

Creating Digital Materials for Antimicrobial Resistance One Health Awareness and Behaviour
Change for Rhodes University Peer Educators.

Thesis submitted in partial fulfilment of the requirements for the degree of

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By
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This thesis is dedicated to the dreams of mothers and daughters.

And to the pandemic, for the forced writer's retreat.

Abstract

Antimicrobial resistance (AMR) is an urgent, global health problem that stems from the inappropriate use of and poor adherence to antibiotics that treat diseases in human beings. It is further exacerbated by the proliferation of antibiotics into the food chain, particularly from the overuse and misuse of antibiotics in agricultural, meat, and dairy production. The recently developed World Health Organisation (WHO) One Health (OH) approach encompasses and acknowledges the various interconnected pathways that drive AMR between the human, animal, and environmental spheres. Until recently, AMR health challenges have been viewed primarily through a biomedical lens, but this study draws on the more holistic perspective that the One Health approach offers. AMR from food sources (AMR-OH) is an underrepresented topic of research. Creating digital health communication for low-literate end-users on this topic using the One Health approach is an emerging field of research. AMR-OH has not been extensively covered in health communication campaigns and requires developing context-specific digital educational materials, such as the ones this study presents.

This study draws on Social Behaviour Change Communication (SBCC) theory elements to create a suggested approach to disseminate AMR-OH information. This intervention was aimed at low-health-literate end-users to accomplish two objectives. First, create awareness and improve knowledge about AMR-OH via a video. Second, offer feasible, easily implementable behaviour change actions in the form of an infographic comprising four food safety steps (Clean, Separate, Cook, and Chill). The study was conducted in three phases. First, recruit participants and conduct a literature review to identify the effective SBCC elements of health communication intervention design. Second, conduct a needs assessment to gauge the volunteering participants' familiarity with digital media and their current health literacy on AMR-OH. Third, conceptualise and design the two AMR-OH digital educational materials (a video and accompanying infographic). The materials were first evaluated by the researcher using the Clear Communication Index (CCI) test, and then shared with the participants via WhatsApp to be evaluated by them, using two end-user tests: the Patient Education Material Assessment Tool (PEMAT) and the Suitability Assessment of Materials (SAM) test. These two tests assessed the materials' readability, understandability, and actionability. A post-evaluation, semi-structured interview (SSI) was then conducted with the participants. Deductive thematic analysis was conducted on the SSI data and analysed using

the five design benchmarks as themes: *Ease of Use of Technology*, *Clarity of Content*, *Appropriate Format*, *Target Audience Resonance (Appropriate for target audience)*, and *Clear calls to Action (Actionable)*.

The rapid onset of COVID-19 restrictions forced the project to scale down and shift entirely online. The study could be conducted due to the active and enthusiastic virtual participation of two Rhodes University Peer Educators (PEs) whose contribution was vital to developing and evaluating the materials. The needs assessment showed that the PEs were comfortable using WhatsApp, had reliable internet connection when on campus, and used this social media platform for professional and personal communication. This assessment also showed that they had prior knowledge of AMR but only from the human health perspective. The video and infographic scored high on the Clear Communication Index, 93.3% and 94.4%, respectively. The PEs' evaluation of the materials was also high on the PEMAT and SAM assessments: video narration (100%, 80% respectively), video (100%, 99% respectively), and infographic (86%, 90% respectively). This study produced an easy-to-use, accessible and appropriate online repository of AMR-OH information in a novel format with actionable steps. The post-evaluation SSI revealed that the materials and the channel of delivery were welcomed. The PEs expressed their confidence in receiving, using, and sharing this novel presentation of evidence and solutions-based information about AMR-OH. They further highlighted that this is the first time they have received and evaluated context-specific digital multimedia about AMR-OH and that this information equipped them to adopt the food safety behaviours – namely, the four food safety steps.

This study demonstrates that the theory-informed creation of engaging digital media for AMR-OH is feasible and viable. Furthermore, it affirms that engaging digital media for AMR-OH can be created to enhance the knowledge of end-users about this health issue. The scaled-down approach created a blueprint to implement a more extensive intervention in the future, informed by this intervention's methods and tools. Lastly, this blueprint for a particular conceptualisation of an AMR-OH digital media intervention provides effective and empowering tools with which the PEs can disseminate this information to the university's support staff.

Declaration

I hereby declare that this half-thesis is my own work. I have acknowledged all other authors' ideas and referenced direct quotations from their work. I have not allowed anyone else to borrow or copy this research.



Shraddha Patnala

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List of abbreviations

AMR	Antimicrobial resistance
AMS	Antimicrobial stewardship
BC	Behaviour change
BCC	Behaviour change communication
BRICS	Coalition of LMICs comprising <i>Brazil, Russia, India, China, & South Africa</i>
CE	Community engagement
CHW	Community health worker
COVID-19	SARS-CoV-2
CV	Community video
eHealth	Digital health
FAO	Food and Agriculture Organization of the United Nations
HC	Health communication
HCP	Healthcare professional
HIC	High-income country
IT	Information technology
LMIC	Low and middle-income country
mHealth	Mobile health
OH	One Health
PAHO	Pan American Health Organization
PC	Persuasive communication
PE	Peer Educator
PEMAT	Patient Education Material Assessment Tool
PV	Participatory video
RQ	Research question
SAM	Suitability Assessment of Materials
SBCC	Social Behaviour Change Communication

SMS	Short Message Service
SRH	Sexual and reproductive health
SSI	Semi-structured interview
UN	United Nations
WEF	World Economic Forum
WHO	World Health Organisation
WPHP	Workplace health promotion

1 Chapter One: Introduction

1.1 Introduction

Antimicrobial resistance (AMR) is an urgent, underlying, under-addressed and largely invisible global health crisis that has a bearing on the SARS-CoV-2 pandemic (hereafter COVID-19) (Holloway, 2020). AMR has long been exacerbated by unregulated antibiotic use for livestock and agriculture, particularly in low and middle-income countries (LMICs) (Holloway, 2020; Zaman, 2020). AMR is also partly caused by inappropriate prescription – including over-prescription – and non-completion of prescribed doses of antibiotics in the health care system. While there have been some health education campaigns in some countries, there is relatively little literature on this topic in digital health communication (HC) and public health studies (Akpan et al., 2020; Chetty et al., 2019; Essack et al., 2017). This study first identifies current gaps in health communication and behaviour change (BC) literature regarding the levels of awareness of the drivers of AMR from food sources. Second, it conceptualises and proposes approaches for creating digital health communication AMR awareness materials, based on an initial small-scale campaign designed to aid Rhodes University Peer Educators (PEs) to bring this health issue to the attention of Rhodes support staff.

As food production, especially the provision of red meat, rises to meet the demands of a growing middle class among the global population, there has been a continuous and still largely unregulated rise in the use of antibiotics as growth promoters to boost agricultural, meat, and dairy outputs (FAO, 2018; Mayen, 2018; Minasyan and FAO, 2020; WHO, 2018a). The AMR in humans caused by this unregulated overuse and misuse of antibiotics as livestock and agricultural growth promoters is now a more significant contributor to AMR than the overuse or poor treatment compliance of prescription antibiotics to treat infections in humans (Mayen, 2018; Minasyan and FAO, 2020). There is evidence to show that the overuse and misuse of antibiotics in industrial farming could be best approached by incorporating the One Health in AMR interventions that prioritise health communication (Cipolla et al., 2015; Okello et al., 2014).

Due to poor regulation and erratic surveillance, there is widespread overuse of antibiotics for livestock globally, particularly in LMICs (Mayen, 2018; Minasyan and FAO, 2020; WHO,

2017a; World Health Organization, 2015). As an end-user, the consumer is mostly unaware of the extensive use of antibiotics in meat and agriculture. Consumers are also not equipped with easy, manageable ways to make better choices and to safely eat these products through four specific food safety actions (explained further in section 1.5.1) promoted by the Food and Agriculture Organisation of the United Nations (FAO) (CDC, 2020a; FAO, 2017; WHO, 2017a). For consumers who have the means to access information about AMR on the internet, and are interested or concerned about such matters, the WHO and FAO websites offer credible health information (FAO, 2017; WHO, 2018a, 2017b, 2015a). However, only a small percentage of internet users are aware of, literate, interested, and concerned enough to pursue improving their knowledge about AMR and understand its causes and consequences.

Digital media has started to play a crucial role in modern health communication and behaviour change in the 21st century, and digital connectivity and devices are now more widely available even in poorer and developing countries (Ganesh and Stohl, 2013; Livingstone et al., 2017; Michelsen, 2012; Pindayi, 2017). Digital media extends the potential reach of health information into low-resource settings (Agboola and Ahmed, 2020; de Lanerolle et al., 2017; Koomson, 2019; Molapo et al., 2017; WHO, 2017b). This study proposes and develops two digital education materials due to a dearth of context-specific public education and awareness programmes about what the public can do at a consumer level through the One Health approach: the first, a video on the danger of AMR from food sources (AMR-OH) to humans, and second, an infographic to present four food safety actions.

1.2 Background and context

This chapter outlines the background, context, and rationale for this study overviews the theories and methods used in the study. It further previews the subsequent chapters, where the rationale for the material design is presented and critically examined.

1.2.1 Antimicrobial resistance is a global and local problem

According to the World Health Organisation (WHO), AMR occurs when antimicrobials are overused and misused causing microbes (bacteria, viruses, parasites, and fungi) to build resistance via mutation against various medications (WHO, 2018a). Overuse and misuse of

antibiotics to treat diseases in humans are especially high in LMICs because of poor regulation, legislation about rational use, and under-resourced health systems (Essack et al., 2017; Graham et al., 2016; Mir and Zaidi, 2010; Nadimpalli et al., 2018; World Health Organization, 2015), but this issue is not confined to low-middle income countries (LMICs): globally there is significant over-prescription of antibiotics (Farley et al., 2019; Ncube et al., 2017; Wits University, 2019). Much of this takes place in the contexts of poor hygiene and sanitation, and other factors such as sharing medication, weak surveillance and low adherence/completion rates which have caused the rise and spread of AMR (WHO, 2018a). The global mortality rate from antibiotic-resistant infections is estimated at 700,000 deaths annually, and current antibiotic overuse and misuse, combined with continued inaction and lack of awareness, could increase this figure to ten million people per year by 2050 (O'Neill, 2016a, 2016b; World Economic Forum, 2018) unless urgent measures and better communication are implemented worldwide.

In South Africa, the rise, spread, and effects of AMR endanger the large-scale antibiotic treatments used to counter the country's quadruple burden of diseases (Akpan et al., 2020). This quadruple burden refers to the combined impacts of HIV/AIDS, tuberculosis (TB), high maternal and child mortality, and high levels of violence and injury, and an increasing affliction of non-communicable diseases (NCDs) (Basu, 2018, p. 48). Considering South Africa's increasing burden of diseases and current economic instability, the growing threat of AMR poses potentially long term challenges to the national health and development of the population unless addressed adequately (Essack et al., 2017; Jasovský et al., 2016). These include using antibiotics to ameliorate TB epidemics and other bacterial infections related to HIV/AIDS. There is also high antibiotics prescription to manage infections from South Africa's high level of trauma (i.e. accidents and violent injuries), and combat South Africa's inordinately high maternal and infant mortality rates. Of course, antibiotics are also used to contain other communicable diseases and deal with certain comorbid NCD infections from diabetes, hypertension and cardiovascular diseases (Basu, 2018; Department of Health, 2015a).

In South Africa, as is the case with other LMICs, the overuse of antibiotics impacting human health can be substantially reduced if healthcare professionals (HCPs) prescribe antibiotics only based on regularly updated standard treatment protocols (Essack et al., 2017; WHO, 2018a, 2018b, 2015b). Communication campaigns are generally aimed at the public and are

relatively rare for health professionals, based on evidence from global literature. High-income countries, such as Japan and Finland, for example, have had some success in improving antibiotic adherence with digital media AMR campaigns focused on human health (WHO, 2017c). South Africa is one of the few LMICs that promotes rational use of antibiotics through standardised selection, procurement and use; which is relatively well-supported by the national AMR stewardship (AMS) programme (Chetty et al., 2019; Essack et al., 2017). However, as is explored in sections 1.4 and 1.6, there are several deficiencies, often informed by low resources contexts, in how LMICs and South Africa approaches AMS and AMR communication.

1.3 The dangers of antimicrobial resistance from food sources

As shown in Figure 1 and Figure 2 (FAO, 2017; Interagency Coordination Group on Antimicrobial Resistance, 2019), a significant driver of AMR is the overuse and misuse of antimicrobials to boost agricultural productivity and prevent disease in livestock (CDC, 2020a; Feeds, 1980; WHO, 2017a, 2015b). This systematic, often reckless, mostly under-surveyed, and often unregulated, use of antimicrobials for food heightens the risk of resistance in microbes (FAO, 2018; Global Agriculture, 2020; Mayen, 2018; Schar et al., 2018; Van Boeckel et al., 2019); and when such food is consumed regularly, the resistant microbes can be transferred to humans (WHO, 2017a, 2017b). The dangers of AMR from food sources and the ways it is being curbed will be further developed in section 2.4.

1.4 Antimicrobial Stewardship in South Africa

Information about AMR and how to combat its spread is more accessible to healthcare professionals and scientists than the general public (Nahrgang et al., 2018; Redfern et al., 2020; Walker, 2019). Dutta-Bergman (2005), and Viswanath and Finnegan (2002) reflect on the potential of independent health information campaigns from experts in the field and show that they are necessary for public health education, and this study contributes to their reflection. At the national level, in South Africa, various governmental and private organisations have created biomedical spaces for clinicians, laboratory experts, and health professionals to learn more about and surveille the current strains of resistant microbes (Albert, 2018; Brink et al., 2016; Schellack et al., 2017). These spaces consolidate biomedical

data from participating hospitals on these microbes and gauge how best to prepare for worst-case scenarios to inform and strengthen the National Action Plan from the South African Department of Health (Chetty et al., 2019; Department of Health, 2017; Schellack et al., 2017, 2017).

Presently, the general public can educate themselves and their families about AMR and what can be done to combat it by actively reading relevant information on the internet and published literature on AMS. Published research is freely available through repositories like Google Scholar, official academic journal websites, and academics publishing their research and discussing AMR and AMS in South Africa (CDC, 2020b; Department of Health, 2017; ReAct, 2020, 2017; WHO, 2018b, 2015b). For the general public who are aware and concerned, there are online antimicrobial stewardship (AMS) pledges available, such as the ‘Antibiotic Guardian’ created in collaboration with Public Health England, Federation of Infectious Diseases Societies of Southern Africa (FIDSSA), the South African Antibiotic Stewardship Programme (SAASP), and the South African Department of Health (FIDSSA, 2014). The ‘Antibiotic Guardian’ pledge is important because concerned members of the general public who are interested to learn more about AMR, and also show their engagement with the issue on social media, can do so through the pledge. This online pledge, which the public can access on the FIDSSA website and engage with on Twitter, using the hashtag #AntibioticGuardian currently has 85,066 pledges (FIDSSA, 2020, 2014).

1.5 The One Health approach, food safety, and health communication

The 2017 WHO-endorsed One Health approach encompasses all the drivers that accelerate antimicrobials' entry into human, animal, and environmental (WHO, 2017d) spheres. The innovative One Health approach, particularly with its strong communication component aligned with Objective 1 of the WHO Global Action Plan (WHO, 2015b), is both a holistic perspective of the drivers of AMR and a proposed response to the problem. The approach explains why thinking holistically about AMR is necessary (WHO, 2017d), as shown in Figure 1:

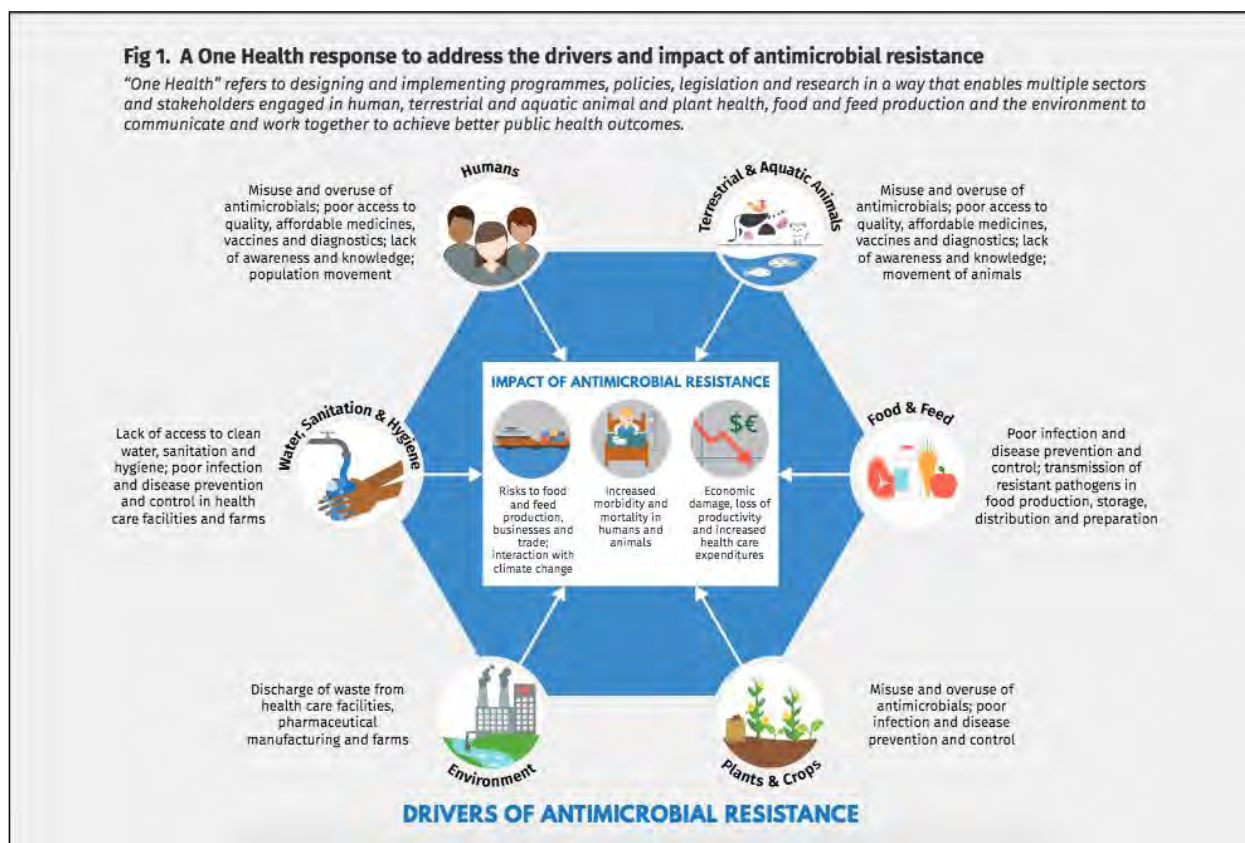


Figure 1: The One Health approach (Interagency Coordination Group on Antimicrobial Resistance, 2019).

Figure 2, similarly, presents the various drivers of AMR and offers readers an easy-to-read breakdown of the different levels of curbing AMR. This infographic presents four ‘Food Safety’ tips as a series of consumer-level behaviour change actions that can be taken by the general public.

At the global level, the WHO is a credible source of health information providing verified facts on AMR-OH because of their large scale research, surveillance from regional offices (Essack et al., 2017) and established presence as a health information source (WHO, 2019a, 2018a, 2017d, 2017a, 2015b; World Health Organization, 2015). As a global health policy and guidelines authority of the United Nations (U.N.), the WHO provides a standardised approach for all member states to address a worldwide public health problem.

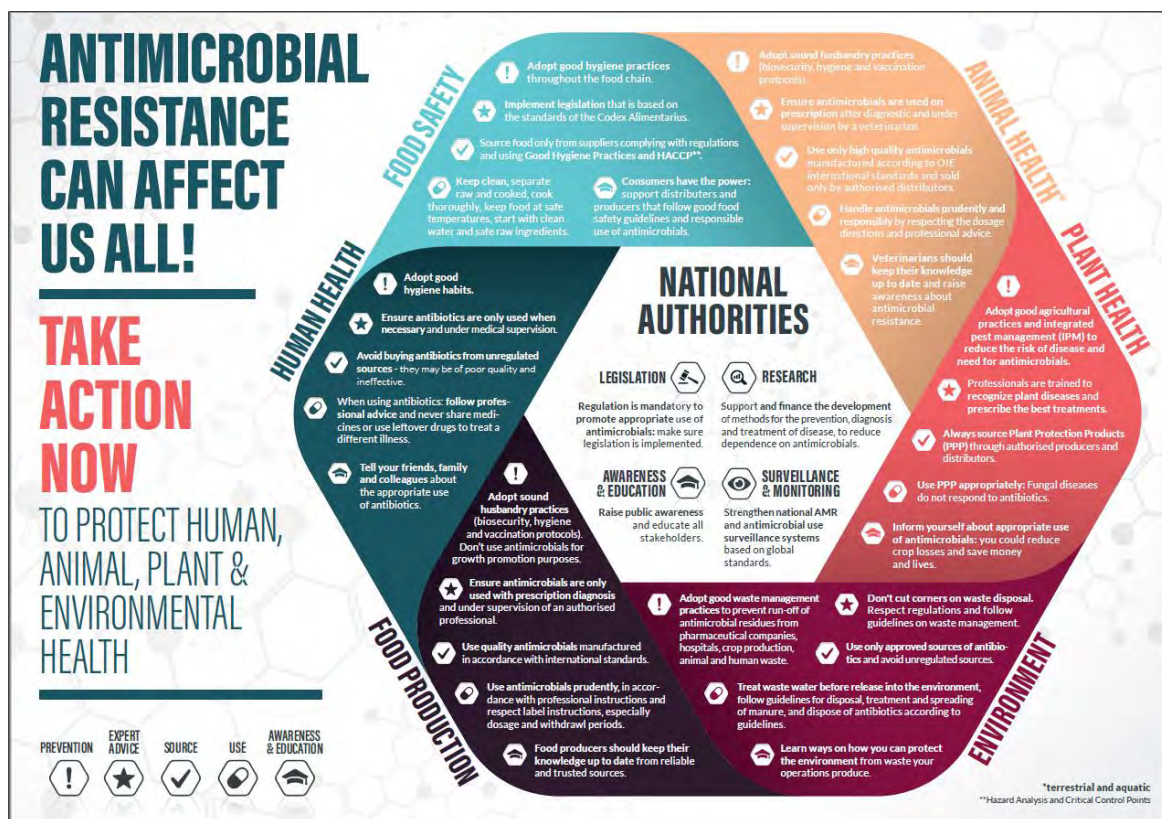


Figure 2: FAO's infographic representing the sources and solutions to AMR from all of its drivers (FAO, 2017).

The WHO's One Health approach (Figure 1) and the FAO's infographic (Figure 2) both call for a more controlled, responsible use of antimicrobials (especially for livestock and agriculture to avoid hastening the evolution of ever-more resistant microbes) at legislative and food producer levels. In particular, Figure 2 offers a way for consumers from the general public to play a role in addressing AMR by being aware, learning more, and changing or adding to their current behaviours.

1.5.1 Food safety

The four food safety steps, as endorsed by FAO for consumer-level behaviour change in Figure 2, are: clean, separate, cook, and chill. Clean refers to the need to use clean hands to handle raw fruits and vegetables before washing and consuming them. Raw and ready-to-eat foods must be kept separate while preparing, consuming, and storing so there are fewer

chances for potential microbial transmission. The FAO encourages all meat to be cooked thoroughly, and that all food items are stored at 4 degrees Celsius in a refrigerator when not being consumed.

The WHO's One Health approach informs this study's examination of the current health communication and behaviour change literature. The food safety tips directly inform the conceptualisation of digital educational materials that could be implemented in future health communication research to effect behaviour change in Peer Educators. The One Health approach is explored in more detail in the Literature Review, and specific application-relevant aspects are presented in the Methodology chapter.

1.6 South Africa's adoption of the One Health approach & current AMR stewardship

The South African Department of Health has recently adopted the One Health (WHO, 2017d) approach to implement an AMR stewardship campaign through the Antimicrobial Resistance National Strategy Framework 2018-2024 ("South African Antimicrobial Resistance National Strategy Framework: A One Health Approach 2018-2024," 2018). This Framework (Mendelson, 2015; Mendelson and Matsoso, 2015) seeks to involve healthcare professionals (HCPs), veterinarians, and agriculture and pastoral farmers to guide and advise the government on improvements to human, animal, and ecological health through the responsible use of antibiotics. This strong national response to this public health issue has begun to influence the knowledge, attitudes, and practices of HCPs in public and private settings (Chetty et al., 2019; Farley et al., 2019; Khan et al., 2019; Pressentin et al., 2019). Impacts from such national responses have been positive at hospitals where the stewardship programmes were conducted; for example, there has been a rise in AMR awareness and need for stewardship. However, among the general public, in an LMIC like South Africa, basic knowledge of how to prevent bacterial infections, and adherence to TB treatment and other diseases is still relatively low in rural areas, and knowledge of AMR from food sources is, from available evidence, significantly lower (Essack et al., 2017; WHO, 2019a, 2018b, 2018a, 2018c, 2013).

Antimicrobial stewardship (AMS), is a set of processes and approaches aimed at helping HCPs, community health workers (CHWs), and the general public gain greater awareness of the threat AMR poses to healthcare systems and take appropriate action. The WHO has published a practical toolkit for AMS in low-resource settings, and emphasises the need for “effective communication, education, and training” (WHO, 2019a, p. 01). Stewardship plays a crucial role, in the One Health approach, as an active, engaged system of human surveillance and advocacy for rational use of antibiotics for human, agriculture, and livestock (Chetty et al., 2019; Holloway, 2020; “South African Antimicrobial Resistance National Strategy Framework: A One Health Approach 2018-2024,” 2018; WHO, 2015b). Some HCPs, in certain South African public sector hospitals, have been among the first to take it upon themselves to use and call for the responsible use of antimicrobials, and raise further awareness about the issue (Chetty et al., 2019; Holloway, 2020; Pressentin et al., 2019; WHO, 2015b).

1.7 Rationale for a digital AMR-OH campaign

There is a dearth of research and literature on health communications that have been designed to improve public antimicrobial resistance awareness or promote stewardship among the public (Akpan et al., 2020). This paucity is critical to raise in this research because - while individual and communal change is possible regarding human health, which is an aspect people can control - the food-chain and environmental aspects of antimicrobial misuse and overuse is something people do not have direct control over, or even much knowledge or opportunities to influence policy. The most effective way to combat AMR-OH collectively will likely be an increase in knowledge and awareness of what the threat is, and to advocate practices that limit the consumption and use of antimicrobials in humans, animals, plants, and the environment, and spread awareness about AMR and One Health (WHO, 2017d, 2015b). In this digital and social media age, it makes sense to create digital tools to, at least, supplement communications campaigns. In some cases, such as AMR, it may make sense to make campaigns primarily or exclusively digital, even if only some face-to-face facilitation of the behaviour change programmes is retained. To strengthen workplace health promotion, particularly on AMR from food sources, opting to use WhatsApp as the channel of communication among PEs is worth exploring and evaluating. More about the effectiveness of WhatsApp in health communication will be presented in section 2.6.6.

The conceptualisation will present a step-by-step process of designing, implementing, and evaluating a digital media AMR-OH behaviour change intervention for Peer Educators. This is a part of the study to ensure that a “blueprint” is available when such an intervention can be implemented in future.

1.7.1 Rhodes University Peer educators as end-users of health communication

Rhodes University academic projects raised awareness about relevant health issues for Peer Educators, such as the dangers of the over and misuse of alcohol (Marara, 2018), tobacco (Duxbury, 2018), the importance of heart health through salt regulation (Mushoriwa, 2017), and more recently the dangers of human misuse and overuse of antibiotics (Govender et al., 2018). These projects are biomedically focused on non-communicable diseases (NCDs) and lifestyle changes, but they tested their printed educational material using health communication assessment tools such as the Patient Education Material Assessment Tool (PEMAT) (Shoemaker et al., 2014) and the Suitability Assessment Material (SAM) tests (Doak et al., 1996).

Through participatory action research, Sharma *et al.* (2018) used a print-based intervention to address the consequences of alcohol abuse specifically aimed at Rhodes University support staff with low formal literacy. Similarly, a study on tobacco use conducted by Duxbury (2018, pp. 52–94), co-developed a print-based Health Information Leaflet (HIL) to improve knowledge and awareness about the negative impacts of smoking. Both studies relied on participatory action research to conduct their interventions. These are useful reference points for this study because of two elements: health information communication through media, and community-engaged, participatory action research for workplace health promotion (WPHP) (Chigumete et al., 2018). From the media perspective, as a print-based intervention, the HILs were aimed at low-literate audiences and tested for readability, actionability, comprehension and suitability (Chigumete et al., 2018; Duxbury, 2018; Mushoriwa et al., 2017; Sharma et al., 2018) to ensure it was contextually and culturally relevant to the intended readers. These participatory action projects were integrated into the University’s peer educator’s health information repository for future use. Such studies offer insight into how health information is received, how participants make meanings from printed media, and how media studies theory could be beneficial to creating prevention interventions for public health issues. However, these studies with the Rhodes University PEs did not use a baseline

indicator test, such as the Clear Communication Index (CCI) (section 3.8.2), for the health communication they created.

1.7.2 About the researcher's interest in AMR-OH

This study is a practical and academic intersection of two of my interests. The first is aesthetic and appropriate 'fit-for-purpose' communication design, and the second is effective health communication. During my undergraduate degree I specialised in producing digital media alongside the theory coursework. This specialisation led to a better understanding of why a mindful, holistic approach to design is vital to communication. My interest in health communication stemmed from following Dr Sunitha Chandrasekhar Srinivas's professional work at Rhodes University.

My interest in AMR-OH stemmed from Srinivas's conceptualisations of AMR health information targeting safe medicine use and adherence among the PEs. This work was preceded by her conceptualisations of non-communicable disease (NCD) educational interventions with the PEs. In these projects, health information was presented on printed health information leaflets (HILs) to deliver the simplest version of the information in an accessible format. At the time, as an undergraduate student at the School of Journalism and Media Studies, I was involved in proofreading these HILs, and saw the need for better designed, more appealing presentation of health information. My interest in the digital element of health communication design was piqued in 2019. As an explorative exercise for my thesis proposal, I combined my interest in communicating health information with my passion for simplifying complexity through aesthetically pleasing digital formats. This solidified my research direction.

AMR from a pharmacist's perspective is all about safe medicine use, storage, and adherence. However, AMR still flows in and out of the larger systems of human life through other paths – one of which is food. The dearth of context-specific AMR-OH health educational interventions was evident during the initial reviews of public health and health communication literature. While this topic was met with interest among the academics and students, it had not yet been something that the target audience cared about before. The introduction of theory to this practical challenge of design and generating awareness was new to me, and it was something I looked forward to learning.

1.8 Research questions

This study's overarching research framework seeks to better understand how a Social Behaviour Change Communication (SBCC) and One Health informed approach might facilitate the creation of digital educational materials about the dangers to humans of AMR from food sources and food safety for Rhodes University Peer Educators (PEs). To provide insights, the researcher has segmented the overarching research framework into two key research questions (RQ):

RQ1: What are the elements of Social Behaviour Change Communication interventions that could increase awareness and knowledge about the danger of AMR arising in humans from the overuse and misuse of antibiotics in the food industry; and therefore, what potential adoption of food safety behaviours, could be incorporated into the conceptualisation and design of the proposed digital AMR-OH intervention, for Rhodes University support staff?

The study's first objective is to identify what can be learned from other health communication and behaviour change interventions to inform the creation of digital materials about the dangers of AMR from food sources. A literature review will identify the effective uses of digital media in social behaviour change communication to conceptualise¹ the context-specific digital educational materials in two formats. The first will be a short explanatory video about the source, presence, and dangers of AMR from food sources. The second will be an infographic to communicate the four behaviour change goals (i.e., food safety steps), and their importance and relevance to the consumer-level action against AMR from food sources.

RQ2: Based on the PEs' existing awareness of AMR, what themes can inform and be used to evaluate an end-user feedback-based conceptualisation of this intervention design?

After creating samples of the digital educational materials about the topic, the two materials (i.e. the video and the infographic), will be shared via WhatsApp. The step-by-step process of evaluating its accessibility, relevance, helpfulness, and cultural appropriateness with the volunteering Peer Educators are presented in the Methodology chapter. A pre-existing knowledge of AMR as a healthcare/health information counselling concept was a necessary foundation on which to build AMR-OH knowledge. As stated in sections 1.7 to 1.7.2, there were other health education projects from another faculty taking place, including ones on

¹ 'Conceptualisation' in this study refers to the design and development of the digital AMR materials.

AMR, for the PEs. Therefore it was necessary to establish that the PEs have this foundational understanding before talking about the AMR from food sources. Additionally, the presence of this foundational understanding means that the two materials from this study offer PEs the next step of their awareness and understanding of AMR. The study uses the researcher's digital media skills to conceptualise an evidence-based, accessible, and contextually-relevant educational digital HC materials for the Rhodes University Peer Educator group. This intervention also expands their educational repertoires beyond their HIV/AIDS, NCD prevention work by including AMR-OH advocacy.

This study does not aim to inspire any form of public activism, reduce individual choice to consume meat or protest against the meat industry and the government of South Africa's current regulations. This research focuses on the step-by-step conceptualisation of digital educational materials about the awareness of the danger to humans of AMR from food sources; and the individual, consumer-level actions of adopting the four food safety practices.

1.9 Theoretical background

This study draws on Social Behaviour Change Communication (SBCC) to identify the elements best suited to conceptualise behaviour change digital educational materials about AMR from food sources and consumer-level food safety in the South African context.

1.9.1 Social Behaviour Change Communication

As is explored in more depth in Chapter Two, SBCC is a health communication approach that looks at changing specific behaviours through communicating actions that can be taken within a particular community to help them improve their health (Booth, 2015; Family Health International, 2002; Gurman et al., 2012; Koenker et al., 2014; Ntshebe et al., 2006). Usually, when SBCC theory and approaches are used to design and inform health communication interventions, this requires face-to-face interaction with research participants (usually members of the community that the research will target) to current behaviours, responses and beliefs and to construct communication to challenge those beliefs and promote different behaviours to improve health.

Persuasive communication (PC) is another field informed by media studies, consumer behaviour, and health communication, which looks into how consumers of any kind can be persuaded to change ideas into adopting a set of behaviours. Health communication, particularly in the more effective interventions, uses PC in the form of narrative to raise awareness and change behaviours (Adam et al., 2019; Balint and Bilandzic, 2017; Cardarelli et al., 2017; Guttman, 2017; Occa and Suggs, 2016; Shen et al., 2015; Willoughby et al., 2016).

Communication campaigns and studies that have used SBCC and PC opted for a variety of relevant, contextually-appropriate media, ranging from posters and flyers to videos and Twitter hashtags, depending on their participants' formal and health literacy levels (Adam et al., 2019; Balint and Bilandzic, 2017; Cardarelli et al., 2017; Occa and Suggs, 2016; Shen et al., 2015; Willoughby et al., 2016).

1.10 Methodology

As is explored in depth in Chapter Three (Methodology), this study draws on the most relevant elements of the recommended approaches from SBCC to conceptualise the digital educational materials about AMR from food sources and food safety. The design also incorporates the One Health approach with SBCC in creating awareness.

The design process uses a limited amount of end-user feedback to conceptualise and develop the digital AMR-OH materials for the PEs. More feedback was initially planned for, before the COVID-19 Health Emergency. The researcher first evaluates the materials using the Clear Communication Index test, and then end-user feedback is obtained from semi-structured interviews and the Patient Education Material Assessment Tool (PEMAT) (Blagojevic and Kelly-Campbell, 2020; Kang and Lee, 2019; Sharma et al., 2018; Shoemaker et al., 2014; Zellmer et al., 2015), the Suitability Assessment of Materials (SAM) (Doak et al., 1996; Finnie et al., 2010; Hoffmann and Ladner, 2012; Rhee et al., 2013; Shieh and Hosei, 2008; Smith, 2008) tests with a small number of individual participants via WhatsApp. The analysis includes whether this practical health communication behaviour change project could serve the Peer Educators' knowledge and outreach; and whether the digital educational materials (i.e., proofs of concept), were relevant, engaging, and appropriate to their formal and health literacy levels.

1.11 Chapter summary and thesis outline

The Introduction chapter first introduced the problem and research area this study is situated in and how it addresses the problem. The subsequent five chapters in this thesis present the literature review, the methods used, results, discussion, and conclusion. The literature review explores the relevant studies from SBCC and public health communication, the end-user tests used to evaluate the readability, understandability, and actionability of materials, and present this study's design benchmarks. The Methodology chapter presents the three phases of the research process and explain how data was collected. The Results chapter presents the analysed data collected during the research process. These results and their implications are discussed in relation to other studies in the Discussion chapter. The conclusion closes this thesis by highlighting the strengths, limitations, and recommendations of this study.

2 Chapter Two: Literature review

2.1 Introduction

As stated in Chapter One, this research project seeks to conceptualise and design the materials for a digital health information intervention with the goal to improve awareness about antimicrobial resistance. It incorporates the World Health Organisation's One Health approach and is aimed at Peer Educators (PEs) at Rhodes University. This project distinguishes between awareness creation among individuals of policy-driven actions taken by the government to regulate the overuse of antibiotics in the food production industry, and the consumer-level food safety actions individuals can take when handling and consuming meat. This study foregrounds the problem of AMR from food sources as relevant to people, and emphasises the food safety actions that are feasible. It investigates which core elements are needed to create a digital media intervention that might increase AMR-One Health (AMR-OH) knowledge and awareness, and potentially stimulate behaviour change through food safety practices among the PEs. This intervention focuses on the PEs, but might also have wider applicability beyond Rhodes University.

This chapter covers three areas relevant to this study. First, it overviews health communication and explores key health communication theoretical milestones, and presents, through considering key debates, how the thinking has advanced over time. It also elaborates on the role that community-centred approaches play in the success of health communication (sections 2.2 and 2.3). Second, the chapter explores the capacity of digital media to enhance health communication and the kinds of digital approaches (and channel choices) other communication campaigns have used (section 2.3). Third, theory-informed approaches to health communication intervention design are reviewed to provide the basis for this study's design benchmarks (section 2.8). This final section draws from the elements of other intervention designs and presents the design benchmarks in detail for the materials conceptualised and designed in this study.

2.2 Health communication as a field

To situate the study's aims in the literature, this section draws out relevant themes about creating public health communication campaigns, epidemiology communication, psychology-

influenced models, debates, and contestations which affected modern health communication since the 19th century. Health communication is defined as “The study of how health information is generated and disseminated and how that information affects individuals, community groups, institutions and public policy” (Harvard School of Public Health, 2021). This study aims to first identify the most effective elements of communicating health information, and then draw on that to design a set of materials about AMR and refine that through obtaining and incorporating end-user feedback.

The concept of communicating information to prevent disease and promote health has existed for millennia. With the improvement of communication through language and social relationships between groups of people, the idea formed that certain aspects of one’s health depends on the decisions of others to also practice and ritualise healthy behaviours (Saini, 2016; Salmon and Poorisat, 2020; Svalastog et al., 2017). Social organisations, particularly the religious kind, prioritised preventative measures against disease. These practices emphasised the need for hygienic living, consumption, and agricultural and pastoral practices (Allegranzi et al., 2009). A simple example of this intersection between health communication and socio-cultural ritualisations of health behaviours is the practice of hand hygiene embedded in ritual religious practices (Allegranzi et al., 2009; Khuan et al., 2018). Centuries ago, communication was didactic and shared from one source to an audience of one or many through oral traditions, such as ritual, song, spoken word, epic poetry, and various forms of social pedagogy, especially in pre-colonial Southern African societies. The advent of the printing press and mass literacy through missionary language education created a tremendous shift to mass communication. Then, in the 19th century, with the invention of broadcasting technologies and devices, people around the world with access could learn about scientific advances concerning public health, such as the germ theory of disease.

Prioritising health became an important social value to modern society, especially in the post-WWII world, and was linked with personal well-being (Thomas, 2006, pp. 39–40). This meant that as more people were exposed and understood the concept of germ theory, the more health as personal responsibility for community well-being was encouraged. In the United States of America, this social value indicated the need for an institutionalised tertiary healthcare system that developed in tandem to health communication. In the West, health communication was legitimised as an impactful field of study in the early 1970s, and this led to more standardised channels and forms of health communication (Kreps, 2014, p. 568).

However, the effects of what was legitimised and institutionalised in the US remained within its borders. On the other hand, the World Health Organisation (WHO) developed and guided the policies and procedures of healthcare systems in over 190 member states by the WHO, and this had a larger impact than the institutions in the US alone (WHO, 2021).

Communication as a field of enquiry was studied because of its positive impacts on health promotion, literacy, and delivery (Kreps, 2014). Studies from this field are as varied as there are health issues, and as nuanced as the social environments for which they are designed. According to Kreps *et al.* (2014) there are two “interdependent” perspectives of communicating health: “health care delivery” and “health promotion”. While the former focuses into the effectiveness of health communication in the delivery of healthcare, the latter hones in on the persuasiveness of mediated communication that promotes health (Kreps *et al.*, 1998). In the context of this study, the broader field of “health promotion” is drawn upon to design a digital media intervention to improve AMR-OH awareness and cause potential behaviour change among PEs.

At a global level, since 1948, the WHO has played a pivotal role in promoting, theorising, and the deployment of health communication and a shift to primary healthcare to raise awareness, improve knowledge, understanding, and practices to promote health (WHO, 1998). The WHO’s Alma Ata Declaration of 1978 presented, and continues to represent, the renewed focus on participatory primary healthcare, where the community members partner with locally available health systems to encourage self-reliance in the organisation and operation of “preventive” and “promotive” healthcare resources (WHO, 1978). The Declaration represents the potential for the spirit of partnership for health education and empowerment. While the Declaration provided a vision for strengthening local primary healthcare initiatives on a global scale, the international conference on primary health expressed an urgent need for the “world community” to protect and promote the health of all people in the world (WHO, 1978, p. 159).

The varied socio-political and knowledge environments, in which campaigns for issues such as smallpox, polio, HIV/AIDS, and even family planning were created, have also incorporated health communication. The WHO’s emphasis on primary healthcare has shifted the focus to a deeper consideration and inclusion of individuals and communities taking action and being accountable for their own and their community’s health (WHO, 1998). The transition to large scale primary healthcare initiatives and their related health information

campaigns required the conceptualisation and design for specific factors such as age, culture, and language (Svalastog et al., 2017). These factors are matched with the appropriate media for message delivery (Svalastog et al., 2017).

Since the early 1990s, the development of the internet, and then of social media, and more recently, the wide availability of smartphones, has allowed health information to be far more accessible. However, this has not made health communications redundant. As, Svalastog *et al.* (2017) argue, social understanding of health information depends on a variety of factors, including, but not limited to, formal literacy level, identity, social norms, cultural ideas of what constitutes health and well-being. These factors are necessary to inform the design of health information to attract the focussed attention of participants.

Traditionally, health communication has been “top-down”, and health issues that are focussed upon are often determined by existing social power structures and relations between members of society (Dutta-Bergman, 2005, pp. 105–106). This approach to the framing of problems has often led to solutions that maintain the marginalisation of indigenous and vulnerable groups, of which women, and people of colour, are a significant part (Callander et al., 2020, p. 02; Nelson and Macias, 2008, pp. 21, 26). In LMICs, efforts are being made to sensitively and sustainably collaborate with local communities and leaders to address health issues through local solutions. These local solutions are prevention-based and present opportunities to address health issues at the primary healthcare level. One such primary healthcare example is of Dixon Chibanda’s initiative, the Friendship Bench, designed to improve people’s comfort with the idea of seeking mental health care in Zimbabwe (Nuwer, 2020; Weisberg, 2019). Chibanda collaborated with local “grandmothers” (elder women from various communities) to get people talking to them about mental health, and seek non-medical advice in a known, destigmatised physical space: a regular bench at a community park. This example shows that non-medical volunteers can be trained and integrated into healthcare systems to support HCPs in addressing public health issues.

The majority of the health communication initiatives were designed to address major and urgent health crises, such as Cholera, and the 1918 flu outbreak, among others. Post WWII, the focus was on smallpox and the rise of HIV/AIDS. Another such initiative, although with much more funding, is the Soul City campaign to destigmatise HIV/AIDS in South Africa, curb risk behaviours and decrease incidence rates (Soul City Institute, 2019). This campaign viewed the problem of HIV through a South African lens, focusing on youth and at-risk

populations, and was designed to inform them about HIV/AIDS, what causes it, and how to prevent it. This information included the further health and social risks of contracting the illness. The Soul City health information campaign was sustained, contextually specific, and is regarded as a milestone to understand the improvement in knowledge and awareness among the viewers (Tufté, 2007). Such initiatives, especially in severely resource-constrained settings, offer an alternative to a hegemonic, “top-down” approach to health communication; and rely on professional collaboration between community members and the campaign.

Kline and Khan (2019) argue for the need for collaborative efforts to bridge the digital, health literacy, and even economic gaps through deliberate, sustained, and sensitive health communication. Kline and Khan suggest collaboration with fields such as “nursing, medical education and training, health education and health promotion, health psychology and sociology, and other health professional settings” (Kline and Khan, 2019). With such collaborations critical health communication has the opportunity to not only present itself as a necessary element of designing health communication, but also diversify the research from the other public health fields. Such arguments for theory-informed, transdisciplinary collaborations are echoed and championed by other leading experts of health communication, and have inspired this study to do the same within the context of a low-resource, pandemic-constrained setting.

Under the critical lens, health communication came to build itself on theories and models that could help identify what people valued about their health, and the stages to behaviour change that campaign designers would need to take people through. Theories, such as the Health Belief Model and Theory of Reasoned Action, have informed health communication since the 1970s, and they all focus on the individualistic nature of behaviour change and effects of persuasion (Dutta-Bergman, 2005, pp. 105–106). However, Dutta-Bergman (2005, pp. 106–107) argues for researchers to consider the collective aspect of behaviour change, in that despite a theoretically individualistic model, an individual’s choice to adopt healthy behaviours depends on what is socially acceptable. Health communication campaigns, especially in traditional and under-resourced settings, require the additional element of addressing the collective’s impacts on individual behaviour choices, and engage with community leaders before attempting to address the individuals within it.

2.3 Health communication campaigns

Though health promotion and disease prevention are the easier, more efficient, and less-resource intensive options, when compared to treatment of diseases (especially chronic), evidence shows that there are insufficient effective health communication campaigns. Health information and healthcare advice were often disseminated through propaganda and advertising in the form of posters, radio broadcasts, films, and, in the modern era, a combination of print and audio/visual (WHO, 2009, p. iv). During the First and Second World Wars, governments thought it prudent to encourage morale and improve population well-being through communication via public posters (Public Health England, 2017; US National Library of Medicine, 2012; WHO, 2009, p. iv). Sincere and sustained efforts were made to create media that would remind people whom they were fighting against and what kinds of people could join the fight (i.e., healthy people). Such messages, defining the values of a war-time society, such as eating and drinking moderately, and maintaining good personal hygiene, were conveyed through posters encouraging the adoption of healthy behaviours to support the national interest (Public Health England, 2017).

In the global North, public health communication campaigns have improved remarkably since the 1940s and can be traced over three distinct developmental eras (Viswanath and Finnegan, 2002, p. 289). Viswanath and Finnegan summarise that public campaigns began with many failures in what is called the “minimal effects” era between the 1940s-1950s, and in the 1960s transitioned into the “Campaigns CAN succeed” era. While the first era was still learning about the effects of mass media, the second era had implemented those lessons and enjoyed some success - especially for campaigns that employed a varied methodology over a long period of time. It was only in the 1980s, the so-called “moderate effects” era, after applying theory to the practice in a more systemic fashion, building in notions of testing and pre-testing, and monitoring and evaluation, that health communication campaigns began to reach their potential to change behaviours (Viswanath and Finnegan, 2002, pp. 289–290).

In the United States of America (USA), some of the earliest large scale health communication campaigns covered cardiovascular disease (CVD) and associated risk factors during the 1960s, and used mass media to foreground the gravity of CVD (Viswanath and Finnegan, 2002, p. 296). With the emphasis on valuing “prevention” and preventive behaviours (Clark, 2020), these campaigns were somewhat successful, found that there was a steady increase in

knowledge of CVD risk factors and in the number of people who opted to test their blood cholesterol levels (Viswanath and Finnegan, 2002, p. 296).

For the rest of the world, the WHO, in partnership with local, non-governmental organisations, was looking into relevant issues of public health in LMICs such as vaccination, family planning, TB, HIV, and malaria awareness (Palilonis, 2016). These campaigns were all geared towards changing risk behaviours (Palilonis, 2016).

High Income Countries (HICs) such as the USA and the United Kingdom (UK) remained the primary donors to global organisations like the UN, WHO, and the International Monetary Fund (IMF) (Palilonis, 2016, p. 06). Structural adjustment programmes were initiated by international economic organisations, such as the World Bank and the IMF, to prioritise the economies in LMICs to facilitate their debt-repayment (Palilonis, 2016, p. 06). While the prioritisation of an economy is essential for an LMIC, doing so at the cost of other aspects essential to national development, such as education and healthcare, is harmful. This shift in national priorities towards economic interests is essential to consider because this study deals with AMR from meat and animal products (i.e., a crucial economic sector) in South Africa. Meat industries in LMICs are catering to growing populations, and to sustain their business, farmers' misuse and overuse of antibiotics to promote growth and prevent disease in healthy animals, living in a variety of industrial environments, is adding to the threat of AMR from food sources (Feeds, 1980; Hughes and Heritage, 2004; Klein et al., 2018; Schar et al., 2018; Van Boeckel et al., 2015). However, an example of a LMIC prioritising the threat of AMR-OH is Namibia. In 1991, Namibia was the first African country to create and enforce legislation to ban the use of all growth-promoting hormones, and the misuse of disease-preventing antibiotics, in their beef industry (WHO, 2017e). Due to their public awareness of AMR from food sources (AMR-OH), this legislation was enacted, and Namibia became the first African country to export organic, and responsibly reared meat to the European and US markets (WHO, 2017e). The Namibian legislation is an example of the benefit of a nation prioritising both their economic and health interests.

2.3.1 Channels of health communication

As presented above, health information has been communicated through every medium available to people. During and between the World Wars information suggesting changes in

everyday practices (eating, drinking, smoking, sexual behaviours, and personal hygiene among others) were primarily conveyed through context-specific, culture-sensitive posters (Public Health England, 2017; WHO, 2009). Once radio and television technologies were developed, these were also employed as useful channels to reach and engage with more distant and widespread audiences. Radio and television are still a reliable channel of communicating urgent information, and remain a channel to deliver consistent reminders regarding health behaviours in South Africa and other African countries (Bosch, 2020; Sarfo, 2012; Scheepers et al., 2004; Soul City Institute, 2019; Tufte, 2002), as is the case for the COVID-19 pandemic in Mozambique (Colonna, 2020).

In the early 2000s the rise of mobile technology led to the development of various mobile health (mHealth) initiatives and interventions in urban areas, but were also aimed at households in rural communities (Chen et al., 2018; Isler et al., 2019; Ojo, 2018; Olu et al., 2019). As the communications technology improved its reach, there were advances being made in science and medicine that allowed people to be better informed about them via new technology. This meant that the health issues which were covered were designed and disseminated specifically for the public. Multimedia communication channels, such as a combination of radio, print, and television were used to promote health information. Additionally, with the ease of access to the internet, especially in urban areas, digital health (eHealth) became another milestone for health communication. Noar and Harrington (2012) argue that “biomedical strategies also often require behaviour change” (2012, p. 10), and rightly so because with the rise of eHealth more people could be informed of behaviours relevant to the most pressing health issues in their areas. Soon health information and campaigns were being communicated through social media directly to individually owned digital devices (sections 2.6.1 - 2.6.6). Health and risk communication via social media has become an interactive experience, and it is suggested that interactivity is an important component of successful behaviour change (Noar and Harrington, 2012, pp. 05–06). Noar and Harrington (2012) echo Casell *et al.* (1998) regarding the need for health communication to be “response dependent” so that health messages become personally relevant to the receiver (Noar and Harrington, 2012, p. 06).

2.4 AMR-OH literature

The One Health approach is defined by the WHO as an “approach to designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes” (WHO, 2017d).

The approach foregrounds good communication across all levels of health care systems (i.e., consistent messages and a holistic approach), as a foundation on which nation-states and health educators can build media interventions to increase awareness of AMR and its effects.

Unlike the varied literature that can be found on HIV/AIDS or TB behaviour change communication campaigns, particularly relevant to the African or LMICs perspectives, AMR-OH is an emerging topic of scholarly research. It is essential to bring attention to the rampant misuse of antimicrobials in the meat, dairy, agriculture industries (Van Boeckel et al., 2015). This driver of AMR impacts human health more broadly than when antimicrobials are misused when treating human illnesses (Van Boeckel et al., 2015), because of how consistently people consume meat compared to antibiotic treatments. For example, because of the high global demand for animal protein, particularly in LMICs, the use of antimicrobials to boost animals’ health and productivity has been normalised (Schar et al., 2018, p. 02). In the United States, “*Antimicrobials are widely used for disease prevention and growth promotion in food animals. In the United States, antimicrobial use in food animals is estimated to account for ~80% of the nation’s annual antimicrobial consumption ...*” (Van Boeckel et al., 2015). Van Boeckel *et al.* (2015) further project that antimicrobial consumption will “nearly double” in Brazil, Russia, China, India, and South Africa (BRICS) (Schar et al., 2018, p. 02; Van Boeckel et al., 2015).

The context of this study covers rural and low-income perceptions of preparing and consuming meat safely in relation to AMR. According to Xazela *et al.* (2017) South African people, particularly consumers in the Eastern Cape, have a high preference for meat and dairy products and perceives it to have physiological and cultural importance. Although meat consumption patterns are not easily predictable, Xazela *et al.* (2017) conclude that South Africans’ positive perception of meat consumption combined with their “disposable income and cultural background” leads people to purchase it regularly. Supermarkets in South Africa have become more accessible to rural populations, and 65% of participants reported that they purchase meat from supermarkets because of their freshness and hygiene (Xazela et al.,

2017). More importantly, they posit that the meat industry should develop an interest in the rural populations' "quality cues" regarding the health and safety of the meat they purchase, because, not only will it keep rural communities safe, it will also add a competitive edge to the business. Here, again, there is evidence of economic interests influencing how public health issues are framed, and what aspects are prioritised.

The study also reported that 59% "were aware of the health risks, associated with meat consumption" (Xazela et al., 2017, p. 08), which included CVDs and cancers etc. This reported awareness supports the scope of this study in that PEs, as rural community members, have an understanding about meat and health risks. Additionally, the PEs in the context of this study, have sufficient prior experience with previous tailored educational projects on health, nutrition, and AMR occurring at the University to comprehend this study's AMR-OH information. The PEs' existing knowledge of AMR could aid in their adoption of the suggested food safety practices presented in this study. Furthermore, food labels are useful and credible sources of informing public and industry practices (N Koen MNutrition et al., 2016; Shangguan et al., 2019; Soederberg Miller and Cassady, 2015) . In South Africa, the Department of Health draws attention to the risks of such overuse of antibiotics far outweighing the advantages. However, for consumers, information about antimicrobial use in livestock and agricultural produce is not presented on food labels unless prompted by government regulations (Department of Health, 2011, pp. 36–38). For example, only the chicken and honey items explicitly require labelling about any antimicrobial use, according to the Department of Health Guidelines, despite the presence of other meat, dairy and animal products on the list which could potentially have been grown or cultured using antimicrobials (Department of Health, 2011, pp. 36–38).

In other countries around the world there is evidence that communication campaigns – created by health authorities, health professionals, and the public – can slow the spread of AMR through awareness programmes led by community-based participatory action. A major online information campaign run by the WHO is about antibiotic resistance, called 'AWaRe', to inform and influence HCPs and strengthen healthcare systems (WHO, 2019b, 2019c). The WHO encourages the spread of information to the public, concerning the negative effects of overusing antibiotics, through their websites on the topic and their associations with various non-governmental organisations (NGOs) and health ministries (WHO, 2018d, 2018e, 2017c). While the HCPs have gone digital to learn about and treat illnesses, there is a need for the

public to shift to digital media for disease prevention and health promotion, thus making the healthcare system more efficient. The use of digital media also offers the opportunity for widespread use to reach out and engage with the public on health issues. So, a context specific and culturally relevant digital media intervention to improve knowledge, awareness and access is a necessity, especially in a country that relies heavily on various antimicrobial treatments due to the quadruple burden of diseases.

2.5 Social Behaviour Change Communication

As presented in the Alma Ata Declaration of 1978, there is a need for social mobilisation to create a “world community” (WHO, 1978, p. 159) to improve preventive primary health care. SBCC offers a framework to operationalise social mobilisation for AMR-OH awareness and knowledge, and behaviour change action (the food safety steps). This study draws on the SBCC framework to design the AMR-OH materials for the PEs because SBCC focuses on creating sustainable health education for the intended end-user to adopt healthy behaviours. SBCC is a comprehensive approach that attempts to educate its target audience often through multi-media campaigns and also includes forms of ‘social mobilisation’ (Perlman et al., 2013) often with substantial face-to-face elements.

Alongside social mobilisation, SBCC interventions cover communication for behaviour change, advocacy, and strengthening media capacity (Greiner, 2017, p. 81). However, in recent years, health behaviour studies have incorporated social and digital networks to improve reach, accuracy and information retention over time, and expand topics (Gurman et al., 2012; Latkin and Knowlton, 2015). For example, Perlman *et al.* (2013) in partnership with the Soul City Institute, produced information about sexual and reproductive health aimed at young girls across South Africa (Perlman et al., 2013). Their campaign used the existing and trusted Soul City platform to educate and train regional staff in “edutainment methodology, research, print, and television...” (Perlman et al., 2013). It was a socially mobilised project, meaning the target audiences went through the stages of SBCC (see Figure 3), and is made aware and is urged to become concerned about a particular issue. Then their newfound concern, alongside relevant, accessible knowledge, motivates their contemplation of change. Finally, if the campaigns were effective, active behaviour change can occur once the audience can ‘internalise’ the campaign message (Ngigi and Busolo, 2018), overcome

barriers to change, and have opportunity to actively change behaviours based on the information the SBCC program has conveyed. Such campaigns are conducted in a community setting where key stakeholders or at-risk groups are participants. Behaviour change is encouraged and sustained by social support (Latkin and Knowlton, 2015) and actionable behaviours, and this intervention design embeds itself within an existing social and professional support system on campus.

In this study, SBCC offers a useful framework to structure and design the materials. It also leads the participants and the assessment and refinement of materials through the following stages, presented in the list below and in Figure 3:

- Unaware
- Aware
- Concerned
- Knowledgeable
- Motivated to change
- Practicing trial behaviours
- Sustained behaviour change



Figure 3: Stages of Social Behaviour Change Communication. (Family Health International, 2002, p. 07)

These stages rely on enabling factors such as the provision of “effective communication”, “creating an enabling environment”, and “providing user-friendly, accessible services and commodities” (Family Health International, 2002, p. 07). Each of these enabling factors, respectively, relies on mass media, reliable community networks, and group communication (Family Health International, 2002, p. 07). In this study, the researcher opted to incorporate the following stages and elements of the theoretical frameworks as presented in Figure 4:

STAGES OF Social Behaviour Change Communication

A step-by-step guide



Figure 4: The stages of SBCC that this study is concerned with. (Family Health International, 2002, p. 07)

This study deliberately limited itself to the first three stages (Unaware > Aware > Concerned), because it only aimed to conceptualise and design the AMR-OH materials. The materials would have to be implemented and tested to understand how this conceptualisation and design could increase knowledge, motivate participants to change, practice, and sustain the food safety behaviours; which are beyond the scope of this study.

The choice of media-use is a vital component of any SBCC process, but theory and design do not explicitly guide these choices. This project proposes delivering a short educational video via smartphone for this topic. Informed by the One Health approach, this study seeks to incorporate digital media elements into health and communication. The integration of SBCC and the One Health approach in this project acknowledges that while governmental policy may dictate what is expected of individuals, it is, more importantly, their awareness about the

problem and willingness to adopt safer behaviours to ensure their community's and their own health and well-being (Iskandar et al., 2020, p. 11).

Using mass media to spread knowledge and awareness about public health issues, and change health behaviours, has been beneficial and thriving because of the number of people the message can reach cost-effectively (Lankford et al., 2014, p. 1065). Noar *et al.* developed the Major Principles of Effective Campaign Design (Noar, 2006), and Lankford *et al.* (2014, p. 1066) used the principles created by Noar (2006) to design and analyse campaign effectiveness: (i) formative research; (ii) audience segmentation; (iii) theory-based; (iv) message design; (v) channel placement; (vi) process evaluation; and (vii) sensitive outcome evaluation. Formative research refers to understanding what the target audience requires from the materials through pre-testing the message. Audience segmentation is essentially categorising the audience into groups based on the members' age, prior experience with the suggested behaviour, and their personality characteristics. A theoretical framework provides the basis on which the message is designed and evaluated based on formative research and audience segmentation outcomes. The message is designed to “spark interpersonal discussions” through presenting it to the audience using a new and exciting channel. The channel of information delivery is also based on information from the formative research. And finally, the campaign is evaluated for its effectiveness and validity (Lankford et al., 2014, p. 1066).

Using these principles to analyse literature on health campaigns to increase physical activity, Lankford *et al.* (2014, p. 1066) found that while “exposure to the campaign message has long been a fundamental premise behind the success of a campaign, ...”, the use of the Principles such as from Noar (2006) proved to be an indicator of a higher success rate (Lankford et al., 2014, p. 1066). Noar (2006), based on their review of health campaign literature covering the years 1996 – 2005, proposed that such campaigns have a high impact because they used the suggested design principles, as presented above.

Another essential part of the campaign design, as Poland *et al.* (2009) prioritised, is developing a deeper understanding of the setting in which a health campaign or intervention might take place. According to them, intervention design, particularly for health information dissemination, is affected by various contextual factors such as computer literacy levels, access to the internet, and the health issues' immediate relevance to the individual and the community. Poland *et al.* (2009) created a framework based on their understanding of

settings to design, implement and analyse a health information intervention. They proposed that to create a space that allows community members and leaders to empower themselves, the design stage's two major focal points should be the community's context and capacity (Poland et al., 2009). The setting or context varies according to the community's social structures, power relations, the localised determinants of health, and the extent to which the community's environment has a bearing on their health and knowledge of the health issue (Poland et al., 2009, p. 508). The setting's capacity refers to the systems in place to organise and achieve the change, such as community, professional, governmental, and the "overall system" (Poland et al., 2009, p. 510).

Their framework is built on three components: understanding the setting, changing the setting, knowledge development and translation (Poland et al., 2009, p. 507). When combined, the framework offers a holistic perspective of the wider impacts of and on a public health issue and puts participatory action research into practice; which also helps researchers intervene, bridge a specific gap, and provide materials for a community to empower itself. In this study, the PEs' capacity and context have been strengthened in the University setting in which various collaborative workplace health promotion projects were facilitated (Chigumete et al., 2018; Duxbury, 2018; Govender et al., 2018; Pearse and Srinivas, 2018; Sharma et al., 2018).

Seven years before Poland *et al.* (2009) wrote about the importance of setting on intervention design, Kiwanuka-Tondo & Snyder (2002) proposed an organisational theory to understand how "organisational variables such as financial resources, participation, and training impinge on campaign design variables, ..." (2002, p. 60). They tested relationships between organisational factors, campaign design elements, and campaign quality within AIDS education and outreach campaigns in Uganda. They found that organisational factors like financial resources, training and participation of outreach workers, and the audience participation in receiving and further disseminating the information were pivotal to campaign design and eventual success (Kiwanuka-Tondo and Snyder, 2002, pp. 71–74). In terms of campaign design, they found that researching what the community required and had prior knowledge of, pretesting messages, using multiple channels to spread the messages and targeting fewer groups led to higher campaign quality (Kiwanuka-Tondo and Snyder, 2002, pp. 72–74). In their study on mobile health intervention design for diabetes patients,

Mulvaney *et al.* (2011) distinguished cell phones, from print or broadcast channels, as a tool that allows for “real-time, contextually relevant support ...” (Mulvaney et al., 2011).

Similarly, this study will use smartphones to communicate with and evaluate the AMR-OH materials with the participants. Mulvaney *et al.* (2011) further recommended that interventions be geared towards “goal setting and problem solving...”. It showed that when goal setting and problem solving are incorporated into the design, there is an improvement in participants’ engagement, knowledge and awareness. In this study, the goal was to raise awareness about AMR-OH and persuade the end-user to practice food safety as a consumer-level solution.

Another practical example of a health information intervention is a study by Schulz *et al.* (2011) that emphasised the importance of identifying the barriers to choose healthier lifestyle activities (2011, p. 902). Their study prioritised a community-based participatory planning approach to designing multi-level health interventions to eliminate cardiovascular health inequities in high-risk, low-resource communities. They suggested that identifying such barriers would help the design process implement the facilitating factors within the intervention to ensure ease of access to the information and potential behaviour change through equipment use (Schulz et al., 2011, pp. 904–905). These barriers ranged from individual safety while exercising and lack of awareness to border control in public spaces (especially in neighbourhoods with high immigrant populations) and lack of accessible or affordable recreational equipment (Schulz et al., 2011, p. 904). Schulz *et al.* (2011) also suggested that planning be geared towards social and engaging activities for the interventions to eliminate health inequities by inspiring community leadership and more resource access through the community’s networks. In this case, the project aims to inspire community leadership through the PEs’ evaluation of the digital AMR-OH materials.

2.6 Relevant lessons from SBCC literature

This section identifies the most relevant communication channels and presents the key findings from behaviour change literature to support this study’s methods and means of delivering the AMR-OH information.

2.6.1 Digital media

The ubiquity of affordable portable communication devices like cell phones, smartphones, tablets, and laptops have created a versatile space in which people can customise and personalise their interactions with others. Digital media has had relative success as a tool to collect and spread information, particularly for small and large scale public health interventions. Information, reminders, and notices as text messages or posts on social media platforms play a crucial role in improving knowledge and awareness on country-specific issues. For example, in South Africa, informational interventions on pregnancy, neonatal health, tuberculosis (TB), HIV/AIDS (UNICEF, 2017), and most recently the Coronavirus (COVID-19) have been prioritised. Information about these issues is accessible and easy to use because it has often been curated specifically for the intended audience and for the platform itself.

While the body of literature on the benefits and uses of digital media is still developing as more research is conducted, mobile technology's ubiquity and affordability make digitally mediated interventions and campaigns more effortless to create and disseminate (Hagg et al., 2018). However, when designing informational interventions, there are essential factors to consider, such as access, cultural relevance, internet skills, the channel of delivery, and the health message's actionability. For example, the recent COVID-19 lockdowns continue to prove and even widen the skills and access disparities across societies (Nguyen et al., 2020).

This study also considered the need for face-to-face interaction to disseminate the AMR information from the materials designed in this study. The study remained aware that most PEs and support staff would not have immediate access to the digital educational materials developed in this study due to lack of internet access, skills, and prior health literacy about AMR. Considering the pandemic's lasting effects, the study suggests that such interaction between the PEs (once they have accessed the AMR materials) and the support staff can be integrated into this digital media intervention in a post-pandemic phase.

2.6.2 mHealth initiatives

South Africa has shown considerable interest in using mobile technologies to spread health information. The mHealth interventions, led by the Department of Health, have created a space for low-income and low-literate mobile users to do the following: adhere to treatments,

learn about diseases and preventative measures against them; and extend the range of mobile users from merely using the phone to make calls (Department of Health, 2015b). According to a review of mHealth interventions by Ojo (2018), mHealth initiatives in South Africa have been on-going since 2014 and were a popular and viable channel of health information delivery because 149 per 100 inhabitants subscribed to cell phone networks (Ojo, 2018, pp. 01–02). Additionally, a pilot study of a mHealth intervention designed to improve the time it takes to seek and give TB treatment in South Africa was deemed an effective, feasible, and context-appropriate health intervention (Maraba et al., 2018). Such examples highlight the need for context-specific solutions to improve health information delivery and health outcomes based on a more aware populace. This AMR-OH research contributes to helping achieve that.

For healthcare professionals, a mHealth initiative can comprise various programmes to monitor, assist, run disease surveillance, and share accurate health information with people living in rural areas and cannot access regular medical help. Some notable examples of mHealth projects in South Africa include:

MomConnect launched as a flagship mHealth programme in 2014 by the Department of Health; this intervention provides information twice a week to pregnant women and new mothers on healthy practices for them and their child. Since its inception, *MomConnect* has reached over 1.5 million pregnant women and new mothers (Barron et al., 2018; Peter et al., 2018; Seebregts et al., 2016). This programme has been scaled to reach over 95% of South African healthcare centres, and it was purposely designed to be free so that it could remain accessible to women in rural areas and lower socioeconomic strata (Barron et al., 2018).

In 2015 a mHealth intervention designed to “improve TB case identification and treatment initiation” was pilot tested in Johannesburg, South Africa (Maraba *et al.*, 2018). The study was conducted with 457 patients in two inner-city primary healthcare centres (PHCs). The study recorded an increase in the documentation of TB cases (97.4%) and treatment (84.8%) at the PHCs and proved promising for scale-up.

The South African Department of Health digitised the *Road to Health* (RTH) booklet, so healthcare professionals can record, access, monitor, and add to children’s developing health information record (Department of Health, 2018; Western Cape Government, 2019, 2018). This booklet is accessed through the eRTH app that is available to phones with Android

operating systems. Side-by-side, the government initiative in partnership with local NGOs, uses this digitised booklet to connect parents to other helpful features such as community events, pamphlets about neonatal healthcare, and text reminders to parents about clinic visits (Western Cape Government, 2019, pp. 06–07).

The implications of these examples for this study are that digital health communication interventions are feasible because there exists a prior awareness and the use of mobile and internet technology in South Africa. However, while such monitoring and recording could be conducted for AMR's human health aspect, this will not be feasible or practical for niche topics like AMR-OH information on the overuse of antimicrobials in animals and plants, and the environment.

Although these programmes are targeted at improving health promotion and access to health information, a review of mHealth initiatives in South Africa conducted by Adebowale Ojo (2018, p. 01) states that further studies are needed to show evidence of mHealth programmes working for the people who use them. This review helps trace the transition from mHealth to eHealth in South Africa and examine the kinds of health issues that have been addressed. Such a review presents the gaps in the literature for AMR digital interventions and provides a reason for this AMR One Health-focused intervention to be developed.

2.6.3 Affordances of digital and social media

The ability of digital media, both media in digital format and media shared via digital means for spreading public health information is considerable (Keller et al., 2014). As an audio-visual platform, multimedia and interactive devices engage with people personally or at an intimate level through their digital devices (Vaterlaus et al., 2015). An important aspect of behaviour change is that of showcasing a mastery of new behaviours with others in a group (Kashian and Liu, 2020), and this extends to preventative behaviours such as physical exercise and preparing and eating healthy foods. The convergence of social media, wearable technology, and smartphones has led to the interactive and fashionable sharing of individuals' exercise routines and progress, in the form of photos and videos, with potentially hundreds of people online (Kashian and Liu, 2020). The affordances of digital media for sharing individuals' physical exercise and diet behaviours shows that people share their progress or adoption of healthy nutrition behaviours; however, meta-analysis shows that sharing about

such topics on social media occurs more frequently when it is socially supported (Hsu et al., 2018; Williams et al., 2014, p. 02). However, using such technology to make information relevant and accessible to young, literate, and technologically-savvy people is more straightforward than using these same elements to reach out to young people who live in rural areas, where Wi-Fi and data access are either severely limited or non-existent. Such affordances of digital media are available to members in rural, lower-socioeconomic conditions in Makhanda. This study draws on PEs (i.e., support staff living in the township), with smartphones for this digital AMROH educational intervention.

When combined with various social media sites' forms and functions, digital health information can effectively bridge knowledge gaps. As people become familiar with the way Facebook, Instagram, TikTok, WhatsApp and other sites function, they learn that the platforms serve as a space to share any publicly-acceptable thoughts through (or complemented by) photos and videos. Furthermore, people on social media sites often use it to extend their social lives beyond their physical space. The virtual element becomes a space that can hold people of the same mindsets in large or intimate groups, over temporal and geographical distances, and details can be shared in simple or highly stylised ways.

2.6.4 The shift from mHealth to eHealth

The use of digital media, or eHealth, for public health information delivery has been recognised as an essential channel of communication, and it has shifted the idea of how to communicate health information on a global scale (Fayoyin, 2016, pp. 02–03).

The reason for the shift from mHealth to eHealth was to build alternative, modern routes to disseminate health information to the increasingly digital public (Fayoyin, 2016, p. 02). Since better communication is widely understood to be pivotal in alleviating the burden of diseases in South Africa, and other African countries, the shift from mHealth to eHealth (digital media for health communication) has become popular in the Global South (Fayoyin, 2016, p. 02).

This shift is sparked by social media's ubiquity, the privacy it affords users to talk about ordinarily taboo health topics, and the swift access to information. For example, social media made its mark as an eHealth tool on the continent for HIV/AIDS awareness and the 2014 Ebola outbreak (Odlum et al., 2018). Nigeria, one of the first countries to be affected by Ebola, used Twitter to disseminate accurate information about the virus. In partnership with

the WHO's context-specific public health efforts and Facebook, this information campaign improved context-specific knowledge at a crucial time and improved mortality rates in Nigeria because of a large, coordinated e-health campaign (Fayoyin, 2016, p. 03). The communication elements of this campaign's success in particular further led to a series of digitised educational tutorials for healthcare workers using Google Trends, Facebook, and other Android apps to track, monitor, record, and control the spread of the virus. These real-time records also helped healthcare professionals understand the scale and prepare for it (Fayoyin, 2016, p. 03). Various Short Message Service (SMS) groups shared this information among family and friends to contain the spread as a citizens' effort.

Another example is Marie Stopes, a US-based organisation that provides information on sexual and reproductive health (SRH). This organisation has used one-to-many and one-to-one messaging, and quizzes via SMS to engage with youth, particularly young women on the African continent across various countries (Fayoyin, 2016, p. 04). Kenya and Tanzania run a similar programme on SRH, also via SMS, called Mobile for Reproductive Health (m4RH) aimed at young women and men (L'Engle et al., 2013). It is an on-demand text service that provides information and dispels misconceptions about reproductive health and contraception.

Syred *et al.* (2014) show that Facebook is a useful tool to promote health. Their results showed that when users were provided with an online space to have a conversation around health, there was a positive response. Although their study relied heavily on advertising this page to sustain user engagement, 93% of their content was user-generated and users engaged with the intervention's key messages on chlamydia and chlamydia testing. However, despite this positive response, the study showed that users could not sustain the conversation around this public health issue independently (i.e., a moderator was required to drive the conversation). In such contexts, necessitating a moderator, relying on CHWs and PEs to bridge the linguistic, informational, and cultural gaps has been established as an effective alternative (Syred et al., 2014).

A recently established consortium to share updated knowledge about COVID-19 with a multidisciplinary panel is another example of using digital strategies to communicate health and discuss context-specific, evidence-based best practices from various countries (Kalyatanda et al., 2020). The weekly consortium meetings via Zoom (an online video conferencing platform) offered a virtual space where doctors, pharmacists, health

communication experts, NGOs, lawyers, and journalists could discuss and share their thoughts and professional experiences with COVID-19 and its effects. This platform was also used to suggest context-specific solutions at times, one of which was the need to wear masks in public and medical spaces.

Studies using social media show that platforms such as Twitter and Facebook offer a reliable and novel way to engage with target audiences to disseminate AMR health information (Thornber and Rahman, 2020; Wright et al., 2020). The role of nurses in the US as “thought leaders” to generate interest and continue conversations about AMR on Twitter was explored in the Wright *et al.* (2020) study. They concluded that Twitter was accessible enough to have clinical conversations on a global scale and generate “communities of interest” to raise awareness about AMR in virtual public spaces (Wright et al., 2020). Similarly, in an LMIC such as Bangladesh, where there is extensive 4G (internet) connectivity, Facebook was used to promote AMR awareness among aquaculture farmers and stakeholders (Thornber and Rahman, 2020). Their study concluded that while social media has immense potential for AMR information dissemination in rural Bangladesh and other parts of Asia, further research into context-specific content is necessary, such as the kind of research and materials from this study.

However, unlike the participants in Thornber and Rahman’s (2020) study who do not have a strong understanding of the underlying science of the spread of AMR, this study’s participants have prior exposure to basic AMR information. Moreover, this study builds on the PEs’ existing understanding of how germs can spread and harm people, and how germs become resistant to antimicrobials, through the digital media intervention on AMR-OH.

Most mHealth and eHealth campaigns focus on important health topics that socially and economically impact people's lives. However, there is paucity in the current research activities, health campaigns, and therefore literature, about AMR, One Health, social media interventions on WhatsApp, and participatory action research to ensure its sustainability. This study, which is essentially an eHealth intervention, offers both a practical conceptualisation of digital AMR materials and their evaluation through end-user feedback on a digital media platform (i.e., WhatsApp).

2.6.5 Social media and health campaigns

Little is known about what type of communication campaigns and health-provider interventions are needed to raise awareness about what ‘works’ and ‘does not’ for interventions on high-profile, high-risk health challenges like AMR-OH. In this study, WhatsApp, a social media platform mostly used via smartphones, is the primary channel to communicate the danger of AMR-OH and the suggested solution.

As a high-profile concern detailed in the 2013 Global Risks Report (World Economic Forum, 2018), it continued to present itself as a risk that required collective, sustained attention. Although the Report does not use the term ‘One Health’, it stated the driving causes of AMR: “... the overuse and misuse of antibiotics, in both human health systems and livestock management; and the fact that no new classes of antibiotics had been invented since the 1980s.” (World Economic Forum, 2018). McParland *et al.* (2018) suggest identifying and disaggregating global AMR interventions’ critical components to design improvements to local information campaigns. There is evidence that patients in South Africa, as is the case in many other countries, expect and pressure medical professionals to prescribe antibiotics (Farley *et al.*, 2019). This evidence has prompted primary healthcare prescribers to request “education resource aids” to aid discussions on antibiotic resistance and to explain the difference between viral and bacterial infections (Farley *et al.*, 2019). Such reports and studies, and their outcomes, show that using social media to spread information about a topic is worthwhile because it creates awareness and can prompt user engagement with the issue.

2.6.6 Social media in South Africa

Globally there are over 5.135 billion smartphone users, and of these 191 million are active social media users on the African continent (Kemp, 2018). WhatsApp is a messaging service branch owned by Facebook for use on smartphones connected to the internet and offers users the options to send, receive, and share a variety of digital media such as photos, stickers, graphic interchange format (GIFs), videos, and audio files (WhatsApp, 2020). This platform is the preferred medium of communication for 58% of South Africans, as a rapidly growing mobile and internet economy (Ornico, 2019; Shapshak, 2015; World Wide Worx, 2014). Such figures support the argument that social media platforms when used as a context-specific channel of health information delivery, offer a powerful way to influence and promote healthy behaviours.

This study aims to use social media as a repository for Peer Educators to obtain information on AMR-OH to share verbally or via social media with their peers and the wider community. Mobile communication is not new to African countries, and as improvements in both social media platforms and internet-enabled technology progress, there has been a visible shift to smartphone and internet use to build communication, commerce, learning, and entertainment (Cele, 2019; Kemp, 2018; Kemp et al., 2018). South Africa's internet penetration in 2018 stood at 54% and the daily average time spent on the internet for users aged 16-64 was 8 hours and 32 minutes (Kemp et al., 2018). According to the ATKASA consolidated report for South Africa, 95% use mobile devices, 60% of the surveyed population uses smartphones, and 65% use the internet every day (ATKASA, 2018). Moreover, according to the 2018 Google Consumer Barometer, 66% of South African users believe that new technologies offer more opportunities than risks (Kemp et al., 2018). This social media platform's interactive nature can be harnessed to serve as an educational tool for niche public health issues like AMR-OH, as shown in this study. Building an interactive repository of AMR-OH information for PEs on the most popular messenger app in the country (ATKASA, 2018; Kemp et al., 2018; Ornico, 2019; Shapshak, 2015; World Wide Worx, 2014) brings a fresh perspective, and added persuasion, to this study.

2.6.7 Persuasion through visual media

The study and literature review concerning visualised information remains a niche area with a limited scope because it is a nascent research field. As a solution, Lonsdale & Lonsdale (2019) suggest the use and empirical testing of existing design principles, such as the Gestalt design principles, for the conceptualisation of visual health communication materials (2019, p. 06). Lonsdale and Lonsdale (2019) prioritise theories of cognition and principles of visual perception when referring to effective data visualisation for health information (2019, pp. 14–22).

Cognition refers to thinking, and the visual element of health communication is an integral component of how people remember health information (Lonsdale and Lonsdale, 2019, p. 17). Human memory has three types of processing visual representations of information: iconic, working, and long-term (Lonsdale and Lonsdale, 2019, p. 15). While the iconic and working memories help store information in the short term, it is the long-term memory that persuasive and behaviour change-centred interventions aim for when using visual media.

Particularly for infographic design, Lonsdale and Lonsdale (2019) suggest using ‘information chunking’, ‘familiar elements’, and ‘order’ among others to limit the cognitive load on the end-user (2019, p. 16). They suggest that information be separated into small, meaningful units that are strategically presented to show that each unit is a ‘chunk’ of information to be processed and remembered easily. The use of familiar elements such as symbols and words the end-user has previously encountered also helps cement the information in their memory. The order of information presentation (where the most relevant information comes first) provides the structure to process the information (Lonsdale and Lonsdale, 2019, pp. 16–17).

The information has to be presented in an appealing structure flowing from the main message to why this is important to know and what to do. This presentation ensures that health information remains in the target audience’s memory. To effectively conduct data visualisation, Lonsdale and Lonsdale (2019) suggest the use of the Gestalt principles of visual perception (2019, pp. 17–22). ‘Gestalt’, a German word, refers to ‘shape’ or ‘form’, and the principles are the definitive “regularities” by which the mind can help the eye best perceive units of information (Todorovic, 2008). The principles are shown in Figure 5 (Verlarde, 2019).

Studies have shown that using these principles to design infographics and other formats for health communication is necessary for the end-user to effectively perceive and process the information (Costa et al., 2020; Lazard and Mackert, 2014; Witteman and Zikmund-Fisher, 2019). Witteman and Zikmund-Fisher (2019) show that presenting laboratory results to patients using the Gestalt principles are a theoretically-informed way for the end-user to “convert data [lab results] into information, and information into knowledge [about what to do next],” (Witteman and Zikmund-Fisher, 2019). Lazard and Mackert (2014) identified that “design complexity” (the way the information is presented) for web-based health communication is worth acknowledging and acting on, and incorporated as an “influential variable” for digital health communication research (Lazard and Mackert, 2014). In this study, the Gestalt principles inform the five design benchmarks, as explained in section 2.8 and shown in Figure 5 below.

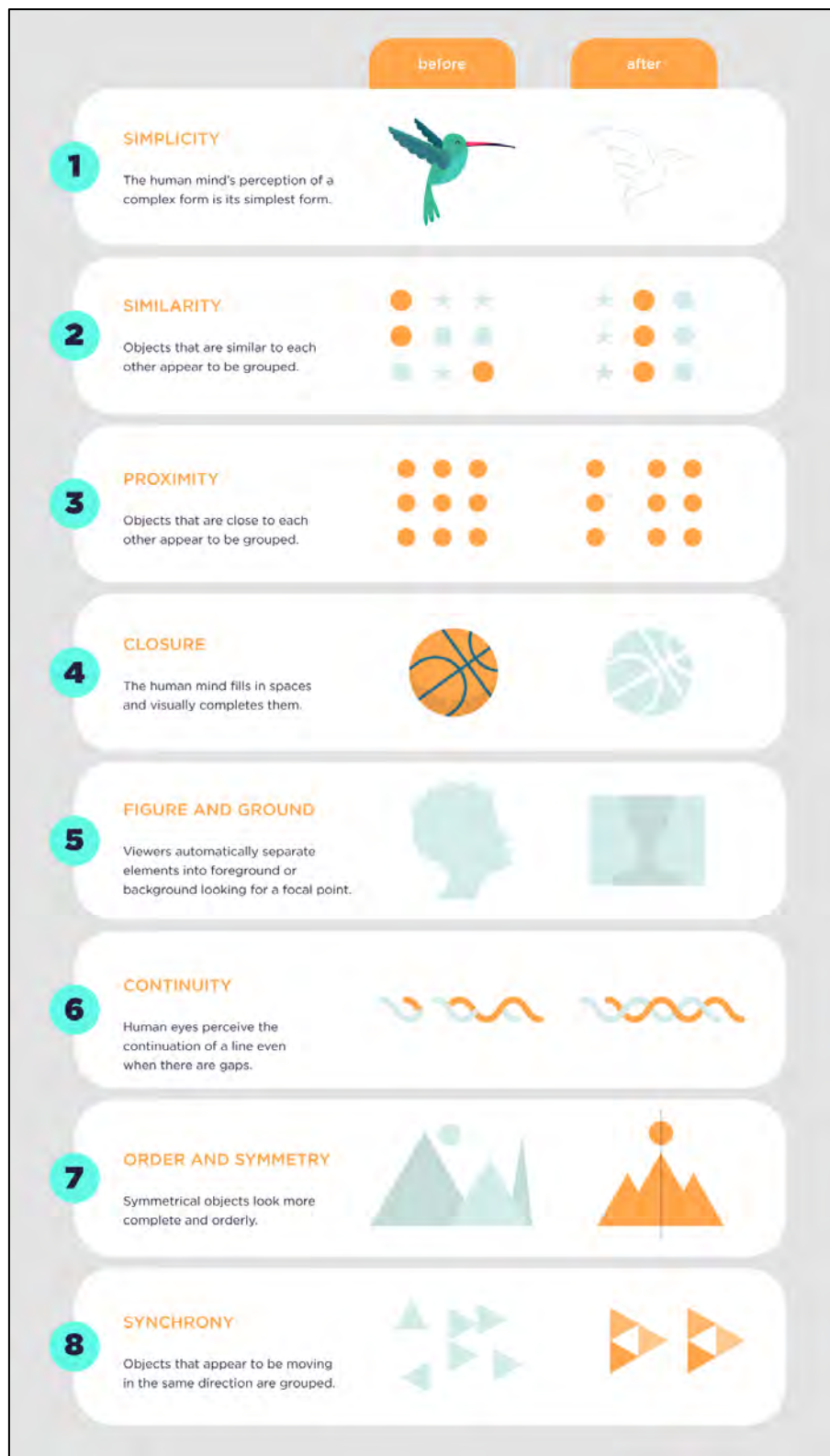


Figure 5: The Gestalt Principles.

2.6.8 Video campaigns

Studies have confirmed that videos are viable and customisable tools to communicate health information, inspiring and improving behaviour change through memorable messages. Videos also help people who are not used to this format become comfortable learning through them (Adam et al., 2019). Human-centred design and theory-based information visualisation for health information interventions show that conscientiously-designed videos with narratives offer viewers a sense of personal relevance (Adam et al., 2019; Lonsdale and Lonsdale, 2019). The human-centred design prioritises the end-user and their context when designing the video. User-centred video design is customised to communicate health, drawing on impactful visuals of cultural elements, including language-appropriateness, to strengthen the information's relevance (Chiu, 2009). Videos to convey health information are a valuable and personalisable part of eHealth applications of technology for health behaviour change (Noar and Harrington, 2012, p. 06).

Additionally, the use of participatory videos (PV) for community-led initiatives to increase awareness of AMR in Nepal proved successful and relevant to the community, because it was created for and by the community (Cooke et al., 2020). Videos make health information accessible, relevant, and culturally-sensitive through a critical lens, and Cooke *et al.* encourage further development of this format for future projects. Cooke *et al.* (2020) successfully pioneered the use of PV specifically for AMR in an LMIC. This study draws inspiration from such a context-specific, culturally-tailored eHealth intervention to create an AMR-OH awareness video for PEs in rural South Africa.

2.6.9 Infographics for health communication

Scott *et al.* (2016) advocate using infographics to convey health information, for two reasons. First, infographics convey complex information through intelligent design and specific wordings to provoke responses, evoke emotions and remind people of the most critical aspects of the problem (Lonsdale and Lonsdale, 2019, pp. 24–27; Scott et al., 2016, p. 1104). Data visualisation in infographics is tailored to specific audiences with memorable chunks of information presented in a visually appealing manner. Second, infographics, which can be repeatedly shared with the physical and virtual public, bear the potential to “build campaign impact” (Scott et al., 2016, p. 1104).

Persuasive, relevant, accessible, and culturally-sensitive information design in the digital age, particularly regarding typography and graphics, are vital to information campaigns' success (Dur, 2014, p. 43). With shorter attention spans when browsing online media, Lonsdale and Lonsdale stress the need for efficient design (Lonsdale and Lonsdale, 2019, pp. 26–27). They report that infographics are preferable compared to “in-depth stories”, because they offered only the essential parts of the concept in an appealing, effective manner, and also found that messages were consistently and “intrinsically memorable” across various groups of people (Lonsdale and Lonsdale, 2019, pp. 25–27). For this study, infographics are vital to conveying AMR-OH information to the PEs, who can then explain this information to the support staff.

2.6.10 Soul City: visual media for health communication and social outreach

As a large-scale campaign using multiple channels to spread awareness and knowledge about HIV/AIDS during an epidemic, Soul City is one of the foremost examples of context-specific health information and behaviour change campaigns in South Africa. Soul City is a lasting example of how channels, such as TV, radio, and print offered the target audience a comprehensive, age-appropriate understanding of HIV/AIDS (among other topics) and resonant suggestions for preventative action (Soul City Institute, 2019).

Soul City had a considerable impact since its first broadcast in 1994. It managed to attract and sustain millions of young viewers between 16 - 25 years (Tufte, 2002, p. 04), a particularly difficult demographic to reach (Odimegwu et al., 2017; Rose and Friedman, 2017). Tufte and others suggest that such a broad range of media and technology for edutainment considerably improves awareness of important health information while bridging two specific gaps (Tufte, 2002, pp. 04–05). Soul City sought to bridge the knowledge gap through a comprehensive long-term exposure to HIV/AIDS information, related infection vectors such as sexually transmitted illnesses (STIs) and breaking down cultural norms that made it difficult, and even taboo, to talk about STIs and HIV because of social stigma.

The Soul City campaigns, over more than two decades, were successful on multiple fronts. The campaigns were successful because they were a community-based series that offered the at-risk community solutions through the show’s well-known characters (Soul City Institute, 2019). The multi-year series also provoked and encouraged discussion among at-risk, low-

income, low-literate, and young and vulnerable viewers about a wide range of pressing health issues. In various ways across series, the overall Soul City campaign facilitated and legitimated people's space and time to learn about HIV/AIDS, confront, and talk about significant social and public health problems. By 1999, after four series of the show had aired, there were many indicators of tangible changes in attitudes and practices among large sections of the populations exposed to the programmes and support materials, including increased awareness and practice of safer sex (Tufte, 2008). Through “strategic partnerships” with local women’s shelters and NGOs, Soul City became a platform through which some viewers reached out to relevant call centres for guidance, and advocacy groups, such as Red Cross, Medecins Sans Frontieres, North Star Alliance, and regional NGOs in Swaziland, Zimbabwe, and other nearby African countries. Through a partnership with South African newspapers, such as *The Sowetan*, millions of supplementary printed educational materials were distributed to adults. South African schools also received specific training material to equip young adults with HIV/AIDS educational resources (Scheepers et al., 2004) on various public health and socially relevant topics.

This study designs the AMR-OH educational materials by drawing from Soul City’s use of well-designed printed pamphlets for the infographic with the four food safety steps, and the context-specific, health-literacy level appropriate video content for narrating the basics of AMR-OH.

2.7 Intervention design

As presented in section 2.6, this study draws from the most context-specific and accessible channels of communication to conceptualise, design, and deliver AMR-OH information. To achieve a feasible and viable intervention, thorough research and appealing design are the necessary preliminary components for designing persuasive, behaviour change health communication (Lonsdale and Lonsdale, 2019, p. 07). Additionally, when aligned to the appropriate language, ease of use, appropriate content and format, these components strengthen the campaign’s ability to empower members of that community (Adam et al., 2019; Campbell and Gibbs, 2008; Chiu, 2009; Tufte, 2007). There is no dearth of information about AMR on the internet. For example, information about AMR is available in its entirety on the internet, and when sourced from the “tripartite” consisting of the WHO, FAO, and OIE

(WHO, 2015a) it is designed to demonstrate how AMR is detrimental to national wellbeing and health outcomes. However, as Lonsdale and Lonsdale (2019) argue, well-researched information alone cannot persuade people to adopt healthy behaviours (Lonsdale and Lonsdale, 2019, pp. 07–08).

This study aims to design a digital health intervention, drawing from reliable sources of information, in two formats that facilitate the end-users' application of the AMR-OH information in their daily food-related practices. It attempts to create an intervention mindful of the context and health literacy level and makes AMR-OH accessible to the end-user. Social Behaviour Change Communication (SBCC) theory informed the conceptualisation and design of this study. This theory-informed selection and use of the five design benchmarks, presented in section 2.8, provide the basis for the design and evaluation of the materials for this study.

2.8 Design benchmarks

The study drew five key practical elements, or design benchmarks of successful health communication from the aforementioned SBCC studies to create: *Ease of use of technology*, *Clarity of content*, *Appropriate Format*, *target audience resonance* (hereafter *Appropriate for target audience*), and *clear calls to action* (hereafter *Actionable*). The following sections present the outcomes of the literature review to derive the benchmarks. These benchmarks were used to structure the themes and develop the semi-structured interview questions presented in the coding memo (Appendix S). They present both the scaffolds by which to structure the conceptualisation and design the materials, as well as the criteria of evaluation of the materials created in the study. Each benchmark, and sub-benchmark (presented in Figure 6), are elaborated on below.

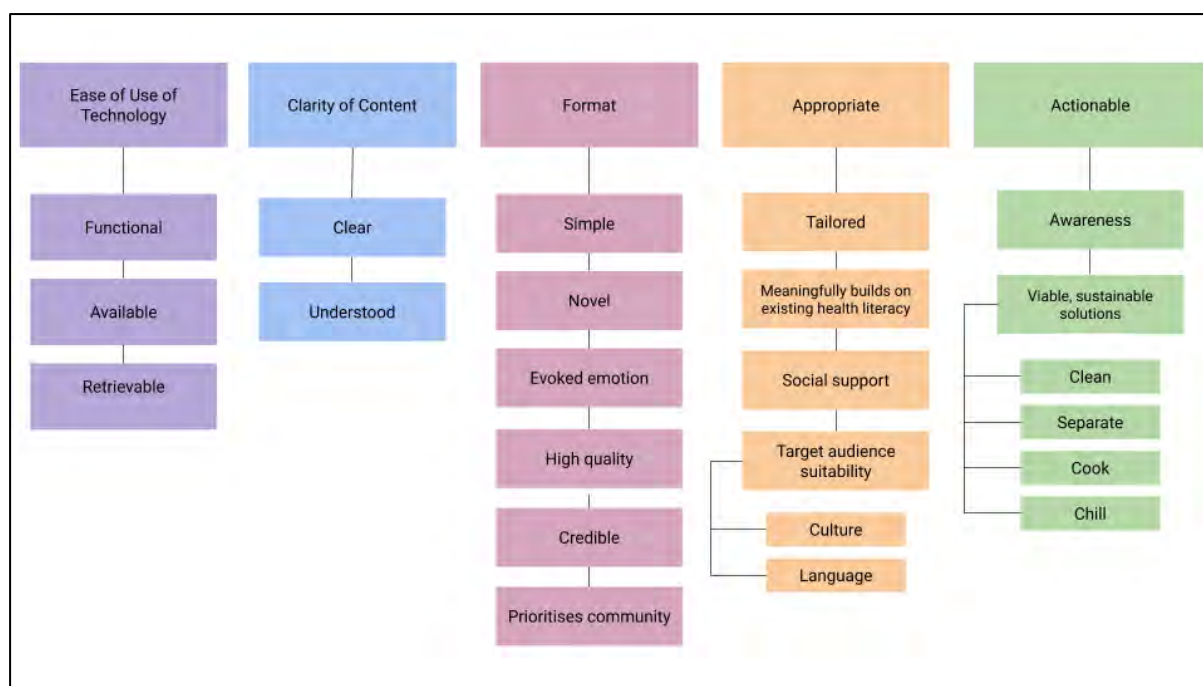


Figure 6: This study's design benchmarks.

2.8.1 Ease of use of technology

Studies using technology to disseminate health information have consistently used devices or channels that are the easiest to use for their target audience, and this the foremost priority for the design of the materials in this study. In remote desert communities of the Sahel, researchers prioritised community-specific technologies, used community videos to communicate health information and found that it was effective in changing behaviours and improved women's engagement with modern technology (Harou et al., 2017, pp. 57–58). This example supports this study's use of smartphones as the most operable and easily accessible technology for the target audience in a rural setting.

Health information is often presented in posters and other printed materials that are either used to explain concepts to others or to supplement a training session for healthcare workers and the general public. As explained in Section 2.3.1, the presentation of health information has shifted with the times, so digital means to disseminate should be as functional, available to, and retrievable by the PEs as printed information. The functionality, availability, and retrievability are sub-themes and are further elaborated on below.

The first sub-benchmark is functionality. The functionality of a digital channel depends on how regularly the target audience uses the technology, either through personal means or with the assistance of publicly available devices, such as video recording equipment in the Harou *et al.* (2017) study. The more regularly the target audience uses the technology, such as an information kiosk, a personal computer, or a smartphone, the more functional it becomes. The higher the level of functionality, the easier it becomes for researchers and healthcare professionals to disseminate health information through relevant technological channels.

Second, the information must be, as much as possible, physically and personally available to the target audience whenever they wish to access it (Jones, 2003, p. 334). This level of physical and personal access to digital technology can be expected in LMICs because of smartphones' ubiquity (Ganesh and Stohl, 2013; Livingstone *et al.*, 2017; Michelsen, 2012; Pindayi, 2017). WhatsApp, in particular, has been especially popular among low-income, rural smartphone users because the individuals can enforce how much data their communications use, regarding what kinds of files they download and share (de Lanerolle *et al.*, 2017; Kauta *et al.*, 2020; Shapshak, 2015).

The third sub-benchmark is personal retrievability. Retrievability is a necessary element to successful health communication. Jones defines this as “*whether or not the person has the money, time, skill, knowledge, mobility, understanding, and emotional strength to make use of a particular source of information...*” (Jones, 2003, p. 334). Retrievability is a useful design benchmark to consider because it also applies to health information's relevance to the target audience (Jones, 2003, pp. 334–335). Health information is often complicated and requires the target audience to reinforce their understanding with every encounter. Retrievability would be a practical element of health communication design regarding the ease of use of technology. These sub-themes for this study imply that the ubiquity of smartphones for professional and personal communication in rural places such as Makhanda makes it a feasible channel to deliver health information. Smartphones are personal devices that allow information to remain available to people to retrieve whenever they desire. However, while the ease of use of technology is a pragmatic starting point, information of any kind is useless if it does not clearly present the problem, why it is important for the intended audience to know, and the possible solution.

2.8.2 Clarity of content

Clarity is an essential technical and design element. Health information from a credible, reputed source, as Caballero *et al.* (2020) explain, needs to be easy to read and understand. Caballero *et al.* (2020) assessed online public health information about COVID-19 using PEMAT and SAM tests and found that while the materials scored 70% for understandability and 79% for actionability, over half the materials scored low on readability (Caballero *et al.*, 2020, p. 03). With such poor readability of online health information, combined with low levels of health literacy among the American public, it was concluded that care should be taken to design evidence-based materials and check what the target audience requires of its public health officials. In this study, ‘clear’ and ‘understood’ are categorised as sub-themes under ‘Clarity of content’ as presented below.

The Centre for Disease Control and Prevention (CDC) created an evidence-based test, the Clear Communication Index (CCI), to assess the clarity, through the readability, understandability, and actionability of health information materials (HILs) (CDC, 2019, 2014). The CCI is operationalised as a pre-test assessment of whether a HIL is clearly communicating the health message to the end-user from the creators’ or researchers’ perspective (Alpert *et al.*, 2017, p. 142; Baur and Prue, 2014, p. 631; Marinho *et al.*, 2020; Porter *et al.*, 2019, p. 783). For example, Alpert *et al.* operationalised the CCI by testing an online portal of health information used by over 80,000 patients in the US. The portal, an online repository that provided patients both preventative and chronic care information for various health issues, was designed prioritising health literacy principles. However, the evaluated materials scored below the 90% threshold and were considered in need of improvement (Alpert *et al.*, 2017, pp. 143–147). More recently, Porter *et al.* scored printed health behaviour change materials, from the ‘SIPsmartER’ campaign, using the CCI (Porter *et al.*, 2019). This campaign aimed to reduce the consumption of sweetened drinks among the adult population of a rural Appalachian community (Porter *et al.*, 2019, p. 783). Porter *et al.* (2019) found that the CCI evaluation led to improved clarity of the materials’ content.

The CCI evaluative tool has not been used as a pre-test method for the projects mentioned above with Rhodes University PEs. In this study, it is intended to obtain baseline scores for the materials to compare with the PEMAT and SAM evaluations from the PEs. In its own small, innovative way this project seeks to mobilise the Peer Educators to increase their

access to and awareness of AMR-OH information through this clear, engaged, digitised potentially actionable, intervention design.

Studies that have assessed health information materials through end-user tests show that information is clearer to the reader when presented using innovative data visualisation and simple language. The PEMAT (Blagojevic and Kelly-Campbell, 2020; Caballero et al., 2020; Kang and Lee, 2019; Shieh and Hosei, 2008; Shoemaker et al., 2014; Vishnevetsky et al., 2018), and SAM (Doak et al., 1996; Finnie et al., 2010; Helitzer et al., 2009; Maraba et al., 2018; Rhee et al., 2013; Sharma et al., 2018; Shieh and Hosei, 2008) tests are elaborated on in sections 3.8.4 and 3.8.5. Materials with innovative data visualisation offer the reader an eye-catching, appealing presentation of the topic's essential information (Dur, 2014; Lonsdale and Lonsdale, 2019, p. 49). To effectively disseminate information to the public, materials often use the most appropriate language to the context so that end-users can understand the message with low formal literacy. Both these elements directly impact the clarity of the materials' content.

The clarity of content can be observed and measured in the Understandability section of the PEMAT test. Understandability in this study takes its definition from the PEMAT and SAM tests and draws from the studies that have assessed health information with these end-user tests. The PEMAT tool uses 18 items to test the material's understandability (see Appendix K) and prioritises the readers' experience with the material (Shoemaker et al., 2014). The SAM test uses various items across six sections to assess whether the material's content and presentation were easy to understand and presented in ways that made the information and its importance clear to the reader (Appendix L). However, the ways in which information is clear and easy to understand also depend on how it is presented. When using such tests to measure clarity, it is important to consider the format in which the information is conveyed, because the level of clarity required varies between audio-visual and print formats.

2.8.3 Appropriate Format

Health communication campaigns have relied on a variety of effective formats to deliver and disseminate necessary information. Over time, the formats have increasingly leaned toward the digital, particularly in LMICs (Kemp et al., 2018). Limaye *et al.* (2017) used a “digital health training package” in the form of a netbook with digital resources for fieldworkers to

disseminate much-needed family planning information in rural Bangladesh (Limaye et al., 2017, p. 02). This digital training resource was easy to use and carry around farms and display during home visits and, because of the novelty of the technology for communicating health information, more women in the rural areas were interested in learning about family planning and using contraceptives from the fieldworkers (Limaye et al., 2017, p. 06).

Other important aspects of the format of health information are the quality, credibility, and identifying whether the community is comfortable with the format (Finset et al., 2020). Quality and credibility can be achieved through careful attention to design and information sources for the content. However, the needs of the target community often vary so the format of health information cannot always cross social, economic, literacy, and language barriers (when information is not in the target audience's home language) (Finset et al., 2020, p. 02; Mummah et al., 2016, p. 02). Mummah *et al.* stress the need for design grounded in theory, and state that user-centered design when communicating health information has positive outcomes such as empowerment and self-efficacy (Mummah et al., 2016, p. 02). This study uses these sub-themes to inform the design and evaluate the video (audio-visual) and infographic (written/print) formats of the AMR-OH information. While the study considers whether the format is appropriate or not, the subsequent consideration is whether the ease of use of technology, level of clarity, and appropriate format are indeed relevant, and appropriate, for the intended audience.

2.8.4 Appropriate for target audience

It is essential for information of any kind to be appropriate to the intended audiences' access to technology, level of education, and their preferred mode of information delivery. All these factors influence how well any communication will resonate with its intended audience. Health campaigns focused on changing behaviours have proved more impactful when the content is customised to the target audiences' culture and values, especially in LMICs (Booth and Carroll, 2015; Matthews and van Wyk, 2018), or when creating materials for immigrant audiences with differences in language and context (Palmer et al., 2009).

Health outcomes and the adoption of healthy behaviours depend on how grounded healthcare is in the community's values and beliefs, and materials that are tailored to modifying factors such as age, ethnicity, and knowledge of the problem have better outcomes (Champion and

Skinner, 2008, pp. 45–49). Among the various health systems strengthening components, Matthews and van Wyk (2018) show that providing high-quality patient-centered care in South Africa also depends on technical aspects, such as the accuracy of health information, and socio-cultural aspects such as language (Matthews and van Wyk, 2018, p. 196). While patients might be aware of illness and diseases prevalent in their communities or regions, they still require a respectful, human element to the communication they receive from HCPs to ensure the impact of an illness is appropriately understood or that prescriptions are adhered to (Matthews and van Wyk, 2018, pp. 196–197).

Language appropriateness also extends to the simplicity of the language used to communicate the information. Considering the unexpected influx of COVID-19 information the world has experienced since November 2019, Finset *et al.* identified that simple, emphatic language that displays an understanding of the impacts of COVID-19 on individuals and their families worked better to positively change behaviours (Finset *et al.*, 2020, p. 874). For example, the familiar slogan-solutions of “Wash your hands!” or “Keep distance - Social distancing” during the COVID-19 pandemic are aggressively available for everyone to notice in public spaces, and are, therefore, easy to remember. However, there is a gap between knowledge and practice. Finset *et al.* (2020) posit that such messages do not target internalised, routine behaviours that might be harmful, and suggest that suggesting a safer alternative to the harmful behaviour is more favourable (Finset *et al.*, 2020, p. 874) — for example, suggesting the use of an elbow-bump or a wave when greeting someone instead of not shaking hands. Therefore, it is also crucial for the intervention design to consider how the target community talks about disease, how its members order their world, and their cultural beliefs about, in this study, food, germs, meat, and what causes food-related illnesses. Such considerations could greatly influence and improve the appropriateness of the material.

Cultural beliefs often inform health behaviours, and understanding of public health concepts and information appropriateness (to the target audience’s age, gender, and religion) are pivotal to health information campaigns' success. A study by Palmer *et al.* (2009) showed that Sudanese women living in Australia lacked education about and access to information about HIV and that this was a potential threat to their well-being because they were considered an at-risk group for the disease (Palmer *et al.*, 2009). They concluded that an educational HIV intervention would be well-received if the culture and community were actively involved in delivering and disseminating the information (Palmer *et al.*, 2009). The

Palmer *et al.* (2009) study illustrates that when intervention designers consider and collaborate with the end-user, the information can be tailored to the community's needs. These sub-themes for this study imply that the materials need to be tailored to the PE community, designed in a way that can be easily received, used, and shared, and builds on any current AMR knowledge, in order to spur particular action as a result of exposure to the information.

2.8.5 Actionable

Behaviour change health communication prioritises the actionability of the information, i.e. it suggests and encourages action and seeks to recommend and reinforce behaviours that are possible to adopt in the target audiences' circumstances. While health communication can improve individuals' awareness of a health issue, it does not translate that awareness into behaviour change without presenting viable, feasible actions to curb the risk of illness (Goldberg and Sliwa, 2011; Soul City Institute, 2018).

Actionability is included as a vital component of the PEMAT and SAM tests because patient information often requires the patient to change their lives based on the recommended actions of the health information. The PEMAT uses seven items, and the SAM test uses three items to test how actionable the health information is based on the clarity of content, the presence of any actionable behaviours, and whether it was motivating for the reader/viewer (Doak *et al.*, 1996; Shoemaker *et al.*, 2014). Although PEMAT and SAM are predominantly used in studies conducted by HCPs to test their conceptualisation or available content, they are valid and reliable tests that can be useful for media theory-informed conceptualisation and designs of health information.

Despite the rising HIV rate in South Africa (Satoh and Boyer, 2019), Soul City remains an enduring example of end-user-centered behaviour change communication, with community-appropriate actions such as fidelity, condom use, and steps to reduce stigma (Soul City Institute, 2019; Tufte, 2008, 2007, 2002). Soul City is an apt example because it was a highly visible, sustained, community-engaged, and socially-supported campaign in an LMIC with a high incidence and disease mortality rate. For AMR-OH, the actionability aspect is presented in four food safety steps in the infographic. The literature review consistently shows that when a problem is presented with a solution tailored to the intended audience's comfort with

technology, using clear and understandable visual design and language to deliver a culturally-appropriate health message in a novel, simple format, the intervention's behaviour change steps can be enacted.

2.9 Chapter summary

This chapter overviewed some key aspects and approaches to health communication informed by studies and repositories of information within the context of LMICs. It then elaborated on the role and impacts of digital and social media in health communication to define this study's scope. Finally, it presented the SBCC theory that informed this project's conceptualisation and design through the five design benchmarks. The following chapter will present the methodology for this project.

3 Chapter Three: Methodology

Having outlined this study's aims and objectives in Chapter One, and presented the five design benchmarks guiding the design of the materials in the literature review, this chapter outlines the project's key methods. First, the original pre-COVID-19 project, and the COVID-19-revised objectives shape the research methodology chosen for this study in line with the two research questions. Second, the study settings are presented to provide context. Third, the research method is presented along with the phases of research, sampling, and the qualitative and quantitative data collection techniques and forms of analysis for each. Finally the ethical considerations, limitations, and delimitations of the study are presented.

3.1 The larger project

As outlined in the introduction, this study was initially conceived of as a more elaborate project. It would have involved co-creating a video and related infographic through participatory action research, with a small sample drawn from Rhodes University Peer Educators (PEs) and then testing the materials with the entire population (30 Peer educators). However, this larger project was no longer feasible during the post-March 2020 national lockdown in response to the COVID-19 pandemic. Moreover, some of the PEs could no longer participate in the original ways because of the risks to their health. Because of these health concerns, to secure and ensure some participation from the PEs, and the timeous completion of the study, the project was scaled down to focus in more depth on the first of the three 'stages' of SBCC. These three stages consisted of moving audiences from 'Unaware' (which with AMR-OH especially, most people are unaware) to 'Aware', through to 'Concerned' - as presented in Figure 4 above. Within these stages there was potential to learn more and act on the knowledge from the intervention.

3.2 The objectives guiding the method

Research question 1 was addressed through conducting the literature review. This chapter details the methods used to answer the key empirical research question 2: *Based on the PEs' existing awareness of AMR, what themes can inform and evaluate an end-user feedback-*

based conceptualisation of this intervention design? The objectives for the second research question were to:

- a) Conceptualise digital educational materials about AMR-OH from food sources in video and infographic formats.
- b) Evaluate whether these materials are easy to use, clear, in the appropriate format, are appropriate for the target audience, and actionable for the Peer Educators.

Research question 2 was addressed by conceptualising and designing theory-informed materials and obtaining feedback on these materials from the Peer Educators. This was done so that when these materials are eventually implemented in future, this study's methods and results could practically inform that process.

To determine what elements would be needed to conceptualise and design theory-informed digital AMR-OH materials, this study opted for a formative evaluative research design. Drawing on an extensive literature review, the study first sought to identify and address the gaps in AMR-OH health communication literature. Based on that, a questionnaire was developed to elicit quantitative data, and a related questionnaire was developed to shape a number of semi-structured phone interviews to obtain qualitative data (see Appendix F). The materials were first evaluated using the Clear Communication Index (CCI) by the researcher, and then the Patient Education Material Assessment Tool (PEMAT), and Suitability Assessment of Materials (SAM), (outlined below) were designed to provide end-user quantitative and qualitative data.

As outlined in Chapter 2, this study uses the literature review to compile the most relevant studies to answer the study's two research questions. A literature review was conducted for two reasons. First, to identify the current studies that used theory-informed health communication materials to raise awareness and change behaviours about AMR from food sources (AMR-OH). Second, highlight the gap regarding the use of digital media in such literature, and motivate the need for the conceptualisation of appropriate digital educational materials on the topic.

3.2.1 Enabling factors & channels of communication

Any message that aims to present information to persuade a change in behaviour or thinking is considered persuasive communication (PC); which is a part of SBCC (de la Hera Conde-Pumpido, 2015, pp. 02–05). Persuasive communication can be used through any medium and is often tailored to the specific behaviour change that is required for the situation. Through the literature review, it is established that persuasion is more successfully done through a narrative that engages the intended audience's values, fears, and lived experiences (Cardarelli et al., 2017; Ntshebe et al., 2006; Occa and Suggs, 2016). In this case, the researcher avoided using fears, and instead used persuasive communication to inform the way the video narration and food safety actions engaged with the PEs' understanding of AMR-OH, and the tools they use to cook and store food at home. There were two enabling factors in this study. The first is that the project tapped into an existing community network (the PEs) and channel of communication (WhatsApp). The second is that the conceptualised materials are familiar forms of media (videos and images, i.e. infographics) shared using a well-known channel of communication (WhatsApp).

3.3 Study setting

3.3.1 Makhanda

Makhanda (formerly known as Grahamstown) is a small city in the Eastern Cape province of South Africa. The city has about 70,000 residents and covers 62.67 km² (Firth, 2011). The residents are predominantly Black African, and the remaining members consist of Coloured, Indian, Asian, and White citizens. This predominance is further reflected in the languages spoken in the city, with isiXhosa being the most widely spoken among English, Afrikaans, and other South African languages. The city is well-known for its many churches, well-established private and public schools, High Court, and Rhodes University. It was recently renamed Makhanda, as a form of “symbolic reparation”, after the warrior-philosopher of the same name who led charges against the invading British and Dutch colonial settlers in the 1800s (IOL, 2018; Khubeka, 2018).

3.3.2 Participants

Primary healthcare, particularly in LMICs, increasingly relies on community leaders' participation. Introduced and elevated in the Alma Ata Declaration of 1978, community health workers (CHWs) are integral to the implementation and success of public health campaigns, because they offer an alternative but effective route to spread awareness and change behaviours (Govender et al., 2018, p. 16; WHO, 2004, pp. 01–02). Having failed to reduce “medical elitism”, because of maintaining a top-down approach to healthcare and information dissemination, CHWs were often undermined or excluded from primary healthcare until the early 2000s (Govender et al., 2018, p. 16). This study, drawing on community leaders in the form of PEs, actively endorses the “spirit of self-reliance and self-determination” enshrined in the Alma Ata Declaration (WHO, 2004, pp. 01–02) as a contribution to the strengthening and sustainability of CHWs as health information providers.

The Peer Educators are a type of community health worker in that they educate the support staff community across various South African universities (Mohapi, 2020). The group was established in 2012 as a governmental response to the HIV epidemic in South Africa, to assist trained healthcare professionals in their efforts and to “bridge the health equity gap”(Olaniran et al., 2017, pp. 01–02). A study conducted by Graham *et al.* (2016) in Zambia shows that CHWs were able to influence drug adherence rates and be a reassuring healthcare presence for rural communities - especially when there is a good level of health literacy among the rural population (Graham et al., 2016, pp. 10–11).

Rhodes University approaches the overarching wellness of its staff and students through three centres: Counselling, Health Care, and the HIV Office (Rhodes University, 2013). These are collectively known as Wellness Centres. The PEs central to this study are support staff at Rhodes University. They are primarily trained in disseminating health information and counselling for their fellow support staff through the HIV Office. The PEs are manager-approved support staff who can volunteer, or be peer-elected, to be trained through the Wellness Centres. The Rhodes University PE group was established in 2012, as a part of the national governmental response to the HIV/AIDS epidemic, so their main educational work is around HIV/AIDS and Sexually Transmitted Infections (STIs). As a part of this national response the PEs were exposed to health communication materials that used behaviour change communication (BCC) to compel people to practice safer sex, get tested, and remain faithful to one partner. They were also trained to use such health communication materials to

teach and counsel their peers who were considered a vulnerable population. The PEs have since transitioned into training, counselling, and educating their peers on other health issues through recent health promotion projects run by the Faculty of Pharmacy. More recently, they have expanded their programme to wellness, and also cover non-communicable diseases.

Based on their role as health counsellors and information providers, along with their social and historical contexts, and the way they share information among themselves as a group of practitioners, this group of PEs can be described as a community of practice (Farnsworth et al., 2016, p. 140). The PEs are not a naive group of participants, because they have engaged with health promotion workshops and interventions for many years. They have also often collaborated with departments and faculties, for example, the Faculty of Pharmacy and the departments of Psychology and the Rhodes Business School, on health and wellness projects. These collaborative projects prioritised community engagement. They further ensured a transdisciplinary approach to communicating, conceptualising, designing, and implementing messages about the dangers of tobacco and alcohol abuse, and a sedentary lifestyle with high salt, fat and sugar diets. Through these projects the PEs became experienced in assisting with the development of health communication material and providing feedback through the PEMAT and SAM tests. This research is thus able to view the PEs as experienced informants and practitioners.

The materials created in this study will be evaluated by the volunteering PEs, because this project was envisioned to make an impact on them as the end-user. An outcome of this research, as a blueprint for the larger implementation, is that it should be an informed and motivating call for One Health advocacy from PEs within their leadership capacity as health information providers to support staff. The Peer Educators act as catalysts to facilitate the transmission of AMR-OH information to support staff, and they will be further able to inform this research based on their knowledge of the support staff they work with. For this study to remain viable and operational during the national COVID-19 lockdown, the researcher engaged virtually with the volunteering PEs.

3.4 Research methods

According to Babbie (2014), the purpose of evaluation research is to evaluate a social intervention by using evaluative data collection (Babbie, 2014, p. 353). This is conducted

through needs assessments, monitoring, and cost-benefit studies among others (Babbie, 2014, pp. 353–355). According to Ronald Powell, evaluation research is defined as a research method that uses “standard social science research methods for evaluative purposes” (Powell, 2006, p. 102). This method is used when some material, system of organisation, or a programme needs to be evaluated on its effectiveness, or potential effectiveness in this case, based on its current inputs, processes, and outcomes (Powell, 2006, pp. 103–105).

This study drew from Powell’s (2006) conception of evaluation research. It used a formative evaluation research approach to evaluate the conceptualised materials, and how they align to the five design benchmarks for the PEs’ context when properly implemented. Evaluation research allows the researcher to situate the study in the real world, promotes engagement with the community relevant to the research, and ensures that potential action is presented as a solution based on the evaluation (Powell, 2006, pp. 104–106). Using this as a research method supported this study’s use of multiple data collection techniques to obtain both qualitative and quantitative data (Babbie, 2014, pp. 360–366; Powell, 2006, p. 111). The researcher collected numerical data from the questionnaire, the CCI, the PEMAT, and the SAM tests; and collected qualitative data from the open-ended questions in the questionnaire, the semi-structured interviews (SSI), and the extra comments sections of the PEMAT and SAM tests. All contact with the participants was via a closed WhatsApp group.

This approach was adopted for two reasons. First, it was clear that obtaining both quantitative and qualitative data would benefit this study. The data would quantitatively reflect the PEs’ digital and social media use, their awareness about AMR-OH, their thoughts on the video and infographic materials, and the relevance and helpfulness of these materials. Qualitatively, they could also provide a detailed account of their roles as PEs, their previous interactions with public health information, other health communication projects, and their feedback on this study’s materials. Second, such data would better inform the future implementation, and testing, of the conceptualised materials from this study. There were three stages of evaluation research in this study, as presented in Figure 7.

Once the PEs were approached, those who had access to an internet-enabled smartphone with WhatsApp were requested to volunteer as participants for the research. In Stage 1, the researcher conducted a needs assessment in the form of a questionnaire to assess the participants’ current digital/social media use and their knowledge of AMR-OH. In Stage 2, the researcher evaluated the materials using the CCI to obtain baseline indicator scores for the

video and infographic and then obtained formative evaluative feedback from the PEs on the same materials. All interactions with the participants, as conducted in Phases 1 and 2, were in English because it was the common language for both participants and the researcher. In Stage 3, the researcher analysed the data, evaluated the materials based on participants' feedback against the five design benchmarks (see Figure 6), and offered recommendations for future implementation. These three types of evaluation were carried out in three phases, as shown in Figure 8 below.

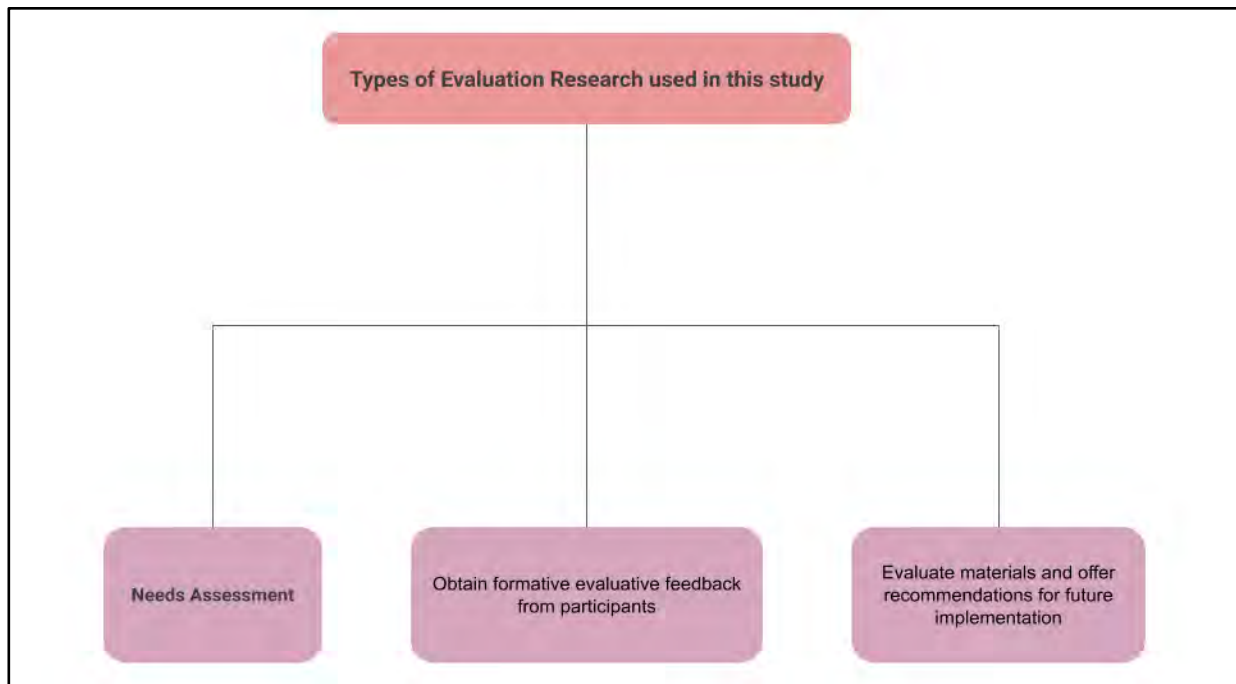


Figure 7: The three types of evaluation research used in this study.

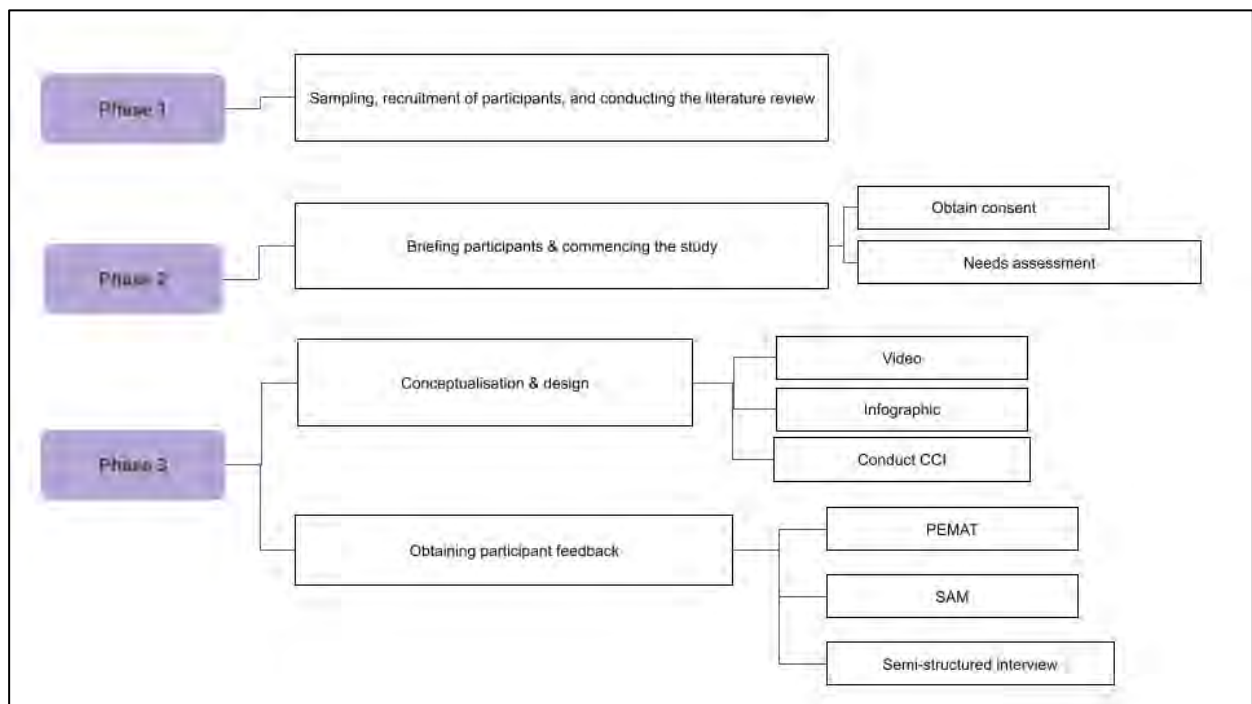


Figure 8: The three phases of the research process in this study

3.5 Phases of the research process

This section details the phases of data collection.

3.5.1 Phase 1: Recruitment of Participants & Conducting a literature review

This two-part phase consisted of first approaching the participants before the research began to assess their potential interest and engagement with the topic of AMR from food sources. The second part was conducting an extensive literature review on the current studies that use SBCC, and digital media, in health communication about AMR-OH.

3.5.2 Phase 2: Briefing the Participants & Commencing the Study

The researcher first explained the study's purpose to the participants and then obtained their consent over individual WhatsApp calls because the participants did not have access to printers or scanners on the University campus during the lockdown. The researcher then briefed the participants about how they would contribute to the study. The needs assessment was conducted to individually assess their current media and internet use, understanding about AMR, the danger to humans of AMR-OH, and meat-related food safety behaviours they currently follow.

3.5.3 Phase 3: Conceptualisation, Design, & Evaluation of Materials

In this phase, the researcher conceptualised and created the video and infographic, as presented in Figure 9 below. These conceptualisations were based on the five design benchmarks (see Figure 6) based on the literature review of successful elements of SBCC used in health communication studies.

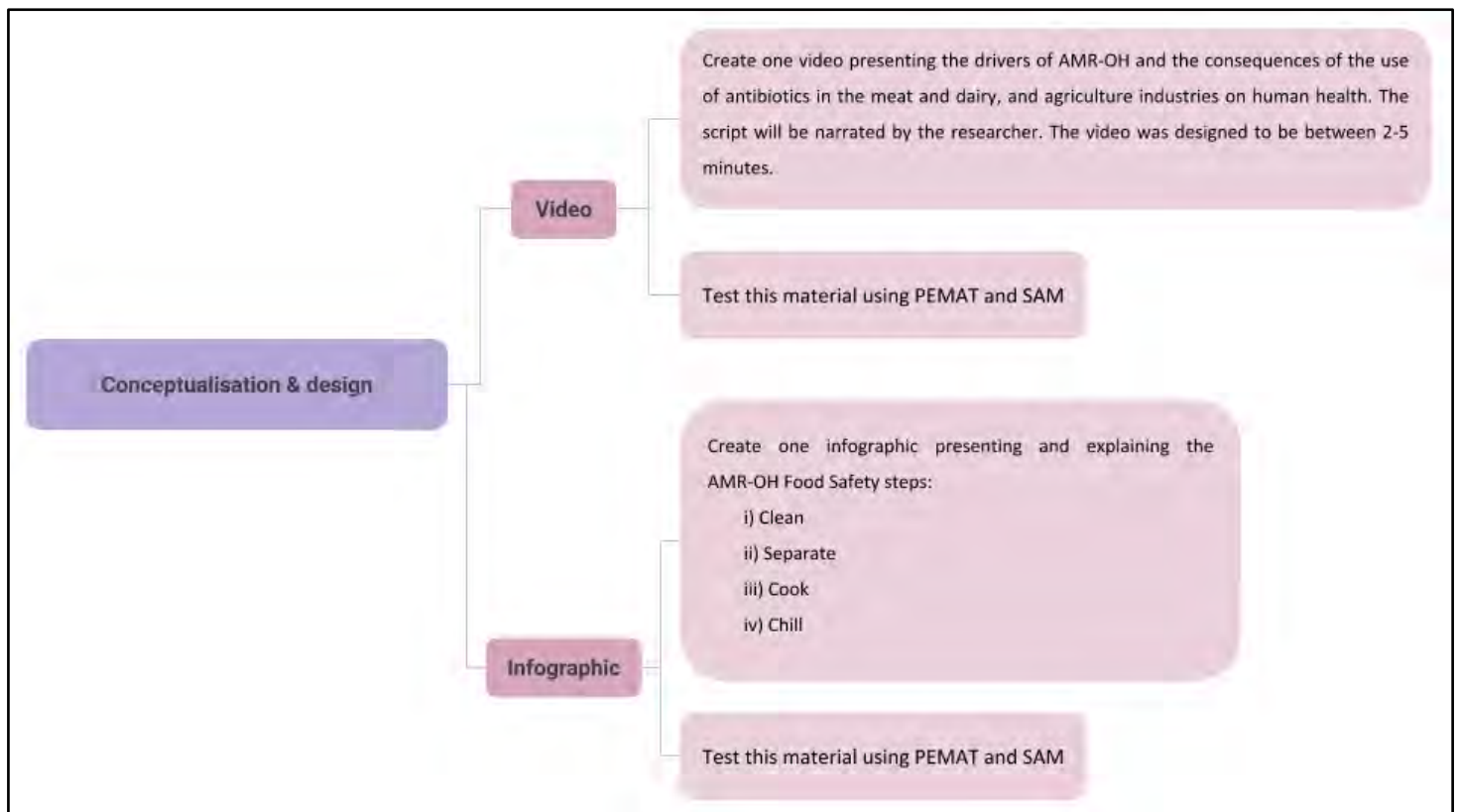


Figure 9: The conceptualisation and design of the materials.

3.5.3.1 Video

In .mp4 format, the video was designed to start with a simple narration to present AMR drivers and then focus on the overuse and misuse of antibiotics in the food industry, which causes AMR-OH. The researcher designed the video into two parts. First, the narration was written and presented in a WhatsApp text form to the PEs as the first draft of the video script. The researcher then obtained formative evaluative feedback on the script from the PEs using the PEMAT and SAM tests. In the second part of the video design, the researcher incorporated the visual and audio elements and presented this second draft to the PEs for evaluation.

The researcher shared the first draft of the video narration script on the closed WhatsApp group for the participants to read. The participants had one week in which to assess the draft. At the end of that week, the researcher called the participants individually to obtain their feedback in PEMAT and SAM scores with additional comments. Once the feedback was implemented, the researcher then sent the second draft of the script with the visual elements

(i.e., the full video). The second draft underwent the same procedure. This phase lasted three weeks.

The video was created using three software programmes. The narration was recorded using Audacity and saved as a .mp3 file. Canva was used to design the slides, and Adobe Premiere was used to combine the slides with the pre-recorded narration. The final result, the video, was shared with the PEs via the closed WhatsApp group.

3.5.3.2 Infographic

Drawing from the literature, this study's use of videos with infographics to complement them is a relatively untested method. While videos are an impactful channel of delivery, particularly of a narrative to engage emotionally with the audience (Occa and Suggs, 2016, pp. 02–06), infographics are geared towards rapid, long-term use (Ebrahimabadi et al., 2019). As conducted in this study, the combined use of videos and infographics for behaviour change is new. However, the use of data visualisation to deliver health information so the end-users can make appropriate lifestyle choices is not (Liu et al., 2016).

The researcher designed the infographic (Appendix N) to present the possible consumer-level actions to prevent and decrease the risk of spreading AMR from food sources. These consumer actions were the four food safety steps presented in section 1.5.1. The food safety steps added the behaviour change element to the awareness created in the video about AMR from food sources. Again, the first draft of the infographic was presented to the PEs for feedback using the PEMAT and SAM tests. Once their initial feedback was incorporated into a revised infographic, the second draft was presented to them, and the same tests were used to obtain their feedback on the subsequent draft. The infographic was shared with the PEs as a PDF file via the closed WhatsApp group. The participants had one week to assess the draft, and at the end of that week, the researcher called the participants individually to obtain their feedback. Once the feedback was implemented, the researcher then sent the second draft of the infographic. The second draft underwent the same assessment procedure. This phase also lasted three weeks.

The researcher conducted a final SSI to obtain feedback on the final drafts of the video and infographic. This feedback SSI also assessed whether the materials were aligned to the five design benchmarks, as presented in Figure 6.

3.6 Sampling

This section details and presents the rationale for the sampling methods used in this study. According to Martínez-Mesa *et al.* (2016, p. 327), sampling is defined as “the process through which individuals or sampling units are selected from the sample frame.” An ideal sample, especially in a health communication study, offers a representative part of the population by which something can be measured or assessed (Martínez-Mesa *et al.*, 2016, p. 326). In media and communication studies, as with health communication, samples can be people, texts, social groups, and even events (Deacon *et al.*, 1999, pp. 41–42).

3.6.1 Sampling method

The study used purposive sampling, drawing from the existing PE population. The PEs were approached before the research began to assess whether they would participate in the study. After the research project had received full ethical approval, the researcher approached the participants via their professional WhatsApp group to request volunteers for the study. This professional WhatsApp group was created by the PEs to discuss, notify, and share information relevant to their work.

3.6.2 Inclusion criteria

The study used the following inclusion criteria for the participants:

- they had to be volunteering PEs
- they had to have access to a smartphone
- they had to have access to the internet

3.6.3 Approaching the PEs

Initially approached before the COVID-19 lockdown, the head PE was the primary contact to the PE population. After expressing interest in the topic and offering to support the study as a participant, the head PE introduced the researcher to the rest of the PE group via the PEs' WhatsApp group. The researcher could then advertise the study on this WhatsApp group and recruit volunteers to evaluate the digital AMR-OH materials. Out of the 30 PEs, only 15 who had access to a smartphone, the internet, and used WhatsApp could volunteer for this study.

Due to COVID-19's impacts on the PEs' access to the campus Wi-Fi, only two PEs could fully commit as volunteer evaluators for this study. The researcher then organised a separate, closed WhatsApp group with only those members who had volunteered. Both participants in this study were Black and identified as female.

During this process of approaching and recruiting the PEs, the researcher reviewed the current literature to identify the gap in health communication for AMR-OH from the food industry. The literature review highlighted health communication that uses behaviour change strategies. It also identified the successful elements of these studies in health communication about this topic. This literature review was conducted to summarise the relevant, available literature and address the gap in the form of this study.

3.7 Other research method considerations

This section details the additional considerations when following the above research procedure.

3.7.1 Study duration and materials on AMR-OH

The study was designed to collect data over six-to-seven weeks, with a weekly presentation of drafts, feedback, and feedback implementation.

3.7.2 Sharing the materials

The data collection was designed to take place via WhatsApp messages, group and individual calls, and file sharing service to send the digital health information materials. In Word document, PDF, and mp4 formats, the materials were designed to use as little data as possible when sharing and downloading. WhatsApp messages were sent to the group as often as necessary to clarify information about the material and book time slots to conduct the PEMAT and SAM tests.

3.7.3 Evaluating the conceptualised materials

The researcher obtained the baseline scores for the materials using the CCI. The baseline scores were calculated by inputting responses into a PDF form (see Appendix I and Appendix J).

The researcher then conducted WhatsApp calls to individually administer the PEMAT and SAM tests to the participants and collect responses. This process would take between 20 – 35 minutes, depending on whether they had any additional comments or feedback to share. The participants' responses from the initial interview and the subsequent feedback sessions were recorded on a pre-constructed Word document assigned to them. Each PEMAT and SAM score sheet was titled with the participant's name and a specific code for the draft they were assessing to simplify recording, organising, and retrieving responses; for example, the PEMAT response document for the video narration script for each participant was titled "MA_PEMAT_response_ParticipantName_Vn_D1".

The study produced two types of health information materials: an infographic and a short video. The video presented information about the rise, spread, and dangers of AMR from the overuse and misuse of antibiotics in the meat, dairy, and agricultural industries, and the infographic offered four food safety actions as a consumer-level response. The initial drafts of the infographic and video were conceptualised and designed in advance and then presented to the PE consultants, after which the PEMAT and SAM tests were used to assess each consecutive draft.

3.8 Data collection techniques

This section details and motivates the data collection techniques used in the study: the questionnaire, CCI, PEMAT, SAM, and the semi-structured interview.

3.8.1 Questionnaire

According to Hansen *et al.* (1998) questionnaires are a list of relevant questions that are standardised and organised around the research topic so that the same questions can be administered to participants (Hansen et al., 1998, pp. 225–226). This study used a telephone-administered pre-intervention questionnaire to gauge the following background information

about the participants: the extent of their roles as PEs; their current level of internet use; their levels of comfort with using internet-connected devices to access information or browse social media sites; their current knowledge about AMR and AMR-OH concerning human health and the overuse and misuse of antibiotics in the meat, dairy, and agricultural industries respectively. Additionally, responses about AMR prevention behaviours such as hand hygiene and cough etiquette were also gathered. This questionnaire, intended to be a needs assessment, used mostly closed-ended questions with some questions requiring a short explanation from the participants (Appendix E). The participants' responses informed the design of the materials.

3.8.2 Health communication clarity assessment: Clear Communication Index

This study opted to present a baseline score for the materials and used a reliable evaluative test: the Clear Communication Index (CCI). The CCI works as a tool for researchers and health communication creators to assess content clarity (Alpert et al., 2017; Baur and Prue, 2014; Marinho et al., 2020; Porter et al., 2019). This clarity also addresses the readability, understandability, and actionability of HC material in any format using 20 items scoring either zero or one across seven areas (CDC, 2019, p. 01):

1. Main Message and Call to Action
2. Language
3. Information Design
4. State of the Science
5. Behavioural Recommendations
6. Numbers
7. Risk

This study's use of the CCI is drawn from this test's validity, as shown in other studies. Baur and Prue (2014), using the CCI to assess various health communication material's clarity in a vast online repository, show that the CCI is a valid and effective tool. Baur and Prue also point out that "The CDC Index is built on research about effective clear communication criteria and integrates this research with risk communication, health and science literacy, behavioural science, and numeracy research for a set of criteria that reflect the breadth of audiences, topics, and circumstances that public health professionals routinely encounter."

(Baur and Prue, 2014, p. 630). Their CCI assessment revealed that many materials were unclear to patients because of confusing words and poor, unappealing data visualisation (Baur and Prue, 2014, pp. 632–636). Once the low-scoring materials were improved, the respondents showed that the main messages were clear to them.

Marinho *et al.* (2020) further emphasise the validity of the test for a cross-cultural examination of Brazilian Portuguese because the CCI assesses the “Main Message and Call to Action,” “Language,” “Information Design,” “State of the Science (scientific knowledge),” “Behavioral Recommendations,” “Numbers,” and “Risk in a short time,” (Marinho *et al.*, 2020, p. 02). The CCI, developed as a tool by healthcare professionals, can assess health communication format and topic (Marinho *et al.*, 2020, pp. 02–03). In this study, CCI evaluation was conducted for the video and infographic and provided a baseline score for each.

3.8.3 Health literacy assessment tests

The study used two reliable and valid health material assessment tests (Finnie *et al.*, 2010; Hoffmann and Ladner, 2012; Kang and Lee, 2019; Shoemaker *et al.*, 2014; Vishnevetsky *et al.*, 2018; Zellmer *et al.*, 2015), to obtain end-user feedback. These tests are presented below. Once applied to the material designed in this study, these tests were expected to reflect an adequate level of reliability and the normal level of validity for a study in which the research interactions with participants were conducted in English.

3.8.4 Patient Education Material Assessment Tool (PEMAT)

The Patient Education Material Assessment Tool (PEMAT) is a way to test the Actionability and Understandability of health information materials (Shoemaker *et al.*, 2014). The tool is designed to assess printed and audio/visual materials. Various other studies worldwide have used this tool to identify strengths and weaknesses to improve digital and printed health information materials’ content and reception (Blagojevic and Kelly-Campbell, 2020; Kang and Lee, 2019; Sharma *et al.*, 2018). As presented in the Agency for Healthcare and Research and Quality PEMAT user guide, there are two domains of assessment, Understandability and Actionability, and these domains have 19 and 7 items respectively, to measure these domains (Agency for Healthcare Research and Quality, 2013). Items under Understandability measure

how easily readers of various backgrounds and health literacy levels can “process and explain key messages”; and the Actionability items measure whether they can establish what they can do about the issue from the information provided on the material (Agency for Healthcare Research and Quality, 2013). In this study, the PEMAT was used to identify whether the PE consultants could read, understand, and possibly put into action any behaviour presented in the materials. Based on the initial interviews, each PEMAT item was rephrased to suit the participants' literacy level.

3.8.5 Suitability Assessment of Materials test

The Suitability Assessment of Materials (SAM) test is a “systematic method to objectively assess the suitability of health information materials for a particular audience in a short time...” (Smith, 2008). This test was created by Doak et al. (1996), and it uses six primary evaluation criteria: Content, Literacy Demand, Graphics, Layout and Typography, Learning Stimulation and Motivation, and Cultural Appropriateness; and each criterion has several items further addressing that criterion (Shieh and Hosei, 2008). As with the PEMAT, many studies have used the SAM test to assess the suitability of health literacy materials to either present a review of materials in the area or improve them (Helitzer et al., 2009; Rhee et al., 2013; Sharma et al., 2018; Shieh and Hosei, 2008). In this study, the SAM test was used to identify if the material was suited to the participants' literacy level and cultural background. It also tested whether the form and function of the material were appropriate for their work as PEs. Based on the initial interviews, each SAM item was rephrased to suit the participants' literacy level and cultural context; this was done by repeating the question with simpler words and emphasising the aspect of the material the researcher was asking the participants about.

3.8.6 Semi-structured interview

Post-intervention semi-structured interviews (SSI), conducted individually over the phone, were used to understand how the intervention impacted the participants personally and establish whether they considered the conceptualised materials suitable for their work as PEs. These questions were open-ended and required descriptive responses from the participants.

3.9 Data analysis

This section presents how the data was analysed, and the tools used to do so.

3.9.1 Numerical data

The numerical data from the needs assessment and SSI, and the PEMAT and SAM tests were first recorded in individual Microsoft Word documents. These Word documents were each titled based on what data they each contained: participants' names, date and time of the interaction, and the name of the data the researcher was collecting on the first pages of each document. The scores were then transferred to an Excel spreadsheet with matching labels from the Word documents. Responses regarding the PEs' media use were analysed by listing the kinds of media used, the devices, and the number of hours they spend online. The AMR-OH questions' answers were recorded similarly and analysed by comparing the participants' needs assessment responses with responses from the SSI administered in Phase 3.

3.9.2 End-user data analysis

Each draft of the materials was scored individually by the two participants. Their responses were combined in a PEMAT or SAM titled Word document for each draft of the material (video and infographic). The video and infographic's final scores were calculated after PEMAT, and SAM data was collected for the final drafts. This final score revealed how well-suited the material was for the PEs. Tabling this data in an Excel spread sheet allowed the researcher to analyse each score from the PEMAT and SAM questions for the video and infographic.

3.9.3 Qualitative

The qualitative data was collected from the needs assessment, SSI and the PEMAT and SAM tests' additional comments sections. While the needs assessment data was transcribed manually on Word documents, the SSI responses were recorded and transcribed using the Otter AI™ app on the researcher's iPad Air. All qualitative data were recorded with clear and specific labels and titles, as mentioned above. NVivo 12 Pro® (hereafter NVivo®) was used to input the recorded data to code the participants' responses by questions (Appendix H) and

under themes (see Figure 10). This data was analysed using deductive thematic analysis (Boyatzis, 1998; Pearce, 2019). When qualitative data undergo deductive thematic analysis, the researcher categorises and codes the data based on theory-driven themes (Boyatzis, 1998, pp. 29, 33; Pearce, 2019, p. 265). In this study, research question 2 and the supporting literature presented in Chapter Two, guide the themes in Figure 6. The SSI questions, the PEMAT test, and the SAM test are directed toward these themes, so the PEs' answers are categorised accordingly.

3.10 Ethical considerations

The human experience, even when reduced to numbers, is still a human experience. A study about creating and evaluating health literacy, and accessible to the financially and physically more vulnerable campus community members, is centred on the Peer Educators' lived experiences. Despite its "low-risk" status, this study requires the research to consider ethical standards.

This study was first proposed to the University's Higher Degrees Committee and received full approval on 13 November 2019. Ethical approval was sought through an application. This study's ethical approval (Appendix A) was granted by the Rhodes University Ethical Standards Committee (2020-1058-3430) on 15 May 2020. The researcher ensured participants were treated with respect, understood the benefits of their participation, and had the option to withdraw from the study at any point without any negative consequences.

The study shared a letter of invitation and consent form with each participant (Appendix C). Since the participants could not physically access the University's printers and scanners during the lockdown, the researcher instead read the documents aloud and explained to each participant over individual WhatsApp calls before requesting their verbal consent. The PEs' verbal consent to their participation in the study was sent via voice notes on WhatsApp to the researcher.

This study further ensured that all participants, including any identifiable information they shared, were kept confidential. The letter of invitation and consent form assured the PEs' confidentiality, its meaning was explained when obtaining the PEs' informed consent. Participants were given a code during data analysis, and this code was used to refer to them

and their feedback throughout this thesis. Their codes will be used in any future publication from this research to ensure their continued confidentiality.

3.11 Limitations and delimitations

This section presents the limitations and delimitations of this study.

3.11.1 Limitations imposed by COVID-19 and how they affected the study

The researcher could no longer use participatory action research to co-create digital educational materials as initially intended. The more extensive implementation (section 3.1) included intensive community engagement, such as the digital media training sessions for the PEs, the co-creation of the digital materials, and the pre and post-test focus group discussions to identify the impacts of the intervention. The COVID-19 lockdown meant that the researcher could no longer implement the extensive intervention or test the materials to evaluate such material's impact and effectiveness. Due to the lockdown conditions, the researcher adapted the study to only design the intervention and conceptualise the digital educational materials, and evaluate the *potential* impact and effectiveness of the material.

The lack of face-to-face contact further limited the study, due to the pandemic conditions in which the study was conducted. Due to the original project's digital nature, the researcher and supervisors could take appropriate measures to shift the project entirely online. However, this response drastically reduced the number of participants and diluted the richness of the interaction with the participants. However, the participants who volunteered remained invaluable to the progress of this study.

3.11.2 Delimitations and how they define the scope of the study

As a response to the limitations imposed by COVID-19, the study was scaled down to prioritise two aspects. First, identifying the current gap in the literature on AMR-OH and how SBCC fits into digital health communication on this topic. Second, addressing this gap by conceptualising digital educational materials on AMR-OH. As mentioned above, this study looks only at the initial phase of a larger project.

Two specific delimitations defined the scope of the study: the topic and the target audience. The study excluded the other drivers of AMR, as shown in Figure 1, and focused only on AMR from food sources as the health communication topic. Moreover, the conceptualised materials were explicitly aimed at and designed for the Rhodes University PEs as the intended audience. The PEs, already familiar with AMR from previous projects, are the more relevant audience for the conceptualised materials, building on their existing knowledge and supporting their professional role.

The choice of the audience also influenced three aspects of the conceptualised materials. First, the kinds of behaviour change actions the materials suggested for the audience were specifically consumer-level actions that could easily be incorporated into daily life. Second, the language used in these materials to describe AMR-OH and its danger to human health were simplified for the PEs' reading levels. These levels were identified during the needs assessment. Third, the channel of communication was restricted to WhatsApp because the needs assessment showed that this was their most accessible channel of communication.

3.12 Chapter summary

This chapter presented the study's methodological framework, the data collection techniques, data analysis, the ethical considerations, and the limitations and delimitations. All these sections were aligned to the central aims and objectives of the study's research questions. The following chapter will present the results of the study.

4 Chapter Four: Results

This study was conducted in three phases presented in the previous chapter. The study collected both qualitative and quantitative data which were then analysed and concentrated into this chapter. Chapter Four presents the results of this study aligned with the objectives of research question 2. These results were coded against five themes (*Ease of Use of Technology*, *Clarity of Content*, *Appropriate Format*, *Appropriate for target audience*, and *Actionable*) created to implement deductive thematic analysis, and are presented accordingly. These five themes and their respective sub-themes are illustrated in Figure 10:

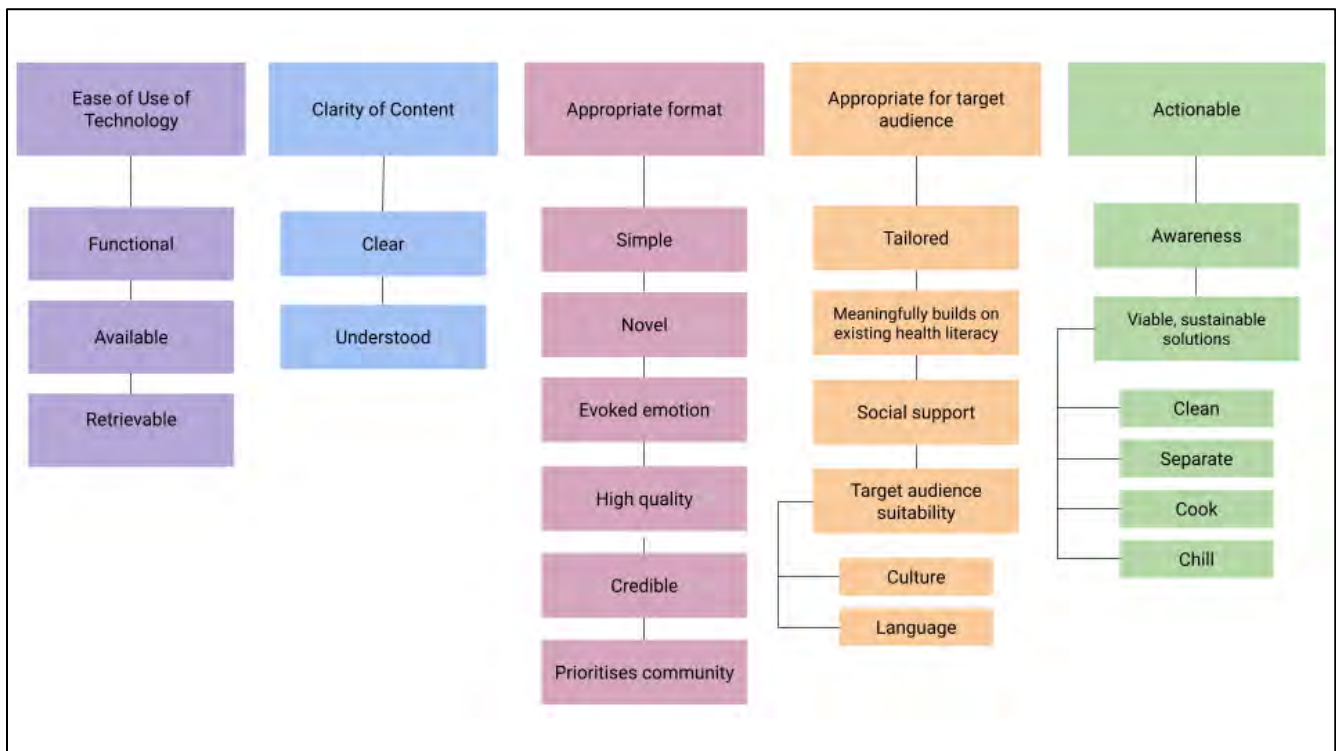


Figure 10: The themes and sub-themes under which all data were coded.

While the results in their entirety were disaggregated and coded based on the corresponding benchmarks, sections 4.1 to 4.3 present an overview of the high-level results, the demographics of the participants, and a more detailed description of how the deductive thematic analysis was conducted.

4.1 High-level results

The data collection began with a needs assessment; and once the conceptualisation and design phase were initiated, the video and infographic were first tested using the CCI, and then the PEMAT and SAM tests. The semi-structured interview (SSI) was the final phase of data collection. The needs assessment collected a combination of qualitative and quantitative data while the CCI, PEMAT and SAM tests were designed to collect quantitative data. Here, however, the researcher elected to give participants the option to elaborate on their PEMAT and SAM scores, so some qualitative data was also collected. The video and infographic scored high on the CCI test. The video scored 93.3%, and the infographic scored 94.4%.

The PEMAT and SAM test scores improved based on the subsequent test of each material. The SSI collected only qualitative data and took place over two 60-90 minute sessions. The SSI data represents the PEs' interest in the topic, and thoughts on the digital educational material they evaluated, in quantitative and qualitative form. All qualitative responses were coded according to the themes and sub-themes in Figure 10. The following charts present the aggregated PEMAT and SAM scores for the narration on its own, the video, and the infographic:

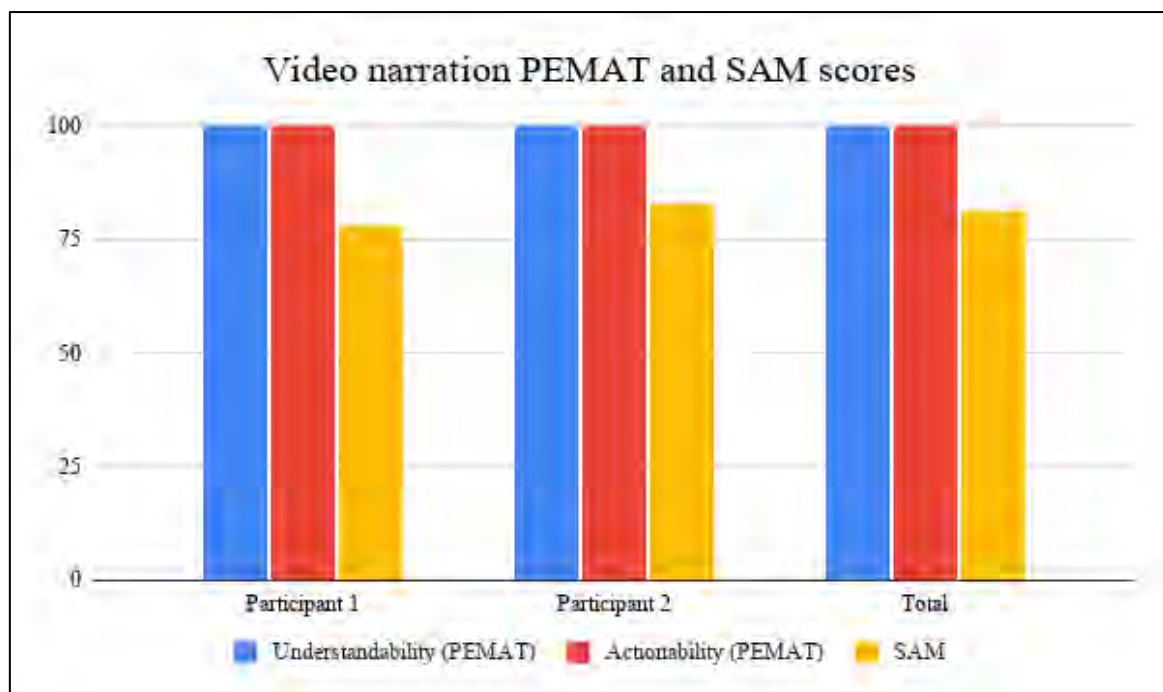


Figure 11: The PEMAT and SAM scores for the video narration.

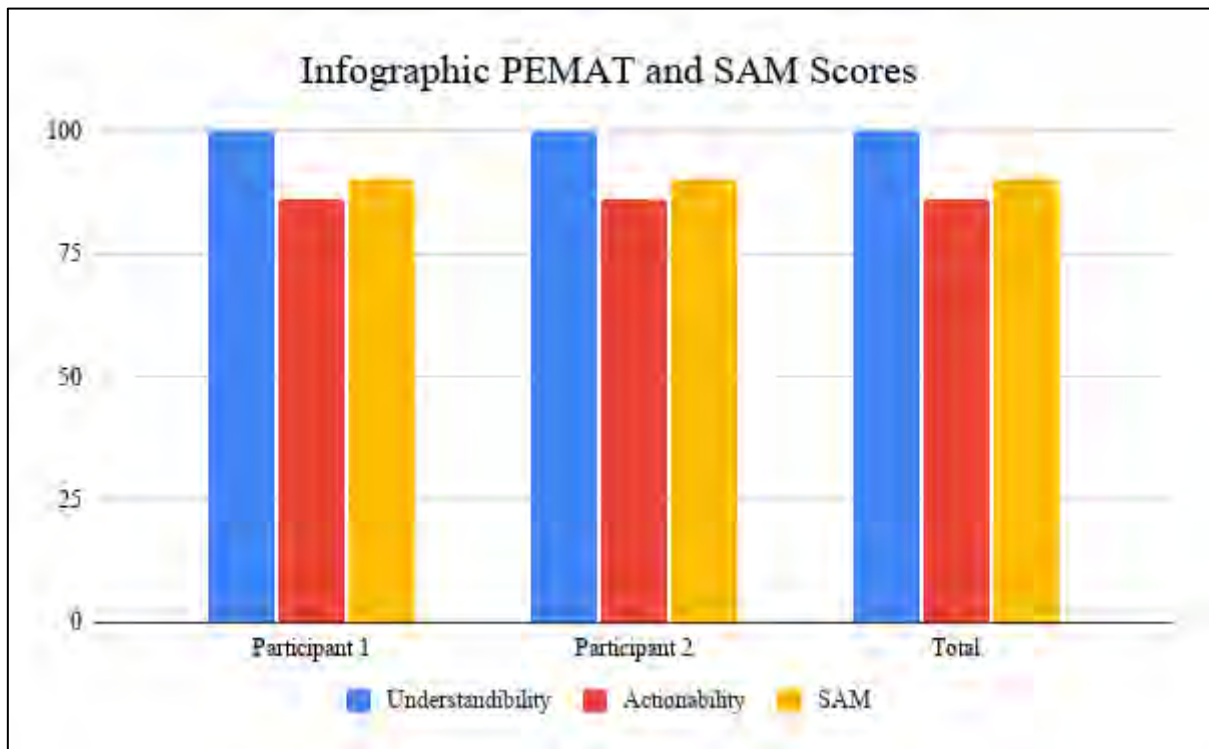


Figure 12: The PEMAT and SAM scores for the video.

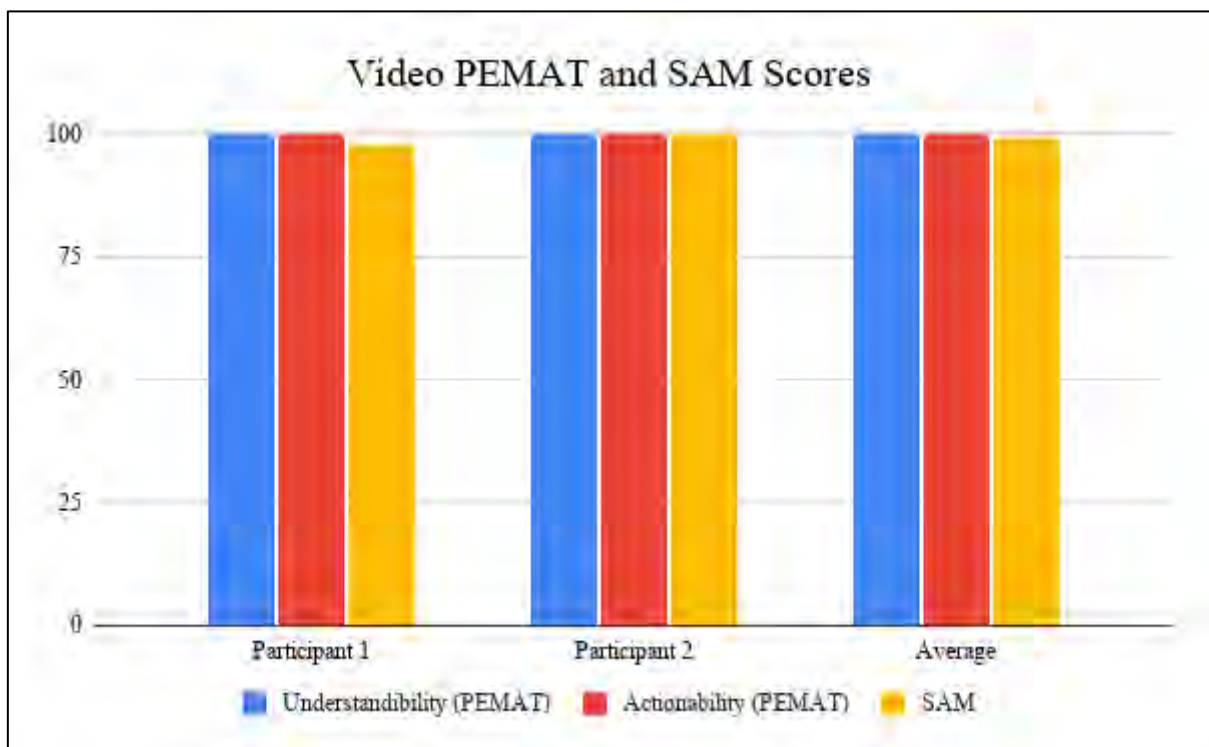


Figure 13: The PEMAT and SAM scores for the infographic.

In this chapter, however, the relevant results, presented under each of the five themes, are drawn from disaggregating the qualitative and quantitative data. Each theme will begin with relevant responses from the need assessment, then the PEMAT and SAM test scores, and conclude with the SSI responses. For the aggregated presentation of the results, please see Appendix Q & Appendix R.

4.2 Demographics

The two volunteering participants were both peer educators, support staff, female, Black, and spoke isiXhosa as their first language and English as their second. They differed in the following ways presented in Table 1:

Question	Participant 1	Participant 2
<i>How old are you?</i>	43	38
<i>What is your current occupation?</i>	Cleaner	Housekeeping supervisor
<i>When did you become a peer educator?</i>	2016	2012
<i>What is your highest qualification?</i>	Grade 11	Diploma in Hotel Operations Management
<i>Which area of Makhanda do you live in?</i>	Extension 8	Town, High Street

Table 1: This table shows the demographics of the two participants.

4.3 Deductive thematic analysis

As described in section 3.9.3, the behaviour change element, shown in the qualitative data, was evaluated by developing and using the five themes drawn from the literature (see Figure 10). The qualitative data was analysed thematically by manually coding the PEs' responses in the transcripts on Google Docs™, and then refined on NVivo®. On Google Docs, the participants' responses were highlighted in the darker shade of the relevant colour to identify the most relevant answer to the design benchmarks/themes. A lighter shade of the same

colour was then used to identify the context for the response, so the researcher could better understand why the participants responded that way. The following figures show how the manual and NVivo® coding were conducted.

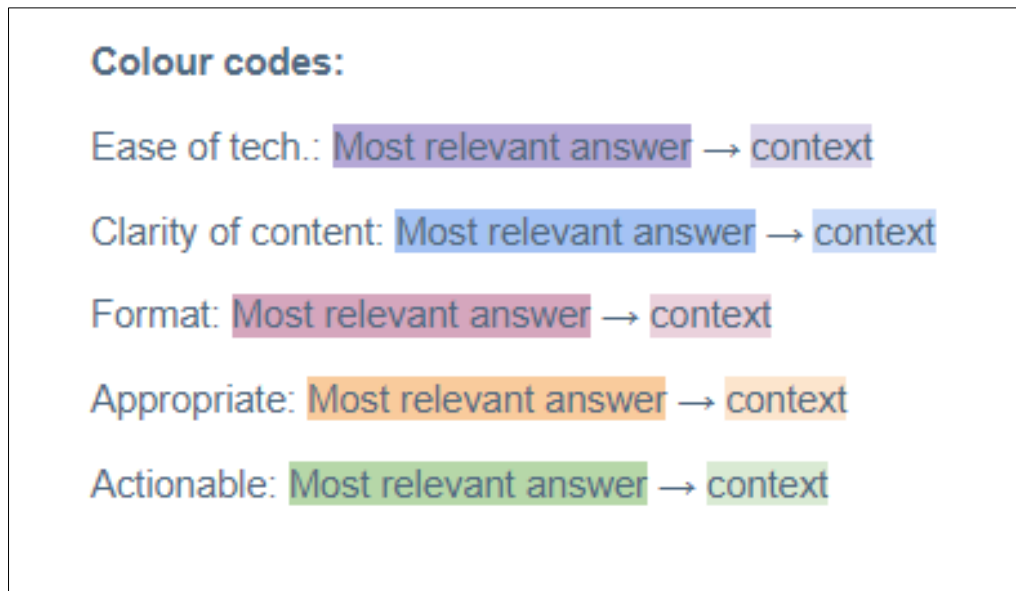


Figure 14: The colour codes used to identify themes in the participants' responses on Google Docs.

Shraddha 05:41
Okay, so, so when it comes to the video and infographic that I shared with you, **what features made it easy for you to share? I mean, for you to receive the video and infographic, and what made it easy for you to keep?** So, for example, was it small file size that you could download quickly. Yeah.

06:10
I would start with your size. Size was very adequate because in some phones, you would find that, you know, as I say, depending on the upgrade or, you know, model of a phone that you have, some - if the file are, you know are too big, or the videos take too much space, they won't allow you to the phone, or they would request you to delete certain things in order for you to accommodate that.

Shraddha 06:38
Yeah,

06:38
...so, on your video I think that the size was fine right because it was a small form, because in some forms depending what you've got, it will actually ask you before it receives it that change the size, because it to say maybe the size the picture is too large so change more. In some phones, you're not even that lucky, they will just decline and say that, you know, delete some stuff to make more space.

Figure 15: An example of manually coding participant responses for the theme 'Ease of Use of Technology'.

Name	References	Created On	Created By	Modified On	Modified By
A. Ease of use of technology	1	2 2020/10/12 12:17	S	2020/10/04 15:30	S
C. Available	1	5 2020/10/22 08:23	S	2020/10/25 15:23	S
D. Functional	1	6 2020/10/22 08:23	S	2020/10/25 15:34	S
E. Retrievable	1	8 2020/10/23 08:23	S	2020/10/24 15:26	S
B. Clarity of content	0	0 2020/10/12 12:17	S	2020/10/02 08:41	S
C. Clear	1	4 2020/10/22 08:28	S	2020/10/25 15:48	S
D. Understood	1	5 2020/10/22 08:28	S	2020/10/25 15:49	S
C. Format	0	0 2020/10/22 08:29	S	2020/10/02 08:43	S
C. Credible	1	2 2020/10/22 08:10	S	2020/10/25 16:01	S
D. Evoked emotion	1	7 2020/10/23 08:29	S	2020/10/25 15:57	S
E. High quality	1	1 2020/10/22 08:10	S	2020/10/25 16:00	S
F. Novel	1	1 2020/10/22 08:29	S	2020/10/25 15:52	S
G. Prioritises the community	1	2 2020/10/22 08:31	S	2020/10/25 15:41	S
H. Simple	1	3 2020/10/22 08:29	S	2020/10/25 15:50	S
D. Appropriate	0	0 2020/10/12 12:18	S	2020/10/02 08:46	S
C. Cultural suitability	1	7 2020/10/23 08:15	S	2020/10/25 16:12	S
D. Linguistic suitability	1	2 2020/10/22 08:22	S	2020/10/25 16:08	S
E. Meaningfully builds on PE's existing knowledge + healthy literacy levels	1	6 2020/10/22 08:32	S	2020/10/25 16:31	S
F. Social support from PEs	0	0 2020/10/23 08:13	S	2020/10/22 08:13	S
G. Tailored information	1	6 2020/10/25 15:29	S	2020/10/25 16:09	S
E. Actionable	1	2 2020/10/22 12:18	S	2020/10/02 08:46	S
C. Raise awareness	1	6 2020/10/22 08:34	S	2020/10/25 16:10	S
D. Viable + sustainable actions	1	4 2020/10/22 08:36	S	2020/10/25 16:00	S
F. Food Safety	0	0 2020/10/12 12:39	S	2020/10/02 08:46	S
a. Clean	2	7 2020/10/12 12:35	S	2020/10/25 16:36	S
b. Separate	2	5 2020/10/12 12:41	S	2020/10/25 16:37	S
c. Cook	1	2 2020/10/12 12:41	S	2020/10/25 16:38	S
d. Chill	2	3 2020/10/12 12:41	S	2020/10/25 16:39	S

Figure 16: Coding participant responses in NVivo®.

4.4 The themes

The following themes, drawn from the literature and illustrated in Figure 10, and the corresponding results are presented below. Each theme presents the needs assessment results, the relevant PEMAT and SAM scores, and finally, the SSI responses.

4.4.1 Ease of use of technology

This theme prioritised the functionality, availability, and retrievability of the video and infographic. Here, the PEs' responses were coded for whether the smartphone is the PE's personal device, is Wi-Fi enabled when on campus, or data-enabled to access the AMR-OH information.

4.4.1.1 Functionality

This section details the digital media aspects of the participants' personal and professional lives. This sub-theme examined whether the participants used their smartphone regularly and comfortably to communicate via WhatsApp. The participants' regularity and comfort with using a smartphone and WhatsApp qualify them as familiar with technology as they are with paper health information materials.

4.4.1.2 Internet and smartphone access

Both participants owned smartphones and used them regularly for personal, and some professional, communication. While Participant 1 used only their smartphone as the primary device to access social media and communicate online, Participant 2 used a desktop personal computer (PC) in addition to their smartphone. Both participants relied on Eduroam, the free campus Wi-Fi, and data to access the internet; however, only Participant 2 had access to Wi-Fi at home using a domestic connection they personally paid for. The participants spent about an hour every day for casual browsing and banking. According to their responses, while they both spent time browsing on weekdays (when they have access to Eduroam), only Participant 1 continued browsing on weekends.

Regarding their confidence when using a smartphone and PC, both participants rated high on the scale (1 = low, 5 = moderate, 10 = high) for both devices respectively. Participant 1 provided context regarding their confidence using a PC, sharing that they “did a computer course”.

4.4.1.3 Social media use

The concept and variety of social media were familiar to the participants. Facebook and WhatsApp were platforms both participants used daily, and only Participant 2 used an additional platform, Twitter. On the scale of 1-5, going from the least to the most active concerning browsing and posting on social media, both participants opted for “2 = I browse sometimes but don’t post/text”. Here Participant 2 differentiated between the two social media platforms they use most often. They rated their Facebook use “2 = I browse sometimes but don’t post/text” and rated their WhatsApp use “5 = I browse a lot and post/text a lot”.

During the needs assessment, both participants were recorded to spend “between 2-4 hours” on social media during work. They shared that they use only WhatsApp during their work hours to communicate peer educator-related information.

During the SSI, as they stated during the needs assessment, both participants shared that they had personal smartphones which they were comfortable using. Only the SSI interviews were conducted on a group call with both participants on the call because they were repeatedly experiencing internet breakdowns and had to be on campus to participate fully in this study. They were also familiar with WhatsApp and used it to communicate in their professional and

personal spaces. The participants had the following to say regarding the use of WhatsApp as a channel of information delivery:

Participant 1: “As [Participant 2] have said like WhatsApp was so easy, of which because it's so easy even for you to press the [.] to forward the information to some people, even to our colleagues, So it was much easier for us to communicate with what[sApp].”

Participant 2: “Well, for me, it worked ... in the sense that on WhatsApp, it's very easy to share stuff, you know, because as soon as it comes in, you are able to share that video, or that document with everyone that is on the list on the WhatsApp list.” [SSI-2]

4.4.1.4 Availability

The participants shared that their smartphones were available to them at all times, and they could, therefore access the video and infographic at any time. However, Participant 2 raised the issue of having purchase data to use the internet during the strict COVID-19 lockdown.

Participant 2: “it helped because we had smartphones that do allow these things, and also as [Participant 1] said, when we are at work at least we are at the privilege of having Eduroam, you know yeah for wireless. So that helps a lot. At home, if we are at home, like maybe we did on the lockdown days, we're using a lot of our own personal data.” [SSI-2]

4.4.1.5 Retrievability

Both participants downloaded the material from WhatsApp while on campus via Eduroam. They both stored the materials on their phone's internal storage and shared that

they found this easy to receive, keep, and share. The following are the PEs' responses about the retrievability of the materials.

Participant 1: "I'm storing them in my phone so I can watch them time and again." [SSI-2]

Participant 2: "on your video I think that the size was fine right because it was a small form, ..." [SSI-2]

Although both participants spoke about the video more than the infographic regarding retrievability, they also stored the infographic in the same way.

4.4.2 Clarity of content

The PEMAT and SAM test scores revealed that the participants could easily understand the video narration script.

Participant 1 regarding their ease of reading the scientific terms used in the script: "[the researcher] shorten[ed] them and then explain[ed] them." [PEMAT-video narration]

Participant 2 picked up on the lack of culture-specific icons or terms in the script: "There are no specific images related to the amaXhosa culture." [SAM-video narration]

The video narration script scores informed the subsequent conceptualisation and design of the video, which was also, evaluated using the PEMAT and SAM tests. Here, the participants

rated the video high in understandability because the scientific and general vocabularies were clear. Both participants rated “1” for three items related to the ‘Clarity of content’ theme, which contributed to a total score of 100%. As illustrated in Figure 11 and Figure 12, the SAM scores between the narration and video increased from an average suitability of 81% to 99% respectively.

PEMAT scores for the video		Participant 1	Participant 2
3	<i>Does the video use words that are easy to understand? (P and A/V)</i>	1	1
4	<i>Are the scientific words in the video easy to understand? (P and A/V)</i>	1	1
5	<i>Are the numbers in the video clear and easy to understand? (P)</i>	1	1

Table 2: This table presents the participants’ scores for the video.

These three items from the PEMAT test were the most relevant to this theme. (P = Print materials, AV = Audio/Visual materials)

The PE’s SSI responses were coded for their evaluation of the clarity and understandability of the content. Both participants shared that the content in the video and infographic was clear to understand. They referred to the simplicity of the icons and vocabulary in their responses. Here, both participants elaborate on how the icons in the video were chosen to match the script, helped them visualise the information they heard, and therefore made the video clear and easy to understand.

Participant 1: “Its clean, and when you look at the pictures, it shows everything... ..the pictures says it all. And then even the information while you're trying to when you try to explain it shows it makes you move back to the pictures or else to the topic. So that we could understand and it's easier.” [SSI-2]

Participant 2: “Yeah, I’m with [Participant 1] as well. It was, it was very clear and very understandable. ... As I said before, I liked the fact that you only highlighted a few, you know, certain key words, as I said, as you would have

for a 'human', you know, we would have that picture, you know of a man, or you know, picture of the animal if it's about the animal, about pills. And the fact that I like the way that it was composed on the sense that you are there explaining, so while you are listening. You know, you also can see that is on the video there yeah and the arrow will connect so and as you are speaking then the arrow will tell you that we are connecting you know a person to the pill to the animal then you would have that. So it was very clear and very easy to understand.” [SSI-2]

These icons remained the same between the video and the infographic to maintain consistency and aid a common visualisation.

When asked about whether there were any elements the PEs could not explain or understand or anything that the support staff would consider a barrier to their understanding of the topic, both participants responded that this was not the case. Both participants found the few scientific words properly explained, and the general vocabulary to be clear and easy to understand.

Participant 1: “No... . Is that as we have said that there are no bombastic words here. Even the same scientific words that you have used is understandable. And you put the scientific words, then you explain it, like, a people who could understand, then you explain it's what is AMR [...] it's much easier.”

The participants' responses were positive. Participant 2 elaborated that conducting a needs assessment with an emphasis on the target audience's health and formal literacy levels helps identify how best to tailor the information to ensure clarity and understandability. Participant 2 raised this issue because they found that PEs could easily explain the information in the video and infographic to the support staff.

Participant 2: “Just to add on that as well because as I said, it's always a good idea when you get people, or assessing people, like you did with me and [Participant 1]. So you would have people with sort of like try, you know your presentation because when we go and go to the peer educators... we end up having to explain those you know those words. So it's a very I think it's very important when you're doing you know your research and stuff to make sure that you know the people that are on the frontline, understand what you're trying to push across.” [SSI-2]

4.4.3 Appropriate Format

The format of the information (i.e., the video and infographic), was included as a theme and examined during the semi-structured interview. Here the sub-themes have been combined into two groups for efficiency. The first consists of ‘Simple’, ‘Novel’, and ‘Evoked emotion’. The second comprises ‘High quality’, ‘Credible’, and ‘Prioritises community’.

During the needs assessment, the participants shared that they view videos and images on their smartphones while using their preferred social media platforms, WhatsApp and Facebook. They also reported that health information, particularly AMR-OH, in video and image (infographic) format would be of interest to them personally and professionally.

They both affirmed that having a repository of digital health information to share with their peers would help their role as peer educators. They explained why below:

Participant 1: “Because people don’t believe that something you say by mouth. But when you see pictures and videos [it] would be helpful to make [them] understand better.”

Participant 2: “Useful in image/video format. Sometimes explaining things is quicker and more understandable in a video or image. For example, smoking and what it does to the lungs. Just a picture of an affected lung/liver has an

impact on the viewer. Especially the before and after pictures. Sometimes people have knowledge but no visuals.”

4.4.3.1 Simple, novel, and evoked emotion

The PEMAT and SAM scores suggest the participants felt that the infographic was simple to read through and easy to understand. The simplicity of the icons representing the four food safety actions was highlighted:

Participant 2: “because it's got these pictures that are sort of showing 'Okay, this is the fire [icon] so obviously with what with whatever education level you've got [...] 'fire' you associate it with temperature. So, you know, you know, and so I think for me, I don't know about others but I think also for the peer educators, it's very well aligned.” [SSI-2]

The participants found that the video and infographic as individual formats were simple to use. The infographic, in particular, was referred to when talking about simplicity:

Participant 1: “Yes, it was simple, my dear, even if [...] it doesn't bother you, you can read it. Like continuously. It's not bothering.” [SSI-2]

The format's novelty, which both participants affirmed during the needs assessment and SSI, brought forth the following feelings: excitement, curiosity, concern, and relief.

Excitement and enjoyment regarding the use of smartphones to view the educational video and infographic:

Participant 1: “To me, ... because I’m so excited about it and ... also be comfortable with it. ...” [SSI-2]

When asked if they enjoyed viewing the content, both participants responded positively and reiterated how exciting the experience was to them.

Curiosity to learn more about AMR-OH:

The participants responded that they became more curious about AMR-OH because they regularly consume meat, dairy, and agricultural produce. When asked to elaborate, they shared that although they had heard about AMR from food sources as an aspect of AMR from human overuse and misuse of antibiotics, they had no further information regarding the topic. With the materials created in this study, Participant 2 explained that these materials piqued their interest to learn, and do more to decrease the chances of AMR in their life.

Participant 2: “So you like coming with it now on the side of food, we thought maybe we were safe, we don’t have to worry. Or consider any you know resistance with antibiotics, ...” [SSI-2]

Participant 1: “I am curious it because it’s exciting. It makes you learn more, because, as [Participant 2] said, we used to get hear those [inadialable] foods but now it lives in food so it’s more interesting. I feel like we’ve learned more.” [SSI-2]

Concern about the danger of AMR-OH on human beings:

Regarding the potential negative impacts of AMR from food sources on people, both participants expressed their concern. Through the video and infographic, i.e. the presentation of the problem and the consumer-level solution, respectively, the participants began to question and consider changing their current food safety habits.

Participant 2: “Yes, I was. ... I was because I started asking myself questions, and you know it started, you know on me, you know, on what I do on a daily basis when it comes to my food standard to know to my culture as a black person. You know what we do when we've got, you know, gatherings and how we handle [meat].”

Participant 1: “...very much concerned, my dear, because I never realized that maybe I will maybe cook like my meat into half-cooked, that could be [.] harm my health. like, yeah, so I was so much concerned.” [SSI-2]

Relief about having solutions to address the problem:

The participants were asked whether the food safety steps, presented as a solution at the end of the video and making up the entire infographic, gave them relief. Both participants expressed that the four food safety steps were a relief. Other than relief, Participant 2, in particular, highlighted that inclusion of a solution enhanced their experience of viewing and reading the digital educational materials.

Participant 2: “As I was saying that it was a very nice gesture, you know for having to outline the problem [.] . And also you know at the same breath, offering a solution. So that a person that is willing to change their situation, you know, can do it, and have confidence.” [SSI-2]

4.4.3.2 High in quality, credible, and prioritises the community

This sub-theme covered the video and infographic quality and the credibility of the content presented in these formats. It also coded the responses for whether the formats prioritised the needs of the PE community. The participants felt that the format was high in quality and that the content presented in such formats were credible.

Participant 1: “The quality was high and you can trust it as well. ...the quality was high like [...] It's something that we're using every now and again, the thing is that now we have a solution of how to try by all means to run away from bacteria that can make us sick and all that stuff.”

Participant 2 shared that, because of their Food Services training and their position as a housekeeping supervisor on campus, they could see that the researcher had presented credible information in the video and infographic. According to them, this added to the quality of the materials.

Participant 2: “Well, for me, as I said, it was high quality. So as I have mentioned before that I was in food services. So, I did do food theory before I came to work here. So, I was able to pinpoint that there was a research that was done. And because some of the stuff I could relate, to some of the stuff I did ... [...]. Maybe if I didn't have that background. I would have asked you, you know, a few questions.” [SSI-2]

4.4.4 Appropriate for target audience

This theme coded responses to see if the content's vocabulary and the format were appropriate for the participants' role as peer educators. Under this theme, there were four sub-themes: 'Tailored', 'Meaningfully builds on existing health literacy', 'Social support', and 'Target audience suitability'. The last sub-theme was further divided into 'Cultural' and 'Linguistic' suitability.

4.4.4.1 AMR and AMR-OH background

When asked about their prior health literacy about AMR and AMR-OH during the needs assessment, both participants reported to have some knowledge about AMR because of their work as PEs:

Participant 1: “I hear about it at the training workshop for PE in 2019. With the Pharmacy department.”

Participant 2: “[I] Heard about it during an outbreak of TB (XDR and MDR), knowledge about resistance came about. [I] Can’t remember the year, but they were talking about it at the clinics. Through peer education work.”

4.4.4.2 AMR

Both participants reported knowing not to request doctors for antibiotic prescriptions and why that is dangerous to human health.

Participant 1: “If you always use antibiotics they will get tired of you and not work. Its better take when its necessary.”

Participant 2: “I know about it as a PE, because we were exposed to AMR information from the Pharmacy students: PE workshops on AMR, and the dangers of misusing antibiotics.”

Only Participant 2 reported that they had taken a course of antibiotics during the year, and shared that their doctor shared the following instructions regarding the medicine:

Instructions regarding antibiotic use and storage	Participant 2 responses
Complete the prescribed course of antibiotics	TRUE
Do not share this antibiotic with others	FALSE
Use the medication only for this illness	TRUE
Do not skip doses	TRUE
Do not double the skipped doses	FALSE
Return unused antibiotics	FALSE
Keep away from children	FALSE
Follow storage instructions. E.g.: Do not store in hot or wet places, like kitchen and bathroom cabinets	TRUE (“especially for kid’s medicines like syrups”)
Do not throw unused or expired antibiotics in toilet/sink or garbage bins	FALSE

Table 3: Participant 2’s responses about their doctor’s instructions regarding antibiotic use and storage.

(True = Yes, False = No.)

Only Participant 1 affirmed that they read the information leaflet that comes with the medicine, and Participant 2, who does not read this leaflet, shared “... *but they always ask if the patient is allergic to penicillin*”.

When asked about hand hygiene and cough etiquette, both participants reported knowing about these AMR-prevention techniques. They were also asked to explain why they thought these techniques were important.

Hand hygiene:

Participant 1: “It is useful because it kills germs. If you wash your hands it’s better for you to use soap to kill the germs.”

Participant 2: “Prevent cross contamination when we touch things. Ensure hands are washed regularly.”

Cough etiquette:

Participant 1: “It is useful because if you cough in your elbow it won’t spread to someone else.”

Participant 2: “When you cough, traces of saliva will come out, so airborne infections can be transmitted. Cough into a tissue or elbow so you don’t spread germs to other people.”

Both participants affirmed that they would share information about these prevention techniques with their co-workers if they had information about them. When asked about the key factors that could help change current risk behaviours and improve knowledge about AMR prevention, the participants responded with the following, as shown in Table 4:

Key factors	Participant 1	Comments	Participant 2	Comments
Context-specific information	TRUE		TRUE	
Digitised, engaging informative posts on social media	TRUE		TRUE	
Digitised, engaging informative reminders on social media groups	TRUE		TRUE	Especially for hand hygiene during COVID-19

SMS reminders	TRUE		TRUE	
An AMR stewardship course run by a professional	TRUE		TRUE	
A quarterly public health refresher on AMR run by the peer educators	TRUE		TRUE	For example, we've had a workshop before for support staff about energy drinks and then they bring the information back for the support staff.
Spreading awareness among the university support staff community through information campaigns run by peer educators	TRUE		TRUE	this happens during the first-things-first campaigns for other topics/public health issues
Social media trends and hashtags to make AMR a popular topic to spread awareness	FALSE		TRUE	would be more successful for students instead of support staff

Table 4: Participants' responses about the key factors that could be used to improve knowledge and potentially change current behaviours of support staff on campus.

(True = Yes, False = No.)

4.4.4.3 AMR-OH

Here neither participant knew about AMR from food sources as a topic, nor checked the meat and dairy products they purchase for any antibiotic use, but Participant 1 reported to have learned about it briefly:

Participant 1: “We learned about it on the course [with the Pharmacy students] last year.”

When asked about the overuse and misuse of antibiotics in livestock and plants, both participants reported “No.” but related their prior understanding of the AMR-OH content from the video narration script and the infographic, which the researcher had shared with them in advance. Ultimately the participants reported “No” but elaborated their experiences with this topic to provide better context to the researcher:

Participant 1: “The same course – it was a mix of everything about AMR.”

The following response was regarding the participant’s personal experience of altered or artificially improved produce:

Participant 2: “... but you often hear things when people see a fruit or veg looks different to organic ones or is bigger.”

Both participants reported “Yes” when asked about potentially changing their meat and dairy consumption habits, and their food choices, if presented with more information about AMR-OH.

4.4.4.4 Tailored information that builds on existing knowledge and health literacy level

The participants found the content suitable for their reading levels, as shown by the understandability PEMAT score and the readability SAM scores (Figure 11, Figure 12, and Figure 13). The participants shared that this is the first time they have used their smartphone to access customised health information about AMR-OH information.

Participant 2 further elaborated that the topic covered in the video and infographic built meaningfully on their existing knowledge about AMR and the impacts it has on the illnesses they are familiar with as PEs.

Participant 2: “Yes, as I said you know, it was dealing with food. It was as I'm saying now I'm explaining you know antibiotics from TB from [sexually transmitted infections] and all that stuff, including HIV. But now it's like, for yours, you brought something that is, you know, close to home, that we didn't expect them[.] It becomes quite exciting as I said, because it all starts with the little things.” [SSI-2]

Both participants affirmed that the content was conceptualised and designed, keeping the PEs in mind and that the content in the video and infographic formats held their attention well. When asked about whether it built on their knowledge about AMR related to TB, they shared positive responses. Participant 2 also elaborated on why this project's digital educational materials built on their existing knowledge:

Participant 2: “Now yours is well did [well done] because it also explained to you at the beginning of the video what it is about. And when you listen you can clearly say that it's resistance from food. So you know as I said, we already had that sort of, you know, information with the trainers manual that we did with Sam - still fresh. Because that was ... also on antibiotic resistance. ...but that was basically more on hygiene. Yours sort of like fits in there as well, because it's like a follow up. ... [be]cause now it linked and yours goes directly to the food product.” [SSI-2]

4.4.4.5 Cultural, linguistic, and social suitability

During the SSI, both participants maintained that they did not find the video and infographic specific to their culture, but it remained relevant to their culture in the general sense.

*Participant 1: "It doesn't explain about the culture. Its general information."
[SAM-Video]*

Participant 2 shared how, culturally, Black people are not ignorant of the overuse or misuse antibiotics, or forget about food safety when preparing meals.

Participant 2: "For us as people you know especially as Black people, we do a lot of things that we don't even think about. ...Sometimes you do it [sharing antibiotics] you know it's not because [...] out of ignorance. It's because you know ..., so maybe we get sick or all three of us get sick, or if you are lucky, ... they don't show any symptoms ..., but we never think that okay maybe it could be that simple, in that portion [of food]." [SSI-2]

Both participants emphasised that culturally, especially for any ritual involving animal slaughter, Black people (the amaXhosa in this case) had improved their hand, food, and general preparation hygiene standards.

Participant 2: "I think nowadays it's not like the olden days. Now when you're doing this cultural things [rituals] and you're slaughtering something now we know that we have We know that you know that knife or blade that's being used has to be sanitized, you know, even for the meat and for the fur, you have to put on salt to avoid for flies sticking on the [raw meat] you know, stuff like that. So I think over the years, as we get more knowledge, its [hygiene at cultural rituals] improving."

Participant 1: "Yes, my dear, it is, because, as [Participant 2] said that when we slaughtering it's not like then, like the older days. We do have water now so

that when we slaughtering we wash the meat first and then wash our hands, even in our cultural ceremonies. They do have that dish that is going around with soap so that you could wash your hands before you eat. So it's really it's not like the older days, like, its much easier and healthfully.” [SSI-2]

Regarding the linguistic suitability, both participants enthusiastically suggested and agreed that translating the content into isiXhosa and Afrikaans would extend the materials' reach. They felt that doing so would also improve the level of customisation for the PEs.

4.4.5 Actionable

This theme coded for whether the video and infographic made the PEs aware of the AMR-OH problem and whether the four food safety steps as a consumer-level solution was viable and sustainable. The PEMAT and SAM scores showed that the video was well-received with no changes requested. As presented in Figure 12 above, the participants found that the information in the video was completely actionable, scoring 100%, and was 99% suitable for their reading level. Both participants rated “1” for all the Actionability items in the PEMAT test, which was also reflected in the relevant SAM test items.

Actionability		Participant 1	Participant 2
1	Does the video clearly identify at least one action you can take? (P and A/V)	1	1
2	Does the video address you directly when describing the actions? (P and A/V)	1	1
3	Does the video break down the actions into clear, manageable steps? (P and A/V)	1	1
4	Is the video helpful to show and explain the concept of AMR from food sources to the support staff? (P)	1	1
5	Does the video provide simple instructions? (P)	1	1
6	Does the video explain how to use the diagrams to take actions? (P and A/V)	1	1

7	Does the video use visual aids whenever it could make it easier for you to act on the instructions? (P)	1	1
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*Table 5: PEMAT test items evaluating the video's Actionability.
(Score: Yes = 1 and No = 2).*

Learning stimulation and motivation		Participant 1	Participant 2
17	Interaction used: does the video ask you to solve a problem or make choices?	2	2
18	Behaviours are modelled and specific: were proposed behaviours (food safety actions) explained clearly?	2	2
19	Motivation: does the change (food safety steps) the video is asking you to consider possible for you?	2	2

*Table 6: SAM test items evaluating the video's learning stimulation and motivation.
(Score: Superior = 2 points / Adequate = 1 point / Not Suitable = 0 points)*

4.4.5.1 Creates awareness

In the form of the narration script, the video, and the infographic, the content raised awareness about the dangers of AMR-OH and the consumer-level solutions to combat them. The participants affirmed that they were not fully aware of the danger of AMR from food sources before encountering the conceptualised digital educational materials for this project. As illustrated in Figure 13 above, the infographic scored 100% for Understandability and 86% Actionability on the PEMAT test, and a 90% Suitability score on the SAM test.

When asked about their daily food safety practices, both participants shared that they had not previously considered following the infographic's food safety steps.

Participant 1: "Okay, it [current food safety practices] is much different my dear because now I know that I have to wash my veggies, and I don't have to

mix the meat with veggies at the same time. So I have to make sure that I wash [...] them. Even if they are coming from the shop.”

Participant 2, with their food services background, had existing knowledge about the dangers of contamination and knew that it was safer to separate raw animal products from ready-to-eat foods. However, they had not previously understood the need to defrost frozen meat in the fridge instead of on a countertop at room temperature.

Participant 2: “...Because when in terms of defrosting, I would just, you know, take out the, you know, meat raw meat from the freezer, just put it on the tabletop, you know, on a tray, going to defrost. ... So that when I come back from work [it would] be ready for cooking. So, yeah, it has helped me in that sense, because now I've realized that while it's sitting there [at] room temperature, you know, it could be you know, a victim to bacteria.” [SSI-1]

Both participants shared that digital educational materials informed their daily actions when preparing and storing food. When asked what made them consider changing their previous food safety practices, both participants shared their experiences with the materials.

Participant 1: “Its because I used to put everything together. Now I have an idea that I have to separate, even when I'm buying I have to separate because I have to put everything in the same trolley. You see, now I know that I have to separate it even when I'm doing my shopping ...” [SSI-1]

Participant 2 highlighted how one's daily schedule could affect how food is prepared, especially as a primary breadwinner *and* the person who prepares the family's meals. When asked about what made them consider changing, they responded that a food safety step, such

as defrosting in the fridge instead of at room temperature, could be neglected because of the rush of daily life.

Participant 2: "... the thing that made me consider changing it's that I seen that they if you mix things [don't separate raw meat from other foods] the bacteria, its so easy for them to to intervene. ...although you might have knowledge or do not know about these things, when you get home, you've got that, you know, element of sort of like neglecting because you're like, I need to do this already." [SSI-1]

Participant 2 also expressed that their experience of the project led them to reconsider such potentially dangerous food preparation actions. They emphasised how their split-second choice to ignore food safety presented in the infographic could harm their family, and increase potential medical costs.

Participant 2: "And now, but now, you know, being on the project has made me to realize that, that two minute or two second decision that I'm taking for my whole family, might be dangerous for them, because now it means from this meat to that I'm taking straight from the freezer to the pot, you know, something could happen in between there." [SSI-1]

When asked about their future choices after watching the video and reading the infographic, Participant 1 shared how they remain committed to reminding themselves and their children about food safety and following the four steps.

Participant 1: "I choose the healthy one because I know that this could harm my family if I do the old steps that I used to do. So I'm trying by all means to practice. So It's much easier when you put them on you that this is what we have to do." [SSI-1]

4.4.5.2 Viable, sustainable solutions

Regarding the potential viability and sustainability of the food safety steps, the participants found that the four steps were easy to remember and do. Participant 2 emphasised how helpful the infographic was at reminding them about the food safety steps. However, Participant 2's practices differed between their professional and domestic spaces and roles. They reiterated how easy it was to forget such food safety steps when navigating between these spaces.

Participant 2: "...I even remember now all the four steps to me were very, very important. ...But when you get home, it becomes quite a different thing. You know, though, at work, you have to separate and do these things, because you would think that it's a procedure that I have to follow because I'm at work. So when it comes to home, you know, you neglect those things." [SSI-1]

4.4.6 Food safety actions

The food safety steps were not part of the coding memo, but the research team felt they were necessary to include when coding for the Actionable responses. This data was derived from the SSI conducted after the end-user tests, with questions specifically aimed at the suggested behaviour change actions. Questions about the food safety actions are presented in Appendix F.

4.4.6.1 Clean and Separate

The participants found cleaning an easy step to do after reading the infographic. Although they reported having washed their fruits and vegetables before consuming or preparing them before the study, Participant 2 shared that this was not always the case.

Participant 2: "... automatically I do that ... So it was always first thing, you wash it. But I don't want to lie because from the shop you never wash. You would just take stuff from the shop and put it straight into the fridge. ... the

steps, also help, because it's sort of like gives you, you know, the first step. What to do ...” [SSI-2]

Separating was a familiar concept to the participants, although they approached it in different ways. When asked what makes this step easier to do, Participant 1 responded that using plastic or glass containers were useful to keep raw meat separate from other foods.

Participant 1: “...If your fridge is not spacious enough because you can use a container maybe to put your meat, so that they [...] blood when it's defrosted the blood could not flow all over the fridge. So containers I think are the best, like making [it] easier, to separate everything in the fridge.” [SSI-2]

Participant 2 reported that they already practice separating raw meat regularly.

Participant 2: “Yeah, yeah. So my mom buys those [transparent veggie bags], so I'm used to that even at home. So when ...the meat comes and gets [...] ... it gets cut into smaller pieces and we put it in plastics and then we freeze it. ...” [SSI-2]

4.4.6.2 Cook and Chill

Both participants were comfortable with this step because they both organised and prepared the food in their respective homes. This step, mainly the information about cooking and storage temperatures, was new to Participant 1.

Participant 1: “I think I've learned that even your fridge should be in four degrees and store remaining cooked [...] meat in the fridge, as soon as you are finished, like eating. You see? And when food is not in the same temperature

throughout but they can begin growing in spores ... at room temperature. ...the bacteria can multiply quickly with food is left outside the fridge.” [SSI-2]

Participant 2, with their Food Services training, knew and practiced these steps.

4.5 Chapter summary

This chapter presented the most salient numerical and quantitative features from the needs assessment, CCI, PEMAT and SAM tests, and SSI responses, all of which were coded under the five themes. This study's outcomes further included the participants' responses to their consideration and possible adoption of the food safety actions. The following chapter will discuss this study's outcomes in relation to relevant literature structured under the five themes.

5 Chapter Five: Discussion

5.1 Introduction

Public health studies focusing on improving knowledge and awareness of a given health issue, such as the one conducted by Farley *et al.* (2019) show that creating awareness among the public improves the likelihood of “protective attitudes, perceptions, and behaviours” (Farley et al., 2019). Creating awareness about a problem has the potential to change health behaviours, increasing quality of life, longevity, and economic productivity.

The study sought to answer two research questions. First, how identifying the most effective elements of behaviour change communication in health campaigns could be incorporated into a conceptualisation of this AMR-OH intervention design. Second, based on end-user feedback, how aligned an intervention with video and infographic formats would be to the five benchmarks (Figure 6).

Research question one was elucidated and resolved through an extensive literature review. It presented an overview of the field and narrowed down the most effective elements from other communication campaigns and their assessment and evaluation studies. These effective elements were integrated into the five themes (see Figure 10) under which the participants’ responses were categorised and analysed. In response to research question two, the data from the needs assessment, PEMAT and SAM tests, and the SSI, were coded and consolidated according to the five themes identified from the literature.

The study’s results indicate that a theory-informed conceptualisation and an end-user-evaluated digital health communication design for AMR-OH holds immense potential for media studies research on developing and testing health communication. The most salient results are highlighted and discussed in this chapter. This chapter first identifies the beneficial impacts of using SBCC, conducting a needs assessment, and using the PEMAT and SAM tests to evaluate the digital educational materials.

It then draws from the five themes deduced from the literature since they essentially cover the SBCC goals of effective educational material for behaviour change. These diverse themes represent the design benchmarks for the study and also form the structure of this chapter. Each theme will be discussed in turn to present the similarities and differences with other relevant studies.

5.2 Social Behaviour Change Communication theory

In this study, the video informs end-users of the problem and its consequences. The infographic presents end-users with a possible solution to adopt, which is a consumer-level behaviour change. Results from this study indicate that a theory-informed conceptualisation of an AMR-OH intervention was helpful to the research. The use of SBCC informed the study's design, including the identification of the five design benchmarks. The participants found the digital media platform to be a novel channel of receiving health communication. Modern health campaigns have adopted and transformed persuasion strategies through the use of social media to spread awareness, recommend actionable behaviours, and improve public engagement with health issues (Oh and Lee, 2019; Oh et al., 2020; Prado et al., 2019; Raksha, 2019).

When human behaviours supplement the improvement of health indicators, as the world has experienced during the on-going COVID-19 pandemic, SBCC is a useful theory. This study's intervention was designed to help PEs understand the consequences of the overuse and misuse of antibiotics in the meat and agriculture industry. SBCC also informed the PEs' specific behaviours such as the potential adoption of food safety actions. In the context of the Ebola outbreak, a study suggested that a more refined approach to comprehensively and systematically “conceptual[ise] and operational[ise]” SBCC theory strengthens health communication interventions to make a more substantial impact (Gurman, 2015). Similarly, GARIMA, a menstrual health and hygiene management intervention run in India, was also SBCC theory-informed. This study's use of SBCC to inform the video and infographic design is reflected in the GARIMA intervention, which also used video and print material to convey positive messaging about menstrual health and hygiene (Ramaiya et al., 2019).

The researchers found that rooting their intervention in theory produced positive results because it considered the roles of gender, culture, and the participants' communities in improving knowledge, attitudes, and practices regarding menstruation (Ramaiya et al., 2019). In this study, the researcher found that SBCC could be used to create an informational video and a complementary infographic suggesting behaviour change steps for AMR-OH specifically. Additionally, this study revealed that digital SBCC interventions could help end-users engage with the technology they are familiar with to receive and share context-specific health information.

5.3 Needs assessment

Conducting a needs assessment as the initial step in this study's research design (section 3.4) was a beneficial aspect because it provided the evidence for the need for such a project. It further assessed the simplicity and novelty (a part of the 'Appropriate Format' benchmark) of the video and infographic. Results demonstrate that conducting a "test" session with the materials was beneficial because the materials could undergo further customisation and be of real use to the PEs. A study conducted in the U.S.A suggests that implementing a system-wide needs assessment offers useful insight into how best to implement health interventions (Bias et al., 2020).

Although this study might provide a blueprint for future implementation, the groundwork conducted through the needs assessment with the two participants illustrates that this is a vital step in community-engaged digital media health communication design. As explored in a study by Lonsdale *et al.* (2019), there is a need for designing user-centered materials, digital or print, (Lonsdale et al., 2020, p. 134) by first understanding what the target audience desires, what they find appealing, and what media they can access through a needs assessment. Understanding and learning about the PEs' needs regarding digital educational materials has remained a core element of this study.

5.4 User-centered design using the Clear Communication Index

The researcher was cognisant of the need for simplicity, understandability, and accessibility when designing the video and infographic. As explored in the Literature Review, user-centered design succeeds when the information is designed to be understood and accessed easily (Lonsdale et al., 2020, p. 140). The design benchmarks (i.e., the five themes), offer an in-depth presentation of how this study's results confirm that these effective elements make for accessible, understandable, and actionable information. The needs assessment of the materials provided the evidence to design the appropriate materials that covered the five themes.

The researcher also conducted the Clear Communication Index Test on the materials (CDC, 2019). This test has been used since 2014 to evaluate the clarity of health information materials (Alpert et al., 2017; Baur and Prue, 2014; Marinho et al., 2020; Porter et al., 2019). This pre-intervention, self-administered CCI test offered the researcher a baseline indicator of

whether the material would suit the peer educators. This Index scores the clarity and understandability of health information material from the creator's perspective. A score above 90% indicates that the material is easily understandable and clear; and for this study, the researcher administered this test for the video and infographic. The peer educators were the intended primary audience for the materials, so the video (Appendix P) and infographic (Appendix N) were developed based on their health and formal literacy levels. However, since the information, once implemented, will also be conveyed to support staff with lower health and formal literacy, it was essential to ensure that the video and infographic were accessible, understandable, and actionable for the support staff as well.

Accessibility, understandability, and actionability were assured through the high baseline scores for the video (93.3%) and infographic (94.4%) from the CCI. The CCI scores assisted the researcher to foresee potentially unclear or un-actionable suggestions before conducting the needs assessment. These scores ensured the materials could score similar figures or higher on the PEMAT and SAM end-user evaluation tools. This study can conclude that the CCI is helpful to design and assess health interventions, including those for AMR-OH, in any digital format.

5.5 PEMAT and SAM tests

This study collected and evaluated data using the PEMAT and SAM tests. Although not much used in critical health communication, these tests remain relevant to health communication because they are an accessible, reliable, and user-friendly form of material assessment. These features have been shown in other studies with their diverse range of questions, improving the quality of the conceptualisation and the design of their health information materials (Caballero et al., 2020; Doak et al., 1996; Helitzer et al., 2009; Kang and Lee, 2019; Sharma et al., 2018; Shieh and Hosei, 2008; Shoemaker et al., 2014; Zellmer et al., 2015). Results from this study are significant because the materials are rooted in SBCC (Briscoe and Aboud, 2012; Colonna, 2020; Gurman, 2015; Kim et al., 2016; Soul City Institute, 2018), are evaluated using public health tests, and they demonstrate that such theoretical and practical academic collaboration can exist.

A study on the suitability of printed health materials shows that using the SAM test highlighted specific areas that needed improvement and customisation. One of these areas

was the presentation of a summary of information and modelled behaviours (Shieh and Hosei, 2008, pp. 85–87). The SAM test offered the researcher insight into what was suitable and what was not, thereby showing that this study's results support the findings from the Shieh and Hosei (2008) study. Similarly, a recent study tested the readability, understandability, and actionability of online COVID-19 health information using the PEMAT test (Caballero et al., 2020). They found in order to successfully recommend health behaviours, the health information in question needed to achieve the following criteria: be accessible to the target audience, suited to their literacy level, and be actionable in a way that upholds the target audiences' agency in considering new health behaviours (Caballero et al., 2020, p. 03). Based on this study's positive results with the PEMAT and SAM tests, the researcher proposes that these tests be used when professionals in media studies create health information materials. This proposal's primary motivation is that the tests have strong roots in health communication theories that HCPs continue to design, circulate, and rely upon. Additionally, since the behaviour change element was evaluated through the five design benchmarks, the study further proposes that they be included to enrich the results of health communication conceptualisation, design, and implementation studies. As elaborated on in section 2.8, the benchmarks provided a scaffold on which the study could layer the sub-themes of each benchmark productively, and this is presented in the following sections.

5.6 Ease of use of technology

This theme specifically coded responses matching the smartphone and WhatsApp's functionality, availability, and retrievability.

5.6.1 Functionality

The results from this study support the idea from Mouttham *et al.* (2012) that technology used for health communication “must be examined in the context of the people, processes and information that use the technology.” (2012, p. 84). As both participants expressed, WhatsApp was the easiest and most relevant to use in the PEs' everyday context – even more so in the current pandemic lockdown context. The PEs expressed the comfort and regularity with which they used their smartphones during the needs assessment; and their enthusiastic, virtual participation in the study itself. The video scored 93.3%, and the infographic scored

94.4% on the CDC Clear Communication Index (see Appendix I and Appendix J respectively). These scores indicated the baseline for the materials. The PEMAT and SAM test results show that the participants found the video and infographic to be easily accessible, understandable, and clear, thereby confirming the CCI scores.

The use of technology to convey health information to the public requires the channel of communication to be physically available and retrievable in order for it to count as accessible (Jones, 2003, p. 334). This study drew from Jones' (2003) work to inform the development of this theme and its sub-themes. Furthermore, it lends an evidence-based voice to the debate that using digital media to communicate health information to raise awareness and inspire behaviour change regarding AMR-OH is worthwhile. The participants' regularity and comfort with using smartphones and WhatsApp qualify their familiarity with using technology as equivalent to their familiarity with paper-based health information materials.

5.6.2 Social media

This study's results indicate that social media is an exciting and viable channel for communicating AMR-OH information. According to a study conducted in India, social media is pivotal to disseminating AMR information to improve antibiotic adherence among Indian patients (Raksha, 2019). According to this study, and as illustrated in the Literature Review, there is a lacuna concerning the topic of AMR from food sources. This study shows that such a gap can be bridged through a video and an infographic shared with PEs via WhatsApp. Both participants shared that they are comfortable with using WhatsApp to communicate in their personal and professional environments. Therefore, using this social media platform as a channel to communicate health information is not only innovative but also sustainable and community-engaged.

The researcher envisioned particular long-term goals for a more extensive, future, implementation of this project. First, strengthen the PEs' link with the Community Engagement Office (offering access to computers and the internet through their Social Innovation Hub) for digital health communication projects on this topic. Second, further encourage media professionals within the School of Journalism to support the PEs' access to digital media training, online health information, and generate more awareness through co-

creating digital media materials about relevant issues among their support staff peers. Third, these collaborations would expand within the PEs' wider community outside the University.

5.7 Clarity of content

This theme coded for responses regarding the clarity and understandability of the content in the video and the infographic. Results from this study indicate that the materials were clearly and easily understood. Both participants rated the video high in understandability because the scientific and general vocabularies were clear. They also rated the infographic high in understandability as well, with a final score of 100%. As illustrated in Figure 11 and Figure 12, the SAM scores between reading the narration script and watching the video increased from an average suitability of 81% to 99% respectively. Such results support the theory that visualising data is helpful to understand health information (Lonsdale and Lonsdale, 2019, p. 06).

Lonsdale and Lonsdale (2019) emphasise the need for health communication studies to conceptualise and evaluate the effectiveness of infographics. They support using infographics to visualise complex information in appealing, more manageable chunks of information (Lonsdale and Lonsdale, 2019, p. 06). The results from this study not only support their view of evaluating the effectiveness of using infographics to communicate health information, but also provide evidence that the use of tested infographics in such contexts is effective. The results also indicate that showing a video to introduce the problem and highlight its relevance before presenting viewers with an infographic with the solution is effective. Both participants reported that the icons appeared in the video just as the relevant word was narrated and that the icons between the materials remained consistent, so this helped them understand the infographic better. According to the participants, the order in which the materials were presented, as well as the design elements that remained consistent, made the materials clear and easy to understand.

These results demonstrate that this study considered the PEs' health and formal literacy levels. The researcher conceptualised and designed the materials using the participants' needs assessment responses to the digital media, AMR, and AMR-OH questions. Ultimately, these measures ensured that both participants found the AMR-OH information clear and easy to understand. Similarly, other studies have emphasised the need to ascertain participants' health

literacy levels when looking at health communication in general (Edward et al., 2018; Oh and Lee, 2019), and health-seeking behaviours in particular (Jovanić et al., 2018, p. 09).

5.8 Appropriate Format

In this study, during the needs assessment, both participants affirmed that they often view videos and images on WhatsApp using their smartphones. Their affirmation led to the conceptualisation and design of a video detailing the source, relevance, and dangers of AMR-OH, and an infographic presenting consumer-level solutions in the form of food safety steps. Both participants agreed that the materials were useful to them and would benefit their role as PEs. They further reported that having an online store of health information would be helpful in their professional spaces. Finally, due to having participated in previous national campaigns and local health interventions, the PEs demonstrated their foresight regarding the materials they use to conduct peer education through this study.

Studies have demonstrated that infographics are favoured when attempting to disseminate essential information about a topic in a memorable and accessible way, and are useful to communicate health information (Dur, 2014; FAO, 2017; Scott et al., 2016). However, as explored in a study about the use of infographics for local health workers in New Zealand, this format presented challenges of “search, retrieval, access, and storage,” (Anderson, 2019, p. 02). The suggested solution was to create an online repository of health information in the form of infographics to remain accessible to the local health workers. This study, drawing from Anderson’s (2019) conclusion, began with a platform on which to create an online repository of AMR-OH health information.

5.8.1 Simplicity

Design principles, such as the Gestalt principles (Todorovic, 2008), are pivotal when conceptualising and designing health communication. Lonsdale and Lonsdale suggest information design should consider the material’s cognitive load on the reader or viewer (Lonsdale and Lonsdale, 2019, p. 16). The report suggests the use of “informational chunking” – that is, a limited number of visuals and repeated visual cues, as well as creating an order through hierarchy and consistency to improve the ease with which information is received and remembered (Lonsdale and Lonsdale, 2019, pp. 16–17). Similarly, the results

from this study confirm that the level of attention the materials were given between drafts, as well as the memorability of the information, were improved by the use of these design principles. Because the PEs were consulted from the beginning of the study, they had the required information to evaluate how and where the materials' drafts had improved. They then shared these observations during the PEMAT and SAM tests for each draft of each material. Both participants found the visual cues from the video and infographic to be helpful in their understanding of AMR-OH and the food safety steps. The participants articulated their observations as general comments about the material; and more formally, as answers to the relevant PEMAT and SAM questions concerning graphics and typography. As stated in the previous chapter, the simplicity of the icons representing the four food safety actions was highlighted. Both participants thought that even low-literate support staff would be able to identify the meanings.

5.8.2 Credibility

Both participants judged the information in the video and infographic to be high quality and from credible sources. Participant 2, with their background in Food Services, highlighted that their professional training informed their favourable judgement of the material. According to Participant 2, the quality of the materials designed in this study was enhanced by the credibility of the sources used.

5.9 Appropriate for target audience

This section discusses salient results from the 'Appropriate for target audience' theme in relation to other studies. It further discusses the implications of the results on future AMR-OH literature created for and in South Africa.

5.9.1 Digital media and antimicrobial resistance

In various studies conducted on the use of social media to communicate during health crises, Twitter has been quoted as a prime example of disseminating information quickly and effectively tracking the spread of the illness (Broniatowski et al., 2018; Goff and van den Bergh, 2015, p. 04; Liu et al., 2016; Raksha, 2019; Signorini et al., 2011). Although the

participants did not use Twitter for risk communication with their peers and other support staff, both participants affirmed that receiving “digitised, engaging” alerts and reminders about AMR on social media groups would help change current risk behaviours. Therefore, the use of WhatsApp in this study is a viable and sustainable channel of communicating such alerts and reminders about the dangers of AMR-OH and presenting the food safety steps as a valid solution.

Furthermore, this study's results suggest that the issue and dangers of AMR-OH were framed appropriately because neither participant misunderstood any of the information. A study on health information framing in the media, using a TV advertisement, illustrates the need for behaviour change health communication to present the message in a way that communicates the danger of AMR (Anjuli, 2019). Anjuli (2019) found that since the “severity of antibiotic resistance was not conveyed” to the public through the advertisement and led to increased misunderstandings of what AMR is. Anjuli’s study (2019) also showed why it is essential for individuals to curb their demand for antibiotics when seeking medical attention for problems that do not need antibiotics (Anjuli, 2019, pp. 28–35).

5.9.2 Tailored information

This study ensured that the channel, format, and content were all customised to the participants’ health and formal literacy levels and ease of use. This customisation was based on the responses from the needs assessment. The participants confirmed that this study’s topic, content, and information delivery system were novel to the PEs. They experienced excitement about using new technology, curiosity and concern about AMR-OH, and relief that there is a consumer-level solution to the problem. These confirmations support current literature that customised information, and opting for the most relevant and accessible channel, are vital for health communication success and potential behaviour change (Kreps, 2017, p. 127).

This study showed that creative, engaging, and interactive materials could draw and hold the PEs’ attention. These findings support the conclusions of current literature affirming the need for health communication design to be engaging and interactive, as well as provide a safe space in which people can learn and consider changing their current risk behaviours (Sharp et

al., 2020). This study further offers a pilot-tested, evaluated proof of concept of tailored digital materials that prioritise culture- and language-sensitivity.

5.9.3 Cultural suitability

This study designed materials with information that would resonate with anyone who consumes meat, dairy, and agricultural produce. Though the video contains information about AMR-OH that applies to all who consume food in general, the infographic is aimed explicitly towards end-users who consume meat.

Meat consumption is high in South Africa (Erasmus and Hoffman, 2017). Rural consumers have become more aware and demand the need for meat and animal products to have a certain level of safety and standardisation (Xazela et al., 2017). Meat is considered an important part of the human diet, playing an influential role in cultural identities and gatherings across the country (Erasmus and Hoffman, 2017). It is estimated that there will be a sharp rise in meat consumption in LMICs between 2010-2030, as populations continue to grow. This rise in population will increase the routine use of antimicrobials to secure high productivity in animals (Van Boeckel et al., 2015). van Boeckel *et al.* (2015) strongly suggest that consumers must become aware of the “uninhibited growth in veterinary antimicrobial consumption” (Van Boeckel et al., 2015); this study brings this fact to the PEs’ attention for further dissemination.

This study’s materials, aimed at comparatively low-literate and low-income community leaders, support the national and international AMR efforts (“South African Antimicrobial Resistance National Strategy Framework: A One Health Approach 2018-2024,” 2018; WHO, 2015b) to educate the public about the need for consumer-level awareness about AMR from food sources.

Participants found the video and infographic to be unspecific to the AmaXhosa culture, but still relevant to their cultural and domestic practices. Drawing from the SBCC need to create community dialogue through the materials (Family Health International, 2002, p. 05), this study aimed to create messaging that could influence the PEs’ consideration of food safety behaviours without targeting specific cultural or domestic practices. A study conducted in Ethiopia indicates that large-scale behaviour change campaigns are associated with improvements in rates of maternal and child mortality (i.e., health outcomes) (Kim et al.,

2016). The study relied on community mobilisation to ensure the message was received (via radio) and acted upon by mothers, thus creating a dialogue for healthy behaviours regarding age-appropriate child nutrition in a resource-poor setting (Kim et al., 2016). Similarly, this study relies on the two PEs, as the leaders and community members of the support staff group, to disseminate information (from the materials) to communicate the problem of AMR-OH and the consumer-level solutions. Digitised peer education, using accessible, interactive materials such as the video and infographic, contributes to the existing dialogue about health and wellness on campus.

This study has indicated that incorporating the end-users in the design of the materials improved customisation and cultural suitability. Such material not only caters to the community but also becomes socially acceptable (O'Brien et al., 2016) and creates community dialogue (Family Health International, 2002) because the topic has the element of social support (Jones, 2003). Furthermore, through the integration of regularly used social media to deliver AMR-OH information, in formats with which the PEs were familiar and comfortable, this study offered a virtual space where such social support and community dialogue can exist. The results support current literature that collaborating with low-literate participants to create an immersive virtual space in which they can learn without feeling disadvantaged or pressured to perform, yields positive results for improving awareness about a problem and changing risk behaviours (Mueller et al., 2020).

5.10 Actionable

This section discusses how actionable the behaviour change recommendations in the infographic are when aligned with relevant literature. Overall, results support current literature about evaluating digital health interventions and their potential “as scalable tools to improve health and healthcare delivery by improving effectiveness, efficiency, accessibility, safety, and personalization,” (Murray et al., 2016). As illustrated in the previous chapter, actionability relies on the PEs’ perception of this topic, the potential “uptake of the intervention” (Murray et al., 2016), and their desire to adopt the food safety behaviours. According to Murray *et al.* (2016) when digital health materials are “effective, efficient, accessible, safe, and personalised” it means that the “cumulative knowledge base” is high enough that such digital materials can be integrated into the group (Murray et al., 2016). This

study is a practical example of delivering such actionable digital health information in a low-resource context, another aspect that Murray *et al.* (2016) highlight.

The concept of using behaviour theory is not new to the development of actionable health communication. This study is a potential blueprint for future implementation. It offers a potentially effective, socially viable, application-based example of digital health information specifically for AMR from food sources. The developmental and design processes of the materials from this study can be used in support of the Integrate, Design, Assess, and Share (IDEAS) strategy (Mummah *et al.*, 2016). The phases of 'IDEAS' reflect the phases of research processes conducted in this study (see Figure 8), whereby behaviour change theory informs each phase and the stratagem Mummah *et al.* (2016) suggest using. Mummah *et al.* (2016) indicate that the “framework strives to provide sufficient detail without being overly prescriptive so that it may be useful and readily applied” (Mummah *et al.*, 2016). Fulfilling this criterion is what this study has shown it can do.

Based on the evidence, this study has contributed to the PEs' consideration and adoption of the food safety actions by providing sufficient detail and avoiding a prescriptive presentation of information. The presentation of AMR-OH information in this format is the first step by the School of Journalism towards addressing a global health emergency at the local level. Results from this study indicate that actionability not only depends on the simplicity of the message but also on the understanding of *why* people should adopt the recommended behaviour change steps. Such understanding can only occur when the public has user-friendly, clear, and appropriate media that contain context-specific behaviour change actions, particularly regarding the culture of food safety at an individual level (Bjelajac and Filipović, 2020).

5.10.1 Creates awareness

Digital media health interventions offer health communication immense potential to create and improve awareness and influence positive health behaviours. This study aimed to do the same. However, this study addressed a previously underestimated and largely disregarded AMR driver. This subsequently created the need for an in-depth look at what AMR-OH is and why it is relevant to the groups most at-risk of illnesses needing antibiotic treatments in South Africa. As this study's results indicate, such information requires rapid customisation

and a kind of exciting, memorable engagement that can only come with a reliable researcher-participant relationship, and the use of modern technology (Patrick et al., 2016).

The PEs' feedback obtained during this study further supports the need for modern African solutions to African problems, in that the use of digital media for health should be conceptualised and designed by people who live on the continent. Health issues such as maternal and child health (Agboola and Ahmed, 2020; Kim et al., 2016), the need to diversify and return to indigenous nutrition (Coté, 2016, pp. 02–05), and prevent the spread of COVID-19 (Caballero et al., 2020; Finset et al., 2020; Nguyen et al., 2020) are all reliant on media designed to create awareness and affect necessary behaviour change. The popularity of using digital media to create awareness, its effectiveness at reaching rural populations in LMICs, and the strict need for physical distancing during the current pandemic. The results of this study thus support the use of digital media to increase AMR-OH awareness.

Participants highlighted that chicken is the easiest meat to purchase and prepare regularly. Considering that consumers in South Africa do not follow proper food safety measures when purchasing (55%) and thawing (44%) chicken, or wash their hands before (31%) and after (36%) touching raw chicken (Katiyo et al., 2019), it is imperative that memorable food safety steps are disseminated.

The participants' feedback further confirms that encountering previously unknown information in engaging formats that inspire behaviour change is successful through digital media. More importantly, a theory-informed conceptualisation and a user-centered design of the materials helped improve participant awareness and affected some behaviour change. In this study, the participants emphasised that they often neglect some food safety steps because of their rushed daily schedules. However, both participants affirmed that since they engaged with the video and infographic, they have altered their daily food preparation and storage actions. This alteration in behaviour indicates that a well-designed, motivating digital media intervention helped remind the PEs about the food safety steps.

After having encountered the materials, the participants also stressed how important it was to remind themselves to make that “split-second” decision to follow the food safety steps to avoid harming their families and incurring preventable medical costs in the event of contracting a resistant pathogen. This illustrates the credibility and capacity of two simple digital materials regarding the potential behaviour change of an entire PE community, as well

as the hundreds of support staff who rely on them for accessible, well-explained health information.

As peer educators, both participants highlighted the ease with which they would be able to share this information, both digitally and orally. While previous studies focus on CHWs, such as field workers in Bangladesh disseminating digital health information on the need for family planning (Limaye et al., 2017, p. 05), this study focuses on the potential of digital peer education regarding AMR-OH. The participants' responses demonstrate that the PEs, already playing a critical role in providing accessible, culturally-sensitive health information in the workplace, have the basic knowledge about AMR-OH to now share with the other PEs and then the support staff.

5.11 Chapter summary

This chapter introduced and discussed salient results from this study, relating their similarities and differences to relevant results from SBCC literature. Each theme was discussed in turn, with particular attention to the format and delivery of the AMR-OH information to create awareness and encourage behaviour change. Furthermore, the materials scored highly on the CCI, and the end-user PEMAT and SAM tests, thus displaying a high level of readability, understandability, and actionability – all of which are essential criteria for successful SBCC interventions. The materials, having been positively received by the PEs, reflected this study's contribution to the literature on SBCC and digital health communication for AMR-OH. The following chapter concludes the study and presents the limitations and delimitations, as well as the recommendations for further practice and research.

6 Chapter Six: Conclusion

6.1 Overview

As stated, and supported in Chapter One, AMR is an urgent, evidence-based public health issue that is being steadily exacerbated through six human-driven actions (see Figure 1). The effort to raise awareness and knowledge about AMR so the public can safely rely on antimicrobials to treat diseases is especially important during pandemics, such as COVID-19. This study offered a multidisciplinary, multimedia approach to address and complement HCPs' efforts to improve public awareness and knowledge about the interconnected nature of potential disease transmission from farm to fork through human choices that create resistant microbes. The study aimed to identify SBCC elements that could increase awareness and knowledge about AMR-OH, and conceptualise a theory-informed digital media intervention to be evaluated by the PEs using validated, end-user tests: the CDC's Clear Communication Index, PEMAT, and SAM.

The study's objectives were as follows: first, to identify lessons from other health communication and behaviour change interventions to inform this study's conceptualisation of the materials, and the themes by which to evaluate them. The literature review presented aspects of effective SBCC intervention design, such as context specificity, the relevance of the topic to the end-user, and an appropriate channel and format of delivery for the health information. From these aspects, five themes were crystallised: *Ease of Use of Technology*, *Clarity of Content*, *Appropriate Format*, *Appropriate for target audience*, and *Actionable*. These themes, presented in the coding memo (Appendix S), were used to categorise and analyse the PEs' responses during the SSI using NVivo® software. Second, a needs assessment was conducted to gauge the PEs' levels of formal and health literacy, familiarity with digital media, and their awareness of AMR, and AMR-OH. This needs assessment aided the creation of the video for awareness of AMR-OH and the infographic to recommend behaviour change actions to be adopted by the PEs. Both these materials were then evaluated by the PEs for relevance, readability, understandability, and actionability through the PEMAT and SAM tests. Furthermore, to elicit in-depth responses, a semi-structured interview was conducted with the participants to analyse their evaluative responses using the five themes.

The literature review, arguing for the use of digital and multi-media as a tool for health communication, identified a variety of studies that, in their own ways, effectively used digital media to convey various, context-specific health information. This literature review presented various effective elements that the study drew from to create the five themes by which the PEs' SSI responses were categorised. These themes further informed the design of the materials to focus on the themes and sub-themes (see Figure 10). The CDC's Clear Communication Index presented high scores for both materials (See Appendix I and Appendix J). The PEMAT and SAM evaluations yielded positive and high scores from the PEs for the materials' readability, actionability, and understandability (Figure 11, Figure 12, and Figure 13).

The SBCC and One Health approaches informed this study's process. While the SBCC framework guided the theoretical, design, and evaluation aspects of the intervention, the One Health approach informed how to address AMR-OH holistically. There were three phases, and the processes by which the outcomes were achieved are as follows. In Phase 1, the two participants were recruited through calls to volunteer advertised on the PEs' professional WhatsApp group. A literature review was conducted to identify the relevant elements of other health communication interventions, and the outcome was that this review informed the conceptualisation of the materials. Phase 2 consisted of briefing the participants who volunteered and commencing the study by first obtaining the PEs' consent and then conducting the needs assessment. The outcome from this phase was a better understanding of the PEs' formal and health literacy levels, their range of awareness about AMR as a health topic, and their comfort with digital media as a channel of information delivery. This understanding directly informed the design and presentation of the materials. In Phase 3, the conceptualisation and design of the materials occurred, and the aforementioned end-user feedback tests were conducted along with a final semi-structured interview to elicit in-depth responses. Once these quantitative and qualitative responses were calculated and analysed using the coding memo (Appendix S), the researcher concluded the study.

This study elucidated that while there was an awareness of AMR, there was a lack of knowledge about AMR-OH. This study conceptualised digital educational AMR-OH materials for PEs, drawing from current SBCC literature for health communication. The materials scored high on the Clear Communication Index, as evaluated by the researcher, and showed that the video and infographic clearly communicated the AMR-OH information. The

PEMAT and SAM tests elicited the PEs' evaluations of the same materials, and demonstrated that the materials were readable, understandable, and actionable, while also being relevant and appropriate to the PEs' context.

6.2 Addressing knowledge gaps

The paucity of prior studies in this field encouraged the need to draw from public health and health communication studies, including context-specific interventions that used multimedia. SBCC studies were used to incorporate the behaviour change aspects of health communication to inform this study's conceptualisation of the video and infographic.

The study found that this holistic approach, with the creation and presentation of tangible materials to work from, was welcomed by the two participants. The study concludes that a theory-informed blueprint, with materials created during this study, is a strength for a future implementation of this intervention. It offers an original perspective of the combination of public health communication and SBCC taking a crucial step in the right direction for media theory-informed AMR-OH digital educational interventions.

The needs assessment established that the PEs would appreciate a digital channel of delivery, particularly during the pandemic. The CCI was administered to provide a baseline score for the materials that allowed the study to ensure they would be clear and easy for the end-users to understand. The result of using an established, valid test to score novel materials about emerging HC topics such as AMR-OH was that the design process became easier, faster, and allowed the focus to remain on the end-users.

The study further encouraged OH advocacy, through this AMR-OH intervention, among the PEs' established repertoire of other health issues. The study established that this constructive, context-specific, and solution-based digital health communication played a role to improve the potential for a future implementation of this project on a larger scale.

Finally, the study opted to use only the video and infographic formats to disseminate this information because, based on the needs assessment, these formats were familiar and easy to operate for the PEs. Since this project was conducted during the COVID-19 pandemic, under lockdown conditions, using the video and infographic formats were the most viable and feasible digital options that did not require any end-user training to use.

6.3 Limitations and delimitations

There were substantial COVID-19-induced limitations to this study and these included selection bias, sample size, time constraints, language, and face-to-face contact.

The Rhodes University Peer Educators were selected because of their professional role as health information providers and counsellors for the support staff on campus. Due to COVID-19, there were consistent operational delays, including obtaining ethical clearance and contacting PEs who were off-campus during the lockdown, which impacted the number of volunteers and their interest in participation. Moreover, the PEs could only volunteer for the study if they had a personally available smartphone and a reliable domestic internet connection. The pandemic affected the study's access to the PEs, and the PEs' access to the free campus Wi-Fi. It was only once the lockdown was lifted for essential support staff to re-enter campus – which took several months and severely constrained the duration of the study – that the PEs could be approached for more reliable data collection. So, in the end, out of three volunteers, only two could complete the study. Furthermore, the study could not yet be opened to the PEs without smartphones and internet connections during the pandemic for the aforementioned reasons.

The material design was mindful of the participants' literacy levels. Since English was the common language to the participating PEs and the researcher, it was used as the primary language of communication, presentation, and evaluation of the materials. Unfortunately, the language barrier was not overcome due to the pandemic circumstances (the lockdown and time constraints). This barrier was due to the researcher's repertoire excluding fluency in South African languages. Furthermore, there was severely limited time to complete the conceptualisation, design, and evaluation of the materials on the potential they could have with other peer educators. Having noticed that the material was not presented in isiXhosa both participants suggested that translating the video and infographic would improve reception and memorability, and therefore the potential actionability.

The researcher was unable to physically meet with the participants due to COVID-19 pandemic. Such face-to-face contact would have improved the study, particularly regarding conducting a more thorough needs assessment, strengthening the community-researcher relationship, and designing the video and infographic more collaboratively.

The study limited itself to the food-related drivers of AMR (see Figure 1), specifically meat, and how the dangers of this to humans could be conveyed to the PEs. The digital materials were developed according to SBCC and data visualisation theories, and aimed at end-users with low-health literacy about AMR-OH. Due to the COVID-19 restrictions, this study focused on producing and evaluating a viable blueprint for more extensive implementation of this project. As it stands, this study offers insights into the need for building on existing AMR knowledge from previous projects at Rhodes University. Conducting this study incrementally, building on their existing knowledge, was aimed to support the PEs' professional role as health information providers and counsellors to the University's support staff. The study ensured the solutions (the four food safety actions shown in Appendix N) presented to the end-users were appropriate for their context as food consumers. The needs assessment guided the level of simplicity in language, information presentation, and the channel of delivery. WhatsApp was the most feasible and viable platform on which to share the materials and receive end-user feedback.

6.3.1 A brief reflection on my research journey

The pandemic stands as an (on-going) historic experience in which people had to adapt to new ways of thinking, doing, and being. Before proceeding to the study's recommendations, I would like to reflect on my academic journey. Looking back to 2019, there was no way to predict the immensely frustrating, emotional, and gratifying experience this Masters programme would be; and while there is no one way to write a critical reflection about one's research process, I would like to share my experience from three perspectives: the academic, the systemic, and the personal.

From an academic point of view, this study moved from action research with an elaborate digital training scheme for the PEs, to scaling down to creating a "blueprint" of the larger intervention. As stated in section 1.7.2, the introduction of theory to this practical conceptualisation to generate awareness was new to me. While this study is an intersection of my interests of health communication and digital design, this research process has nurtured an additional interest in behaviour change for health communication. Through this study, a topic that I had initially overlooked became an integral element to consider when designing and consuming digital or digitised information. My understanding and use of behaviour change processes in this study (see Figure 3 and Figure 4) has now lead to an interest in

further learning about User Interface and User Experience, i.e. the way design and language affect the ways people become aware and take action through digital platforms.

The study ended up using a previously unfamiliar theoretical framework and research method, and a lot of learning was involved. My prior experience of the PEMAT and SAM tests, and the SSIs as a data collection method, led to a better appreciation of having theoretically problematised the paucity of appropriate digital educational materials for AMR-OH. During the literature review process I was forced to acknowledge that this study may be the first of its kind, because it used the SBCC framework in combination with popular public health clarity tests. This acknowledgement enhanced my academic learning. As a student who prioritised and enjoyed the practical aspects of journalism over the theoretical, I now know that the inclusion of theoretical frameworks as the foundation for health communication design is necessary and important.

Systemically, I learned that this kind of study in this context lends valuable insight into the ontologies and epistemologies of people the university serves, supports, and works with as a part of the community. Rhodes University does not exist in isolation from Makhanda, and neither should the research and knowledge it keeps and produces. While the “new” is often met with criticism, shock, or worry that it could upset the status quo of what is considered knowledge – or research – I discovered that the School and the University were supportive of this endeavour. I also learned that, in the Humanities, one often reads literature far outside one’s native field of research. Far outside my field is where I began my own academic journey; as the study progressed, so did my understanding and respect for the theoretical aspects of communication as a whole. While this study was for my own education, a tangible exploration of my interests, and building scholarly research within this field, I also persevered in the hope that others would take this as a successful example of strengthening health communication design with the appropriate application of theory.

Personally, this journey has shaped my own behaviour and thinking as an academic. Having successfully completed and evaluated this “blueprint” I have learned that good research – especially during a pandemic – requires time, self-motivation, support, and the need to keep an open mind. Two years is a long time to sit at a desk with one’s thoughts. There were many uncertain months when I felt I would have been better off employed instead of remaining at university, but there was great personal value attached to this work. I saw this study as a tangible, practical extension of my belief that research should be about looking beyond what

one sees around them. Diversity in thinking leads to diversity in the kinds of knowledge that are produced and accepted. As someone who has had the privilege of unhindered access to tertiary education, I find that this research is a powerful and empowering project to have conducted.

6.4 Recommendations

This study presents recommendations for further research and practice.

6.4.1 Further research

The SSI conducted in this study demonstrated a critical link between enhanced awareness of AMR-OH, rapid adoption of the food safety behaviours, and gender. Since this was not explored, the study recommends considering gender as a potentially influential aspect of the adoption of suggested behaviour change and recommends this perspective when conducting further research. Although gender was not included as a research consideration, this recommendation is based on a salient but non-generalisable result from this study.

This research was aligned with other studies evaluating and exploring the use of digital media to disseminate health information among rural populations on the African continent (Agboola and Ahmed, 2020; Koomson, 2019; Molapo et al., 2017; Olu et al., 2019; Pindayi, 2017). Additionally, in this study, the influence of gender in the uptake of health information presented via social media was a salient result as it was the case in other studies (Agboola and Ahmed, 2020; Suwana and Lily, 2017). The intervention materials were found to be aligned to the end-users' domestic contexts, which are informed by their gender, because both participants were female and reported that they organised all activities and purchases regarding food and childcare in their homes. This study found that the participants' roles as primary caregivers of the family informed how positively the AMR-OH information was received and how quickly it was adopted. Although this study did not measure those 'action' aspects at this stage, it is worth highlighting that both participants expressed their concern about AMR-OH and the ease of adopting the food safety actions as the people who prepare meals for their respective families. Both participants shared that they purchase, clean, prepare, and store the food "automatically" because they are women. Therefore, the study recommends the inclusion of gendered perspectives.

6.4.2 Further practice

For media practitioners, results from this interdisciplinary study indicate that such a project is feasible and viable, and certainly requires the nuances of media theory to inform health communication development. The study strongly recommends the use of customised, language-sensitive digital media materials for future practice in the health communication field. Moreover, the study also recommends encouraging topic-specific advocacy among the end-users to strengthen and sustain health information dissemination and the adoption of healthy behaviours.

The objective of this research was to present AMR-OH as a public health problem to be aware of, particularly in the COVID-19 context, using a media-centered approach. This is especially necessary in the case of South Africa, and the health and development challenges caused by the quadruple burden of disease. This study aimed to straddle the health communication and media studies fields as a response to the end-users' low-AMR-OH-literacy, and their available channels of information delivery, particularly during the COVID-19 pandemic. The study found that the PEs were more receptive to the AMR-OH information because of the volume of COVID-19 health communication shared via digital media. Every COVID-19 prevention tip shared with the public was consistent, sustained, and simplified to include even the poorest and least literate population. 'Health for all' can become an achievable goal, because of what has transpired globally due to a unified, resolute approach to create awareness among people and globally responsible citizenry to "flatten-the-curve". The need and effectiveness of digital media has been proven during this pandemic, and was evaluated as such in this study.

The study further recommends inviting a moderator fluent in isiXhosa to oversee and aid the SSI sessions in future. The inclusion of a language-sensitive moderator would improve the level of comfort for the PEs to express their thoughts in their home languages. A collaborative approach depends on first overcoming the language barrier, and this is the easiest to overcome in post-pandemic settings.

On its own, social media is a multi-channel communal space that engages users with user-generated content that they can then interact with (Heldman et al., 2013, p. 02). Social media can function as an important tool for public health interventions, as it already has influential status as a space to share and gather information whilst being "participatory and reciprocal" (Heldman et al., 2013, p. 05). Heldman *et al.* state that social media complement public

health information interventions led by the participants and designed by the broader community to “community build” (Heldman et al., 2013, pp. 05–06).

This grassroots-level intervention design provides a platform on which current health information leaders on campus, the Peer Educators, can expand their position as One Health advocates through learning and sharing this context-specific digitised health information with the support staff. Therefore, this project showed that digitised messaging to increase knowledge and awareness offers communities a chance to improve and sustain existing workplace health promotion efforts using institutional environments as a springboard for information dissemination. The study recommends the integration of the One Health approach to further studies on this topic. It is recommended that future studies consider encouraging One Health advocacy among future participants, to foster community leadership and individual accountability concerning responsible antimicrobial use. Furthermore, community leaders such as PEs are the locus of a more extensive community network and are optimally positioned to expand this research.

The study used the PEs’ existing knowledge about AMR as a foundation to build their knowledge about AMR-OH. It also conducted a round of PEMAT and SAM evaluations at every stage of the design process to ensure the material remained customised and could be further customisable if required. An implication of this study is that this combination of theory and method offers a concrete example of what future media studies projects in digital health communication can achieve. It is recommended that subsequent research should explore scaling this blueprint and implementing the intervention.

In conclusion, this research shows that creating digital educational materials to increase AMR-OH awareness and suggesting behaviour change actions to PEs is feasible. The use of WhatsApp to convey this information in a video and an infographic is a viable and sustainable channel and format of delivery. Finally, this study contributes to this nascent topic of research as a blueprint for further implementation in low-resource contexts.

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Appendices

Appendix A: Ethics Approval

 RHODES UNIVERSITY <i>Where leaders learn</i>	Human Ethics subcommittee Rhodes University Ethical Standards Committee PO Box 94, Grahamstown, 6140, South Africa t: +27 (0) 46 603 9055 f: +27 (0) 46 603 9822 g: ethics.committee@ru.ac.za www.ru.ac.za/research/research/ethics NHREC Registration no. REC-241114-045
<p>15 May 2020</p> <p>Shraddha Patnala</p> <p>Email: g15p4352@campus.ru.ac.za</p> <p>Review Reference: 2020-1058-3430</p> <p>Dear Prof Dugmore</p> <p>Title: Designing and implementing a reception analysis on a digital Antimicrobial awareness intervention for Peer Educators at Rhodes University.</p> <p>Principal Investigator: Professor Harry Dugmore</p> <p>Collaborators: Ms. Shraddha Patnala, Professor Noel Pearse</p> <p>This letter confirms that the above research proposal has been reviewed and APPROVED by the Rhodes University Ethical Standards Committee (RUESC) – Human Ethics (HE) sub-committee.</p> <p>Approval has been granted for 1 year. An annual progress report will be required in order to renew approval for an additional period. You will receive an email notifying when the annual report is due.</p> <p>Please ensure that the ethical standards committee is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the ethics committee on the completion of the research. The purpose of this report is to indicate whether the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the ethical standards committee should be aware of. If a thesis or dissertation arising from this research is submitted to the library's electronic theses and dissertations (ETD) repository, please notify the committee of the date of submission and/or any reference or cataloging number allocated.</p> <p>Sincerely,</p> <div style="text-align: center;"></div> <p>Prof Arthur Webb</p> <p>Chair: Human Ethics Sub-Committee, RUESC- HE</p>	



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27 May 2020

Mr Siyanda Manqele
Ethics Committee
Rhodes University

Dear Mr Manqele

Re: Ethics approval for online data collection (Review Reference: 2020-1058-3430)

Title: Designing and implementing a reception analysis on a digital Antimicrobial awareness intervention for Peer Educators at Rhodes University.

Student: Ms. Shraddha Patnala

Principle supervisor: Professor Harry Dugmore

Co-supervisor: Professor Noel Pearse

Due to the COVID-19 lockdown this project will shift to online methods of data collection to ensure its completion as scheduled.

The original data collection methods were as follow:

- A two-part survey pre-intervention questionnaire to identify the participants' existing knowledge of antimicrobial resistance and the One Health approach (AMR-OH), and their formal and computer literacy levels.

- A series of weekly focus group discussions over four-to-six weeks to examine the participants' understanding of AMR-OH and receive feedback to improve the co-created digital health information materials.
- Administer a post-intervention questionnaire to see if there has been an increase in awareness about AMR-OH among the participants

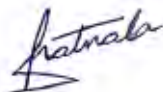
Due to the lockdown, the participants have been recruited through their current Peer Educator WhatsApp group. And any participant who volunteers to join the research and has access to a smartphone with an internet connection is welcome.

The online methods of data collection are as follow:

- Administer a short initial interview-based questionnaire to identify the current gap in knowledge and what the participants would like addressed. This will be conducted using the WhatsApp call and group call features.
- Collect participants' feedback to improve the digital health information materials using the WhatsApp call features.

These changes ensure that the project remains within the bounds of the original ethics application that was granted full approval on 15 May 2020.

Yours sincerely,



Shraddha Patnala

Masters candidate, School of Journalism and Media Studies

Student No. g15P4352

Appendix C: Consent form



RHODES UNIVERSITY

Grahamstown, 6140, South Africa

RUESC
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Consent form

Title of the study: Designing and implementing a reception analysis on a digital Antimicrobial awareness intervention for Peer Educators at Rhodes University.

You are being invited to participate in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. The researcher will make arrangements to present this information in your home language through a translator.

Purpose of the study: The rationale for this research is aligned to the One Health (OH) initiative proposed by the World Health Organisation (WHO), which encourages an interdisciplinary approach to alleviating and solving public health crises. This means that my skills as a journalism and media studies student will be incorporated as additional support to your work as peer educators to be aware and know about AMR. The aim of this research

2

www.ru.ac.za

project is to bridge the digital divide by co-creating, i.e. working with you to make a digitised public health intervention as educational material for you to learn from, train others, and use as peer educators.

Why you have been invited to participate: as peer educators you access health information that you then share with your peers (the support staff). AMR deeply affects all people but it endangers people who are less informed about it. So as peer educators you can use this platform to create your own digitised educational material about this topic and spread this knowledge among the other support staff.

Participation in this research study is voluntary. You can stop participating at any time without any consequences. You can also skip any questions you wish.

If you are willing to take part in the study, then I request you to give me times and dates for the following:

- i) conduct a pre-intervention survey over one hour,
- ii) train you to use the computer and internet to create the educational materials over three days,
- iii) co-create the digital AMR-OH intervention over two weeks,
- iv) give you two weeks to use the educational materials we created,
- v) conduct a post-intervention survey over one hour,
- vi) and conduct 3 – 4 focus group discussion sessions (one hour each) on how this information affected you, your position as a peer educator, and your knowledge about AMR-OH.

For the survey you will have to provide the following information:

- i) name
- ii) age
- iii) phone number (to add you to the closed WhatsApp group)

- iv) position as support staff
- v) how long you have been a peer educator
- vi) how often you use the internet in a day
- vii) which devices you use the internet on
- viii) your knowledge about AMR-OH

For the focus group discussion you will have to provide the following information:

- i) how you felt about the intervention
- ii) whether this information about AMR-OH was useful for you as a peer educator
- iii) whether this information about AMR-OH was easy to understand and share for you as a member of the support staff
- iv) whether this information about AMR-OH was suited to your literacy level, economic position, and cultural background

I will be recording and transcribing the focus group discussion.

Your identity will be kept confidential and anonymous in the survey, focus group transcriptions and the mini thesis. Only my supervisor and I will know this information, and we will not share it with anyone.

You can choose *not* to answer any of the questions and this will not have any consequences on your position as a member of staff or as a peer educator.

I require you to sign this consent for the above before the study begins.

Potential benefits of taking part in the research study: this research is aimed at bridging the digital divide, co-creating the educational materials with you, and understanding how this material will be received. The processes and products from this research will benefit your position as a peer educator and a member of the support staff, because by the end of this intervention you will have learned how to and created digital educational material about AMR-OH. This material will be useful to learn from, train future peer educators, and share with your peers when talking about AMR-OH.

- ☐ Agree
☐ Disagree

Do you agree or disagree to use the materials we have co-created in your position as a peer educator?

- ☐ Agree
☐ Disagree

Do you agree or disagree to complete the post-intervention survey?

- ☐ Agree
☐ Disagree

Do you agree or disagree to participate in, and be audio recorded for, the focus group discussions?

- ☐ Agree
☐ Disagree

I freely consent to participate in this study.

Participant signature:	Date:
------------------------	-------

Appendix D: Gatekeeper permission letters



RHODES UNIVERSITY
Where leaders learn

Deputy Director: Residential Operations

Division Infrastructure and Operations

Rhodes University, PO Box 94, Grahamstown, 6140

☎ 046-603 8784, 📠 0828012389, 📠 046-603 7566, jay.pillay@ru.ac.za

26 February 2020

Dear Ms Shraddha Patnala

Please consider this letter as my formal permission for you to access / make contact with the peer educators from Residential Operations Division to participate in your research as outlined in your research proposal and Ethics Application.

I wish you the very best with your research.

Kind regards

Mrs Jay Pillay

Permission letter from the Deputy Director: Residential Operations.



RHODES UNIVERSITY
Human Resources Division

14 May 2020

Ms Shraddha Patnala
School of Journalism and Media Studies
RHODES UNIVERSITY

Dear Ms Patnala

REQUEST TO CONDUCT RESEARCH WITH RHODES UNIVERSITY STAFF AND/OR STUDENTS

This letter is to confirm that your request to conduct research on *"Designing and implementing a reception analysis on a digital Antimicrobial awareness (AMR) intervention for Peer Educators at Rhodes University.."* topic has been approved by the Ethics Committee. In my capacity as Acting HR Director, I do not have any objection should you wish to follow a coordinated approach by surveying and/or interviewing staff.

Yours sincerely

Mrs S Robertson
Acting HR Director

Permission letter from the Acting Director of Human Resources

Needs assessment questions

This pre-intervention questionnaire is expected to take approximately 1 hour for participants to complete in writing. This duration includes translation time when necessary.

Section 1

Participant information:

- 1.1 What is your name?
- 1.2 How old are you?
- 1.3 What is your current occupation?
- 1.4 When did you become a peer educator?
- 1.5 What is your highest qualification?
- 1.6 Which area of Makhanda do you live in?
- 1.7 What is your phone number?

Section 2

About their position as peer educators:

- 2.1 Which aspect of being a peer educator is most appealing to you? Please explain.

- 2.2 Which aspects of being a peer educator is most challenging to you? Please explain.

Section 3

Digital media information:

3.1 Do you own a smartphone?

- Yes
- No

3.2 Where do you access the internet? Tick all that apply:

- At home (Wi-fi)
- At work (Wi-fi)
- Cellphone (using mobile data)
- At a friend's home (using their Wi-fi)
- Other (please state)

3.3 What devices do you use to access the internet? Select all that apply:

- smartphone
- tablet
- laptop
- desktop computer.

3.4 Which device do you use the most to access the internet? Select all that apply:

- smartphone
- tablet
- laptop
- desktop computer
- other

please state: _____

3.5 How long do you spend on the internet everyday (for banking, games, and casual browsing)? Tick the most relevant box.

- 0 – 1 hour
- 2 – 4 hours
- 5 – 7 hours

3.6 When do you spend the most time online? Circle one: Weekdays/Weekends.

3.7 Do you have a social media account? If yes, select all that apply:

- Facebook
- WhatsApp
- Snapchat
- Instagram
- Twitter
- Pinterest
- TikTok
- Skype
- Other (please state)

3.8 How active are you on your social media accounts per day? Tick the most relevant box.

- 1 = I don't browse or post/text
- 2 = I browse sometimes but don't post/text
- 3 = I browse and post/text sometimes
- 4 = I browse a lot and post/text sometimes
- 5 = I browse a lot and post/text a lot

3.9 How long do you spend on social media in a day for work communication and finding information? Tick the most relevant box.

- between 0 – 1 hour
- between 2 – 4 hours
- between 5 – 7 hours

3.10 Do you use social media for work? Circle one: Yes/No

- i) If yes, please list all the platforms. If no, please state how you communicate with your colleagues.

- ii) If no, would you like to learn to use social media for your work as a peer educator?

- Yes
- No

3.11 On a scale of 1 – 10 (1 = low, 5 = moderate, 10 = high), how confident do you feel using a smartphone? Tick the most relevant box.

- 1 – 4 (low)
- 5 – 7 (moderate)
- 8 – 10 (high)

3.12 On a scale of 1 – 10 (1 = low, 5 = moderate, 10 = high), how confident do you feel using a desktop computer? Tick the most relevant box.

- 1 – 4 (low)
- 5 – 7 (moderate)
- 8 – 10 (high)

3.13 Do you watch videos on your smartphone? Circle one: Yes/No

- i) Do you think you could personally benefit from health information in video format? Circle one: Yes/No
- ii) Do you think your work as peer educators could benefit from health information in video format? Circle one: Yes/No
- iii) Does health information from videos make you think about changing your behaviour to improve your health? Circle one: Yes/No

- iv) Do you think health information on antimicrobial resistance and One Health in video format would be beneficial to your work as peer educators? Circle one: Yes/No

3.14 Do you view images on your smartphone? Circle one: Yes/No

- i) Do you think you could personally benefit from health information in image format? Circle one: Yes/No
- ii) Do you think your work as peer educators could benefit from health information in image format? Circle one: Yes/No
- iii) Does health information from images make you think about changing your behaviour to improve your health? Circle one: Yes/No
- iv) Do you think health information on antimicrobial resistance and One Health in image format would be beneficial to your work as peer educators? Circle one: Yes/No

3.15 Do you see any public health information on social media feeds you are active on? Circle one: Yes/No

- i) If yes, do you see any information about antimicrobial resistance (AMR)? Circle one: Yes/No

3.16 Do you think your position as a peer educator would be made easier if you had a digital store of health information in video and infographic formats you could share with co-workers who come to you for help? Circle one: Yes/No

- i) If yes, please explain why:

Section 4

Antimicrobial resistance (AMR) and human health:

4.1 Have you heard of Antimicrobial Resistance (AMR)? (Yes/No)

i. If Yes, please list the source(s):

4.2 Do you think Antimicrobial Resistance (AMR) is a public health problem in South Africa? (Yes/No)

i. If Yes, please state why you think so:

4.3 Do you request antibiotics be prescribed by a doctor or nurse when you have a sore throat/cough so that you do not get sick during work? Circle one: Yes/No

i) Do you know why this is dangerous? Circle one: Yes/No

ii) If Yes, please explain:

4.4 Have you been on antibiotics in the past year? Circle one: Yes/No

i) If Yes, what instructions did your doctor/nurse/pharmacist give you about the antibiotics? Tick all that apply:

- Complete the prescribed course of antibiotics
- Do not share this antibiotic with others
- Use the medication only for this illness
- Do not skip doses
- Do not double the skipped doses

- Return unused antibiotics
- Keep away from children
- Follow storage instructions. E.g.: Do not store in hot or wet places, like kitchen and bathroom cabinets
- Do not throw unused or expired antibiotics in toilet/ sink or garbage bins

4.5 Do you read the information leaflet provided in the medicine box to know what side effects the antibiotics will give you? Circle one: Yes/No

i) If Yes (for (4.5), do you understand it? Circle one: Yes/No

ii) If No (for (4.5.i), do you use the internet to understand it? Circle one: Yes/No

4.6 Do you know what hand hygiene is? Circle one: Yes/No

i) If Yes, do you know why hand hygiene is useful in stopping the spread of Antimicrobial Resistance (AMR)? Please explain:

ii) If No, would you practice proper hand hygiene if you had more information about why it is important? Circle one: Yes/No

4.7 Do you know what cough etiquette is? Circle one: Yes/No

i) If Yes, do you know why cough etiquette is useful in stopping the spread of Antimicrobial Resistance (AMR)? Please explain:

ii) If No, would you practice proper cough etiquette if you have more information about why it is important? Circle one: Yes/No

4.8 If you had information about these topics, would you share it with the support staff who come to you? Circle one: Yes/No

4.9 What do you think are the key factors in changing unhealthy/harmful uses of antibiotics on the Rhodes University campus for support staff? Please select all that apply:

- Context-specific information
- Digitised, engaging informative posts on social media
- Digitised, engaging informative reminders on social media groups
- SMS reminders
- An AMR stewardship course run by a professional
- A quarterly public health refresher on AMR run by the peer educators
- Spreading awareness among the university support staff community through information campaigns run by peer educators
- Social media trends and hashtags to make AMR a popular topic to spread awareness

Section 5

AMR and One Health

5.1 Do you know about the overuse of antibiotics in the meat and dairy industry to prevent healthy animals from getting sick? Circle one: Yes/No

i) If Yes, where did learn about this?

Appendix F: Semi-structured interview questions

Ease of Use of Technology

- i) Do you have a smartphone? If so, how did your smartphone make it easier and/or difficult for you to receive the AMR-OH information?
- ii) What features of the video and infographic made the information easy for you to receive and keep?
- iii) How do you access the video and infographic on your phone? (store it on your phone? Or retrieve it on WhatsApp alone?)
- iv) Can you explain why WhatsApp worked or did not work for you to receive this information?
- v) Do you think the AMR-OH information can be useful in the video and infographic formats for other PEs?
 - a) Follow up: How about in their role as PE for the support staff?
 - b) Do the other PEs typically have a personal smartphone and access to Wi-Fi? Alternatively, do you if know the other PEs have access to smartphones, internet, and what their comfort levels are to use it?

Clarity of Content

- i) When you watched the AMR-OH information in the video was it clear to you as a PE?
- ii) When you read the infographic was the information clear to you?
 - a) Was there anything in the video that was confusing to you?
 - b) Was there anything in the infographic that was confusing to you?
- iii) Please share what you think made the information feel like it made sense to you.
- iv) Was the information in the video understandable to you?
- v) Was the information on the infographic easy for you to understand?
- vi) Was the narrative of the AMR-OH information easy for you to understand?
- vii) Were the icons used in the video clear and understandable to you?
- viii) Were the icons used in the infographic clear and understandable to you?
 - a) Do you think the other PEs will understand this information easily?
 - b) Do you think this info will be clear to them? Please share why and how you think so.

Format

- i) Did you find the video and infographic **simple** as ways to learn about the AMR-OH information?
- ii) Is this the **first time** you have had digital health information resources to learn from and use as PEs?
 - a) How do you think this will be experienced by the other PEs when it is shared with everyone with smartphones?
- iii) Did you **enjoy** using this digital form of health information?
 - a) Did it make you **curious** to learn more about it?
 - b) Were you **concerned** about AMR-OH's effects when you watched the video?
 - c) Were you **relieved** to find a simple, four-step solution in the infographic?
- iv) Did you think the video and infographic were high **quality** material? Please share why/why not.
- v) When you watched the video and read the infographic, did you feel you could **trust** this information? Please share why/why not.

Appropriate

- i) Is the AMR-OH info **customised** to your role as PE?
- ii) Do you think this customised info holds your **attention** well? Why/Why not?
- iii) What do you think could be done to make the information more **customised** for PEs?
- iv) How does the AMR-OH information **build on** what you (PEs) know about AMR and its effects in South Africa?
- v) How might this information **improve** the other PEs knowledge about AMR?
- vi) Does the video provide you with enough background information about AMR before making you aware of AMR from food sources?
- vii) How does this information about AMR from food sources suit your culture's ways of preparing and eating meat and animal products?
- viii) And what about the food safety steps?
- ix) What did you feel about the English language and terminology use in the video and infographics?
- x) Was the tone in the video and infographic friendly and positive?
- xi) Do these materials speak to you? (Are this info and format relatable to you?)

Actionable

Peer Educators' potential intended behaviour:

- i) How do your current food preparation and storage practices compare to that specified in the infographic and video?
- ii) Given the content of the video and the infographic, what do you think might trigger a change in your current food preparation and storage practices?
- iii) Do you think the information will **prompt** you to act on any one of the four food safety steps?
 - a) Which step(s)?
 - b) Why this step(s)?
 - c) Why not the other steps?
- iv) Which food safety steps would be easy for you to do:
 - What would make 'Cleaning' easy for you to do? Why?
 - What would make 'Separating' easy for you to do? Why?
 - What would make 'Cooking' easy for you to do? Why?
 - What would make 'Chilling' easy for you to do? Why?
- v) What motivates you to change your current behaviour about food preparation and storage?
- vi) How is your intended behaviour going to be sustained?

Support Staff's potential intended behaviour:

- vii) Do you think the support staff would be interested in this topic? Please explain why.
- viii) Do you think the support staff might be motivated to adopt the four food safety steps?
 - a) Which ones do you think they might choose to adopt?
 - b) Why do you think so?
 - c) Why not the other steps?
 - d) Do you think they could continue it as a part of their daily life? Please explain why.

Appendix G: Post-evaluation questions

Digital media

7.1 Now that you have engaged with the infographic (on why and where antimicrobial overuse occurs in the food industry):

- i) Do you think you personally benefitted from health information in infographic format? Circle one: Yes/No
- ii) Do you think your work as peer educators benefitted from health information in infographic format? Circle one: Yes/No
- iii) Did the health information from the infographics make you think about changing your behaviour to improve your health? Circle one: Yes/No
- iv) Did the digitised health information that you could access on your phone and/or computer help you understand the why:
 - Behaviour Change Goal 1 important to stop the spread of Antimicrobial resistance (AMR)? Circle one: Yes/No
- v) Do you think this digitised health information on antimicrobial resistance and One Health in infographic format was beneficial to your work as peer educators? Circle one: Yes/No

7.2 Now that you have engaged with the video (on the dangers of the overuse of antibiotics in the meat and dairy industry, its impact on human health, and the environmental impacts) do you think:

- i) Do you think you personally benefitted from health information in video format? Circle one: Yes/No
- ii) Do you think your work as peer educators benefitted from health information in video format? Circle one: Yes/No
- iii) Did the health information from the video make you think about changing your food consumption choices to improve your health and reduce the spread of antimicrobial resistance? Circle one: Yes/No

iv) Did the digitised health information that you could access on your phone and/or computer help you understand:

- Why the overuse of antibiotics in the food industry is dangerous?

Circle one: Yes/No

- Why this overuse of antibiotics is important to consider before buying meat and dairy products? Circle one: Yes/No

v) Do you think this digitised health information on antimicrobial resistance and One Health in infographic format was beneficial to your work as peer educators? Circle one: Yes/No

AMR-OH and human health

Now that you have completed the intervention:

8.1 Do you think AMR is a public health problem in South Africa? Circle one: Yes/No

ii. If Yes, please explain why you think so:

8.2 Will you request antibiotics be prescribed by a doctor or nurse when you have a sore throat/cough so that you do not get sick during work? Circle one: Yes/No

iii) Do you know why this is dangerous? Circle one: Yes/No

iv) If Yes, please explain:

8.3 If you are prescribed antibiotics in the future, what instructions do you think the doctor/nurse/pharmacist will give you? Tick all that apply:

- Complete the prescribed course of antibiotics
- Do not share this antibiotic with others
- Use the medication only for this illness
- Do not skip doses
- Do not double the skipped doses
- Return unused antibiotics
- Keep away from children
- Follow storage instructions. E.g.: Do not store in hot or wet places, like kitchen and bathroom cabinets
- Do not throw unused or expired antibiotics in toilet/ sink or garbage bins

8.4 Will you read the information leaflet provided in the medicine box to know what side effects the antibiotics will give you? Circle one: Yes/No

iii) If Yes (for (5), will you understand it? Circle one: Yes/No

iv) If No (for (5.i), will you use the internet to understand it? Circle one: Yes/No

8.5 Will you check your meat and dairy products to see if they have been raised/cultured using antibiotics? Circle one: Yes/No

i) If Yes, what will you do about it? Please explain:

ii) If No, will you change your meat and dairy consumption habits if you had more information on why the use of antibiotics in the food and agriculture industry is harmful to public health? Circle one: Yes/No

iii) What kind of information would persuade you? Please state:

8.6 Now that you have such information, will you share it with the support staff who come to you? Circle one: Yes/No

8.7 Will you use social media (like WhatsApp and Facebook) to share this information with the support staff who come to you? Circle one: Yes/No

8.8 What do you think are the key factors in changing unhealthy/harmful uses of antibiotics on the Rhodes University campus for support staff? Please select all that apply:

- Context-specific information
- Digitised, engaging informative posts on social media
- Digitised, engaging informative reminders on social media groups
- SMS reminders
- An AMR stewardship course run by a professional
- A quarterly public health refresher on AMR run by the peer educators
- Spreading awareness among the university support staff community through information campaigns run by peer educators
- Social media trends and hashtags to make AMR a popular topic to spread awareness

Appendix H: Needs assessment and SSI responses

Click this link to view the participants' responses for the needs assessment and the SSI:

<https://docs.google.com/spreadsheets/d/1pdTemF44jepf3i9GTpwppdBK1wlUAzKHnhsNHxz7wgQ/edit?usp=sharing>

Appendix I: Clear Communication Index – video

	Print	Reset Form
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CDC Clear Communication Index Score Sheet

Name of material AMR-OH Video

Name of person scoring Shraddha Patnala

Date 07 / 19 / 2020

Before you begin, identify your primary audience, their health literacy skills, your primary communication objective, and main message. You must know these 4 pieces of information to score the material accurately. If you don't have this information, wait until you do to score the material.

Note about translated materials: If the audiences for the English and non-English versions are different, you should create and score the materials separately to account for audience differences.

1. Who is your primary audience? Peer Educators

Note: See Appendix C of the User Guide for a list of common CDC audiences.

2. What do you know about the health literacy skills of your audience?

Consider not only reading and numeracy skills but also motivation, attention, and distractors that may affect how your audience comprehends and uses your materials. If you don't have this information, assume average or limited skills. Examples include knowing what words and numbers your audience uses to describe a health issue, their familiarity with graphs, and the amount of time they spend reading health materials.

The PEs are aware of AMR as a health issue, and have been trained over the years to learn from and disseminate information from printed health information about various illnesses.

3. What is your primary communication objective?

A communication objective is what you want your audience to think, feel, or do after they receive the message or material. For example: Increase the proportion of women between 18-25 years who intend to increase consumption of folic acid.

To raise awareness about the dangers of AMR from food sources and introduce the four-step food safety solution.

4. What is the main message of the material?

AMR from food sources is just as dangerous, and presents an existential threat. And this information needs to be known about and addressed at a consumer level.

If you are reviewing an existing material with multiple messages, list all possible messages.

N/a

Office of the Associate Director for Communication

Revised May 2013

Save Form

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CDC Clear Communication Index Score Sheet

Using the Score Sheet

The Index has a total of 20 items in 4 parts. These 20 items are presented as questions.

- Questions 1-11 in Part A are **applicable to all materials**
- Questions 12-20 in Parts B, C, and D may not apply to all materials.
- Choose one answer for each item you score.
- Only score a point when all instances of an item in the material meet the criteria.

More detailed descriptions and examples of each item can be found in the User Guide.

Part A: Core

The items in this section (1-11) apply to all materials.

Questions	Score (Check one per question)
Main Message and Call to Action	
1. Does the material contain one main message? <i>A message is the information you are trying to communicate to another person or group of people. If the material contains several messages, and there is no obvious main message, answer no. (User Guide page 5)</i> NOTE: If you answered No to Question 1, score 0 for Questions 2-4 and continue to Question 5.	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
2. Is the main message at the top, beginning, or front of the material? <i>If the material is a single print page, answer yes if the main message is in the top fourth. For a Web material, answer yes if the main message is visible without scrolling. (User Guide page 6)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
3. Is the main message emphasized with visual cues? <i>If the main message is emphasized with font, color, shapes, lines, arrows or headings, such as "What you need to know," answer yes. (User Guide page 7)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
4. Does the material contain at least one visual that conveys or supports the main message? <i>For example, count photographs, line drawings, graphs and infographics as visuals. If the visual doesn't have a caption or labels, answer no. If the visual has human figures who aren't performing the recommended behaviors, answer no. (User Guide page 8)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
5. Does the material include one or more calls to action for the primary audience? <i>If the material includes a specific behavioral recommendation, a prompt to get more information, a request to share information with someone else, or a broad call for program or policy change, answer yes. If the call to action is for someone other than the primary audience, answer no. (User Guide page 10)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0

CDC Clear Communication Index Score Sheet

Language

- | | |
|---|--|
| 6. Do both the main message and the call to action use the active voice?
<i>If only the main message or only the call to action uses the active voice, answer no. If you answered no to #1 or #5, answer no. (User Guide page 11)</i> | <input checked="" type="checkbox"/> Yes = 1
<input type="checkbox"/> No = 0 |
| 7. Does the material always use language the primary audience would use?
See top of Score Sheet for primary audience.
<i>If all specialized or unfamiliar terms are explained or described (not just defined) the first time they are used, answer yes. Acronyms and abbreviations must be spelled out and explained if unfamiliar to the audience. (User Guide page 12)</i> | <input checked="" type="checkbox"/> Yes = 1
<input type="checkbox"/> No = 0 |

Information Design

- | | |
|---|--|
| 8. Does the material use bulleted or numbered lists?
<i>If the material contains a list with more than 7 items, and the list is not broken up into sub-lists, answer no. If the list is for additional information or references only or at the end of the material, answer no. (User Guide page 14)</i> | <input checked="" type="checkbox"/> Yes = 1
<input type="checkbox"/> No = 0 |
| 9. Is the material organized in chunks with headings?
<i>This item applies to prose text and lists. If the chunks contain more than one idea each, answer no. If the headings don't match the information chunks, answer no. (User Guide page 15)</i> | <input checked="" type="checkbox"/> Yes = 1
<input type="checkbox"/> No = 0 |
| 10. Is the most important information the primary audience needs summarized in the first paragraph or section?
<i>The most important information must include the main message. (User Guide page 17)</i> | <input checked="" type="checkbox"/> Yes = 1
<input type="checkbox"/> No = 0 |

State of the Science

- | | |
|--|--|
| 11. Does the material explain what authoritative sources, such as subject matter experts and agency spokespersons, know and don't know about the topic?
<i>If the material addresses both, answer yes. If the material addresses only one (what is known or not known), answer no. (User Guide page 18)</i> | <input type="checkbox"/> Yes = 1
<input checked="" type="checkbox"/> No = 0 |
|--|--|

Part A score

Total 10 / 11

Comments

Save Form

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CDC Clear Communication Index Score Sheet

Part B: Behavioral Recommendations

Answer this question to determine if items 12-14 apply to the material.

Does the material include one or more behavioral recommendations for the primary audience?

- If **yes** – score items 12-14.
- If **no** – skip to Part C. [Go to Part C](#)

Questions	Score (Check one per question)
12. Does the material include one or more behavioral recommendations for the primary audience? <i>If no, STOP here and don't score Part B. (User Guide page 19)</i>	<input checked="" type="checkbox"/> Yes = 1
13. Does the material explain why the behavioral recommendation(s) is important? <i>If you offer only numbers to explain the importance of the behavioral recommendation with no other relevant information for the audience, answer no. (User Guide page 20)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
14. Does the behavioral recommendation(s) include specific directions about how to perform the behavior? <i>This may include step-by-step directions or a simple description (for example: Look for cereal with 100% daily value of folic acid). If the material includes information about when or how to contact a medical provider or health official, answer yes. If the material mentions when or how often to perform a behavior, answer yes. (User Guide page 21)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0

Part B score

Total 3 / 3

Comments

Save Form

Next Page

CDC Clear Communication Index Score Sheet

Part C: Numbers

Answer this question to determine if items 15-17 apply to the material.

Does the material include one or more numbers that convey or support the main message?

- If **yes** – score items 15-17.

- If **no** – skip to Part D. [Go to Part D](#)

Questions	Score (Check one per question)
15. Does the material <u>always</u> present numbers the primary audience uses? <i>Whole numbers are used by most audiences. The types of numbers used will vary for each audience. (User Guide page 22)</i>	<input type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
16. Does the material <u>always</u> explain what the numbers mean? <i>For example, "The amount of meat recommended as part of a healthy meal is 3 to 4 ounces – it will look about the same size as a deck of cards." (User Guide page 23)</i>	<input type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
17. Does the audience have to conduct mathematical calculations? <i>Adding, subtracting, multiplying, and dividing involve calculations. Calculating a common denominator for the purposes of comparison is a mathematical calculation.</i> NOTE: for this item, Yes is scored 0 and No is scored 1. <i>(User Guide page 24)</i>	<input type="checkbox"/> Yes = 0 <input type="checkbox"/> No = 1

Part C score**Total** 0 / 3

Comments

Save Form

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CDC Clear Communication Index Score Sheet

Part D: Risk

Answer this question to determine if items 18-20 apply to the material.
Does the material present information, including numbers, about risk?

- If **yes** – score items 18-20.
- Items 19 and 20 have a “not applicable” (NA) option.
- If **no** – skip to Calculate Your Score. [Go to Calculate](#)

Questions	Score (Check One per Question)
18. Does the material explain the nature of the risk? <i>If the material states the threat or harm and how and why people may be affected, answer yes. If the material has only the threat or harm but no explanation, answer no. For example, if the material states there are 1,000 new cases of a contagious disease in Springfield, does it also state that people in Springfield may be more likely to get the disease, why they may be more likely, and how serious the threat of the disease is? (User Guide page 26)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
19. Does the material address both the risks and benefits of the recommended behaviors? <i>This includes actual risks and benefits and those perceived by your audience. If the material addresses <u>only</u> risks or <u>only</u> benefits, answer no. If no behavioral recommendation is presented, answer not applicable (NA). (User Guide page 27)</i>	<input type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0 <input checked="" type="checkbox"/> NA
20. If the material uses numeric probability to describe risk, is the probability also explained with words or a visual? <i>Examples of probability information in a risk message are numbers (such as 1 in 5 or 20%). If the material presents numeric risk and also uses text to explain the probability, answer yes. If the material presents numeric risk and also uses a visual to explain the probability, answer yes. If the material only presents numeric risk, answer no. If the material does not include this type of probability information, answer not applicable (NA). (User Guide page 28)</i>	<input type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0 <input checked="" type="checkbox"/> NA

Part D score**Total** 1 / 1

Comments

Save Form

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CDC Clear Communication Index Score Sheet

Calculate the Score for the Material

- **Step 1:** The total points that the material earned (this is the numerator).
» A: 10 B: 3 C: 0 D: 1 = 14
- **Step 2:** The total possible points that the material could have earned (this is the denominator).
» A: 11 B: 3 C: 0 D: 1 = 15
- **Step 3:** The numerator divided by the denominator multiplied by 100 to get the total score.

$$\underline{14} / \underline{15} \times 100 = \underline{93.3}$$

How to Interpret the Score

The purpose of the Index is to improve the clarity of communication products.

If the total score is 90 or above:

Excellent! You have addressed most items that make materials easier to understand and use.

If the total score is 89 or below:

Note which items scored 0 points. Use the descriptions and examples in the User Guide to revise and improve the material. Then apply the Index again to check your work. You can use the Index as many times as you need to revise the material to get a score of 90 or above.

Additional Comments

Email Form

Print

Save Form

Appendix J: Clear Communication Index – infographic

	Print	Reset Form
CDC Clear Communication Index Score Sheet		
<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;">Name of material Food safety infographic</div>		
<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;">Name of person scoring Shraddha Patnala</div>		
<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;">Date 0 7 / 1 9 / 2 0 2 0</div>		
<p>Before you begin, identify your primary audience, their health literacy skills, your primary communication objective, and main message. You must know these 4 pieces of information to score the material accurately. If you don't have this information, wait until you do to score the material.</p>		
<p>Note about translated materials: If the audiences for the English and non-English versions are different, you should create and score the materials separately to account for audience differences.</p>		
<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;">1. Who is your primary audience? Peer educators</div>		
<p><i>Note: See Appendix C of the User Guide for a list of common CDC audiences.</i></p>		
<p>2. What do you know about the health literacy skills of your audience?</p>		
<p><i>Consider not only reading and numeracy skills but also motivation, attention, and distractors that may affect how your audience comprehends and uses your materials. If you don't have this information, assume average or limited skills. Examples include knowing what words and numbers your audience uses to describe a health issue, their familiarity with graphs, and the amount of time they spend reading health materials.</i></p>		
<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;">The PEs are aware of AMR as a health issue, and have been trained over the years to learn from and disseminate information from printed health information about various illnesses.</div>		
<p>3. What is your primary communication objective?</p>		
<p><i>A communication objective is what you want your audience to think, feel, or do after they receive the message or material. For example: Increase the proportion of women between 18-25 years who intend to increase consumption of folic acid.</i></p>		
<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;">Get the PEs to consider adopting the four food safety steps.</div>		
<p>4. What is the main message of the material?</p>		
<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;">Safeguard oneself from AMR from food sources through adopting the four food safety steps.</div>		
<p>If you are reviewing an existing material with multiple messages, list all possible messages.</p>		
<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 10px;">N/a</div>		
Office of the Associate Director for Communication		1
Revised May 2013		<div style="display: inline-block; border: 1px solid black; padding: 2px 10px; margin: 0 5px;">Save Form</div> <div style="display: inline-block; border: 1px solid black; padding: 2px 10px; margin: 0 5px;">Next Page</div>

CDC Clear Communication Index Score Sheet

Using the Score Sheet

The Index has a total of 20 items in 4 parts. These 20 items are presented as questions.

- Questions 1-11 in Part A are **applicable to all materials**
- Questions 12-20 in Parts B, C, and D may not apply to all materials.
- Choose one answer for each item you score.
- Only score a point when all instances of an item in the material meet the criteria.

More detailed descriptions and examples of each item can be found in the User Guide.

Part A: Core

The items in this section (1-11) apply to all materials.

Questions	Score (Check one per question)
Main Message and Call to Action	
1. Does the material contain one main message? <i>A message is the information you are trying to communicate to another person or group of people. If the material contains several messages, and there is no obvious main message, answer no. (User Guide page 5)</i> NOTE: If you answered No to Question 1, score 0 for Questions 2-4 and continue to Question 5.	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
2. Is the main message at the top, beginning, or front of the material? <i>If the material is a single print page, answer yes if the main message is in the top fourth. For a Web material, answer yes if the main message is visible without scrolling. (User Guide page 6)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
3. Is the main message emphasized with visual cues? <i>If the main message is emphasized with font, color, shapes, lines, arrows or headings, such as "What you need to know," answer yes. (User Guide page 7)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
4. Does the material contain at least one visual that conveys or supports the main message? <i>For example, count photographs, line drawings, graphs and infographics as visuals. If the visual doesn't have a caption or labels, answer no. If the visual has human figures who aren't performing the recommended behaviors, answer no. (User Guide page 8)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
5. Does the material include one or more calls to action for the primary audience? <i>If the material includes a specific behavioral recommendation, a prompt to get more information, a request to share information with someone else, or a broad call for program or policy change, answer yes. If the call to action is for someone other than the primary audience, answer no. (User Guide page 10)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0

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CDC Clear Communication Index Score Sheet

Language	
6. Do both the main message and the call to action use the active voice? <i>If only the main message or only the call to action uses the active voice, answer no. If you answered no to #1 or #5, answer no. (User Guide page 11)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
7. Does the material <u>always</u> use language the primary audience would use? <i>See top of Score Sheet for primary audience.</i> <i>If all specialized or unfamiliar terms are explained or described (not just defined) the first time they are used, answer yes. Acronyms and abbreviations must be spelled out and explained if unfamiliar to the audience. (User Guide page 12)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
Information Design	
8. Does the material use bulleted or numbered lists? <i>If the material contains a list with more than 7 items, and the list is not broken up into sub-lists, answer no. If the list is for additional information or references only or at the end of the material, answer no. (User Guide page 14)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
9. Is the material organized in chunks with headings? <i>This item applies to prose text and lists. If the chunks contain more than one idea each, answer no. If the headings don't match the information chunks, answer no. (User Guide page 15)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
10. Is the most important information the primary audience needs summarized in the first paragraph or section? <i>The most important information must include the main message. (User Guide page 17)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
State of the Science	
11. Does the material explain what authoritative sources, such as subject matter experts and agency spokespersons, know and don't know about the topic? <i>If the material addresses both, answer yes. If the material addresses only one (what is known or not known), answer no. (User Guide page 18)</i>	<input type="checkbox"/> Yes = 1 <input checked="" type="checkbox"/> No = 0

Part A score	Total 10 / 11
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Comments

Save Form

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CDC Clear Communication Index Score Sheet

Part B: Behavioral Recommendations

Answer this question to determine if items 12-14 apply to the material.

Does the material include one or more behavioral recommendations for the primary audience?

- If **yes** – score items 12-14.

- If **no** – skip to Part C. [Go to Part C](#)

Questions	Score (Check one per question)
12. Does the material include one or more behavioral recommendations for the primary audience? <i>If no, STOP here and don't score Part B. (User Guide page 19)</i>	<input checked="" type="checkbox"/> Yes = 1
13. Does the material explain why the behavioral recommendation(s) is important? <i>If you offer only numbers to explain the importance of the behavioral recommendation with no other relevant information for the audience, answer no. (User Guide page 20)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
14. Does the behavioral recommendation(s) include specific directions about how to perform the behavior? <i>This may include step-by-step directions or a simple description (for example: Look for cereal with 100% daily value of folic acid). If the material includes information about when or how to contact a medical provider or health official, answer yes. If the material mentions when or how often to perform a behavior, answer yes. (User Guide page 21)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0

Part B score

Total 3 / 3

Comments

Save Form

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CDC Clear Communication Index Score Sheet

Part C: Numbers

Answer this question to determine if items 15-17 apply to the material.

Does the material include one or more numbers that convey or support the main message?

- If **yes** – score items 15-17.
- If **no** – skip to Part D. [Go to Part D](#)

Questions	Score (Check one per question)
15. Does the material <u>always</u> present numbers the primary audience uses? <i>Whole numbers are used by most audiences. The types of numbers used will vary for each audience. (User Guide page 22)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
16. Does the material <u>always</u> explain what the numbers mean? <i>For example, "The amount of meat recommended as part of a healthy meal is 3 to 4 ounces – it will look about the same size as a deck of cards." (User Guide page 23)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
17. Does the audience have to conduct mathematical calculations? <i>Adding, subtracting, multiplying, and dividing involve calculations. Calculating a common denominator for the purposes of comparison is a mathematical calculation.</i> NOTE: for this item, Yes is scored 0 and No is scored 1. <i>(User Guide page 24)</i>	<input type="checkbox"/> Yes = 0 <input checked="" type="checkbox"/> No = 1

Part C score

Total 3 / 3

Comments

Save Form

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CDC Clear Communication Index Score Sheet

Part D: Risk

Answer this question to determine if items 18-20 apply to the material.
Does the material present information, including numbers, about risk?

- If **yes** – score items 18-20.
- Items 19 and 20 have a “not applicable” (NA) option.
- If **no** – skip to Calculate Your Score. [Go to Calculate](#)

Questions	Score (Check One per Question)
18. Does the material explain the nature of the risk? <i>If the material states the threat or harm and how and why people may be affected, answer yes. If the material has only the threat or harm but no explanation, answer no. For example, if the material states there are 1,000 new cases of a contagious disease in Springfield, does it also state that people in Springfield may be more likely to get the disease, why they may be more likely, and how serious the threat of the disease is? (User Guide page 26)</i>	<input checked="" type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0
19. Does the material address both the risks and benefits of the recommended behaviors? <i>This includes actual risks and benefits and those perceived by your audience. If the material addresses <u>only</u> risks or <u>only</u> benefits, answer no. If no behavioral recommendation is presented, answer not applicable (NA). (User Guide page 27)</i>	<input type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0 <input checked="" type="checkbox"/> NA
20. If the material uses numeric probability to describe risk, is the probability also explained with words or a visual? <i>Examples of probability information in a risk message are numbers (such as 1 in 5 or 20%). If the material presents numeric risk and also uses text to explain the probability, answer yes. If the material presents numeric risk and also uses a visual to explain the probability, answer yes. If the material only presents numeric risk, answer no. If the material does not include this type of probability information, answer not applicable (NA). (User Guide page 28)</i>	<input type="checkbox"/> Yes = 1 <input type="checkbox"/> No = 0 <input checked="" type="checkbox"/> NA

Part D score

Total 1 / 1

Comments

Save Form

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CDC Clear Communication Index Score Sheet

Calculate the Score for the Material

- **Step 1:** The total points that the material earned (this is the numerator).
» A: 10 B: 3 C: 3 D: 1 = 17
- **Step 2:** The total possible points that the material could have earned (this is the denominator).
» A: 11 B: 3 C: 3 D: 1 = 18
- **Step 3:** The numerator divided by the denominator multiplied by 100 to get the total score.

$$\frac{17}{18} \times 100 = 94.4$$

How to Interpret the Score

The purpose of the Index is to improve the clarity of communication products.

If the total score is 90 or above:

Excellent! You have addressed most items that make materials easier to understand and use.

If the total score is 89 or below:

Note which items scored 0 points. Use the descriptions and examples in the User Guide to revise and improve the material. Then apply the Index again to check your work. You can use the Index as many times as you need to revise the material to get a score of 90 or above.

Appendix K: PEMAT score sheet

Patient Education Materials Assessment Tool (PEMAT) test

Material:

Participant:

Interview date:

Score: (Yes = 1, and No = 2) for each item

Understandability

Print or Audio/Visual	Video	Infographic	Score	Comments
(P and A/V)	Does this material help you understand why you should be aware of AMR from food sources?	Does this material help you understand why you should be aware of AMR from food sources?		
(P)	Does the material include anything that makes the message difficult to understand?	Does the material include anything that makes the message difficult to understand?		
(P and A/V)	Does the material use words that are easy to understand?	Does the material use words that are easy to understand?		

(P and A/V)	Are the scientific words in the material easy to understand?	Are the scientific words in the material easy to understand?		
(P)	Are the numbers in the material clear and easy to understand?	Are the numbers in the material clear and easy to understand?		
(P)	Does the material ask you to calculate anything?	Does the material ask you to calculate anything?		
(P and A/V)	Does the material break information into short sections?	Does the material break information into short sections?		
(P and A/V)	Do the material's sections have informative headers?	Do the material's sections have informative headers?		
(P and A/V)	Does the material present information in an order you can understand easily?	Does the material present information in an order you can understand easily?		
(P and A/V)	Does the material provide a summary at the end?	Does the material provide a summary at the end?		

(P and A/V)	Does the material use visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points?	Does the material use visual cues (e.g., arrows, boxes, bullets, bold, larger font, highlighting) to draw attention to key points?		
(A/V)	Is the text on the screen is easy to read?	Is the text on the screen is easy to read?		
(A/V)	Could you hear the words clearly (e.g., not too fast, not garbled)?	-		
(P)	Did the material use visual aids whenever it could make content easier to understand (e.g., illustrations of the sources of AMR-OH)?	Did the material use visual aids whenever it could make content easier to understand (e.g., symbols for the food safety actions)?		

(P)	Did the material's visual aids (symbols & pictures) reinforce the dangers of AMR-OH and its sources without distracting your attention to other things?	Did the material's visual aids (symbols) reinforce the importance of food safety through the four steps without distracting your attention to other things?		
(P)	Do the material's visual aids have clear titles or captions that tell you what they mean?	Do the material's visual aids have clear titles or explanations that tell you what they mean?		
(P and A/V)	Does the material use illustrations and photographs that can be seen clearly?	Does the material use illustrations and photographs that can be seen clearly?		
(P and A/V)	Does the material use simple tables to organise the information with short and clear row and column headings?	Does the material use simple tables to organise the information with short and clear row and column headings?		

Actionability

Print Audio/Visual	or Video	Infographic	Score	Comments
(P and A/V)	Does the material clearly identify at least one action you can take?	Does the material clearly identify at least one action you can take?		
(P and A/V)	Does the material address you directly when describing the actions?	Does the material address you directly when describing the actions?		
(P and A/V)	Does the material break down the actions into clear, manageable steps?	Does the material break down the actions into clear, manageable steps?		
(P)	Is the material helpful to show and explain the concept of AMR from food sources to the support staff?	Is the material helpful to show and explain the food safety actions to the support staff?		

(P)	Does the material provide simple instructions?	Does the material provide simple instructions?		
(P and A/V)	Does the material explain how to use the charts, graphs, tables, or diagrams to take actions?	Does the material explain how to use the charts, graphs, tables, or diagrams to take actions?		
(P)	Does the material use visual aids whenever it could make it easier for you to act on the instructions?	Does the material use visual aids whenever it could make it easier for you to act on the instructions?		

Appendix L: SAM score sheet

Suitability Assessment of Materials test

Score: Superior = 2 points / Adequate = 1 point / Not Suitable = 0 points

Intervention:

Participant:

Date of interview:

Section	Questions	Score	Comments
Content	(a) Does the material tell you exactly what it is for?		
	(b) Is there content about behaviours you can adopt to solve the problem?		
	(c) Is there a summary of the information at the end of the material?		
Literacy demand	(a) Was this easy to read for you? <ul style="list-style-type: none">• Superior= 5th grade or lower• Adequate=6th to 8th grade• Not suitable= 9th grade and above		

	(b) Did the material use a positive, friendly tone directed at you (the reader)?		
	(c) Was the vocabulary in the material easy to understand?		
	(d) Was the context for this information given to you?		
	(e) Did the material have informative headings?		
Graphics	(a) Did the cover graphic (main pictures or symbols) help you understand exactly what this material is for? i.e. did they make the material's educational purpose clear to you?		

	<p>(b) Did the type of graphics (images, tables, symbols) help you understand the topic of AMR from food sources?</p> <p>Infographic: Did the type of graphics (images, tables, symbols) help you understand the food safety steps and why they were important?</p>		
	<p>(c) Were the illustrations (pictures, symbols) relevant to the information? i.e. did they match the information?</p>		
	<p>(d) Were the lists and tables explained clearly?</p>		
	<p>(e) Were there captions used for the graphics (pictures, tables)?</p>		

Layout and typography	(a) Was the layout (presentation of information) easy to read?		
	(b) Did the material use clear, easy-to-read font? (typography: font size, typeface)		
	(c) Were there subheadings used in the material to help you identify the sections?		
Learning stimulation and motivation	(a) Interaction used: does the material ask you to solve a problem or make choices?		
	(b) Behaviours are modelled and specific: were proposed behaviours (food safety actions) explained clearly?		

	(c) Motivation: does the change (food safety steps) the material is asking you to consider possible for you?		
Cultural appropriateness	(a) Cultural match: does this material give you information that is close to part of your region and culture's food choices availability?		
	(b) Cultural image and examples: does the material use cultural examples of foods that are relevant and accessible to you?		
		Total Score	

Appendix M: Semi-structured interview transcripts

Click on this link to view the first SSI transcript:

https://docs.google.com/document/d/1AXVksg5qfOdl-1jC0_Zmcy9wqEcvVN3J2TLoXu48zo/edit?usp=sharing

Click on this link to view the second SSI transcript:

https://docs.google.com/document/d/1auHVMVW_nuNJw6GMOWLvpTQPbvIgMvEI2rPu8m5_tFmQ/edit?usp=sharing

PROTECTING YOURSELF WITH FOOD SAFETY



1: CLEAN

- Wash your hands and cooking surfaces.
- Clean fruits and vegetables with water.
- WHY?: germs that can cause food poisoning can live anywhere in your kitchen.



2: SEPARATE

- Use separate cutting boards for meat and ready-to-eat foods.
- When shopping keep the meat away from other foods.
- Keep both raw and cooked meat away from other foods in the fridge.
- WHY?: raw and cooked meat dishes can spread germs to other ready-to-eat foods.



3: COOK

- Different kinds of meat need to be cooked at different temperatures.
- Cook the meat all the way through.
- WHY?: food cooked at the right internal temperature ensures that dangerous germs can be killed and the food is safe to eat.



4: CHILL

- Keep your fridge at 4 degrees Celsius.
- Store the remaining cooked meat in the fridge as soon as you are finished eating.
- Thaw frozen food in the fridge, in the microwave, or in water. Never thaw it on the counter.
- WHY?: when the food is not the same temperature throughout, bacteria begin growing in spots at room temperature and can contaminate food. Bacteria can multiply quickly when food is left outside the fridge.

SOURCE: FOUR STEPS TO FOOD SAFETY (CDC, 2020)

SCHOOL OF JOURNALISM & MEDIA STUDIES RHODES UNIVERSITY

Appendix O: AMR-OH video narration script

Topic: how the overuse of antibiotics in our food sources harms our health.

[One narrator]

[Slide: AMR]

What is AMR?

[Slide: AMR = antimicrobial resistance]

AMR stands for antimicrobial resistance.

[Slide: Microbes]

AMR happens when harmful microbes, such as bacteria, viruses, parasites, and fungi develop resistance against medicines used to treat the infections and diseases they cause.

[Slide: AMR & South Africa]

This is a huge problem in South Africa, because we experience a heavy burden of infectious diseases. Antibiotics are used to treat everything from simple bacterial infections to TB. The fight against AMR needs all of us to use antimicrobials responsibly and only as prescribed by a doctor. This means that we must be **aware** of the problem, learn the steps to **address** it, and make an effort to **act** on those steps.

Why is AMR increasing?

Human activities have caused the rise of AMR because of the overuse and misuse of antimicrobials. These activities or drivers of AMR come from:

i) **Humans** overusing and misusing antimicrobials to treat infectious diseases...

...and contact with dirty **water**, unreliable **sanitation**, and poor **hygiene** practices. These result in infectious diseases that need antibiotics as treatment.

ii) The irresponsible use of antimicrobials in **food producing animals** - such as cows, pigs, sheep, fish, and chickens - to prevent infections, promote growth

and production of meat and milk. This causes AMR, and becomes dangerous to the people who eat them regularly. Like you and me.

iii) The misuse and overuse of antimicrobials in **food and feed**;

iv) The unregulated use of antimicrobials on **plants and crops**;

v) And the discharge of waste containing antibiotics from **healthcare, pharmaceutical manufacturing, and farm facilities** into the environment...

...are all dangerous human-centred activities that increase the rise and spread of AMR.

AMR from food sources

Antibiotics are used to prevent infections and promote growth in farm animals and crops. In farm animals antibiotics are used to prevent disease and stimulate hunger, so they eat more and produce more meat and milk.

When farm animals are given antibiotics even when they are not sick, the bacteria in their bodies build up resistance

against the antibiotics, make the antibiotics ineffective as a treatment, and become a part of their meat and milk. Researchers have shown that giving animals antibiotics when there is no disease, to promote growth, and increase appetite is dangerous to animal health and ours because it causes resistance in microbes. This means that when we eat those animals or their products regularly, we also consume the resistant germs.

To fight the rise and spread of AMR, we must be **aware** of the problem, learn how to **address** it, and make an effort to **act** on it.

As a consumer, you can help by adopting and following the four food safety steps:

Clean: Ensure your hands, surfaces, and food, are clean.

Separate: Keep raw meat away from ready-to-eat food.

Cook: Cook meat to the proper temperatures to kill all harmful microbes.

And **Chill:** store meat dishes in the fridge so that harmful microbes do not grow on the food.

More details about these steps can be found in the infographic.

The fight against AMR is something we must all be a part of. And these steps ensure that everyday people like you and I can slow down the rise and spread of AMR from food by following these four food safety steps.

[Duration: approximately 00:04:30]

References for the script:

Centers for Disease Control and Prevention. 2020. Food and Food Animals. URL: <https://www.cdc.gov/drugresistance/food.html>. Date accessed: 13/05/2020.

Food and Agriculture Organisation of the United Nations. 2020. Antimicrobial resistance. URL: <http://www.fao.org/antimicrobial-resistance/background/what-is-it/en/>. Date accessed: 15/05/2020.

NHS Inform. 2020. Antibiotics. URL: <https://www.nhsinform.scot/tests-and-treatments/medicines-and-medical-aids/types-of-medicine/antibiotics>. Date accessed: 13/05/2020.

World Health Organisation. 2020. Antimicrobial resistance in the food chain. URL: https://www.who.int/foodsafety/areas_work/antimicrobial-resistance/amrfoodchain/en/. Date accessed: 13/05/2020.

References for the infographic:

Centers for Disease Control and Prevention. 2020. Food and Food Animals. URL: <https://www.cdc.gov/drugresistance/food.html>. Date accessed: 13/05/2020.

World Health Organisation. 2020. Antimicrobial resistance in the food chain. URL: https://www.who.int/foodsafety/areas_work/antimicrobial-resistance/amrfoodchain/en/. Date accessed: 13/05/2020.

World Health Organisation. 2017. Country Cooperation Strategy At A Glance. URL: https://apps.who.int/iris/bitstream/handle/10665/136874/ccsbrief_zaf_en.pdf;jsessionid=83051BC9CAAD47312DDF9D1B8C7E6591?sequence=1. Date accessed: 14/05/2020.

Ronquest-Ross L-C, Vink N, Sigge GO. Food consumption changes in South Africa since 1994. S Afr J Sci. 2015;111(9/10), Art. #2014-0354, 12 pages. <http://dx.doi.org/10.17159/sajs.2015/20140354>. Date accessed: 14/05/2020.

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Fish (meat): Icons made by surang from www.flaticon.com

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Poop: Icons made by Freepik from www.flaticon.com

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Appendix P: AMR-OH video

Click this link to view the AMR-OH video:

<https://drive.google.com/file/d/1a48S3YkTvvVDG89o0gQxc43O1pOtLxi5/view?usp=sharing>

[g](#)

Appendix Q: PEMAT results

Video Narration:

<https://docs.google.com/spreadsheets/d/1pdTemF44jepf3i9GTpwppdBKlwlUAzKHnhsNHxz7wgQ/edit#gid=0&range=A1:F32>

Video:

<https://docs.google.com/spreadsheets/d/1pdTemF44jepf3i9GTpwppdBKlwlUAzKHnhsNHxz7wgQ/edit#gid=981337643&range=A1:F32>

Infographic:

<https://docs.google.com/spreadsheets/d/1pdTemF44jepf3i9GTpwppdBKlwlUAzKHnhsNHxz7wgQ/edit#gid=1709847766&range=A1:F32>

Appendix R: SAM results

Video Narration:

<https://docs.google.com/spreadsheets/d/1pdTemF44jepf3i9GTpwppdBKlwlUAzKHnhsNHxz7wgQ/edit#gid=0&range=A37:F67>

Video:

<https://docs.google.com/spreadsheets/d/1pdTemF44jepf3i9GTpwppdBKlwlUAzKHnhsNHxz7wgQ/edit#gid=981337643&range=A37:F67>

Infographic:

<https://docs.google.com/spreadsheets/d/1pdTemF44jepf3i9GTpwppdBKlwlUAzKHnhsNHxz7wgQ/edit#gid=1709847766&range=A37:F67>

Appendix S: Deductive thematic analysis coding memo

Label	Formal definition	Description of occurrence (what does it look like?)	Inclusion + Exclusion criteria	References
Ease of use of technology	The medium of delivering the AMR-OH information through digital means is as functional, available to, and retrievable by the PEs as printed information.	<p>Functional: The PE uses their smartphone regularly and comfortably to communicate via WhatsApp.</p> <p>Available: The AMR-OH information is there whenever the PE wants to access it.</p> <p>Retrieval: They can retrieve it from their smartphone whenever they want to.</p>	<p>Inclusion: the smartphone is the PE's personal device that is Wi-Fi enabled when on campus, or the PE can use their personal data to access the AMR-OH information.</p> <p>Exclusion: Any reference to the content of video/infographic.</p>	(Caballero et al., 2020; Jones, 2003, p. 26; Lagan et al., 2020; Liu et al., 2019, p. 03; Moutham et al., 2012, p. 74)
Clarity of content	The educational content is clear to the audience, and can be understood by the target audience.	<p>The information, in video and infographic formats, is clear to the PEs.</p> <p>The educational content is easy to understand by the community of</p>	<p>Inclusion: foregrounds the clarity and understandability of the AMR-OH content of the video and infographic only, not their understanding of</p>	(Anderson et al., 2019; Jones, 2003, p. 26; Lagan et al.,

		PEs.	<p>the topic more broadly.</p> <p>Exclusion: other sources of information the PEs access in their own time. Any reference made to tech and challenges of using tech.</p> <p>Any reference made to cultural and linguistic aspects of the information.</p> <p>Any reference to prior experience of this topic or any features of the user (PEs).</p>	<p>2020; Mouttham et al., 2012, p. 74)</p>
Format	<p>The video and infographic were simple, novel, evoked emotion, and they were designed keeping quality, credibility, and the community in mind.</p>	<p>The PEs find the video and infographic formats simple to use, a novel medium of disseminating health information, and evoked emotion (e.g. enjoyment, concern, curiosity) about AMR from food sources.</p> <p>They find the video and infographic to be high in quality and a</p>	<p>Inclusion: only the video and infographic conceptualised and designed for this study count.</p> <p>Exclusion: any reference to the content, ease of use of technology, and appropriateness of content.</p>	<p>(Finkler and Leon, 2019, pp. 07–11; Harou et al., 2017, p. 57)</p>

		credible format to learn about AMR-OH and the actions they can take against it.		
Appropriate	<p>The AMR-OH information is tailored to the target audience, and meaningfully builds on the PE's existing knowledge and their current health literacy levels.</p> <p>The information is culturally and linguistically suitable to the target audience, and is socially supported by the PE community.</p>	<p>The tailored information responds to and builds on the PE's health literacy levels and professional and life experiences. .</p> <p>The tailored information is culturally and linguistically relevant to the PEs, and is socially acceptable?</p>	<p>Inclusion: the vocabulary fits their health and formal literacy levels, and the information and format are relevant to their work as PEs.</p> <p>Exclusion: the information and format being relevant to their role as anything other than PE (for now).</p>	<p>(Caballero et al., 2020; Kreps, 2017, p. 126; Kreuter and McClure, 2004, pp. 227–228; Kreuter and Wray, 2003, p. 231)</p>
Actionable	<p>The AMR-OH educational information makes PEs aware of this aspect of AMR as a problem and offers viable, sustainable actions (e.g. 4 food</p>	<p>The tailored educational content and format are meaningful, and therefore actionable, to the participants' work as PEs (based on their current engagement</p>	<p>Inclusion: the educational content makes the PEs' aware of this aspect of AMR as a problem. Include any actionable steps, including the 4 food</p>	<p>(Anderson et al., 2019; Caballero et al., 2020; Lagan et al., 2020;</p>

	<p>safety steps) to safeguard their personal health.</p>	<p>with the topic of AMR-OH).</p> <p>The information and format (video and infographic) are relevant to them in a way that triggers and motivates them to consider adopting the recommended behaviour change actions.</p>	<p>safety steps, which are viable and can be sustained by the PEs.</p> <p>Exclusion: any information or behaviour change step that cannot be acted upon or implemented in some way.</p>	<p>Leach et al., 2007, p. 170; Oh et al., 2009, p. 244)</p>
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