

Digital health technologies in a deprived community: a qualitative co-design study.

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Digital Health Technologies in a Deprived Community: A Qualitative
Co-Design Study

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Digital Health Technologies in a Deprived Community: A Qualitative Co-Design Study

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degree of Master of Research

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Declaration

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Abstract

Scott McVean, MRes. Digital Health Technologies in a Deprived Community: A Qualitative Co-Design Study

An ever-growing body of literature is recognising the multitude of ways digital health technologies are impacting health. In Scotland, healthcare is becoming increasingly digitised. Access and usage of digital health technologies however is unequal between socioeconomic positions. Despite this, research remains silent on digital health and health inequalities. The present study investigates the health and well-being needs of a deprived community and how digital health technologies could be implemented to meet those needs. An interpretative, qualitative approach was adopted. 18 residents from the deprived community of Raploch, Stirling were recruited. Participants were split into two age cohorts 26-49 (N=4) and 50+ years of age (N=14). Three focus group discussions and a semi-structured interview were used to explore the digital health needs of the residents using open-ended questions and co-design activities. Grounded theory was used to analyse the transcribed data. The findings revealed that there are multitude of accessibility and affordability relations that influenced the everyday experience of the residents. The complex assemblage of relations must be understood and addressed if digital health interventions are to be successfully implemented into a deprived community. The study indicated that the co-designed ideas of community hub digital health interventions and digital video consultations could alleviate, rather than exacerbate health and well-being issues in the community with appropriate support.

Key words: digital health, deprivation, health and well-being, co-design, health inequalities, deprived community, focus groups

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Chapter 1 – Introduction

Introducing the Issue

Digital health is viewed as the panacea to many of the health issues in society. Digital health is a term used to describe any digital technology that can be used to track, monitor or improve an individual's health (Lupton 2017). The range of technologies, such as mHealth apps and Fitbits, are increasingly becoming embedded in healthcare in an attempt to empower and support the individual to lead a healthy lifestyle. Overall, digital health technologies appear to offer low cost and accessible healthcare solutions. As such, the technologies are portrayed to have a transformative impact on public health by empowering individuals to be in control, monitor and self-manage their own health (Sonnier 2017).

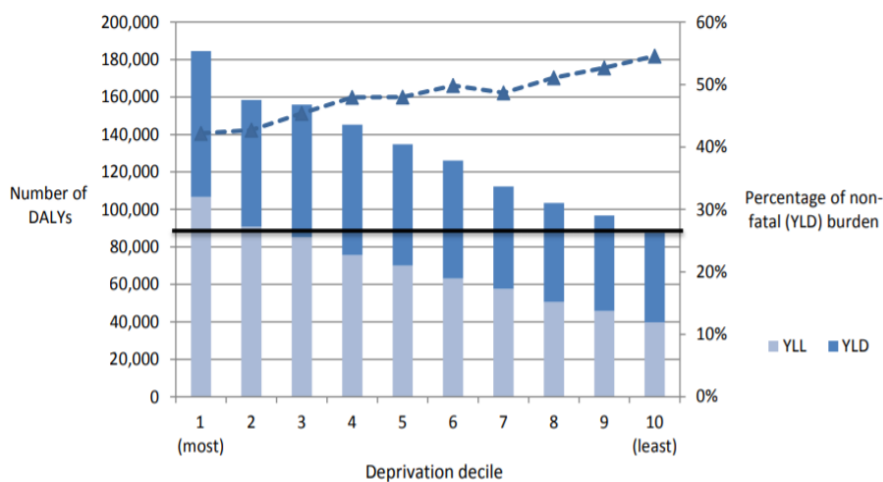
In Scotland, digital health technologies have been outlined to be a core and critical part of healthcare. For instance, in 2018 *Scotland's Digital Health and Care Strategy: Enabling, Connecting and Empowering* (SDHCS) was published. The strategy highlighted a broad vision on how to improve Scotland's health with the use of digital technologies. Furthermore, the Scottish Government and Local Government have stated that digital technology is a substantial element of public health reform. *Realising Scotland's full potential in a digital world: A Digital strategy for Scotland* (2017) is a strategy that identifies digital as being a central part of all aspects of everyday life. The central role of digital technology extends to SDHCS as digital technology is aimed to make health care services more citizen-centred. Therefore, the trend for health policy in Scotland is becoming increasingly digital.

Digital health as central to healthcare in Scotland could be problematic in relation to existing health inequalities. Arguably, there are two main reasons that the increased digitisation is an issue. Firstly, it overlooks the social roots of health inequalities by focusing on the individual. Secondly, it assumes that all citizens will be equal in access and use of digital technologies. To understand why these are issues, each problem will now be discussed.

Deprivation shapes the health and wellbeing of many communities in Scotland. Life expectancy and healthy life expectancy in deprived communities are significantly lower than the Scottish national average (Walsh et al 2016). Figure 1 indicates the magnitude of difference in health between the most and least deprived. The data is presented as 3-year averages for the period 2014-2016 (Scottish Index of Multiple Deprivation 2016). Overall, burden of disease, or disability adjusted life year (DALY), is twice as high in the most deprived areas of Scotland than the least deprived. In addition, years of life lost (YLL) due to premature mortality is nearly three times as

frequent. Furthermore, years living with disabilities (YLD) is also higher in the most deprived areas. The figure demonstrates that there is a clear and continual social gradient to health, with those that are higher up the gradient leading healthier lives and have a longer life expectancy than those that are further down (Marmot 2015). As such, these inequalities represent a systematic difference in health of people occupying unequal positions in society (Graham 2009). The inequalities are socially produced, and therefore, avoidable, unfair, and unjust (Smith, Bambra and Hill 2016). Overall, deprivation contributes to a vast number of health issues and mortalities in the communities lower on the social gradient. It is therefore vital to consider and understand the variety of determinants of health that contribute to the lived experience of deprivation.

Figure 1: Number of DALYs by deprivation decile, Scotland (Source: SBoD 2016)



To understand the phenomena, and to illustrate the issue that focusing on the individual to improve health using digital technologies poses, Dahlgren and Whiteheads (1991) model of health determinants is useful (See Figure 2). The model highlights the determinants of human health as a series of layers that begin with the individual in the centre with their fix set of genes, surrounding the individual are influences such as individual lifestyle factors, community influences and living and working conditions. Finally, there are the socio-economic, political, cultural and environmental determinants that have the greatest jurisdiction over health (Barton and Grant 2006). The determinants produce health inequalities, for instance, as lack of wealth can lower access to goods and services. As such, it can cause inequalities in aspects such as access to health care, quality of housing and nutritional diets (Skalická et al 2009). However, Smith, Bambra and Hill (2016) noted, due to the complexity of health inequalities it is doubtful

that a single explanation, or determinant, is sufficient enough. Therefore, a broad focus and the incorporation of a multitude of determinants is necessary to tackle health inequalities. The conversion of health services to digital health that focus on the individual to ‘take control’ of their health requires in depth understanding.

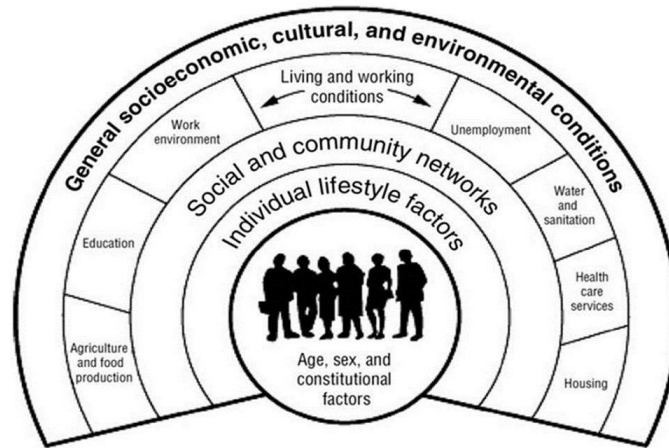


Figure 2: The Main Determinants of Health (Source: Dahlgren and Whitehead 1991)

There are, however, some suggestions that digital technologies could be effective interventions in reducing health inequalities as it is a multi-layered issue. The *Health Policy Inequalities Review* (2014) identified that interventions and change are crucial in three domains of health inequalities in Scotland. There are fundamental sources such as tax and benefits systems, wider community/environmental sources such as housing and healthcare and individual experiences such as lifestyle. Digital health interventions may be able to be integrated at community and individual sources. For instance, NHS Health Inequalities Action Framework (2013) identifies that interventions at community level sources could produce actions that can mitigate the health consequences of social inequalities. However, such interventions require an understanding and recognition of another inequality.

The second issue highlighted above was assuming that all citizens are equal in accessing the digital technologies. However, literature on the digital divide reveals that digital inequalities exist. The digital divide describes the systematic difference in access and usage of digital technologies between social groups. Generally speaking, social inequalities are reflected in the access and usage of digital technologies. In the UK, areas that are excluded from digital technologies have poor health status and lower levels of education and income (UK Digital Exclusion Heatmap 2016). There are also inequalities in access, digital skills and motivations and

attitudes between social groups. It can be said that there are complex factors that are responsible for the inequalities in digital technology usage and access which are yet to be fully understood. The increased digitisation of healthcare therefore adds new complexities to health inequalities. Arguably, the issue of the digital divide needs to be adequately problematised. In doing so, it can be understood if digital interventions are more likely to alleviate or exacerbate existing health inequalities.

Research Question and Objectives

Despite the crucial nature of the issue, there remains limited research on exploring how digital health technologies could impact on a deprived community. Within digital health research there is a focus on testing an existing or trialling a new digital health technology to establish how effective it can be to change a certain behaviour (Lupton and Maslen 2019). Additionally, much research adopts a quantitative approach that showcases the existence of inequalities in digital health access and usage. However, these studies are limited as they do not demonstrate the underlying social processes involved in digital inequalities. The present study investigates what health issues are experienced by residents living in Raploch, a deprived community in the Scottish city of Stirling. Focus group discussions explore how the residents in the community think the health issues identified could be improved through digital technologies. The research is novel as it constructs an understanding of digital health and health inequalities that originates from the experiences of residents living in one of the most deprived communities in Scotland.

The research question is: What are the digital health needs of a deprived community?

The research objectives are:

- To identify how residents in a deprived community can be empowered to take advantage of digital health technologies.
- To identify if there are digital health technologies that could be implemented into a deprived community to help the health and wellbeing issues they experience.

In exploring this question and following these objectives the thesis develops a more in-depth understanding of the research issue. It also provides recommendations for policy makers and designers of technology with actions needed to prevent the adverse effects of health inequalities.

Overview of Thesis

Chapter 2 contains a literature review of the most relevant theories, studies and trends to build a comprehensive and current understanding of inequalities in digital health. Chapter 3 will discuss and justify the philosophical underpinnings, methodological approach and methods used. In addition, it will outline the recruitment strategy, data collection and data analysis used in the study and ethical considerations. Chapter 4 displays the main findings of the study by exploring the themes of affordability, accessibility and ideas. Chapter 5 will discuss the main findings by exploring the complex relations involved in digital health use and access in a deprived community. In addition, practical implications are suggested. Chapter 6 concludes the study and summarises the main implications. Limitations of the study and recommendations for future research are also proposed.

Chapter 2 – Literature Review

The present chapter offers a detailed account of the relevant literature relating to the research issue. The aim of the literature review is to provide the reader with a clear and current understanding of the trends and theories. In addition, the review demonstrates the complexity of digital health access and usage. As such, the following chapter draws on a range of literature that relates to digital health, digital technology and the digital divide. To be applicable the literature reviewed explores the current understanding on the subject. There is also literature that dates back to 20th Century that has been included as it forms the foundations for some relevant concepts. First, the shift in responsibility from the state to the individual reflected in digital health is problematised by exploring the implications it may have for inequalities. Second, the literature on the digital divide is reviewed. The literature on the digital divide provides a wealth of insight into understanding the research issue. However, there are a number of gaps in the topic that require to be understood including identifying the underlying processes and mechanisms that influence the inequalities. Third, research on relational materiality between the social and technologies is crucially outlined. The literature emphasises the importance of context that opens new avenues that traditionally operate outside the typical enquiry of digital divide research.

As briefly highlighted in the introduction, digital health has been dominated by optimism (Sonnier 2017). Research within medical and public health from disciplines such as psychology and ICT have frequently perceived it as being a panacea to public health issues experienced in society. The focus is typically on user experience to study how effective the technologies are in changing a certain behaviour (Lupton 2019). Additionally, studies concentrate on technological design with the intention of optimising usage and producing accurate content (Devine et al 2016). Arguably, this literature can be criticised for assuming a technological deterministic stance as it focuses on exclusively the digital health technologies capabilities to change human behaviour.

Technological determinism can be described as the belief that technology is the driving force in society. These positions are assumed by digital health designers and technologists. Today, one of the main technologists in the field of digital health, Paul Sonnier (2017 p.6), states that “the global impact of digital health is creating a new era of human progress” by producing a technology driven sociocultural revolution of healthcare. Arguably, this position is profoundly anti-sociological as it presumes technology as the prominent force in society. Instead, sociologists tend to argue that the reversal of the putative order of causality is required to

understand digital health technologies (Prout 1996). Fundamentally, by assuming technology as the driving force of societal change the technological determinist stance found in literature on behavioural change and technological design fail to account for the social determinants that produce the phenomena of health and digital inequalities (Timmermans and Berg 2003). Thus, the technological optimism in digital health discourse is often challenged in sociological literature focused on inequalities by illuminating the wider complexity of social determinants. To begin, a critical response to healthcare's shift of responsibility from the state to the individual is discussed.

2.1. Digitally Engaged Patient

The concept of the 'digitally engaged patient' is a useful starting point. The 'digitally engaged patient' was coined by Lupton (2017 p.41) as describing "lay people that are ideally willing to seek relevant health and medical information actively, engage in their own healthcare and take up behaviours that preserve and maintain good health, in the attempt to shift burden of such responsibilities from the state to the individual". The described shift in responsibility from state to individual is integral to understanding digital health. For Jones, Pykett and Whitehead et al (2013), the shift involves the governance of populations by using psychological models of behaviour change. The outcome of such models is to encourage citizens to voluntarily engage in self-care practices using digital health technologies to improve their health, happiness and productivity. It can be said that this perspective holds parallels to Foucault's concept of biopower since power is not coerced by a dominant group but instead it is the citizens themselves that are the possessors of power (Foucault 1990). Under such a paradigm, power is embedded in norms, practices, interactions and habits of everyday life (Petersen and Burton 1997). Consequentially, digital health technologies encourage usage by reflecting ideals of self-responsibility over one's health will lead to happiness and productivity.

There are a multitude of different digital health technologies that operate in this manner. Arguably, smartphones are the most widely owned technology that offer digital health functions. For instance, 84% of adults in Scotland own a smartphone. Furthermore, 71% of those with a household income of below £10,400 per annum own a smartphone suggesting they are widely used by those in lower socioeconomic positions (Ofcom 2019). These digital devices function as if it were part of the body by continuously monitoring what the citizen is doing (Rich and Miah 2017). As a result, parts of everyday life such as walking have come under the 'medical gaze'. This process re-establishes walking as a health issue that requires a digital health intervention to increase the activity (Saunders et al 2013). Many mHealth applications found on smartphones

are aimed at individuals to 'take control' of their health entrepreneurially by continuously providing data that monitors the citizens activities. These are often based on predetermined, quantifiable standards of health and fitness (Lupton 2017). For instance, there is a set agreed upon fitness norm of walking 10,000 steps per day as the baseline to be deemed healthy (Ajana 2017). A process therefore occurs in which the user internalises these norms, assesses themselves and acts in accordance to an idealised number (Rowse 2015).

As such, a number of authors have attempted to theorise how the body becomes knowable as an object of quantified knowledge and how the pedagogy of biopower operates. The pedagogy of how this form of biopower operates, for Williamson (2015), is by producing techniques that are numerically mediated for governing and ordering the body. Elsewhere, Ruckenstein (2014) suggests that this form of 'personal analytics' is tied to notions of control and governmentality. Within this framework, health becomes the responsibility of the citizen as a productive consumer, whereby they become primarily responsible for their own health. The quantified knowledge can then be redefined by the user to adhere to societal expectations of health. Take the idea of successful ageing, for instance. Marshal and Katz (2016) considers that as biological and social determinants of aging become increasingly obsolete in understanding health then aging becomes a personal choice and responsibility. The aging process is therefore redefined as being manoeuvrable. Moreover, Urban (2017) has observed that heart rate watches, which were originally designed for optimal physical training, have become popular and repurposed by older adults to monitor bodily functions and performance. Therefore, the ideals reflected in digital health technologies encourage the user to become a 'digitally engaged patient'.

2.1.1. Digitally Engaged Patient: A Critique

As outlined above, digital health technologies utilise psychological models of behavioural change to encourage positive health behaviours. However, literature on health inequalities has long recognised that the determinants of health behaviours reflect a complex interplay between contextual factors that operate outside of the individual (Whitehead and Dahlgren 1991). By isolating health behaviours as the primary cause of poor health, the increased digitisation of healthcare and the emphasis on self-responsibility may put additional strain on those that live in disadvantaged circumstances. As far as the researcher is aware, there has been limited research on how technological interventions may actually deepen existing social inequalities by focusing on self-responsibility. There is, however, literature that explores the implications of failing to adhere to health norms.

Arguably, digital health technologies mirror neoliberal ideals¹ in that poor health is viewed as the responsibility of the individual. Crawford (1977) states that the principles of individual responsibility and self-control lead people to expect to be in charge of their own health in contrast to the idea of a right to health care. For Van Dyk (2015), under these standards some individuals do not remain cost neutral for society if they fail to stay active and healthy in spite of the 'possibilities' made available to them. In a study of illness management of type 2 diabetes, the narrative responses from UK participants associated poor health with two types of moral failure. First, a failure of character, will, restraint and knowledge. Second, being a burden to society. These normative practices, if failed, were internalised as shameful for the individual and inspired little sympathy in others (Vassilev et al 2017). In addition, Rich and Miah (2017) draw attention to an NHS (2013) think-tank that explored the impact of having a more 'responsible' population in which the UK respondents suggested that people who lead healthier lifestyles should be rewarded with easier access to healthcare. Consequentially, on one hand, it can be said that constructing conceptions of health normality creates a desire to conform. On the other, failure to conform to standards of good health is portrayed as a moral decision that labels the individual with a deviant status and less deserving of health care (Pylypa 1998). As such, it is vital to understand the implications that digital health technologies and the increased self-responsibility of healthcare can have on the user.

Developers of digital health technologies can be criticised for often assuming that individuals have continuous enthusiasm and motivation for tracking and monitoring their own health on their devices. Instead, integrating digital health devices into everyday life is complex. Oudshoorn (2008) comments on the 'invisible labour' required by patients can cause them to resent, challenge or ignore the functions of the technology. Furthermore, failing to use the technologies can produce negative emotional responses. Fotopoulou and O'Riordan (2016) use media analysis and autoethnography to explore the role of how Fitbits become normative devices that teach the user to engage in self-care and regulate the body through micro-practices including mediation and sharing their own data on social media. They found that these micro-practices produce productive subjects who are willing and able to constantly self-monitor and, crucially, feel remorse when data is missed. Elsewhere, Ancker et al (2015) conducted semi-structured interviews to explore patients with multiple chronic conditions perspectives on tracking their own health and medical data. They noted that biometric data was described by patients in

¹ Neoliberal ideals refer to life chances being presented and understood as being the sole responsibility of the individual (Beck 2002). The ideals are common in the British public psyche and does much to help overshadow the growing inequalities in access to opportunities that effect the lives of those most deprived.

moralistic terms. Patients that had failed to engage consistently in self-tracking were considered by others as being 'bad patients' as they had not adhered to healthcare providers expectations of them. However, the reasoning for resistance was as some patients did not want to observe their biometric data as when 'bad numbers' appeared they felt anxious, worried or depressed. Consequentially, by shifting responsibility of healthcare to the individual, new technologies bring new burdens of expectations to the patient. Crucially these burdens can be said to be unnecessary, Bell (2013) notes that when molecular biomarkers are represented numerically, they have meanings for patients that are quite different to their actual biological meanings. As shown, becoming a 'digitally engaged patient' is difficult. The literature above raises questions on the impact these ideals have for the most vulnerable that cannot easily avoid the determinants of health such as those living in deprived communities.

Summary

In sum, the 'digitally engaged patient' describes an individual that adheres to neoliberal ideals of self-responsibility over their own health. These ideals are reflected in digital health technologies by utilising psychological models of behavioural change to motivate the user to become empowered and in control. However, without acknowledging the social complexity of both health and digital technology usage the increased digitisation of healthcare raises concerns on the impact it could have on the most socioeconomically disadvantaged groups. The next section focuses on the digital divide literature that highlights these concerns in more depth.

2.2. Digital Divide

Overall, it can be said that the research investigating the digital divide provides the richest understanding for the current study. To recap, the digital divide describes the difference in digital technology usage and outcomes between social groups. Originally, digital divide literature made a simple binary distinction between those that had access to digital devices and those who did not. These differences were attributed to economic capital (Van Dijk 2005). However, although economic capital is a contributing factor to the inequality, the earlier literature assumed that individuals would automatically have access to all the advantages of digital technologies once they have obtained access (Blank and Lutz 2016). Yet, as the physical access to digital devices has been improving within socioeconomically disadvantaged groups due to an increasing proportion of citizens gaining access at home, work and community centres, there still remains an inequality (Goedhart et al 2019). Consequentially, researchers began to expand the scope of investigation to differences in motivation, material access and digital skills. In addition, literature also explores the differences in outcomes and benefits between socioeconomic

groups. The focus of the following section will be to examine the current understanding on the digital divide, particularly with regards to digital health.

2.2.1. Social and Digital Inequalities

Social inequalities are the underlying issue. Consequentially, they are key to comprehending the imbalance in digital technology usage and access. Generally speaking, inequalities from deprivation carry over to inequalities in digital technologies. Longley and Singleton (2009) found that areas of England characterised with high levels of deprivation experience low levels of digital engagement and lower levels of internet usage. Additionally, an international survey investigating Swedish and British citizens found that digital exclusion is concentrated among the populations that are most socially disadvantaged (Helsper and Reisdorf 2017). Elsewhere, Helsper (2012) modelled the process of digital exclusion which indicated that inequalities in social, cultural, economic and personal capital in the offline world reflect inequalities in the online world. These findings suggest that the features of deprivation negatively impact digital technology usage. Baum, Newman and Biedrzychi (2012) conducted focus groups to investigate the implications of exclusion from digital technologies are likely to be for the social determinants of health. The findings suggested that people from low socio-economic groups are “restricted in the ways that they can access and use digital ICTs and that this limited access and use can, in turn, affect their access to a range of social determinants of health”(Baum, Newman and Biedrzychi 2012 p.353). Therefore, they describe digital exclusion as a digital vicious cycle that exacerbates existing social determinants of health (See Figure 3). Crucially, all of these studies agree that digital inequalities are mediated by individual factors such as attitude, material access and digital skills.

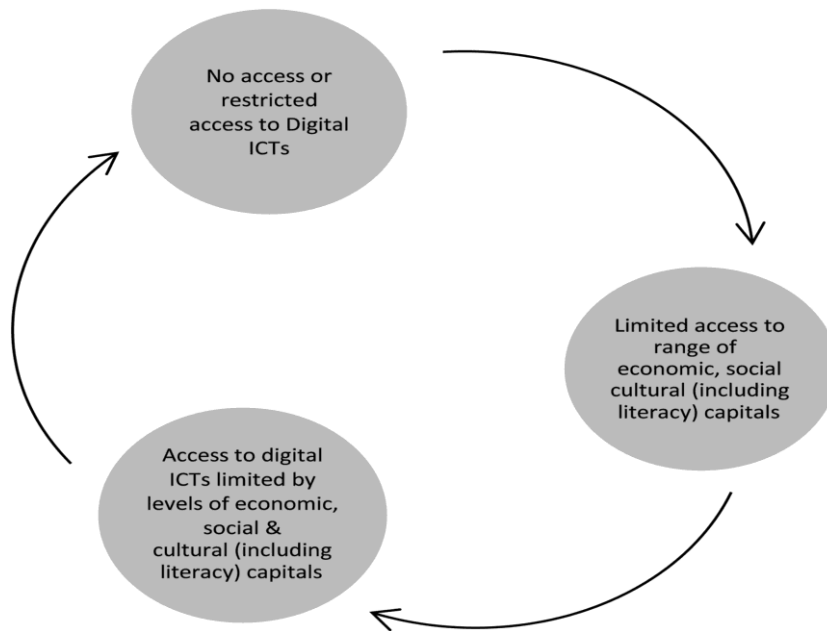


Figure 3: The Digital Vicious Cycle (Source: Baum, Newman and Biedrzychi 2012)

The Resources and Appropriation theory (Van Deursen and Van Dijk 2014) is useful to provide a framework for investigating these factors. In short, the theory proposes that the process of technology appropriation occurs in four stages: motivation and attitude, material access, skills and usage. The core argument within the theory is that social inequalities cause inequalities in the four stages of appropriation. However, the theory is limited as it states that appropriation is a consecutive process. Yet, it can be argued that the appropriation of digital technologies does not follow a precise sequential pattern. Instead, it involves a complex intertwining of the factors including the stages of access outlined by Van Deursen and Van Dijk. The sequential process of the theory is therefore not advocated. Alternatively, the theory is used as a framework to explore the wealth of literature that focuses on inequalities in motivation and attitude, material access and digital skills. In addition, physical access is also included for reasons that will become apparent.

2.2.2. Motivation and Attitudes

To begin, the importance of motivations and attitudes in digital health usage will be explored. These two factors are closely related and intertwined. For instance, motivation is primarily shaped by attitudes towards technologies (Van Deursen and Van Dijk 2014). Overall, the digital divide literature identifies motivation and attitude as essential for explaining differences in digital technology usage. Reisdorf and Groselj (2017) found that having a more positive attitude

towards the internet results in a higher frequency and breadth of use. Additionally, Eynon and Geniets (2012) interviewed UK residents on low and non-usage of digital technologies finding that quality of attitude is a determinant of low or discontinued use. Yet, some have argued that lack of motivation in adopting digital technologies is decreasing (Van Dijk 2013). However, there is still evidence that attitudinal and motivational issues are disproportionately present in disadvantaged social groups. To understand how motivation to use digital health may form it useful to understand the concepts people have towards health and technologies.

Health is experienced differently by different people depending the context they are situated. Consequentially, Lupton suggests that to understand how different social groups use digital health technologies it is important to consider the notion of health and illness they hold (Lupton 2017). Take, for example, the concept of healthism. Healthism is the idea that good health should be prioritised over other aspects of everyday life (Crawford 1977). However, socioeconomically disadvantaged groups may have other priorities that take precedence over health such as obtaining employment (Lupton 2017). Furthermore, it has been found that they often have a lack of confidence in being in control of their health (Savage, Dumas and Stuart 2013). Arguably, the beliefs and concepts that social agents hold about themselves can be invested into the usage of digital technologies (Dunbar-Hester 2010). For example, limited educational opportunities meant that low income individuals find difficulty using technologies as they lacked confidence in learning new skills (Baum, Newman and Biedrzycki 2012). More positively, semi-structured interviews with low socioeconomic status adults found that they expressed a need for greater control of their health. As such, they felt that text-based support for quitting smoking would help them achieve this by being in more control to decide when and where they engaged with the support (Boland et al 2017). Therefore, the beliefs and concepts that individuals attribute to themselves and health can illuminate differing explanations in motivation to use technologies.

Older adults are the most common demographic that has been targeted in research to understand motivation and attitude inequalities. Overall, studies have identified the importance of differing beliefs and concepts in explaining the issue. On one hand, lack of motivation in using technology is influenced by low interest, lack of confidence, viewing technology as impractical and age-based perceptions such as feeling they are too old (Vroman, Arthanat and Lysack 2015). These reasons mean it is more unlikely for them to join a computer class and engage with digital technology (Jung et al 2010). On the other hand, improved motivation to attend computer classes is influence by supportive family and friends, wanting information and wanting to

communicate (Huber and Watson 2014). By attending community-based computer classes lower socioeconomic status older adults reported decreased technological anxiety and continued computer use after participation (Campbell 2009). These findings suggest that motivational and attitudinal issues can be improved with appropriate support. However, it is important to note that the concepts and beliefs that older adults have about digital technology cannot be overlooked.

Older adults have also been a key focus in digital health literature. Choi and DiNittos (2013) found that low income housebound older adults had significantly lower eHEALS scores, an eHealth literacy scale that includes measurements of attitudes, than the housebound younger low-income age group even in those that used the internet daily to access health related information. However, the findings did not explain the reasons why the differences existed. Importantly, Choi et al (2014) also conduct qualitative interviews with low income housebound older adults' acceptance of homebased telehealth problem solving therapy. The findings revealed that that availability and accessibility of the technology was not likely to be sufficient to motivate them to participate. Instead, they faced multiple personal barriers to engagement including lack of motivation, insistence on religious coping, stigma, and mistrust of mental health providers. Arguably, then, there are a multitude of reasons for the non-adoption of digital technologies. Consequentially, instead of measuring by means of most important, the range of reasons requires them to be taken into account conjointly (Helsper and Reisdorf 2013).

Overall, the evidence presented demonstrates that motivational and attitudinal factors are key to digital technology usage. The beliefs and concepts individuals hold about themselves; health and technologies are also crucial. While literature has identified reasons for usage in low income older adults, there is a need to understand if and what motivational and attitudinal issues are relevant for those living in deprived communities. Researchers have noted they remain speculative as to how these issues relate to socio-economic factors, calling for a more detailed analyse to understand the mechanisms (Hunsaker and Hargittai 2018). As such, more in-depth examinations may tease out underlying beliefs that hold back usage in residents living in deprived communities.

2.2.3. Physical Access

Physical access to digital health technologies is decisive for usage. Simply put, inequalities in physical access describe a difference between those that have digital devices and those that do not. However, according to Van Dijk (2013), physical access to computers and the internet is

approaching a stage of universal access in the most technically advanced countries. Under this line of thought, all individuals will have access to some type of digital device. The digital health literature has also frequently adopted this assumption. The more recent literature has therefore seldom recognised physical access as contributing to the inequalities, instead focusing primarily on material access when discussing access to devices. It is argued that physical access inequalities still require investigation as for those that do not have access, it is a critical issue.

Ancher et al (2017) analysed the impact of replacing an opt-in policy with a universal access policy to access medical records. Overall, the policy was associated with a large reduction in socioeconomic disparities between those who did and did not access their medical records. However, an inequality in access remained for those with the lowest socioeconomic status. Physical access to devices was a possible explanation for the inequality. Furthermore, older adults with two or more e-devices in their homes were much more likely to use the Internet (82.1%) than those with one (25.5%) or no home e-devices (1.8%) (Arcury et al 2020). In addition, it has been found that some low-income individuals do not purchase digital technologies because they need to afford a range of other facilities. As such, they view it as a luxury (Baum, Newman and Biedrzycki 2012). The consequences of limited physical access can arguably have detrimental effects for equal healthcare opportunities. However, in much digital health research that focuses on trialling technologies, the implementation of devices only lasts for the duration of the research practices. After the pilot or trial of the technology is complete, the removal of the device follows, meaning the infrastructure for usage collapses for those without physical access to devices (Pols and Willems 2011). As such, the reliability of the results in a real-world setting come into question.

Varanasi and Helzlsouer's (2019) randomized clinical trial on empowering cancer patients from low-income backgrounds had many positive implications. First, they were able to design a technology-based intervention with patients that was effective and allowed them to adhere to better treatment than using internet access alone. Secondly, the study found that after a 2-hour training session those with no computer access were able to navigate the application successfully. However, the patients were provided with netbook computers and internet access throughout the duration of the study to eliminate bias related to technology access. Yet, when the study concluded these were taken away which removes the option for continued usage. Elsewhere, Choi, Marti and Conwell (2016) compared problem solving therapy in person and through digital consultations in low income, housebound adults suffering depression. They found that digital consultations were effective in reducing hopelessness and suicidal ideation. Once

more, despite showing positive implication for digital health interventions in low-income groups, the study also raises the fundamental issue of physical access. Upon completing the study, the laptops provided were removed thereby eliminating the opportunity of follow-up therapy to some of the participants that did not have personal access to such technologies. Thus, it can be inferred that those who are most digitally excluded would not benefit from the interventions in a real world setting as they do not have physical access to digital technologies. Surprisingly, there has been an increasing lack of focus on physical access throughout the literature since the original inception of the digital divide. It is argued that it is a critical issue due to the growing healthcare opportunities technology provides. Consequentially, the inequality between those that have physical access and those that do not requires further understanding.

2.2.4. Material Access

Now, the attention draws to material access. It is important to clarify that within the literature; physical access is not synonymic with material access. Material access refers to all costs of the use of computers, devices, connections, peripheral equipment, software, and services. In this sense, material access can only be achieved if physical access is acquired. Inequalities in material access occur for two primary reasons. First, inequalities in financial resources means that individuals have differing material access expenses. Second, the costs of the material equipment are increasing as the technology becomes more advanced. For example, the quality of hardware, connection speed and conditional access will continue to vary and persistently diverge (Van Deursen and Van Dijk 2014). Subsequently, those that are socioeconomically disadvantaged may never reach the same level of access as those in more advantaged groups (Gonzales 2014). For instance, in a 2018 UK survey, 93% of lowest socioeconomic status group stated that they personally use a mobile phone compared to 97% of the high socio-economic status groups (Ofcom 2019). However, statistics such as those that appear to indicate that the divide is narrowing actually reflects persistent inequalities in material access (Van Deursen and Van Dijk 2014).

With regards to digital health, material access is an issue. For example, in assessing eHealth usage for a variety of health purposes including self-management and control of diabetes, it was found that individuals with higher income are more likely to use mHealth apps than those with lower income (Hansen et al 2019). The researchers stated that a possible explanation is that the cost of downloading some of the apps is too expensive. Additionally, they suggested that novel healthcare solutions may reach those with higher socioeconomic status first (Bell 2014). For example, in the same study, the low-income group with Type 1 Diabetes were more likely to use

video-based platforms such as YouTube for health information compared to medium and high-income groups. They suggest that low income-groups may benefit more from video-based information, thus, increased usage. However, the same association was not found for groups with Type 2 Diabetes (Hansen et al 2019). Nonetheless, the findings are important as it suggests there are material access differences in eHealth usage between income groups. However, it is limited as the researchers can only give presumptions about the reasons behind the statistics. On the contrary, semi-structured interviews on digital exclusion among mental health service users revealed that material access does not operate in isolation. Although personal finances were a barrier to engagement, mental health and living situation also limited usage of internet-enabled technology (Greer et al 2019). As such, attempts to address inequalities in digital health usage would benefit by considering a broad range of possible influences.

There is some evidence that addressing material access inequality can be beneficial for those most socially disadvantaged. Katz, Moran and Ognyanova (2019) found that by improving internet access in low income households, parents in the most disadvantaged groups used it more intensively to compensate for limited access to information resources available to them through other social channels. Therefore, by lowering economic barriers in quality connectivity, those that would previously be unable to afford the material technology are able to benefit. Overall, although it has been argued that inequalities in material access will continue to persist, there is research that indicates there are ways that it can be addressed. Consequentially, there needs to be a greater understanding of how material access operates.

2.2.5. Digital Skills

Being able to effectively and efficiently use digital health technologies is vital. To begin, a delineation of digital skills is required. Van Deursen and Van Dijk (2014) describes five main types of digital skills that follow in a sequential process. These are operational, formal, communication, content creation and strategic. From operational skills which involves basic knowledge such as how to turn on a device, to strategic skills that refers to the ability to use digital technology as a means of personal or professional goals, which would be concurrent with certain digital health tracking and health management devices. More specifically to digital health, Norman and Skinner (2006 p.27) describe eHealth literacy as “the ability to seek, find, understand and appraise health information from electronic sources and apply knowledge gained to addressing or solving a health problem”. It is important to note the difference in terminology used throughout the literature: skills or literacy. For the most part, both are used to describe an individual’s capacity and ability to use a digital technology. Digital literacy suggests that the

processes involved in reading and writing literacy are similar to digital technology usage. Whereas digital skills denote a more interactive form of usage that is more closely in line with the actual process (Van Deursen and Van Dijk 2015). Hence, the term digital skills are used.

Digital skills are important for health-related purposes. Individuals with lower digital skill levels tend to have worse online health knowledge, interactions with healthcare provider and self-management of health needs and behaviours (Czaja et al 2013). A body of literature proposes that existing social differences and inequalities come forward in digital skills. Choi and DiNitto (2013) state that the skills required to use eHealth technologies is lower among those traditionally associated with inequalities. Furthermore, Helsper and Reisdorf's (2017) work on the emergence of a 'digital underclass' indicates that, although most Britons are now online, large differences in their skills exist. These differences did not improve significantly between 2005 and 2013. Importantly, the results suggested that social exclusion was more strongly related to the probability of being a non-user in 2013 than in 2005. The implications of these findings are concerning as the increased digitisation of healthcare and lack of digital skills within socially disadvantaged groups may widen existing health inequalities.

Research has attempted to understand how digital skills can improve among those experiencing inequalities. Those with the lowest digital skills tend to find it most difficult obtaining high-quality support and are dependent on informal support which is typically of poorer quality (Helsper and van Deursen 2017). Similar to the literature on attitudinal and motivational influences, older adults have been the primary focus. For example, by training older adults on health information technology it has been found to increase eHealth skills and the ability to navigate complex health websites (Czaja et al 2013). Moreover, it has been found that both collaborative and individual learning conditions improve internet skills with regards to accessing health information in older adults (Xie 2011). However, multivariate lagged regression analysis on self-learning digital skills identified that internet users with weak digital skills do not benefit from this approach compared to those that had strong digital skills. As such, all individuals improve their skills independently of their initial skills (Matzat and Sadowski 2012). Therefore, self-learning approaches are ineffective in reducing inequalities in digital skills. Ultimately, many attempts at improving digital skills aim to strengthen the individual using person-based strategies. Alternatively, there are also advocates of matching the digital health technology to the digital skills of the intended user (Norman and Skinner 2006). These narrowly targeted digital skills interventions are limited as improvements are more likely achieved by economic, social and cultural policies. The increased digitisation of healthcare demands digital skills level sufficient to

utilise digital health technologies for all. A more in depth understanding of the processes involved in digital skills is required that highlight factors that may be unconsidered in individual targeted interventions. Here, qualitative enquiry is valuable to reveal a richer account of digital skills.

Goedhart et al (2019) conducted individual interviews and focus group discussions with low income mothers in Amsterdam to improve their digital skills level. They extended Van Deursen and Van Dijks (2014) Resource and Appropriation Theory and added the themes of needs and ideas. To learn digital skills the participants felt that community centres were ideal places to receive personal attention from community volunteers they trusted. Additionally, it was highlighted as an area where they could socialise. Baum, Newman and Biedrzychi (2012) found a similar importance towards social connections as they were seen to reduce digital exclusion, however, the exclusion is intensified if they do not have networks that include people with digital skills to learn from. Furthermore, practical conditions were mentioned in the study. The location had to be close to their home as they did not have the time or budget to travel far distances. In addition, family life strongly influenced the mother's priorities and cognitive resources. As a consequence, this leaves fewer cognitive resources available to improve digital skills (Mani et al 2013). From the study, it is evident the strength of qualitative enquiry to be able to discover the underlying reasons that may act as barriers to improving digital skills. Ultimately, for low income mothers these were closely related to limited financial resources and more prominent responsibilities. Arguably, to get a comprehensive perspective of digital skills it must be acknowledged that it is influenced by a multitude of factors outside the typical focus of digital skills interventions.

2.2.6. Outcomes and Consequences

There is some concern that accessing and using digital devices with adequate digital skills do not lead to beneficial outcomes for all (Blank and Lutz 2016). In response, recent literature has begun to broaden its scope of investigation to the outcomes and consequences of digital technology usage. As noted, digital inequalities reflect existing social inequalities. Those of higher socioeconomic status experience more beneficial social, economic and educational capital-enhancing opportunities when using digital technologies (Van Deursen and Helsper 2015). As Bruno et al (2011) describes it, usage of digital technologies produces 'winners' and 'losers'. Dutton, Blank and Groselji (2014) showed that those with lower income are less likely to use the Internet and, when they do, have a narrower use. Beck et al (2014) conducted a nationally representative survey of French adults using the internet as an information tool for

health-related issues and noted that low socioeconomic status individuals experienced less benefits. These findings require an explanation.

There are a number of different explanations that have been presented to understand the phenomena. For Blank and Lutz (2018), users with low socioeconomic status find it more difficult to take advantage of the internet because they lack the necessary resources of material, human and social capital to do so. Moreover, there may be common patterns of beliefs and attitudes that shape differences in outcomes while using technologies (Dutton, Blank and Groselji 2013). Elsewhere, Dutton and Reisorf (2019) found that when compared with people that have no qualifications, those with a higher education are twice as likely to find information that helped improve their health. To explain, they draw on the 'knowledge gap'. The 'knowledge gap' refers to the process whereby when presented with the same information those from more educated households are more likely to benefit. Physical health barriers have also been attributed to differences in outcome, regardless of digital skill level. For instance, it was found that both young and old low-income housebound adults felt confident about their search skills and were able to access information. These findings indicated that age and income-based inequalities in digital skills had reduced. Instead, the primary barrier was physical, functional and vision-related limitations due to being housebound (Choi and DiNitto 2013). However, there is still a lack of understanding of how differences in outcomes and benefits of digital technology usage occur.

Summary

As the review of digital divide literature reveals there are crucial differences between socioeconomic positions with regards to motivation and attitudes, physical access, material access, digital skills and outcomes and benefits of usage. Importantly, the multiple disadvantages and hardships described above are not individual issues. They are instead socially produced outcomes of deprivation (Shildrick 2018). So far, though, there remains limited research that understands the mechanism that influence these inequalities. There has been some qualitative research that has revealed a number of contextual factors contributing to the inequalities. For instance, location of digital skills training due to cost of transport (Goedhart et al 2019). Yet, digital health literature has an inadequate understanding of how contextual factors may influence usage in socioeconomically disadvantaged groups. Digital inequalities in digital health technologies require a more nuanced and multifaceted understanding. The focus now shifts to a body of literature that explores a multitude of factors influencing usage that are typically ignored by digital divide research.

2.3. Relational Materiality

In a sense, the digital divide literature is problematic as digital health technologies are viewed as a tool that have the traditional interests of sociology projected onto them. In this way, the technology itself is often left unexplored (Timmermans and Berg 2003). Increasingly, digital technologies are being viewed as material actors that interact with human actors (Ledderer, Møller and Fage-Butler 2019). Science and Technology Studies, for instance, focus on the relationship between society and technological objects. The literature emphasises co-productive processes whereby they shape and interact with one another. There are a variety of different theories that could be discussed; however, all articulate some form relational materiality between human and non-human actors. As such, only a select few are represented. The purpose of the following section is to examine the ‘material turn’ in sociological enquiry as it offers a new avenue to understanding digital health technologies. As Bruno Latour (1992 p.153) states,

“What our ancestors, the founders of sociology, did a century ago to house the human masses in the fabric of social theory, we should do now to find a place in a new social theory for the nonhuman masses that beg us for understanding.”

2.3.1. New materialism

New materialism is an approach with a focus on matter as a social relation rather than a social construction. Simply put, it looks at how matter interacts, affects and is affected by other material. The approach derives from Bruno Latour’s Actor-Network Theory (ANT) which emphasises that society can be understood through a sociology of associations involving the relational interplay between human and non-human actors (Latour 2005). New materialism also draws on Deleuze and Guattaria’s form of materialism in that all matter is viewed as relational. Materials are contingent and ephemeral, gaining ontological status through their relationship with other materials in an assemblage. The assemblage of material relations produces an affect economy of forces. Matter is therefore evaluated not on what it is, but on its capacities to affect (Fox and Alldred 2016). For instance, in a new materialist analyse of Fitbits, the Fitbit-user assemblage is said to comprises a minimum of these relations:

body movements – terrain – product – wearer – manufacturer – associates.

Within the Fitbit-user affect economy there is the physical terrain of usage, the products specific functionalities, the wearers motivation towards normative health behaviours through certain body movements, opportunities to share behaviours with associates producing competitiveness

and the commercial interests of the manufacturer that commodifies private aspects of the user's life (Fox 2017). Thus, insights from new materialism establish a complex affective flow.

Elsewhere, Lupton and Maslen (2019) conducted focus groups and individual interviews to understand how Australian women use digital technologies for health from a new materialist perspective. The participants accounts revealed that engagement with technologies produces the capacity to understand and generate information and knowledge about bodies and health. Furthermore, these were not limited to their own bodies and health but also that of their friends and families. In addition, the respondents noted that the technologies offered them a sense of empowerment and control of their health. For instance, to decide whether or not concerns about their and others health required a medical appointment or lay remedies. However, Lupton and Maslen comment that the capacities of the human-technology assemblages were closed down if the technology failed to work as expected. Often, the women felt frustrated by the design of the technologies that did not cater for their needs meaning the material capacities described above were not developed. Despite the findings, engaging fully with new materialism in qualitative enquiry is criticised. A key foundation of the theory is its rejection of anthropocentrism that privileges the human as the measure of all things. However, qualitative research cannot avoid accounting human actors' interpretations as the focal point of the studies (Hein 2016). None the less, the importance of new materialism in Lupton and Maslen's (2019) study is to indicate that human and technological materials affect one another.

2.3.2. Domestication Theory

The significance of context is crucial in the domestication theory. In general, the main premise of the theory is that technology can only be understood in the context of a particular practice as this is where the technology is actively co-shaped (Oudshoorn and Pinch 2003). The process involves the technology influencing what can be done with them and addressing their users in certain ways. At the same time the user appropriates the technology to fit their own routines and goals. Consequentially, the same technology may perform differently depending on the context. The outcomes can be quite different from what the designer had intended. In short, in order to function at all, technologies need to be domesticated (Pols and Willems 2011). To show the complexity of domesticating a digital health technology into the home setting, insights from a study on an electrical toothbrush are discussed.

Carter, Green and Thorogood's (2013) case study highlights how even a seemingly simple, mundane technology is difficult to domesticate in the home. The researchers found that

although most people at one point had attempted to use an electric toothbrush, they often never continued. As such, the presence of technologies cannot determine action in a simplistic way. The relationship formed by the co-production of the setting, user and technology was an unruly sociotechnical system. Compared to the brushing movements involved in a traditional toothbrush, the technology analysed here influenced the participants health behaviours by the delegation of bodily movements to a device (Latour 1992). Yet, at the same time, their behaviours influenced their perception and use of the technology as the household members debated the proper routine, positional and privacy use of the new device. The co-shaping between the technology and the user caused discontinued use. Ultimately, when a new technology is introduced in the home, it enters an environment composed of existing relationships between actants. How it interacts can be unpredictable. Therefore, even an object such as an electrical toothbrush that requires limited skills to use can become unstable in a domestic setting. As the digital divide debate calls for a more nuanced approach, understanding how technologies may interact with socially disadvantaged individuals in their social context may be useful for successful technological interventions.

2.3.3. Ambivalence

How people engage and disengage with digital health technologies in different contexts can benefit by incorporating ambivalence. Rather than being static, ambivalence should be understood as a relational concept (Arribas-Ayllon and Bartlett 2014). It has been argued that there needs to be more focus on the tensions and contradictions that are enacted in sociotechnical practices. Co-design workshops and interviews with HIV patients exhibited how ambivalence can be used to reveal the complexity of usage (Marent, Henwood and Darking 2018). For instance, cross-dimension ambivalence showed that the patients valued some affordances of a digital device such as instant reminders for medication intake. On the other hand, they rejected others such as remote access to quantified blood test results. In all, ambivalence emphasises the multiple uncertainties involved in digital technology usage. As such, by finding relationships between opposing perspectives in technological design could give rise to agency that challenges traditional narrowly defined interventions.

2.3.4. Material Turn and Digital Inequalities

Research is limited in utilising a material understanding to explore the digital divide. Arguably, concepts of relational materiality seem to oppose much of literature on digital inequalities as it has a flat ontology that rejects pre-existing structures. Inequalities are therefore analysed by

unpicking networks within an assemblage they are part of with the understanding that there are only a set of stable-for-now relations that could change at any time (Prout 1996).

Consequentially, by refusing systematic conceptions and structures of inequality it has little to say about exclusion of certain social groups from using digital health technologies (Greenhalgh and Stones 2010). Thus, socio-technical relations of the literature described above should not be seen as a critique of social stratification but as a tool to enhance the understanding (Halford and Savage 2010).

Strong Structuration Theory analyses the interconnection of agency and structural factors as well as different personal, social and technological contexts in technology adoption and use (Neves, Waycott and Malta 2018). Neves et al (2018) mixed-methods study highlighted the complexity of technological adoption to improve social connectedness among frail institutionalised older adults by drawing on the theory. Importantly, they state that the reasons for usage cannot be studied in isolation as they interact recursively. Firstly, external structures included social factors, such as the residential setting and family expectations. Secondly, internal structures such as digital skills, attitudes and usability of device. Thirdly, agency was related to differing types of usage that were linked to both internal and external structures. Fourthly, the outcomes are evaluated by the use and implications for social connectedness. The study revealed, for instance, how family and technological design can interact in usage. The app was designed for older adults to communicate with family and friends. The design therefore acknowledged issues such as visual difficulties meaning that they found it easier to learn how to use the app. However, for an elderly male participant, the app made him more aware of his lack of social connectedness as his son failed to reply to his messages and his wife did not use the digital device. Consequentially, the technology revealed a lack of meaningful social connectedness with family which discourage usage.

Summary

The literature reviewed above illustrates the cruciality of context by focusing on a multitude of factors that influence usage and relationship between society and technological objects. However, ontologically, some of the literature can be said to oppose much of the current understandings on inequalities by rejecting pre-existing structures. Nonetheless, the insights are valuable by showing the multifaceted and contextual properties of technological adoption by allowing a rich exploration into the complex phenomena. Similar acknowledgement of the range of influences can provide a fuller understanding of digital health inequalities.

Conclusion

In conclusion, the literature review aimed to inform current understanding of the phenomena. Overall, the literature review highlighted that a more in depth understanding of digital health inequalities is required as little attention has been given to the wider social context of the user. The main body of research in the area has used quantitative approaches. In addition, the majority of qualitative research focuses on the participants perspectives after they have tested or trialled the digital technology. However, there needs to be a recognition of the multiple deprivations they experience. There is also a need to understand how the residents can overcome the barriers of digital inequalities such as lack of digital skills and confidence. The 'digitally engaged patient' describes an individual that adheres to neoliberal ideals of self-responsibility over their own health. These ideals are reflected in digital health technologies by utilising psychological models of behavioural change to motivate the user to become empowered and in control. However, without acknowledging the complexity of both health and digital technology usage the increased digitisation of healthcare raises concerns on the impact it could have on the most socioeconomically disadvantaged groups. The digital divide literature revealed there are crucial differences between socioeconomic positions with regards to motivation and attitudes, physical access, material access, digital skills and outcomes and benefits of usage. However, there remains limited research that understands the mechanism that influence these inequalities. There has been some qualitative research that has revealed a number of contextual factors contributing to the inequalities. For instance, location of digital skills training due to cost of transport (Goedhart et al 2019). Yet, digital health literature has an inadequate understanding of how contextual factors may influence usage in socioeconomically disadvantaged groups. Consequentially, the literature review above also illustrates the cruciality of context by focusing on the relationship between society and technological objects. The insights are valuable by showing the multifaceted and contextual properties of technological adoption by allowing a rich exploration into the complex phenomena. In sum, inequalities in digital health technologies require a more nuanced and multifaceted understanding.

Chapter 3 – Methodology and Research Approach Justification

The present chapter is a justification and discussion of how the research was carried out. To begin, there is a discussion of the philosophical underpinnings, research paradigm and methods that were used. The section will focus on justifying these decisions by referencing back to the objectives and the literature review. After, the research procedure is outlined including the sampling and recruitment strategy, data collection and data analysis. The chapter will be concluded with a summary of the ethical considerations.

3.1. Philosophical Underpinnings, Research Paradigm and Methods Justification

The following section will justify the research approach adopted to investigate the objectives of the study. First, the philosophical framework will be outlined. Second, the importance of qualitative research will be highlighted in reference to the gaps identified in the literature review. Third, the methods used will be justified.

To recap, the research objectives are:

- To identify how residents in a deprived community can be empowered to take advantage of digital health technologies.
- To identify if there are digital health technologies that could be implemented into a deprived community to help the health and wellbeing issues they experience.

3.1.1. Philosophical Underpinnings - Interpretative Framework

The current investigation is positioned within an interpretative framework. To justify, it is useful to outline the components of the opposing philosophical framework, positivism. In general, positivists state that reality is stable and can be observed and described from an objective viewpoint (Levin 1988). Quantitative enquiry is primarily adopted under such a framework to identify differences and relationships between features of the social world objectively. However, the suitability of positivism for understanding the social world is debatable because they claim there is one stable reality. As such, there is a claim of certainty. Yet, this is more suitable for natural sciences; not social sciences. Alternatively, an interpretative account embraces multiple and different realities that can be understood from how humans interpret and acts on their world (Hammersley 2012). The interpretive paradigm is a relativist ontology in that a single phenomenon can have multiple interpretations. Consequentially, interpretivist research can establish humans' experiences of the world within different contexts. The interpretive philosophy is best captured in qualitative enquiry as it documents multiple realities.

3.1.2. Qualitative Research

The current study focuses on the experiences of residents living in a deprived community. Therefore, it is placed within the qualitative domain. Quantitative research can highlight that inequalities exist; however, they cannot describe the lived experience in any insightful way. It can be said that such an approach produces a bland account of social life by generalising the base of understanding for the whole population. Qualitative research, on the other hand, provides a rich account of social life by gaining a deeper understanding of the phenomenon in its unique, and often complex, context. Furthermore, it is in line with the fundamentals of C. Wrights Mills (1959) 'sociological imagination' as it can present private troubles as public issues.

The literature review highlighted that there is a need for more qualitative enquiry to understand the underlying processes involved in the digital divide. By exploring the social processes underlying how technologies are consumed and used a broader understanding of the digital divide can be established. However, the main body of digital health inequalities research within this methodological framework have focused on testing or trialling an existing technology then interviewing the participants to understand their perspectives on a specific technology. Instead, it is important to understand the resident's interpretations and experiences of the multiple deprivations they experience. Doing so can begin to unravel why the residents do or do not engage with the technologies in more detail. Furthermore, narratives can provide a crucial insight into the dynamic relationship between human agency and wider social structures that underpin inequalities. For example, Elliott, Popay and Williams (2015 p.229) stated about qualitative research on health inequalities that:

"as people talk of the everyday, they weave accounts of personal experience and biography with the material, social, normative, and 'macro'-political processes generating inequalities. They also reveal the salience of social context for understanding individual agency."

Thus, the capacity of qualitative research to uncover individual, material, social and structural factors makes it particularly adequate to understand digital health technologies in a deprived community. It can also form new grounds for generating mechanisms that can address the issues of digital inequalities.

3.1.3. Grounded Theory

In the present study, grounded theory was used. There are three main reasons for using grounded theory. First, its capacity to make new discoveries. In line with the interpretative

underpinnings, rather than beginning with a theory, data is generated to be inductively interpreted and developed into a theory (Goulding 1999). As such, the findings from the study are grounded in the data to provide new insights. This is advantageous as there has been limited research understanding the digital divide from a qualitative perspective and even less specifically focused on digital health. Secondly, grounded theory excels in investigating the real-life nature of sociopsychological and socio-structural processes (Charmaz 2006). For instance, it allows an integration of both individual agency and social structures by generating abstract concepts and the relationships between them. Thirdly, and most importantly, grounded theory offers a set of guiding principles for conducting research. There is debate about what constitutes as pure grounded theory as it has been criticised for its philosophical position and practical concerns (Christie 2006). However, as Charmaz (2006 p.9) states:

“Grounded theory guidelines describe the steps of the research process and provide a path through it. Researchers can adopt and adapt them to conduct diverse studies. How researchers use these guidelines is not neutral; nor are the assumptions they bring to their research and enact during the process.”

Therefore, grounded theory is used in the present study as it provides a method to conduct the study. The methods prescribed by this approach as they applied to the current study will be discussed later (See Section 3.2.5. Data Analysis)

3.1.4. Method: Focus Groups

The following section provides a practical and theoretical justification for focus groups. Within focus groups, a collective sense is made through the process of group interactions (Wilkinson 1999). Researchers have noted the advantage of community focus groups as participants feel more comfortable engaging as they share a common culture (Fallon and Brown 2002). It can therefore be used to explore the community's concepts, norms and meanings towards health and wellbeing and digital technologies. It also gives participants the opportunity to reflect on a common topic and permission to discuss issues that may not usually be raised (Barbour 2008). In doing so, focus groups are effective in finding out what people think, but they excel in investigating why participants think as they do (Barbour 2008). This is something that surveys, and occasionally interviews, fail to do well. The experiences of the participants in the focus groups can provide theoretical connections between the individual, social structures and processes (Elliott, Popay, and Williams 2015). This is fitting for the current study as the knowledge of the community, those that experience deprivation first hand, can reveal the fabric

of everyday life and offer a stronger understanding of the individual, community and social processes that shape the lived experiences of health inequalities and digital health. Furthermore, as the investigation is a relatively unexplored area the open-ended questions of focus groups allow participants to offer new perspective that the researcher may not have taken into account. In this way, focus groups have been noted as being particularly useful in the ability to access the reasons involved in healthcare services and interventions uptake by exploring a multitude of perspectives (Tausch and Menold 2016). As such, they are useful for researching the community's perspectives on digital health and to provide data on planning appropriate and effective technological interventions in future (Barbour 2008). Overall, focus groups will:

- Give the residents of a deprived community the opportunity and platform to express their experiences and needs as they define them.
- Establish what the health and well-being need of the community are and help identify what types of digital technologies people living in a deprived community would view as useful in meeting those needs.

3.1.5. Method: Semi-Structured Individual Interview

As will be explained in the next section, a single semi-structured individual interview was conducted. Despite being a different method to focus groups, it still provided valuable data as it is qualitative and encourages open-ended discussions about the issue. As such, it can deliver an in-depth exploration of the participants thoughts and experiences.

3.1.6. Co-Design

Co-design activities are used to generate ideas on digital health technologies during the focus groups. Barbour (2008) states that there is no right or wrong way to design focus groups. The crucial factor is to be able to justify the approach in the context of the specific study. Therefore, for co-design activities to be included they need to be justified. Co-design is useful as those that will use the technologies are able to have a say in how they are designed. It is important to include those that experience digital social inequalities in the design process. The approach allows interventions that could have greater efficiencies and an enhanced fit between the residents needs and the service delivered (Baim-Lance et al 2019). For instance, by designing technological ideas that match their digital skill level (Norman and Skinner 2006). Additionally, it can bring theory forward into practice-based suggestions for the future digital health design and interventions (Lupton 2018). Health inequalities research can be criticised as, regardless of the methods used; it often falls short of developing a theory of transformative action (Elliott, Popay,

and Williams 2015). However, by adopting co-design activities they may raise issues that can lead to the production of digital health technologies that are more likely to improve, rather than exacerbate inequalities. The activities also give the opportunity to give insight into sociotechnical relations of digital technology use in disadvantaged social groups.

Previous literature has used co-design activities to design digital health technologies to suit the needs of vulnerable groups that are typically excluded from usage (Marent, Henwood and Darking 2018; Boland et al 2017; Neves et al 2017). For example, co-design activities generated new possibilities for understanding HIV communities' approaches, imaginations and anticipations towards a forthcoming mHealth platform. However, despite the successes of the studies, they use a pre-designed technology that has been produced by the technologists and researchers. The technologies are then trialled by getting participants to use the pre-designed technology. After, the participants make suggestions on how to modified the digital health technology to best suit their needs. Arguably, such an approach fails to consider the extended social context that influences usage by predesigning a technology first, thereby limiting the scope of co-design the participants have. Consequentially, as the area of study is relatively new it is important to gain a broad understanding of their digital health needs that derives inductively from the residents themselves. Co-design activities were used for the following outcomes. First, because it enables the co-creation of baseline data with the participants of the health and well-being needs of those living in a deprived community. As such, this means that future interventions can be based on evidence of their specific needs and requirements. Second, the co-creation of conceptual ideas of new digital technologies could be developed and scaled up with appropriate support.

3.2. Research Procedure

The research procedure section will outline the research procedure. First, the sampling and recruitment strategy will be described and justified. Next, the data collection process will be explained in detail. After, the data analysis process will be outlined. Finally, ethical considerations will be discussed.

3.2.1. Sampling

Purposive sampling was adopted during the initial stages of recruitment. The reason for selecting purposive sampling was because the study focused on a specific community that had experience and knowledge of the phenomena under investigation (Cresswell and Clark 2011). As such, the selection of participants that were information rich on the issue was crucial (Palinkas et al 2015). Whereas random sampling, for instance, is used when the researcher intends to make generalisations about populations by minimising potential bias in selections, purposive sampling is best used in research that embraces diversity in the participants varying perspectives, beliefs and opinions. It is therefore consistent with the aims and purpose of the study. It should also be noted that snowball sampling occurred during the latter stages of recruitment. Snowball sampling is useful to recruit participants that are difficult to get access to through the use of social networks. Simply, participants refer the researcher to other potential participants. It is cheap, simple and cost-efficient (Atkinson and Flint 2001). Furthermore, Morgan (1996) states that focus groups should be homogenous in terms of background, not attitudes. Therefore, being an adult resident of a community called Raploch was the criteria for inclusion in the study. The recruitment strategy will now be outlined and expand the justification for the criteria further.

3.2.2. Recruitment Strategy

The recruitment process was adapted from MacDougall and Fudges (2001) recruitment strategy. The strategy was selected as it focused on community research and provides coherent guidelines to follow. In addition, it should be said that any names used from now will be anonymised to ensure anonymity and confidentiality. Firstly, the prepare stage:

Raploch Community

The first part of recruitment strategy was to identify the sample that would be involved in the research. The community of Raploch was selected to be the focus of the present study. Raploch is located within the city of Stirling. The population of the community is approximately 3,000. The Scottish Index of Multiple Deprivation (SIMD) indicates that Raploch has a range of health

and social inequalities. The Raploch area contains two Scottish Index of Multiple Deprivation (SIMD) data zones in the 5% of most deprived areas of Scotland. They are the 81st and the 102nd most deprived data zones of the SIMD. Approximately 1,535 people live in the deprived data zones. Furthermore, Raploch contains two other data zones that are in Quantile 1 of deprivation, the lowest quantile, indicating highest deprivation, in Scotland. The area suffers significantly from a multitude of determinants of health including low income, low employment, low education, poor housing and high crime. With regards to health domain, the two most deprived areas in the Raploch represent the 98th and 345th worst health in Scotland. Table 1 displays all the relevant and available data on Raploch’s health profile in comparison to the Stirling and Scottish national average. The data is sourced from *The Scottish Public Health Observatory* (2019). Overall, Table 1 indicates that the health and wellbeing profile of the Raploch displays significantly worse levels than the Scottish national average and Stirling average for a multitude of health conditions and issues. Raploch therefore provided a suitable location for the research as it displays the core features of a deprived community. These features of deprivation are also closely associated with digital inequalities. To recap, the inclusion criteria for participating in the research was to be a Raploch resident and over 18 years old.

Table 1: Health Condition and Issue Comparisons Between Scottish, Stirling and Raploch Averages
(Age-sex standardised rate per 100,000)

Health Condition and Issue	Year Period	Scottish National Average	Stirling Average	Raploch Average
Alcohol-related hospital admissions	2018-19	669.13	430.82	1403.17
Asthma patient hospitalisations	2016-2019	90.64	58.99	98.57
Bowel Screening Uptake	2015-2017	56.36	58.31	38.37
Chronic obstructive pulmonary disease (COPD) patient hospitalisations	2016-2019	286.58	165.3	833.94
Coronary heart disease (CHD) patient hospitalisations	2016-2019	378.56	286.47	486.58
Deaths all ages	2016-18	1153.68	1031.53	2125.57
Deaths, aged 15-44 years	2016-2018	110.25	94.67	436.12
Early deaths from cancer (<75)	2016-18	156.64	130.35	210.71

Early deaths from coronary heart disease (CHD), aged <75 years	2016-2018	51.48	40.76	71.67
Emergency patient hospitalisations	2016-2018	7589.48	6400.26	11148.61
Life expectancy, females	2017	81.08	82.83	74.12
Life expectancy, males	2017	77.06	78.68	67.95
Maternal Obesity	2016-2019	24.25	18.58	22.15
Multiple emergency hospital admissions, aged >65 years	2016-2018	5428.51	4315.02	6853.65

Information Sources and Key Contacts

The next part of recruitment was to identify information sources and key contacts. The Raploch Community Partnership (RCP) was identified as a key contact for recruiting participants as they hosted various events weekly that were open to the public to attend such as Big Noise Adult Orchestra, Art Groups, Bingo, Healthy Hearts (group focused on healthy living), Singing Group and a Gardening Group. The researcher was aware of somebody that worked in the community centre and contacted them by email. The purpose of the email was to ask them if they would be interested in helping the recruitment process. The email explained the purpose of the study and a copy of the participant information sheet was attached (See Appendix 1). She contacted the RCP and they responded positively to the prospect of the research. Contact information of a member (Lucy) of RCP was then received. Lucy also gave contact information for Derek who worked at the local church and hosted events in the community. Both agreed to assist the researcher with recruiting participants. As such, they acted as gatekeepers in the study. The first stage of the recruitment process had then been complete as a sample had been identified. In addition, information sources and key contacts had now been established.

Contacting the Community

The next stage was the contact stage. The researcher met with Lucy at the community hub to explain the research in more detail and ask for recommendations on recruiting residents. The contents of the meeting included identifying groups the researcher could attend to meet residents, information on the design of posters and leaflets (See Appendix 2 and 3) and using financial incentives (See Section 3.2.6. Ethical Considerations for Justification).

The researcher then attended the agreed community groups. At the groups a short presentation was given to explain the purpose of the research, the inclusion criteria and to hand out leaflets. Meeting residents allowed them the opportunity to ask questions about the research. It also allowed the researcher to establish the time and place of the focus group that would best suit their needs. If interested, the residents were asked to sign a sheet with their name, age group and contact information (See Appendix 4 for Template). The researcher revisited the community groups on several occasions to access as many residents as possible. Revisiting the groups also allowed the opportunity to confirm the date and time with those that had already agreed to participate. An activity log was recorded of the researcher’s attendance at community groups (See Appendix 5). Posters were displayed at the community hub with the relevant information to participate including when and where. Residents and RCP members informed residents that did not attend community groups of the research in order to recruit more participants. Finally, the day before the scheduled focus groups/interview the residents were contacted to confirm they would be in attendance. The recruitment process had therefore been completed and data collection could begin.

3.2.3. Participants

Originally, the intended number participants were 40. Time constraints and the limited number of attendees at community groups made this difficult. Instead, the total number of participants was 18. From meeting residents at groups, 18 had expressed interest and written down their contact details. However, only 11 of these residents were able to attend the groups due to lack of availability and loss of communication. From snowball sampling there were 7 residents recruited. See Table 2 for the full list of participants and the focus group (FG) they attended. Ian* a resident and community worker could not attend any of the focus groups. Instead, an individual interview was conducted with him to provide more data.

Table 2: Participant Information

Resident	Group	Age Range	Sex
Angela	FG1	50 +	Female
Trina	FG1	50+	Female
Olivia	FG1	50+	Female
Jim	FG1	50+	Male
Jessie	FG1	50+	Female
Robert	FG1	50+	Male

Grace	FG1	50+	Female
Eta	FG1	50+	Female
Leslie	FG2	50+	Female
June	FG2	50+	Female
Lewis	FG2	50+	Male
Peter	FG2	50+	Male
Alannah	FG2	50+	Female
Cathy	FG3	26-49	Female
Sarah	FG3	26-49	Female
Linda	FG3	26-49	Female
Christie	FG3	26-49	Female
Ian*	Interview	50+	Male

3.2.4. Data Collection

The following section outlines the data collection procedure. First the settings and instruments are described. Then, the focus group procedure is detailed.

Setting and Materials

The focus groups and interview were conducted in rooms at the Raploch Community Centre. The location was chosen as it was accessible and familiar to the participants. The following instruments/items were included:

- Information sheet, consent form (See Appendix 6) and debrief forms (See Appendix 7).
- Two digital recorders.
- A flipchart.
- Pens.
- Question guide for the researcher to reference to (See Appendix 8).
- Refreshments.
- Activity sheet for the participants (See Appendix 9).
- 18 X £20 supermarket gift vouchers.

Focus Group Discussion

The focus group discussions were the primary source of data. The focus groups lasted around 1.5 hours each. The study used unstructured questions to encourage participants to discuss the topic as they defined them. Unstructured questions allow responses that are rich and detailed as they can reveal views, feelings, intentions, and actions as well as the contexts and structures of their lives (Charmaz 2006). As in line with interpretivism, the questions were broad and general so that the participants can construct the meaning of a situation with other participants.

Although the unstructured approach allows for open discussion, the moderator has a role to ensure that the participants are focused on the study. Prior to data collection, the questions and activities were developed and refined by the researcher and the research supervisor, Dr Chris Yuill. The individual interview did not include the activities but followed the same questions. The procedure of the focus group, including the questions and activities are now described:

Prearrival: The researcher arrived at the room 30 minutes before the participants were due to arrive. The purpose was to set up the room to ensure the table and chair layout was appropriate. In addition, to ensure each participant had the appropriate forms and worksheet. Refreshments, digital recorders and pens were also placed on the tables in preparation.

Arrival: Participants were welcomed by the researcher. They were asked to sign a register provided by the community centre reception. The participants were allowed time to talk with each other and to the researcher to make it more informal and conversational before the data collection began.

The purpose of the research was outlined by reading the information sheet, reminded of their right to withdrawal and that all data that will be publicly available will be anonymised. They were asked to sign the consent form. After the consent forms had been signed the digital recorders were switched on and the discussions began.

Activity one: The participants were asked to introduce themselves individually and say one thing they enjoy doing in their spare time. This was to get the group more comfortable with speaking and also to be able to identify who is speaking during the recording. Next, they were asked what is their idea of good health and well-being.

Activity two: The participants were split into smaller groups of two or three people. They used the worksheet to summarise using text, pictures or both their responses to two prompt

questions. The first question asked them to summarise their time living in the Raploch. The second question asked them to list what the main health and well-being issues of the area are.

Activity three: The participants were invited to share their ideas with the wider group in order to identify common themes. It was the participants not the researcher that agreed the common themes. The researcher used a flipchart to write down the participants responses in order to engage and encourage discussion between the participants of the different perspectives. The session was paused for a refreshments break.

Activity four: The focus then changed to how they thought the health and wellbeing issues could be improved. They were asked to discuss as a group of any healthcare solutions that has or hasn't worked well in the area. After, the idea of digital solutions was introduced. The participants were given a clear description of the topic and examples where appropriate. Before moving on the participants had the opportunity to clarify any queries they had on digital solutions.

Activity five: The focus group then divided into the same smaller groups. Using the worksheet once more they were asked to respond to two questions. Firstly, "do you think digital technologies could work in improving the health and well-being issues of the area?" And secondly, "Building on this, if you had the opportunity to design a piece of digital technology or implement an existing one into the community, what would the technology do?".

Activity six: Once again the ideas are shared among the group with the researcher writing down the perspectives of the participants to promote discussion of others opinions. The participants discussed each other's ideas. It was the participants, not the researcher, that agreed on the potential for digital technology on the health and well-being of the community. Finally, the participants will be asked to "Jot down on a piece of paper one phrase or one sentence that best describes how you feel about digital technologies potential impact on the community's health and well-being.". The session was then concluded. The researcher collected the worksheets. The participants were handed and read the debrief form. They were thanked for their participation and received a £20 supermarket voucher each.

After: The researcher jotted down their immediate thoughts on the focus group including the main themes that were recurring or important. Later, the researcher transcribed all of the digital recordings onto word documents for analysis.

3.2.5. Data Analysis

In section 3.1.3. it was mentioned that grounded theory would be used in the study to an extent. Grounded theory provided guidelines for analysing the data. Analysis had two main stages. These were initial and selective coding. It is important to recognise when analysing the data for the researcher to acknowledge their own background shapes their interpretation. The researcher does not force preconceived theories or concepts but follows leads that they define in the data. It is crucial to remain as open as possible in data; however, the interpretation of the data is shaped by their own interests, experiences and background. The role of the researcher must be used reflexively to analytic advantage (Charmaz 2006). The researcher is a male student from Stirling who has a background knowledge of health inequalities. Thus, it may explain why specific codes were grouped together such as those relating to low income. However, being aware of his own subjectivity through reflective memo-writing during analysis meant that biases could be identified. In addition, member checks at the end of each focus group, the constant comparison approach in analysis and presenting the findings to the research supervisor at different stages of analysis ensured that trustworthy interpretations were generated. Furthermore, as the researcher is a Stirling resident, they have an understanding of the textuality of the community, a knowledge of the area and some of the issues facing the residents. This positionality characteristic helped build bridges with the community and reduced the social distance between the researcher and the residents.

Initial coding

NVivo 11 was used as a tool for data analysis during the initial stage of coding. The initial coding involved line-by-line coding of the transcripts. It was important for the researcher to not make conceptual leaps and see actions in the data rather than applying pre-existing categories. The researcher therefore had to remain open and kept the codes simple, short and precise. Coding in this way moves on from simply describing and repeating the respondent's terminology. It highlights motivations and intentions, making it more analytical and theoretical. Constant comparison was made between codes as a way of making connections between the data. Every time a code was similar to a previous one it was compared. The researcher used a constant questioning approach to asked questions of the data such as: What's happening here? (Glaser

1978). The process was continued until all data had been coded and similarities and differences were beginning to be established. Categories between codes had been formed by grouping concepts that related to the same phenomena.

Selective Coding

The researcher stopped using NVivo 11 in the second stage as it removed them from the context of data as it was difficult to view both the transcript and codes simultaneously. As the analysis was of focus groups it was crucial to be grounded in the context of the discussions. Instead, all codes were transferred onto a Microsoft Word Document for analysis to continue manually. Comparisons between codes had been documented in memos throughout to write-up ideas and relationships between the codes. In line with the questioning approach, the data in the categories addressed a multitude of questions including with who, when, where, what, how, how much, why etc. The comparisons of codes revealed the different properties and variations that similar codes have. The researcher identified similarities and differences within and between groups. Larger sections of data were used to summarise the categories. The categories were then compared to make connections between them. The categories would often overlap; however, it was important to have a central phenomenon in each. Comparisons and the questioning approach were continued throughout until the data was sufficiently analysed and developed into themes. The themes had well developed dimensions and properties with the possibilities and variations within the codes having been fully identified within the timeframe. The selective stage coding therefore synthesised, sorted and organised the large amounts of data into theoretical categories. There were three main themes that developed. Each had different subthemes.

3.2.6. Ethical Considerations

Before the findings are presented, there is an array of ethical considerations that need to be outlined first. These include privacy and confidentiality, risk and harm, building trust and rapport and informed consent. Robert Gordon University provided ethical approval for the research.

Privacy and Confidentiality

An appropriate understanding of how to protect the privacy and confidentiality of the participants is very important. A lack of privacy during the focus group discussions can make participants feel worried or even withdraw from the study (Sieber and Tolich 2013). This is detrimental to not just the data, but also the participants wellbeing. To ensure the privacy

interests of the participants are met several procedures were put in place. Firstly, the gatekeeper, was somebody who worked with the community regularly. They were asked about the privacy interests of the Raploch community. Secondly, as the researcher began to know the community from attending community events the members of the community themselves were asked what they thought privacy issues could be. Thirdly, the room used for the focus groups was tested to ensure that discussion could not be heard in other rooms and by somebody passing by as this could threaten privacy.

With regards to confidentiality, given that there was more than one participant in each group, the handling of material discussed and confidentiality is a particular issue (Sieber and Tolich 2013). It was clarified and encouraged from the beginning that what each participant shares should be kept confidential. This is particularly vital if a situation arises that a participant wishes to withdraw what they have said, however, due to the nature of focus groups this may be difficult. Therefore, to alleviate any potential discomfort it was important to secure an agreement regarding confidentiality from the beginning. To ensure confidentiality all participants were anonymised. The anonymity of the names of participants will be in place using pseudonyms to avoid any potential harm from the comments being traced back to the individual. Furthermore, if there is any information that could reveal the identity of the participant this was not included in the report. Overall, standard procedures to assure anonymity, data protection and GDPR compliance were followed throughout the research. Only the researcher had access to the data.

Risk and Harm

The potential for any harm during the discussions were minimal, however, there are some points that need to be outlined that helped eliminate the risk. Research fatigue can often occur for people living in areas on deprivation (Clark 2008). Moreover, researchers make promises about what the research will do but do not deliver. As such, it was important to take time to become known and accepted by the community. Furthermore, it was made clear that the research is to provide information for future development. It was also made clear throughout the research process that it was to provide information about the health and well-being needs of the wider community and does not require participants to disclose any private personal medical information as this could potentially cause harm. Instead, it focuses on participants discussing and reflecting on the general health and well-being needs of the community without any requirement to reveal their own medical information. Furthermore, it was crucial to minimise any power differentials that the participants may have perceived between the researcher and

the community as it can make them feel intimidated and alienated by the research process (Sieber and Tolich 2013). With regards to power differentials, socio-economic status will likely have the greatest bearing on the research process as the researcher could potentially be perceived as coming from a privileged position. To overcome this building trust and rapport with the participants was essential. If tensions and conflicts arose and were not managed well it can cause harm to participants. Furthermore, as the participants are from the same community it can be said that these situations can continue once the focus group finishes and onto other parts of their lives (Sieber and Tolich 2013). To avoid a situation like this from occurring the focus groups focused on solutions rather than problems, which are easier to manage (Barbour 2008). After the focus group, debriefing is crucial to minimising potential harm.

Building trust and rapport

By creating good relationships with the community, especially the gatekeeper, then respectful and appropriate relationships were established and reduce any harm to the participants. Building trust and rapport occurred at every step of the research process. Through collaboration and work with the gatekeeper at the beginning stages of the research and attending community groups it ensured it started appropriately by gaining their trust. Posters in the local community centre made the residents be able to identify the researcher easier when attending the community events to meet them, this could be especially important for the older cohort that may be more vulnerable and wary of strangers (Sieber and Tolich 2013).

Informed Consent

Participants were required to sign a consent form before the focus groups began. As previously stated, they were explained the purpose of the study and given information sheets. They also had the opportunity to ask any questions before they signed the consent form. It is vital they know exactly what they are getting into before the research starts. However, it is important to be aware of factors that influence an individual's ability to give informed consent. The following information is adapted from a taxonomy by Kipnis (2001) on assessing decision making skills of the participants.

Firstly, potential participants may be cognitively vulnerable due to issues such as mental illness or lack of education which can impact their ability to make a rational choice if they are not fully informed. Secondly, participants may be vulnerable to authority. A perceived power relationship between me and the community can cause participants to agree from respect or unwillingness to offend (Sieber and Tolich 2013). Thirdly, as this was a health-related study there may be a

tendency for participants to feel this could directly improve their own health and well-being. However, the research focuses on how digital technologies could be used to help the needs of the community as a whole, not the individual. As such, it is emphasised that the purpose of the discussions is only to provide information of the general health and well-being needs of the community. Fourthly, as participants received a £20 gift voucher for participating it poses the ethical issue of being an exploitative offer as those in the community could be in an impoverished position and may accept this offer even without wanting to consent to the focus group. Unfortunately, this may be unavoidable as these incentives are crucial for recruitment. The gatekeeper was asked for advice on this and help chose the most suitable supermarket for the community. Although these vulnerabilities may be difficult to detect, an effective solution for all of them was to present as much information to the community about the focus groups well before the event so that they have ample time to consider the decision.

Summary of Main Points
• The study has an interpretive philosophical underpinning.
• The study adopted a qualitative approach.
• Methods used were focus groups and a semi-structured individual interview.
• Co-design activities were utilised in the focus groups.
• Purposeful and snowball sampling were used.
• Recruitment involved attending community groups to build trust and rapport with residents.
• The focus group followed an unstructured questioning route and co-design activities.
• The digital recordings were transcribed and analysed by the researcher.
• Initial and selective coding were used in line with the grounded theory guidelines
• Ethical considerations include building trust and rapport, ensuring confidentiality and privacy, reducing harm and informed consent.

Chapter 4 - Findings

Introduction

The following chapter displays the main findings of the study. There are three main themes that emerged from the data. Firstly, affordability includes issues such as unemployment, low income, universal credit and community funding. In general, limited financial resources influence the resident's perspectives on digital health technologies. Secondly, accessibility is multifaceted and includes access issues relating to digital health technology such as access to healthcare worker, physical access, access to public transport, access to community hub and digital skills. Thirdly, the ideas theme includes the digital health ideas that the residents suggested. The affordability and accessibility themes are closely related and affect each other. It can be said that they form the context and inspiration for the resident's technological ideas. See Figure 4 for a summary of the main findings. To begin the chapter, affordability is discussed.

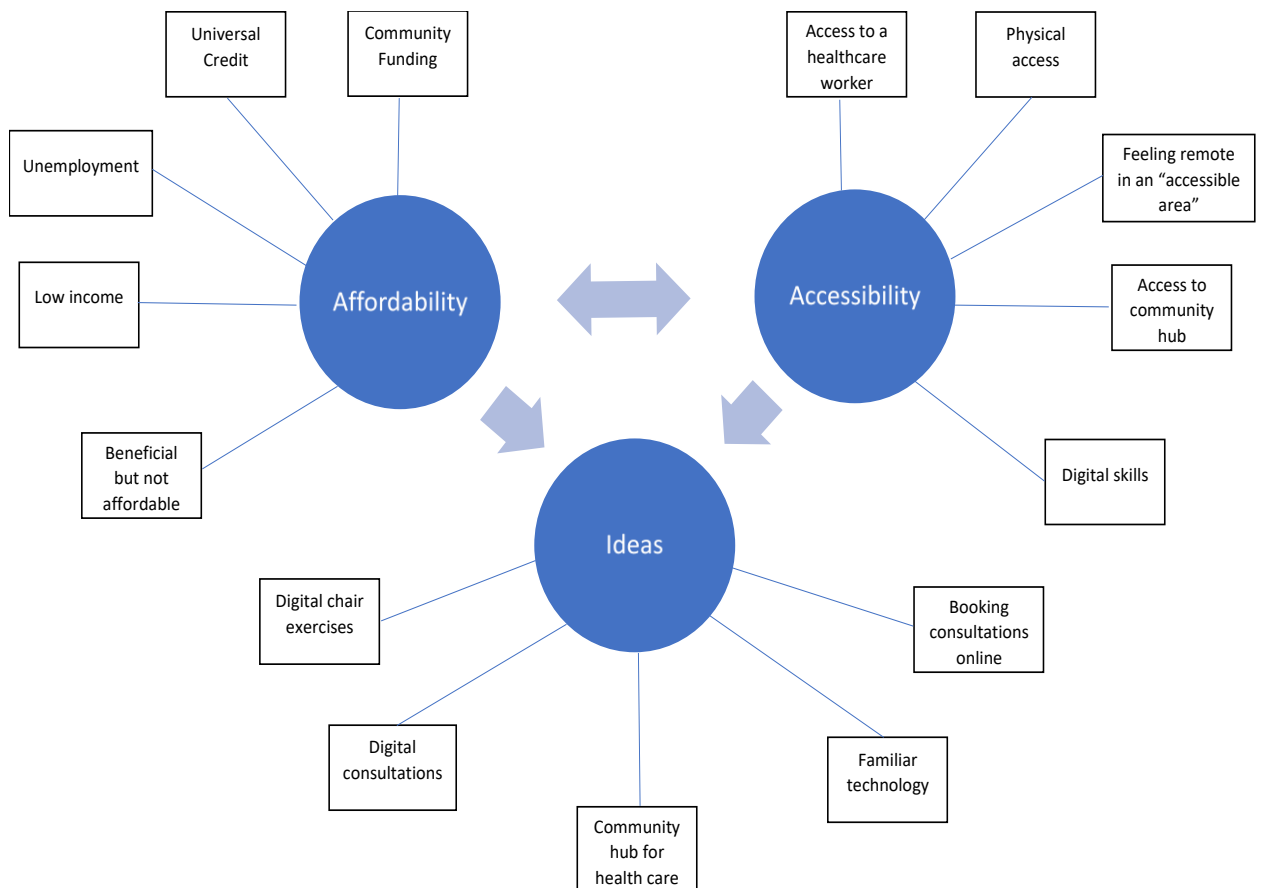


Figure 4: Main Themes and Subthemes

4.1. Affordability

Affordability is the first theme to be discussed. Affordability encapsulates a multitude of factors that influence the everyday life of the residents. The residents highlighted that unemployment, low income and universal credit were important factors that limit their opportunities and choices. As such, these limitations influence their health and well-being. These contextual factors that form the foundations of affordability greatly impacts the resident's concepts, ideas and opinions on the implementation of digital health technology in the community. In all, there is a need for digital health technologies to be affordable.

4.1.1. Unemployment

Unemployment was described as being "*the base of*" (Jessie FG2) poor health in the community. Some residents viewed unemployment as a principal reason for being unable to lead a healthy life. They emphasised that it lowers opportunities and limits positive choices available to them. In FG2, when asked what the main health and well-being issues in community are Lewis describes the impact unemployment can have on the residents:

Because being unemployed leads to them having a difficult lifestyle which is turn can lead to drink and drugs and if you dinni have money you can't buy nice healthy food so that aspect of St Marks helps [Local church provides schoolchildren free meals] and leads to lots of illnesses as well if you're no feeding yourself, no looking after yourself. (Lewis FG2)

As this description illustrates, residents believe poor health behaviours are influenced by issues such as unemployment. On those effected, unemployment was internalised as having a lack of control over their life and health by limiting their choices and opportunities. The influence of this issue was said to be far reaching and can have differing effects on people such as drug addiction and poor nutrition. Consequentially, the residents think that employment is intrinsically linked to health. For instance, when participants were asked what is their idea of good health and well-being Jim (FG1) responded to "*try get a job*". Despite being an older adult, Jim's (FG1) response implies that he is coming from a position where employment is a necessity but also something that is difficult to obtain. Jim's (FG1) idea of good health and well-being reinforces the proposition that they lack control over their life circumstances. Elsewhere, Jessie (FG2) states that for poor health in the community, "*unemployment would be at the base of it*". By unemployment as the 'base' of poor health, it can be said the residents perceive it to impact a wide range of factors that lead to health issues in the community. In sum, the residents pinpointed unemployment as an issue in the community because it limits opportunities and

choices. In doing so, the residents that are unemployed have a lack of control over circumstances in their life. The outcome of this process was said to lead to worse health and well-being. However, the residents argued that becoming employed does not guarantee control, opportunities and choices. In the community, low income replicates these issues.

4.1.2. Low Income

As shown, unemployment is considered to have an important influence over health and well-being in the resident's lives. Yet, the residents expressed concern that the same issues remained even when in employment due to low income. There are, however, additional issues that developed from the resident's perception on the influence of low income that differed from unemployment. Most notably, a sense of disempowerment due to being in employment but lacking the resources to lead a healthier life. During the beginning of the discussion in FG3, the residents emphasised that low income was a main health and well-being issue. They were asked to expand on this:

Interviewer: How do you think low income contributes to health and well-being?

Sarah: Well because Sainsbury's here and it's the dearest supermarket.

Linda: Yeah.

Sarah: And if you're on a low income and you don't drive and bus isn't working in the scheme anymore...

Cathy: And you've got a couple of kids

Sarah: And you've got a couple of kids... you'd quickly just nip up there but you're not able to get much...

Linda: because it's so expensive

Cathy: But then healthy foods need to be reduced in prices because it's cheaper to feed a family of four on unhealthy stuff than it is on healthy stuff

The resident's responses indicate that there is a shared sense of disempowerment to the multiple responsibilities of being a mother on low income. As illustrated from this conversation between all the residents in FG3, low income intensifies the issues of poor transport accessibility and an expensive food environment. The opportunities that are enabled on low income do not adequately accommodate the needs of being a parent. As such, this makes the lived experience

of keeping a well-balanced diet for both themselves and their family difficult. Furthermore, it can force residents into using food banks. When discussing a resident who has been forced to use food banks, low income was highlighted as the issue by Trina (FG1):

I was actually yeah, I was talking to, I'm not gonna say their name because I don't want to say... but his sister phoned him in tears and she works the lassie and she doesn't get enough wages and she was forced to go to a food bank for the first time in her life and she phoned her brother in tears, she had to go to the food bank to get the food... and she works but she's low paid and see the firm that's she working for... billionaires! (Trina FG1)

The disempowerment caused by low income is evident in this statement. Despite being in employment she is unable to sustain necessities such as food without external assistance. Similar to those in unemployment, she lacks control over her life circumstances. These experiences can cause emotional distress in the residents by forcing them to go to food banks. Trina (FG1) has strong feelings towards the resident's circumstances as she feels there is an injustice because the employers are billionaires. The focus on authorities, such as employers and councils, being unempathetic towards the limited resources those living in the community have was common. Olivia (FG1) believes that they generalise the reasons why people are in difficult situations such as requiring food banks:

It's not the individuals fault cause I used to help out and the council just turn a blind eye to it ... they just put it all down to this big huge thing it's because they abuse alcohol or they've got a drug problem no its not (Olivia FG1)

As such, the residents believe that authorities wrongly blame the individual as the reason for having to attend food banks. By failing to recognise the contextual circumstances that lead an individual to require food banks the residents experience further disempowerment as those that have the resources to alleviate the issues identify the individual as the source. Importantly, the circumstances that are influenced by low income in everyday life are crucial for understanding digital health in the community. Multiple responsibilities, limited resources and a lack of consideration about their financial capabilities all are said to influence the uptake of digital health technologies. For example, during FG3 Christie explained how she could not afford a mental health app recommended to her by the GP:

Christie: I know there's a lot more now but I remember at the time my doctor was telling me about this app that I was gonna have to pay £5.99 for but he gave me all these exercises and it

was all gonna be really good but at the time I was like I can't afford that when I'm paying for everything else ehm so I know there is more stuff now but it's not always affordable

Sarah: Available... it takes you back to the low income ae

Low-income limits the adoption of digital health technologies. From the encounter with her GP, although she recognised there are more apps available for mental health today, Christies experiences highlight two primary points. Firstly, that being able to afford an mHealth application depends on a multitude of different financial responsibilities which may need to have precedence. Secondly, that there was a misunderstanding between the healthcare providers perception of the financial resources of residents and their actual resources. This issue is critical as the healthcare services offered to residents are unable to be accessed due to low income. Clearly, the health needs of the community may not be met if the implementation of digital health technology fails to consider the array of circumstances influenced by low income.

4.1.3. Universal Credit

Universal credit can be said to similarly replicate the issues experienced by unemployment and low income. However, the resident's perspectives on universal credit showcases the importance of matching a policy with the needs of the community. As described above, the residents cited misunderstandings by authorities as a key source of disempowerment. Here, through the lens of universal credit the issue is further emphasised. The benefits system was described as the healthcare solution that has had the 'biggest impact' on their health. In FG1 its counterproductive impact was highlighted as *"it's supposed to help people"* (Robert) but left them financially worse off. As such, when asked to discuss the main healthcare solutions that have or haven't worked in the community FG1 used it as a platform to explain universal credits downfalls:

Sometimes I was waiting for weeks for the money while I was working ... 7 weeks. I phoned the head office they said "it's alright" I said how's it alright I've got nae money! (Jim FG1)

Jim's experience emphasises the disempowerment that universal credit can produce. The system meant that Jim was unable to have an adequate and stable source of income for several weeks. The health implications by lowering opportunities and choices can be postulated from the findings on unemployment and low income above. The main point that experiences of universal credit raises is that there is a lack of consideration about the everyday circumstances in a deprived community when implementing a policy. Overall, there are concerns from the residents

that it may even worsen some issues. During the in-depth individual interview, Ian stated that universal credit is detrimental to those with drug addictions in the community:

I mean I think universal credit has been a massive problem because what happens is within universal credit there is no housing benefit anymore, the housing benefit, the rent money all gets paid to the client now. The old housing benefit used to get paid straight to the council for peoples rent but that money goes right into their bank account at the end of the month, so they've got the money to live with and the money to pay rent and if you've got an addiction, rents not gonna get paid. And that's just a fact of life. (Ian)

From Ian's outline, due to the change in receiving benefits, it can be implied that if fundamental necessities such as housing are not being paid then digital health technologies are not going to be affordable or a priority for those with drug issues. There needs to be a recognition of the financial barriers that the residents are challenged with. Overall, the impact of universal credit in the community indicates that digital health solutions are likely to struggle to be effective if they are not equipped with an understanding of the implications of limited financial resources. The residents debated that resilience against these issues can be helped with community funding.

4.1.4. Community Funding

Community funding is central to improving and increasing the opportunities available to the residents. The community campus/hub was identified as being an integral part of the resident's social life as it provides a space for them to socialise, learn and stay active. It was recognised by Jessie (FG1) that it "was all funded by different funders" and without the funding an important aspect of the resident's lives would be unsustainable. In FG2, when asked to summarise their experiences living in Raploch, Lewis (FG2), highlighted the importance of the community funding for making improvements:

I came through in the 60s originally, moved away and have come back again and it's got great community spirit this place now. It did have a bad reputation at one time but it's much, much nicer since they done all this stuff here [community hub]. (Lewis FG2)

As illustrated the funding has had a transformative impact on the community and helped to improve the community spirit. The residents throughout the discussions referenced the importance of the community hub for a multitude of differing reasons. These will be explored further in the next theme: accessibility. For now, the value of community funding is the focus. Despite the residents generally perceiving community funding of the hub as instrumental to

creating positive opportunities, there were some that thought it was limited due to the lived experience outside of the community hub. For Olivia (FG1), there is only so much benefits that community campus funding can bring to help the community when other aspects are still so poor:

The council had to come for rats, to get rid of rats... this is what we're dealing with and its okay saying to change things around the campus but people have to live like this... and I don't even have a council house I have a private let but that's what we're putting up with. (Olivia FG1)

It is clear from Olivia's response that the beneficial features of community campus funding are limited when the living conditions at home for some residents are poor. As such, this overshadows the optimistic perspective of community campus funding. Nonetheless, the funding still has a beneficial, albeit limited, impact for the community.

The premise of funding in the community campus was applied to digital health technology. There was a general consensus that if the technologies were not funded then certain residents in the community would struggle to engage. In FG1, Jim repeatedly used the phrase "free websites" for an intervention that would be beneficial in the community. The group enquired what he meant by this and he informed them that a community had received funding to provide free Wi-Fi in the area:

It was in the paper... everybody can use a free website... that's how it should be... the full community clubbed in together to get it all (Jim FG1)

The concept of 'free websites' demonstrates there is a need for Wi-Fi to be affordable, if not free. The residents in FG1 agreed that access to internet due to cost is an issue. Therefore, free internet access was seen as important for the residents in order to reach those that might otherwise be unable to benefit from it. Community funding could help with this issue. Additionally, as the residents believe that internet access should be available for everybody in the community it highlights that they perceive it as being beneficial. However, a crucial factor in the implementation of digital health in the community arises once more in the discussion of community funding. The technology needs to be affordable.

4.1.5. Beneficial but Not Affordable

Overall, the components in the theme of affordability are crucial for forming the resident's perspectives and experiences on digital health technologies. Limited resources and multiple responsibilities are influential in understanding digital health technologies in a deprived

community. The residents approach purchasing the technologies by considering if they are a necessity or a luxury. The phrase “*beneficial but it’s not always affordable*” was used by Sarah (FG3) on several occasions which summarises this perspective. When discussing funding for implementing a digital health technology into the community schools, FG3 raised the point that it is not always affordable for personal use:

Sarah: I think it would be beneficial but it’s not always affordable

Christie: Yeah

Cathy: No [Agreeing]... but then some schools can get the money because one of the schools that I ...

Sarah: Aye but I’m not meaning schools... I’m meaning for the area ... like it is beneficial but it’s not always affordable like the Nintendo switch or the Nintendo Wiis like its’ not always affordable... for families like the FitBit’s it’s not always affordable... if you’ve got a family with 5 people in that d’you know what I mean its....

Christie: Mhmm it’s a lot of money.

The conversation between the residents show that due to family responsibilities there are limited resources to afford the technologies. An explanation is that other factors take precedence over purchasing a digital health technology such as family. It is also important to note that the technologies were seen to be useful and beneficial. Consequentially, the design and capabilities of the technology become irrelevant for empowering usage in some residents if they are not affordable. However, for those that purchase the technologies, financial sacrifices occur. When discussing the ‘free websites’ idea, Olivia (FG1) highlighted this struggle:

That would be good because not everyone can afford the internet its really quite hard ... and if you can afford the internet you just can’t afford everything else. (Olivia FG1)

The affordability of the internet can mean that sacrifices in other areas are experienced. As such, Olivia’s observation indicates that affording internet access in households has a mixed outcome. On one hand, internet access provides potential benefits such as access to health information. On the other, there is a struggle to afford other amenities. Therefore, digital health technologies require difficult financial choices. There is also an issue of being unable to utilise the entire potential of the technology due to limited financial resources. During FG3, Cathy stated that most young people in the community own smartphones, however, the functions of the phone cannot be appropriately utilised or afforded:

Sarah: I think its beneficial but it's not always affordable

Cathy: Yeah

Christie: Yeah

Sarah: Because you can have your phone but if you dinni pay your phone bill ...

Cathy: Yes

Christie: Or if you don't have a lot of internet access and stuff like that yeah

Even with the affordability and physical access to a smartphone this does not guarantee full usage of it. Issues such as having no internet data or being unable to pay bills limit the residents ability to experience the full benefits of a smartphone. It can be said that being able to afford a digital health technology does not guarantee usage. In this way, there must be consideration of the multiple affordability issues to allow and empower residents to use the technologies equally.

Summary

The affordability theme illustrated that limited opportunities, choices and financial resources are crucial to understanding a deprived community. The experiences of these factors are caused by various sources such as unemployment, low income and universal credit. As a result, the residents had a lack of control and a sense of disempowerment over their health. These factors influenced the resident's perspectives on digital health technologies viewing them as beneficial but not always affordable. Instead, other aspects of everyday life may be prioritised.

4.2. Accessibility

There is a need for digital health technology to be accessible for the residents. In the following section, it will be shown how accessibility for the community is a multifaceted issue. There are a number of different accessibility issues outlined including access to a healthcare worker, physical access, public transport access, access to community hub and digital skills.

4.2.1. Access to a Healthcare Worker

The primary health and well-being need described by the community was access to a health care worker. Overall, the importance of having access to a health care worker was emphasised in all groups. For instance, in FG1, the residents were asked to summarise the focus group discussion on the main health needs of the community. The group agreed with Roberts (FG1) summary of “*access to just a health worker ae*”. However, the need for access to a healthcare worker is multifaceted and differing explanations were provided across the focus groups of factors that influenced the issue. There was a suggestion that there is a lack of availability to healthcare in the community. Christie (FG3) raised this issue:

Not being able to get appointments at the doctors, I think is a big thing or just even being able to get a doctor. Cause I'm in a doctor's the now and its horrific cause no other doctors are taking on so I can't even swap. (Christie FG3)

The availability issue raised by Christie (FG3) indicates two main concerns. First, there is difficulty accessing a GP in the community. Secondly, there is a lack of control over her access to a healthcare worker. The latter point also suggests that being registered at a doctor is not sufficient to improve the accessibility issue. Overall, the discussions highlighted that there are a variety of barriers that operate alongside availability of a health care worker that explain why being registered at a doctor is sometimes not enough.

The process of booking a GP consultation was an issue for some residents as there was not effective communication about their health issues. This particular issue spawned from difficulty accessing a GP due to a miscommunication between receptionists and residents. The residents thought that those who are more vulnerable and have fewer social skills can be deterred from contacting the GP which, for Peter (FG2), means “*they are dicing with people. You canni do that. It's very dangerous.*” This leads him to believe that a change in accessing a GP is required:

*Because I think they should scrub that... that's just... its quite sad but that's just a way of holding people back and a lot of people will not go and phone when they are asking questions like that.
(Peter FG2)*

From Peters (FG2) comments, it is clear that the residents have had experiences with the receptionists that often feels unwarranted and rude. The consequences of interactions with receptionists may deter those who struggle to effectively communicate about their health issues. Peter (FG2) raises concern that the health issues may worsen by treating vulnerable people with a lack of respect as it is 'very dangerous'. In FG1, the comments of Peter (FG2) are reflected by some in the discussion as they also think that experiences with receptionists is a deterrent. The residents in FG1 extend this point by indicating it is because that they have a lack of medical knowledge:

Robert: Somebody at the receptionist ae when you're tryna see the doctor they ask you all the questions

Trina: Aye they think they know more than the doctors

Jessie: Oh, I know

From the brief interaction between Robert, Trina and Jessie show how their experience of booking a doctor's appointment is made difficult because the receptionists appeared lack of medical knowledge. The experiences with receptionists indicate that effective communication when accessing healthcare is important for the residents. As such, it was important for a health care worker to be somebody that was medically qualified such as a nurse or a GP as they have trusted medical knowledge. Also, there is need to feel respected and comfortable disclosing their health information in these situations. The residents believe that providing an environment that supports, rather than deters, them to feel open communicating their health information would be of value.

Access to a health care worker was a valued need, not only because of the accessibility issues, but because it can boost the resident's confidence. The residents did not only focus on issues but also on the reasons that accessing a health care worker is beneficial for them. Trina (FG1) suggested that obtaining access can make them feel more in control and confident over their health:

Trina: But I mean some people just feel better once they've spoke to a doctor ... it's like conformation that you're no dying ... cause I mean if you go and say I've got this and this and they say well actually it's that, it's that you feel better right away

Robert: Aye

Jim: Aye

The group agreed with Trina (FG1) that access makes them more confident and lowers anxiety about their health. The reliance on the GP to make them feel comfortable and in control of their health is important as she suggests that they can misinterpret their symptoms. The residents therefore want access to medical information they can trust from a health care worker. In sum, access to a healthcare worker represents a primary healthcare concern within the community. As a consequence, the residents conceived ideas of a digital health technology to challenge some of these issues (See Ideas for full discussion). The attention now turns, however, to challenges in the community in accessing digital health technologies.

4.2.2. Physical Access

"I mean you need computer access for that... you've got to have computer access"

Physical access to digital devices was said to be an issue for some in the community. In the affordability section, this form of access was highlighted as being influenced by limited financial resources. The implications of lack of physical access, however, were not fully mentioned. The residents believed that issues of healthcare accessibility could be exacerbated for some if they do not have physical access to digital devices. As such, any benefits that could be enable by digital interventions would be unable to develop. During FG1, there were physical access concerns about using digital technologies for booking a GP consultation:

Jessie: Even for making an appointment for the doctor's surgery if you could go online and just make an appointment instead of queuing and trying to phone up ... one that was open 24 hours you know because sometimes some surgeries you've got to phone before 8 o'clock ...

Robert: Aye just to get that that day

Olivia: I mean you need computer access for that... you've got to have computer access. What if you don't have computer access and you've got to wait still until whatever time it opens

Olivia (FG1) believes that there needs to be a recognition of limited computer access in implementing digital health solutions into the community. Without addressing physical access,

she considers how individuals would be disadvantaged when booking an appointment online. It could mean that those without physical access to a computer would have more limited opportunities for accessing a healthcare worker due to time constraints. The residents argued that the problem of physical access is most prominent among the older adults in the community. This point is emphasised by Angela (FG1) when asked about using digital technologies in the community:

The problem is there are some elderly people that have no digital anything, they've no got telephones, they've no got mobile phones, they've no got computers, and some people are isolated and they don't have any way or anybody, especially if they've not got neighbours or family. Some people are quite isolated. (Angela FG1)

Here, Angela (FG1) envisages an issue with the prospect of digital technologies being increasingly used for healthcare. For her, older adults that are both socially and digitally isolated would not be able to experience the benefits of digital health. Similar to Olivia (FG1), she is concerned that there would be a disadvantage in accessing healthcare if there is a reliance on digital technologies as some people have limited access to digital devices. Elsewhere, in FG3, the residents shared a similar perspective on increasingly implementing digital technologies into different areas of everyday life, including healthcare:

Sarah: I think it would make things easier aye I think everything would work but there's always gonna be people that are not gonna find it beneficial it's the same as everything you're never gonna please everybody

Cathy: Its gonna benefit the younger generation but its gonna eliminate the older generation

As Sarah (FG3) points out, the digital technology may 'work' but there are certain residents that it will not accommodate for. For Cathy, the older generations would be excluded from the benefits. The residents recognise that there are shortcomings with integrating digital health technologies into the community as it would not be equal for all. There is the risk that older adults who do not have physical access would lag behind those that do have access in terms of access to certain elements of health care. As such, the residents argued that lack of physical access to digital devices is an issue that could disadvantaged access to health care. Older adults were singled out as being a group of particular concern. However, some of the older adults in the focus groups discussed their experiences of using digital technologies, suggesting it is not an issue for all in the community.

Benefits of Physical Access to Devices

Physical access to digital technologies was not an issue for all of the older adults. There were accounts given by the residents of experiences when physical access to technologies had benefitted their access to healthcare. Both Peter and Alannah (FG2) experienced positive outcomes from having physical access to digital technologies. Firstly, Peter contacted the GP practice as he had been waiting for blood test results for a long time. When he contacted them, the nurse was able to access his health information and his concerns were alleviated:

That happened to me personally and you think that's great without, you're talking about technology, without that you could never have got that, you know what I mean. She's got the info into your stuff you know. My health is private but she can tell me about it, you know what I mean. (Peter FG2)

Secondly, Alannah and her husband received a Facebook message from the GP informing them to come home early from a holiday as blood tests had revealed her husband needed to receive medication urgently to stop potential eyesight loss:

Because we had loads of messages on the answer machine when we got home but we weren't there so... we had never thought to give our mobile number and he just would have stayed. We came home like on the Thursday instead of the Saturday and but maybe by the Saturday it would have been more serious so that actually, when you think about it, that was quite handy. (Alannah FG2)

These experiences both involved access to a healthcare worker and health information through digital technologies. Peter actively used the technology to receive personal health information. Whereas, Alannah, was the receiver of health information without her actively seeking it. Both residents merited the efficiency and accessibility of communicating health information to them due to having access to the devices. In Alannah's case, more traditional technology had failed as they had missed calls on their answering machine from the GP practice. As such, she proposes that without the digital technology there would have been no way to access the vital health information and her husband's condition may have worsened. These examples suggest that digital health technologies for communicating with a health care provider are of value for the residents. However, it also strengthens the concerns raised in FG1 and FG3 about the increased use of digital technologies for healthcare could disadvantage those that do not have physical access. In all, physical access is critical. Yet, the residents also debated that having physical access does not guarantee an efficient and effective access to healthcare.

4.2.3. Feeling Remote in an “accessible area”

The features of the built environment influenced digital technology usage in the community. Despite the residents describing Raploch as being an “accessible area” they experience a sense of remoteness in accessing healthcare. Unlike physical access to devices which were determined to be a concern for primarily older adults, the current accessibility issue was found to be prominent for both the younger and older groups. In FG3 the residents were discussing using the NHS 24/7 service to access advice on health concerns. However, despite having physical access, if the NHS 24/7 operator indicated that medical attention was required the residents experienced transport issues at certain times:

Interviewer: Do you think they're useful [NHS 24/7 service]?

Sarah: Mmm if you've got public transport... if you've got your own transport because out of hours is out of hours and if you've not got public transport because if you can't drive, public transport is all... how you supposed to get there because they no longer do house calls

Sarah (FG3) indicates that digital health technologies in this circumstance were useful to an extent. The NHS 24/7 service worked appropriately but accessing healthcare was limited due to transport accessibility. As a consequence, the usefulness of digital health was lessened by the residents need for more accessible transportation. For those that rely on public transport the level of care they can access out of hours is limited and more difficult for a few reasons. First, as they do not have access to a car. Second, the affordability of a taxi as Christie (FG3) notes they “would have to get a taxi and how much is that gonna cost me”. Third, the distance between Raploch and the out of hours hospital “you couldn't walk there” (Sarah FG3). Therefore, the residents reliant on public transport feel remote despite living in an area located within a city. Like most of the accessibility issues, the problem with this form of accessibility is that it could prolong them from seeing medical attention. Public transport in the community can also influence health and well-being by making individuals more isolated. For instance, in FG1 the residents stated that the bus service had recently change route meaning that a section of the community was excluded:

Trina: See what it is it's no good for their eh mental health because they people are isolated now down there and you go on the buses and you don't see the people that's down there anymore...

Olivia: No you don't

Trina: 2 or 3 times a week you'd see the old yins getting on the bus... they're no getting out and about

Robert: aye because they canni get out ... see the bus going up beatie avenue they've stopped doing that

From this exchange it is evident that residents who rely on the close proximity of public transport such as older adults or those that struggle with mobility are unfairly excluded from using it. Consequentially, they may have a lack of opportunities and choices as they cannot gain access to any facilities. The residents believe that changes to the bus service have made some people isolated. Evidently, digital health technologies can work accordingly but the residents are challenged with issues that operate outside of physical access and technological design.

4.2.4. Access to Community Hub

The importance of the community hub for the participants cannot be overestimated. In the affordability section it was mentioned that the hub was central to the resident's everyday lives as it offers a place for them to engage in activities and learn. In addition, it is seen as important for their health and well-being. As such, access to the community hub is viewed as enabling some resilience to the issues within the community by empowering them with opportunities and purpose. Socialising is the key factor in permitting these benefits.

Socialising

Socialising is seen as fundamental for a variety of reasons with regards to health and well-being. Crucially, the residents believe it is a foundation to improving health and well-being in their present circumstances. When asked what their idea of good health and well-being is many residents responded "*socialising*". It was considered to be important for all residents regardless of age group. Socialising is important as a strategy to encourage other residents to engage in community events. Trina (FG1) highlights this point:

*And the confidence I think to have somebody to say 'oh am going next Tuesday d'you fancy going wi me' ... cause some people will not go on their own as they lack confidence and are quite shy.
(Trina FG1)*

Here, it can be said that Trina (FG1) identifies communicating as crucial to becoming involved in community events. The finding also highlights that being socially isolated can be helped by this method to encourage engagement to an extent. It implies, however, that those that have weak social ties may not benefit from the opportunities than those that do socialise. With regards to

digital technology, social media is “one of the biggest ways to bring people into the hub” (Christie, FG3) and used to raise awareness of groups:

Christie: Yeah the healthy hearts, yeah we run the healthy hearts group on Mondays now. They've had more people joining they seem to be doing quite well

Sarah: Its quite good cause you see the updates on Facebook of what they are doing in the hub but if you never had facebook then how would you find out about all this

Christie and Sarah (FG3) show that in order to be aware of some community events and information there is a reliance on digital technologies. However, without this type of exposure they recognise that those without social media could miss out on these opportunities. Similar to those that are isolated and lack strong social ties, those that are digitally isolated experience comparable disadvantages. In FG2 the advantages of attending community groups such as a sewing group called ‘simple stitches’ and a healthy lifestyle group called ‘health hearts’ were illuminated:

And I retired ae and I thought what am I gonna do with my life ae and Alannah's asked me round [to community hub] and it's been the best thing ever that I've done ae. (June FG2)

This extract displays the value of the community hub for the residents, especially the older adults in the community. The groups give the residents more purpose and offers them new opportunities. For example, the groups give the residents the opportunity to become more educated and aware of healthy food choices. Leslie (FG3) displays how becoming more aware of health information was useful when explaining what her idea of good health and well-being is:

Uh huh and understanding what you're actually eating which is really important because since we've came to the healthy heart's we've actually learned you know... things that we thought were okay for us really weren't okay for us. Getting educated. (Leslie FG3)

In this way, Leslie (FG3) highlights that the community hub operates as a space for communicating about health information. The hub, therefore, can be used as an environment that the residents feel purpose, empowered and engaged in their health and well-being by providing learning opportunities and positive social ties. Moreover, this is strengthened by the community workers. The relationship between the community workers at the community hub and residents is integral for their engagement in events and groups. As Jessie (FG1) describes, “it's like one big family”. When issues arise, for instance when using computers, the staff are always on hand to assist the residents the best they can:

But you're encouraged to ask questions tae ae... so if you're stuck with something ask somebody and they'll sort it... don't just sit there... especially to do with computers. (Robert FG1)

Robert (FG1) indicates that the community workers can be useful for learning to use the computer more effectively. In addition, it also signifies that they are enthusiastic about the help provided at the community hub by others. This example is just one of the reasons that the community workers are integral to the success of the community hub. To reiterate Jessie (FG1), they provide an environment that makes the residents feel like 'one big family'. Overall, access to the community hub offers the residents a chance to engage in different groups, learn and a sense of purpose. As will be indicated in the Ideas theme, the community centre was central to some of the digital health ideas.

4.2.5. Digital Skills

The theme of accessibility is multifaceted. The wide variety of influences and issues described are instrumental for understanding digital health technologies in the community. Within the present section, accessibility once again takes on a differing meaning. Before discussing the ideas, it is important to give voice to issues the community are said to experience in using the devices. The design of the technology and the skill level of the user were seen as relational to one another. The residents noted that they had observed differences in digital skills between generations. During FG1 the suggestion of exercise and health apps for older adults was written onto the flipchart. However, this was argued against:

Trina: I'm looking at that [flipchart] I understand... I agree with that apps for the elderly but it's no everybody elderly ...

Olivia: That can get an app

Trina: That can get that and can work a phone or a mobile.

As shown, the residents considered that alongside physical access, the ability to work a digital technology was also a barrier for older adults. Trina (FG1) agreed that apps could be useful, however she did not expand on why, but that some older adults cannot work smartphones to be able to access the app. There was a contrast in skills identified by the residents between the younger and older residents. Trina (FG1) believed the reason for the difference was because "they're brought up with it, we're no". The group agreed with her. Those that had the least exposure to technologies were said to have the most difficulty in using them. FG2 also

recognised that younger adults appeared to use technology with more ease, however, they were optimistic that the older generation were improving:

Alannah: Cause all the young ones are so good on technology their amazing

June: They are

Alannah: Definitely, we're catching up... slowly!

Leslie: See that's the way the futures going

Alannah (FG2) highlights that they are gaining more confidence in having similar digital skills to the younger generation. Leslie (FG2) also pinpoints the importance of acquiring digital skills as she views it as being increasingly essential. However, during the physical access theme it was shown that Alannah (FG2) has access to digital technologies. As such, this could explain her stance that older adults in the community as becoming more confident in their digital technology usage. Overall, the issue of digital skills was seen as a barrier for accessing digital technologies for the older adults in the community. Simply providing a digital technology to those that are digitally isolated does not guarantee usage and poses a fundamental issue.

Are digital skills enough?

The resident's responses also indicated that having the skills to use digital technologies does not guarantee that it will have a positive outcome, or be used at all. For instance, one of the main uses of digital technology for some of the residents was to access health information. In these cases, physical access and the digital skills of the residents were sufficient to access health information. However, although those that use it find it useful to an extent, it can produce anxiety and make them worried about their health. This point was conveyed in a discussion during FG3 when talking about accessing health information online:

Christie: Yeah I used to use symptom checker and go on the NHS website quite a lot

Interviewer: Okay and dyou think it was useful?

Christie: Eh... I think it made me more paranoid

Sarah: Yeah I think it makes you...

Christie: Aye you're like I am dying and you're like no I am not

Cathy: Aye see when you go to the doctors for something more serious, they say "Don't google it!"

Sarah: Yeah

Linda: I don't look for conditions on the phone because it makes me more paranoid

Christie: It makes you more paranoid ae

As the conversation indicates, although digital skills allow them to use digital health technologies it makes them feel in less control of their health. This holds parallels to one of the reasons accessing a health care worker is important as the residents misinterpret symptoms and want medical knowledge they can trust. Instead, accessing health information online and being aware of certain illnesses make the residents anxious. Furthermore, the negative emotional responses that can occur when interpreting health information online can cause some of the residents to refuse to engage in future. Consequentially, in some instances digital skills are not enough to empower continued usage. In fact, digital skills can increase initial access but can lower sense of control over their health. Elsewhere, it was suggested that even the simplistic technologies could be misused and rejected.

The residents in FG1 were familiar with the MECS alarm. The alarm can be said to be a very simple technology as only a singular button requires to be pressed to alert a healthcare worker. In FG1, they discussed their experiences with the technology in different ways. Firstly, Robert (FG1) said that his Dad used the MECS alarm as it was intended. Secondly, Angela's (FG1) aunty uses the technology but differently than it was originally intended saying "*they're really good my aunties got one and she just leaves it at the end of the bed and she doesn't wear it*". Importantly, although Angela (FG1) viewed the MECS alarm as useful, her aunty leaves the alarm at end of her bed and does not wear it around her neck as intended. Thirdly, Trina's (FG1) Mum hides the alarm and refuses to use it. When asked why she didn't use the alarm she replied "*well she's 96!*". These experiences show that the intended user can adopt, modify or reject using even the simplistic technologies in differing ways. While some modify it to best fit how they personally want to use it, others can reject using it. Possible explanation can be found from Trina (FG1) as she believes exposure to technologies throughout life is important for usage but her Mum may not use the alarm as she is not used to the technology. For those that refuse to use digital technologies, socialising with another was seen as a key motivator to encourage usage. The residents thought that 'digital chair exercises' could help those who struggle with mobility or are isolated become more active (See Ideas for full discussion). However, they also feel that without motivation from others then the technology would be ignored:

Trina: See if there was access to something on the computer, something showing you exercises that, for when you're sitting in the house ...

Jessie: Digital chair exercises, somebody sitting and showing how to do exercises on a chair

Trina: But that's what I was saying that's good but if you've no got somebody there encouraging you to do it, you'll not do it

Trina (FG1) again raises concerns over the importance of having social ties for staying active in the community. She believes that residents that are isolated would use the digital technology if they did not have another person there to encourage them to engage. Regardless of digital skills, there is the chance that the technology would not be used by the residents. Finally, Ian offers another explanation as to why technologies may be rejected despite possessing the digital skills required for usage. Despite using them frequently at work, he does not see a need for digital technologies in his private life:

It's not a thing I've ever used. I know when I'm tired I go to bed, I sleep really well, I'm normally up and awake around 7 and I'm up and pacing again. Listen technology to keep people healthy, I'm all for it, but I don't particularly use it. (Ian)

The functions of the digital technology are not necessary for Ian as he has been able to keep a well-balanced routine without them. Although he merits the technologies potential for others, he does not imagine they would be useful for himself. Similarly, Sarah (FG3) discussed the features of a mobile app that keeps track of her pregnancy records. She found it useful but commented that it was personal choice and depended “*if you want to read them*”. As such, digital skills do not necessarily guarantee usage as the residents form different concepts and responses when engaging with digital technologies. Overall, the resident's responses highlighted that accessibility is multifaceted with digital skills arguably not being sufficient to encourage continued usage in some circumstances.

Summary

Accessibility is a multifaceted theme that demonstrates the complexity of digital technology usage. The theme identifies the main health and well-being need of the community, access to a health care worker. This issue can be said to be related to many of the subsequent issues. There were accessibility issues in relation to public transport that limited the success of digital health technologies. Furthermore, the residents highlighted physical access problems that older adults in the community faced. In addition, access to the community hub was outlined as being crucial

for the everyday life of residents by offering a space to socialise and learn. Finally, the older adults were also said to have digital skills issues. However, there was suggestion that digital skills were not enough to use the technologies due to anxiety accessing health information online, for instance.

4.3. Ideas

Affordability and accessibility illustrated the complex issues that could be involved in the implementation of digital health technologies in community. Interestingly, the residents remained optimistic about the potential of digital health technologies. During the conclusion of each discussion the residents were asked to write down in a phrase or sentence how they perceived the potential impact digital health technologies could have on the community (See Appendix 10). The majority of residents commented that the technologies could be positive. Therefore, the residents produced ideas for digital health technologies they thought could alleviate some of the issues in affordability and accessibility. There have been brief descriptions of what the technologies were, however, the current section dedicates a platform for these to be fully discussed. Overall, the resident's ideas were developed in relation to the context and experience of the community. In this way, the digital health technologies could best suit their needs. Furthermore, as has been highlighted the main health and well-being need was access to healthcare. Therefore, the ideas typically focused around this premise.

4.3.1. Booking a Consultation Online

Booking an appointment online with more efficiency and effectiveness was proposed to be valuable. Referring back to the previous section, these ideas can be said to have developed from poor experiences with receptionists. Additionally, the residents experienced difficulty in accessing, booking and communicating with healthcare workers due to time constraints and lack of availability. To combat some of these issues, they suggest that digital technology could help when booking an appointment with the GP:

Even for making an appointment for the doctor's surgery if you could go online and just make an appointment instead of queuing and trying to phone up ... one that was open 24 hours you know because sometimes some surgeries you've got to phone before 8 o'clock ... (Jessie, FG1)

The main functions that Jessie (FG1) highlights as being desirable are for it to be on demand ("*open 24 hours*"). The inspiration for the idea was due to the limited period of time where they could book an appointment to see a GP. The constraints produced by the current system for booking an appointment could be improved by an on demand and accessible system that would be available on an internet enabled device. More specifically, the residents emphasised that a "*drop and wait*" function would be useful and improve accessibility. For example, this point is highlighted in FG1 when they are discussing the process of booking a digital consultation:

Trina: Aye I've got the same, an opportunity to talk to a doctor on skype or television or a doctor's surgery one day a week. And you don't need an appointment it could be like a drop in ae

Olivia: But skype what if somebody doesn't have skype

Jim: Aye just drop and wait... be good if you didn't need to phone up

Similarly, in FG2 a 'drop and wait' system is suggested to be beneficial:

Lewis: So you could just by pass the receptions hopefully and just book a space for 15 minutes or however much it is... that would be a great thing

Peter: That would help your health issues as well, regarding your technology, get through to the doctor quicker etc as well

Both of the focus groups in the extracts above advocated that changing the process of booking an appointment would be benefit from digital technologies. Jim (FG1) comments that the service should be instant to access and simple to use by utilising a system where the patient can "just drop and wait" rather than speaking to receptionists. For Lewis and Peter (FG2), having an online booking service where the patient can book a certain time slot with efficiency would be valued as it could lead to accessing the GP quicker. In sum, the resident's ideas for the design of booking a GP appointment were to:

- Utilise an internet enabled device
- Be available 24/7
- Feature a simple 'drop and wait' function to book time slots

The minimal functions that are needed in this case reflects the main need: accessing a healthcare provider. However, the simplicity may also reflect limited digital skills of the residents.

Throughout the discussion on creating technology for the community, there was a continued emphasis on its simplicity.

4.3.2. Familiar Technology

The ideas for booking an appointment online conceived by the residents were focused on their accessibility and ease of use. However, the residents noted that older adults in the community struggle with using digital technologies. In response, they considered ideas for those that lacked familiarity with digital technologies. Moreover, for all the technologies suggested, there was not an emphasis on a technology that had a complex and extensive range of features. Instead, the

technology had to be simple to use to match their needs. The familiarity of a traditional technology was deemed as being an important solution to those that may lack skills to utilise more advanced digital technologies or would struggle to get physical access to the device. FG1 suggested that a telephone would help those that are digitally isolated engage:

Angela: There should be a telephone ... like just a basic telephone rather than an online one

Robert: A hotline

Angela: Aye a hotline... direct to their own doctor

The residents recognise the need to accommodate for those that do not have access to digital devices. However, they did not specify how the technology would function. But, the idea of using a 'basic telephone' indicates the importance of providing safeguards for those that may not have equal access. The key point is that for some residents it is important for the technology to be familiar to them. Similarly, in FG2, the function of familiarity was deemed as crucial when discussing the how technology could be used to remind them to take medication:

Peter: Aye something to remind you to take your tablets, its simple but through technology aye

Leslie: Cause they say see even like the old people that they can remember songs so even like their favourite songs make them remember oh I need to take my tablets... something like that anyway

The residents thought that having technology to assist them to take medication would be of use. Again, they highlight familiarity as a feature that would encourage engagement. By having their favourite song play Leslie (FG1) thinks it could have a beneficial influence on reminding older adults to take their medication. Overall, the older adults in the community could benefit from technology that is familiar as it would be simpler to use and would not require them to learn new skills.

4.3.3. Digital Consultation

Digital consultations were proposed as an idea to address many of the accessibility issues faced in the community. Digital consultations were agreed to be desirable for all the residents. The residents felt the implementation of such a technology would enable them to access a GP with more efficiency and effectiveness. Importantly, the idea was developed from the need to access a healthcare worker. There were a number of differing comments about the promise that the digital health technology could bring to the community. One reason was that it could help those

that are isolated or physically struggle to access a GP. Here, Lewis (FG2) describes an imagined future situation that could be improved with the technology:

Meeting them without actually having to go into the surgery cause the last time I had to contact the doctor it was for it was because I had done something to my back ... it was a bloody nightmare getting there you know. If I could have just done that it would have been so much better. (Lewis FG2)

This description suggests that digital consultations could be useful for those that are housebound or struggle with mobility. The technology would enable these individuals the chance to be in more control of their health that may otherwise find it difficult to access medical attention. Principally, though, the technology was deemed useful for all residents due to the issues involved in accessing a healthcare provider. More specifically, the digital consultation technology was wanted to be incorporated into the television. FG1 had some ideas:

Interviewer: Okay, so have you thought of any ideas? I'll just go around the groups once again and see what we've got.

Jessie: I was wanting the TV one

Me: TV one?

Olivia: A doctor, a doctor online

Jessie: Switch the TV on and go to a channel and it's the doctor! A doctor online would be nice

Olivia: But make it just on some technology that isn't going to cost somebody a lot of money so that it is accessible to everybody that's the important bit

Trina: Aye I've got the same, an opportunity to talk to a doctor on skype or television or a doctor's surgery one day a week. And you don't need an appointment it could be like a drop in ae

The residents were interested in having a digital consultation that would be tuned to a specific channel on the television. The key need was to be able to communicate to a doctor. In addition, by utilising an existing technology in the home the residents could be more empowered to engage with the technology. Once again, the residents only gave preliminary ideas about what technologies they would find useful. For instance, one resident sketched her idea for the digital consultation on a television (See Figure 5). The drawing is simplistic and more detail of how the functioning of how the technology would operate was never explicitly given. However, it could

indicate that the residents want to be able to access a GP as simply as possible, for instance, to just “switch the TV on and go to a channel and it’s the doctor” (Jessie FG1).

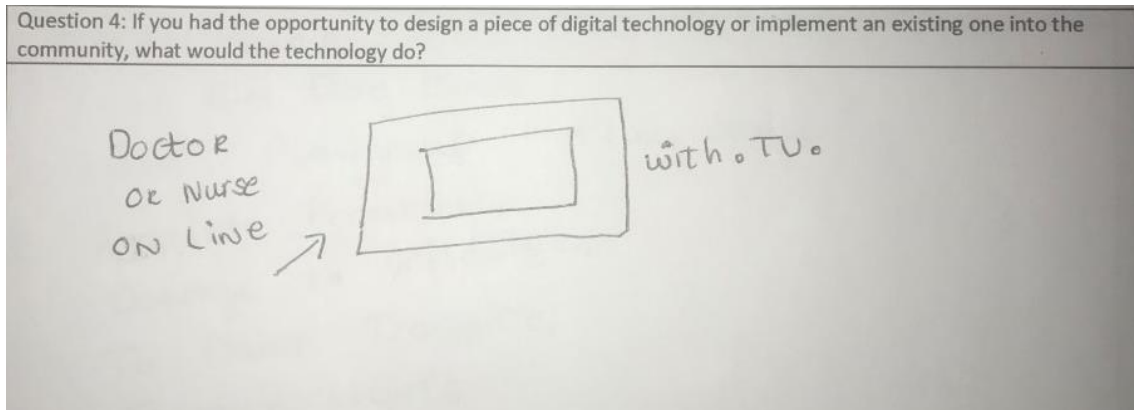


Figure 5: Drawing of Digital Consultation Idea (Olivia FG1)

However, despite the promising potential the older adults in the focus groups had for digital consultations, the residents in the younger focus group recognised that the technology may suffer the same issues that are currently involved with accessing a GP. Sarah (FG3) pinpoints that the availability of the GPs is a limiting factor:

Sarah: I suppose it would be how many GPs were there and how many were allocated to do it, because if you can't get an actual GP then how are you gonna be able to look at their face over the phone

The limitation highlighted by Sarah (FG3) reflects the majority of issues that act as barriers to successful digital technology usage. The availability of GPs is a factor that operates outside of the design of technology, yet, needs to be considered for it to be successful. None the less, *if* the issues were resolved then the residents believed that video consultations with their GP would empower the residents to have more control over their lives. In sum, the main features of the technology were:

- GP consultation at home
- Easy to use
- On technology that were already familiar (e.g. television or mobile phone)

4.3.4. Digital Chair Exercises

Using the home as a space for engaging with health and well-being was also found in the idea of “digital chair exercises”. The idea holds similarities to the need of a digital consultation in that it would encourage those that are housebound to benefit from the technologies and improve

access to healthcare. In addition, the technology would function again by using the televisions. Jessie (FG1) summarises the idea by saying “*digital chair exercises, somebody sitting and showing how to do exercises on a chair*”. Furthermore, Trina (FG1) identifies some of the features:

Yeah because if you're sat in the house and you're bored and you're on your own but if you've got something that you can switch on and then you're thinking oh that's encouraging me to move and it's a companion as well. Its company, even though its like a television its company for people that use it ... put some music on and show you how to move (Trina FG1)

By providing classes that can be accessed on the television to encourage exercises could benefit those that are isolated in the community. The technology would also not suffer the same limitation as the digital consultation as the exercises could be pre-recorded. In this way, the digital health technology could have some potential to help isolated and housebound individuals stay active. However, it is important to note that without somebody motivating them to engage the residents considered it would be less likely residents would use it.

4.3.5. Community Hub for Healthcare

The usage of the hub was identified as a central space for the residents as it provided them with a number of opportunities. The community hub was, therefore, proposed as a space where the residents could access healthcare as it could help remove many of the accessibility barriers. Although the usage of digital technologies was encouraged, the residents also thought that the community hub could act as a space for face-to-face access to healthcare. For instance, Trina (FG1) proposed it as a place where a health professional could come and visit weekly:

Would be good if there was a doctor that could come down once a week ... like a wee doctor's surgery or a nurse's surgery. (Trina FG1)

Trina's (FG1) it illustrates that physical space could be important in improvements in the resident's access to healthcare. Once again, it emphasises the need of the community to be able to have access to a healthcare worker. However, with regards to digital technologies Olivia (FG1) proposes that localising digital health technologies at the community hub could alleviated both affordability and accessibility issues. She stated when discussing if digital consultations would be beneficial for the community that:

Yeah it would, but if you had it at a community hub because not everyone can afford to get internet into the house. That's just an illusion that everyone has internet. I mean if I took 10

people that I know, probably 3 of them have internet... and we all kind of hook up to who's got internet. (Olivia FG1)

Olivia's (FG1) comments give a crucial insight into how providing access to a digital consultation-enabled device would be beneficial for the community. She notes the issue of physical access once again, however, she also indicates that the resident's solution to limited access is to share devices among each other in the community. Similarly, having digital technology at the community hub for healthcare would be used in a comparable way as the residents are able to collectively use and share the technology if they cannot afford or do not have access themselves. The community hub offers a space where residents feel purpose, gain strong social ties, learn and engage in their health and well-being in various groups. By incorporating digital health technologies into the hub, the hub can also become a space that would be able to fulfil the community's primary health need: access to a healthcare worker.

Summary

The residents were able to creatively produce digital health ideas that would suit their needs. Typically, these ideas were in response to access to a healthcare worker. In sum, the residents suggested a platform to book appointments online, digital consultations and digital chair exercises. There was an emphasis on the technologies being familiar to the residents. Finally, the community hub was suggested as a space for digital health technologies to be accessible and affordable.

Conclusion

In conclusion, the findings reveal the complex, multifaceted context of implementing digital health technologies in a deprived community. There were three main themes that emerged from the data. First, affordability encapsulates the influence that limited financial resources have on the community. The theme reveals that the residents experience a lack of control and sense of disempowerment in relation to the opportunity's and choices available to them. These experiences influence the resident's perspective on digital health technologies revealing that there are more fundamental issues in the community that need to take priority. Second, accessibility is a multifaceted theme that illustrates the complexity of digital technology usage. Within the theme there is the main health and well-being issue identified by the community which is access to a healthcare worker. Many of the subsequent accessibility issues are directly related to access to a healthcare worker. For instance, it was revealed that due to limited public transport the residents were limited in access to healthcare. As such, it highlighted the limitation

of digital technologies in improving health if community infrastructure is not adequate to allow access. Physical access was emphasised as being an issue for many of the older adults in the community. In addition, digital skills were also proposed to be a problem among the same group. However, there was suggestion that digital skills were not enough to utilise digital technologies. For example, accessing health information caused anxiety and was therefore not used. Furthermore, access to the community hub was outlined as being crucial for the everyday life of residents. It offered a space for resilience against the many barriers and lack of opportunities the residents experience. Third, the ideas theme described the technological ideas the residents had. As the main health issue was access to a healthcare worker, most of the ideas were derived from this including digital consultations, booking an appointment online and the community hub for healthcare. Additionally, digital chair exercises and familiar technology was also crucial. Overall, the findings have revealed the complex reality of deprivation and the multifaceted barriers that need to be acknowledged in implementing digital health technology in a deprived community.

Chapter 5 – Discussion

The current chapter discusses the main findings of the study and the implications they have for understanding the digital health needs of a deprived community. First, the theoretical implications of the study are discussed. Second, the practical implications of the study are discussed.

5.1. Theoretical Implications

The present study investigated the digital health needs of a deprived community. From the findings it is evident that there are a multitude of affordability and accessibility factors that influence each other and the residents in a deprived community. In other words, the study revealed a complex assemblage of relations (Fox and Alldred 2016). To recap, throughout the literature review it was cited that understanding the implementation of digital health technology into a deprived community required a multifaceted, relational and nuanced approach.

Consequentially, the findings are discussed by drawing on the basic premise of relational materiality in that materials interact and shape one another. By illustrating these material relations, the multifaceted reality and lived experience of deprivation is mapped out to the reader in a comprehensive way. It is important to note that all of the materials relate to each other in differing ways. However, for the purpose of the discussion the most prominent relations will be emphasised and explored in depth (See Figure 6 for Full Table of Relations). The main materials that were identified from the study are now presented, in no particular order:

Unemployment – Low income – Universal Credit – Community Funding – Opportunities and Choices – Health Behaviours – Disempowerment – Lack of Control – Material Resources – Priorities - Family – Housing – Community Hub – Digital Technology – Access to Healthcare – Relationships – Community Proximity – Public Transport – Food Environment - Digital Skills – Socialising – Community Spirit – Deprivation – Resident – Health Conditions – Environment

Figure 6: Full Table of Relations

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	n/a													
B		n/a												
C			n/a											
D				n/a										
E					n/a									
F						n/a								
G							n/a							
H								n/a						
I									n/a					
J										n/a				
K											n/a			
L												n/a		
M													n/a	
N														n/a

KEY

Stronger Relation
Weaker Relation

A. Sources of finances (unemployment, low income, universal credit, community funding)	B. Opportunities
C. Health Behaviours	D. Disempowerment (emotional distress, affording digital technologies, lack of control, confidence, anxiety, misinterpret symptoms, worried about health, sense of control over health)
E. Resources (affording digital technologies, technologies as luxuries, difficult financial choices, internet data, cost of phone bills, internet access, physical access, digital isolation)	F. Family (priorities)
G. Housing (living conditions)	H. Community Campus/Hub (community events, resilience, education, empowerment, computer classes)
I. Technology design and capabilities (social media, traditional technology, design of technology, perceived usefulness of technology, familiar technology)	J. Access to healthcare (accessing GP, healthcare accessibility)
K. Relationships (residents, workers, GPs, misunderstandings from healthcare providers, effective communication, trusted medical knowledge)	L. Community Proximity (poor transport, built environment, sense of remoteness, transport issues, public transport, food environment)
M. Digital Skills (intergenerational differences in skill, exposure to technology)	N. Socialising (social skills, social isolation, digital isolation, community spirit,)

By referring to previous literature, the relations will be explored and form a crucial insight into deprivation and digital health technology. In short, the section identifies these key materials and the relations they hold. First, external sources of income are discussed including unemployment, low income and universal credit. After, material resources, opportunities and choices capacity to affect are outlined. Then, the relational influence of what can be considered individual factors such as disempowerment, lack of control and digital skills. Finally, relationships, socialising and community spirit is explored in relation to other materials including the community hub. The study provided insight into understanding digital health technologies contribution to health and wellbeing in a deprived community. It is argued that they could exacerbate existing health inequalities for those that are most deprived. The section therefore concludes with a theoretical conceptualisation of these suggestions called the Inverse Digital Care Law. For now, the focus turns to discussing the relational materiality of a deprived community.

Low income, unemployment and universal credit had a crucial influence. As the materials had similar relations to each other they will be discussed together. Within the resident's responses the issues of lack of income and control were attributed to unemployment, low income and universal credit. The opportunities and choices to lead a controlled and healthy lifestyle become limited if there are inadequate sources of income. In addition, they limited the material resources available to afford basic essentials. Also, it contributed to a sense of disempowerment and lack of control over health. These relations raise concerns over the applicability of digital health technologies in deprived communities. There has been a frequent association in the literature between low income and digital technology usage. Generally speaking, those with lower income are less likely to use digital technologies and when they do experience less benefits than individuals with higher income (Hansen et al 2019, Dutton, Blank and Groselji 2013). Brynes (2005) low-pay, no-pay cycle identifies those living in deprivation lack the adequate income to remove themselves from the adverse effects due to low paid work and poor welfare support. In addition, universal credit has been previously cited as leaving individuals without any income for prolonged periods of time (Shildrick 2018). It can be said that sources of income described by the residents have a similar influence on their everyday experience. The residents perpetually experience the effects of deprivation due to these relations. Dahlgren and Whitehead (1991) would argue that these factors have the most influence over an individual's health. It is important however to refrain from emphasising these materials as the most important. As Helsper and Reisforf (2013) state it is crucial to explore the range of reasons in conjunction with each other. For digital health interventions to succeed in a deprived community

requires a nuanced understanding of the assemblage of relations that the technology would be implemented into. Simply stating that low income, unemployment and universal credit are crucial in the everyday experience of the residents is insufficient. Instead, how these materials affect other materials is necessary. To do so, a consideration of material resources is where the discussion next focuses.

Material resources are fundamental for understanding digital health technologies in a deprived community. The influence of the sources of income described above means that day-to-day living and having the material resources to meet immediate essential needs is difficult (Skildrick 2018). Overall, material resource issues forms relations by limiting opportunities and choices, contributing to disempowerment and control over circumstances, impacting health behaviours and access to healthcare. Additionally, as limited material resources worsen some of the issues of deprivation it can have a cumulative impact in the access and usage of digital health technologies. The techno-utopian promise of low cost and accessible healthcare solutions are arguably challenged by these findings.

Digital health technologies are commercialised products requiring material resources to afford them. As such, they are imperatively linked with physical and material access to digital technologies in the community. Physical access to digital devices is crucial for digital health interventions to be successful. Older adults in the community were particularly identified as being digitally excluded due to a lack of physical access. Without addressing the physical access issue then residents in the community have unequal and limited opportunities for accessing digital health technologies. These findings have important implications as only 1.8% of older adults with no home e-device are likely to use the internet (Arcury 2018). Consequentially, those that lack physical access are also unable to access digital healthcare. The design and capabilities of the digital technology and digital skills to use them become insignificant for the residents that experience a lack of physical access. With regards to material resources, justification for not purchasing digital technologies was as the residents had limited funds to allocate towards essentials for meeting their own and family's basic needs. Similar to Baum, Newman and Biedrzchi (2012) the residents perceived digital technologies as a luxury rather than a necessity. Physical access is therefore a critical issue to tackle in order to avoid exacerbating access to healthcare for those that are most vulnerable. Improving material resources are key to addressing the issue. However, it was not a universal issue for all older adults in the community as some residents highlighted having positive experiences accessing healthcare through digital technologies. As a consequence, it emphasises the need to provide equal physical access to all to

avoid widening inequalities in access to healthcare. Material resources also affected material access.

Experiences of material access inequalities were surfaced during the focus group discussions. The findings support previous literature in so far as identifying that the residents were unable to gain access to the digital healthcare interventions despite having physical access to a mobile phone (Van Deursen and Van Dijk 2014). The present study was able to identify the multiple relations involved in material access inequalities that provides insight into how the phenomena operates. One resident (Christie, FG3) described an experience where they did not download an mHealth app suggested by her GP. The reasoning for not purchasing the mHealth solution was due to limited material resources and more prominent responsibilities that took priority over her own health such as caring for her family. These difficult decisions have been identified as a main characteristic of deprivation, particularly for mothers, to pay bills or provide food and clothes for their family (Chase and Walker 2015). Limited material resources influenced by inadequate income has been recognised as causing negative 'spill-overs' into home life that lowers and restricts the individual as being able to provide healthy food choice for their family (Devine et al 2006). Arguably, as the residents struggle to afford basic essentials then the 'spill-overs' are crucial for understanding the capabilities of residents to afford digital health solutions. There is also some suggestion that in order acquire material access then sacrifices to everyday essentials are required. For example, to afford WiFi. Processes of adhering to accepted norms of inclusion by further exacerbating limited material resources and limited essentials are a common experience of those in deprivation (Shildrick 2018). Some residents may do everything they can to have access to digital technologies in order to distance themselves from the stigma and discrimination involved in being labelled deprived and culpable for their situation (Pylypa 1998). Without recognition of these processes then material access inequality may persist and marginalise vulnerable groups from ever reaching the same level of healthcare as more advantaged groups (Van Deursen and Van Dijk 2014). In addition, narrowing the gap in material access may also represent increased disadvantage in other aspects of everyday life. The increased digitisation of healthcare and limited material resources therefore could worsen the issues of living in a deprived community.

As the discussion above highlights, many of the problems and difficulties associated with deprivation are interconnected. Hence, the opportunities and choices enable for residents in a deprived community to better their life chances and health are limited. Material resources are a key influence in the opportunities and choices residents have. Ultimately, the context of

deprivation denies them from having the opportunity and choice to play a full part in society. Access to healthcare is a limited opportunity that was vital for the residents.

The main health and well-being need agreed by the residents was access to healthcare. Subsequently, the focus groups revealed that the introduction of digital health technologies to improve the need would encounter multiple relations that could limit the success of an intervention. The need for access to healthcare was produced, for example, as limited material resources were linked to worse health and well-being by limiting opportunities and choices to have adequate living conditions and a healthy lifestyle. However, the relations producing an increase need to access healthcare are not met with an appropriate infrastructure to meet the requirements of the community. Consequentially, insufficient access to healthcare meant that the residents often felt disempowerment and lacked control over their health and well-being. Access to healthcare, particularly GPs, is an issue for communities experiencing deprivation in Scotland. Importantly, 90% of health care is provided through primary care such as nurses and GPs (Mercer and Watt 2007). However, despite a steep gradient in need, the distribution of GPs is flat across socioeconomic positions (Mackay, Sutton and Watt 2005). Consequentially, deprived communities in Scotland do not receive healthcare to meet their needs. The health profile of Raploch indicates that residents have an unequal distribution of physical, mental and social morbidities that require appropriate medical attention (Scottish Public Health Observatory 2019). Yet, residents in deprived communities are seen less in a day, wait longer to be seen, are less satisfied with their consultation and want to discuss more problems with their GP than more affluent communities (Mercer and Watt 2007). Practices in deprived areas can only increase consultations by shortening the duration or working longer hours (McLean et al 2015). Given the evidence, it is unsurprising that the residents attributed much emphasis on requiring access to a healthcare worker. Simply put, the availability of healthcare does not meet the needs of the Raploch community. Without acknowledging the complex context of deprivation and addressing the material relations contributing to access and usage then an increased reliance on digital health technologies could exacerbate disempowerment, lack of control and poor health experienced for those most in need.

The link between public transport and digital health usage illustrates the value of approaching the issue with a multifaceted understanding and recognising the varied contextual relations that can influence the success of a digital intervention. The residents, regardless of age, felt remote due to limited access and reliance on public transport. These findings are supportive of public transport statistics. Individuals with the lowest income make an average of 101 bus journeys per

year compared to 61 for the average of all incomes. Furthermore, 66% of households on the lowest real income have no cars (Titheridge et al 2014). With regards to digital technology, Goedhart et al (2019) noted that low income mothers did not have the resources to travel far for digital skills training. Additionally, there has been research that indicates lack of access to transport, personal or public, reduces the ability of urban populations to access healthcare (Power 2012). The current study extends these findings to digital health technologies. The residents highlighted that limited transport meant that they had less opportunities and choices. For instance, when using NHS 24/7 to receive health information and advice, the digital technology design became obsolete in improving their health as the resident's opportunities to travel to receive healthcare were limited to certain times. Here, individual factors such as the health condition and digital skills level are embedded and mutually affected by the financial circumstances such as low income and material resources. These factors are also influenced by human relationships such as interaction with NHS operator and the organisational environment including the availability of the GPs. The digital technology affected the residents by illuminating that they had limited access to healthcare, due to limited public transport, causing disempowerment and lack of control. As such, although access to public transport was an important issue in the situation described, it does not act in isolation and instead operates as part of a complex assemblage of relations.

So far, individual factors such as disempowerment and lack of control have only been briefly mentioned. However, these materials are critical for understanding deprived communities and digital health. The following section explores the relations and influence they have with the increased digitisation of healthcare. As Lupton (2017) highlights, in order to understand how different social groups use digital health technology then it is important to consider the notion of health and illness they hold. By comparing the resident's ideals and beliefs with the concept of healthism then a useful insight can be gathered. To recap, healthism is the concept that health is the responsibility of the individual and should be prioritised over other aspects of life (Crawford 1977). Crucially, these ideals are increasingly reflected in healthcare and digital health technologies by shifting the responsibility from state to individual, requiring them to become empowered and in control of their own health (Lupton 2017). Arguably, some of the concepts the residents attribute to health and well-being and digital health are not compatible with the ideals associated with the increased digitisation of healthcare.

There is a challenge in deprived communities towards the shift in responsibility from state to individual. The challenge, however, arises from lacking the confidence and ability to exert control

over their health. For instance, the residents noted that they often became anxious and worried when interpreting symptoms causing them to reject using health information websites. There has been a recognition that digital health technologies can produce anxiety and worry in the user (Ancket et al 2015). In addition, it has been previously noted that socioeconomically disadvantaged groups have a lack of confidence in exerting control over their health (Savage, Dumas and Stuart 2013; Boland et al 2017). Goedhart et al (2019) found that low income and family life limited participants cognitive resources to improve their digital skills. Consequentially, the residents of a deprived community may feel they do not have the individual resources to become empowered and be self-responsible for their own health. Instead, rather than interventions that focus on the individual, the residents required technology that strengthens the patient-doctor relationship. In this way, the residents can become more in control of their health with digital health technology that bridges the responsibility of the state and the individual. However, disempowerment and lack of control over health is complex and exists in relation to limited opportunities, choices and material resources. Limited material resources and multiple responsibilities have been noted above as meaning some residents view the technology as an out of reach luxury. The significance and influence of these relations take precedence over the capacity of the digital technology to provide healthcare, despite the need for access to healthcare. Arguably, then, the residents did not attribute the technologies as being a primary source of healthcare but rather as an additional source. Thus, the residents lack the control over material resources and life circumstances to be able to incorporate the technology into everyday life. As a result, disempowerment and lack of control over health may continue.

Digital skills are another individual factor that affected digital health technology usage in the community. It was stated that intergenerational differences in digital skills existed between the residents. Throughout the digital divide literature, digital skills have been identified as crucial for the successful usage of digital health technologies (Choi and DiNitto 2013). Disadvantaged groups have been found to have difficulty using technologies as they lacked confidence in learning new skills (Baum, Newman and Biedrzycki 2012). Crucially, however, the older adults in the focus groups expressed confidence and motivation to learn digital skills. These findings are contrary to previous literature such as Vromen, Arthanat and Lysack (2015) found that older adults do not use digital technology due to a lack of confidence, low interest and viewing technology as impractical. For the older adults in the focus groups they displayed a lot of interest and perceived the technologies as being applicable for some of the issues in the community. It is important, however, not to generalise these findings to the entire community. The residents

were recruited primarily from the community hub where they have computer access. For the harder to reach residents and those that are digitally isolated, the issue of increased digitisation could further their exclusion from access to healthcare. For example, the literature suggests they could lack the motivation, confidence and skills to utilise the digital interventions (Vroman et al 2015). As such, without the infrastructure for usage such as affordable and accessible technology, digital skills and motivation for usage are limited in narrowing digital inequalities as they are part of a complex assemblage of relations. None the less, there are some relations that provide resilience to the disadvantages experienced by the residents.

Socialising and relationships were pivotal for resilience against the adverse effects of deprivation. These materials affect material resources, empowerment, opportunities, health behaviours, community hub and digital skills. Unlike the other relations, it can be argued that socialising and relationships contributes to improving health and well-being in the community. Resilience is needed to manage the day-to-day living on low income and meet essential and immediate needs (Skildrick 2018). The community hub acts as a place for resilience and empowerment.

The residents noted the importance of socialising at the community hub for improving health opportunities and choices. For instance, it encouraged them to stay active by attending groups and computer classes. Interventions that are located at the community hub are strengthened due to the community spirit by building social cohesion and mutual support. For example, the support of other residents and community workers made the residents feel comfortable and confident to use the computers and improve digital skills due to their openness and friendliness. Baum, Newman and Biedrzycki (2012) found a similar association between digital skills and strong social connections as they were seen to reduce digital exclusion, however, the exclusion is intensified if they do not have networks that include people with digital skills to learn from. Furthermore, it has previously been demonstrated that having access to community centres with trusted community workers and an area for socialising were important to encourage learning digital skills for low income individuals (Goedhart et al 2019). Additionally, supportive family and friends have been exhibited to improve attendance of computer classes in older adults (Huber and Watson 2014). By attending computer-based classes lower socioeconomic status older adults have reported decreased technological anxiety (Campbell 2009). The older adults noted that computer classes were available and attended at the community hub. As such, this could explain the confidence and perceived usefulness of digital technologies. Although there were instances of age-based perceptions (Vroman et al 2015), instead of these being a deterrent to

the older adults in the focus groups it was only mentioned to highlight differences between themselves and younger residents' digital skills usage. Similarly, the community hub holds key relations that could explain the difference in physical access.

As previously stated, physical access to digital devices was not viewed as a universal issue for all older adults in the community. Possible explanations could be that the residents who have physical access are active and engaged in the community and the community hub. The suggestion that older adults with strong social networks are more likely to use digital technologies also supports these findings (Huber and Watson 2014). Furthermore, the community groups were said to occasionally inform the residents of important information on social media, suggesting they had access and were competent in using the platform. Conversely, the older adults that were more vulnerable, housebound and isolated were arguably excluded from participating. The residents noted that those that lacked strong social ties and were less active in the community were more digitally excluded. Thus, the community hub and strong social relationships are a valuable asset for digital technology usage and provide some resilience against the adverse effects of deprivation by empowering the residents.

The importance of social connections and support is clearly demonstrated. However, those that are isolated and do not attend the community hub may be further excluded from opportunities. The study and previous literature have showcased that digital exclusion is intensified if they do not have other individuals to encourage and motivate them to use and access digital technologies (Baum, Newman and Biedrzycki 2012). Without having strong social connections such as those formed at the community hub it can be inferred that residents who are isolated may be less likely to use digital technologies. Thereby, producing an inequality in digital technology access and usage between the residents that have strong social ties and those that are more isolated. It is important to note that the community hub is funded and without the external funding the relations formed that benefit the residents would also break down. In this way, community material resources can only be benefitted with the assistance of funding and support. Overall, the community hub is part of a complex set of relations that is vital to alleviate some of the adverse effects of deprivation.

Inverse Digital Care Law

To summarise the theoretical implications of the discussion, the attention is drawn to the development of a new understanding of digital health and health inequalities called the Inverse Digital Care Law. The discussion has established that there are a multitude of relations that can

influence the most deprived from accessing equal digital healthcare. Consequentially, it raises concerns on its contribution to widening, rather than narrowing, health inequalities. The Inverse Digital Care Law provides a suggestion to the ways digital health technology could contribute to health inequalities. The Inverse Digital Care Law is adapted from Julian Tudor Hart's Inverse Care Law (1971). The key premise of the original law is summarised in the statement that "the availability of good medical care tends to vary inversely with the need of the population served" (Hart 1971). The law is therefore very applicable to the study. It is worth acknowledging that as far as the researcher is aware, digital health research has not applied Hart's law to the increased digitisation of healthcare. Therefore, the literature review did not make reference to the theory. Consequentially, justification must be made for introducing the law as having a central role in understanding the findings. The study investigated a relatively unexplored area. It was therefore important to utilise grounded theory for its capacity to make new discoveries. Thus, the purpose was not to deductively investigate an existing theory but rather to inductively interpret and develop a new theory grounded in the data (Charmaz 2006). In this way, the study has produced new discoveries that previous literature on the digital divide has so far not conceptualised. Simply put, the Inverse Digital Care Law adopts and redefines Harts (1971) original law to: The availability of good *digital* healthcare tends to vary inversely with the need of the population served.

Arguably, the multiple health conditions experienced in a deprived community suggests they would most benefit from successful digital healthcare interventions. However, there are multiple, complex relations that must be addressed to avoid exacerbating health inequalities in those that are most in need. Similar to Baum, Newman and Biedrzycki (2012), it is suggested that if residents are limited in using and accessing digital technologies an exacerbation of existing inequalities would occur. As such, if healthcare increasingly relies on digital health, without appropriate funding and understanding to address the complex needs of a deprived community could mean that their needs will only be partially met. Ultimately, a failure to meet the needs of the community could result in health and well-being issues remaining and worsening. The Inverse Digital Care Law predicts that the conversion of healthcare onto digital health technologies could disproportionately disadvantage those in the most deprived communities and with the greatest healthcare needs, while benefitting those that are more affluent and have greater access to healthcare that meets their needs. Overall, without recognising the complex assemblage of relations in a deprived community then digital health technology access and usage could remain unequal. Consequentially, it could contribute to widening health inequalities,

rather than narrowing them. Thus, the Inverse Digital Care Law provides an important conceptual platform that should be further investigated within different deprived communities.

5.2. Practical Implications

One of the main purposes of the study was to identify how residents of a deprived community can be empowered to take advantage of digital health technologies. As discussed above, the implications of the study suggest that without appropriate support then the technologies could exacerbate health inequalities by providing unequal access to healthcare. However, the investigation is advantageous as it also provides insights into how these adverse effects could be alleviated. The following section makes recommendations for future digital health interventions with supporting evidence from both the current study and other literature.

Digital Health Interventions

Any macrostructural policy that tackles the fundamental causes of health inequalities would be beneficial to improving access and usage of digital health technologies. However, it is recognised the complexity of these policies and that they rarely have the sole purpose of reducing health inequalities (Whitehead 2007). There are, though, interventions that can be implemented that could alleviate some of the effects of digital inequalities as it is a multifaceted issue. The introduction indicated that both the *Health Policy Inequalities Review (2014)* and *NHS Health Inequalities Action Framework* suggests that community and individual experience level sources can be targeted to mitigate the health consequences of social inequalities. As such, the following interventions will not solve the underlying issues that cause digital and health inequalities such as income inequality but can provide resilience by improving affordability and accessibility to digital health technologies. Interventions that target these sources could be valuable for Raploch as they are useful when the residents express a sense of disempowerment and lack of control over their lives (Whitehead 2007).

Community Hub

Digital health interventions that are located at the community hub have the potential to ease a number of the issues outlined by the residents. The community hub could be used as a space for digital health technologies to be affordable and accessible with appropriate support. For example, some of the residents suggested having the opportunity to access a video consultation with a GP at the community hub. However, they did not specifically design the intervention, possible ideas could be a private booth that is located somewhere in the community hub. It can be said that providing digital health technologies at the community hub could help those that lack physical or material access to the technologies by providing an infrastructure for usage. Additionally, implementing digital health interventions at the community hub is easily accessible

and lessens, to an extent, the public transport issue for accessing a healthcare worker. Elsewhere it has been noted that reducing financial barriers to travel is useful in addressing inequalities as it provides more opportunities that can be reached (Titheridge et al 2014). Therefore, providing the opportunity to access a healthcare worker within walking distance is valuable. Furthermore, it provides a space for the residents to receive digital skills training. However, there is the risk that informal support is unhelpful for those that have the lowest skill level (Helsper and van Deursen 2017). With appropriate support, though, the community workers could be trained on how to effectively communicate and teach digital skills to the residents. Alternatively, the technology implemented could be designed to match the digital skills level of the intended user (Norman and Skinner 2006). Overall, it is recommended that community hubs should be incorporated into future digital health interventions in deprived communities to alleviate issues such as lack of material resources, physical access, material access, digital skills and limited public transport.

Doc-Box

The resident's ideas and support from previous literature forms and develops the recommendation for a future digital health technology intervention called Doc-Box. The researcher has incorporated the three principle ideas that the residents suggested into an intervention that matches some of the needs of the community. Doc-Box is an internet enabled webcam device that connects on top of the user's television at home. The technology provides the resident with access to their GP via video consultation from home. To book an appointment with the GP the Doc-Box is designed with an in built 'drop and wait' feature that allows residents to select a specific time available to them on screen using a simple remote. In addition, Doc-Box also incorporates the 'digital chair exercises' idea in two different ways. First, it provides a connection to physiotherapy. The features would benefit those that need access to the physiotherapist to perform exercises but struggle to attend appointments due to limited mobility. Second, pre-recorded exercises can be saved onto the device to allow access to exercises that could improve the health and well-being of the user. The key focus of the technology is access to a health care worker. By utilising familiar technology such as the television and a simple remote it could make residents feel more confident in using the healthcare service. The remote and features should be designed to match the intended user's digital skill level.

Doc-Box could help isolated and housebound individuals in the community. It is crucial as reaching the more vulnerable residents in the community could help to avoid exacerbating

existing inequalities, particularly isolated older adults. For instance, socially isolated older adults are more likely to die prematurely, have worse mental health and be socially disengaged (Steptoe et al 2013). However, literature has shown that digital therapy can be effective in reducing hopeless and suicidal ideation in low income, housebound adults suffering depression (Choi et al 2014). These findings indicate that isolated older adults can be helped using digital health technologies. The digital technology is not limited to isolated older adults, though, as the residents in the discussions advocated the idea for all residents in the community.

In terms of effectiveness, doctor-patient communication has been shown to be the same in both web-based and face-to-face consultations indicated by information exchange, interpersonal relationship building and shared decision making did not differ between web-based and face-to-face consultations (Tates et al 2017). Furthermore, NHS Scotland have recently launched the Attend Anywhere system that is similar to the community co-design ideas (Attend Anywhere 2019). It offers consultations that patients can attend anywhere by entering a virtual waiting room where the GP selects the patient and a video consultation is conducted. However, although NHS Forth Valley (the territorial board that includes Raploch) have had consultations in diabetes and primary care, the call volumes are low. As such, the service is still at the testing stage. None the less, the majority of territorial boards now have Attend Anywhere implemented into their health service and the user feedback is positive. In a survey of 522 users, 98% of them said they would use the service again. Furthermore, there were a multitude of travel savings. Video consultations can therefore be said to be effective in accessing a healthcare worker and has positive patient feedback. Doc-Box could therefore be beneficial for those living in deprived communities such as Raploch. However, it is important to note that these are only baseline findings. There will be technological design factors that have not been included in the scope of the suggestion. The intervention requires appropriate support and insight from those that specialise developing and designing digital health technology.

Moreover, without community funding and financial assistance it is unlikely that residents can become empowered to use digital health technologies. The interventions suggested above would be unable to be implemented without the appropriate support to combat the multiple disadvantages experienced from deprivation. Wi-Fi is fundamental for usage but the residents noted many older adults did not have access. Therefore, Doc-Box would be unable to provide access to healthcare for the residents lacking Wi-Fi. It has been found elsewhere that providing Wi-Fi and removing financial barriers benefits the most socially disadvantaged groups (Katz, Moran and Ognyanoca 2019). As such, it is crucial to approach any intervention in communities

experiencing deprivation with sensitivity as Doc-Box could also have the potential to widen inequalities in access in those that are already excluded due to lack of Wi-Fi. Arguably, community funding of Wi-Fi could be an ambitious but crucial necessity for the implementation of digital health technology in the community. Without Wi-Fi, the interventions could reinforce the unequal access for those that have the most health needs.

Summary

There are practical implications that developed from the study that could mitigate some of the effects of inequalities. First, by providing digital health technology interventions at the community hub material resources, physical and material access, public transport and digital skill issues could be alleviated. Second, Doc-Box is an internet-enable digital health technology that would provide video consultations with GPs and physiotherapy. In addition, it would be familiar and simple to use to match the resident's skills level. However, these practical implications cannot be developed without the appropriate support. The multifaceted experience of deprivation requires interventions that have a multifaceted response. Therefore, community funding and more in-depth understanding is required.

Conclusion, Limitations and Recommendations

In conclusion, the thesis explored the digital health needs of a deprived community. By adopting a qualitative approach, the study revealed the complex and multifaceted context of deprivation and the implications of the increased digitisation of healthcare for a deprived community. The resident's experiences and interpretations brought the complexity of implementing digital health technologies into focus. To become empowerment to use the technologies then the multiple hardships and disadvantages the residents face must also be addressed.

The findings revealed that the residents have limited material resources to adequately meet their needs. Unemployment, low income and universal credit were catalysts for these relations by exacerbating a multitude of issues experienced by the residents. For example, they experienced a lack of control and a sense of disempowerment over the opportunities and choices available to them due to limited material resources. The residents therefore viewed digital health technologies as being an out of reach luxury because other priorities and responsibilities took precedence when allocating their limited resources. Accessibility is multifaceted and illustrated the complexity of digital health technology usage. Affordability factors, access to a healthcare worker, limited public transport, physical access, socialising and digital skills interacted and co-shaped the experiences of the residents to illuminate the multiple challenges and disadvantages they faced as a community. In addition, the community hub was advocated as providing resilience against some of the hardships they encountered. Overall, the study contributed to making new discoveries and provides an infrastructure to understanding digital health and deprivation.

Previous digital divide literature is arguably still underdeveloped with regards to understanding the implications that the increased reliance on digital health will have on those in the most deprived communities. Despite there being a body of quantitative and clinical trials research on digital health and inequalities, there was a requirement for constructing the underlying processes that operated the inequalities. By investigating the resident's interpretations, concepts, beliefs and opinions on the everyday experiences of deprivation, health and digital technologies a rich assemblage of relations was discovered.

The study challenges the perception that digital health is the panacea to many of the health issues in society by revealing how such a stance overlooks the complexity of everyday life for the residents. As such, it is crucial that research and policy refrains from assuming digital technology is the driving and most important force in the future of healthcare. By isolating the design and

capabilities of technologies to empower behavioural and lifestyle changes then the increased digitisation of healthcare may put additional strain on those that live in disadvantaged circumstances and have a lack of control over their life. Consequentially, sociological enquiry is pivotal as it broadens and deepens the scope of relevance to encapsulate the intricate and complex reality of living in a deprived community. Without an acknowledgement of the complexities, the Inverse Digital Care Law predicts that the conversion of healthcare onto digital health technologies will disproportionately disadvantage those in the most deprived communities and with the greatest healthcare needs, while benefitting those that are more affluent and have greater access to healthcare that meets their needs.

Healthcare in Scotland is entering a new era that is shifting the responsibility from the state to the individual more than ever before. However, the promises of increased empowerment and control over health by using digital health technology needs to be critically problematised as it has serious implications for residents living in deprived communities that lack the affordability and accessibility related infrastructure to do so. Without addressing and further understanding these issues then digital health technology access and usage will remain unequal. Thus, the increased digitisation of healthcare could contribute to widening health inequalities, rather than narrowing them.

Limitations and Future Recommendations

There are a number of limitations of the study that require to be outlined. First, the majority of participants that were recruited attended groups at the community hub. However, the researcher noted reaching saturation while recruiting in this way as the same residents attended the groups. Limited samples such as this can be problematic as it excluded residents that do not engage with the community hub. For instance, the researcher was unable to recruit any residents aged between 18-25. The community workers stated that there was a lack of engagement of this age cohort in the community hub. As such, the data was provided by mostly older adults that were highly motivated and engaged in the community. Furthermore, the younger cohort interviewed (aged 26-49) were also engaged in the community hub. Future research should allow more time to the recruitment process and identify ways that could expand the scope of recruitment to those that are less engaged with the community. In doing so, there can be a greater understanding of the needs of young adults living in deprivation and more difficult to reach populations.

Second, the study is limited in explaining the reasoning behind differences between the residents interviewed. For example, why physical access was an issue for some older adults and

not for others. It can be argued that the investigation would have benefitted from applying a more in-depth intersectionality approach to the participants by documenting their household income and educational attainment. There is suggestion that some digital technology uses are only influenced by education and others by income (Blank and Lutz 2016). By doing so, in group comparisons could have provided more in-depth explanations. Future research in exploring the digital health needs of deprived communities would benefit from applying such an approach.

The current study is benefitted in its application of a relational materiality in understanding of digital inequalities in the discussion. However, future research in exploring digital inequalities would benefit from applying the approach and being distant critics of digital health interventions by examining the multiple relations in the real-world setting (Marent, Henwood and Darking 2018). Future development and trialling of the digital health technology, such as Doc-Box, could adopt an ethnographic approach to establish a more in-depth understanding of the multiple relations involved in usage. For example, studies on the domestication theory have shown the complexity of implementing technology into the home setting (Carter, Green and Thorogood 2013). Utilising domestication or new materialism analysis and co-design interviews to understand the nuances involved in using the Doc-Box in a household within a deprived community would be valuable. Doc-Box could therefore be further co-designed by residents and implemented back into the community. Overall, research that adopts similar methods would illuminate how the technology operates and contribute to designing a digital health intervention that specifically and effectively meets the community's need to access healthcare.

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Appendixes

Appendix 1 – Participant Information Sheet



Information Sheet for Participants

Welcome to my research project and thank you for considering to participate! Before we begin it is important to note that you should only participate if you want to. If you choose not to take part or withdraw it will not disadvantage you in anyway. The purpose of this sheet is so you can understand why the research is taking place and what participation will involve. Please take time to read the following information carefully, or have it read to you, and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. After, you will be asked to sign consent form.

Aims of this project

The research will investigate what the digital health needs are of the community. Digital health involves any technologies can be used to track, manage and improve our health. However, it has been found that these technologies have often failed in improving health and well-being due to a lack of consideration about the needs of the communities and individuals they are intended to help. Therefore, you have been invited to share your views and experiences to understand how you feel digital technologies could be used to help the health needs of the community.

Procedure

As part of this study, you will be in a group of 8-10 individuals and the discussion will take around an hour and a half. I will lead the discussion and ask several questions about your experiences of living in the Raploch, what the health and well-being issues of the area are and how digital technologies could be used to resolve these. There is no right or wrong answer during these discussions, I am simply interested in your opinion on the subjects discussed and feel free to share your opinion even if it differs from what others have said. This event will be audio-recorded with your permission and notes will be taken throughout. What you say during the discussion will remain confidential, and no names or information about yourself will be included in the final report. The recordings will be transcribed by myself and analysis will involve finding common views and perspectives that people have said and merging these together. After, the results will be used as findings and written up in a report.

Confidentiality

Anything that you discuss will be managed and stored in accordance with current data protection regulations. The recordings will be securely kept on a password protected computer and I will be the only individual that has access. These will be deleted after transcripts have been made. All participants will be asked to respect the confidentiality of the other participants and not disclose any content discussed. As mentioned above, if you agree to take part, but then decide to withdraw, then that is no problem. Once the focus group has been completed, however, then data cannot be withdrawn.

Benefits and Risks

As a participant in the event you will receive a £20 gift voucher. You will also be provided with free refreshments throughout the event. By participating you can provide information that could be used for future developments in the area. There are no risks anticipated beyond those experienced during an average conversation. However, as the discussion will be about health this may lead to some sensitive material being shared.

Yours Sincerely,

**PARTICIPANTS FROM
RAPLOCH NEEDED FOR
RESEARCH ON DIGITAL
HEALTH**



To learn more about this study, or to participate, please contact:

Scott McVean

s.mcvean@rgu.ac.uk or

07795175025

Appendix 3 – Participant Leaflets

What is Digital Health?

Digital health is a term used when talking about any technologies that can be used to get information about your health, monitor your health, used to improve your health or help promote healthy behaviours.

PARTICIPANTS NEEDED FOR RESEARCH ON DIGITAL HEALTH



Who are we looking for?

We are looking for people aged 18 and above who are currently living in the Raploch area.



What will you be asked to do?

You will be invited to an event which will include around 8-10 other people from the Raploch. The event will be a casual conversation about the community's health and well-being needs with the main focus being on how digital technologies could be used to help. The chat will be audio recorded with your permission. Don't worry, there is no right or wrong answers, we are only interested in your experiences and opinions.

Your participation is **entirely voluntary** and would take up approximately 1 and a half hours.

What is in it for you?

In appreciation of attending the event you will receive a £20 supermarket gift voucher. Refreshments will also be provided throughout the event. You also get the opportunity to voice your opinion which will help lead to a greater understanding and potential future developments in the subject.

To learn more about this study, or to participate, please contact:

Scott McVean
s.mcvean@rqu.ac.uk or
07795175025

Appendix 5 – Community Event Activity Log

<p>01/05/2019 2.5 hours with community</p>	<p>Attending first community event which was intergenerational gardening. Met around 8 members of the community and 4 signed up, with another willing to join but never signed paper. Handed out leaflets to each of them to consider joining in and allow plenty of time. All 50 and over. Monday afternoon or Friday afternoon is probably best for them.</p>
<p>02/05/2019 1.5 hours with community</p>	<p>Attending a singing group. Explained research to around 6 woman and handed out leaflets to all. One person that had previously put name down pulled out as not from Raploch. Activity was singing with school children. Will be back next week to try get some participants. Happy hearts at 10 on Tuesday.</p>
<p>08/05/2019 0.5 hours with community</p>	<p>Met with participants I had previously spoke to and confirmed a date for the first focus group. Monday 27th May @ 2PM.</p>
<p>09/05/2019 0.5 hours with community</p>	<p>Met with participants before the singing group and got 3 more for 27th May focus group. All of them are 50+. Total of 6 confirmed and 1 maybe. Happy Hearts on Monday hope to get at least another 1.</p>
<p>15 and 16/05/19 0.5 hours with community</p>	<p>Room availability changed so had to organise a new time/date they could all manage. Focus group is now in meeting room 1 between 2.30 to 4.00 on Monday 3rd June.</p>
<p>26/06/19 1 hour with community</p>	<p>Met with parents at the local church and outlined the purpose of study. Met around 8 people, all signed sheet and put down contact details. Handed out leaflets for them to consider appropriate time.</p>
<p>Total: 7 hours</p>	



ROBERT GORDON UNIVERSITY

Consent Form for Participants

Name of Participant:

Name of Researcher: Scott McVean

I would like to thank you for considering to take part in this research. I am required to fully explain the research project before you agree to take part. Participation in this study is voluntary. If you have any questions about the information sheet or my explanation of the study, please let me know before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

	Please Initial Box
I have read and understand the study information, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	
I understand that if I decide at any time before the research data collection that I no longer wish to participate, I can notify the researcher and withdraw immediately without giving any reason. I understand that due to the nature of the discussion that it may not be possible to withdraw what I have said after taking part.	
I consent for photographs to be taken during the discussion activities.	
I consent that my participation will be audio-recorded. I understand that the recording will be handled in accordance with current data protection regulations.	
I understand that the information I provide will be used for a thesis and the information will be anonymised.	
I understand that any personal information that can identify me will be kept confidential and not be shared with anyone.	
I consent to my information being anonymously stored for use in future research.	

Please feel free to write any additional requests regarding the usage of data in the space below:

Participant signature:

Date:

Investigator signature:

Date:

For information please contact: Scott McVean at s.mcvean@rgu.ac.uk or 07795175025.



Debriefing Form

Thank you for your participation in this study! If you have further questions about the study, please contact myself, Scott McVean, at s.mcvean@rgu.ac.uk or 07795175025. In addition, if you have any concerns about any aspects of the study, you may contact my research supervisor Chris Yuill at c.yuill@rgu.ac.uk.

Please let me know if you would like to be kept updated with the research process and the findings. Also, you have the opportunity to attend a dissemination event in January 2020 where I will present the results of the research to members of the Digital Health Institute, policymakers, designers and developers. If you would also like to discuss your experiences and feelings on the topic at the dissemination event please let me know and I will be in touch to organise this.

If you feel concerned or upset about any of the topics discussed during the event, please feel free to contact me for options on support and counselling. Alternatively, you can also phone the Samaritans on 116 123 for free. Samaritans are a registered charity aimed at providing emotional support to anyone and offer support on any type of emotional distress.

Thanks again for your participation, your contribution is greatly appreciated.

Yours sincerely,

Scott McVean

Appendix 8 – Question Guide for Researcher

Introduction: 10 Minutes

1. Tell me your name and one thing you enjoy doing in your spare time (2 mins).

Reason

- To make participants feel comfortable
- To identify who is speaking when I transcribe
- To get participants to speak in a group

2. What is your idea of good health and well-being? (10 mins)

WHAT – asking for information specifically about good health and well-being

IS YOUR IDEA – What do they think? This can be from individual/personal, health of close others, community or society. An open question.

GOOD HEALTH AND WELL-BEING – Focuses on the positives rather than BAD health.

ANTICIPATED TOPIC DISCUSSIONS:

- Physical and mental health
- Being in shape; Self-care; Taking care of yourself; balanced lifestyle;
- Happiness; stable; happy home and work life; having help and support
- Active; diet; exercise; alcohol; smoking
- Access to good healthcare

Q: What do you mean?

Follow up – You talked a lot about looking after yourself and your own choices, do you think having the good health and well-being is also having the opportunities to be healthy?

3. Think back, how would you summarise your time living in the Raploch? (10 mins)

THINK BACK – This can be at any time. The here and now or to another time, or your general feelings throughout your time in the Raploch. What ever comes to your mind is completely fine.

How would you summarise – thoughts and feelings

Your time (changed from experiences)- same as THINK BACK

Living in the Raploch – Broad and whatever comes to your mind. Does not have to be about health but if that is what you think then that is okay. Your own personal experiences; how the community has changed over time; your relationships with people; events that have happened.

4. Can you list what you think the main health and well-being issues of the area are? (15 mins)

List – Just write down any health and well-being issues that come to mind.

Issues – By issues I mean health and well-being I mean any problems or characteristics of the H&WB that could be improved in the area.

Area (as a whole)- Concentrating on the issues that most impact the community, not asking about specific personal experiences.

5. Can you think of anything healthcare solutions that have or haven't worked well in the area? (10 mins)

Important to try wait for examples. But if not see below.

Health care solutions- Anything that has been implemented or started in the community to try improve your health. This can range from larger government policies to things happening in the community. Things that offer lifestyle changes or support.

6. Introducing the idea of digital solutions. (5 mins)

First introduce DT – Then DTS for health – Then Examples.

Digital technologies - Digital technologies is a very broad term and can be used to describe electronic tools, systems and devices. Well known examples include computers, mobile phones and social media.

Digital health technologies - Using technology to help improve individual's health and well-being.

Are digital technologies involved and is there an impact on health, healthcare or living? (Maybe write this up)

EXAMPLES

Accessing health information online – search engines, health and medical-related websites, online. Social media forums.

Communicating to healthcare providers through digital technologies (e.g. smart TV, mobile phone, email) – messages, emails

Wearable devices and Apps (FitBits, Apple Watches, Glucose Monitor)– that collect detailed information about the body, track your activity levels and monitor your body such as tracking your heartbeat. Delivering pharmaceuticals or regulating/enhancing bodily functioning. Track your diet, sleep and exercise e.g. fitness and wellness management. Apps to mindfulness, mental health and well-being. FW for full list of apps.

Personal emergency response systems- used to alert caregivers or healthcare professionals if the user has a medical emergency at home

Gaming technology for fitness and health

Sensor based environmental monitoring systems

7. Do you think digital technologies could work in improving the health and well-being issues of the area? (20 mins)

8. Building on this, if you had the opportunity to design a piece of digital technology or implement an existing one into the community, what would the technology do? (20 mins)

9. Jot down on a piece of paper one phrase or one sentence that best describes how you feel about digital technologies potential impact on the community's health and well-being. (5 mins)

Appendix 9 – Activity Sheet for Participants

Discuss in groups of two or three your responses to these questions. Please write down your responses to the questions. This can be written in words, sentences, examples or even pictures. Once you have answered these questions, I will bring the groups back together where we will discuss your responses as a whole group.

Activity 1

Question 1: Think back, how would you summarise your time living in the Raploch?

Question 2: Can you list what you think the main health and well-being issues of the area are?

Activity 2

Digital health technologies can be described as technologies to help improve health and well-being.

A useful way to find out if something is a digital health technology is to ask yourself:

Are digital technologies involved and is there an impact on health, healthcare or living?

Question 3: Do you think digital technologies could work in improving the health and well-being issues of the area?

Question 4: If you had the opportunity to design a piece of digital technology or implement an existing one into the community, what would the technology do?

Appendix 10 – Table Displaying Participants responses to the question: “Jot down on a piece of paper one phrase or one sentence that best describes how you feel about digital technologies potential impact on the community’s health and well-being”.

Resident	Focus Group	Comment
Angela	1	Could have a place in health and well being in the future, but only if accessible to everyone.
Trina	1	Digital technology is brilliant but more security is needed to safeguard the persons using the technology. It is definitely the way forward.
Olivia	1	To help poorer people make it available to all people at the hub or campus.
Jim	1	Website: Lets you job search and learning things knowing what’s going on. It’s the future.
Jessie	1	Digital technology is a good thing for the future if available for everyone.
Robert	1	It would make a positive impact on people who are isolated and infirm.
Grace	1	I think the new technologies for the future of the environment and for us are a good thing.
Leslie	2	Could help people come together to discuss various issues.
June	2	Definitely very good
Lewis	2	Digital technologies could help prevent problems before they arise.
Peter	2	Large impact, over all things is the thing of the future.
Alannah	2	Digital technologies could help the community health by informing the dangers of over indulging in drink.
Cathy	3	Beneficial to younger generation
Sarah	3	Beneficial when supported
Linda	3	It will be good if benefits young and old
Christie	3	Beneficial and teachable when supported