need to be considered when rolling out public health initiatives. Low literacy levels are not confined to developing countries or low socio-economic groups. This population of vulnerable people are evident in first world countries such as Australia, United Kingdom, Canada and the United States (Lassetter et al., 2015; Prior, 2013; Smith, 2014).

It may be the case that this population is not adequately currently considered when public health campaigns are developed or deployed.

- Community organisations may not have the funding available to design publications on a large scale. Many early examples used to communicate healthcare instructions to low textual literate communities were sketched by lay people within the organisation (Kripalani et al., 2007; Weiss & Coyne, 1997).
- Community organisations may wish to review their audience scope prior to the design of any publication to ensure that the disability among the participant cohort is catered for in the design.

### **7.5.2 Recommendations for community health workers**

From experience, healthcare workers who operate within the community often face many barriers communicating with patients and issuing instructions for treatment. The issue of multiple languages, poor literacy and cultural stigmatism associated with the provision of healthcare are present in many domestic environments and this phenomenon is not exclusive to developing nations. Previous attempts have been made to translate post-care instructions into a picture-graphic content (Green & Myers, 2010; Katz et al., 2006; Kennedy, Rogers, Blickem, Daker-White, & Bowen, 2014) however these have been for a limited target group and mostly used pictures and graphics to supplement the text rather than replacing the text.

- All new post-care or instructional literature to be designed with cartoon-based content. Design considerations to absorb end-user feedback during design and implementation to ensure target group acceptance.
- Adapt existing post-care instructions into a picture-only format to ensure that any individual with poor literacy or health literacy skills can fully understand and follow instructions.

- If this is not achievable in the short term consider supplementing existing post-care instructions with well-designed picture-graphics to enable less textual literate groups to understand content. This type of hybrid design has proved successful for supplementing pharmaceutical dosage instructions (Houts, Doak, Doak, & Loscalzo, 2006; Kripalani et al., 2007). This can be as basic as including the use of simple icons to determine the time of day or frequency to take the medication rather than using medical terminology.

### **7.5.3 Recommendations for the design of future health care education publications**

A new approach of pictures replacing words must be adopted to enable a higher percentage of the population to understand messages communicated by content creators or health educators or health communicators or message designers and policy makers. The application of cartoon or picture based elements in an instructional publication makes numerous language version varieties obsolete, making the initiative a truly multilingual design. This aspect alone has considerable financial considerations, not to mention logistical advantages.

Maybe the best example of how effective this change in thought process has been applied on a large scale to alter design policy is the airline in flight safety card (Maksel, 2014). Although this example has dominated in a non-medical field, the lessons are clear and can be transferred to the medical environment. Instructions with photos alone were less easy to understand than those with picture graphics used to convey actions.

- All new healthcare instruction to be developed in a cartoon-based format to enable universal comprehension.
- Industry led consensus to design, develop and promote universally agreed icons to represent common health and medical topics and instructions and actions.
- Further research to be funded by cross-disciplinary collaboration between allied health workers to expand understanding on detrimental effect of health literacy on general population.
- International non for profit groups to develop educational forum to assist in design and development of healthcare related material in a cartoon-based format with few or no words.

#### **7.5.4 Recommendations for future research**

From a comprehensive literature review it is evident that little is understood of the effects of health literacy levels in modern society, and even less on the related subject of health literacy. There is limited research conducted on negative outcomes associated with patients' not following medical instruction due to non-comprehension. There has been little or no research conducted on a large scale assessing health literacy in developed communities. Key stakeholders in healthcare such as Professor Fiona Woods have realised that the low levels of literacy within our own state of Western Australia have contributed to the low levels of compliancy in hygiene and first aid related subjects (Duke et al., 2011). Research into a cartoon-based healthcare promotion would assist possible State health policy construction in the future, allowing communication of public health issues to a greater percentage of the community.

- Conduct research on negative outcomes associated with non-compliance of medical instruction due to poor comprehension.
- Develop a tool to evaluate health literacy in resource poor settings.
- Evaluate level of health literacy in Australia.
- Conduct literacy census within Australia.
- Assess impact of picture based healthcare instruction material to Aboriginal communities in Western Australia.
- Develop a validated, industry acceptable bank of picture graphics for use by individuals and organisations intent on improving the comprehension of their healthcare information.

This may have been the first time the group had received such information: and so the newly-aware participants may have been reflecting knowledge of a new message, not necessarily comprehension of a message because of a tool. The result may also have simply because of the short time lapse between message delivery and recall testing. "this is a cautious finding which needs to be tested further in a more controlled research design that was not possible on this occasion".

#### **7.6 Significance of the Study**

Poor adult literacy levels are a significant co-morbidity indicator (Bynum et al., 2013; Caremark, 2014; Carmona, 2005; Doak, Doak, Friedell, & Meade, 1998; Wilson, 2003; Lassetter et al., 2015; Nokes et al., 2007; Pignone & Dewalt, 2006; Prior, 2013; Valenti, 2007; "Where there is illiteracy, there is poverty", 2015; Wolf, Feinglass, Thompson, & Baker, 2010) yet there seems to be little emphasis in

working towards a solution. It may prove financially and logistically implausible to teach the global community of adults to read and write, so why not alter the way we communicate our healthcare messages?

Developing healthcare education into a format that can be understood by all must be the way forward, turning full circle and adopting a universal language based in pictures or cartoons. If key stakeholders can agree on a universal message system we can begin to educate the vast majority of the adult population that has not been able to take advantage of global healthcare messages. If we can educate more of the population in basic hygiene standards, and promote the washing of hands in soap and water, how many lives would be saved from faecal-oral transmission disease?

## **7.7 Concluding Comment**

Poor adult literacy is not a characteristic of developing communities, it is a real threat here in Australia (Prior, 2013). This present study seeks to determine if a new angle on presenting vital healthcare information can bridge the literacy gap on a global scale, similar to the methods employed by international airlines to communicate vital safety information. Disease and the spread of infection can be limited and controlled by employing basic hygiene standards such as hand washing with soap and water at point zero (Cairncross, 2003; Curtis & Cairncross, 2003; Dutton, 2011; Fan & Mahal, 2011; Luby, Halder, Huda, Unicomb, & Johnston, 2011; Savolainen-Kopra et al., 2012). The visual educational tool developed and evaluated for this present research successfully educated a low- textual literate cohort from a resource-poor community to understand the basic chain of infection and the importance of washing hands with soap and water, and to show intention to modify their behaviour. Further, the tool evaluated in this study showed potential for being a resource that community members could use to pass on accurate and consistent health messages without the need of health workers.

## References

- Adams Safety and Training. (2013). First aid training: ABCD and 4Bs concepts. Retrieved from <http://safetytraining01.blogspot.com.au/2013/04/first-aid-training-abcd-and-4bs-concepts.html>
- AfDb, A. (2014). Millennium Development Goals (MDGs) Report 2014 (Vol. 14-01): African Development Bank.
- Agosto, D. E. (1999). One and inseparable: Interdependent storytelling in picture storybooks. *Children's Literature in Education*, 30(4), 267-280.
- ARC advanced life support level 1: immediate life support / Australian Resuscitation Council. (2011). East Melbourne, Victoria: East Melbourne, Victoria: Australian Resuscitation Council.
- Arichi, M. (2007). IKUMI KAMINISHI: Explaining Pictures: Buddhist Propaganda and Etoki Storytelling in Japan. 246 pp. Honolulu: University of Hawai'i Press, 2006. \$49. *Bulletin of the School of Oriental and African Studies*, 70(01), 199-201. doi: doi:10.1017/S0041977X0700033X
- Ayiga, N., & Rampagane, V. (2013). Determinants of age at first marriage in sub-Saharan Africa: A comparative study of Uganda and South Africa. *Journal of Social Development in Africa*, 28(1), 9-34.
- Bank, A. D. (2014). Millennium Development Goals (MDGs) Report 2014 (Vol. 14-01): African Development Bank.
- Barongo, L., Borgdorff, M., Mosha, F., Nicoll, A., Grosskurth, H., Senkoro, K., . . . Rugemalila, J. (1992). The epidemiology of HIV-1 infection in urban areas, roadside settlements and rural villages in Mwanza region, Tanzania. *Aids*, 6(12), 1521-1528.
- Bullen, M. (2013). Rock art and narrative. *Rock Art Research*, 30(1), 91-96. Retrieved from <https://search.informit.com.au/fullText;dn=488093238123425;res=IELAPA>
- Bust, P., Gibb, A., & Pink, S. (2008). Managing construction health and safety: Migrant workers and communicating safety messages. *Safety Science*, 46, 585-602.
- Bynum, S., Wigfall, L., Brandt, H., Richter, D., Glover, S., & Hébert, J. (2013). Assessing the influence of health literacy on HIV-positive women's cervical cancer prevention knowledge and behaviors. *Journal of Cancer Education*, 28(2), 352-356. doi: 10.1007/s13187-013-0470-4.

- Cairncross, S. (2003). Editorial: Handwashing with soap – a new way to prevent ARIs? *Tropical Medicine & International Health*, 8(8), 677-679. doi: 10.1046/j.1365-3156.2003.01096.x.
- Cairncross, S., Hunt, C., Boisson, S., Bostoen, K., Curtis, V., Fung, I. C. H., & Schmidt, W.-P. (2010). Water, sanitation and hygiene for the prevention of diarrhoea. *International Journal of Epidemiology*, 39(suppl1), i193-i205. doi: 10.1093/ije/dyq035.
- Campbell, J. D. (2005). Health literacy: a prescription to end confusion. *Choice*, 42(7), 1260. Retrieved from <http://search.proquest.com/docview/225797341?accountid=14681>
- Caremark, C. (2014, February 14th 2014). Low Health literacy Compromises Health, Increases Costs. Washington Post.
- Chinn, D. (2011). Critical health literacy: A review and critical analysis. *Social Science & Medicine*, 73(1), 60-67.
- Choi, J. (2011). Pictograph-Based Discharge Instructions for Low-Literate Older Adults after Hip Replacement Surgery: Development and Validation. *Journal of Gerontological Nursing*, 37(11), 47-56.
- Ciampa, P. J., Vaz, L. M. E., Blevins, M., Vermund, S. H., Vergara, A. E., Sidat, M., & Rothman, R. L. (2012). The association among literacy, numeracy, HIV knowledge and health-seeking behavior: A population-based survey of women in rural Mozambique. *PLoS ONE*, 7(6). doi: 10.1371/journal.pone.0039391
- Classroom Productions (2010). *Transmission of infection* [Streaming Video]. Retrieved from <http://www.emdistributors.com/Series/139%20Aseptic%20Bedside%2016/139%20Aseptic%20Bedside-16.html>
- Cooke, M., Mitrou, F., Lawrence, D., Guimond, E., & Beavon, D. (2007). Indigenous well-being in four countries: An application of the UNDP'S Human Development Index to Indigenous Peoples in Australia, Canada, New Zealand and the United States. *BMC International Health and Human Rights*, 7(1), 9. doi: 10.1186/1472-698X-7-9
- Cordasco, K. M., Asch, S. M., Bell, D. S., Guterman, J. J., Gross-Schulman, S., Ramer, L., Mangione, C. M. (2009). A Low- literacy Medication Education Tool for Safety-Net Hospital Patients. *American Journal of Preventive Medicine*, 37(6, Supplement 1), S209-S216.
- Cowling B. J., Chan K. H., Fang V. J., Cheng C. K., Fung R. O., Wai W., ... Leung G. M. (2009). Facemasks and hand hygiene to prevent influenza transmission

- in households: A cluster randomized trial. *Annals of Internal Medicine*, 151(7), 437-446. doi: 10.7326/0003-4819-151-7-200910060-00142
- Cox, B. (1991). A picture is worth a thousand worksheets (Open to suggestion). *Journal of Reading*, 35(3), 244-245. Retrieved from <http://eric.ed.gov/?id=EJ434211>
- Cummins, R. O., Chamberlain, D., Hazinski, M. F., Nadkarni, V., Kloeck, W., Kramer, E., Cobbe, S. (1997). Recommended guidelines for reviewing, reporting, and conducting research on in-hospital resuscitation: the in-hospital 'Utstein style': A statement for healthcare professionals from the American Heart Association, the European Resuscitation Council, the Heart and Stroke Foundation of Canada, the Australian Resuscitation Council, and the Resuscitation Councils of Southern Africa. *Resuscitation*, 34(2), 151-183. doi: 10.1016/S0300-9572(97)01112-X
- Curtis, V. (2001). Hygiene: How myths, monsters, and mothers-in-law can promote behaviour change. *Journal of Infection*, 43(1), 75-79.
- Curtis, V., & Cairncross, S. (2003a). Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. *The Lancet Infectious Diseases*, 3(5), 275-281.
- Curtis, V., & Cairncross, S. (2003b). Water, sanitation, and hygiene at Kyoto. *British Medical Journal*, 327(7405), 3-4.
- Curtis, V. A., Danquah, L. O., & Aunger, R. V. (2009). Planned, motivated and habitual hygiene behaviour: an eleven country review. *Health Education Research*, 24(4), 655-673. doi: 10.1093/her/cyp002
- Cutilli, C. C., & Bennett, I. M. (2009). Understanding the health literacy of America: Results of the National Assessment of Adult Literacy. *Orthopaedic Nursing*, 28(1), 27-34. doi: 10.1097/01.NOR.0000345852.22122.d6s
- Dagne, T. (2010). Tanzania: Background and Current Conditions. In S. Library of Congress Washington DC Congressional Research (Ed.).
- Davies, M., Maguire, S., Okolie, C., Watkins, W., & Kemp, A. M. (2013). How much do parents know about first aid for burns? *Burns*, 39(6), 1083-1090. doi: 10.1016/j.burns.2012.12.015
- Dean, E. (2010). Pupils learn essential skills. *Nursing Standard*, 24(35), 9-9. Retrieved from <http://journals.rcni.com/doi/abs/10.7748/ns.24.35.9.s14>
- Dehaene, S. (2010). Reading in the brain: the new science of how we read / Stanislas Dehaene. New York: New York: Penguin Books.

- Delp, C., & Jones, J. (1996). Communicating information to patients: The use of cartoon illustrations to improve comprehension. *Academic Emergency Medicine*, 3(3), 264.
- Dike, N., Onwujekwe, O., Ojukwu, J., Ikeme, A., Uzochukwu, B., & Shu, E. (2006). Influence of education and knowledge on perceptions and practices to control malaria in Southeast Nigeria. *Social Science & Medicine*, 63(1), 103-106. doi: 10.1016/j.socscimed.2005.11.061
- Dill, B., & Crow, B. (2014). The colonial roots of inequality: Access to water in urban East Africa. *Water International*, 39(2), 187-200. doi: 10.1080/02508060.2014.894212
- Dirr, K. L., & Katz, A. A. (1989). Cartoons vs. realistic illustration: Picture preferences of adolescent patients. *The Journal of Biocommunication* 16(4), 2-7. Retrieved from <http://europepmc.org/abstract/med/2600074>
- Doak, C. C., Doak, L. G., Friedell, G. H., & Meade, C. D. (1998). Improving comprehension for cancer patients with low literacy skills: Strategies for clinicians. *CA: A Cancer Journal for Clinicians*, 48(3), 151. doi: 10.3322/canjclin.48.3.151
- Dowse, R., Lecoko, L., & Ehlers, M. (2010). Applicability of the REALM health literacy test to an English second-language South African population. *International Journal of Clinical Pharmacy and Pharmaceutical Care*, 32(4), 464-471. doi: 10.1007/s11096-010-9392-y
- Dreger, V., & Trembeck, T. (2002). Optimize patient health by treating literacy and language barriers. *AORN Journal*, 75(2), 278-293. doi: [http://dx.doi.org/10.1016/S0001-2092\(06\)61407-5](http://dx.doi.org/10.1016/S0001-2092(06)61407-5)
- Duke, J., Wood, F., Semmens, J., Spilsbury, K., Edgar, D., Hendrie, D., & Rea, S. (2011). A 26-year population-based study of burn injury hospital admissions in Western Australia. *Journal of Burn Care & Research*, 32(3), 379-386. doi: 10.1097/BCR.0b013e318219d16cs
- Dutton, P. (2011). Handwashing with Soap-Two Paths to National-Scale Programs.
- Ellis, J., Ootoova, A., Blouin, R., Rowley, B., Taylor, M., DeCourtney, C., Gaboury, I. (2011). Establishing the psychometric properties and preferences for the Northern Pain Scale. *International Journal of Circumpolar Health*, 70(3), 274-285. Retrieved from <http://search.proquest.com/docview/877024913?pq-origsite=gscholar>
- Ester, P., Torres, A., Freire, J., Hernandez, V., & Gil, A. (2011). Factors associated to infant mortality in Sub Saharan Africa. *Journal of Public Health in Africa*, 2(2), e27. doi: <http://dx.doi.org/10.4081/jphia.2011.e27>

- Eulie, J. (1969). Creating interest and developing understanding in the social studies through cartoons. *Peabody Journal of Education*, 46(5), 288-290. doi: 10.1080/01619566909537642
- Evangelista, L. S., Rasmusson, K. D., Laramée, A. S., Barr, J., Ammon, S. E., Dunbar, S., ... Yancy, C. W. (2010). Health literacy and the patient with heart failure-implications for patient care and research: A consensus statement of the heart failure society of America. *Journal of Cardiac Failure*, 16(1), 9-16. doi: 10.1016/j.cardfail.2009.10.026
- Ezer, T., Kerr, K., Major, K., Polavarapu, A., & Tolentino, T. (2006). Child marriage and guardianship in Tanzania: Robbing girls of their childhood and infantilising women. *Georgetown Journal of Gender and the Law*, 7, 357-1185.
- Fan, V. Y.-M., & Mahal, A. (2011). What prevents child diarrhoea? The impacts of water supply, toilets, and hand-washing in rural India. *Journal of Development Effectiveness*, 3(3), 340-370. doi: 10.1080/19439342.2011.596941
- Freebody, P. (2007). *Literacy education in school: Research perspectives from the past, for the future*. Australian Council for Education Research (ACER) Press. Retrieved from <http://research.acer.edu.au/cgi/viewcontent.cgi?article=1001&context=aer>
- Gamelli, L., Mykychack, I., Kushnir, A., Driscoll, D. N., & Fuzaylov, G. (2015). Targeting burn prevention in Ukraine: evaluation of base knowledge in burn prevention and first aid treatment. *Journal of burn care & research: official publication of the American Burn Association*, 36(1), 225. doi: 10.1097/BCR.0000000000000103
- Gatto, J. T. (2000). *The underground history of American Education*. The Oxford Village Press.
- Geneva, A. (1995, 1995 May 07). Scripts illuminated; BOOKS. *The Independent*, p. 37.
- Gessler, M. C., Msuya, D. E., Nkunya, M. H. H., Schär, A., Heinrich, M., & Tanner, M. (1995). Traditional healers in Tanzania: sociocultural profile and three short portraits. *Journal of Ethnopharmacology*, 48(3), 145-160. doi: 10.1016/0378-8741(95)01295-O
- Gideon, K., Mughwira, A. M., Deodatus, C. K., Ina, W., Charles, A. M., Japhet, K., Phyllis, F. (2012). Tanzania health system and workforce crisis. *Journal of Public Health Policy*, 33(S1), S35. doi: 10.1057/jphp.2012.55
- Gordetsky, J., & O'Brien, J. (2009). Urology and the scientific method in Ancient Egypt. *Urology*, 73(3), 476-479. doi: <http://dx.doi.org/10.1016/j.urology.2008.09.045s>

- Gorman, M. (2008). Getting graphic: TOON Books.(interview with Francoise Mouly)(Interview). *Library Media Connection*, 27(1), 38. Retrieved from <http://search.ebscohost.com/login.aspx?direct=true&db=iih&AN=34384610&site=e=ehost-lives>
- Goscinnny. (1961). Asterix le Gaulois / texte de Goscinnny ; dessins de Uderzo. Neuilly-sur-Seine, [France]: Neuilly-sur-Seine, [France] : Dargaud Editeur.
- Graham, H. E., Bache, S. E., Muthayya, P., Baker, J., & Ralston, D. R. (2012). Are parents in the UK equipped to provide adequate burns first aid? *Burns*, 38(3), 438-443. doi: 10.1016/j.burns.2011.08.016
- Grantham, H. J. M., & Narendranathan, R. (2012). Basic and advanced cardiac life support--what's new? *Australian family physician*, 41(6), 386.
- Grayson, M. L., Melvani, S., Druce, J., Barr, I. G., Ballard, S. A., Johnson, P. D. R., . Birch, C. (2009). Efficacy of soap and water and alcohol- based hand- rub preparations against live H1N1 influenza virus on the hands of human volunteers. *Clinical Infectious Diseases*, 48(3), 285-291. doi: 10.1086/595845
- Green, M. (2013). Teaching with comics: A course for Fourth-Year Medical Students. *Journal of Medical Humanities*, 34(4), 471-476. doi: 10.1007/s10912-013-9245-5
- Green, M., & Myers, K. (2010). Graphic medicine: use of comics in medical education and patient care. *British Medical Journal*, 340(7746), 574.
- Greenhoot, A. F., & Semb, P. A. (2008). Do illustrations enhance preschoolers' memories for stories? Age-related change in the picture facilitation effect. *Journal of Experimental Child Psychology*, 99(4), 271-287.
- Griffin, D. B. (2005). Health literacy and the comprehension of printed patient education materials for African Americans with diabetes. (3182071 Ph.D.), The University of Alabama at Birmingham, Ann Arbor. ProQuest Dissertations & Theses Full Text; ProQuest Public Health database.
- Grimes, J. E., Croll, D., Harrison, W. E., Utzinger, J., Freeman, M. C., & Templeton, M. R. (2015). The role of water, sanitation, and hygiene in reducing schistosomiasis: A review. *Parasites & Vectors*, 8(1), 156.
- Gurak, L. J. (2003). Toward consistency in visual information: standardized icons based on task. (Review of Research). *Technical Communication*, 50(4), 492.
- Haigh, C., & Hardy, P. (2011). Tell me a story — a conceptual exploration of storytelling in healthcare education. *Nurse Education Today*, 31(4), 408-411.
- Hansen, B. (2004). Medical History for the Masses: How American Comic Books Celebrated Heroes of Medicine in the 1940s. *Bulletin of the History of Medicine*, 78(1), 148-191.

- Herndon, J. B., Chaney, M., & Carden, D. (2011). Health literacy and Emergency Department Outcomes: A Systematic Review. *Annals of Emergency Medicine*, 57(4), 334-345.
- Hiatt, B. (2013). *Adult literacy, maths shock*. The West Australian.
- Houts, P., Doak, C., Doak, L., & Loscalzo, M. (2006). The role of pictures in improving health communication: A review of research on attention, comprehension, recall, and adherence. *Patient Education and Counseling*, 61, 173-190.
- Houts, P. S., Bachrach, R., Witmer, J. T., Tringali, C. A., Bucher, J. A., & Localio, R. A. (1998). Using pictographs to enhance recall of spoken medical instructions. *Patient Education and Counseling*, 35(2), 83-88.
- Houts, P. S., Witmer, J. T., Egeth, H. E., Loscalzo, M. J., & Zabora, J. R. (2001). Using pictographs to enhance recall of spoken medical instructions II. *Patient Education and Counseling*, 43(3), 231-242.
- Howarth, T. (2012). 4 B's of First Aid: - How to prioritize care. Retrieved from <https://blog.seatoskyservices.com/2012/02/16/4-bs-of-first-aid-how-to-prioritize-care/>
- Hunter, S. L. (2011). Perceptions of a HIV testing message targeted for at-risk adults with low functional health literacy. (3501107 Ph.D.), Georgia State University, Ann Arbor. ProQuest Dissertations & Theses Full Text database.
- Hurlburt, G. F., & Voas, J. (2011). Storytelling: From Cave Art to Digital Media. *IT Professional*, 13(5), 4-7. doi: 10.1109/MITP.2011.87
- International, S. (2015). International literacy Day September 7, 2001, Washington, DC. Retrieved from <http://www-01.sil.org/literacy/LitFacts.htm>
- Janson, A. (2007). Shed some light on darkness: will Tanzania reach the millennium development goals? *Acta Pædiatrica*, 96(6), 781-786. doi: 10.1111/j.1651-2227.2007.00293.x
- Kapiga, S., Ewings, F., Ao, T., Chilongani, J., Mongi, A., Baisley, K., ... Hayes, R. (2013). The epidemiology of HIV and HSV-2 infections among women participating in microbicide and vaccine feasibility studies in Northern Tanzania. *PLoS ONE*, 8(7). doi: 10.1371/journal.pone.0068825
- Karaoz, B. (2010). First- aid Home Treatment of Burns among Children and Some Implications at Milas, Turkey. *Journal of Emergency Nursing*, 36(2), 111-114. doi: 10.1016/j.jen.2009.12.018
- Katz, M. G., Kripalani, S., & Weiss, B. D. (2006). Use of pictorial aids in medication instructions: a review of the literature. *American journal of health-system*

- pharmacy: *AJHP: official journal of the American Society of Health-System Pharmacists*, 63(23), 2391.
- Ken Fenn, R. (2011). Shorthand and secret conferences. *The Plymouth Evening Herald*. p. 11
- Kenna, M. E. (1985). Icons in theory and practice: An Orthodox Christian example. *History of Religions*, 24(4), 345-368. doi: 10.1086/463013
- Khalid Hamidon, M. T. S., Halim Lilia. (2010). Teachers Perception towards Usage of Cartoon in Teaching and Learning Physics. Paper presented at the International Conference on Learner Diversity
- Kickbush, I. S. (2001). Health literacy: addressing the health and education divide. *Health Promotions International*, 16(3).
- Kripalani, S., Robertson, R., Love-Ghaffari, M. H., Henderson, L. E., Praska, J., Strawder, A., Jacobson, T. A. (2007). Development of an illustrated medication schedule as a low-literacy patient education tool. *Patient Education and Counseling*, 66(3), 368-377. doi: 10.1016/j.pec.2007.01.020
- Kumar, R. (2011). *Research Methodology* (3rd Ed.): Sage.
- Kunzle, B. (2007). *Father of the Comic Strip: Rodolphe Töpffer*. Retrieved from <https://books.google.com.au/books?hl=en&lr=&id=ZPt0GVZSsU4C&oi=fnd&pg=PR7&dq=Father+of+the+comic+strip:+Rodolphe+Topffer&ots=6XYLRAflrw&sig=MXItzfz1yJWdeXRISF9mjVHNe3g#v=onepage&q=Father%20of%20the%20comic%20strip%3A%20Rodolphe%20Topffer&f=false>
- Lassetter, J. H., Clark, L., Morgan, S. E., Brown, L. B., Vanservellen, G., Duncan, K., & Hopkins, E. S. (2015). Health literacy and Obesity among Native Hawaiian and Pacific Islanders in the United States. *Public Health Nursing*, 32(1), 15-23. doi: 10.1111/phn.12155
- Lawrence, C. (1990). Launch of the literacy Institute. Retrieved from [http://espace.library.curtin.edu.au/R?func=dbin-jump-full&local\\_base=era01lawrence&object\\_id=113096](http://espace.library.curtin.edu.au/R?func=dbin-jump-full&local_base=era01lawrence&object_id=113096)
- Leishman, D. (2004). Visual literacy and learning: finding some online territories for the slow learner. *On the Horizon*, 12(1), 26 - 30. doi: 10.1108/10748120410540472
- Liamputtong, P. (2007). *Researching the vulnerable: A guide to sensitive research methods*. London, UK: SAGE Publications Ltd.
- Liddell, C. (1997). Every picture tells a story - or does it? Young South African children interpreting pictures. *Journal of Cross-Cultural Psychology*, 28(3), 266.

- Luby, S. P., Halder, A. K., Huda, T., Unicomb, L., & Johnston, R. B. (2011). The Effect of Handwashing at Recommended Times with Water Alone and With Soap on Child Diarrhea in Rural Bangladesh: An Observational Study (Handwashing at Recommended Times). *PLoS Medicine*, 8(6), e1001052. doi: 10.1371/journal.pmed.1001052
- Mariotti, S. P., Pascolini, D., & Rose-Nussbaumer, J. (2009). Trachoma: global magnitude of a preventable cause of blindness. *British Journal of Ophthalmology*, 93(5), 563-568. doi: 10.1136/bjo.2008.148494
- Martin, H. J. (1994). *The history and power of writing*. Chicago, US: University of Chicago Press.
- Martin, N. R. (2010). An overview of women's work and employment in Ukraine. AIAS working paper, 10-94. Amsterdam: Amsterdam Institute for Advanced labour Studies, University of Amsterdam. Retrieved from [https://pure.uva.nl/ws/files/1433527/97247\\_WP94\\_Klaveren\\_Tijdens\\_Hughie\\_Williams\\_Ramos\\_Ukraine.pdf](https://pure.uva.nl/ws/files/1433527/97247_WP94_Klaveren_Tijdens_Hughie_Williams_Ramos_Ukraine.pdf)
- Martinet, X., L'Helgouarc'h, J. L., Roche, I., Favoulet, P., Goudet, P., & Cougard, P. (1998). [Laënnec, re-inventor of the stethoscope?]. *Presse Médicale (Paris, France: 1983)*, 27(30), 1534-1535. Retrieved from <http://europepmc.org/abstract/med/9810312>
- McDermott, T. J. (1989). Cartooning: a humorous approach to medical and health education. *The Journal of Biocommunication*, 16(4), 20-27.
- McDonald, E., Bailie, R., Grace, J., & Brewster, D. (2009). A case study of physical and social barriers to hygiene and child growth in remote Australian Aboriginal communities. *BMC Public Health*, 9, 346. doi: 10.1186/1471-2458-9-346
- McLees, L. (2011). Access to land for urban farming in Dar es Salaam, Tanzania: Histories, benefits and insecure tenure. *The Journal of Modern African Studies*, 49(4), 601-624. doi: 10.1017/S0022278X11000498
- Mead, C. D. (2008). Less painful than reading books: The military, literacy, and videogames (Order No. 3327987). Available from ProQuest Dissertations & Theses Global. (304450060). Retrieved from <http://search.proquest.com/docview/304450060?accountid=14681>
- Mulvaney, K. (2013). Iconic imagery: Pleistocene rock art development across northern Australia. *Quaternary International*, 285, 99-110. doi: <http://dx.doi.org/10.1016/j.quaint.2011.07.020>
- Ngorosho, D. (2011). literacy Skills of Kiswahili Speaking Children in Rural Tanzania. Vasa. Retrieved from <https://www.doria.fi/handle/10024/67004>

- Nokes, K. M., Coleman, C. L., Cashen, M., Dole, P., Sefcik, E., Hamilton, M. J., . . . Holzemer, W. (2007). Health literacy and health outcomes in HIV seropositive persons. *Research in Nursing & Health*, 30(6), 620-627. doi: 10.1002/nur.20219
- Nutbeam, D. (2008). The evolving concept of health literacy. *Social Science & Medicine*, 67(12), 2072-2078. doi: 10.1016/j.socscimed.2008.09.050
- Organisation for Economic Co-operation and Development. (2013). OECD Investment Policy Reviews: Tanzania 2013. Retrieved from <http://www.oecd.org/investment/investment-policy/tanzania-investment-policy-review.htm>
- Osborne, H. (2006). Health literacy: How visuals can help tell the healthcare story. *Journal of Visual Communication in Medicine*, 29(1), 28-32. doi: 10.1080/01405110600772830
- Parikh, N., Parker, R. M., Nurss, J. R., Baker, D. W., & Williams, M. (1996). Shame and health literacy: the unspoken connection. *Patient Education and Counselling*, 27, 33-39.
- Park, J. H., Edgar, D. W., Wood, F. M., Heggie, K. M., & Bulsara, M. K. (2013). Does the type of skin replacement surgery influence the rate of infection in acute burn injured patients? *Burns*, 39(7), 1386-1390. doi: 10.1016/j.burns.2013.03.015
- Parliament of Tanzania. (2013). Summary of Public Expenditure 2013/2014 – Consolidated Fund Services and Supply Votes.
- Peck, M., Molnar, J., & Swart, D. (2009). A global plan for burn prevention and care. *Bulletin of the World Health Organization*, 87(10), 802-803. doi: 10.2471/BLT.08.059733
- Piaw, C. Y. (2012). Using content-based humorous cartoons in learning materials to improve students' reading rate, comprehension and motivation: It is a wrong technique? *Procedia - Social and Behavioral Sciences*, 64, 352-361. doi: 10.1016/j.sbspro.2012.11.042
- Pickering, A. J., Boehm, A. B., Mwanjali, M., & Davis, J. (2010). Efficacy of waterless hand hygiene compared with handwashing with soap: A field study in Dar es Salaam, Tanzania. *The American Journal of Tropical Medicine and Hygiene*, 82(2), 270. doi: 10.4269/ajtmh.2010.09-0220
- Pickering, A. J., Davis, J., Walters, S. P., Horak, H. M., Keymer, D. P., Mushi, D., ... Boehm, A. B. (2010). Hands, water, and health: Fecal contamination in Tanzanian communities with improved, non-networked water supplies.

- Environmental Science & Technology*, 44(9), 3267-3272. doi: 10.1021/es903524m
- Pignone, M. P., & Dewalt, D. A. (2006). Literacy and Health Outcomes: Is Adherence the Missing Link? *Journal of General Internal Medicine*, 21(8), 896-897. doi: 10.1111/j.1525-1497.2006.00545.x
- Pleasant, A., & McKinney, J. (2011). Coming to consensus on health literacy measurement: An online discussion and consensus-gauging process. *Nursing Outlook*, 59(2), 95-106.e101. doi: 10.1016/j.outlook.2010.12.006
- Prior, M. (2013). Language and literacy challenges for Indigenous children in Australia. *Australian Journal of Learning Difficulties*, 18(2), 123-137. doi: 10.1080/19404158.2013.840901
- Rabbi, S., & Dey, N. C. (2013). Exploring the gap between hand washing knowledge and practices in Bangladesh: a cross-sectional comparative study. *BMC Public Health*, 13. doi: 10.1186/1471-2458-13-89
- Ramos, F. S. (1999). The FotoDialogo method: Using pictures and storytelling as learning tools. Washington, DC: World Bank Group, Adult Outreach Education.
- Rawlinson, N. (2015). 50 years of road signs. *Auto Express* 1352, 20-22. Retrieved from <http://search.proquest.com/docview/1647262451?accountid=14681>
- Reitmaier, T., Bidwell, N. J., & Marsden, G. (2011). Situating digital storytelling within African communities. *International Journal of Human-Computer Studies*, 69(10), 658-668. doi: <http://dx.doi.org/10.1016/j.ijhcs.2010.12.008>
- Rog, M., Swenor, B., Cajas-Monson, L., Mchiwe, W., Kiboko, S., H, M., & West, S. (2011). A cross-sectional survey of water and clean faces in trachoma endemic communities in Tanzania. *BMC Public Health*, 11, 495. doi: 10.1186/1471-2458-11-495s
- Roger Maynard in, S. (2003). Secret cave's ancient Aboriginal art.(Overseas news) (pp. 14).
- Rowell, R. M., & Van Kirk, J. A. (1978). Tutorial Modules: How We Keep Humans in Our Instructional Packages. *Educational Technology*, 18(11), 13-15.
- Saks, M., & Allsop, J. (2007). *Researching health: Qualitative, quantitative and mixed methods*. London, UK: SAGE Publications Ltd.
- Salami, A., Stampini, M., Kamara, A. B., Sullivan, C., & Namara, R. (2014). Development aid and access to water and sanitation in Sub-Saharan Africa. *Water Int.*, 39(3), 294-314. doi: 10.1080/02508060.2013.876570
- Sales, V. (2003). History of Manga. *Library Journal*, 128(2), 34. Retrieved from <http://search.proquest.com/docview/196800020?accountid=14681>

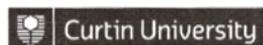
- Sandora, T. J. (2012). Hand sanitizer and cough hygiene can reduce the number of influenza A infections in school children. *The Journal of Pediatrics*, 160(5), 881-882. doi: 10.1016/j.jpeds.2012.01.061
- Savolainen-Kopra, C., Haapakoski, J., Peltola, P. A., Ziegler, T., Korpela, T., Anttila, P., ... Hovi, T. (2012). Hand washing with soap and water together with behavioural recommendations prevents infections in common work environment: an open cluster-randomized trial. *Trials*, 13, 10. doi: 10.1186/1745-6215-13-10.
- Sepulveda, M., Laval, E., Cornejo, L., & Acarapi, J. (2012). Elemental characterisation of pre-hispanic rock art and arsenic in northern Chile. *Rock Art Research: The Journal of the Australian Rock Art Research Association (AURA)*, 29(1), 93-107. Retrieved from <https://search.informit.com.au/documentSummary;dn=275347658487431;res=IELAPA>
- Shieh, C., Mays, R., McDaniel, A., & Yu, J. (2009). Health literacy and Its Association with the Use of Information Sources and With Barriers to Information Seeking in Clinic-Based Pregnant Women. *Health Care for Women International*, 30(11), 971-988. doi: 10.1080/07399330903052152
- Silla, R. C., Fong, J., Wright, J., & Wood, F. (2006). Infection in acute burn wounds following the Bali bombings: A comparative prospective audit. *Burns*, 32(2), 139-144. doi: 10.1016/j.burns.2005.09.002
- Smith, S. (2014). Tasmanian literacy levels alarm school education experts, who call for 'significant change'. LATELINE.
- Social science and the citizen. (1994). *Society*, 31(2), 2-3. Retrieved from <http://connection.ebscohost.com/c/articles/9411130991/social-science-citizen>
- Stangeland, T., Dhillon, S. S., & Reksten, H. (2008). Recognition and development of traditional medicine in Tanzania. *Journal of Ethnopharmacology*, 117(2), 290-299. doi: 10.1016/j.jep.2008.02.008
- Stangeland, T., Reksten, H., & Dhillon, S. S. (2008). Recognition and development of traditional medicine in Tanzania. *Journal of Ethnopharmacology*, 117(2), 290-299. doi: 10.1016/j.jep.2008.02.008
- Stillman, A. (2007). Medical Visual Language Translator. In Kwikpoint (Ed.), 2007. USA: Kwikpont.
- Stratton, L., Neill, M. S., Kruk, M. E., & Bell, M. L. (2008). The persistent problem of malaria: Addressing the fundamental causes of a global killer. *Social Science & Medicine*, 67(5), 854-862. doi: 10.1016/j.socscimed.2008.05.013

- Sugiyama, M. S. (2001). Food, foragers, and folklore: the role of narrative in human subsistence. *Evolution and Human Behavior*, 22(4), 221-240. doi: [http://dx.doi.org/10.1016/S1090-5138\(01\)00063-0](http://dx.doi.org/10.1016/S1090-5138(01)00063-0)
- Tanzania 2010: Results from the Demographic and Health Survey. (2012). *Studies in Family Planning*, 43(1), 69-74. doi: 10.1111/j.1728-4465.2012.00304.x
- Taylor, B. (2009). Improving the lives of Tanzanian women and children through committing to: Improved sanitation and hygiene, Improved school & health facility WASH, Sustainability of water supplies Situational Analysis of Women, Children and the Water, Sanitation and Hygiene Sector in Tanzania.
- Taylor, H., West, S., Amoo, M., Katala, S., Turner, V., Lynch, M., Rapoza, P. (1989). Hygiene Factors and Increased Risk of Trachoma in Central Tanzania. *Archives of Ophthalmology*, 107(12).
- Thomas, Y., Boquete-Suter, P., Koch, D., Pittet, D., & Kaiser, L. (2014). Survival of influenza virus on human fingers. *Clinical Microbiology and Infection*, 20(1), O58-O64. doi: 10.1111/1469-0691.12324
- Timmins, C. L. (2002). The impact of language barriers on the health care of Latinos in the United States: A review of the literature and guidelines for practice. *Journal of Midwifery & Women's Health*, 47(2). doi: 10.1016/S1526-9523(02)00218-0
- Tone, K., Skitmore, M., & Wong, J. K. W. (2009). An investigation of the impact of cross-cultural communication on the management of construction projects in Samoa. *Construction Management and Economics*, 27(4), 343-361. doi: 10.1080/01446190902748713
- Torpy, J. M. (2011). Health literacy. *JAMA: The Journal of the American Medical Association*, 306(10), 1158. doi: 10.1001/jama.306.10.1158
- Treitler, Q., Kim, H., & Hunter, M. (2008). Improving Patient Comprehension and Recall of Discharge Instructions by Supplementing Free Texts with Pictographs. Paper presented at the AMIA 2008 Symposium.
- United Nations Children's Fund. (2011). Water, sanitation and hygiene. Retrieved from: [https://www.unicef.org/tanzania/resources\\_11476.html](https://www.unicef.org/tanzania/resources_11476.html)
- United Nations Development Programme. (2013). Human development report 2013: The rise of the South: Human progress in a diverse world. Retrieved from [http://hdr.undp.org/sites/default/files/reports/14/hdr2013\\_en\\_complete.pdf](http://hdr.undp.org/sites/default/files/reports/14/hdr2013_en_complete.pdf)
- United Nations Development Programme (2014). Tanzania human development report 2014: Economic transformation for human development. Retrieved from <http://hdr.undp.org/sites/default/files/thdr2014-main.pdf>

- Vaccarella, M. (2013). Exploring graphic pathographies in the medical humanities. *Medical Humanities*, 39(1), 70. doi: 10.1136/medhum-2012-010209
- Valenti, W. M. (2007). Health literacy, HIV, and outcomes. *AIDS Reader*, 17(3), 124-128.
- Van Rompay, K., Madhivanan, P., Rafiq, M., Krupp, K., Chakrapani, V., & Selvam, D. (2008). Empowering the people: Development of an HIV peer education model for low literacy rural communities in India. *Human Resources for Health*, 6. doi: 10.1186/1478-4491-6-6
- Van Rompay, K., Madhivanan, P., Rafiq, M., Krupp, K., Chakrapani, V., & Sevam, D. (2008). Empowering the people: Development of an HIV peer education model for low literacy rural communities in India. *Human Resources for Health*. doi: 10.1186/1478-4491-6-6
- van Rooyen, P. (2012). Two southern African rock art sites as indicators of ancient migratory routes. *Rock Art Research: The Journal of the Australian Rock Art Research Association (AURA)*, 29(2), 179-186.
- Venugopal, V., & Yilmaz, S. (2010). Decentralization in Tanzania: An assessment of local government discretion and accountability. *Public Administration and Development*, 30(3), 215-231. doi: 10.1002/pad.556
- Videlier, P., & Piras, P. (1992). Strip cartoons for health. *World Health*, 22. Retrieved from <http://search.proquest.com/docview/214120649?accountid=14681>
- Wang, S. J., Briskie, D., Jan Ching Chun, H., Majewski, R., & Inglehart, M. R. (2010). Illustrated Information for Parent Education: Parent and Patient Responses. *Pediatric Dentistry*, 32(4), 295-303.
- Ward, D. J. (2011). The role of education in the prevention and control of infection: A review of the literature. *Nurse Education Today*, 31, 9-17.
- Water and Sanitation Program (2010). Practical Guidance for Measuring Handwashing Behavior. Retrieved from [http://www.wsp.org/sites/wsp.org/files/PracticalGuidance\\_HWWS.pdf](http://www.wsp.org/sites/wsp.org/files/PracticalGuidance_HWWS.pdf)
- Wedin, A. (2008). Literacy and power—The cases of Tanzania and Rwanda. *International Journal of Educational Development*, 28, 754-763.
- Weiss, B. D., & Coyne, C. (1997). Communicating with Patients Who Cannot Read. *The New England Journal of Medicine*, 337(4), 272-274. doi: 10.1056/NEJM199707243370411
- Werner, D. (1977). *Where there is no doctor: A village health care handbook*. California, US: Hesperian Health Guides.
- Werner, D. (1980). *Where there is no doctor (Indian Adaptation)*. The Voluntary Health Association of India.

- Werner, D., Thunman, C., & Maxwell, J. (1992). *Where there is no doctor: A village health care handbook, Revised edition*. California, US: Hesperian Health Guides.
- Wetton, N. M., & McWhirter, J. (1998). Images and curriculum development in health education. *Image-based research: A sourcebook for qualitative researchers*, 263-283.
- Williams, I. C. M. (2012). Graphic medicine: comics as medical narrative. *Medical Humanities*, 38(1), 21. doi: 10.1136/medhum-2011-010093
- Wilson, J. F. (2003). The crucial link between literacy and health. *Annals of Internal Medicine*, 139(10), 875-878. Retrieved from <http://annals.org/aim/article/716952/crucial-link-between-literacy-health>
- Wilson, L. D. (2011). Developing low-literacy health education materials for women. *MCN. The American Journal of Maternal Child Nursing*, 36(4), 246. doi: 10.1097/NMC.0b013e3182183bbd
- Wolf, M. S., Davis, T. C., Cross, J. T., & Marin, E. (2004). Health literacy and patient knowledge in a Southern US HIV clinic. *International Journal of STD & AIDS*, 15(11), 747 - 752.
- Wolf, M. S., Feinglass, J., Thompson, J., & Baker, D. W. (2010). In search of 'low health literacy': Threshold vs. gradient effect of literacy on health status and mortality. *Social Science & Medicine*, 70(9), 1335-1341. doi: 10.1016/j.socscimed.2009.12.013
- World Health Organization. (2011). World malaria report 2011. Retrieved from [http://www.who.int/malaria/world\\_malaria\\_report\\_2011/en/](http://www.who.int/malaria/world_malaria_report_2011/en/)
- World Health Organization. (2013). World Health Statistics 2013. Retrieved from [http://www.who.int/gho/publications/world\\_health\\_statistics/2013/en/](http://www.who.int/gho/publications/world_health_statistics/2013/en/)
- Zarcadoolas, C. (2006) *Defining health literacy. Advancing health literacy: Framework for understanding and action*. Ch.3 pp 45-67 Jossey-Bass. Retrieved from [http://link.library.curtin.edu.au/p?pid=CUR\\_ALMA51109046120001951](http://link.library.curtin.edu.au/p?pid=CUR_ALMA51109046120001951)
- Zeng-Treitler, Q., Kim, H., & Hunter, M. (2008). Improving patient comprehension and recall of discharge instructions by supplementing free texts with pictographs. *AMIA Annual Symposium Proceedings Archive*, 849-853. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2656019/>
- Zoellner, J., You, W., Connell, C., Smith-Ray, R. L., Allen, K., Tucker, K. L., ... Estabrooks, P. (2011). Health literacy is associated with healthy eating index scores and sugar-sweetened beverage intake: Findings from the Rural Lower

Mississippi Delta. *Journal of the American Dietetic Association*, 111(7), 1012-1020. doi: 10.1016/j.jada.2011.04.010



**Memorandum**

<b>To</b>	Professor Mark Jones, Associate Professor Jaya Earnest, Mr Jeremy Barrett
<b>From</b>	Professor Dianne Wynaden
<b>Subject</b>	Protocol Approval SON&M5-2013
<b>Date</b>	15 February 2013
<b>Copy</b>	

Office of Research and Development  
 Human Research Ethics Committee  
 Telephone 9266 2784  
 Facsimile 9266 3793  
 Email hrec@curtin.edu.au

Thank you for your "Form C Application for Approval of Research with Low Risk (Ethical Requirements)" for the project titled *"Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities"*. On behalf of the Human Research Ethics Committee, I am authorised to inform you that the project is approved with the following conditions:

1. *Data collection cannot commence until written approval is provided from the community of Masanganya in the Kisawari District of the Pwani region of Tanzania to conduct the study in their community and a copy of that approval is provided to me.*
2. *That a local contact in the area to support the student is identified and added to the information sheet to participants.*

Approval of this project is for a period of twelve months 15<sup>th</sup> February 2013 to 15<sup>th</sup> February 2014.

The approval number for your project is **SON&M 5-2013**. Please quote this number in any future correspondence. If at any time during the twelve months changes/amendments occur, or if a serious or unexpected adverse event occurs, please advise me immediately.

Professor Dianne Wynaden  
 Minimal Risk Coordinator/ Ethics Advisor  
 School of Nursing and Midwifery

Please Note: The following standard statement must be included in the information sheet to participants:  
*This study has been approved under Curtin University's process for lower-risk Studies (Approval Number SON&M 5- 2013). This process complies with the National Statement on Ethical Conduct in Human Research (Chapter 5.1.7 and Chapters 5.1.18-5.1.21).*  
 For further information on this study contact the researchers named above or the Curtin University Human Research Ethics Committee c/- Office of Research and Development, Curtin University, GPO Box U1987, Perth 6845 or by telephoning 9266 9223

Appendix 2 Letter to Masanganya Chairman Seeking Permission to Conduct Study



**GlobalHealthAlliance**  
Western Australia

**Jeremy Barrett**  
Researcher and Master's Student,  
Centre for International Health  
Faculty of Health Sciences  
Curtin University of Technology  
Perth, Western Australia  
Mobile: 0405061101  
[jeremy.barrett@postgrad.curtin.edu.au](mailto:jeremy.barrett@postgrad.curtin.edu.au)

**District Executive Director  
Health Department  
P.O.Box 28002  
Kisarawe.**

**Saturday, May 4, 2013**

Dear Sir/Madam,

**RE: PERMISSION TO UNDERTAKE A STUDY TITLED 'Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities AT MASANGANYA VILLAGE**

Reference is made above for the permission to conduct a study titled "Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities"

This proposed study will develop a cartoon-based pictorial educational tool (CBPET) to communicate key messages about hygiene and bacteria contained within the natural environment.

Should this tool prove to be effective in the delivery of information to this representative community it will demonstrate that other vital healthcare education may be able to be communicated in a similar fashion.

I have gained Ethics approval from Curtin University in Australia and am seeking permission from COSTECH for ethical clearance procedure in Tanzania. The interviews will take approximately one week and I hope to conduct this study between July and September 2013.

Regards

Jeremy Barrett

A handwritten signature in blue ink, appearing to read 'J Barrett'.

Appendix 3 Letter from Masanganya Chairman Granting Permission to Conduct Study

Masanganya Village,  
P.O.Box 28002  
Kisarawe- Tanzania  
20<sup>th</sup> July 2013

Jeremy Barrett  
Researcher and Master's Student,  
Centre for International Health  
Faculty of Health Sciences  
Curtin University of Technology  
Perth, Western Australia

Dear Sir/Madam

**RE: PERMISSION TO UNDERTAKE A STUDY TITLED 'Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities AT MASANGANYA VILLAGE.**

Reference is made to your letter of 8<sup>th</sup> July 2013, requesting for permission to undertake a study titled "Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities at Masanganya village.

The village council have granted you a permission to conduct the study on the date of 3<sup>rd</sup> and 4<sup>th</sup> August 2013 as requested and the villagers will voluntarily participate in the study.

Yours Sincerely

*Magomba*  
JUMAANE A-MAGOMBA

MW/KITI WA KITONGOJI  
CHA BOMANI  
MASANGANYA-KISARAWA

Village Chairman.

**TANZANIA COMMISSION FOR SCIENCE AND TECHNOLOGY**

**(COSTECH)**

**Telegrams:** COSTECH  
**Telephones:** (255 - 22) 2700745/6  
**Director General:** (255 - 22) 2700750  
**Fax:** (255 - 22) 2775313  
**Telex:** 41177 UTAFITI  
**E-M:** Rclearance@costech.or.tz



Ali Hassan Mwinyi Road  
Kijitonyama Area  
P.O. Box 4302  
Dar es Salaam  
Tanzania

**APPLICATION FOR RESEARCH CLEARANCE (I)**

**1. Applicant Personal Particulars**

**Surname:** BARRETT

**Other names:** JEREMY CHRISTOPHER

**Title (MR)**

**Nationality:** AUSTRALIAN

**Date of Birth:** 13/ 02/ 1965

**Highest academic qualification:** BSc Paramedic Science

**Institutional Affiliation:** Curtin University

**Mailing Address:** 3 CARDINAL CRESCENT, LEEMING, 6149, WA

**Country:** AUSTRALIA

**Permanent address:** 3 CARDINAL CRESCENT, LEEMING, 6149, WA

Australia

**Email address:** jeremy.barrett@postgrad.edu.au

**2. Title of proposed research project:**

Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities

**3. Purpose of Research Master**

Can a suitably researched, well-designed and effectively delivered cartoon-based pictorial educational tool (CBPET) inform and subsequently improve understanding, behavior, and attitudes towards hygiene as well as introducing

the 'chain of infection' concept) in a resource poor Tanzanian community with low literacy levels?)

#### 4. Research objectives:,,

1. Within a group of low literacy participants within the Masanganya community in Tanzania:
  - o document existing personal hygiene practices)
  - o determine the perception of the cause and transmission of disease as well as existing awareness of common pathogens.)
2. Design and develop CBPET in English and Swahili to communicate key messages regarding common pathogens, transmission routes, and the importance of hand washing.)
3. Implement and trial the CBPET tool to a cross-sectional sample group of low literate members of the Masanganya community.)
4. Evaluate behavioural change in hand washing practice following implementation of the CBPET and assess the comprehension of basic pathogens within the sample group.))

#### 5. Research methodology (brief description):,,

The research will be conducted in three phases. It will use a mixed method approach of semi-structured interviews combined with questionnaires and implementation of the CBPET. This approach would gather qualitative data as to the efficacy of the newly introduced CBPET in improving hygiene with a hypothetical reduction in the incidence of infection. Phase 1 will consider the historical context of pictograph use to convey health enhancing messages. Building on this analysis icons will be developed to characterize the nominated pathogens identified as posing the greatest risk to resource poor communities and a novel CBPET will be developed. Phase 2 will involve the use of a pre-delivery interview tool to assess the current understanding of basic hygiene concepts. If the CBPET will then be delivered to the study group using a well respected member of the local health care system. A post-delivery interview tool will then be applied to assess the groups understanding following the delivery of the CBPET. Phase 3 will consist of transferring all data collected from phase two onto a spreadsheet and correlate trends to determine the effectiveness of the CBPET.)

6. Regions in Tanzania, where research, will, be, conducted, (Coast, Dar es Salaam,)

7. Date, research, will, commence: (July 2013)

8. **Estimated period of research:** One Year

9. **(a) Financial sponsor (Name & Address):** GHAWA – 189 Royal Street, East Perth  
WA

**(b) Research budget:** AU\$ 1,940.00

10. **Contact address while in Tanzania:**

Block B, 286 Kimwari Road, Msasani Village, Dar es Salaam, Tanzania.

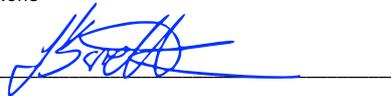
11. **References (provide names and addresses of two referees, preferably one of whom should be based in Tanzania):**

Professor Pauline Peter Mella  
Dean and Head of the Faculty of Nursing  
The Hubert Kairuki Memorial University  
P.O. Box 65300, Dar Es Salaam, Tanzania.

Professor Mark Jones FCNA(NZ), FACN  
Centre for International Health  
School of Nursing and Midwifery | Faculty of Health Sciences  
Curtin University  
GPO Box U1987, Perth, Western Australia, 6845, Australia

12. **Name of other applicants (if any):** None

13. **Signature of applicant:** \_\_\_\_\_



<b>TANZANIA COMMISSION FOR SCIENCE AND TECHNOLOGY (COSTECH)</b>	
	
<b>Telephones:</b> (255 - 022) 2775155 - 6, 2700745/6 <b>Director General:</b> (255 - 022) 2700750&2775315 <b>Fax:</b> (255 - 022) 2775313 <b>Email:</b> rclearance@costech.or.tz	Ali Hassan Mwinyi Road P.O. Box 4302 Dar es Salaam Tanzania
<b>RESEARCH PERMIT</b>	
<b>No. 2013-182-NA-2013-82</b>	<b>17<sup>th</sup> May 2013</b>
1. Name :	<b>Jeremy C. Barrett</b>
2. Nationality :	<b>Australian</b>
3. Title :	<b>“Development, Implementation and Evaluation of a Cartoon based Pictorial Educational Tool for Low- Literacy, Resource Poor Communities”</b>
4. Research shall be confined to the following region(s):	<b>Coast, Dar es Salaam</b>
5. Permit validity	<b>17<sup>th</sup> May 2013 to 16<sup>th</sup> May 2014</b>
6. Contact /Collaborator:	<b>Prof. Pauline P. Mella, The Hubert Kairuki Memorial University, P.O. Box 65300, Dar es Salaam</b>
7. Researcher is required to submit progress report on quarterly basis and submit all Publications made after research.	
 M. Mushi for: <b><u>DIRECTOR GENERAL</u></b>	

**TANZANIA COMMISSION FOR SCIENCE AND TECHNOLOGY  
(COSTECH)**



**Telephones:** (255 - 022) 2775155 - 6, 2700745/6  
**Director General:** (255 - 022) 2700750&2775315  
**Fax:** (255 - 022) 2775313  
**Email:** rclearance@costech.or.tz

Ali Hassan Mwinyi Road  
P.O. Box 4302  
Dar es Salaam  
Tanzania

*In reply please quote:* **CST/RCA 2013/82/2013**

**17<sup>th</sup> May 2013**

Director of Immigration Services  
Ministry of Home Affairs  
P.O. Box 512

**DAR ES SALAAM**

Dear Sir/Madam,

**RESEARCH PERMIT**

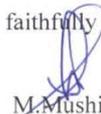
We wish to introduce **Jeremy C. Barrett** from **Australia** who has been granted Research permit No. **2013-182-NA-2013-82** dated **17<sup>th</sup> May 2013**

The permit allows him/her to do research in the country "**Development, Implementation and Evaluation of a Cartoon based Pictorial Educational Tool for Low-Literacy, Resource Poor Communities**"

We would like to support the application of the researcher(s) for the appropriate immigration status to enable the scholar(s) begin research as soon as possible.

By copy of this letter, we are requesting regional authorities and other relevant institutions to accord the researcher(s) all the necessary assistance. Similarly the designated local contact is requested to assist the researcher(s).

Yours faithfully

  
M. Mushi

For: **DIRECTOR GENERAL**

- CC: 1. Regional Administrative Secretary: Coast, Dar es Salaam  
2. Local contact: **Prof. Pauline P. Mella, The Hubert Kairuki Memorial University, P.O. Box 65300, Dar es Salaam**  
3. Co-Researcher: **None**

**PART IV - PARTICULARS AS TO INSTITUTION**

25 INSTITUTION : COSTECH  
26 LOCATION : DAZ  
27 POSTAL ADDRESS : 4302  
28 PLACE OF WORK : CONST. DSM  
29 PLACE OF RESIDENCE (in Tanzania) : NA  
30 INDUSTRY/SECTOR : NA e.g. Mining  
31 SUB-SECTOR : NA  
32 INVESTMENT SCALE: LARGE  MIDDLE:  SMALL  OTHERS (Specify) .....  
33 TELEPHONE NUMBER 

+	2	5	5	2	2	2	7	0	0	7	5	0
---	---	---	---	---	---	---	---	---	---	---	---	---

  
34 MOBILE PHONE NUMBER 

--	--	--	--	--	--	--	--	--	--	--	--	--

  
35 E-MAIL ADDRESS : rclearance@costech.or.tz

**PART V - DECLARATION BY EMPLOYER**

36 I, Moshukuri M. Mwingombizi

Do HEREBY SOLEMNLY and sincerely declare that to the best of my knowledge and belief the particulars stated in Part I, II, III & IV of this Data sheet are true, and in event of my application being granted, I undertake to abide by Immigration laws and the Laws of United Republic of Tanzania.

  
Signature of Employer

Declared at COSTECH this 17 day of 17/07/2013

## Appendix 7 Participant Information Sheet (English version)

### **Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities**

#### **INFORMATION SHEET**

##### **Nature and purpose of the project**

Hello, my name is Jerry Barrett from the Centre for International Health, Faculty of Health Sciences, Curtin University in Australia. I am developing a system that translated public health information into cartoons to make them easy to understand as part of my Master's in International Health project. I have been speaking to the community leaders in Masanganya (Tanzania) to try and get a better understanding into your culture and home environment so that I can incorporate these into the system I am trying to develop. I need to now ask you what you think of my educational tool and if you can understand the information that I am trying to deliver.

##### **What the project will involve**

Your involvement will add to the depth of findings and I would be most grateful if you could spare about 30 minutes of your time to assist in this project. You will be required to participate in a semi-formal interview with the researcher and translator answering a range of questions (please see attached appendix) that will assist me in improving and perfecting this tool so that other people can learn and benefit from this information.

##### **Benefits of the study**

This educational tool will be able to deliver information and health care messages to everyone in the community, even those that have not been to school and have problems reading. Once it has been developed it will be able to teach people how to keep themselves healthy and free from illness without the use of words.

##### **Voluntary Participation and Withdrawal from the Study**

Your participation in this study is by invitation and is entirely voluntary. You may withdraw at any time. All information is treated as confidential and no names or other details that might identify you will be used in any publication that may arise from the research. If you withdraw, all information you have provided will be destroyed. If required, you will also have the opportunity to view the transcript of your interview. You can contact my supervisor and me at the details below.

#### **THANK YOU VERY MUCH**

<b>Jeremy Barrett</b> Researcher and Master's Student, Centre for International Health Faculty of Health Sciences Curtin University of Technology Perth, Western Australia Mobile: 0405061101 <a href="mailto:jeremy.barrett@postgrad.curtin.edu.au">jeremy.barrett@postgrad.curtin.edu.au</a>	<b>Mark Jones</b> Professor Centre for International Health Faculty of Health Sciences Curtin University of Technology Perth, Western Australia Tel   +61 8 9266 3535 Email   <a href="mailto:mark.jones@curtin.edu.au">mark.jones@curtin.edu.au</a> Web   <a href="http://curtin.edu.au">http://curtin.edu.au</a>
---	--

This project has been approved by the Curtin University Human Research Ethics Committee (Approval Number CIH 01/2009). If you have any concerns about this project please contact:

The Secretary, Human Research Ethics Committee  
Office of Research and Development  
Curtin University of Technology, GPO BoxU 1987, Perth  
Phone: +61 8 9266 2784  
email: [hrec@curtin.edu.au](mailto:hrec@curtin.edu.au)

**Maendeleo, utekelezaji na tathmini ya elimu katika michoro ya katunii kwa ajili ya jamii maskini yenye elimu ya chini na rasilimali ndogo.**

**FOMU YA MAELEZO KWA WASHIRIKI**

**Asili na madhumuni ya mradi**

Habari, jina langu ni Jerry Barrett kutoka Kituo cha Afya ya Kimataifa, Kitivo cha Sayansi ya Afya, Chuo Kikuu cha Curtin Australia. Nina tayarisha mfumo wa afya ya umma kwa kutumia michoro ya katuni ili kuifanya iwe rahisi kuelewa kama sehemu ya masomo yangu ya udhamili katika mradi wa kimataifa wa afya. Nimekuwa akizungumza na viongozi wa jamii katika Masanganya (Tanzania) kujaribu na kupata uelewa mzuri katika utamaduni wenu na mazingira ya nyumbani ili niweze kuingiza mambo haya katika mfumo huu ninaojaribu kuuendeleza. Nahitaji kujua nini unafikiria kuhusu njia hii ya elimu ninayotaka kuitayarisha na kama unaweza kuelewa habari ninaojaribu kutoa

**Mradi utahusisha**

Ushiriki wako utaongeza kwa kina matokeo ya uchunguzi huu. Naomba na napenda kuwa wengi kushukuru kama unaweza vipuri dakika 30 ya muda wako ili kusaidia katika mradi huu. Utashiriki katika mahojiano takribani nusu saa na mtafiti akisaidiwa na mkalimani kujibu maswali mbalimbali (tafadhali angalia kiambatanisho) yatakayonisaidia kuboresha mfumo ninaoutayarisha ili watu wengine waweze kujifunza na kufaidika kutokana na utafiti huu. Natumaini kupata watu 20 kutoka jamii yenu katika utafiti huu.

**Faida ya utafiti**

Zana hii ya elimu itaweza wa kutoa habari na ujumbe wa huduma za afya kwa kila mtu katika jamii yenu, hata wale ambao hawajaenda shule ama wamekuwa na matatizo ya kusoma. Mara bahada ya hitimisho la utafiti huu, utaweza kufundisha watu jinsi ya kuweka wenyewe afya na kuepukana na

magonjwa bila ya matumizi ya maneno. Muhtasari wa matokeo ya utafiti itakuwa inapatikana kwa washiriki katika hitimisho la utafiti.

### **Ushiriki na kujitoa kwa hiari katika utafiti huu.**

Mradi huu utatekelezwa kwa mujibu wa Taarifa ya Taifa ya Maadili Katika Utafiti inayohusisha Binadamu (NHMRC). Ushiriki wako katika utafiti huu ni kwa mwaliko na ni hiari kabisa. Unaweza kuondoa wakati wowote kwa kusema hamu yako ya kuondoka na mhojaji. Utafahamishwa matokeo yoyote muhimu yatakayojitokeza wakati wa utafiti huu. Taarifa zote zitahifadhiwa kwa siri na usalama kwa miaka 5 na hakuna majina au maelezo mengine ambayo yatakayoweza kukutambua wewe zitatumika katika uchapishaji wowote kutokana na utafiti huu. Ukijitoa, taarifa zote ulizotoa zitaangamizwa. Mwishoni mwa kipindi cha kuhifadhi taarifa zote utakapofika zitaangamizwa. Kama unahitaji, wewe kuona mahojiano yako mahojiano yako kunatakuwa na nakala inayoenyesha. Unaweza kuwasiliana na msimamizi wangu kwenye maelezo ya chini. Kwa maelezo zaidi kuhusu mradi huu au maswali yoyote tafadhali jisikie huru kuwasiliana Bright Aloyce Simu: 255 786 150 477

### **ASANTE SANA**

Jeremy Barrett Mtafiti na Mwanafunzi Mwalimu, Kituo cha Afya ya Kimataifa Kitivo cha Sayansi ya Afya Curtin Chuo Kikuu cha Teknolojia Perth, Australia Magharibi Simu: 0405061101 jeremy.barrett @ postgrad.curtin.edu.au	Mark Jones Profesa Kituo cha Afya ya Kimataifa Kitivo cha Sayansi ya Afya Curtin Chuo Kikuu cha Teknolojia Perth, Australia Magharibi Simu   +61 8 9266 3535 Barua pepe   mark.jones @ curtin.edu.au Mtandao   <a href="http://curtin.edu.au">http://curtin.edu.au</a>
---	---

Utafiti huu imekuwa kupitishwa na Chuo Kikuu cha Curtin Binadamu Utafiti wa Kamati ya Maadili (Idhini Number.....). Kamati inakuwa na wanachama wa umma, wasomi, wanasheria, madaktari na wauguzi wafugaji. Kama inahitajika, uhakiki wa idhini zinaweza kupatikana ama kwa kuandika kwa Curtin Chuo Kikuu Binadamu Utafiti wa Kamati ya Maadili, c / - Ofisi ya Utafiti na Maendeleo, Chuo Kikuu cha Curtin, GPO Box U1987, Perth 6845 au kwa simu9266 9223 au kwa barua pepe hrec @ Curtin . edu.au.

## Appendix 9 Pre-intervention Questionnaire

Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities: Appendix B: Pre Delivery Interview guide

### Appendix B: Pre Delivery Interview guide

Location:	Name of Interviewer:		
Date:	Signature:		
Sample ID:	Gender: Male/	Female	
Age:	Occupation:		
Educational Level:	Religion:		
Marital Status:	Access to Health Service:		
Number of Children:	Access to traditional services:		

*Interviewer to circle closest answer*

1. Do you know what a germ is?

Yes	not sure	No
-----	----------	----

1.1 If YES please explain in your own words what a germ is.

2. Do you know where germs live.

Yes	not sure	No
-----	----------	----

2.1 If YES please explain in your own words where a germ lives.

3. Will germs to make you sick if they get into your body?

Yes	not sure	No
-----	----------	----

4. Do you know how germs can enter the body.

Yes	not sure	No
-----	----------	----

4.1 If YES please explain in your own words how a germ enters the body.

5. Do you know how germs travel between infected people and me.

Yes	not sure	No
-----	----------	----

5.1 If YES please explain in your own words how germs travel between people..

6. I have been taught how to wash my hands.

Yes	not sure	No
-----	----------	----

7. Is handwashing important?

Yes	not sure	No
-----	----------	----

7.1 If YES please explain in your own words why hand washing is important.

8. Where do you wash your hands?

Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities: Appendix B: Pre Delivery Interview guide

in a sink	in a bowl	in a stream	other: <i>(please note)</i>	I don't wash my hands
-----------	-----------	-------------	-----------------------------	-----------------------

9. How many times a day do you wash your hands?

0	1 to 3 times	4 to 6 times	more?
---	--------------	--------------	-------

10. When do you wash your hands?

when I wake up in the morning	when I go to bed at night
before I eat my food	before I prepare my food
after I eat my food	before I go to the toilet
after I go to the toilet	before I touch animals
after I touch animals	before I touch a wound
after I touch a wound	before I have sex
after I have sex	when my hands feel dirty
when my hands look dirty	before I change a baby
after I change a baby	I don't wash my hands

11. Do you have access to soap?

Yes	not sure	No
-----	----------	----

12. Do you have access to water?

Yes	not sure	No
-----	----------	----

13. Would you wash your hands more frequently if you had better access to soap & water?

Yes	not sure	No
-----	----------	----

13.1 If NO please explain in your own words why not?

14. Does soap and water can kill germs.

Yes	not sure	No
-----	----------	----

15. Would education about basic hygiene would prompt me to wash my hands more.

Yes	not sure	No
-----	----------	----

15.1 If NO please explain in your own words why not?

## Appendix 10 Post-intervention Questionnaire

Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities: Appendix C: Post Delivery Interview guide

### Appendix C: Post Delivery Interview guide

Location:	Name of Interviewer:
Date:	Signature:
Sample ID:	Gender: Male/ Female
Age:	Occupation:
Educational Level:	Religion:
Marital Status:	Access to Health Service:
Number of Children:	Access to traditional services:

*Interviewer to circle closest answer*

*Interviewer to circle closest answer*

1. Do you know what a germ is?

Yes	not sure	No
-----	----------	----

2.1 If YES please explain in your own words what a germ is.

--

2. Do you know where germs live.

Yes	not sure	No
-----	----------	----

2.1 If YES please explain in your own words where a germ lives.

--

3. Will germs to make you sick if they get into your body?

Yes	not sure	No
-----	----------	----

4. Do you know how germs can enter the body.

Yes	not sure	No
-----	----------	----

4.1 If YES please explain in your own words how a germ enters the body.

--

5. Do you know how germs travel between infected people and me.

Yes	not sure	No
-----	----------	----

5.1 If YES please explain in your own words how germs travel between people..

--

6. I have been taught how to wash my hands.

Yes	not sure	No
-----	----------	----

7. Is handwashing important?

Yes	not sure	No
-----	----------	----

7.1 If YES please explain in your own words why hand washing is important.

--

8. Where do you wash your hands?

in a sink	in a bowl	in a stream	other: <i>(please note)</i>	I don't wash my hands
-----------	-----------	-------------	-----------------------------	-----------------------

Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities: Appendix C: Post Delivery Interview guide

9. How many times a day do you wash your hands?

0	1 to 3 times	4 to 6 times	more?
---	--------------	--------------	-------

10. When do you wash your hands?

when I wake up in the morning	when I go to bed at night
before I eat my food	before I prepare my food
after I eat my food	before I go to the toilet
after I go to the toilet	before I touch animals
after I touch animals	before I touch a wound
after I touch a wound	before I have sex
after I have sex	when my hands feel dirty
when my hands look dirty	before I change a baby
after I change a baby	I don't wash my hands

11. Do you have access to soap?

Yes	not sure	No
-----	----------	----

12. Do you have access to water?

Yes	not sure	No
-----	----------	----

13. Would you wash your hands more frequently if you had better access to soap & water?

Yes	not sure	No
-----	----------	----

13.1 If NO please explain in your own words why not?

14. Do you know that germs can be passed to other people and make them sick.

Yes	not sure	No
-----	----------	----

14.1 If YES please explain in your own words how germs can be passed on to other people.

15. Does soap and water can kill germs.

Yes	not sure	No
-----	----------	----

16. Has education about basic hygiene has prompted me to wash my hands more.

Yes	not sure	No
-----	----------	----

17. Did you gain any new knowelage from the visual educational tool?

Yes	not sure	No
-----	----------	----

17.1 If YES please explain in your own words what you have learnt.

18. Was there anything that you disliked about the visual educational tool?

Yes	not sure	No
-----	----------	----

18.1 If YES please explain in your own words what you disliked.

Development, implementation and evaluation of a cartoon based pictorial educational tool for low-literacy, resource poor communities: Appendix C: Post Delivery Interview guide

19. Where you offended by any part of the visual educational tool?

19.1 If YES please explain in your own words what offended you

--

20. Do you have any comments to make about the visual educational tool?

Yes	not sure	No
-----	----------	----

20.1 If YES please explain in your own words .

--