A description of midwives' perceived roles in health educating pregnant women at Primary Healthcare Clinics in a Sub-District of eThekwini, KwaZulu-Natal, South Africa.

ETHICS: HSSREC/00000181/2019

Submitted to the School of Nursing and Public Health, College of Health Sciences, University of KwaZulu-Natal, South Africa in partial fulfilment of the degree for Coursework Masters in Nursing (Advanced Midwifery, Maternal and Child Health Nursing)

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2020

DECLARATION

I, Sanveer Ramnund, student number 209529175, declare that:

I. The research reported in this thesis, except where otherwise indicated, is my original research.

II. This thesis has not been submitted in part, or whole, to UKZN or any other tertiary institution for purposes of obtaining an academic qualification, whether by myself or any other party.

III. My contribution to the thesis was as follows: I read deeply on the topic to arrive, with supervision, at the conceptualisation of the topic, the design of the study, and data collection methods. I solely liaised with the research sites for access and co-operation in the study. I headed the data collection, led the compilation of the thesis, and the analysis of the data.

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VII. This original piece of work is submitted for Coursework Master's Degree in Advanced Midwifery, Maternal and Child Health.

Signature:  Date: 10/06/2020

Discipline of Nursing, School of Nursing and Public Health, College of Health Sciences, University of KwaZulu-Natal, South Africa.

This dissertation has been examined and approved for submission.

Supervisor: Dr OB Baloyi

Date:09 June 2020

Co-supervisor: Dr M A Jarvis

Date 09 June 2020

DEDICATION

This thesis is dedicated to my parents, Rakesh and Reka, who always encouraged me to pursue my hunger for knowledge and always made sure I never gave up during the hardest of times; my granny, Pramilla, who was my pillar of strength during the times when I was almost ready to give up; my sister, Saiyuri, who always reminded me how smart I am and held my hand throughout this Masters; my Uncle Vishal, Aunt Twinkle, baby cousins Rishay and Ayan for being my biggest supporters during this Masters; finally my baby, Cuddles, who always kept me smiling.

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ABSTRACT

Introduction and background

Antenatal care (ANC), the care preceding birth, is described as a careful, systematic assessment and follow up of pregnant women through their pregnancy, culminating in the delivery of the foetus (Al-Ateeq and Al-Rusaiess, 2015). Health education has shown it can result in better pregnancy outcomes (Al-Ateeq et al., 2015). ANC health education is frequently conducted in PHC clinics by midwives (Phillips, 2014; Susuman, 2015), but with the advent of mHealth, it is not confined to the PHC setting (Skinner et al., 2018; Susuman, 2015).

Aim/Purpose

The aim of the study was to describe midwives' perceived roles in maternal health education and their acceptance of mHealth in health educating pregnant women during and between antenatal visits at Primary Healthcare clinics in a sub-district of EThekwini, KwaZulu-Natal, South Africa.

Methodology

A quantitative approach was used, with an explorative and descriptive design, framed within a merged model of Donnabedian's quality framework and the Unified Theory of User Acceptance of Technology (UTAUT) model. Purposive sampling selected a sub-district of eThekwini, and the participating midwives and unit managers. Data collection occurred over three and a half weeks, in February 2020, using a self-administered questionnaire with the midwives and a researcher-developed survey of the health education landscape with the unit managers. The four-part questionnaire included two validated scales to measure health education (Aldossary et al., 2013) and mhealth (Yakubu et al., 2019). Findings were grouped according to the sections of the questionnaire, namely Section A: Demographics, Section B: Roles and perception of health education, Section C: Acceptance of technology and mHealth in the PHC clinic and Section D: Actual health education conducted. Data was entered into IBM SPSS version 24, and descriptive and inferential statistics calculated. All ethical considerations were adhered to.

Results

Response rate was 88.5% (n= 92) for the completion of the self-administered questionnaire and 16 surveys of the health education landscape of the PHC clinics The mean age of the respondents was 39 years, with the majority of midwives being female (87%). Responsibility of midwives (*m*= 18.17/24 [*CI95%* 17.68-18.67]) was the highest of the subscales, emphasising the important role that midwives play in health education towards pregnant women. Performance Expectancy (*m*= 16.61/20 [*CI95%* 15.92 – 17.29]) was the highest of the mHealth

subscales. Significant differences were found in the midwives >50 years of age for responsibilities of midwives, and in the male midwives for responsibilities of midwives and perceptions of patient's responses to health education and midwives perceptions of their role in delivery of health education. During the survey of the health education landscape in the PHC clinics (n=16), the midwives mainly focused on ANC care with 730 sessions conducted in PHC clinics, but less mHealth registrations (n=22, 23.9%). Maternity health policies were available in all clinics (n=16), but just over half (n=10; 62.5%) were able to provide policies on mHealth.

Conclusion

The study identified both structure and process related information in its description of midwives' perceived roles in maternal health education and their acceptance of mHealth in health educating pregnant women during and between antenatal visits. Structurally, mHealth polices need greater visibility in the clinics and increased facilitating conditions, such as support for the midwives for mHealth. In particular, midwives older than 50 years and male midwives could add further resistance to the seamless implementation of health education, when utilising both digital and face-to-face approaches. However, from the process perspective of quality care, the midwives showed positive perceptions towards both their roles and responsibility in health education, with high Performance Expectancies of a mHealth application to deliver maternal health education. The level of Performance Expectancy can be drawn on in the COVID-19 pandemic, to ensure continued maternal and neonatal health, despite constraints brought about by social distancing and thereby mitigate against increased maternal mortality rates.

Recommendations

Studies to identify mitigating circumstances and barriers towards mHealth applications as well as further investigation towards male midwives perceptions of their roles, and responsibilities towards maternal health education.

Limitations

The use of one district resulted in a small number of clinics and respondents. During this study the Chronbach α scores of the highest subscale 'responsibilities of midwives' was low (α= 0.37), thereby affecting the generalisability of that subscale to the population of studies.

Key words:

Antenatal education, barriers, health education, mHealth, Midwives, Midwifery, perceptions

ABBREVIATIONS

ANC	Ante-natal care
AU	Actual Usage
BI	Behavioural Intentions
CARMMA	Campaign of Accelerated Reduction of Maternal and Child Mortality in Africa
EE	Effort Expectancy
eHealth	Electronic Health
FC	Facilitating Conditions
ICT	Information and communication technology
ITU	International Telecommunication Union
KZN	KwaZulu-Natal
KZN DoH	KwaZulu-Natal Department of Health
LMIC	Lower middle income countries
MMR	Maternal mortality ratio
mHealth	Mobile Health
NCCEMD	National Committee on Confidential Enquiries into Maternal Deaths
NHRD	National Health Research Database
NMR	Neonatal mortality ratio
PE	Performance Expectancy
PHC	Primary healthcare
RMNCH	Reproductive, Maternal, New-born and Child health
SI	Social Influences
SMR	Saving Mother Report
SPSS	Statistical Package for the Social Sciences

TCC	Targeted client communication
UIC	Upper income countries
UTAUT	Unified Theory of User Acceptance of Technology

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CHAPTER ONE: INTRODUCTION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

Pregnancy can be a risk to women irrespective of age, background, race, or economic standing (Da Serra, Dippenaar and McCall Sellers, 2018).Within the first decades of the 20th century, in an attempt to decrease the risk factors of pregnancy, ante-natal care (ANC) came into being (Al-Ateeq et al., 2015). ANC, the care preceding birth, is described as a careful, systematic assessment and follow up of pregnant women through their pregnancy, culminating with delivery of the foetus (Al-Ateeq et al., 2015). The inception of the ante-natal programme in Primary Healthcare (PHC) clinics was directed towards women in socially challenging living conditions in Europe (Al-Ateeq et al., 2015), slowly disseminating to countries around the world and reaching South Africa post-apartheid (Da Serra et al., 2018).

During the period 1940 to 1960, as a global leader, South Africa pioneered the conceptualisation of the PHC approach with the Pholela experiment (Tollman and Kautzky, 2008), which, after being discontinued in 1960, was re-instated with the advent of democracy (Phillips, 2014; Tollman et al., 2008). The aim of the PHC programme was to provide freely accessible and efficient healthcare, using a case-based approach (Phillips, 2014). The case-based approach placed an emphasis on health promotion, such as health education and illness prevention, integrated into the ANC programme (Phillips, 2014; Tollman et al., 2008). ANC health education is frequently conducted in PHC clinics by midwives (Phillips, 2014; Susuman, 2015), but with the advent of mHealth it is not confined to the PHC setting (Skinner et al., 2018; Susuman, 2015).

ANC health education tailors a wide variety of topics pertaining to maternal health during pregnancy, according to the needs of the presenting women (Al-Ateeq et al., 2015). Consequently, ante-natal health education is a particularly important measure against pregnancy related conditions that could possibly result in maternal or child mortality or morbidity (Nwankwo and Ezenwaka, 2018). Antenatal health education is an intervention that starts at the antenatal booking, and continues throughout the pregnancy until delivery (Al-Ateeq et al., 2015; Da Serra et al., 2018). However despite the importance of ante-natal health education, international and national policy documents, such as the World Health Organization

(WHO) (2016) Standards for Improving the Quality of Maternal and New-born Care in Health Facilities and the Guidelines for Maternity Care South Africa (2015), only provide brief and broad descriptions of ANC health education (NDOH, 2015; WHO, 2016). Notwithstanding the brevity of descriptions in policy documents, South Africa is home to initiatives that align with international and national maternal health polices (NDOH, 2015; WHO, 2016), and recognise both the importance of the antenatal period and South Africa's high maternal mortality (MMR) (83.3 per 100 000 live births) and neonatal mortality rates (NMR) (8.9 per 1000 live births) (Saving Mothers Report 2014-2016), in particular those reported in KwaZulu-Natal (KZN) (127.1 per 100 000 live births) (Moodley and Pattinson, 2016) and some of its municipal districts (Simelane, 2015). In the period 2018/2019 within eThekwini, (the largest municipal district of KZN), the total MMR was 113 per 100 000 live births, with a higher ratio located within Umlazi/Engonyameni (220 per 100 000 live births) (Msimango, 2018). A strategy by the KwaZulu-Natal Department of Health (KZN DoH) to counter the high MMR, despite the 90% ANC booking rate in South Africa, was the adoption of the Safe Motherhood initiative (Saving Mothers Report 2014-2016). Pillar two of the Safe Motherhood initiative recognises the need for health education within the ANC programme (DOH, 2015; 2016).

Maternal health education empowers pregnant women, offering them an opportunity to increase their sense of value and ability to identify concerns and problems during the antenatal period (Al-Ateeq et al., 2015; Da Serra et al., 2018; Hardie, Horsburgh and Key, 2014). Maternal health education can be delivered through many approaches, inclusive of the more traditional one-to-one teachings, group discussions, and through non-technological modes (posters and pamphlets) and technologically driven modes (WHO, 2019b). Technologically driven modes include mHealth programmes that offer possibilities for a wide dissemination of maternal health information using information and communication technologies (ICT) (Barron et al., 2016; Dalton et al., 2018; Nwankwo et al., 2018).

In 2012, the WHO (2012) published a planning workbook addressing ICT in women and children's health, however, in 2015 the WHOs (2015) recommendations in maternal health promotion interventions listed the research gap of mHealth as a supportive mechanism to maternal health. This gap was only closed by the current WHO (2019) document outlining recommendations on digital interventions for health system strengthening, which have singled out maternal health amongst the five audiences for targeted client communication (TCC) via mobile devices. However despite the WHO only recently closing this gap, the dissemination of health education to pregnant women's mobile devices, such as smartphones, has shown

success and offers further potential for lower middle income settings, in particular Sub-Saharan Africa (Lau et al., 2014; WHO, 2016).

Mobile phone purchases and use have become omnipresent in today's society (Barron et al., 2016) and with this increase mobile technology has become popular for pregnant women seeking health education (Dalton et al., 2018). Mobile devices facilitate the delivery of mobile instant messages based on a variety of topics pertaining to ANC (Barron et al., 2016; Lau et al., 2014; Skinner et al., 2018). Registration on some e-learning platforms in South Africa has reached nearly 50% of pregnant women (Barron et al., 2016), with positive reports of increases in improved decision making in maternal health matters (Barron et al., 2016).

Technological and non-technological resources are significant, as studies have shown the importance of maternal health education in the promotion of health and the prevention of disease (Nwankwo and Ezenwaka, 2018; Susuman, 2015). It is shown the more educated women are, the more likely they will access maternal health services (Susuman, 2015), be able to identify problems (Al-Ateeq and Al-Rusaiess, 2015), and have better pregnancy outcomes (Al-Ateeq, Al-Rusaiess and Al-Dughaither, 2013). The process of pregnant women increasing their level of maternal health awareness is not isolated to each pregnancy, but outcomes are influenced by maternal health education received in previous pregnancies (Al-Ateeq et al., 2013).

Amidst the understanding of the importance and magnitude of health education to pregnant mothers lie barriers and opportunities to women receiving health education (Al-Ateeq et al., 2015; Nwankwo et al., 2018); barriers and opportunities are found in both the delivery and receipt of maternal health education and related national and international policies (Al-Ateeq et al., 2015; Bergevin, Fauveau and McKinnon, 2015; Moodley et al., 2016; Dutta, Geiger and Lanvin, 2015; Haddad et al., 2016; Jaddoe, 2009; WHO, 2016).

In the face of these barriers and opportunities to maternal health education, this study aims to describe the perceived roles of midwives towards health educating pregnant women in an attempt to contribute to improved maternal health service delivery and decreasing MMR.

1.2 PROBLEM STATEMENT

Health promotion is essential in reducing maternal mortality (Bergevin et al., 2015). Women who are better health educated, have better pregnancy outcomes compared to those who have not been educated (Al-Ateeq and Al-Rusaiess, 2015). Hence maternal health education by midwives is an important component of ANC (Al-Ateeq et al., 2013), particularly in PHC as this is the first point of contact pregnant woman have with the healthcare services (Al-Ateeq et al., 2015; Al-Ateeq et al., 2013; Da Serra et al., 2018). Various technological and non-technological modes are available to the midwife (Al-Ateeq et al., 2013; Haddad et al., 2016; Jaddoe, 2009; Nwankwo et al., 2018), for the delivery of health education (Barron et al., 2016; Motsoaledi and Matsoso, 2015). Despite these opportunities for ANC service delivery, including its extended delivery through mHealth programmes, KwaZulu-Natal has an MMR of 127.1 per 100 000 live births, with particularly high MMR within one of the wards (220 per 100 000 live births) of a municipal district of eThekwini (Moodley et al., 2016; Simelane, 2015). A gap existed in the literature to allow for an understanding of the perception by midwives working in PHC clinics of their roles in health educating pregnant women using technological and non-technological modes (WHO, 2012; 2016; 2018; 2019) in order to contribute to the reduction of MMR.

1.3 PURPOSE OF THE STUDY

The purpose of the study was to describe midwives' perceived roles in maternal health education and their acceptance of mHealth in health educating pregnant women during and in-between antenatal visits at Primary Healthcare clinics in a sub-district of the EThekwini, KZN, South Africa.

1.4 RESEARCH OBJECTIVES, RESEARCH QUESTIONS AND HYPOTHESIS

1.4.1 Research objective one

To establish midwives' perceptions of their role and responsibility in disseminating maternal health education in ANC of PHC clinics in a sub-district of EThekwini.

Research questions

1. What is the level of midwives' perceived roles in providing health education to pregnant women attending ANC of PHC clinics in a sub-district of EThekwini?

2. What is the level of midwives' perceived responsibilities towards the dissemination of health education to pregnant women attending ANC of PHC clinics in a sub-district of EThekwini?

3. What is the level of midwives' perceived overall benefits of health education as received by pregnant women attending ANC of PHC clinics in a sub-district of EThekwini?

4. What is the association between midwives' demographics and their perceptions of their roles and responsibilities in the dissemination of maternal health education in ANC of PHC clinics in a sub-district of EThekwini?

$H_{1:}$ There is an association between midwives' demographics and their perceptions of their roles and responsibilities in the dissemination of maternal health education in ANC of PHC clinics in a sub-district of EThekwini.

1.4.2 Research objective two

To assess midwives' current use and technological acceptance of mHealth to disseminate health education to pregnant women attending PHC clinics in a sub-district of EThekwini.

Research questions

1. What is the level of midwives' Performance Expectancy (PE) towards using mHealth to deliver maternal health education to pregnant women attending PHC clinics in a sub-district of EThekwini?

2. What is the level of midwives' Effort Expectancy (EE) of mHealth towards health educating pregnant women attending PHC clinics in a sub-district of EThekwini?

3. What is the level of Social Influence (SI) towards midwives use of mHealth services in disseminating health education to pregnant women attending PHC clinics in a sub-district of EThekwini?

4. What is the level of Facilitating Conditions (FC) for mHealth services that may influence the dissemination of health education by midwives to pregnant women attending PHC clinics in a sub-district of EThekwini?

5. What is the level of midwives' Behavioural Intention (BI) towards using mHealth services in health educating pregnant women attending PHC clinics in a sub-district of EThekwini?

6. What is the level of midwives' Actual Usage (AU) for mHealth services in health educating pregnant women attending PHC clinics in a sub-district of EThekwini?

7. What is the association between midwives' demographics and their level of mHealth acceptance for the dissemination of maternal health education to pregnant women attending PHC clinics in a sub-district of EThekwini?

8. Which demographic characteristics predict e-technology Actual Usage by midwives for the dissemination of health education to pregnant women attending PHC clinics in a sub-district of EThekwini?

H_1: There is an association between midwives' demographics, and mHealth factors of Performance Expectancy, Effort Expectancy, Social Influence, Behavioural Intention and Facilitating Conditions, and mHealth Actual Usage.

1.4.3 Research objective three

To determine the frequency with which midwives conduct health education through non-technological and technological modes in PHC clinics of a sub-district in eThekwini.

Research question

1. How often, in a month, do midwives conduct health education through non-technological and technological modes in PHC clinics in a sub-district of EThekwini?

1.4.4 Research objective four

To survey the health education landscape in PHC clinics of a sub-district in eThekwini for evidence of the delivery of ANC health education by midwives to attending pregnant women.

Research question

1. What is the available evidence in the PHC clinics in a sub-district of EThekwini for structures to support maternal health education by the midwives to pregnant women?

1.5 SIGNIFICANCE OF THE STUDY

1.5.1 Nursing practice

The identification of midwives' perceptions of their role in maternal health education elicited deterrents and contributory factors to the delivery of a composite maternal healthcare service. Identification of these factors will provide an opportunity for senior management to promote positive attributes towards better service delivery, encouraging midwives to perform their role as an educator and counter the barriers, offering recommendations to policy developers. This, in turn, offers an opportunity to improve maternal health outcomes using health education that is always readily available through midwives at PHC clinics. Health education also contributes towards decreasing MMR and possibly reaching sustainable development goal three (SDG-3), which is titled "*Good health and well-being;*" such a goal is achievable by encouraging healthy lives and promoting well-being at all ages (UN, 2015). Establishing resolutions to barriers that affect midwives' roles in health education can allow for better dissemination at PHC clinics.

1.5.2 Nursing research

The findings of this research will serve to add to the knowledge base of literature and facilitate further research by fellow nurse researchers to improve maternal health education initiatives. It will also assist in identifying further gaps and conducting further research in this field of maternal health education. In addition, the findings could offer e-programme developers information to develop existing maternal health e-programmes further.

1.5.3 Nursing policies

The results of this study may assist unit managers and other key personnel in PHC to acknowledge the deterrents and contributory factors towards maternal health education. In such acknowledgement, policies pertaining to maternal health education might be revised and aligned to international and national policy documents (WHO, 2015; Guidelines for Maternity Care in South Africa, 2015) and trends in mHealth information dissemination (Dalton et al., 2018; Lau et al., 2014). This could allow for effective distribution of health education to

pregnant women and in so doing, may contribute to the creation of an effective health education programme for pregnant women attending PHC clinics.

1.5.4 Community

The results from this study could possibly assist in identifying ways to include community members to disseminate health education to pregnant women, find ways to work around possible barriers to health education facing pregnant women in the community and encourage the positive factors that promote health education within the community.

1.5.5 Nursing education

The findings could assist universities and nurse colleges in teaching midwifery students the importance of health education. The relevance of equipping midwives with skills in health education and health promotion, and the promotion of positive attitudes towards maternal health education could be highlighted by the study.

1.6 KEY AND OPERATIONAL DEFINITIONS

Actual usage (AU) is the use of a system or technology by an individual that is largely influenced by BI, stemming from the constructs of PE, EE and SI (Yakubu and Dasuki, 2019). Actual usage also had a direct influence from FC, which also results in an individual using a system or technology in a work environment (Venkatesh et al., 2003; Yakubu et al., 2019).

> ***Operational definition:*** **AU** was operationalised for this study as the subjective use of mHealth programmes by midwives towards health education, measured through the frequency of health education provided in a month, on a Likert scale (5 is strongly agree; 1 is strongly disagree) and through health education registers within the PHC clinics. AU was also measured through the number of pregnant women registered on mHealth programmes for maternal health education from registers in PHC clinics over a duration of a month (Yakubu et al., 2019).

Behavioural Intention (BI) is an individual's probability to participate in a specific behaviour (Yakubu et al., 2019). According to the modified UTAUT framework, it is proposed that PE, EE and SI influences the BI of individuals in technology use (Venkatesh et al., 2003; Yakubu et al., 2019).

Operational definition: **BI** was operationalised for this study as the midwives' intentions to use mHealth programmes towards health education of pregnant women, influenced by PE, EE and SI, measured through four questions using a five point Likert scale (5 is strongly agree; 1 is strongly disagree) in the "Behavioural Intentions" section of the research questionnaire (Yakubu et al., 2019).

Effort Expectancy (EE) is described as the ease associated with the use of a system or technology (Yakubu et al., 2019). EE becomes less significant with increased use of technology by an individual; conversely, at initial stages, EE is the strongest predictor towards technology use. Studies by El-Masri and Tarhini (2017), Sarabadeni, et al. (2017) and Wang (2016) all demonstrated that EE positively affects BI to use and as actual usage of a system or technology (Venkatesh et al., 2003; Yakubu et al., 2019).

Operational definition: **EE** was operationalised for this study for midwives' perceptions of the level of ease to register, operate, and use mHealth programmes for the purpose of health education towards pregnant women. EE, as a sub-scale of technology acceptance, was composed of four questions in the technology acceptance section of the questionnaire, measured using a five point Likert scale (5 is strongly agree; 1 is strongly disagree) (Yakubu et al., 2019).

Facilitating Conditions (FC) is an individual's perception of the degree of support provided by the organisational and technical infrastructure in order to encourage the use of the system (Yakubu et al., 2019).

Operational definition: **FC** were operationalised in this study as the necessary resources, such as technology and time, knowledge, training and technological support through information technology departments and organisational structures of PHC clinics, which influenced the midwives' ability to conduct health education using mHealth programmes. FC as a subscale of technology acceptance in the research questionnaire was measured by four questions determining the availability of technological equipment and the provision of services by the IT departments using a Likert scale (5 is strongly agree; 1 is strongly disagree).

Health education is consciously constructed opportunities for learning, involving some form of communication designed to improve health literacy, including improving knowledge and developing life skills, which are conducive to individual and community health (WHO, 2012).

Operational definition: Health education in this study referred to individual or group talks through non-technological modes and technological modes of mHealth, in particular "momconnect" conducted by midwives, with the aim of equipping the pregnant women with the knowledge to manage their pregnancies, all stages of labour, and the postpartum period, as well as care of the new-born and related health conditions (Da Serra et al., 2018).

Health Promotion is the process of enabling people to increase control over, and to improve, their health (WHO, 2012).

Operational definition: Health promotion in this study related to activities conducted by midwives that improved and increased the pregnant woman's control over her health. Health promotion includes the provision of health talks, issuing of pamphlets and encouraging the reading of posters and watching of educational DVDs that may be available at PHC clinics, as well as linking the pregnant woman onto mHealth platforms such as "momconnect," empowering pregnant women thus leading to better pregnancy outcomes (Al-Ateeq et al., 2015; Nwankwo et al., 2018).

Midwife: is a person who is registered as a nurse and registered midwife in terms of the Nursing Act (Act No. 50 of 1978). The South African Nursing Council (SANC) registers nurses completing a four-year nursing diploma or degree as general nurses and midwives. Midwives carry out their profession under conditions set out in R2488 (26 October 1990).

Operational definition: In this study, a midwife was defined as a trained healthcare practitioner available in PHC clinics who treats, manages and promotes the health of pregnant women visiting PHC clinics with the intention of improving pregnancy outcomes (Al-Ateeq et al., 2015; Da Serra et al., 2018; Nwankwo et al., 2018).

Midwife Specialist is a registered Professional Nurse and Midwife who has advanced expertise in midwifery, holds an additional qualification in midwifery and is registered as such with the South African Nursing Council (SANC, 2014).

mHealth is a subset of eHealth relating to the delivery of health related services via mobile communications technology (Motsoaledi et al., 2015).

Operational definition: In this study, mHealth referred to mobile applications, such as "momconnect," that after successful registration by trained midwives provides a

platform to disseminate health education, involving various topics, to pregnant women attending PHC clinics (Motsoaledi et al., 2015; Tshuma et al., 2017).

Performance Expectancy (PE) is described as the extent to which an individual considers the use of the system as helpful to him or her to attain gains in job performance (Yakubu et al., 2019). According to Venkatesh et al. (2003), PE is the strongest predictor of intention as individuals examine the benefits of technology use towards their job performance.

Operational definition: PE was measured through a subscale of technology acceptance in the research questionnaire and composed of four questions using a five point Likert scale (5 is strongly agree; 1 is strongly disagree) (Yakubu et al., 2019).

Primary Healthcare involves incorporating curative treatment given by the first-contact provider addressing the escalating burden of infectious and deficiency diseases among increasingly impoverished individuals along with promotional, preventive and rehabilitative services provided by multidisciplinary teams of healthcare professionals working collaboratively to the community at large (Phillips, 2014; WHO, 2012).

Operational definition: PHCs in this study were the entry service contact points into the tiered (Level 1-4) South African healthcare system. All services, such as health promotion, illness prevention and treatment and management of common illness, are rendered in PHC clinics, free of charge to pregnant women who will utilise these services (Motsoaledi, 2014; Msimango, 2018).

Social Influence (SI) is an individual's perception that those who are important to him/her believe that he/she ought to use the system. SI is also determined to be a direct influence on BI (Yakubu et al., 2019).

Operational definition: **SI** was operationalised in this study as the perception that midwives have of the importance of people such as colleagues, friends, and managers, who encouraged the use of the mHealth programmes in PHC clinics towards the dissemination of health education to pregnant women (Yakubu et al., 2019). SI as a subscale of technology acceptance, measured through four questions using a Likert scale (5 is strongly agree; 1 is strongly disagree) the influence and encouragement towards mHealth use.

1.7 CONCEPTUAL FRAMEWORK

This study was guided by two frameworks, Donnabedian's Quality Framework (1966) and Venkatesh's Unified Theory of User Acceptance of Technology (UTAUT) (2003). Both models are briefly explained, followed by their application to the study.

1.7.1 Overview of Donnabedian's Quality Framework

Donnabedian described the quality framework as simple and flexible enough to be applied to many healthcare situations, which assess the quality of care provided by healthcare workers (Shojania et al., 2004). The framework includes three concepts that share a forward moving relationship as the model progresses from the first concept of structures towards the final concept of health outcomes (Shojania et al., 2004).

Structures of healthcare (Figure 1) are described as the organisational and physical aspects of care settings, which include equipment, facilities, personnel, financial and operational processes supporting medical care (Shojania et al., 2004). **Processes of care** (Figure 1) include the elements of providing resources and mechanisms for healthcare workers to carry out patient care activities; in addition, this concept sits in the middle of the model as it relies on the structures to provide the necessary resources and mechanisms for individuals to carry out their patient care activities (Donabedian, 2005; Shojania et al., 2004). The last concept deals with the overall health **outcomes** (Figure 1) (Shojania et al., 2004). The outcomes of the model are emphasised by Donnabedian as the process of constant evaluation, eliminating processes that do not favour a positive outcome; these processes can be changed or manipulated until the desired outcomes are reached (Donabedian, 2005, Shojania et al., 2004).

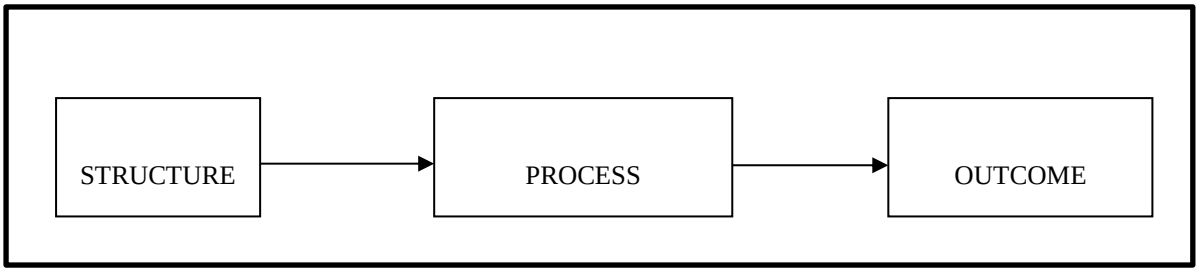

Figure 1: Donnabedian's Quality Framework (Shojania, 2004)

1.7.2 Overview of an adapted Unified Theory of User Acceptance of Technology (UTAUT)

This study used the modified version of the Unified Theory of User Acceptance of Technology (UTAUT) (Yakubu et al., 2019). The UTAUT framework was developed by Venkatesh (2003), by merging eight social theories (Venkatesh et al., 2003). The framework (Figure 2) is made

up of constructs that aim to investigate the actual usage of technology (Venkatesh et al., 2003; Yakubu et al., 2019). The constructs include Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Behavioural Intentions (BI) and lastly Actual Usage (AU) (Venkatesh et al., 2003). **PE** is described as the degree to which an individual may believe that using a system will help them to accomplish tasks and improve job performance (Yakubu et al., 2019). The second construct is **EE,** described as the ease associated with the use of a system (Venkatesh et al., 2003; Yakubu et al., 2019). The third construct is **SI**, described as the perception of an individual who believes that people who are important to them, encourage the use of the system (Venkatesh et al., 2003; Yakubu et al., 2019). The constructs of PE, EE, and SI, are said to positively influence the **BI,** which is described as an individual's likelihood to be willing to partake in a specific behaviour towards the use of a system (Venkatesh et al., 2003; Yakubu et al., 2019), resulting in **AU** of a system (Venkatesh et al., 2003). **FC** is described as an individual's perception on the degree of support that will be provided to them by the organisational and technical infrastructure, which encourages the use of the system, having a direct influence on the Actual Usage. Yakubu et al. (2019) modified the framework by excluding the moderating variables (age, gender, experience and voluntariness of use), however, these variables were used to describe the sample (Yakubu et al., 2019). In this study, the variables of age, gender and experience will be used within the demographics section of the questionnaire.

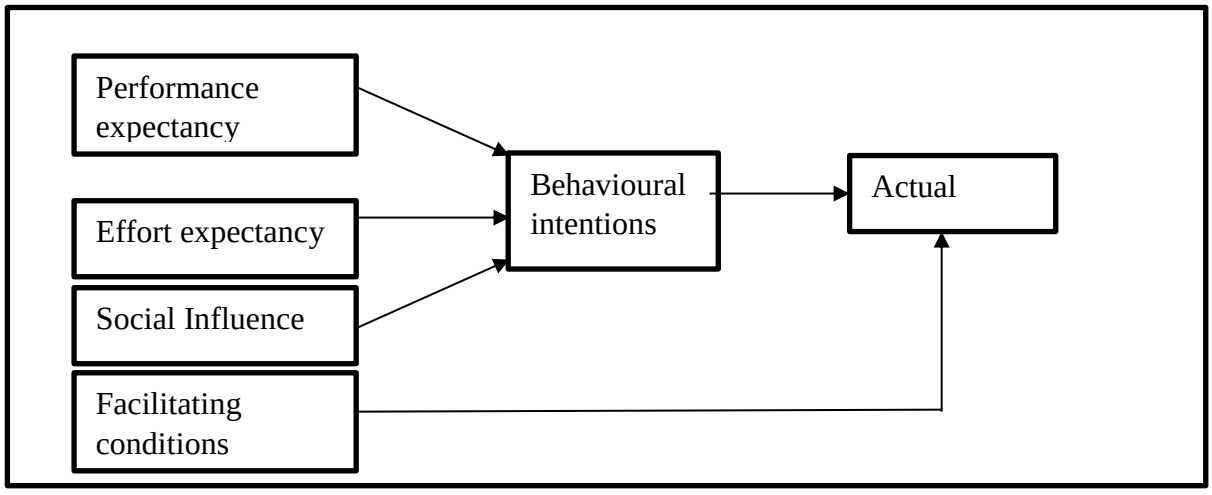

Figure 2: Modified Unified Theory of User Acceptance of Technology (Venkatesh, 2003).

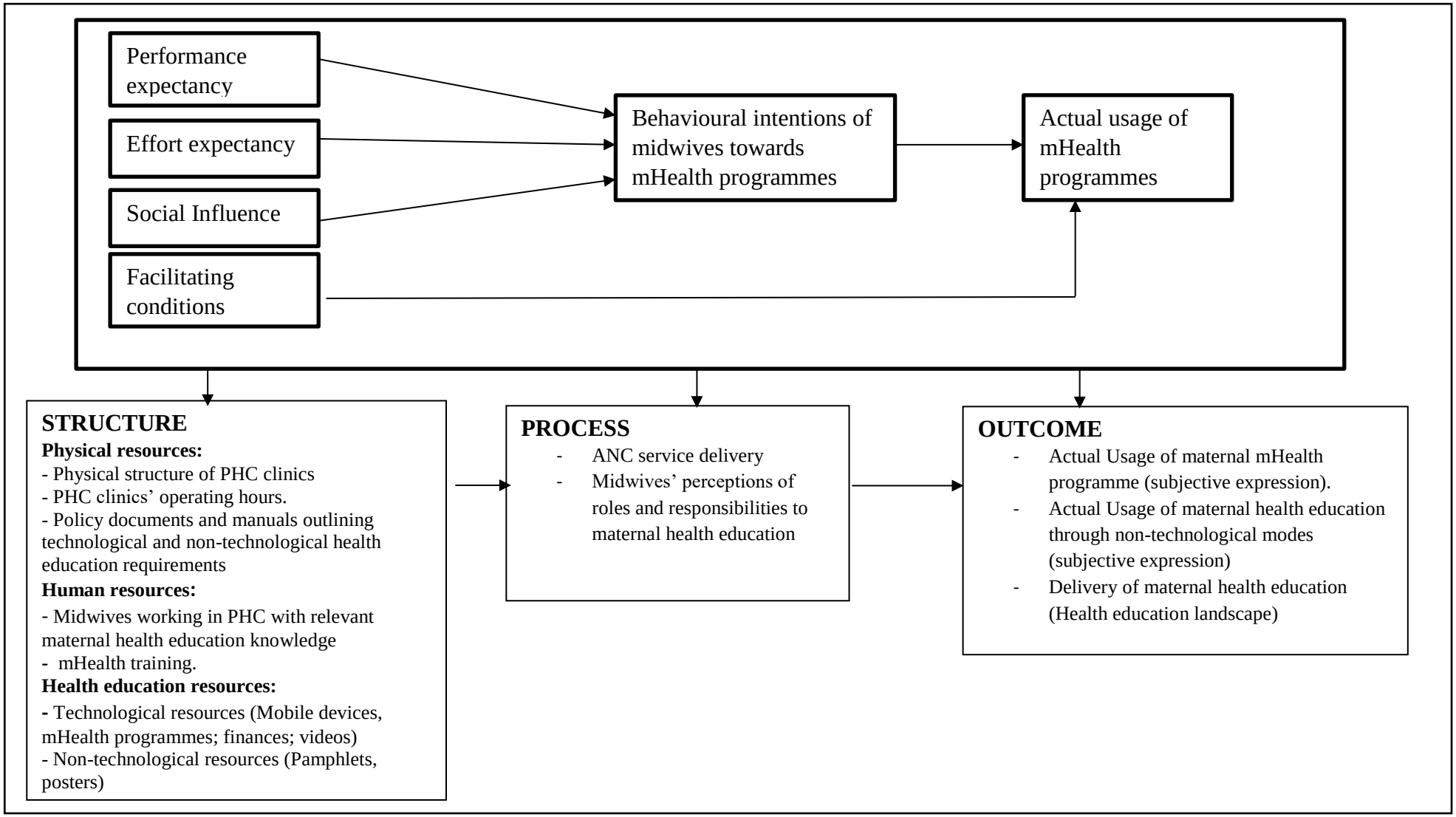

Figure 3: Merged Donnabedian and modified UTAUT models as applied to this study

1.7.3 Application of the merged model to this study

The merging of Donnabedian's quality framework (1966) and Venkatesh's (2003) modified UTAUT model provided the framework for this study. **The structure**s included physical, human and health education resources. The physical resources included the physical structures in the PHC clinics, such as rooms, tables and chairs, in order to conduct health education, PHC clinic operating hours which guided the time available for maternal health care delivery, and policy documents that outlined technological and non-technological health education requirements. Human resources were midwives with the relevant knowledge, who were available to conduct health education to pregnant women. Structures also included mHealth training programmes in order to equip midwives in the initiation of mHealth and delivery of such programmes. Included within the concept of structures were health education resources, availability of technological resources, such as mobile devices (smartphones), finances, videos and mHealth programmes, which aimed to assist the midwife to conduct health education within the PHC clinics. Non-technological resources, such as pamphlets and posters, also guided the health education, as Donnabedian's concept of processes is reliant on these structures in order for health education to be successfully delivered to pregnant women.

Merged within the structures of Donnabedian's model lies the construct of *FC* from the modified UTAUT framework, *FC* is the final construct from the UTAUT model (Venkatesh et al., 2003; Yakubu et al., 2019). FC are the necessary resources, such as technology and time, knowledge, training and technological support through Information Technology (IT) departments, which influence midwives' ability to conduct health education using mHealth programmes (Venkatesh et al., 2003; Yakubu et al., 2019). *FC* were suggested to have a direct influence on Actual Usage of mHealth programmes (Yakubu et al., 2019).

The **process** of care included the dissemination of health education using technological and non-technological modes to pregnant women of all levels of literacy, including access to mHealth programmes (Hardie et al., 2014). Identifying midwives' positive or negative perceptions in PHC clinics may influence the dissemination of health education either through technological or non-technological modes to pregnant women. ANC service delivery and positive perceptions towards health promotion are key to ensuring ongoing health education, so that it may yield results in better communication with pregnant women and more information processing (Al-Ateeq et al., 2015; Barron et al., 2016; Nwankwo et al., 2018).. Therefore, the constructs of PE, EE and SI were suggested to influence the midwives to form a BI to use mHealth programmes within PHC clinics, which resulted in a subjective report of

the Actual Use of mHealth programmes (Yakubu et al., 2019). Donnabedian's concept of processes are dependent on the concept of structures, whilst the BI from the UTAUT framework are dependent on PE, EE and SI (Venkatesh et al., 2003; Yakubu et al., 2019).

Donnabedian's final concept of **outcomes** was evaluated at PHC clinics by determining AU of mHealth programmes, which was subjective in nature as it depended on the perceptions and reports of evidence from midwives that health education of pregnant women was conducted. In addition, the identification of the delivery of maternal health education through attendance registers measured outcomes as reflected in Donnabedian's model (identified during visits to PHC clinics). However, **Actual Usage,** as an outcome measure, was through the frequency of health education through records of the use of mHealth programmes, and the delivery of non-technological health education within the clinics.

1.8 SUMMARY OF CHAPTER ONE

In this chapter the background to health education, midwives perceptions and PHC clinics were explained. The problem statement, purpose of the study in identifying the perceptions of midwives in health education and the research objectives were identified. The researcher explained the significance of health education and the effects of midwives' perception in relation to community, education, policies, research and practice with the possible benefits the study may have for the nursing profession and community at large. The operational definitions used in this study were highlighted.

In Chapter Two, the literature relating to health education, PHC clinics, perceptions, mHealth programmes in the use of health education, barriers and motivating factors towards health education will be discussed.

CHAPTER TWO: LITERATURE REVIEW

Chapter Two explores relevant literature that focuses on the perceptions of midwives, the history of primary healthcare, the roles and responsibilities of midwives in the provision of antenatal care (ANC) and health education describing maternal mortality and the programmes available to combat maternal mortality, as well as technological acceptance of mobile health (mHealth) programmes used during health education.

Various strategies were adopted to access the literature presented in this chapter. The strategies included electronic and hand searches, using keywords expanded to Medical Subject Heading (MesH) terms, which facilitated obtaining journal articles, books, policy statements, reports and information from organisations (e.g. World Health Organization [WHO]). Most items were searched and accessed electronically from the following databases: Google Scholar, PUBMED, CINAHL, Clinical Key and Science Literature (published and grey). In addition, reference lists were combed to assist in obtaining further relevant literature for this study. Literature that addressed the provision of health education through non-technological and technological means in the prevention of morbidity and mortality of pregnant women was readily available. However, a paucity in peer-reviewed literature was evident, in particular for lower/middle-income countries (LMICs), of the perceptions of midwives towards health educating pregnant women, and instead there was a leaning towards more studies in this area from the patients' perspective.

Keywords/phrases: Antenatal care, antenatal education, health education, mHealth, midwives, midwives' perceptions, technology acceptance.

MesH terms/phrases: Pre-natal care, pre-natal education, pre-natal information, Staff nurses

2.1 INTRODUCTION

The structural component of quality care, as described in Donnabedian's model (Donabedian, 2005), in the form of antenatal care (ANC) clinics and the process component of ANC are important in the reduction of both neonatal and maternal morbidity (Susuman, 2015). The

process component of quality ANC services is commonly comprised of infection screening, promotion of healthy lifestyle habits, evaluation of foetal growth and the treatment for illnesses and diseases (Jaddoe, 2009). ANC services in both uncomplicated and complicated pregnancies involves reassurance, support, and health education (Hofmeyr and Mentrop, 2015), which is the central focus of this study. Health education provided during the antenatal period is particularly important for pregnant women as a strategy to prevent communicable and non-communicable diseases and ultimately reduce maternal and child morbidity and mortality (Nwankwo et al., 2018). Various studies (Al-Ateeq et al., 2015; Nutbeam et al., 2000; Susuman, 2015) have demonstrated the importance of health education in pregnant women, highlighting that the more educated women are, the more likely they will use maternal health care services (Susuman, 2015) and have more favourable pregnancies, an outcome of quality ANC care (Al-Ateeq et al., 2013). The influence of health education on pregnant women has shown that it enhances their health knowledge, subsequently improving their attitudes towards pregnancy (Nwankwo et al., 2018).

Health education can be provided to pregnant women using the more traditional non-technological methods such as face-to-face, one-on-one and group teachings, alternatively another method of teaching is through technologically driven mHealth programmes - a structural component in Donnabedian's quality patient care model (Donabedian, 2005). Health education is a service provided to pregnant women during antenatal visits, mainly at primary healthcare clinics (PHC) (Phillips, 2014), at the first point of contact in seeking antenatal care (Da Serra et al., 2018). The process of quality patient care is evident in the mode of delivery of health education.

2.2 PRIMARY HEALTHCARE AND ITS ORIGIN

As a global leader, South Africa pioneered the conceptualisation of the PHC approach with the Pholela experiment during the period 1940 to 1960 (Tollman et al., 2008); in 1960 it was shut down but later re-instated with the advent of democracy (Phillips, 2014; Tollman et al., 2008). The Pholela experiment, which incorporated community members, particularly persons living in rural areas, was a PHC programme focused on illness prevention, through health education, inclusive of ANC (Tollman et al., 2008). The then editor of the South African Medical Journal (SAMJ) declared that the Pholela health centre, initiated by doctors Sidney

and Emily Kark, as a remarkable attempt at commencing PHC services with healthcare innovation, and well ahead of its time (Phillips, 2014).The Pholela PHC programme was closed for two reasons, firstly because of the reluctance of finance from citizens, it was a publically funded programme (Phillips, 2014); secondly, there was political influence to revert healthcare back to outpatients and hospitals instead of the holistic delivery of healthcare at various facilities (Phillips, 2014).

The aim of PHC is to maximise the health of the population through health promotion, inclusive of health education and reducing health inequalities amongst the targeted population/s (Sanders, Hunter and Warren, 2016). Health promotion is the practice of empowering people to increase control over and improve their health, it differs from health education in that it is regarded as a systematic social activity that helps individuals improve their health-related behaviours through activities such as lectures, one-on-one teachings, group teachings and information displayed on billboards (Xu, Huang and Chen, 2017).

PHC clinics can alter in size depending on the size of the population they serve, with the standards that need to be met prescribed by a set of norms and standards in the Ideal Clinic Manual (Da Serra et al., 2018). There are three streams of care provided along this continuum of care, the biggest being the third stream, which is Maternal, Women and Child Health and housed within it are the services of infection screening, promotion of healthy lifestyle habits, evaluation of foetal growth and treatment for illnesses and diseases during the antenatal period (Da Serra et al., 2018). This stream also focuses on post-natal care inclusive of health promotion through health education and other services such as family planning (Da Serra et al., 2018).

In many Upper Income Countries (UIC), public health is made up of PHC with one of its branches focusing on antenatal services, inclusive of health education, and is generally provided by doctors, nurses and midwives (Sanders et al., 2016). However, in UIC clinics many pregnant women prefer to receive health education from midwives, who have been specifically trained to provide health education to pregnant women (Sanders, Hunter and Warren, 2016). England is an example of a UIC that has a central focus of public health centred around health education, with topics including maternal health and its changes during pregnancy, early parenting and infant feeding (Sanders et al., 2016).

In contradiction with UIC, many Lower-Middle Income Countries (LMIC) have numerous issues implementing PHC, inclusive of ANC services, due to the historical imbalances of

accessing healthcare with an ever-increasing communicable and non-communicable disease burden, which is also prevalent in South Africa (Dookie and Singh, 2012). ANC forms part of the comprehensive care package that must be provided by all PHC clinics in South Africa; this division of maternity services is regarded as an essential service that deals with immunisation, antenatal care and post-natal care with the aim of health educating pregnant women in both illness and disease prevention (Da Serra et al., 2018).

Despite reverting to hospitals as the primary source of healthcare, the district health system intended to provide the framework for the roll-out of community-orientated primary healthcare (Phillips, 2014). Recently, PHC clinics have undergone reforms to provide better services to the community at large, using the PHC's motto 'a re-engineered PHC system' (Da Serra et al., 2018; Msimango, 2018; NDOH, 2015). This reform has also led to changes amongst ANC services within PHC clinics through the implementation of the new BANC plus programme (Msimango, 2018; Phillips, 2014). In the re-engineering, the focus is disease management, maternal and child health and health promotion; central to this is health education, which is provided to all individuals attending clinics, inclusive of pregnant women (Phillips, 2014; Tollman et al., 2008). The BANC plus programme promotes early attendance and an increase from four to eight ANC visits per pregnancy (Da Serra et al., 2018).

One of the central strategies and essential elements of ANC, relevant within the context of South Africa is the provision of health education about prevailing health problems such as anaemia, hypertension, diabetes, bleeding in pregnancy, decreased foetal movements, etc., as linked to concerns in pregnancy and methods of their prevention and control (Da Serra et al., 2018). Health education conducted through both technological and non-technological modes (Barron et al., 2016; Nwankwo et al., 2018) in the ANC component of PHC clinics is imperative and mainly performed by qualified midwives, however doctors and student midwives are also involved (Al-Ateeq et al., 2015; Phillips, 2014; WHO, 2012).

The programs and strategies available at PHC facilities are ultimately goaled at a reduction of maternal mortality and morbidly (MMR), holding particular relevance in LMIC countries that which hold the highest figures for women dying of pregnancy related causes (Anshuja et al., 2017).

2.3 MMR IN UIC AND LMIC COUNTRIES

UICs such as the United States of America, the United Kingdom (UK) and Australia account for only 1% of the world's MMR (Anshuja et al., 2017). In order to combat MMR, many UICs have cohesive packages of antepartum, intrapartum and postpartum care through health education provided by various categories of healthcare professionals (Anshuja et al., 2017). The ever increasing difference in MMR between UICs and LMICs underlines that the countries with the greatest morbidity and mortality burdens have made the least progress in improving MMR rates (Anshuja et al., 2017). Therefore in LMICs it is imperative that health education is conducted during the pregnant woman's visits to ANC clinics as it can have a positive impact on them, decrease morbidity and mortality, and allow for better pregnancy outcomes (Al-Ateeq et al., 2015; Da Serra et al., 2018).

In 2017, a total number of 295 000 maternal deaths occurred worldwide following pregnancy and childbirth (WHO, 2019a). Sub-Saharan Africa and Southern Asia accounted for approximately 99% (n=289 000) of the estimated world-wide maternal deaths in 2017 (WHO, 2019a), with approximately two-thirds emanating from Sub-Saharan African settings (n=196 000), while Southern Asia accounted for nearly one-fifth (n=58 000) (WHO, 2019a). Whilst figures are high, since 1990 a global decline of 45% has been recorded (Anshuja et al., 2017; Diaz de Leon Ponce, 2015). However, maternal mortality is often under-reported and very few LMICs have accurate data on maternal as well as neonatal deaths, which often makes the provision of concrete evidence for policy change difficult (Anshuja et al., 2017). In many LMICs maternal and child health services are operational, however a wide disparity exists between the intended care, the actual care and the quality of services provided to pregnant women (Anshuja et al., 2017).

In South Africa, attempts to bridge the gap between actual and intended care is evidenced, although still high, in the continued fall year on year between 2014 and 2016 in the MMR (Moodley et al., 2016). This success can be attributed in part to South Africa abiding, since 1990, to the best practice guidelines as set by the WHO and other countries, such as the UK, which has included collecting information to ascertain the causes and rates of maternal and perinatal deaths (Da Serra et al., 2018). As a consequence, the South African National Department of Health (NDoH) embarked on a strategy to improve the current state of MMR and on 1st October 1997, the National Committee on Confidential Enquiries into Maternal Deaths (NCCEMD) was founded (Moodley et al., 2016), and whose members included experts

in obstetrics, midwifery and anaesthesia. In October 1999, NCCEMD published its first report, called "Saving Mothers Report" (SMR), which has continued to be published triennially, detailing and analysing maternal deaths since 1998 (Moodley et al., 2016). Since 1st October 1997, the death of women in South Africa during pregnancy or childbirth has been declared a notifiable condition in terms of the National Policy for Health Act no. 116 of 1990 (Da Serra et al., 2018).

Key findings in the latest SMR for the period 2014 to 2016 included an overall decrease in maternal deaths in each triennium, and an overall 24% decrease from a peak of maternal deaths in 2008 (Moodley et al., 2016) . The current MMR in South Africa is 83.3 maternal deaths per 100 000 live births (Moodley et al., 2016), which acknowledges meeting the National Development Plan 2030's target to reduce maternal deaths to 100 per 100 000 live births (Manuel and Ramaphosa, 2012). The MMR figures are primarily driven by provincial tertiary hospitals that have the largest number of maternal deaths, possibly due to the high referral rates for specialist services required for these patients (Moodley et al., 2016), with hypertensive disorders in pregnancy, HIV/AIDS and obstetric haemorrhage as the three prime causes of maternal deaths in South Africa (Da Serra et al., 2018; Moodley et al., 2016; NDOH, 2015).

The province of KwaZulu-Natal (KZN), in South Africa, has an MMR of 127.1 maternal deaths per 100 000 live births (Simelane, 2015). The eThekwini municipality located in KZN is one of the largest municipalities of the province and has an MMR of 113 maternal deaths per 100 000 live births, with a greater ratio located within Umlazi/Engonyameni (220 per 100 000 live births) (Msimango, 2018). Nationally, various quality care structures, such as guidelines and programmes, have been implemented to assist healthcare workers to achieve the best possible outcome for pregnant women (NDOH, 2015).

The three tiered South African health system was implemented in 2004 in response to the passing of the National Health Act no 61, of 2003 (Coovadia et al., 2009). The three levels of care namely, primary, secondary and tertiary, are described in the NDoH's policy regulation R655 (Da Serra et al., 2018; Motsoaledi, 2014). Primary healthcare, also known as level one care, is the first point of entry into the healthcare system (Da Serra et al., 2018).

2.3.1 Programmes available to combat MMR

The improvement of maternal health has been a global primacy since 1985 (Da Serra et al., 2018; Fraser et al., 2010). As a result of the primacy, several initiatives and international

strategies have been developed, which include the Safe Motherhood Initiative (SMI) launched by the WHO in 1987 to advocate for safer care for mothers and babies (Da Serra et al., 2018). The SMI provides actions and management through the analogy of pillars, the second and third pillars focus on antenatal and obstetric care respectively, with a greater emphasis on health education for pregnant women (Da Serra et al., 2018; WHO, 2016).

Another international strategy was the Maternal, New-born, Child and Women's Health Directorate, instituted in 1995 to develop strategies, programmes and guide policies in the public sector globally and to continuously set priorities for maternal healthcare (Da Serra et al., 2018). In 2000, the world saw the institution of the Millennium Development Goals (MDGs), as a global programme, where MDG-5 placed the spotlight on mothers and babies, in particular emphasising the reduction of maternal deaths by 75% before the year 2015 (Anshuja et al., 2017); whilst a downward trend was noted in South Africa, maternal deaths continued to remain elevated (Moodley et al., 2016). Despite South Africa's failure to meet the target of the MDG-5, an overall improvement was seen towards achieving a reduction of maternal deaths (Callister and Edwards, 2017; Da Serra et al., 2018; UN, 2015).

In light of the continuous elevated maternal deaths across the globe, in 2005 the WHO established the Partnership for Maternal, New-born and Child Health (PMNCH). The aim of this programme was to strengthen maternal and new-born care globally (Da Serra et al., 2018). Health education is significant with recognition of its importance in preventing illness and promoting good health (Da Serra et al., 2018). Influences from the PMNCH programme accelerated the implementation towards the strategy for the *Every Woman Every Child Movement* by 2030, with partnerships from over 700 organisations located in 77 UIC and LMIC countries (Da Serra et al., 2018).

In response to international strategies, on 7th May 2009 during the fourth session at the conference of African Union (AU) Ministers of Health, the AU initiated the Campaign on Accelerated Reduction of Maternal, New-born and Child Mortality in Africa (CARMMA) (Da Serra et al., 2018). The campaign stressed that Africa accounts for 53% of women who die annually from pregnancy and birth-related complications and therefore aimed towards increased action in improving maternal and new-born survival, and health, in Africa to meet the MDGs (Da Serra et al., 2018). By 2010, 44 countries in Africa had launched the campaign, three more were preparing to launch CARMMA, and five, inclusive of South Africa, were still pondering (Da Serra et al., 2018; NDoH, 2012). Since 2011, South Africa has implemented

many programmes (CARMMA, SMI and others) and strategies in order to align its maternal healthcare delivery with international standards (Moodley et al., 2016; NDoH, 2012). It should be noted that a paucity of literature exists on identifying whether these programmes were successful, as the reporting of maternal deaths amongst the different health systems was a challenge for many LMICs, making it difficult to evaluate programmes and implement policy change (Anshuja et al., 2017).

Due to many countries not successfully achieving the MDGs in 2000, the United Nations General Assembly, in 2012, announced the Sustainable Development Goals (SDGs), which replaced the MDGs and set 169 targets aimed at reducing poverty and improving environmental sustainability by the year 2030 (Da Serra et al., 2018; UN, 2015). Many LMICs, including South Africa, are currently focusing on trying to achieve the target of SDG-3, which aims to reduce MMR to less than 70 deaths per 100 000 live births (Callister et al., 2017). In an attempt to achieve SDG-3, the United States of America launched the quality and safety initiative, Recognize, Educate, Activate, Communicate, and Treat (REACT) to decrease MMR by the timely detection of signs and symptoms in compromised childbearing women (Callister et al., 2017). A programme like REACT bares direct reference to the importance of health education in reducing MMR in pregnant women (Callister et al., 2017). Integration of these programmes in South Africa has led the South African National Department of Health (NDoH) to create guidelines and policies that guide a local framework for healthcare (Da Serra et al., 2018), placing an emphasis on health education to strengthen these programmes and improve the country's maternal mortality rates (Da Serra et al., 2018; Moodley et al., 2016; Msimango, 2018; NDoH, 2012)

The initiation of the district health system, controlled by provinces in South Africa, places the care of pregnant women in the hands of midwives (Da Serra et al., 2018). Midwifery as a structure therefore plays a vital part in the healthcare system in South Africa, with pregnant women receiving care as a process either directly or in-directly from a midwife (Da Serra et al., 2018; Fraser et al., 2010). It is essential in the achievement of favourable outcomes (Al-Ateeq et al., 2015) that midwives are competent in the execution of their roles and responsibilities when carrying out care, implementing programmes, collecting statistics and providing health education to pregnant women who use their services at PHC clinics (Da Serra et al., 2018),

2.4 ROLES, RESPONSIBILITIES AND COMPETENCIES OF MIDWIVES

In South Africa, the practice of midwifery is recognised as a separate discipline and midwives are known to practice with separate roles and independently of doctors (Da Serra et al., 2018; SANC, 2014). Midwifery registration with the South African Nursing Council (SANC) requires the completion of a prescribed SANC accredited programme with concomitant practical experience before they are registered on the roll. (Da Serra et al., 2018). The core competencies have been outlined by the International Confederation of Midwives (ICM), of which South Africa is a member, which is a body that governs the practice of midwifery globally and promotes guidelines for evidence-based midwifery practice (Da Serra et al., 2018; Fraser et al., 2010). In South Africa, the SANC has developed and regulated the Scope of Practice through regulation R2488, which guides practice during pregnancy, post-natal and new-born care in keeping with the competencies and guidelines as per the ICM (Da Serra et al., 2018).

Stemming from the guidelines of ICM, which are applicable to all countries and sometimes amended to the country of practice, the SANC itemised six roles of midwives, which central to this study. The roles include the ability of midwives to provide respect for cultural diversity when delivering care and providing health education for women and childbearing families with the aim of identifying and eliminating harmful practices from within those cultures (Da Serra et al., 2018; Fraser et al., 2010). Midwives are to act as effective role models of health promotion at all times, health educating pregnant women with the aim of decreasing morbidity and mortality, and to actively seek professional, intellectual and personal growth throughout their entire midwifery career with integration into the growth of their practice providing pregnant women with the most updated education (Da Serra et al., 2018; Fraser et al., 2010; Van Meerdervoort, 2008). Regardless of the fundamental significance of health education, it is not separately listed but subsumed in each of the roles mentioned above as health education, part of health promotion aligned to the SANC scope of practise and ICM roles and responsibilities to advocate for improved outcomes for pregnant women (Da Serra et al., 2018; Fraser et al., 2010; Van Meerdervoort, 2008).

The professional responsibilities of midwives are also outlined by the ICM and SANC bodies and include, holding in confidence all client information in order to maintain privacy, and sharing of information should be based on professional judgement, for instance when referring patients for further management or to other disciplines when requiring their services such as

social worker facilities, etc. (Da Serra et al., 2018; Van Meerdervoort, 2008). Midwives are responsible and accountable for their decisions, actions and information provided during health education, including outcomes of events during their care (Da Serra et al., 2018; Van Meerdervoort, 2008). Caution must therefore be undertaken, and midwives during their health education sessions should encourage pregnant women to actively seek care from their local clinics should they encounter adverse events, and not solely rely on the health education provided. Midwives have to understand the adverse consequences that human and ethical rights violations could have on the health of pregnant women and attempt to eliminate these violations (Van Meerdervoort, 2008). These responsibilities should be encouraged at all times by managers in clinics, and promoted during the practice of midwifery in order to promote the best outcomes for pregnant women. (Van Meerdervoort, 2008).

Competencies of midwives are extensive and have been clearly described by SANC. These competencies are divided into subdomains and then further broken down into specific competencies for each domain (SANC, 2014). The competencies correlate with the scope of practice as set out by SANC, encouraging safe practice, and foster the use of these competencies especially towards the use of health education, which falls under domain two (SANC, 2014). For the purposes of this study Domain 2, *health promotion and prevention* will be described further. This domain comprises providing and critically reflecting on education plans that specialise in culturally sensitive, high quality health education and services to all pregnant women in the community in order to promote planned pregnancies, healthy family life, infertility and positive parenting on local, national, regional and international echelons (SANC, 2014). This domain in its specific competency also involves the active participation by midwives and midwife specialists in projects and advocacy campaigns through the process of health education whilst encouraging better pregnancy outcomes (Al-Ateeq et al., 2015; SANC, 2014).

While these necessary competencies, roles and responsibilities of midwives have been clearly described by the professional body in South Africa, availability of skilled nurses and doctors is a growing concern as many are immigrating to other countries, and current staff perceive barriers more often than motivating factors in providing health education to pregnant women (Moodley et al., 2016; Nwankwo et al., 2018).

2.5 MIDWIVES PERCEPTIONS TOWARDS HEALTH EDUCATION

As stressed throughout this review, antenatal (health) education is an important component of high quality healthcare services (Livne, Peterfreund and Sheps, 2017), therefore the perceptions of midwives towards the motivating factors and barriers towards health education must be understood as they may affect the provision of health education to pregnant women and patients (Aldossary, Barriball and While, 2013; Livne et al., 2017; Nwankwo et al., 2018). Health education provided to pregnant women is designed to improve self-care, by providing information to both pregnant women and their families and involving them in decision making, successively increasing their empowerment towards their health (Livne et al., 2017).

UIC countries have different methods of implementing health education to pregnant women with various categories and skillsets providing knowledge within their own medium, such as a post-natal midwife only being confident in health education in his/her field of expertise (Svensson, Barclay and Cooke, 2007). The study by Svenson et al. (2007) found that the specialisation, focused training and delineation of clinical practice limited the knowledge of health professionals resulting in a perceived inability to discuss varied educational topics with pregnant women.

Various studies show that many nurses and midwives perceive the education of patients and pregnant women as vital (Al-Ateeq et al., 2015; Livne et al., 2017). Studies have shown that midwives and nurses were professionally well placed to recognise the advantages of health education to pregnant women, whilst also demonstrating that high percentages of midwives perceived pregnant women benefitted from maternal health education and agreed that intensification of maternal health education would benefit pregnant women greatly (Nwankwo et al., 2018; Owusu-Addo, 2015). In the study by Livne (2017), many motivating elements of health education towards pregnant women as perceived by midwives and nurses were found to be favourable patient outcomes, adherence to treatment, reduced anxiety, self-awareness, and independent decision making abilities (Livne et al., 2017). In keeping with the above, midwives found the following factors enhanced client participation in health education: the attitudes of the midwife, building rapport, trust, creating enabling environments, listening and paying attention to pregnant women and using simple language that pregnant women can understand allows for better provision and uptake of health education activities in PHC clinics (Owusu-Addo, 2015).

Despite the positive patient outcomes resulting from health education, implementation is inadequate due to various challenges and difficulties facing nurses and midwives (Livne et al., 2017). Numerous studies (Al-Ateeq et al., 2013; Anon, 2005; Nwankwo et al.,2016; Zhao et al.,2009) have established that despite recommendations in LMIC, maternal health education is not an integral part of antenatal care compared to UIC, and many facilities have not put into action or have no definitive educational plan that assists midwives in the health education of pregnant women (Livne et al., 2017).

There is a paucity in literature for the perceptions of midwives in the health education of pregnant women and the motivating factors, Instead studies that have focused on perceptions of midwives have mainly established barriers towards health education (Livne et al., 2017; Nwankwo et al., 2018).

2.6 PERCEIVED BARRIERS TO HEALTH EDUCATION

Pregnancy is seen as an opportunity for promoting healthy behaviour through health educating pregnant women who are mostly motivated to provide their unborn child with the best possible start in life (Baron et al., 2017). Pregnant women consider midwives to be the forefront of information sharing during health education sessions in many countries and therefore they rely on midwives for key health discussions, such as healthy lifestyles, exercise and weight gain, amongst other topics (Baron et al., 2017).

Barriers to health education for pregnant women exist both in UICs and LMICs, however the prevalence of barriers exist in larger proportions in LMIC facilities compared to UIC facilities (Al-Ateeq et al., 2015; Haddad et al., 2016; Livne et al., 2017; Nwankwo et al., 2018; Svensson et al., 2007). The perceived barriers that face midwives in UIC facilities are related to the delineation and specialisation of midwives, lack of time at antenatal visits and lack of staff (Svensson et al., 2007). In keeping with the above themes, the study by Livne (2017) looked at barriers to health education by clustering them into perceptions, which was divided into patient education climate perceptions, then further divided into physical, human and organisational resources and nurse role perceptions (Livne et al., 2017). Barriers noted under patient education climate included work overload, low priority given to health education and lack of policies and guidelines (Livne et al., 2017).

Risa, Friberg and Liden (2015) found that midwives in a UIC facility were vulnerable to burnout due to an overload when health educating pregnant women, especially when they were from disadvantaged backgrounds, as the education needed to be individualised (Risa, Friberg and Lidèn, 2015). Lack of staffing was a common barrier seen across many LMIC institutions, whilst noticeable in UIC; most UIC institutions are adequately staffed compared to LMIC institutions (Nwankwo et al., 2018). In LMIC institutions, lack of staff was considered a direct barrier to the provision of health education to pregnant women, whilst many LMICs reported the non-integration of health education for pregnant women in ANC programmes (Al-Ateeq et al., 2015; Nwankwo et al., 2018). Many midwives in numerous UICs felt they were going against their midwifery ethos by having to rush through educational topics, not in keeping with the women's framework of understanding, due to time constraints (Risa et al., 2015). Both midwives from UICs and LMICs acknowledged the main perceived barrier was being able to provide effective information during the short health education session, therefore due to this short period many midwives perceived themselves as meagre messengers and not educators advocating for the health of the pregnant women (Baron et al., 2017; Risa et al., 2015).

Nurses' role perceptions included barriers such as difficulty in communication, not identifying health education as a nursing responsibility and insufficient knowledge and skills (Livne et al., 2017). In keeping with communication, many midwives believed fostering a healthy relationship between themselves and pregnant women was essential in understanding problems and maintaining effective communication between the parties concerned; the lack of such a relationship results in poor health education provided to women (Baron et al., 2017).

In LMIC facilities barriers started with the lack of an organisational culture in which health education to pregnant women was not prioritised and not considered a core value by managers and senior management teams. In Nigeria, 18% of nurses and midwives agreed that hospital policy within their work environment did not promote health education towards pregnant women, with even higher numbers (47%) perceiving their institutions as not being adequately prepared for health education (Livne et al., 2017; Nwankwo et al., 2018). Scarce economic resources allocated to health in LMICs such as India and Nigeria is another barrier that prevents the delivery of health education (Livne et al., 2017; Nwankwo et al., 2018). In the study conducted in Nigeria, many midwives (84%) thought that non-governmental organisations should take over the role of health education due to the availability of resources (Nwankwo et al., 2018).

Rewards for midwives towards health education was unheard of, and supervisors in clinics did not communicate well-defined expectations to midwives regarding health education therefore not emphasising the value of health education towards pregnant women (Livne et al., 2017). Lack of job satisfaction and empowerment were also said to be contributing factors towards midwives' negative attitudes towards health education (Nwankwo et al., 2018). It should be therefore be advocated that all healthcare professionals, especially nurses and midwives who always interact closely with pregnant women during their clinic visits, be sufficiently empowered with ongoing education and training to facilitate their roles (Da Serra et al., 2018; Livne et al., 2017; Nwankwo et al., 2018).

Perceived barriers by midwives included negative attitudes and lack of cultural sensitivity towards health education. This could stem from the lack of policy developments in LMIC clinics (Al-Ateeq et al., 2013; Livne et al., 2017) and some clinics not prioritising health education and identifying clear opportunities in the provision of health education (Nwankwo et al., 2018). In many LMICs, midwives in clinics are faced with various cultural barriers and thus need to be culturally sensitive (Nwankwo et al., 2018). In some LMICs' cultures, death in childbirth or pregnancy is considered natural, and many discourage the use of antenatal services, resulting in the lack of provision towards health education (Aldossary et al., 2013; Nwankwo et al., 2018). A study done in Tanzania showed that less than 50% of pregnant women received professional attendance during childbirth (Nwankwo et al., 2018).

Although LMICs are faced with many barriers, governments and professional bodies are identifying new ways to promote health by providing health education through means of technology such as mobile devices, tablets and other electronic mediums (Barron et al., 2016; Clara, Neo and Svetla, 2014; Motsoaledi et al., 2015). According to the International Telecommunication Union (ITU), subscriptions relating to mobile phones reached almost six billion globally in 2011 (Clara et al., 2014); 660 million new subscriptions during the year 2011 were registered, with 80% of the new subscriptions coming from LMICs (Clara et al., 2014), which increases the possibility of using this platform for the dissemination of health education.

2.7 GLOBAL DIGITAL LANDSCAPE

Mobile phones, the internet and all the other means to collect, store, analyse, and share information digitally have proliferated quickly (Anstey Watkins et al., 2018). UICs are said to

have mobile and technological coverage of between 81 to 97.1 per cent per hundred inhabitants, conversely in LMICs it was estimated that coverage was 41.3 to 48.2 per cent per hundred inhabitants (Haddad, Souza and Cecatti, 2019). In South Africa, mobile phone saturation has exceeded 120%; Information and Communication Technologies (ICT) in conjunction with Electronic Health (eHealth) policies are using this as an avenue to reduce healthcare expenditure costs, whilst improving access to health education for individuals of the country (Botha and Booi, 2016). The mobile phone infrastructure is the most advanced infrastructural development in Africa; more households in LMIC countries own mobile phones than have access to clean water or electricity (Anstey Watkins et al., 2018; Clara et al., 2014; Hampshire et al., 2015), and nearly 70% of the bottom fifth of the population in LMIC countries own a mobile phone (World Bank, 2016). More and more countries globally are becoming connected to the internet, and the number of users has more than tripled in a decade, from 1 billion in 2005 to an estimated 3.2 billion in 2015 (World Bank, 2016).

The Networked Readiness Index (NRI), also known as technology readiness, was created in partnership with the World Economic Forum and the ICT department of Harvard University (Dutta et al., 2015). The NRI provides policymakers, business leaders and concerned citizens with valuable understanding into present market conditions and the state of connectivity across the world, and it assists in identifying where more can be done to hasten the Internet's constructive impact on the world in which we live (Baller, Dutta and Lanvin, 2016; Dutta et al., 2015).

The network readiness framework lies on six principles, which denotes a country having a sound network infrastructure for its people: firstly, a high-quality regulatory and business environment is significant in order to fully leverage ICTs and create impact, which results in good quality assurance and updates with regards to the health education provided to pregnant women; secondly, ICT readiness is imperative as a number of Reproductive, Maternal, New-born and Child health (RMNCH) community partners believe that ICTs, in particular mobile health (mHealth), are key to improving women's and children's health by improving access to information (Hagan and Uggowitzer, 2012); thirdly fully leveraging ICTs requires a society-wide effort, where the business sector, the government and the population at large have a critical role to play, allowing as many people as possible to have access to technology and ICT services around the world, bringing about greater access to health education; fourthly the drivers (environment, readiness, and usage) interact, co-evolve, and reinforce each other to form a virtuous cycle; fifthly, ICT use should not be an end in itself, but the impact they have

on the economy and society is what ultimately matters to provide access; lastly, the networked readiness framework should provide clear policy guidance to enable other countries to adopt ICT within their countries (Dutta et al., 2015). The current NRI for South Africa is 4.1, with a world ranking of 65 out of 139 countries, gaining 10 slots from the previous year 2015 (Baller et al., 2016; Dutta et al., 2015). This growth demonstrates a surge in the access to mobile devices with increased relevance to mHealth applications, as it allows for greater access to health education especially in rural areas, where access to healthcare is difficult and information obtained by those with access to mobile devices can be shared amongst the community (Barron et al., 2016; Botha et al., 2016; Motsoaledi et al., 2015)

2.8 MHEALTH AND ITS USE

mHealth is a division of eHealth (Botha et al., 2016; Clara et al., 2014; Haddad et al., 2019), and refers to the use of mobile devices and technology to promote health by means of communication technologies (Clara et al., 2014; Motsoaledi et al., 2015). mHealth can take many forms, but is not limited to health data collection, patient observation, delivery of healthcare information (Health education), and provision of care (Botha et al., 2016; Haddad et al., 2019). mHealth has demonstrated its effectiveness amongst LMIC countries, especially in remote or resourced poor places where healthcare is difficult to acquire (Khatun et al., 2016; Khatun et al., 2015; Motsoaledi et al., 2015). Universal health coverage is a prospect that can be achieved particularly in remote area's through means of mHealth (Haddad et al., 2019). In addition, concerns exist on how to implement quality based solutions for the prevention and management of complications women may experience during pregnancy, as constraints exist in access and a need for the strengthening of health systems , resulting in inequalities of health coverage (Clara et al., 2014).

However mHealth has the makings to reduce inequalities in care through a collection of applications that aim to make possible the communication between pregnant women and midwives, promote behavioural change amongst pregnant women, assist in data collection, extend training and promote health (Botha et al., 2016; Hampshire et al., 2015; Motsoaledi et al., 2015). Widespread optimism central to mobile phones becomes an enabler to overcome infrastructural constraints and provide routes out of poverty, particularly in rural areas (Hampshire et al., 2015). Shortages of health professionals and midwives in rural resource

constrained contexts have led to effective, affordable and accessible mHealth solutions (Anstey Watkins et al., 2018; Haddad et al., 2019).

Studies by Aranda-Jan (2014) and WHO (2015) as cited in the article by Haddad (2019) have demonstrated the global health community provided significant investment after recognising the potential for mobile phones to bridge healthcare gaps in LMIC countries (Haddad et al., 2019), and further to note the effectiveness of these solutions have demonstrated assuring results, indicating greater increase in adherence of ANC services, increased awareness of risk factors and improvement in management of problems amongst other positive notes (Haddad et al., 2019). South Africa, with its significant mobile penetration of over 120 percent has benefited both nurses and patients from numerous mobile health implementations with aims of data collection, accessing results of diagnostic nature and health education applications (Barron et al., 2016; Botha et al., 2016). However, although studies have explained the many benefits of mHealth (Agarwal et al., 2015; Bonnell et al.,2017; Feroz et al., 2017; Johnsen et al., 2017; Redman et al., 2017; Velu et al., 2017; Zakane et al., 2014), the true impact of improvement on maternal and neonatal morbidity and mortality remains unclear due to the paucity of research within the field (Haddad et al., 2019).

Whilst mHealth has the capacity to reduce inequalities in healthcare, mHealth initiatives remain limited in coverage and scope and are often met with barriers in LMIC countries (Clara et al., 2014; Hampshire et al., 2015; Tshuma et al., 2017).

2.9 BARRIERS TO MHEALTH

Anstey Watkins et al. (2018) in their study uncovered multiple barriers to mHealth, and reported on them from both the perspectives of healthcare workers, including midwives, and from the perspective of patients. Limited computer knowledge from nurses and midwives resulted in greater use of personal mobile devices in order for them to communicate with management, for laboratory results and other tasks related to patient care (Anstey Watkins et al., 2018; Botha et al., 2016; Haddad et al., 2019). Doctors on the other hand, although they had knowledge of computers they also used their personal mobile devices to seek assistance and discuss patients for further management (Anstey Watkins et al., 2018). The use of personal devices resulted in greater financial pressure on nurses, midwives and doctors as they were not compensated for use of their mobile phones (Anstey Watkins et al., 2018).

A major barrier noted in the South African mHealth environment was that most of the initiatives were donor funded, and no major business model was identified that would guarantee sustainability away from a donor involvement (Botha et al., 2016). Healthcare provider organisations are unable to provide resources required by midwives to enable them to use technological communication, regardless of the desire to use mHealth or its potential benefits (Anstey Watkins et al., 2018; Hampshire et al., 2015). Other barriers included older nurses and midwives lacking the ability to operate and having the necessary skills to promote and use mHealth when providing care, increased workload and professional training for mHealth applications (Hagan et al., 2012). Lack of data was another contributing factor that prevented access to mHealth for midwives and nurses, as they did not have the ability to search for information on the web, or communicate with others for the management of patients and the sharing of knowledge (Anstey Watkins et al., 2018; Clara et al., 2014). In South Africa, it was noted that most mHealth implementations provide text or voice-based communication that is often geared towards a specific community or individual through such services as ANC, leaving large communities without access to information (Botha et al., 2016).

Factors affecting patients access to mHealth included lack of access to smartphones, data and airtime, and limited knowledge on use of mobile devices, with a greater effect on poorer and less educated individuals especially in less resourced African countries that continue to have poor infrastructure (Anstey Watkins et al., 2018). The youth is one of the largest groups of mobile phone users, but also the largest affected with barriers such as having no income resulting in access to airtime and data only when they obtain cash, restricted mobility and little social status compared to adults (Clara et al., 2014; Hampshire et al., 2015).

Whilst mHealth is still an ongoing project, with numerous LMIC countries attempting to establish mHealth use and other LMICs improving infrastructure, many individuals, especially the teenage population, adopted other strategic ways of finding information relating to their healthcare (Anstey Watkins et al., 2018; Clara et al., 2014). A common method for overcoming limited mHealth applications was the use of informal mHealth such as searching over the internet and sharing of information over social network applications from free public access networks, or after saving money purchasing airtime or data packages for information seeking and sharing (Anstey Watkins et al., 2018; Clara et al., 2014; Hampshire et al., 2015). Healthcare workers, including midwives, have created digital pages and groups on well-known social networking sites such as “Facebook” and “Twitter” in order to share and obtain information regarding care and management of emergencies and diseases (Anstey Watkins et al., 2018;

Clara et al., 2014). South Africa implemented a holistic campaign from 2009, that focused on attempting to achieve the then Millennium Development Goals (MDG) four and five, with central focus on Sustainable Development Goals (SDGs), through prevention of mother-to-child programmes, HIV and health education through mHealth applications available to communities (Anstey Watkins et al., 2018; Barron et al., 2016; Tshuma et al., 2017).

2.10 'MOMCONNECT'

In 2012, South Africa's NDoH's attempt to achieve the targets of the then MDG, introduced a variety of health system interventions to expand the coverage and quality of health services (Barron et al., 2016). These interventions included a new breastfeeding strategy in 2012, a national family planning campaign in 2013 and a mHealth intervention called ''MomConnect'' in 2014 (Barron et al., 2016; Motsoaledi et al., 2015).

The aim of the mHealth strategy was to support the priorities of the health sector, meet the needs of the healthcare providers and users of mHealth applications and assist policy makers and managers (Motsoaledi et al., 2015). Over the prior five years, with mobile phone use becoming ubiquitous, the usage of mHealth interventions, including a series of initiatives, aimed at bettering maternal and child health had multiplied exponentially (Barron et al., 2016; Clara et al., 2014; Motsoaledi et al., 2015).

'MomConnect' is a NDoH initiative unveiled in South Africa in August 2014, which takes advantage of the large penetration of mobile devices in South Africa to health educate pregnant women (Barron et al., 2016). Use of this application involves a simple registration process at the PHC clinics by midwives or individuals trained on registering pregnant women (Motsoaledi, 2014). The aims of "MomConnect" are to link up pregnant women to health services, to urge pregnant women to attend antenatal clinics as early as possible, preferably before 20 weeks of pregnancy, and to enable pregnant women to work together with the health system by providing feedback on visits to the clinic (Barron et al., 2016).

"MomConnect" not only sends health education messages to pregnant women, but works in three other ways, firstly the day after registration, a survey is sent to pregnant woman providing information on the visit, staff attitudes, cleanliness, waiting times and privacy (Barron et al., 2016). Secondly pregnant women are able to ask for additional information, in the form of text

messages and responses are standard answers from a helpdesk which is manned by a midwife and two other persons (Skinner et al., 2018). The final way "MomConnect" works, is it allows pregnant women to log compliments or complaints of staff and their respective clinics; complaints are forwarded and followed up while compliments are sent to the managers to convey to staff (Barron et al., 2016). Since its inception in 2014, more than 95% of all pregnant women attending PHC clinics have been registered for "MomConnect," the availability of which now exists on "WhatsApp," a social networking application (Barron et al., 2016; Motsoaledi et al., 2015).

2.11 SUMMARY OF CHAPTER TWO

From the literature reviewed in this study, a link between midwives perceptions and health education was noted with its influences on health education provided to pregnant women at PHC clinics (Nwankwo et al., 2018; Svensson et al., 2007). The importance of health education to pregnant women with greater emphasis on more health education was recognised by midwives, however, barriers such as lack of time, staffing, specialisation staff in various stages of maternal health, such as post-natal care, are just a few examples that are present and could hinder health education from occurring (Nwankwo et al., 2018; Svensson et al., 2007). In dealing with some of the barriers, various organisations and management offices have identified the ever increasing world of technology in LMIC countries, with many countries introducing mHealth applications to reach out to individuals to health educate and improve their health status (Barron et al., 2016; Hampshire et al., 2015; Motsoaledi et al., 2015; Tshuma et al., 2017). As a result, more individuals are accessing mHealth or informal mHealth, but whilst this positive move exists, this new emerging field is not filled with barriers. Although midwives are ever willing to adapt and learn and be provided with resources to encourage mHealth use, the lack of support and resources prevents them from using these, especially amongst the remote and rural areas where access to healthcare is scarce (Anstey Watkins et al., 2018). Therefore establishing perceptions and barriers of midwives in health educating pregnant women through technological and non-technological means is important in order to contribute to the reduction of MMR.

CHAPTER THREE: METHODOLOGY

3.1 INTRODUCTION

This chapter details the research approach, design, research setting, population, process, sample size and the data collection instrument used in this research. Data collection was conducted using a structured questionnaire and audit tool, and the data was analysed using IBM Statistical Package for the Social Sciences (SPSS) version 24.

3.2 RESEARCH PARADIGM

A paradigm is considered as a worldview, a general perspective on the various complexities of the world, paradigms for human enquiry are often categorised in the ways in which they respond to the basic philosophical questions relating to the ontological, methodological and epistemological views (Burns and Grove, 2009; Polit and Beck, 2017). A positivist paradigm undergirded this research. Positivism is rooted in 19th century thought, and is a reflection of a larger cultural thought in the humanities, commonly referred to as *modernism,* and emphasises the scientific and rational thinking (Polit et al., 2017). Positivism holds the view that truth is absolute and its ontological view is that a single reality exists and is described through careful measurement (Burns et al., 2009).

The positivists scientific paradigm encompasses the use of orderly, disciplined procedures that are designed to examine researchers' hunches regarding the nature of experience being studied and relationships between them (Polit and Beck, 2004). Systematic processes were performed, following the research process, to search for and identify literature, questionnaires, articles and guidelines to assist in preparation for this study. Observation is the key element in positivism allowing for objective findings (Burns et al., 2009; Polit et al., 2017). The researcher was not present when midwives were completing the questionnaire in an attempt to prevent the Hawthorne effect and remain independent from the study. Social researchers' suggest that positivism is the process of confirming events and knowledge through the five senses, and only then can this be regarded as knowledge. The central purpose of positivism is to generate hypotheses that can be tested, with research that is value free (objective) (Bryman, 2012).

3.3 RESEARCH APPROACH AND DESIGN

A quantitative approach using an exploratory non-experimental design was adopted in this study. A quantitative approach involves the investigation of events that contribute to the precise measurement and quantification, which often involves the use of a rigorous and controlled design (Polit et al., 2017). The controlled design involved the use of a questionnaire to gather numerical data using such measures as Likert scales to identify midwives' perceptions of health promotion, their technological acceptance of mHealth applications and their self-reported actual use of mHealth tools to provide health education at PHC clinics.

The gathered data was analysed and allowed for deductive reasoning (Polit et al., 2017) about health education. In line with deductive reasoning, this study proposed that the midwives' perceptions towards health education could either promote or prevent health education from occurring. This study also predicted that technological readiness of mHealth, allowed for the midwives at PHC clinics acceptance and use of mHealth applications. A non-experimental design was used in that the researcher collected data without introducing or implementing an intervention (Polit et al., 2017).

An exploratory descriptive design was chosen. It was exploratory in nature because the researcher explored midwives' perceived roles in maternal health education and their technological acceptance of mHealth in health educating pregnant women during and in-between antenatal visits at PHC clinics. A descriptive design was chosen as there was no manipulation of variables, and the researcher wanted to gain a more realistic understanding of how midwives perceived their roles and determined the actual use of mHealth at PHC clinics where they provided health education (Polit et al., 2017).

3.4 STUDY SETTING

The setting of this study was the Department of Health's (DoH) PHC clinics located in a sub-district of eThekwini. The eThekwini district is the largest metropolitan health district in KwaZulu-Natal (Figure 4: Map of eThekwini and its major wards) (Msimango, 2018; Simelane, 2015). It comprises 110 wards in a 2297 square kilometre radius, and is bordered by Tongaat in the North, Umkomaas in the South, Cato Ridge in the West and the Indian Ocean to the East (Msimango, 2018). The current sub-districts are under review and therefore

information relating to them was taken from the 2015/2016 and 2018/2019 District Health Plan (DHP) (Msimango, 2018). The South sub-district has been divided into three functional areas: 1) South Central, 2) South West, 3) Umlazi/Engonyameni and Lower South. The North/West is divided into four sub-districts, namely: 1) North Central, 2) Greater Inanda/Tongaat Sub-District, 3) Inner West and 4) Outer West Sub-Districts. Whilst eThekwini is highly urbanised, small areas of rural communities exist on the outskirts of the western, southern, and northern areas, affecting access to services of these inhabitants (Simelane, 2015).

The population of eThekwini is growing annually at an average rate of 1% per annum, with a current count of 3 548 512 people (2018/2019 DHP), comprised of 50.4% females and 49.6% males of all ages (Msimango, 2018). The bulk of the population is Black Africans (71.9%), followed by Asians/Indians (16.3%) and Coloureds (2.2%), the DHP excludes reports of the White population for reasons not given (Msimango, 2018). eThekwini is densely populated, the largest proportion residing in the Sub-district North (32%), but the highest population density is found in South Central district with 2913 person/km^2 (Msimango, 2018; Simelane, 2015).

eThekwini, with its developing population, is made up of 62% below 35 year old individuals (Msimango, 2018; Simelane, 2015). Life expectancy is reported provincially, and last calculated in 2014 for Kwa-Zulu-Natal as 54.4 years for males and 59.4 years for females (Dhlomo and Zungu, 2015). In addition, the fertility rate is low and recorded at 3.53% in 2001 with a drop to 2.98% in 2014 (Dhlomo et al., 2015), due to the quadruple burden of diseases (Msimango, 2018; Simelane, 2015). The current maternal mortality ratio (MMR) remains high within the eThekwini district (113 per 100 000 live births), however the highest rate was in the South district of eThekwini, where MMR was recorded as 220 per 100 000 live births, in 2017, mainly contributed to by figures from Umlazi/Engonyameni of the South district (Msimango, 2018). The economic activity within the district is growing, with 64% of the total population employed (Dhlomo et al., 2015).

The bulk of employed persons, for both youth and adults, were in the formal sector (non-agricultural), followed by the informal (non-agricultural) sector (Maluleke, 2018). There was an increase in households within the province of KwaZulu-Natal (KZN) from 2.2 million households in 2007 to approximately 2.8 million in 2016 (Maluleke, 2018). In eThekwini, approximately 80% of households were formal, whilst the remaining 20% were a mixture of RDP or government subsidised, traditional households or households that have been

categorised as “other” (Maluleke, 2018). In general, 80% of households in eThekwini had access to piped water, whereas approximately 60 per cent of households in eThekwini had access to flush toilets connected to a sewerage system or septic tank (Maluleke, 2018). eThekwini municipality is amongst the municipalities with 95 per cent or more of households able to access electricity (Maluleke, 2018).

The population of eThekwini, inclusive of inhabitants in the Sub-District South, have access to a tiered healthcare system, continuing from levels one through to four providing their own speciality in their respective levels, with Primary Health Care (PHC) as the entry point into the healthcare system (Motsoaledi, 2014). Level one healthcare delivery in the eThekwini district is made up of both metropolitan clinics, run by the local municipalities within each sub-district (Dhlomo et al., 2015; Msimango, 2018), and Department of Health clinics (Motsoaledi, 2014; Simelane, 2015). Level one facilities consist of PHC clinics, Community Health Centres (CHC) and district hospitals, offering care that includes services such as family planning, immunisation, ante-natal care, and treatment of common diseases, treatment and management of Tuberculosis, and HIV/AIDS counselling and testing, amongst other basic health services; all individuals in the country may access healthcare at this point, which is generally free of charge (Motsoaledi, 2014).

Not only is healthcare delivered directly in the healthcare setting, but also through technological means. The technological landscape in South Africa (SA) is increasing, especially amongst the youth of the country, both urban and rural areas, who are obtaining access to mobile devices and seeking information regarding different health topics (Tshuma et al., 2017). The Networked Readiness Index (NRI) in South Africa is steadily growing, and is ranked 72 out of the 121 countries as of 2019, due to the change of the underlying model in which the NRI is based upon; the 2016 NRI therefore cannot be directly comparable to that of the 2019 index (Dutta and Lanvin, 2019). The major changes include the four pillars in which the new model is based upon with its sub-pillars; the four major pillars include: technology, people, government and impact, with their own individual sub-pillars (Dutta et al., 2019).

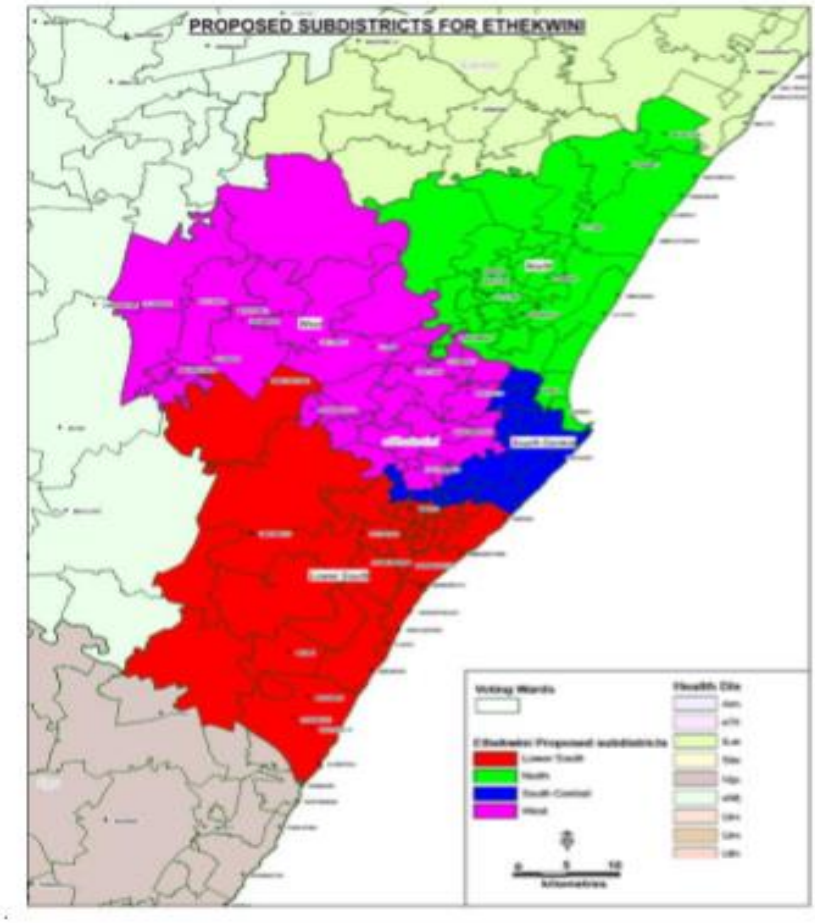

Figure 4: Sub-districts of eThekwini

3.5 STUDY POPULATION AND SAMPLING

3.5.1 Study population

South Africa (SA) has a total of 287512 nurses registered on the South African Nursing Council (SANC) roll; included in this total are 56777 general nurses with psychiatry, community health nursing and midwifery, with 25452 nurses registered as a general nurse with midwifery, resulting in a total of 82229 nurses with a midwifery qualification (SANC, 2018). However these figures represent registrations and do not include the number of midwives actually practising midwifery (SANC, 2018). The highest age distribution of nurses in SA is in the age group of 50 to 59 years with the least falling into the age category of below 30 years (SANC, 2018). Currently, in the South African province of KwaZulu-Natal, the nurse ratio is 336:1 (SANC, 2018).

3.5.2 Sampling

Sampling is the process that involves selecting a group of people, behaviors, events or other elements with the aim of conducting a study (Burns et al., 2009). Purposive sampling was used to select the sub-district with the greatest Maternal Mortality Rate (MMR) of 220 per 100 000 live births, therefore the South sub-district was chosen. The researcher wished to collect data from the 29 municipal clinics in addition to the Department of Health, but the application for gate-keepers permission sent to eThekwini municipality was declined without an explanation (See Appendix 13: Gatekeeper letter from eThekwini municipality), consequently the study focuses on 15 DoH PHC clinics and 1 CHC and going further, this study will collectively refer to these facilities as 16 PHC clinics.

Non-probability purposive sampling was used in determining the respondents, as the central focus of this study involved midwives' perceptions. The midwives, midwife specialists (ADM) and midwifery students completing the one year program in midwifery that attend hours at PHC clinics were included in the study. The eThekwini Health District Office was unable to provide information regarding the staffing due to staff resignation, retirements and post community service placements. After obtaining ethical clearance from the HSSREC and the DoH National Health Research Database (NHRD), the researcher and research assistants were able to enter facilities; due to the inaccessibility of information, a profile is not possible of the nursing staff, inclusive of the midwives in the various PHCs. On an average day, staffing in the 16 PHC clinics ranged between four to seven midwives, with certain clinics having midwifery students completing their prescribed hours, whilst other staff were on leave for various reasons. The estimated total number of midwives in the 16 DoH South sub-district clinics was 104.

The minimal sample size of 83 respondents was determined using the Raosoft calculator (2004) and a 5% margin of error and confidence level of 95%. However, there was oversampling to accommodate respondents not on site at time of data collection and it included all midwives in the PHCs; 104 potential respondents were invited to participate in this study.

Inclusion criteria:

1. All midwives currently employed at the selected PHC clinics within the South sub-district of eThekwini.
2. All midwife specialists (ADM) currently employed at the selected PHC clinics within the South sub-district of eThekwini.

3. Post-basic midwifery students who at the time of data collection were doing their practicals within the selected PHC clinics of the South sub-district of eThekwini.
4. All midwives who were available in the select PHC clinics within the South sub-district of eThekwini and willing to participate in the study on the day of data collection.

Exclusion criteria

1. All registered nurses without a midwifery qualification, enrolled nurses, enrolled nurse auxiliaries, and other healthcare providers working within the PHC clinic.

3.6 DATA COLLECTION INSTRUMENT AND DATA COLLECTION PROCEDURE

3.6.1 Data collection instrument

Two instruments were used to gather data in this study; the first was a health education landscape survey tool, and the other was a self-reporting research questionnaire comprising two instruments.

Research instrument 1

The *survey tool* aligns with Donabedian's quality care model and assessed the health education landscape of the various PHC clinics that were used in this study for **structures, processes** and **outcomes** (Appendix 4: Survey tool for clinic) (Donabedian, 2005; Shojania et al., 2004). The survey tool was designed for the study by the researchers.

Structures assessed for evidence in the frequency of the different midwife categories that provided health education in the clinic, the availability of policy documents, non-technological resources such as posters and pamphlets, and technological resources such as establishing the availability of equipment for watching health promotion DVDs (Shojania et al., 2004).

Processes assessed the frequency in the delivery of health education in PHC clinics, and identified the number of pregnant women who attended PHC clinics in search of ANC care, whilst also establishing the availability and access of mHealth training to the various categories of nurses at PHC clinics (Donabedian, 2005; Shojania et al., 2004).

Outcomes assessed for actual usage of non-technological and technological modes of health education. The actual usage of technological modes of health education through mHealth

programmes was identified through clinic registers of the number of pregnant women registered for mHealth programmes. Outcomes were also assessed through health education registers of the actual usage of non-technological modes of health education. The survey was conducted in each clinic through a walkabout with the researcher/research assistant and the respective unit managers, lasting on average 10 minutes.

Research instrument 2

Research instrument administered to midwives: Data were gathered through self-reporting tools, which was adapted with written permission from Yakubu and Dasuki (2018) and Aldossary, Barriball and While (2013) (Appendix 1: Permission for tool – Dr. Aldossary and 2: Permission for tool – Mr. Yakubu). The tool was adapted by excluding the moderating variables (experience and voluntariness of use) as there was no significance to this study (Yakubu et al., 2019). The questionnaire was in English and there was no need to translate it, as English is the reporting language of the clinics.

The questionnaire consisted of four sections: Section A: demographics (age, gender and experience); Section B: midwives' roles and perceptions (views) of health education (Aldossary, Barriball & While, 2013); Section C: midwives' acceptance of technology and mHealth in the PHC clinics where you are working (Yakubu & Dasuki, 2018); Section D: actual health education conducted in the past month. Section B made use of a 4-point Likert scale, with "4" being "strongly agree" and "1" being "strongly disagree, while section C contained a 5-point Likert scale, with "5" being "strongly agree" and "1" being "strongly disagree". The variable "age" was re-coded into age ranges "25-35," "36-45," "46-55" and "above 56 years". Years of experience was also re-coded into ranges "1-10," "11-20" and 21 years and over.

The subscales included in sections B and C were measured using summation, with relevant items being reverse scored. Section B of the questionnaire included 19 questions and consisted of three subscales; sub-scale one: "Constraints regarding health promotion comprised of four questions" (B1 to B4) with a summation of a total possible sub-scale score of 16; sub-scale two: "Responsibilities of Nurses" comprised of six questions (B5 to B10) with a summation of a total possible score of 24; lastly, sub-scale three: "Perceptions of patients" comprised nine questions (B11 to B19) with a summation of a total possible score of 36. Section C of the questionnaire consisted of 22 questions and six subscales that aligned with the UTAUT model, namely i). Performance expectancy (C1-C4), ii). Effort expectancy (C5-C8), iii). Social

influence (C9-C12), iv). Facilitating conditions (C13-C16), v). Behavioural intentions (C17-C20). Each of the subscales consisted of four questions each with a maximum score of five, which through summation calculated a possible score of 20 for each sub-scale. The last sub-scale in Section C was "Actual usage," which included two questions (C21 to C22) with a summation of 10. Questions B5, 6, 7, and 10 were all reversed scored.

Reliability: Aldossary et al. (2013) tested the reliability of the health education instrument (n=50; n=31 nurses, n=5 doctors, n=14 patients) by reporting the Cohen's Kappa coefficient using a test-retest method, resulting in a score of 0.61 – 1.0, for all items of the questionnaire. Internal reliability for the adapted UTAUT questionnaire showed Cronbach alpha scores per sub-scale of 0.8 Performance Expectancy (PE), 0.8 Effort Expectancy (EE), 0.8 Social Influence (SI), 0.8 Facilitating Conditions (FC), 0.8 Behavioural Intentions (BI) and 0.9 Actual Usage (AU) (Yakubu et al., 2019). A two-step approach was performed, the first being a confirmatory factor analysis, using the maximum-likelihood method to estimate the parameters of the model, and secondly, being a goodness-of-fit test was conducted to ensure a good fit of the data (Yakubu et al., 2019). Lastly, composite reliability was used to confirm the reliability of the measured constructs, in which a value of 0.7 was recommended by the author (Yakubu et al., 2019).

Inter-rater reliability was maintained by training two research assistants on the questionnaire and its instructions, aims and objectives of the study, inclusive of the information sheet and importance of consent. The training was conducted on 10th February 2020, for approximately four hours at a local library; during the training, assistants were informed on the topics mentioned above and emphasis was placed on consent taking for each respondent. Sample documents were provided to assistants with examples of how the consent, questionnaire and survey tool should be completed. Assistants were also informed about what to identify during the "walk about," to maximise information gathering during the survey.

During training, assistants were allowed to ask questions, however, none was asked regarding any information provided to them. In addition, the research assistants were advised that the researcher could be contacted immediately if any problem arose; none occurred. A thorough explanation on the different constructs of the tool was provided during the training session so that the assistants would be able to answer any questions that might be asked by respondents; the researcher visited a single site for each research assistant at the start of data collection to monitor the assistants performing their tasks and making sure the assistants provided and

explained to respondents all correct information regarding the questionnaire, information sheet and consent.

Validity: Aldossary et al's (2013) questionnaire determined validity by means of a review by a panel of 10 experts (selection not specified), based in the United Kingdom and Saudi Arabia, who all confirmed content validity (Aldossary et al., 2013). Face validity was performed in the study of Yakubu et al. (2019), by two experts with experience in eLearning as instructors, and a pilot test was conducted (n=43 students excluded from the main data collection period) (Yakubu et al., 2019).

Face validity of this study's questionnaire was obtained through the engagement of four experts. The four experts provided skills as a language expert, to assess the grammar, language and instructions of the questionnaire, a midwifery expert, to assess the regular provision of health education to pregnant women, an expert in the field of mHealth having undergone the necessary training to register pregnant women onto the database and conduct mHealth applications with patients.

The training consisted of midwives attending a half-day presentation from 8am to 2pm, the training covered a theoretical component conducted by an expert in mHealth, or more specifically "MomConnect," sent from the district office. The theory presentation included the importance, use and relevance of mHealth, how it assists both midwives and pregnant women, followed by a practical demonstration on how to register pregnant women onto the application, as well as the use of the mHealth application. No certificates were issued upon completion of training with no further refresher courses available for new or already trained midwives; the midwife who was trained then trains the staff within the clinic where she is currently employed.

Lastly, the fourth expert was in the field of PHC and had worked closely with the clinics. Feedback was provided and the necessary concerns dealt with; one expert advised they were not sure what mHealth programmes were, and this was described in the tool and the informed consent to all respondents. Experts expressed concern about the length of the questionnaire but they all completed it within seven to 10 minutes.

Content validity was achieved through the literature (Table 1).

Table 1: Content validity

Research Objective	Framework for study	Research question number	Residents question number	Research studies
Questionnaire				
1. To establish midwives' perceptions of their role and responsibility in disseminating maternal health education in PHC clinics in a sub-district of eThekwini	Constraints regarding health promotion	1 to 4	B1 to B4	Aldossary et al., 2013
	Responsibilities of nurses	5 to 10	B5 to B10	Aldossary et al., 2013
	Perception of patients responses to health promotion by nurses	11 to 19	B11 to B19	Aldossary et al., 2013
2. To assess midwives' current use and technological acceptance of mHealth to disseminate health education to pregnant women attending PHC clinics in a sub-district of EThekwini	Performance expectancy	1 to 4	C1 to C4	Yakubu et al., 2019 Venkatesh et al., 2003
	Effort expectancy	5 to 8	C5 to C8	Yakubu et al., 2019 Venkatesh et al., 2003
	Social influence	9 to 12	C9 to C12	Yakubu et al., 2019 Venkatesh et al., 2003
	Demographics	-	1,2,3,4	Yakubu et al., 2019 Venkatesh et al., 2003
3. To determine the frequency with which midwives conduct health education through non-technological and technological modes in PHC clinics of a sub-district in eThekwini	Facilitating conditions	13 to16	C13 to C16	Yakubu et al., 2019 Venkatesh et al., 2003
	Behavioural intention	17 to 20	C17 to C20	Yakubu et al., 2019 Venkatesh et al., 2003
	Actual usage	21 and 22	C21 and C22	Yakubu et al., 2019 Venkatesh et al., 2003
4. To survey the health education landscape in PHC clinics of a sub-district in eThekwini for evidence of the delivery of ANC health education by midwives to attending pregnant women	Actual usage		D1 and D2	Yakubu et al., 2019 Venkatesh et al., 2003 Motsoaledi et al., 2015
Survey tool				
5. To survey the health education landscape in PHC clinics of a sub-district in eThekwini for evidence of the delivery of ANC health education by midwives to attending pregnant women	- Constraints regarding health promotion - Responsibilities of nurses - Perception of patients' responses to health promotion by nurses - Actual usage		1 to 10	Aldossary et al., 2013 Yakubu et al., 2019 Venkatesh et al., 2003

3.6.2 Data collection procedure

Data collection commenced after ethical clearance was obtained from the study/university (HSSREC/00000181/2019) (Annexure: 10: HSSREC Approval Letter) and gatekeeper approval from KZNDoH (Annexure: 11 DOH Gatekeeper Approval Letter). In order to gain access to the respondents, the researcher called and met with managers of the different PHC facilities and determined the most appropriate time to conduct the study that did not interfere with the clinic routine or compromise patient care. Five PHC clinics required permission from the CEO's office before commencing data collection; unfortunately, this led to an extension of the data collection period by four days as some offices had no internet facilities due to load shedding issues and the researcher was called and informed by the personal assistants of the approval.

At the start of the shift (07h00), the researcher/research assistants explained the study and informed all potential respondents that the questionnaire would take between seven and 10 minutes to complete. After the verbal and written information (Appendix 5: Information sheet and consent for research study), the researcher allowed respondents time to decide if they would participate. Only one clinic used midwives' teatime for data collection and the respondents were compensated with a can of juice. Most midwives preferred to complete the questionnaire before commencing duties. Upon voluntary consent to participate, all respondents signed consent and retained a copy, anonymity and confidentiality were maintained and all rights explained (Appendix 5: Information sheet and consent for research study).

The respondents were offered a private place with sufficient lighting and ventilation in the clinic when completing the questionnaire, which took approximately seven to 11 minutes to complete; some midwives opted to use their respective consulting rooms, and others opted for the duty station. All respondents retained the information sheet with relevant contact numbers to access further information about the study if necessary. On completion, all respondents placed their completed questionnaire (Appendix 3: Questionnaire) into a sealed box provided by the researcher/research assistant. Data collection commenced on 17th February 2020 over a period of three and half weeks ending on 12th March 2020, and included all 16 PHC clinics.

Three weeks were allocated to conduct data collection but this was increased by four days due to delays in obtaining permission from the CEO in five of the PHC clinics despite provision of the HSSREC approval letter, NHRD approval letter and letter of support from the District

Office for the various clinics to keep. One clinic returned four questionnaires uncompleted, where large areas or complete sections were not answered citing time constraints as the reason. Four of the clinics within the sub-district had advanced midwifery students who also participated in the study.

3.7 DATA ANALYSIS

Statistical analysis assists researchers in organising, communicating and interpreting numerical information (Polit et al., 2017). Research data was analysed within a quantitative framework making use of univariate and multivariate analysis. Data was entered into Statistical Packages for the Social Sciences (SPSS) version 24 and a *p*-value of <0.05 was considered as statistically significant. Nominal measurements were used in section A, Demographic data of the questionnaire, whilst measurements of frequencies were used in sections B, C and D of the questionnaire. Descriptive statistical analysis of the data (means, standard deviations, ranges, frequencies and percentages) was initially conducted prior to conducting inferential statistics and regression analysis. All questions besides B5, 6, 7, 10, and 18 were reverse scored. Sub-scale scores were calculated through summation of sections B and C of the questionnaire to identify possible associations between demographic data and subscales, whilst also comparing different subscales to one another in an attempt to establish correlations.

The Shapiro Wilkin's test for normality was conducted on this study to determine the use of parametric or non-parametric test use and the Pearson Chi-Square test was used to test the hypotheses about group variances in proportions (Polit et al., 2017). This study used the Mann-Whitney U test and Kruskall-Wallis test to identify associations between categorical variables located in the sub-scales within sections B and C. In this study, reliability was used to determine the consistency of the study, and in order to achieve this external reliability a pre-test post-test method was conducted. Internal reliability was achieved by employing the Cronbach alpha test to the various structures of the research questionnaire.

The survey tool also used descriptive statistical analysis, where the values for mean, confidence intervals and percentages were calculated.

3.8 ETHICAL CONSIDERATIONS

All ethical principles were maintained by the researcher and research assistants during data collection and by the researcher and supervisors during data analysis.

All respondents involved in the study were given an information sheet to peruse and keep, and then they signed a consent form before participation. Operational managers had signed the consent in order for us to conduct our survey tool within the clinics located in the South sub-district. Respondents were informed of their right to withdraw from the study at any point in time and that confidentiality and anonymity would be maintained at all times.

Permission to conduct the study and use of tools: Ethical approval for the study was provided by the study university's Human and Social Science Research Ethics Committee (HSSREC) (HSSREC/00000181/2019) (Appendix 10: HSSREC Approval letter). Permission to carry out the study in the form of gatekeeper's permission was obtained from KZNDoH (Appendix 11: DOH Gatekeeper Approval Letter) and a letter of support for the study was obtained from the local district office (Appendix 12: Letter of support from District Office). The letters included all the relevant information pertaining to the study (purpose of the study, the target population and sampling and the study design). The researcher was available to respond to any queries or concerns, however there were no queries made from the relevant authorities.

The researcher obtained written permission from the authors of the tools (Appendix 1: Permission for tool – Dr. Aldossary and 2: Permission for tool – Mr. Yakubu) and will acknowledged their permission in any publication that should arise from the study.

Informed consent and voluntary participation: The respondents were invited to participate in the study and notified that participation was voluntary. Respondents were provided with an information sheet (Appendix 5: Information sheet and consent for research study), and allowed time to consider participation, thereafter the researcher/assistant obtained informed written consent from all the respondents (Appendix 5: Information sheet and consent for research study). The researcher re-iterated the voluntary nature of their participation and that they could withdraw at any point in the study until posting their responses into the sealed box or choosing not to answer any questions.

Risk of harm: The risk to the respondents was considered low due to the researcher not working with vulnerable groups (Burns et al., 2009; Polit et al., 2017), neither did the

researcher require any invasive procedures to be conducted or enquiring about information that may cause respondents to be harmed or bring about emotional discomfort during the data collection process. All research was carried out at the respondents' institutions and so no possibility towards risk of harm was associated with travelling. The researcher, research supervisor and co-supervisor had all completed the ethics online course, ensuring less harm to the respondents (Appendix 7: TRREE Ethics certificates).

Storage and disposal of research data: All raw data was stored under lock and key in the research supervisor's office until it was captured by the researcher on a password locked computer; thereafter the hardcopies were scanned to a Universal Serial Bus (USB) and subsequently shredded. The USB was retained under lock and key by the supervisor and kept for a period of five years, then destroyed. All captured data after completion of the study was saved onto a USB and stored in the researcher supervisor's office for five years, then crushed. All information on the computer and Cloud was deleted and the recycle bin emptied.

Dissemination of research findings: The findings of this study were communicated to the respondents, PHC clinics and DoH in a written report. The findings of the study will be published in a peer-reviewed accredited journal and all ethical principles of the publication process and journal will be observed.

Statement of confidentiality and anonymity: The researcher ensured the confidentiality and anonymity of the respondents. The respondents were requested not to write any names or other details that could result in possible identification of themselves or the clinic on the questionnaire. Upon completion, the respondents dropped their questionnaires into a sealed box and the possibility of retrieval was not possible. When the researcher surveyed the health education landscape of the clinic, no names of the clinic were recorded on the data collection instrument.

Justice: The principle of justice includes the elements of right to fair treatment and privacy (Burns et al., 2009; Polit et al., 2017). All midwives from the various institutions had an equal and fair opportunity to be included in the research study. Midwives who opted not to participate in the study were not treated in a prejudiced manner. Midwives were all told of their right to privacy and confidentiality during the research study and were provided with an information sheet and consent before participation (Burns et al., 2009; Polit et al., 2017).

3.9 SUMMARY OF CHAPTER THREE

Chapter Three presented the research approach, which was quantitative in nature, whilst an explorative and descriptive design was chosen with the aim of understanding the perceptions of midwives when health educating pregnant women. The research setting, eThekwini and one of its sub-districts, was explained in detail. Purposive sampling was used to determine the respondents for the study and a minimum sample size of 83 was calculated. Data was collected over three and a half weeks (17th February 2020 to 12th March 2020), using two self-administered data collection instruments, namely a four part questionnaire and a survey tool and the data was analysed using the IBM SPSS version 24, using descriptive, inferential statistics, reliability and regression analysis. All ethical considerations were discussed and adhered throughout the study.

CHAPTER FOUR: RESULTS

4.1 INTRODUCTION

This chapter presents the analysis of findings obtained from this study, conducted with midwives at 16 select Primary Health Care (PHC) clinics in a sub-district of eThekwini, using a self-administered questionnaire. In addition, data were collected through a survey tool enquiring of the health education landscape in the 16 PHC clinics. To reiterate, the four objectives of the study were: (1) to establish midwives' perceptions of their role and responsibility in disseminating maternal health education in the ante-natal clinics (ANC) of PHC clinics in a sub-district of EThekwini, (2) to assess midwives' current use and technological acceptance of mobile health (mHealth) to disseminate health education to pregnant women attending PHC clinics in a sub-district of EThekwini, (3) to determine the frequency with which midwives conduct health education through non- technological and technological modes in PHC clinics of a sub-district in eThekwini, and lastly (4) to survey the health education landscape in PHC clinics of a sub-district in eThekwini for evidence of the delivery of ANC health education by midwives attending pregnant women.

Data were checked for completeness and each questionnaire was coded. The researcher used the IBM SPSS statistics version 26 (SPSSv24) package to analyse the data. Descriptive (frequency (*m*) and percentages (%)), inferential statistics (Confidence Interval 95% (*CI95%*), non-parametric tests Mann-Whitney-U (*U*) and Kruskal-Wallis (*K*)) were calculated for the data collected from the survey questionnaire. Significance (*p*) was set at $\leq .05$. Descriptive statistics (mean (*m*), percentages (*%*)) were calculated for the survey tool.

4.2 RESPONSE RATE

The self-administered questionnaires (n=104) were issued by both the researcher and two research assistants to the potential respondents, of which 98 were returned, and 92 used to capture data, resulting in a response rate of 88.5%. Data were not captured from six questionnaires, due to incomplete sections. One questionnaire had no responses to demographic data, two questionnaires had three to five unanswered questions in Sections B

and C and three questionnaires had no responses for all the questions in Section C. Time constraints was one of the reasons cited by the respondents for the incomplete questionnaires and some midwives reported a dislike in the use of mHealth and opted against answering the questionnaires. All 16 survey tools were completed by either the Operational Manager or Senior Midwife, whom the manager had selected to accompany the two research assistants and researcher during the walkabout of the clinic.

4.3 DEMOGRAPHICS

Table 2 below illustrates the respondents' demographics for this study. The mean age of the responding midwives was 39 years of age (standard deviation (±) 9.53 years), the highest percentage of respondents were between the ages of 25 and 35 years (*n*=38, 41.3%), and the lowest percentage of respondents belonged in the age group 46 to 50 years (*n*=11, 12.0%) (Table 2). The results show a substantial percentage (*n*=80, 87%) of respondents were female; furthermore it is noted that the majority of respondents (*n*=53, 57.6%) had the basic midwifery qualification (SANC R425 and R2488) (Table 2). Findings from this study also reflected that the majority of the respondents' (*n*=60, 65.2%) years of practice experience ranged between one and 10 years (Table 2), whereas a small group of respondents (*n*=3, 3.3%) reported having 21 years of practice experience (from this point collapsed into 16 and more years of experience).

Table 2: Demographics of respondents (n=92)

Demographic variables		**No. of respondents (n)**	**Percentage (%)**
Age groups (years)	25-30	23	25.0
	31-35	15	16.3
	36-40	17	18.5
	41-45	14	15.2
	46-50	11	12.0
	≥51	12	13.0
Sex	Male	12	13.0
	Female	80	87.0
Midwifery educational level	Qualified Midwife	54	58.7
	Qualified Midwife specialist	25	27.2
	Midwifery specialist student	13	14.1
Years of practice as a midwife	1-5	26	28.3
	6-10	34	37.0
	11-15	15	16.3
	≥16	17	18.5

4.4 ANALYSES OF THE QUESTIONNAIRE (SECTIONS B, C AND D)

4.4.1 Midwives' roles and perceptions (Views) towards Health Education

The findings of Section B (roles and perceptions towards health education) of the study questionnaire were derived from 19 questions sub-divided into three subscales and evident in the process component of quality care, as described in Donnabedian's model (Donabedian, 2005). Subscale one: *Constraints regarding health education*, consisted of four questions (B1-B4), subscale two: *Responsibilities of midwives*, consisted of six questions (B5-B10) and lastly subscale three: *Perceptions of patients responses to health education and midwives perceptions of their role in delivery of health education* (B11-B19) (Aldossary et al., 2013). Table 3 and Figure 5 below show the Confidence Intervals (*CI95%*) of the three subscales based on the roles and perceptions of the respondents towards health education.

Responsibilities of midwives was the highest scoring of the three subscales (*m*= 18.17/24 [*CI95%* 17.68-18.67]), (converted to *m*=3.03/4 [*CI95%* 2.95-3.11]) (Table 3)., and showed a significant difference between the subscale housing questions linked to *perceptions of patient's responses to health education and midwives perceptions of their role in delivery of health education* (*m*=24.79 [CI 24.01-25.58]), (converted to *m* 2.75/4 [2.67-2.84]) (Figure 5; Table 3).

The first subscale (*Responsibilities of midwives),* showed that the midwives believed most strongly in them not only providing health education when requested by the doctor (*m*= 3.50/4 [*CI95%* 3.33-3.67]) and least strongly in pregnant women not totally responsible to promote their own health during pregnancy (*m*= 2.40/4 [*CI95%* 2.23-2.58]) (Table 3). There was a significant difference between the respondents in the perception that *midwives should [not] only provide health education when requested by the doctor* (*m*= 3.50/4 [*CI95%* 3.33-3.67]) and the perception that *pregnant women are [not] totally responsible to promote their own health during pregnancy* (*m*= 2.40/4 [*CI95%* 2.23-2.58]) (Table 3).

Constraints regarding health promotion was the subscale that followed responsibilities of midwives as the second highest subscale (*m*= 11.40/16 [*CI95%* 10.85-11.95]), (converted to *m*=2.85/4 [*CI95%* 2.71-2.99]) (Figure 5; Table 3). Midwives' strongest perceptions (*m*= 3.24/4 [*CI95%* 3.07-3.41]) lay in them believing that they had the *necessary skills to promote the health of pregnant women*, whilst the lowest rated item (*m*= 2.24/4 [*CI95%* 2.02-2.46]) was related to them *having enough time to carry out health promotion (health education) effectively*

towards pregnant women (Table 3). There was a significant difference between the perception held by the respondents that midwives need to *speak the pregnant women's language to be able to promote their health during pregnancy* (*m*= 2.96/4 [*CI95%* 2.78-3.13]) and midwives *having enough time to carry out health promotion (health education) effectively towards pregnant women* (*m*= 2.24/4 [*CI95%* 2.02-2.46]) (Table 3).

Perceptions of patient's responses to health education and midwives perceptions of their role in delivery of health education (*m*= 24.79/36 [*CI95%* 24.01-25.58]) (converted to *m*=2.75/4 [*CI95%* 2.67-2.84]), was the lowest scoring of the subscales (Table 3). Midwives perceived most strongly (*m*= 3.23/4 [*CI95%* 3.09-3.37]) that when delivering health education to pregnant women it was stimulating and interesting, whereas they perceived the least strongly (*m*= 2.07/4 [*CI95%* 1.91-2.22]) in pregnant women not getting annoyed when the midwife asks them about health related behaviours especially when not directly related to their presenting health problems (Table 3).

In further examination of the single items in the above subscale, a significant difference was noted between the items *midwife should contribute towards pregnant women's lives telling them to change their health related behaviors* (*m*= 3.14/4 [*CI95%* 2.98-3.30]) and *the evidence for changing health related behaviors is certain and confirmatory for the midwives to health pregnant women* (*m*= 2.70/4 [*CI95%* 2.56-2.83]) (Table 3). Another significant difference was present between *pregnant women's lifestyles are conditioned by culture, however there is a lot that midwives do to change them* (*m*= 2.70/4 [*CI95%* 2.54-2.85]) and *pregnant women finding health education delivered by midwives stimulating and interesting* (*m*= 2.70/4 [*CI95%* 2.53-2.86]) (Table 3).

Table 3: Roles and perceptions (views) of midwives of health education (n=92)

Subscale and items	**Mean [*CI95%*]**
Responsibilities of midwives/ 24 (*m*= 18.17 ± 2.40 *CI95%* [17.68-18.67]); Converted score/6; *α*= 0.37	**3.03 [2.95-3.11]**
*B9 /4 The midwife [should not] should only provide health education if it has been requested by the doctor.	3.50 [3.33-3.67]
B7 /4 The midwife is the most appropriate health care worker to get involved in health educating pregnant women.	3.36 [3.21-3.41]
B6 /4 The midwife should take more responsibility for health educating pregnant women.	3.17 [3.00-3.35]
B5 /4 The midwife should be a health advocate, insisting that preventive health is discussed and supported amongst politicians.	3.16 [2.99-3.33]
B10 /4 The midwife should make health education to pregnant women a priority above investigations dealing with pregnancy.	2.58 [2.41-2.74]
*B8 /4 Pregnant women are [not] **totally** responsible to promote their own health during pregnancy.	2.40 [2.23-2.58]

Constraints regarding health promotion / 16 (*m*= 11.40 ± 2.66 *CI95%* [10.85-11.95]; Converted score /4; α= 0.75	**2.85 [2.71-2.99]**
*B2 /4 Midwives [have] do not have the necessary skills to promote the health of pregnant women.	3.24 [3.07-3.41]
*B4 /4 Midwives have [adequate] very limited knowledge about pregnant women's culture/s to be able to promote their health during pregnancy.	2.97 [2.80-3.13]
*B3 /4 Midwives [speak] do not speak pregnant women's language/s to be able to promote their health during pregnancy.	2.96 [2.78-3.13]
*B1 /4 Midwives [have] do not have enough time to carry out health promotion (Health education) effectively towards pregnant women.	2.24 [2.02-2.46]
Perceptions of patients responses to health education and midwives perceptions of their role in delivery of health education / 36 (*m*= 24.79 ± 3.78 *CI95%* [24.01-25.58]); Converted score /9; α= 0.69	**2.75 [2.67-2.84]**
*B12 /4 The midwife finds it [stimulating and interesting] dull and boring to deliver health education to pregnant women.	3.23 [3.09-3.37]
B18 /4 Helping pregnant women to understand how health-related behaviours can interfere with their health is an important part of the midwife's duty.	3.16 [2.97-3.35]
*B14 /4 The midwife [should contribute towards] should not interfere with pregnant women's lives telling them to change their health-related behaviours.	3.14 [2.98-3.30]
*B13 /4 The evidence for changing health related behaviours is [certain and confirmatory] too uncertain and contradictory (clashing) for the midwife to health educate pregnant women.	2.70 [2.56-2.83]
*B15 /4 Pregnant women's lifestyles are conditioned (prepared) by their culture and environment; [however there is a lot] so there is not much that the midwife can do to change them.	2.70 [2.54-2.85]
*B11 /4 Pregnant women find health education delivered by midwives, [stimulating and interesting] dull and boring.	2.70 [2.53-2.86]
*B17 /4 During health education to pregnant women, giving a detailed explanation about their health related to pregnancy conditions tends to [reassure rather than worry them] worry them rather than reassure them.	2.63 [2.46-2.80]
*B16 /4 Pregnant women [take notice] do not take any notice of what the midwife says about changing lifestyles.	2.48 [2.30-2.66]
*B19 /4 Pregnant women [do not] get annoyed (upset) when the midwife asks them about health-related behaviours especially when it's not directly related to their presenting health problems.	2.07 [1.91-2.22]

Note: Subscales and items in sub-scales re-ordered in descending order.* Reverse scored

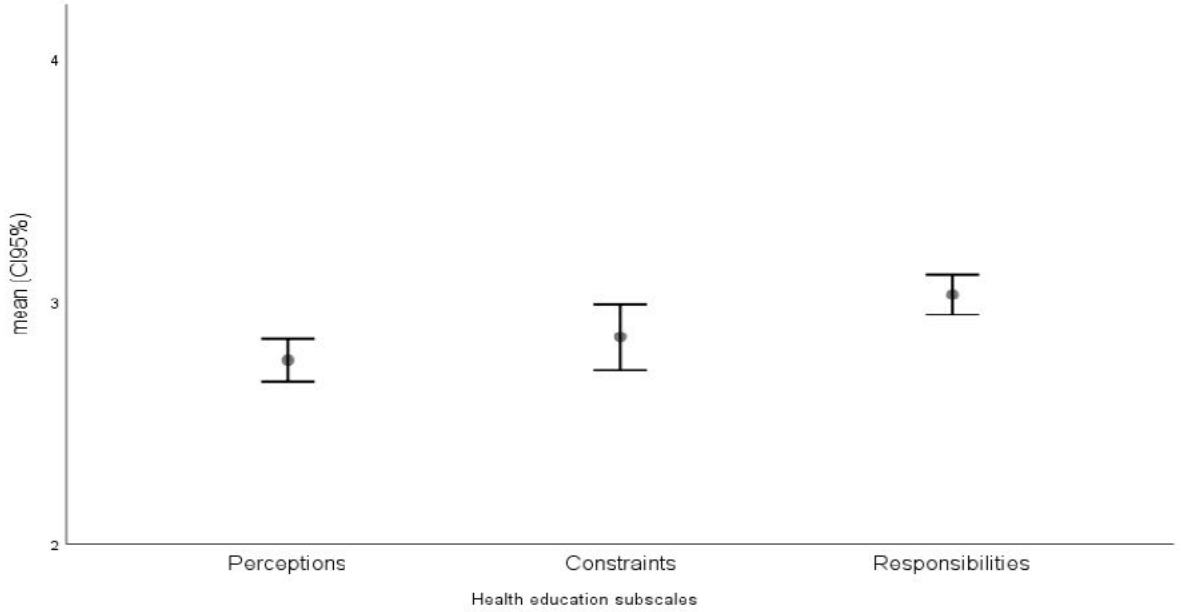

Figure 5: Confidence intervals of health education subscales

Associations between demographics and the roles and perceptions of health education

The positively skewed distribution of data indicated the use of non-parametric tests to test for the hypotheses: there is an association between midwives' demographics and their perceptions of their roles and responsibilities in the dissemination of maternal health education in the 16 ANC of PHC clinics in a sub-district of EThekwini.

There were no significant associations between any of the respondents' demographics and the *subscale Constraint*s. However there was a significant difference in the age groups of the respondents and their *perceptions of their responsibilities to health education* (m=2.82/4 ± 0.41 ≥51 years; 2.85 ± 0.35 41-45 years; vs. 3.06 ± 0.57 46-50 years; vs. 3.01 0.36 31-35 years; vs. 3.03 ± 0.24 25-30 years; vs. 3.01 ± 0.34 31-35 years; K=15.61, p=.008) and in gender (m=2.64/4 ± 0.35 males; vs.3.09 ± 0.37 females; U=3.68, p=.000) (Table 4). A significant difference existed between the male and the females respondents' *perceptions of the patients' responses to health education and their own perceptions of their role in the delivery of health education* (m=2.46 /4 ± 0.49 males; vs. 2.80 ± 0.39 females; U=2.02, p=.043), (Table 4).

Table 4: Associations between demographics and roles and perceptions of health education (n=92)

Demographics		**Total (n, %)**	**Constraints**		**Responsibilities**		**Patients' perceptions**	
			Statistic (*U/K*)	***p*-value**	**Statistic**	***p*-value**	**Statistic**	***p*-value**
Age group (years)	25-30	23(25.0)						
	31-35	15(16.3)						
	36-40	17(18.5)						
	41-45	14(15.2)						
	46-50	11(12.0)						
	≥51	12(13.0)	K=6.04	.303	*K=15.61*	*.008**	K=3.11	.683
Sex	Male	12(13.0)						
	Female	80(78.0)	U=-0.22	.829	*U=-3.68*	.000*	U=-2.02	.043*
Midwifery education level	Qualified Midwife	54(58.7)						
	Qualified Midwife specialist	25(27.2)						
	Midwifery specialist student	13(14.1)	*K=0.98*	.612	K=1.67	.435	K=1.90	.386
Years of practice as midwife	1-5	26(28.3)						
	6-10	34(37.0)						
	11-15	15(16.3)						
	≥16	17(18.5)	K=1.95	.582	*K=0.44*	*.931*	K=6.58	.086

Demographic variables of age groups, sex, midwifery education level, years of practise as a midwife were tested for associations with roles and perceptions of health education using non-parametric tests (Mann-Whitney (U) and Kruskal-Wallis (K)); **p*-value of significance set at <.05

Internal reliability of the 3 subscales

Internal reliability was achieved through performing the Chronbach's alpha on the items of the three subscales of the roles and perceptions of health education questionnaire. Subscales achieved Chronbach alpha scores ranging from 0.37 to 0.75. Constraints to health education obtained the highest (α=0.75), the lowest scoring subscale was *Responsibilities of Midwives* (α=0.37).

4.4.2 Acceptance of technology and mHealth amongst midwives working in PHC Clinics

The Unified Theory of User Acceptance of Technology (UTAUT) model as part of the merged model used in this study had a bearing on the constructs in Donnabedian's model. Table 5 below shows the Confidence Intervals (*CI95%)* of the subscales based on the UTAUT model describing the acceptance of technology towards health education amongst midwives. The subscales are described from the highest to the lowest values and not according to their appearance in the UTAUT model or the questionnaire (Table 5).

Performance Expectancy, described as the degree to which an individual may believe a system will help them to accomplish a task (Yakubu et al., 2019), was the highest scoring of the subscales (*m*= 16.61/20 [*CI95%* 15.92 – 17.29]) (Table 5), while *Facilitating Conditions* (FC) (*m*= 13.60/20 [CI95% 12.81-14.39]) scored the lowest of the six sub-scales (Table 5). There was a significant difference between the *Facilitating Conditions* (m= 13.60/20 [CI95% 12.81-14.39]) and the three subscales of *Effort Expectancy* (*m*=15.87/20 [*CI95%* 15.23-16.51], *Behavioural Intention* (*m*=15.90/20 [*CI95%* 15.22-16.59]) and *Performance Expectancy* (*m*=16.61/20 [CI95% 15.92-17.29]) (Figure 6; Table 5). There was also a significant difference between the respondents' *Actual Usag*e (*m*=14.26/20 [*CI95%* 13.24-15.28]), *Effort Expectancy* (*m*=15.87/20 [*CI95%*15.23-16.51]), *Behavioural Intention* (*m*= 15.90/20 [*CI95%* 15.22-16.59]) and *Performance Expectancy* (*m*= 16.61/20, [*CI95%* 15.92 – 17.29]) (Figure 6; Table 5).

In the Subscale *Performance Expectancy* the respondents perceived more strongly than the other items in this sub-scale that they find mHealth useful for educating pregnant women (*m*=4.27/5 [*CI95%* 4.08-4.47]); however the midwives perceived least strongly (*m*=3.98/5 [*CI95%* 3.76-4.20]) that participating in mHealth training increased their understanding of the use of mHealth in PHC clinics (Table 5).

Behavioral Intention (*m*=15.90/20 [*CI95%* 15.22-16.59]), described as an individual's likelihood to be willing to partake in a specific behaviour towards the use of a system (Yakubu et al., 2019), followed *Performance Expectancy* as the subscale with the second highest values (Table 5). Midwives both 'predicted' (*m*= 4.00/5 [*CI95%* 3.82-4.18]) and perceived they will 'always' (*m*=4.00/5 [*CI95%* 3.81–4.19]) try using mHealth frequently in PHC clinics, when health educating pregnant women (Table 5). However the lowest scoring item in this subscale (*Behavioural Intention*) was the midwives' intention to use mHealth frequently in the coming months to health educate pregnant women (*m*=3.92/4[*CI95%* 3.72-4.13]) (Table 5).

Effort Expectancy (*m*=15.87/20 [*CI95%* 15.23-16.51]) is described as the ease associated with the use of a system (Yakubu et al., 2019). Midwives reported an overall high score (*m*=4.09/5 [*CI95%* 3.90-4.28]) for reporting that their use of mHealth was clear and understandable, when conducting health education with mHealth applications (Table 5). However midwives scored the lowest in this subscale for how easy it was for them to learn to operate mHealth during training (*m*=3.74/5 [*CI95%* 3.52-3.96]); in addition there was a significant difference between this item in the subscale and the other three items of this sub-scale (Table 5).

Actual Usage (*m*=7.13/10 [*CI95%* 6.62-7.64]) was converted for comparative purposes (*m*=14.26/20 [*CI95*% 13.24-15.28]) (Table 5). *Actual Usage* was ascertained by the actual provision of face-to-face/group teachings by the midwives (*m*=3.64/5 [*CI95*% 3.38-3.90]) and through the use of mHealth applications (*m*=3.49/5 [*CI95*% 3.23-3.75]) when health educating pregnant women (Table 5).

In this study *Social Influence* (*m*=13.75/20 [*CI95%* 12.92-14.58]) described as the perception of an individual that people who are important to them, encourage the use of the system (Yakubu et al., 2019), scored second lowest of the six subscales (Table 5). More midwives perceived that their colleagues have a stronger influence (*m*= 3.35/5 [*CI95%* 3.09-3.61]) versus their managers (*m*= 3.16/5 [*CI 95%* 2.88-3.44]), on using mHealth applications to health educate pregnant women (Table 5). There was a significant difference between the influence of colleagues in the use of mHealth (*m*=3.35/5 [*CI95%* 3.09-3.61]) and the general encouragement by the PHC clinic to use mHealth when educating pregnant women. (*m*=3.97/5 [*CI95%* 3.74-4.19]) (Table 5).

Lastly, *Facilitating Conditions* are described as an individual's perception on the degree of support that will be provided to them by the organisational and technical infrastructure, which encourages the use of the system (Yakubu et al., 2019). The highest scoring item in this

subscale was the respondents' perception that they had the necessary knowledge to use mHealth in educating pregnant women (*m*=3.78[*CI95%* 3.57-3.99]) compared to the lowest scoring item of them having a specific person / group available at their worksite for their assistance in mHealth issues (*m*=2.97/4[*CI95%* 2.71-3.23]) (Table 5). Midwives perceived significantly less strongly (*m*= 2.97/5 [*CI95%* 2.71-3.23]) in the availability of assistance towards the use of mHealth applications, as compared to other items in this sub-scale at (Table 5).

Table 5: mHealth enquiry based on UTAUT model (n=92)

Subscale and items	**Mean [*CI95%*]**
Performance Expectancy / 20 (*m*= 16.61 ± 3.30 α = 0.85)	**16.61[15.92-17.29]**
C1 /5 I will find/find mHealth useful for health educating pregnant women.	4.27 [4.08-4.47]
C2 /5 Using mHealth will help/helps me to achieve certain tasks quicker, such as health educating pregnant women	4.24 [4.05-4.43]
C4 /5 Using mHealth, has improved /will improve my communication with pregnant women due to the many language options available for health education.	4.20 [3.93-4.31]
C3 /5 Participating in mHealth training increased my understanding of the use of mHealth.	3.98 [3.76-4.20]
Behavioral Intentions / 20 (*m*= 15.90 ± 3.30; α = 0.89)	**15.90 [15.22-16.59]**
C18/ 5 I predict that, I will use mHealth frequently in the coming months for health educating pregnant women.	4.00 [3.82-4.18]
C20 /5 I will always try to use mHealth frequently every month	4.00 [3.81–4.19]
C19 /5 I plan to use mHealth frequently in the coming months towards health educating pregnant women	3.98 [3.79–4.17]
C17 /5 I intend to use mHealth frequently in the coming months for health educating pregnant women	3.92 [3.72-4.13]
Effort Expectancy / 20 (*m*= 15.87 ± 3.08; α = 0.84)	**15.87 [15.23-16.51]**
C5 /5 My overall usage of mHealth is clear and understandable.	4.09 [3.90-4.28]
C7 /5 In general, I will find/find mHealth easy to use when health educating pregnant women.	4.05 [3.85-4.25]
C6 /5It is easy for me to become skilful at using mHealth whilst health educating pregnant women.	3.99 [3.80-4.18]
C8 /5 Learning to operate mHealth during training was easy for me.	3.74 [3.52-3.96]
Actual Usage / 10 (*m*= 7.13 ± 2.45 [CI95% 6.62-7.64]); Score converted/20; α = 0.94	**14.26[13.24-15.28]**
C21 /5 I have used mHealth often this month towards health educating pregnant women attending this PHC clinic.	3.64 [3.38-3.90]
C22 /5 I am currently using mHealth frequently this month towards health education of pregnant women.	3.49 [3.23-3.75]
Social Influence / 20 (*m*= 13.75 ± 4.00; α = 0.89)	**13.75 [12.92-14.58]**
C12 /5 In general the PHC clinic has encouraged the use of mHealth in health educating pregnant women.	3.97 [3.74-4.19]
C9 /5 My colleagues have an influence on my use of mHealth.	3.35 [3.09-3.61]
C11 /5 The IT department at DOH or the PHC clinic where I am working has been /will be helpful in supporting my use of mHealth.	3.27 [3.00-3.55]
C10 /5 My manager (OM/UM) has an influence on my use of mHealth.	3.16 [2.88-3.44]
Facilitating Conditions / 20 (*m*= 13.60 ± 3.81; α = 0.82)	**13.60 [12.81-14.39]**
C14 /5 I have the knowledge necessary to use mHealth in health educating pregnant women.	3.78 [3.57-3.99]
C15 /5 The PHC clinic provides all that I need to use mHealth in the health education of pregnant women.	3.43 [3.18-3.68]
C13 /5 I have the resources necessary to use mHealth (e.g. technology and time).	3.41 [3.16-3.67]

Subscale and items	Mean [*CI95%*]
C16 /5 A specific person or group is available to assist me with issues I have with mHealth applications at the PHC clinic where I work.	2.97 [2.71-3.23]

Note: Subscales and items in sub-scales re-ordered in descending order.

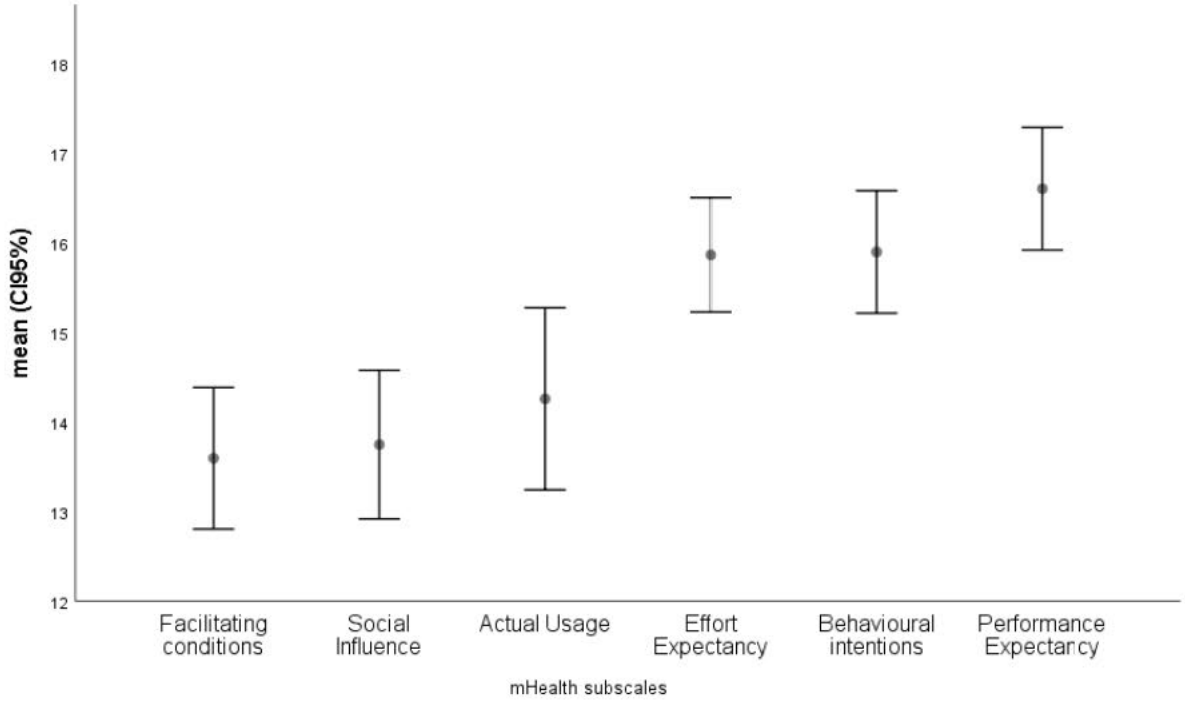

Figure 6: Confidence intervals of mHealth subscales

Associations between midwives' demographics and acceptance of mHealth in the PHC clinics

Associations were tested for the demographic variables and the six subscales in the UTAUT model to refute or prove the second hypothesis (There is an association between midwives' demographics, and mHealth factors of Performance Expectancy, Effort Expectancy, Social Influence, Behavioural Intention and Facilitating Conditions, and mHealth Actual Usage). There was only a significant association evident between Behavioural Intention and age groups, in particular the age group of respondents 51 years and older (m = 13.75/20 ± 4.37 ≥ 51 years; vs. 16.83 ± 1.97 25-30 years; vs. 16.73 ± 3.69 46-50 years; vs. 16.71 ± 3.92 36-40 years; vs. 15.40 ± 1.72 31-35 years; vs. 15.14 ± 3.59 41-45 years; K= 14.01, p=.016) (Table 6).

Table 6 Associations between demographics and mHealth enquiry based on UTAUT model (n=92)

Demographics		**Total (n, %)**	**Performance Expectancy α= 0.85**		**Effort Expectancy α= 0.84**		**Social Influence α= 0.89**		**Facilitating Conditions α= 0.82**		**Behavioural Intention α= 0.89**		**Actual Usage α= 0.94**	
			Statistic (*K/U*)	***p*-value**	**Statistic (*K/U*)**	***p*-value**	**Statistic (*K/U*)**	***p*-value**	**Statistic (*K/U*)**	***p*-value**	**Statistic (*K/U*)**	***p*-value**	**Statistic (*K/U*)**	***p*-value**
Age group (years)	25-30	23(25.0)												
	31-35	15(16.3)												
	36-40	17(18.5)												
	41-45	14(15.2)												
	46-50	11(12.0)												
	≥51	12(13.0)	*K*=6.68	.456	*K*=7.81	.167	*K*=10.25	.068	*K*=4.94	.423	*K*=14.01	.016*	*K*=8.20	.145
Sex	Male	12(13.0)												
	Female	80(78.0)	*U*=-1.22	.221	*U*=-0.64	.412	*U*=-0.82	.412	*U*=-0.01	.995	*U*=-1.71	.087	*U*=-1.01	.314
Midwifery education level	Qualified Midwife	54(58.7)												
	Qualified Midwife specialist	25(27.2)												
	Midwifery specialist student	13(14.1)	*K*=2.76	.250	*K*=1.64	.440	*K*=1.32	.518	*K*=1.10	.578	*K*=3.12	.211	*K*=2.35	.309
Years of practice as midwife	1-5	26(28.3)												
	6-10	34(37.0)												
	11-15	15(16.3)												
	≥16	17(18.5)	*K*=5.19	.158	*K*=3.14	.370	*K*=3.10	.377	*K*=4.29	.232	*K*=1.85	.695	*K*=0.23	.972

Demographic variables of age groups, sex, midwifery education level, years of practise as a midwife were tested for associations with mHealth enquiry based on UTAUT model using non-parametric tests (Mann-Whitney (U) and Kruskal-Wallis (K)); **p*-value of significance set at <.05

4.4.3 MIDWIVES ACTUAL HEALTH EDUCATION THROUGH FACE-TO-FACE SESSIONS AND MHEALTH OVER A 30 DAY PERIOD

Table 7 below shows the midwives' health education actually conducted through non-technological modes such as face-to-face/group sessions and those connected through technological modes (mHealth) over a thirty day period in the 16 PHC clinics. The results presented are from the respondent questionnaire and reflect the process component of quality care, as described in Donnabedian's model (Donabedian, 2005).

Results from this study evidence that midwives opted to conduct face-to-face (group/individual) health education, a few times every day (*n*=47, 51.1%), with a few midwives indicating they conducted face-to-face health education once a week/month (*n*=4, 4.3%) (Table 7).

Connecting of pregnant women through technological modes such as mHealth applications for health education by midwives occurred a few times every day (*n*=14, 15.2%), and once every day (*n*=9, 9.8% (Table 7)). However the majority of midwives connected pregnant women, a few times a week (*n*=22, 23.9%), and once in the past month (*n*=22, 23.9%) (Table 7).

Table 7: Face-to-face health education and mHealth connections over 30 days, reported by the participants (n=92)

Format of interaction / facilitation	Frequency	n	%
Face to Face (group/individual) health education	A few times everyday	47	51.1
	Once every day	21	22.8
	A few times a week	20	21.7
	Once/week to once/month	4	4.3
mHealth connections facilitated by midwife	A few times everyday	14	15.2
	Once every day	09	9.8
	A few times a week	22	23.9
	Once a week	15	16.3
	Once a fortnight	10	10.9
	Once in the past month	22	23.9

4.5 SURVEY OUTCOME OF HEALTH EDUCATION LANDSCAPE IN PHC CLINICS

Results in Table 8 below present the descriptive analysis of the survey tool. The process of Donnabedian's model refers to providing health education through face-to-face/group methods and through connecting patients to mHealth whilst the structures of Donnabedian's model

refers to the landscape of the clinic (buildings, rooms, tables, chairs) and the tools such a posters (non-technological), cellular phones and data (technological) to assist midwives in the provision of health education. During this analysis registered midwives and midwife specialists are referred to as midwives unless otherwise stated.

Process

Volume of health education conducted: A total of 730 (*m*=45.63) health education sessions were conducted by the midwives across the 16 PHC clinics in a month. In the study month (February 2020) four PHC clinics reported having conducted over 200 sessions per clinic, and in contrast three clinics reported having conducted 100 (18.8%) or less health education sessions per clinic. Due to the nature of choosing only one option per question for questions 1, 2, 3 and 4, all 16 PHC clinics reported that health education was conducted by all categories of staff with slightly more than half *(n*=9, 56.3%) of the clinics reporting that Midwife specialists mainly conduct health education, whilst Registered Midwives account for the remainder of the clinics (*n*=7, 43.8%).

Who provides health education: A little less than a third (*n*=5, 31.3%) of the 16 PHC clinics reported having registers that recorded health education sessions conducted by midwives. The reason is that most midwives in the PHC clinics sign the generic health education tool located in each pregnant woman's antenatal card. Amongst the five clinics that had registers of reported health education, the category of staff most prevalent (*n*=197, 35.3%) was conducted by Registered midwives. It is also noted that 14 (2.6%) of the health education sessions were conducted by non-midwifery nurses (Registered Nurses with no midwifery qualification and enrolled nurses), on such generic topics as personal hygiene and the importance of keeping up to appointments.

Frequency of health education conducted: In the reporting about the frequency of health education that occurred in the day there was a variance in responses with nearly three quarters saying it occurred more frequently throughout the day (*n*=12, 75%), rather than having health education sessions only in the morning (*n*=5, 31.3%).

Frequency of health education and topic discussed: A total of 730 (*m*=45.63) health education sessions were conducted in the preceding 30 days in all the 16 PHC clinics. The most frequently discussed topic by midwives was focused on antenatal education to pregnant women and included preparation for labour and danger signs (*n*=397, 30.3%) and foetal wellbeing (*n*=230, 17.5%) (Table 8). Half of the PHC clinics (*n*=8, 50.0%) reported having registers that record

connections on mHealth applications and in these registers there was evidence of a total of 154 (m= 9.63) connections by midwives. It should also be noted that mainly Registered Midwives (n=44, 88%) were connecting pregnant women to mHealth applications for health education as compared to Midwife specialists.

Training: Most of the midwives (n=13, 81.3%) in the 16 PHC clinics had completed training on mHealth, its use and connecting of pregnant women to the database. The unit managers from the PHC clinics reported the adoption of a "train the trainer" approach and that per clinic only one midwife was sent for a single training session on mHealth and once completed had to return and train the remaining midwives at the PHC clinics. Managers mainly assigned midwives (n=8, 50%) to be sent for training when sessions were held, however decisions would change due to staffing requirements of the clinic on the day of training. Some PHC clinics (n=4) also assigned more than one midwife for training if it was allowed. It was noted that Registered Midwives (n=15, 78.9%) versus Midwife specialists was the predominant category of staff that received training on mHealth.

Structure

Health education aids: All 16 PHC clinics displayed posters for health education purposes amongst pregnant women. A total of 124 (m=7.75) posters were displayed across the 16 PHC clinics, with breastfeeding posters (n=53, 42.7%) and Kangaroo Mother Care (KMC) (n=37, 29.9%) (Table 8) as the most frequently displayed posters (Table 8). All 16 PHC clinics reported not using equipment to play DVDs to health educate, however three clinics had television sets which were either switched off or used for entertainment purposes for the pregnant women whilst waiting in the queue.

Policies: All 16 PHC clinics were able to provide the researcher or the two assistants with policies regarding the provision of health education, and all clinics reported having policies on kangaroo mother care (KMC), Mother Baby Friendly Initiative (MBFI) and generic health education teaching policies (Table 8). However only 10 (62.5%) of the PHC clinics provided a policy on mHealth connections (Table 8).

Table 8: Outcome of the survey of evidence for health education in the PHC clinics (n=16)

	Survey item	Number (n)	Percentage (%)
Process	Who conducts the health education performed in your clinic?		
	Registered midwives	7	43.8
	Midwife specialists	9	56.3
	How frequently in a day, does staff health educate?		

	Survey item	Number (n)	Percentage (%)
	Once a day	4	25.0
	More than once a day	12	75.0
	When is health education conducted to pregnant women?		
	Mainly in the morning	5	31.3
	Ongoing throughout the day	11	68.8
	Health education sessions provided by different categories of nurses/midwives		
	Registered Midwives (n=54)	197	35.3
	Midwifery students (n=13)	196	35.2
	Midwife specialists (n=25)	150	26.9
	Non-midwifery nurses (n=14)	14	2.6
	Distribution of topics (*n*=730)		
	Antenatal: ANC appointments and its importance	270	20.6
	Antenatal: Foetal wellbeing	230	17.5
	Antenatal: Communicable and non-communicable diseases	54	4.2
	Antenatal: Antenatal nutrition	40	3.0
	Labour: Preparation for labour and danger signs	397	30.3
	Labour: Pain management	141	10.7
	Post-natal: Post-natal care (including family planning)	180	13.7
	Number of mHealth connections carried out by categories of midwives		
	Registered midwives	44	88
	Midwife specialists	6	12
	Midwifery students	0	0
	mHealth training in PHC clinics		
	PHC clinics that sent Midwives for training for mHealth	13	81.3
	Registered Midwives completed training	15	78.9
Structure	Health education focus in posters (*n*=124)		
	Breastfeeding	53	42.7
	Kangaroo mother care	37	29.8
	Prevention–mother-to-child transmission (PMTCT)	12	9.7
	Labour and its danger signs	05	4.0
	Frequency of policy documents available in clinics:		
	Mother baby friendly initiative	16	100
	Kangaroo mother care	16	100
	Generic health education teachings	16	100
	mHealth registration and use	10	62.5

4.6 SUMMARY OF CHAPTER FOUR

Chapter Four presented the results from the study which included both the respondent questionnaire (*n*=92) and the survey tool (*n*=16). Data was inputted and analyzed for descriptive and inferential statistics using IBM SPSS version 24 (SPSSv24). Findings were grouped according to the sections of the questionnaire namely Section A: Demographics, Section B: Roles and perception of health education, Section C: Acceptance of technology and mHealth in the PHC clinic and Section D: Actual health education conducted, culminating in the presentation of the descriptive statistics from the survey tool. Associations between the demographics and the subscales were calculated and presented to test the hypotheses.

CHAPTER FIVE: DISCUSSION, RECOMMENDATIONS, LIMITATIONS AND CONCLUSION

5.1 INTRODUCTION

This chapter discusses the study's results in relation to its aim, objectives, hypotheses, framed with the conceptual framework consisting of a merging of Donnabedian's quality framework and the Unified Theory of User Acceptance of Technology (UTAUT) model. This chapter highlights the results of the study, to describe midwives' perceived roles in maternal health education and their acceptance of mHealth in health educating pregnant women during and between antenatal visits at Primary Healthcare (PHC) clinics of an eThekwini sub-district, in South Africa.

The research objectives were (1) to establish midwives' perceptions of their role and responsibility in disseminating maternal health education, (2) to assess midwives' current use and technological acceptance of mHealth to disseminate health education to attending pregnant women, (3) to determine the frequency with which midwives conducted health education through non-technological and technological modes, and (4) to survey the health education landscape in the settings for evidence of the delivery of ANC health education by the midwives attending to the pregnant women. Finally, the chapter discusses the limitations of the study, recommendations are made, and a conclusion provided.

5.2 DEMOGRAPHICS

Ninety-two midwives participated in the study and had a mean age of 39 years (± 9.53), with the largest number of the respondents between the ages of 25 and 30 years (n=23, 25%), while the lowest number were older than 51 years (n=12, 13%). The older age groups were least represented in the sample, yet the South African Nursing Council (SANC) statistics show that the highest age distribution of nurses in South Africa is between 50 and 59 years, with the least below 30 years (SANC, 2018). Statistics from an age analysis done by SANC showed that approximately half (47%) of nurses registered were 50 years and older, with a small 3% belonging to the age group of 69 years and older; however, it cannot be ascertained whether these nurses are still registered (SANC, 2018). The clinics were not prepared to disclose the

demographics of the staff hence no conclusion could be drawn as to the incongruence between the actual clinic staffs' demographics and those of the study; however, based on the field notes an assumption is the lesser inclination of the older midwives to participate as they were "nearing retirement."

The majority of the respondents were females (n= 80, 87%), in accordance with national and international statistics where women often outnumber males in nursing (Malfait, Eeckloo and Van Hecke, 2017; SANC, 2018). Furthermore, this study reflected that the majority of the respondents had a basic midwifery qualification (n=54, 58.7%), compared to those with advanced midwifery (n= 25, 27.2%), which is in keeping with the statistics on the SANC register showing there are a higher number of registered midwives (SANC, 2018). Additionally, the findings also showed that over two-thirds of the respondents (n=60, 65.2%) had between one and ten years of experience, which could indicate a larger number of young individuals based in PHC clinics.

5.3 ROLES AND PERCEPTIONS OF HEALTH EDUCATION, ACCEPTANCE OF TECHNOLOGY AND ACTUAL HEALTH EDUCATION CONDUCTED IN PHC CLINICS

Discussed below are the three components of the study.

5.3.1 Midwives' roles and perceptions (views) towards health education

The midwives' roles and perceptions towards health education are discussed according to the three subscales of the questionnaire presented and aligned with the process component of quality care, as explained in Donnabedian's model (Donabedian, 2005).

5.3.1.1 Responsibilities of Midwives

The subscale *Responsibilities of Midwives* in line with the process component of Donabedian's quality model (Donabedian, 2005) was the highest scoring of the subscales (*m*=3.03/4 [*CI95%* 2.95-3.11]), emphasising the importance the midwives attached to their role in health educating pregnant women, as conferred in other studies (Anshuja et al., 2017; Nwankwo et al., 2018). This sense of responsibility was significantly greater than how they believed the patients' perceived their activities. This finding is not without concern, as it is suggestive of the

midwives delivering less participatory and less patient specific information, encased in a "duty bound" approach, to meet the SANC (1990) R2488 Scope of Practice pertaining to health education. This was further collectively demonstrated in the survey of the health education in the clinics (n=16), based on the outcome of Donabedians' model, where the midwives, conducted 730 health education sessions in the 16 PHC clinics, over a 30-day period with an average of 168.25 patients per clinic. In the 30-day period, slightly more than half the respondents (n=47, 51.1%) conducted health education through face-to-face (group/individual) a 'few times every day.' This is again reflective of the responsibilities of midwives in the high rates of providing health education to pregnant women. Kemppainen et al. (2013) and Nwankwo et al. (2019) acknowledged that the majority of midwives were aware of their role in patient health education and it was seen as their key role (Da Serra et al., 2018; Kemppainen, Tossavainen & Turunen, 2013; NDOH, 2015; Nwankwo et al., 2018).

The midwives saw themselves more responsible for the patients' education as opposed to the patient themselves (*m*= 2.40/4 [*CI95%* 2.23-2.58]), which is in alignment with their "soldiering" approach to the activity. This finding is in agreement with Aldossary and colleagues (2013), who described 56% of the respondents believed health education to be the midwife's responsibility. Livne et al. (2017) are of the opinion that the teaching of patients through health education is a significant element of professional duties. However, when determining the reliability of the subscale (Responsibilities of Midwives), the Chronbach Alpha score was low (α= 0.37) and could therefore affect the generalisability of the finding.

It was of interest and commendable to note that the midwives in this study were aware of their independent role in health educating pregnant women, as indicated by the South African Nursing Council (SANC, 2014). They did not wait to be prescribed by the doctor, perceiving health education as part to their day-to-day practice (Da Serra et al., 2018), and proceeded despite constraints. However, despite the sense of responsibility, the study proved the hypothesis showing a significant association between midwives' demographics of age (*p*=.008) and gender (*p*=.000) and their responsibilities in the dissemination of maternal health education in ANC of the PHC clinics. Significant associations existed between the demographics of age (*p*=.008) and sex (*p*=.000) with the subscale *Responsibilities of midwives.* Malfait et al. (2017) whose study showed the favourable influence of nurses older than 55 years, conducted more health education, and through their greater experience on health educating pregnant women were more equipped to handle challenging questions; however, this study showed the midwives of 51 years and older to have a lesser sense of responsibility to health education.

Male midwives were the variable that drove the significant association (p=.000) between the demographic of gender and the subscale responsibilities of midwives and revealed they took on less responsibility towards health education. The study did not explore the reason further and literature is unclear on the reason. One suggestion could be that males might feel uncomfortable providing health education due to the nature of gender differences and the nature of discussion required; conversely, the study by Malfait et al. (2017) stated that men were more prone to providing health education and information sharing.

5.3.1.2 Constraints regarding health promotion

The subscale *Constraints towards health promotion* was the second highest scoring subscale (m=2.85 [*CI95%* 2.71-2.99]. The study respondents did not perceive their skill levels as a constraint (m=3.24/4 [*CI95%* 3.07-3.41]), but significant differences were found between this item and the subsequent three items. The respondents found their limited knowledge of the patients' culture (m=2.97 [*CI95%* 2.80-3.13], their language (m=2.96 [*CI95%* 2.78-3.13], and available time as constraints in the execution of health educating the pregnant women. Malfait et al. (2017) indicated that nurses with years of experience and older than 35 years developed significant skills in health educating patients and answering their challenging questions; however this study did not examine skills in correlation with age, time, language barriers, inadequate staffing, and the perception of midwives that pregnant women find health education boring, predominantly classified as structural items by Donabedian, have resulted in reduced dissemination of health education (Al-Ateeq et al., 2015; Livne et al., 2017; Nwankwo et al., 2017; Susuman et al., 2015).

Various authors agree with the study's findings and showed that language and an emphasis on time were factors that could negatively influence health professionals, inclusive of midwives' ability to conduct health education (Al-Ateeq et al., 2015; Aldossary et al., 2013; Livne et al., 2017; Nwankwo et al., 2018; Svensson et al., 2007), which could result in ineffective health education (Livne et al., 2017) and pregnancy outcomes (Nwankwo et al., 2018).

Various authors (Aldossary et al., 2013; Livne et al., 2017; Nwankwo et al., 2018; Svensson et al., 2007) have highlighted that culture and communication between midwives and pregnant women can result in miscommunication, thus a barrier to health education. Furthermore, this could result in confusion amongst midwives' roles and responsibilities due to the inability to conduct health education.

5.3.1.3 Perceptions of patient's responses to health education and midwives' perceptions of their role in delivery of health education

Perceptions of patient's responses to health education and midwives' perceptions of their role in delivery of health education, was the lowest scoring of the subscales (*m*=2.75 [*CI95%* 2.67-2.84]), where midwives strongly perceived that when delivering health education to pregnant women it was stimulating and interesting (*m*=3.23[*CI95%* 3.09-3.37]), again displaying their understanding of their role in health education and its importance. However, Nwankwo et al. (2018) stated findings contradictory to this study, which involved negative attitudes of midwives, which ultimately negatively affected the delivery and uptake of health education (Nwankwo et al., 2018).

Despite the respondents' positive perceptions (*m*=3.23/4 [*CI95%* 3.09-3.37], their sense of responsibility (*m*=3.16/4 [*CI95%* 2.97-3.35]) and level of conviction in their adopted role of health education (*m*=3.16/4 [*CI95%* 2.97-3.35]) towards delivering health education to the pregnant women, they were significantly less convinced in the difference it made (*m*=2.70/4 [*CI95%* 2.56-2.83]) or the reassurance it provided (*m*=2.63/4 [*CI95%* 2.46-2.80]), or how much notice was taken (*m*= 2.48/4 [*CI95%* 2.30-2.66]). Similarly, Aldossary et al. (2013) showed that only 38.3% of the respondents believed that evidence for changing health-related behaviours could be achieved, and 47.2% felt midwives should contribute to pregnant women's lives informing them to change health-related behaviours (Aldossary et al., 2013).

Once again, the contribution of culture was evident (*m*=2.70 [*CI95%* 2.54-2.85]) and appeared to have a significantly stronger influence on behaviours adopted by the pregnant woman compared to what the midwife could do to change lifestyles. However, despite the apparent perceived lesser relevance of the health education, the patients did not tend to towards annoyance at receiving the information (*m*=2.07 [*CI95%* 1.91-2.22]).

The perceived placid nature of the patients is unlike Nwankwo's (2018) findings, which revealed that a large number (89.8%) of midwives agreed to pregnant women becoming annoyed when discussing health-related behaviours. It can be noted that all items demonstrate the process, as per Donabedian's quality model, of conducting health education or improving the lives of pregnant women, which is concerning in light of Al-Ateeq et al. (2015) identifying that the more educated pregnant women are, the better the pregnancy outcomes.

In addition, there was a significant association between midwives' demographics of gender (p=.043) perceptions of maternal health education in ANC of the PHC clinics, thereby accepting the hypothesis. Male midwives, again, drove the significant association (*p*=.043) between gender and the subscale perceptions of patient's responses to health education and midwives' perceptions of their role in delivery of health education. This study did not attempt to identify the reasons for the above finding, and it is worth investigating in future research. The pregnant women's culture and language within this subscale are additional assumptions, as to the association.

5.4 ACCEPTANCE OF MHEALTH

The section of the study enquiring about midwives' acceptance of mHealth allowed for the acceptance of the hypothesis, showing that the demographic of age was associated with Behavioural Intention. The results of the study are discussed according to the six subscales and aligned with the Unified Theory of User Acceptance of Technology (UTAUT) model, which was incorporated into the structural and process components of quality care as explained in Donnabedian's model (Donabedian, 2005; Yakubu et al., 2019).

5.4.1 Performance expectancy

Performance Expectancy was the highest scoring of the subscales within this study (*m*=16.61/20 [*CI95%* 15.92-17.29], and described the degree to which an individual may believe a system will help them to accomplish a task (Yakubu et al., 2019). PE is considered the strongest predictor of technology usage (Yakubu et al., 2019). On further examination of the items in this sub-scale, it was favourable for future connections of pregnant women onto mHealth applications, such as "MomConnect," to note that the respondents found mHealth useful for educating pregnant women. Various studies concur with the findings (Anstey-Watkins et al., 2018, Aranda-Jan et al., 2014; Colaci et al., 2016; Hampshire et al., 2015) that midwives and other healthcare staff have emphasised the help mHealth applications provide in the provision of health education. It can be assumed that the factor of Performance Expectancy can contribute positively towards midwives' execution of their roles and responsibilities in conducting health education with pregnant women.

5.4.2 Behavioural Intentions

Behavioural Intention was the second highest performing of the subscales (*m*=15.90 [*CI95%* 15.22-16.59]) and described the individual's likelihood to willingly partake in a specific behaviour (Yakubu et al., 2019). In this study, midwives 'predicted' and 'perceived,' with equal strength (*m*=4.00/5 [*CI95%* 3.82-4.18; *m*=4.00 [CI95% 3.81–4.19]), that they will always try to use mHealth frequently when health educating pregnant women. Although this study did not measure the pathways of influence of the factors in the UTAUT model on each other, it is worth floating a hypothesis that the Performance Expectancy by the midwives in the PHC setting will influence the Behaviour Intention and consequently increase the likelihood of the adoption of mHealth as a platform to deliver health education to pregnant women. The use of mHealth towards health education can provide better pregnancy outcomes for mother and baby (Al-Ateeq et al., 2015; Barron et al., 2016). In keeping with the above, Yakubu et al. (2019) performed a 'goodness-of-fit' test through the use of a structural model equation, and determined that Performance Expectancy had a significant influence on Behavioural Intention, which increased the adoption of technology.

However, despite the positive finding towards the possible further implementation of mHealth, it is important to bear in mind the significant association between respondents 51 years and older and the lesser intention to use mHealth (*p*=.016). Conversely, Malfait et al. (2018) identified older nurses as more inclined to provide health education. The study's finding is concerning in the context of the 4th Industrial Revolution (NDoH, 2019), and that the SANC register (2018) shows the largest numbers of nurses are located in the 50 to 59 year age group. The current pandemic of COVID-19 adds a further concern to these findings, as it is in this context, which is synonymous with social distancing (Van den Broucke, 2020), that applications such as "MomConnect" can add considerable value to both the work-life of the midwife and the health of the pregnant woman. A study by Kaphle et al. (2015) investigated the adoption of mHealth by frontline workers, inclusive of nurses, and established that with older ages it negatively affects the adoption of mHealth. This finding cannot be viewed in isolation and needs to be considered with the findings from the subscale of Effort Expectancy, discussed further in this section.

Despite this finding of Behaviour Intent, and the hopefulness attached to it for the future delivery of mHealth programmes, there is incongruence between the expressed intent and the actual implementation by the midwives (Table 4). Across the 16 PHC sites, over a 30-day period, the actual usage of technology reflected that the largest number of midwives, a little

under a quarter, connecting (n=22, 23.9%) pregnant women to the mHealth application "MomConnect" was done either 'a few times a week' or 'once in the past month.' Pitse and van der Heever (2017) stated that midwives generally viewed 'MomConnect' as acceptable, with a potential to improve the quality of care towards pregnant women; however while they supported its continued use, there were mixed perceptions and barriers, such as finding mHealth as additional work that may affect the adoption and overall use of such an application. There is a need for further research to determine the influential reasons for the above results.

5.4.3 Effort Expectancy

Effort Expectancy was the third highest of the subscales observed in this study (*m*=15.87/20 [*CI95%* 15.23-16.51]). It is described as the ease associated with the use of a system (Yakubu et al., 2019). Midwives perceived strongly the delivery of mHealth to be easy with little Effort Expectancy (*m*= 15.87/20 [*CI95%* 15.23-16.51]), which may result in a further increase in connections of pregnant women to 'MomConnect.' Counter to the study's findings, the study by Anstey Watkins et al. (2018) indicated that whilst some midwives and other healthcare workers used technology in health education, most reported an overall rudimentary understanding of the use of technology towards health education. It is of interest that there was no association between Effort Expectancy and age group, suggesting that the older midwives did not find it difficult to use the mHealth application, suggesting the lesser Behaviour Intention is not linked to perceived ease of use.

5.4.4 Actual Usage

Actual Usage was determined by the actual face-to-face/group teachings by the midwives in the 16 PHC clinics, and the use of mHealth applications when health educating pregnant women. This was the fourth highest of the subscales (*m*=14.26/20 [*CI95%* 13.24-15.28]. The study's findings of lesser mHealth use confer with the survey findings of the clinics' landscape, but are in contrast to numerous other studies, which showed, despite several barriers (Lack of data, network coverage, rudimentary understanding of mobile devices, lack of support services), there was an increase in the provision of health education through mHealth (Anstey Watkins et al., 2018; Aranda-Jan, Mohutsiwa-Dibe & Loukanova, 2014; Colaci et al., 2016; Hampshire et al., 2015). In South Africa, mHealth usage can be supported by such factors as the most advanced mobile phone infrastructure, with the potential to make a considerable improvement in health education and thereby facilitate better maternal and neonatal health outcomes (Al-Ateeq et al., 2015; Anstey Watkins et al., 2018; Hampshire et al., 2015), which is particularly relevant in the current COVID-19 pandemic (Chersich et al., 2020).

A noted significant difference was seen between Actual Usage and Effort Expectancy, Behavioural Intention and Performance Expectancy. This conferred with the findings in the survey tool. The findings suggest the presence of an unidentified barrier that needs further investigation in light of the midwives finding the technology easy to use, having intent to use it and believing the application could be useful. Barriers to the implementation of mHealth where perceived ease of use and usefulness were high, have been cited as concerns by the patient about the privacy of information, language barriers, limited income to fund data for mHealth applications and limited knowledge by the patient on technology (Anstey Watkins et al., 2018; Aranda-Jan et al., 2014; Chipps, 2020; Guo, Zhang and Sun, 2016; Hampshire et al., 2015; Skinner et al., 2018). In addition, the midwives' workload might restrict them in the time required to connect the patient and explain the concept of "MomConnect" (Pitse and van der HeeVer, 2017).

5.4.5 Social Influence

Social Influence is described as the perception of an individual that people who are important to them encourage the use of the system (Yakubu et al., 2019), and scored second lowest of the six subscales (*m*=13.75/20 [*CI95%* 12.92-14.58]. In this study, there was significantly less influence by the unit managers (*m*=3.16/4 [*CI95%* 2.88-3.44] than the general PHC climate (*m*=3.97[*CI95% 3.74 – 4.19]* on their use of mHealth applications to health educate pregnant women. Yakubu et al. (2019) reported that social influence had no significant effect on the adoption or use of technology (Yakubu et al., 2019), unlike this study where the midwives perceived collegial influence on usage. It is not clear from the study as to the effort from the unit mangers and fellow friends within the work environment to encourage the midwives to connect pregnant women to the digital resource. Contrary to the findings of Yakubu (2019), a study by Alam et al. (2020) demonstrated that Social Influence can have a significant relationship and thus increase adoption of mHealth applications (Alam et al., 2020).

The seemingly lesser encouragement of mHealth by management is reflected in the structure component of Donnabedian's quality care model. Just over half of the PHC clinics (n=10) were able to provide policies on connecting to mHealth platforms such as 'MomConnect.' The availability of policies in an organisational climate is vitally important as it enables senior management to influence staff in the provision of health promotion focusing on health education (Livne et al., 2017).

5.4.6 Facilitating Conditions

Facilitating Conditions is defined as an individual's perception on the degree of support that will be provided to them by the organisational and technical infrastructure, which encourages the use of the system (Yakubu et al., 2019). Facilitating Conditions was the lowest scoring sub-scale (*m*=13.60/20 [*CI95%* 12.81-14.39]. Midwives perceived most strongly that they had the necessary knowledge to use mHealth in educating pregnant women (*m*=3.78/4 [*CI95%* 3.57-3.99]; however, there was a significant difference in their perception of available support (*m*=2.97/5 [*CI95%* 2.71-3.23]. The outcome of lesser support could be a reduction of mHealth use and failure of a useful system. The lack of support was also noted in the survey, both in the lesser use of technological modes of health education compared to non-technological modes, and in the adoption of the 'train the trainer' approach.

A significant difference was noted between Facilitating Conditions and Effort Expectancy, Behavioural Intention and Performance Expectancy. The significance is possibly explained through the midwives not receiving the necessary support with mHealth applications, the foundation of Facilitating Conditions (Alam et al., 2020; Alam et al., 2019; Yakubu et al., 2019), thereby creating negative perceptions towards mHealth adoption among midwives in PHC clinics.

5.5 SURVEY OF HEATH EDUCATION LANDSCAPE

A survey tool was included in this study to establish the health education landscape of the included PHC, and allowed for a comparison between the actual and the perceived. Information pertaining to the survey discussed earlier in this chapter is not repeated in this section. Registered midwives and midwife specialists are referred to as midwives unless otherwise stated. The process component of Donabedian's model refers to providing health education through face-to-face/group methods and through connecting patients to mHealth, whilst the structures of Donabedian's model refers to the landscape of the clinic (buildings, rooms, tables, chairs) and the tools, such as posters (non-technological), cellular phones and data (technological), to assist midwives in the provision of health education.

In line with the ***structure component*** of Donnabedian's quality model, all PHC clinics displayed posters for health education to pregnant women; in total, 124 posters were displayed across the 16 PHC clinics, with breastfeeding posters and Kangaroo Mother Care the most

frequently displayed posters (Table 8). There was a paucity of studies to indicate the type of posters available as a means for assessing the nature of the health education landscape. The use of posters as a means to health educate pregnant women is important in reducing morbidity and mortality (Nwankwo et al., 2018). Programmes such as the Safe Motherhood Initiative (SMI) provides actions and management through the analogy of pillars; the second and third pillars focus on antenatal and obstetric care respectively, with a greater emphasis on health education for pregnant women (Da Serra et al., 2018; WHO, 2016).

Focusing on the ***process component*** of Donabedian's model, a range of health education topics were covered, with the aim, as in other studies, to contribute to a decrease in morbidity and mortality (Da Serra et al., 2018; Fraser et al., 2010; Van Meerdervoort, 2008). The most discussed topic by the midwives focussed on antenatal education to pregnant women and included preparation for labour, danger signs, and foetal wellbeing (Table 8). These findings were echoed in various studies (Al-Ateeq et al., 2015; Nwankwo et al., 2018) stating that many midwives provided health education on important topics, which allowed for pregnant women to better identify problems and thus have better pregnancy outcomes. However, the researcher is mindful of the findings in this study that talk of the barriers and might not necessarily improve pregnancy outcomes.

Examining the ***outcome component***: the frequency of health education conducted by midwives in PHC clinics, reported that approximately three quarters of the midwives conducted it more throughout the day, rather than having a few health education sessions only in the morning. Herval et al. (2019) noted that a paucity of studies examined the frequency of health education sessions, but suggested that the greater the number of education sessions, the more improved outcomes for pregnant women.

Approximately half of the PHC clinics (n=8, 50%) reported having registers that recorded connections on mHealth applications and showed evidence of 154 (m= 9.63) connections by midwives. It should also be noted that mainly registered midwives (n=44, 88%) were connecting pregnant women to mHealth applications for health education compared to midwife specialists, which could possibly be due to the greater number in the clinics and on the SANC register. A high number (n=13, 81.3%) of midwives completed training on mHealth, and unit managers from the PHC clinics reported the adoption of a "train the trainer" approach, which due to time constraints might discourage midwives' adoption of mHealth applications such as

'MomConnect' (Anstey Watkins et al., 2018; Malfait et al., 2017; Nwankwo et al., 2018; Owusu-Addo, 2015).

All PHC clinics in this study were able to provide policies regarding the provision of health education, and all clinics reported having policies on KMC, Mother Baby Friendly Initiative (MBFI), and generic health education teaching policies (Table 8). However, mHealth policies were only available in 10 clinics.

5.6 KEY FINDINGS

The study revealed five key findings.

5.6.1 Performance Expectancy and increased responsibility of midwives

- There was increased perception amongst midwives in their responsibility towards health education and Performance Expectancy towards the acceptance of mHealth.

The higher Performance Expectancy of mHealth coupled with the midwives' greater sense of responsibility towards health education has the potential to contribute positively to the delivery of health education through a mHealth platform such as 'MomConnect". Yakubu et al. (2019) showed Performance Expectancy as the strongest predictor of technology acceptance, thus contributing to the possible acceptance and use of mHealth applications towards health education amongst pregnant women. The study showed the midwives appearing to "move through the motions" of health education, honouring their responsibility, despite apparent lesser belief in its value. This offers an opportunity to promote connections to mHealth platforms, simultaneously empowering pregnant women to take a greater sense of responsibility towards their own health (Livne et al., 2017; Yakubu et al., 2019)

5.6.2 Different barriers and varying perceptions towards health education

- An issue exists with midwives perceiving pregnant women finding health education boring, despite midwives finding the delivery of health education stimulating.

Midwives in this study perceived their overall skills towards providing health education to be higher, with a positive professional self-concept in how they are positioned in the health team to conduct health education and confidence in their ability to be health advocates for pregnant women and able to act independently in their health education role. This is in line with the

SANC Scope of Practice (R2488 and R2958 – Domain two) and midwives' independent core functions towards health promotion, inclusive of culturally sensitive health education to all pregnant women (SANC, 2014).

However, while the independent role was prevalent in this study, midwives perceived, contrary to their belief of health education being stimulating, that the pregnant women found health education boring and that they were responsible for their health. In addition, the midwives experienced barriers of language and lack of knowledge of the recipients' culture; however, the patients were not resistant to receiving the education. This is where the platform for mHealth applications, such as 'MomConnect,' can flourish, as it enables midwives to connect pregnant women to a health education platform with a more responsible role towards their own health through reading and learning from the health education messages provided. In addition, the barrier of language can be overcome as "MomConnect" is available in 11 languages (Haas, 2016). It is not certain if "MomConnect' specifically targets cultures related to pregnancy.

5.6.3 Complimenting mHealth with face-to-face health education

- Midwives who are connecting pregnant women to mHealth also compliment with providing face-to-face health education. However, a problem exists with Facilitating Conditions' in PHC clinics and may negatively influence the acceptance of technology in health education.

Although midwives connect pregnant women to 'MomConnect' and ensure they remain connected, their traditional roles of face-to-face health education are a means to compliment the information provided through mHealth applications. However, we are currently faced with a pandemic (COVID-19) and social distancing is being encouraged in our daily lives to assist in the prevention of transmission of the virus, therefore mHealth applications such as 'MomConnect' could provide an environment through which midwives spend less time with patients and limit close interaction as health education can be conducted through the application (Chersich et al., 2020; Yakubu et al., 2019). Midwives should identify the information provided on 'MomConnect' to pregnant women, and attempt to employ a 'question and answer' session during ANC visits; this session could allow for 'topping up' of information and prevent the un-necessary repetition of health education, maximising time spent with pregnant women due to limited time and social distancing. This can also encourage pregnant women to further increase their responsibilities, however both these assumptions will have to be examined at length in

further studies where actual use and preferences of face-to-face or 'MomConnect' health education options are explored.

While Performance Expectancy was highly perceived amongst midwives, influencing their technology acceptance, a significant difference was found between Performance Expectancy and Facilitating Conditions. Facilitating Conditions are those resources that should be provided to better able midwives to use mHealth in their work environments; in this study could be mobile devices, data for internet connectivity, network coverage and skills to use the programme (Venkatesh et al., 2003; Yakubu et al., 2019). With Performance Expectancy, the use of technology for health promotion, inclusive of health education to increase health contact (Chipps, 2020), could possibly result in completion of work to be achieved faster as this decreases face-to-face contact time (Chersich et al., 2020). The possible faster processing of pregnant women results in less exposure time between midwives and pregnant women waiting for ANC services, and in light of the current Covid-19 pandemic, decreases waiting times thus allowing institution's to improve their national core standards as set out by the national DoH (Winnie and Busisiwe, 2020). This could also influence midwives as they may see this as decreasing their workload, as institutions are generally short staffed (Al-Ateeq et al., 2015; Botha et al., 2016; Nwankwo et al., 2018; Yakubu et al., 2019). The survey tool in this study documented only 10 of the 16 clinics had policies or some form of guidelines on mHealth applications, and whilst these may not be siginificant now, the increase of COVID-19 could result in midwives wanting to use mHealth more for health education. Attempts were made to access these policies but researchers were denied; these policies should make an attempt to guide and ensure midwives are supported with mHealth usage.

5.6.4 The Focus on Ante-natal Care

- This study reflected that health education was mainly focused on antenatal care, with little reference to post-natal care by midwives.

The survey indicated the lesser focus directed through both the poster format and the health education talks of pain management in labour and to post-natal care, inclusive of family planning, which concurs with the concerns expressed by various authors (Al-Ateeq et al., 2015, Ojuri-King, Jarvis and Baloyi, 2018; Nwankwo et al., 2018 & Svensson et al., 2007). Ojuri-King et al. (2018) link the importance of post-natal education to maternal mortality in LMIC,

given that more than half of the maternal deaths due to obstetric haemorrhage and hypertensive disorders of pregnancy occurred in the post-natal period.

5.6.5 Significant differences of age and sex towards health educating pregnant women

- Both age (>50 years) and sex in particular males were shown to be significantly associated with the delivery of maternal health education. Male midwives perceived less strongly in them providing health education to pregnant women, while older midwives had a lesser sense of responsibility to health education and significantly less intention towards accepting mHealth as a platform to deliver maternal health education.

The lower inclination of the male midwives to provide health education is contrary to findings by Malfait et al. (2017), which indicated that male nurses were more inclined to conduct health education. There is a paucity of studies on the roles and perceptions of male midwives in health education within the maternity discipline, and this requires further investigation to identify the barriers and motivating factors towards health education amongst pregnant women. This is an important area of study, as in 2017-2018 there was a 0.2% increase in registrations of male nurses with SANC (SANC, 2018).

In the current South African context, where the largest number of nurses are 51 years or older (SANC, 2018), the findings related to age are of concern as this is the age group most likely to interface with pregnant woman. The lack of Facilitating Conditions such as provision of mHealth policies, unit managers not driving mHealth connections and a lack of support can have a crippling effect on maternal and neonatal health outcomes.

5.7 SUMMARY OF CHAPTER FIVE

This chapter provides a discussion on the findings of results of this study (Chapter Four). This study demonstrated an increased perception amongst midwives of their responsibility towards health education and Performance Expectancy towards mHealth. Despite midwives perceiving they are stimulated when providing health education, they also perceived that pregnant women find health education boring during health education sessions. However while these negative perceptions do exist, they continue to provide health education through face-to-face means and connect women on mHealth applications. Performance Expectancy was the strongest of subscales directly influencing midwives technology acceptance, however the perception was

perceived poorly in the Facilitating Conditions, which could have a negative impact on technology acceptance, as they perceived no availability of resources and support from managers and departments. This study also reflected a preference to providing health education based on ANC, with minimal attempts at post-natal care, despite its direct impact on maternal mortality. Lastly, it was noted that male midwives and midwives over 51 years were less fond of providing health education.

5.8 RECOMMENDATIONS

Recommendations target five areas.

Midwifery practice

- Supervisors and managers should encourage the provision of health education in their clinics and implement policies that encourage health education as often as possible
- PHC clinics should be provided with necessary resources to implement connections to mHealth applications by providing training

Midwifery research

- A study should be conducted identifying the perceptions, roles and responsibilities of male midwives when addressing health education amongst pregnant women
- Further research needs to be conducted to determine the influential reasons towards decreased registrations on mHealth applications, despite high Performance Expectancy and Behavioural Intentions
- Establish contributory factors and barriers towards non-technological and technological modes of providing health education amongst midwives in an attempt to understand how they influence the provision of health education and technology acceptance
- The use of a larger sample size, and more than one district to determine the true effect of the demographics on the roles and responsibilities of midwives in PHC clinics

Maternal health policies

- Policy documents to be examined, especially those relating to mHealth, to understand how they support midwives
- mHealth policies to be made available in all PHC clinics

Community

- Elders and community members should assist pregnant women in obtaining antenatal care inclusive of health education, by identifying barriers that prevents them from obtaining this care; they can also discourage cultural barriers and foster the uptake of health education by promoting the dissemination of health education

Midwifery education and training

- Findings from this study should be disseminated to educational institutions so that roles and perceptions can be taught to future nurses, with the emphasis on health education through mHealth platforms
- Midwives older than 51 years should receive training and support in the mHealth connections

5.9 LIMITATIONS

The limitations of this study included the small number of respondents due to the limited number of institutions available for conducting this research. Only one sub-district was used in this study, therefore the findings from this study could not be generalised to all PHC clinics.

The Chronbach Alpha score in the subscale *Responsibilities of midwives* within the section roles and perceptions of midwives was low ($\alpha = 0.37$) and could affect the generalisability of the subscale.

The limited number of respondents could have also negatively affected the associations between demographics and subscales, and further research should use larger numbers.

5.10 CONCLUSION

The study identified both structure and process-related information in its description of midwives' perceived roles in maternal health education and their acceptance of mHealth in health educating pregnant women during and between antenatal visits. Structurally, mHealth polices need greater visibility in the clinics and increased facilitating conditions, such as support for the midwives for mHealth. In particular, midwives older than 50 years and male midwives could add further resistance to the seamless implementation of health education, when utilising both digital and face-to-face approaches. However, from a process perspective of quality care, the midwives showed positive perceptions towards both their roles and responsibility in health education, with high performance expectancies of a mHealth application to deliver maternal health education, which all aim towards the outcome of reducing MMR.

The current COVID-19 pandemic has resulted in the practice of social distancing; mHealth applications such as 'MomConnect' can be great tools to ensure continued maternal and neonatal health, despite constraints brought about by social distancing, and thereby mitigate against increased maternal mortality rates. However, greater support by management, as well as provision of resources towards mHealth applications, should be considered in order for midwives to facilitate greater use and registration of 'MomConnect.'

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APPENDIX 1: PERMISSION FOR TOOL – DR. ALDOSSARY

Re: Permission for tool

Dear Mary Ann,

I have been in contact with Dr Aldossary who is happy for the tool to be used and I have asked her to contact Sanveer directly. Dr Aldossary will need to supply the additional information requested.

Best wishes

Louise

Louise Barriball RN, BA, PhD, FHEA | Professor of Nursing Education & Vice Dean (Education) | Florence Nightingale Faculty of Nursing, Midwifery & Palliative Care | King's College London

Permission was obtained on the 04 June 2019 from the author above.

Dear Mary Ann,

I have been in contact with Dr Aldossary who is happy for the tool to be used and I have asked her to contact Sanveer directly. Dr Aldossary will need to supply the additional information requested.

Best wishes

Louise

Louise Barriball RN, BA, PhD, FHEA | Professor of Nursing Education & Vice Dean (Education) | Florence Nightingale Faculty of Nursing, Midwifery & Palliative Care | King's College London

APPENDIX 2: PERMISSION FOR TOOL – MR. YAKUBU

Response from Mr. Yakubu received on 17 June 2019, copied verbatim:

"Yes sure".

Permission for data collection tool received on 17 June 2019.

Good day Professor Yakubu,

Much thanks and appreciation for the tool, Can I take your willingness to share the tool with me as permission as I am sure you are aware I will need to provide permission when submitting my thesis.

Again, a huge thank you, no need for apologies, I am sure you are busy.

Many thanks
Sanveer Ramnund.

Sent from Mail for Windows 10

Nas Yakubu <yakubu.m@aun.edu.ng>
Mon 2019/06/17 23:02
You; Baloyio@ukzn.ac.za; Mary Ann Jarvis

Yes sure. But the measurement instrument was adopted from the UTAUT model by Venkatesh et al. (2003). I just reworded it to suit the context of my study

APPENDIX 3: QUESTIONNAIRE

QUESTIONNAIRE

A description of midwives' perceived roles in health educating pregnant women at primary health care facilities, in two wards of the EThekwini district, KwaZulu-Natal, South Africa.

Thank you for participating in this study.

- P**lease answer the following questionnaire as honestly as possible.**
- **Please do not place your name anywhere on this questionnaire.**
- **On completion, please place it in the provided sealed box.**

If you answer "no" to either of the first two questions below, please do not proceed with the remainder of the questionnaire, but speak to the researcher for further assistance. If "yes" to both questions below please continue answering the questionnaire. (Please tick the appropriate boxes).

Have you read the information sheet and kept a copy?	Yes	No
Have you signed the informed consent and kept a copy?	Yes	No

SECTION A
DEMOGRAPHIC DATA

Please fill in the correct answer or mark with an "X" where appropriate.

1. Your current age in years:_____
2. Sex:

Male	
Female	

3. Your current midwifery education level:

3.1	Qualified Midwife (4 year integrated diploma /degree /1yr post basic course)	
3.2	Qualified Midwife Specialist (ADM) (Diploma/Masters in Nursing)	
3.3	Midwifery student (Post basic)	
3.4	Midwife specialist student (ADM)	

4. T**his question is to be omitted by basic midwifery students (**Post basic)

How long (in years) have you been practising midwifery? _____

Please turn to the next page for Section B

SECTION B
YOUR ROLES AND PERCEPTIONS (VIEWS) OF HEALTH EDUCATION

Please read the statements below and indicate your response with an "X".
Choose ONLY ONE option per statement.

No	Statement	Strongly agree	Agree	Disagree	Strongly disagree
	Constraints regarding health promotion				
B1.	Midwives do not have enough time to carry out health promotion (Health education) effectively towards pregnant women.				
B2.	Midwives do not have the necessary skills to promote the health of pregnant women.				
B3.	Midwives do not speak pregnant women's language/s to be able to promote their health during pregnancy.				
B4.	Midwives have very limited knowledge about pregnant women's culture/s to be able to promote their health during pregnancy.				
	Responsibilities of nurses				
B5.	The midwife should be a health advocate, insisting that preventive health is discussed and supported amongst politicians.				
B6.	The midwife should take more responsibility for health educating pregnant women.				
B7.	The midwife is the most appropriate health care worker to get involved in health educating pregnant women.				
B8.	Pregnant women are **totally** responsible to promote their own health during pregnancy.				
B9.	The midwife should only provide health education if it has been requested by the doctor.				
B10.	The midwife should make health education to pregnant women a priority above investigations dealing with pregnancy.				
	Perceptions of patients				
B11.	Pregnant women find health education delivered by midwives, dull and boring.				
B12.	The midwife finds it dull and boring to deliver health education to pregnant women.				
B13.	The evidence for changing health related behaviours is too uncertain and contradictory (clashing) for the midwife to health educate pregnant women.				
B14.	The midwife should not interfere with pregnant women's lives telling them to change their health-related behaviours.				
B15.	Pregnant women's lifestyles are conditioned (prepared) by their culture and environment; so there is not much that the midwife can do to change them.				
B16.	Pregnant women do not take any notice of what the midwife says about changing lifestyles.				
B17.	During health education to pregnant women, giving a detailed explanation about their health related to pregnancy conditions tends to worry them rather than reassure them.				
B18.	Helping pregnant women to understand how health-related behaviours can interfere with their health is an important part of the midwife's duty.				
B19.	Pregnant women get annoyed (upset) when the midwife asks them about health-related behaviours especially when it's not directly related to their presenting health problems.				

Please turn to the next page for Section C

SECTION C

YOUR ACCEPTANCE OF TECHNOLOGY AND mHEALTH IN THE PHC CLINIC WHERE YOU ARE WORKING

According to the World Health Organisation (2019) mHealth is a branch of eHealth and described as the use of mobile wireless devices such as smartphones for health. "MomConnect" is an example of a mHealth application available on smartphones to disseminate (spread) health education to pregnant women.

Please read the statements below and show your response with an "X" in the box. Choose ONLY ONE option per statement.

No.	Statement	Strongly agree	Moderately agree	Neutral	Moderately disagree	Strongly disagree
	Performance expectancy					
C1.	I will find/find mHealth useful for health educating pregnant women.					
C2.	Using mHealth will help/helps me to achieve certain tasks quicker, such as health educating pregnant women					
C3.	Participating in mHealth training increased my understanding of the use of mHealth.					
C4.	Using mHealth, has improved /will improve my communication with pregnant women due to the many language options available for health education.					
	Effort expectancy					
C5.	My overall usage of mHealth is clear and understandable.					
C6.	It is easy for me to become skilful at using mHealth whilst health educating pregnant women.					
C7.	In general, I will find/find mHealth easy to use when health educating pregnant women.					
C8.	Learning to operate mHealth during training was easy for me.					
	Social influence					
C9.	My colleagues have an influence on my use of mHealth.					
C10.	My manager (OM/UM) has an influence on my use of mHealth.					
C11.	The IT department at DOH or the PHC clinic where I am working has been /will be helpful in supporting my use of mHealth.					
C12.	In general the PHC clinic has encouraged the use of mHealth in health educating pregnant women.					
	Facilitating conditions					
C13.	I have the resources necessary to use mHealth (e.g. technology and time).					
C14.	I have the knowledge necessary to use mHealth in health educating pregnant women.					
C15.	The PHC clinic provides all that I need to use mHealth in the health education of pregnant women.					
C16.	A specific person or group is available to assist me with issues I have with mHealth applications at the PHC clinic where I work.					
	Behavioural intention to use mHealth tools					
C17.	I intend to use mHealth frequently in the coming months for health educating pregnant women					
C18.	I predict that, I will use mHealth frequently in the coming months for health educating pregnant women.					
C19.	I plan to use mHealth frequently in the coming months towards health educating pregnant women					
C20.	I will always try to use mHealth frequently every month					

	mHealth actual usage					
C21.	I have used mHealth often this month towards health educating pregnant women attending this PHC clinic.					
C22.	I am currently using mHealth frequently this month towards health education of pregnant women.					

SECTION D
ACTUAL HEALTH EDUCATION CONDUCTED IN PAST MONTH (30 days)

Please choose the response that best represents the frequency with which you conducted health education to pregnant women in this PHC clinic in the past month (30 days).

Please show your response with an "X" in the box that represents your choice. Choose <u>ONLY ONE</u> option per statement.

D1.	In the past month I have conducted health education face-to-face (individual or group) to pregnant women in the clinic	A few times every day	Once every day	A few times a week	Once a week	Once a fortnight	Once in the past month
D2.	In the past month I have conducted health education to pregnant women using mHealth	A few times every day	Once every day	A few times a week	Once a week	Once a fortnight	Once in the past month

Thank you for taking time to complete this questionnaire.

Please place the completed questionnaire into the sealed box provided by the researcher.

APPENDIX 4: TOOL TO SURVEY HEALTH EDUCATION IN PHC CLINICS

SURVEY TOOL

Date: ___ / ___ 2020

Thank you for participating in this survey of the health education landscape in PHC clinics of a sub-district in eThekwini for evidence of the delivery of ANC health education by midwives to pregnant women. This survey will require answering of questions that I will read to you and examination of the evidence in the clinic. No clinic name is recorded on this survey. Please answer the questions as honestly as possible.

Choose <u>ONLY ONE</u> option per statement.

1. How many antenatal patients attends your clinic in a month? _____

2. Who conducts the health education performed in your clinic for pregnant women?
   Registered midwives …. ☐ Midwifery students ... ☐
   Midwife specialists …… ☐ Non-midwife nurses . ☐

3. How frequently in a day, does staff in this clinic health educate pregnant women?
   Once a day …….. ☐ More than once a day ☐

4. When is health education conducted to pregnant women in your clinic?

Mainly in the morning		Mainly in the afternoon		Ongoing throughout the day	

5.	Are there registers available for you to record when health education is conducted with pregnant women, this includes face-to-face and/or group discussions?	Yes	No
5a	If yes, please can I see them? Please can you help me further to count the following: i. Who is health educating the pregnant women? (If possible insert the number per category) Registered midwives …. ☐ Midwifery students... ☐ Midwife specialists …… ☐ Non-midwife nurses. ☐ ii. Number of sessions in preceding month (30 days) _____ iii. Distribution of health education topics.(**Insert number per topic**)		

Rhesus, PMTCT, STI, TB testing……	☐	Foetal wellbeing (foetal kick chart), breastfeeding …….	☐
ANC appointments and its importance ……...	☐	Communicable and non-communicable diseases …….	☐
Preparation for labour and danger signs …….	☐	Nutrition, exercises, medication compliance ……	☐
Pain management and breathing..	☐	Family planning, Post-natal care	☐

6.	Are there registers available for you to record when health education is conducted through technological modes such as mHealth applications e.g. Momconnect?	Yes	No
6a	If yes, please can I see them? Please can you help me further to count the following: i. Number of connections in preceding month (30 days) _____ **ii.** Who is connecting the pregnant women? (if possible i**nsert number per category)** Registered midwives …. ☐ Midwifery students ... ☐ Midwife specialists …… ☐ Non-midwife nurses . ☐		
7.	Are there posters with information displayed in your clinic that may assist midwives in health educating pregnant women?	Yes	No
7a	If yes, please can I see them? i. Number of posters: ____ ii. Health education focus in posters (**Insert number per poster categor**y) Kangaroo mother care (KMC)….. ☐ Breastfeeding …….. ☐ Prevention of mother-to-child transfer (PMTCT) ……. ☐ Labour and it's danger signs ☐		
8.	Do you have equipment to play DVDs to health educate pregnant women?	Yes	No
8a	If yes, please can I see them? Please can you help me further? i. DVD recorder and monitor in WORKING order; Yes / NO (Mark appropriate with an X) ii. Number of DVDs ____ iii. Distribution of health education topics in DVDs .(**Insert number per topic**) Post Natal care …….. ☐ Exclusive breastfeeding and its importance …… ☐ PMTCT and medication compliance …… ☐ Dangers signs of pregnancy ... ☐		
9.	Are there any policy documents that outlines the provision of health education to pregnant women?	Yes	No
9a	If yes, please can you show me the policy documents? Mother baby friendly initiative (MBFI) …… Yes ☐ No ☐ mHealth applications – registration and use…... Yes ☐ No ☐ KMC ……. Yes ☐ No ☐ Generic health education teachings …. Yes ☐ No ☐		
10.	Have midwives attended any training regarding mHealth apps?	Yes	No
10a	If yes, please can you assist me with the following information? i. How frequently is mHealth training available? ____ (Insert frequency) ii. Who is assigned to attending mHealth training? (Tick appropriate boxes) Registered midwives …. ☐ Midwifery students ... ☐ Midwife specialists …… ☐ Non-midwife nurses. ☐ iii. Which category of midwife in your clinic has received mHealth training? Registered midwives …. ☐ Midwifery students ... ☐ Midwife specialists …… ☐ Non-midwife nurses . ☐		

Thank you for your participation in this survey.

APPENDIX 5: INFORMATION SHEET AND CONSENT FOR RESEARCH STUDY

Information sheet and consent

Date: __ / ___ / 2020

Dear Prospective respondent

My name is Sanveer Ramnund, student number 209529175, a Masters student in the Nursing Department, Howard College, University of KwaZulu-Natal. My contact number is [redacted] and email address 209529175@stu.ukzn.ac.za

I am looking at describing midwives' perceived roles in health educating pregnant women at Primary Health Care clinics in a sub-district of EThekwini, KwaZulu-Natal, South Africa.

The study makes use of a questionnaire that requires tick box responses. Your participation is voluntary, and should you agree to participate you do not need to answer every question. You may withdraw at any point prior to dropping your questionnaire into a sealed box and your withdrawal or refusal to participate will not have any negative effects. The questionnaire is anonymous, so once in the sealed box it cannot be withdrawn.

The University of KwaZulu-Natal Humanities and Social Sciences Research Ethics committee (HSSREC) has approved the study (insert ethics approval #), which assures you of the following: i) Voluntary participation as mentioned earlier; ii) Anonymity with regards to your and the research setting's name such that it will not be recorded on any document, or any report or publication that will come about from the research study; iii) Three months after you have completed the questionnaire, you will receive written feedback of the key findings of the survey. The researcher will keep the questionnaires whilst capturing and analysing the data and after completion, these will be scanned to a USB, which will be stored under lock and key in the researcher's office for five years and then destroyed according to UKZN research policy. Written copies of completed questionnaires or any research notes will be destroyed by shredding.

There is time for you to consider your participation and ask questions from myself, my supervisor, co-supervisor or the HSSREC office using the contact details below. I will return later today to see if you will be participating in the study. If you choose to participate, I will arrange the best time for you to sign consent and complete the questionnaire.

RESEARCHER
Full Name: Mr. Sanveer Ramnund
School: Nursing & Public Health
College: Health Sciences
Campus: Howard College
University of KwaZulu-Natal
Mobile +[redacted]
E-mail: 209529175@stu.ukzn.ac.za

CO- SUPERVISOR
Co-supervisor: Mrs. Mary-Ann Jarvis
School: Nursing & Public Health
College: Health Sciences
Campus: Howard College
University of KwaZulu-Natal
Durban, 4000, SOUTH AFRICA
Email: jarvism@ukzn.ac.za

SUPERVISOR
Full name: Dr. Olivia Baloyi
School: Nursing & Public Health
College: Health Sciences

HSSREC RESEARCH OFFICE
HSS Research Office, Westville campus
Govan Mbheki Building, UKZN
Private Bag X54001

Campus: Howard College
University of KwaZulu-Natal
Durban, 4000, SOUTH AFRICA
E-mail: baloyio@ukzn.ac.za

Durban
4000, Kwazulu-Natal, SOUTH AFRICA
el: 031- 2604557; Fax (+27)31 2604609
Email: HSSREC@ukzn.ac.za

CONSENT

Study Title: A description of midwives' perceived roles in health educating pregnant women at Primary Health Care clinics in a sub-district of EThekwini, KwaZulu-Natal, South Africa.

I……have been informed about the study

	Yes	No
I understand the information sheet of the study involving a survey.		
I understand that my participation in this study is voluntary		
I understand that my or the Primary Health Care clinic's name will not appear on the questionnaire or any reports.		
I understand that I may withdraw at any time, without giving any reason and without any fear of any negative effects.		
I understand that there is no compensation for participating in the study.		
I am aware that the data obtained from the study will be kept confidential		
I am aware that I will receive a report three months after finishing the survey with the key findings.		
I have the contact details of the researcher, research supervisor, co-supervisor and ethics committee should I need further information or have unanswered queries.		

I _____voluntarily consent to participate in this study and understand its processes.

_____ (Respondent's signature)

___ / ___ / 2019

Researcher confirmation

I have given the above respondent the information sheet and an opportunity to ask questions to help his /her understanding for informed consent.

_____ (Researcher's signature)

__ / ___ / 2019

Please ensure that you have retained a copy for your reference.

APPENDIX 6: INFORMATION SHEET AND CONSENT – SURVEY TOOL

Information sheet and consent to participate in a survey tool

Date: __ / ___ / 2020

Dear Prospective participant

My name is Sanveer Ramnund, student number 209529175, a Masters student in the Nursing Department, Howard College, University of KwaZulu-Natal. My contact number is 0[redacted] and email address 209529175@stu.ukzn.ac.za

I am looking at describing midwives' perceived roles in health educating pregnant women at Primary Health Care clinics in a sub-district of EThekwini, KwaZulu-Natal, South Africa.

This part of the study makes use of a survey tool that requires tick box feedback during the assessment of the landscape of the clinic and midwives registers to determine the occurrence of health education within the clinic. This process will be conducted by the researcher with assistance provided by the Unit Manager of the clinic whilst on a walkabout. Your participation is voluntary, and should you agree to participate you do not need to be involved throughout the full assessment as the researcher can continue the walkabout with the information and registers provided. You may withdraw at any point prior to the researcher completing the assessment.

The University of KwaZulu-Natal Humanities and Social Sciences Research Ethics committee (HSSREC) has approved the study (insert ethics approval #), which assures you of the following: i) Voluntary participation as mentioned earlier; ii) Anonymity with regards to your and the research setting's name such that it will not be recorded on any document, or any report or publication that will come about from the research study; iii) Three months after completion of the assessment a collective information report will be provided to the district manager of the key findings of the survey. The researcher will keep the survey tools whilst capturing and analysing the data and after completion, these will be scanned to a USB, which will be stored under lock and key in the researcher's office for five years and then destroyed according to UKZN research policy. Written copies of completed survey tools or any research notes will be destroyed by shredding.

There is time for you to consider your participation and ask questions from myself, my supervisor, co-supervisor or the HSSREC office using the contact details below. I will return later today to see if you will be participating in the study. If you choose to participate, I will arrange the best time for you to sign consent and commence the completion of the clinic survey.

RESEARCHER
Full Name: Mr. Sanveer Ramnund
School: Nursing & Public Health
College: Health Sciences
Campus: Howard College
University of KwaZulu-Natal
Mobile +2[redacted]
E-mail: 209529175@stu.ukzn.ac.za

CO- SUPERVISOR
Co-supervisor: Mrs. Mary-Ann Jarvis
School: Nursing & Public Health
College: Health Sciences
Campus: Howard College
University of KwaZulu-Natal
Durban, 4000, SOUTH AFRICA
Email: jarvism@ukzn.ac.za

SUPERVISOR
Full name: Dr. Olivia Baloyi
School: Nursing & Public Health
College: Health Sciences
Campus: Howard College
University of KwaZulu-Natal
Durban, 4000, SOUTH AFRICA
E-mail: baloyio@ukzn.ac.za

HSSREC RESEARCH OFFICE
HSS Research Office, Westville campus
Govan Mbheki Building, UKZN
Private Bag X54001
Durban
4000, Kwazulu-Natal, SOUTH AFRICA
Tel: 031- 2604557; Fax (+27)31 2604609
Email: HSSREC@ukzn.ac.za

CONSENT

Study Title: A description of midwives' perceived roles in health educating pregnant women at Primary Health Care clinics in a sub-district of EThekwini, KwaZulu-Natal, South Africa.

I……have been informed about the study

	Yes	No
I understand the information sheet of the study involving a survey.		
I understand that my participation in this study is voluntary		
I understand that my or the Primary Health Care clinic's name will not appear on the questionnaire or any reports.		
I understand that I may withdraw at any time, without giving any reason and without any fear of any negative effects.		
I understand that there is no compensation for participating in the study.		
I am aware that the data obtained from the study will be kept confidential		
I am aware that I will receive a report three months after finishing the survey with the key findings.		
I have the contact details of the researcher, research supervisor, co-supervisor and ethics committee should I need further information or have unanswered queries.		

I _____voluntarily consent to participate in this study and understand its processes.

_____ (Respondent's signature) __ / ___ / 2019

Researcher confirmation

I have given the above respondent the information sheet and an opportunity to ask questions to help his /her understanding for informed consent.

_____ (Researcher's signature) __ / ___ / 2019

Please ensure that you have retained a copy for your reference.

APPENDIX 7: TRREE ETHICS CERTIFICATES


Zertifikat
Certificat
Certificado
Certificate
Certificat de formation - Training Certificate
Ce document atteste que - this document certifies that
olivia baloyi
a complété avec succès - has successfully completed
Informed Consent
du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation
August 1, 2017
Professeur Dominique Sprumont
Coordinateur TRREE Coordinator


Zertifikat
Certificat
Certificado
Certificate
Certificat de formation - Training Certificate
Ce document atteste que - this document certifies that
Mary Ann Jarvis
a complété avec succès - has successfully completed
Good Clinical Practice (GCP)
du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation
August 1st, 2017
Professeur Dominique Sprumont
Coordinateur TRREE Coordinator


Zertifikat
Certificat
Certificado
Certificate
Certificat de formation - Training Certificate
Ce document atteste que - this document certifies that
olivia baloyi
a complété avec succès - has successfully completed
Research Ethics Evaluation
du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation
August 1, 2017
Professeur Dominique Sprumont
Coordinateur TRREE Coordinator


Zertifikat
Certificat
Certificado
Certificate
Certificat de formation - Training Certificate
Ce document atteste que - this document certifies that
Mary Ann Jarvis
a complété avec succès - has successfully completed
Introduction to Research Ethics
du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation
July 28, 2017
Coordinateur TRREE Coordinator


Zertifikat
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Certificado
Certificate
Certificat de formation - Training Certificate
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Good Clinical Practice (GCP)
du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation
August 1st, 2017
Professeur Dominique Sprumont
Coordinateur TRREE Coordinator


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Informed Consent
du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation
August 1, 2017
Professeur Dominique Sprumont
Coordinateur TRREE Coordinator


Zertifikat
Certificat
Certificado
Certificate
TRREE
Clinical Trials Centre
The University of Hong Kong
Certificat de formation - Training Certificate
Ce document atteste que - this document certifies that
Sanveer Ramnund
a complété avec succès - has successfully completed
Research Ethics Evaluation
du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation
[redacted]
Professeur Dominique Sprumont
Coordinateur TRREE Coordinator
FMH
FPH


Zertifikat
Certificat
Certificado
Certificate
TRREE
Clinical Trials Centre
The University of Hong Kong
Certificat de formation - Training Certificate
Ce document atteste que - this document certifies that
Sanveer Ramnund
a complété avec succès - has successfully completed
Informed Consent
du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation
[redacted]
Professeur Dominique Sprumont
Coordinateur TRREE Coordinator
FMH
FPH


Zertifikat
Certificat
Certificado
Certificate
TRREE
Clinical Trials Centre
The University of Hong Kong
Certificat de formation - Training Certificate
Ce document atteste que - this document certifies that
Sanveer Ramnund
a complété avec succès - has successfully completed
Good Clinical Practice (GCP-E6(R2) 2016)
du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation
[redacted]
Professeur Dominique Sprumont
Coordinateur TRREE Coordinator
FMH
FPH


Zertifikat
Certificat
Certificado
Certificate
TRREE
Clinical Trials Centre
The University of Hong Kong
Certificat de formation - Training Certificate
Ce document atteste que - this document certifies that
Sanveer Ramnund
a complété avec succès - has successfully completed
Introduction to Research Ethics
du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation
[redacted]
Professeur Dominique Sprumont
FMH
FPH

APPENDIX 8: CERTIFICATE FROM EDITOR

Gill Smithies

Proofreading & Language Editing Services

[redacted], [redacted], [redacted], 4126, KwaZulu Natal

Cell: [redacted] E-mail: [redacted]

Work Certificate

To	S. Ramnund
Address	School of Nursing & Public Health, College of Health Sciences, University of KwaZulu Natal
Date	10/06/2020
Subject	Chapter 1-3 and 5: A description of midwives' perceived roles in health educating pregnant women at Primary Healthcare clinics in a sub-district of EThekwini, KwaZulu-Natal, South Africa
Ref	SR/GS/01

I certify that I have edited the following for language, grammar and style

Chapter1: A description of midwives' perceived roles in health educating pregnant women at Primary Healthcare clinics in a sub-district of EThekwini, KwaZulu-Natal, South Africa, by S. Ramnund.

to the standard as required by the University of KwaZulu Natal.

Gill Smithies

APPENDIX 9: WRITTEN PERMISSION TO DISTRICT OFFICE

[redacted]
4093

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

Date: __ / ___ / 2020

Dear Sir/Madam

Re: Request to conduct study

My name is Sanveer Ramnund, student number 209529175, a Masters student in the Nursing Department, Howard College, University of KwaZulu-Natal. My contact number is [redacted] and email address [redacted]. I am looking at describing *midwives' perceived roles in health educating pregnant women at Primary Health Care clinics in a sub-district of EThekwini, KwaZulu-Natal, South Africa*. This study will use a quantitative study design with a tick response data collection tool for the participants and a survey tool which will be used by the researcher whilst on a walk-about with the Operational manager of the clinic when suitable . My objectives are as follows:

1. To establish midwives' perceptions of their role and responsibility in disseminating maternal health education in PHC clinics in a sub-district of EThekwini
2. To assess midwives' current use and technological acceptance of mHealth to disseminate health education to pregnant women attending PHC clinics in a sub-district of EThekwini
3. To determine the frequency with which midwives conduct health education through non-technological and technological modes in PHC clinics of a sub-district in eThekwini.
4. To survey the health education landscape in PHC clinics of a sub-district in eThekwini for evidence of the delivery of ANC health education by midwives to attending pregnant women.

The clinics that have been chosen are all found within the South basin of eThekwini which has the highest maternal mortality ratio, as my study site. I would like to use the following clinics in my study: Addington Gateway, Beatrice street, Chesterville clinic, Clairwood, Ekuphileni (Umlazi L), Kwamakhuta, Osizweni (Umlazi Q), Prince Mshiyeni gateway clinic, R. K. Khan gateway clinic, Shongweni dam, Umlazi sections D, H, K, V, U21; Wentworth gateway, and Cato Manor CHC.

Your support and permission to conduct the study at your facility will be appreciated and I look forward to your soonest response.

Yours sincerely,
Mr. Sanveer Ramnund.

APPENDIX 10: HSSREC APPROVAL LETTER

UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

30 January 2020

Mr Sanveer Ramnund (209529175)
School Of Nurs & Public Health
Howard College Campus

Dear Mr Ramnund,

Protocol reference number: HSSREC/00000181/2019
Project title: A description of midwives perceived roles in health educating pregnant women at Primary Health Care clinics in a sub-district of EThekwini, KwaZulu-Natal, South Africa.
Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 13 August 2019 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 30 January 2021.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

[redacted]

Dr Shamila Naidoo (Chair)

/dd

APPENDIX 11: DOH GATEKEEPER APPROVAL LETTER

health
Department:
Health
PROVINCE OF KWAZULU-NATAL

Physical Address: 330 Langalibalele Street, Pietermaritburg
Postal Address: Private Bag X9051
Tel: 033 395 2805/ 3189/ 3123 Fax: 033 394 3782
Email:
www.kznhealth.gov.za

DIRECTORATE:
Health Research & Knowledge Management

NHRD Ref No.: KZ_202001_006

Dear Mr S. Ramnund
UKZN

Approval of research

1. The research proposal titled **'A description of midwives' perceived roles in health educating pregnant women at Primary Heath care clinics in a sub-district of eThekwini, KwaZulu Natal, South Africa'** was reviewed by the KwaZulu-Natal Department of Health.

   The proposal is hereby **approved** for research to be undertaken at Addington, Clairwood, Prince Mshiyeni, Wentworth and RK Khan Gateway; Beatrice Street clinic, Ekuphileni (Umlazi L) KwaMakhutha, Osizweni (Umlazi Q), Shongweni, Umlazi D, Umlazi H, Umlazi K, Umlazi V, Umlazi U21clinic and Cato Manor CHC

2. You are requested to take note of the following:
   a. Kindly liaise with the facility manager BEFORE your research begins in order to ensure that conditions in the facility are conducive to the conduct of your research. These include, but are not limited to, an assurance that the numbers of patients attending the facility are sufficient to support your sample size requirements, and that the space and physical infrastructure of the facility can accommodate the research team and any additional equipment required for the research.
   b. Please ensure that you provide your letter of ethics re-certification to this unit, when the current approval expires.
   c. Provide an interim progress report and final report (electronic and hard copies) when your research is complete to **HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200** and e-mail an electronic copy to hrkm@kznhealth.gov.za

For any additional information please contact Mr X. Xaba on 033-395 2805.

Yours Sincerely
[redacted]
Dr E Lutge
Chairperson, Health Research Committee
Date: 23/01/2020

Fighting Disease, Fighting Poverty, Giving Hope

APPENDIX 12: LETTER OF SUPPORT FROM DISTRICT OFFICE

health
Department:
Health
PROVINCE OF KWAZULU-NATAL

DIRECTORATE: CORPORATE SERVICES

83 King Cetshwayo Highway
Maryville, Durban, 4001
Tel: 031 240 5370 Email: sveshni.harrichandparsad@kznhealth.gov.za
www.kznhealth.gov.za

ETHEKWINI HEALTH DISTRICT OFFICE

16 January 2020

Dear Mr. S Ramnund

Re: Permission To Conduct Research at eThekwini District Facilities.

This letter serves to confirm that your application to conduct the research study titled "A description of midwives' perceived roles in health educating pregnant women at Primary Health Care clinics in a sub-district of eThekwini, KwaZulu-Natal, South Africa." in the eThekwini district, with recruitment from the following health care facilities, has been recommended:

1. Addington Gateway
2. Beatrice Street Clinic
3. Clairwood
4. Ekhuphileni (Umlazi L)
5. Kwamakhutha Clinic
6. Osizweni (Umlazi Q)
7. Prince Mshiyeni Gateway Clinic
8. R K Khan Gateway Clinic
9. Shongweni Clinic
10. Umlazi D
11. Umlazi H
12. Umlazi K
13. Umlazi V
14. Umlazi U21
15. Wentworth Gateway
16. Cato Manor CHC

Kindly upload this letter together with your application as required to the Health Research and Knowledge Unit for the KZN Department of Health for Approval.
Please also note the following:

1. This research project should only commence after final approval by the KwaZulu-Natal Health Research and Knowledge Unit, and full ethical approval, has been granted,
2. That you adhere to all the policies, procedures, protocols and guidelines of the Department of Health with regards to this research.
3. All research activities must be conducted in a manner that does not interrupt clinical care at the health care facility,
4. Ensure that this office is informed before you commence your research
5. The District Office/Facility will not provide any resources for this research
6. All logistical details must be arranged with the CEO/medical manager /operational manager of the facility,
7. You will be expected to provide feedback on your findings to the District Office/Facility

Yours sincerely

[redacted]

Dr. A. Harrichandparsad
pp Ms. T. P. Msimango
Chief Director
eThekwini Health District

Fighting Disease, Fighting Poverty, Giving Hope

APPENDIX 13: GATEKEEPER LETTER FROM ETHEKWINI MUNICIPALITY

ETHEKWINI MUNICIPALITY
Community & Emergency Services Cluster
Health Unit

9 Archie Gumede Place
Durban 4001
P O Box 2443
Durban 4000
Tel: (031) 311 3505
Fax: (031) 311 3710
Website: http://www.durban.org.za

17 December 2019

Dear Researcher,

This letter serves to confirm that the Research Committee of the eThekwini Municipality Health Unit has received your protocol titled: **A description of midwives' perceived roles in health educating pregnant women at Primary Health Care clinics in a sub-district of EThekwini, KwaZulu-Natal, South Africa.**

Your protocol was reviewed by the Head of the Health Unit and unfortunately it was deemed unsuitable to be conducted in the eThekwini Municipality Health Unit. We will not be in a position to provide you with gatekeeper approval from the eThekwini Municipality Health Unit. Any grievance regarding this decision can be directed to the office of the Head of the Health Unit.

Regards

[redacted]

Head: Health Unit