

The impact of mobile phone-based health tools on
decisions regarding family planning among Indian women

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Abstract

Family planning plays a role in saving lives across the globe by preventing unwanted pregnancies. Mobile phone-based technology could be used to increase the uptake of contraceptives. In India, health-based mobile phone applications are used by women to make decisions about family planning. The purpose of this multidisciplinary research was to determine the impact of mHealth tools for family planning. The pathway to family planning decision-making was examined using a conceptual framework which was an integration of the theory of planned behaviour (Ajzen, 1985) and the model of change (BBC Media Action, 2015). This study also examined the influence of other factors relevant to contraceptive use that are not accounted for by the theory of planned behaviour, and whether these factors were associated with exposure to mHealth tools.

To examine the association between exposure to mHealth tools for family planning and predictors of behaviour, data was collected from mHealth intervention areas in India. A post-intervention quasi-experimental study with a 2x2 factorial design was conducted among 831 men and women from the state of Bihar. A quantitative survey and focus group discussions were conducted.

The quantitative data analysis evaluated the extent of influence that predictors of behaviour (beliefs, social norms, perceived behaviour control, and outcome behaviour) have on a woman's decisions about family planning. The results indicated an association between exposure to mHealth tools and improved communication about family planning among various family members after receiving health information from a health worker (H1). A relationship between exposure to mHealth tools and increased support women received from their husbands and extended family (mothers-in-law specifically) and peers (H2) was also found. A further result showed that knowledge about family planning was greater among users of family planning (H4). In the present research, qualitative data was used to broaden the interpretation of the quantitative findings. A directed content analysis approach (Hsieh & Shannon, 2005) provided insights about women's and men's experience of family planning and mobile phone use. The key consideration for many participants was that information on mobile

phones helps them to ascertain information available at the village level, because the information was accessed first hand and without any time lag.

This research supports the notion that in cases where the mHealth tools for behaviour change have their foundations in psychosocial theories, they could be effective. Such tools have the potential to effect positive change by reaching out to populations living in resource-poor settings or lacking social authority. The replicability of the conceptual framework could be tested in other contexts. There is potential for organisations that are planning to design and implement technology-based tools to base the designs and content of the tools on theoretical principles using this framework.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Preeti Tiwari

14/05/19

Signature

Date

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Ethics Approval

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9 August 2016

Jay Wood

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Dear Jay

Re Ethics Application: **16/256 The impact of mobile phone based mHealth tools on decisions regarding family planning among Indian women.**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 8 August 2019.

As part of the ethics approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/researchethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 8 August 2019;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/researchethics>. This report is to be submitted either when the approval expires on 8 August 2019 or on completion of the project.

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,



Kate O'Connor

Executive Secretary

Auckland University of Technology Ethics Committee

Cc: Preeti Tiwari, preeti.tiwari@outlook.com

Chapter 1 Introduction to the research

1.1 Chapter outline

This chapter describes the role of family planning in saving lives across the globe and how technology is used to increase the uptake of contraceptives. The chapter begins by describing the need for family planning to prevent maternal mortality. Sections two-four of the chapter discuss the status of family planning in India, followed by a description of the ecosystem of sexual and reproductive health at the individual, family and community levels. Sections five and six explain the issues related to family planning and provide insights into how socio-cultural and attitudinal barriers limit the use of contraceptives in India. This section also discusses the use of communication channels such as mass media, interpersonal communication and mobile phones to promote contraceptive use among vulnerable sections of the population. Section six also describes a rising trend in the use of mobile computing and communication technologies for health behaviour change, along with some opportunities and challenges in using mobile phones for change. The last section of the chapter describes how issues related to family planning and the use of mobile computing and communication technologies helped to develop the focus of this research and the research questions. The final section outlines the chapter plan for this thesis.

1.2 Need for family planning

Family planning saves the lives of many women by preventing unwanted pregnancies. It contributes to community well-being at individual, family and social levels. All types of maternal mortality in Asia can be reduced by 35% through family planning services that reduce unwanted pregnancies (Smith, Ashford, Gribble, & Clifton, 2009). In India, there has been a constant improvement over the last decade in the uptake of family planning products and services. However, there has been a disparity in the uptake between urban and rural areas and across different wealth quintiles. These differences are associated with marginalisation, poverty, gender inequity and inequality, abuse, exploitation, and low literacy levels (Indian Institute of Population Sciences, 2017). The rural state of Bihar in India has the highest rates of maternal and child mortality and low contraceptive uptake as compared to other states in the country. In this region, mobile phone use outnumbers the use of basic facilities such as water taps and toilets,

with 32% of adult women owning a phone and 83% having access to one (BBC Media Action, 2013).

According to the World Health Organisation's (WHO) eHealth survey (2011), developing countries with low incomes and large populations are leveraging mobile phone technologies to provide health information and engage individuals in healthier behaviours. This change occurs through the use of mobile phones that allow for generating improved health outcomes by improving knowledge, shifting attitudes and social norms, and motivating people to act in the interest of their health (BBC Media Action, 2013). It is recognised widely that what people see on their mobile phone influences everyday decisions such as where to eat, what to wear, when to buy cheap air tickets and which doctor to go to. Similarly, in India, women use mobile phones to decide how to plan their family, when to use contraceptive pills and where to buy condoms. As a social scientist, I was challenged to identify the role of technology in the decision-making processes of women living in resource-poor settings. This research is an assessment of what the mobile phone brings to the domain of family planning.

There is a need for further research on the interaction between public health, human behaviour and technology, to explore how mobile phone-based health tools can impact decision-making, by viewing that process through the lens of psycho-social theoretical frameworks. Some initial evidence is available on the relationships between preventive health behaviour and mobile phone use. For example, a study by Family Health International in Kenya and Tanzania showed that providing contraceptive information via a text message-based mobile phone service was an effective strategy for reaching young people and influencing their contraceptive behaviour (L'Engle, Vahdat, Ndakidemi, Lasway, & Zan, 2013). However, little is known at present about the influence of mobile computing and communication technology on the underlying mechanisms of preventive health decision-making and behaviour.

1.3 Status of Family Planning in India

Family planning involves the ability of individuals and couples to anticipate the spacing and timing of the births of children and attain their desired number of children.

According to the World Health Organisation's population plan of action (1987), family planning is educational, involving comprehensive medical and social activities that

enable individuals to determine the number and spacing of their children freely and to select the means to achieve those plans.

The national family planning programme in India offers services that include contraceptive/birth control methods, emergency contraceptives and follow-up care. The contraceptive methods can be divided into three categories based on the duration of protection against pregnancy they could provide. Short-acting methods offer a one-time or up to three months of protection, for example, male and female condoms, oral contraceptive pills, emergency contraceptives and injectables. Long-acting methods are those that offer more than one year of protection against pregnancy. They include all types of intra-uterine devices. Permanent methods typically provide life-time protection against pregnancy and are not easily reversible. These include female sterilisation (tubectomy) and male sterilisation (vasectomy). Based on the duration of protection against pregnancy, individuals and couples use methods such as condoms and pills for spacing or sterilisation for permanently limiting the number of children. The terms family planning and contraception are used interchangeably in this research.

Twenty-one percent of pregnancies in India are unplanned. According to a policy brief, 13% of pregnancies occur among women aged 18 years or less and only 5% of married younger women less than 18 years of age report any use of contraceptives (Pachauri, 2014). The use of contraceptives increases with age, peaking at 67% for women in the 35–39 age group. The choice of contraceptive method depends on the quality of the available services, including information on possible side effects, follow-up and informed decision-making. It is young women who need family planning information and services the most. Adoption of contraception such as female sterilisation typically happens only once a couple has three or more children. The Government of India's National Family Health Survey–4 (Indian Institute of Population Sciences, 2017) noted that sterilisation is by far the most popular method of contraception practised, accounting for 75.3% of contraceptive use. Nationally the family planning programme is skewed towards women, with male methods of contraception (condom and vasectomy) accounting for only 12.3% of total contraceptive use. There are social, cultural, psychological, financial, environmental and technological factors that influence the use of and opinions about the use of contraceptives. In India, the pace of

decline in fertility and mortality has been notably slower in states that are geographically large, more populous and poorer on the human development index.

1.4 The ecosystem of sexual and reproductive health

In India, the public health system is the primary provider of family planning services, providing permanent limiting methods such as female sterilisation to the rural population. In contrast, the private sector is responsible for the uptake of birth spacing methods such as pills, condoms and intra-uterian devices, which is very small compared to permanent methods of contraception (Indian Institute of Population Sciences, 2017). To increase choice and improve the quality of family planning services, it is vital to strengthen the infrastructure, human resources, accountability and governance of the public health system and to encourage and engage the private sector to be actively involved in family planning service delivery (Pachauri, 2014).

Studies have shown that trained female health workers in the public health system are the primary source of information on contraception and health education in India (Chib, 2010; BBC Media Action, 2013). Because of women living in resource-poor and challenging conditions, village-based female health workers form a vital link between the community and the public health system. They are the first port of call for the health-related demands of the deprived sections of the population, especially women, children, the elderly, the sick and people with disabilities. The primary responsibilities of a health worker include encouraging and helping women to adopt healthy antenatal and postpartum practices, facilitating institutional deliveries, mobilising children for routine immunisation, distributing condoms and oral pills, and promoting healthy behaviour in communities (Chib, 2010; Daniel, Masilamani & Rahman, 2008).

Hajason, Piña, and Raveloharimisy (2013) empirically studied the relationship between family influence and contraceptive use and found a significant relationship between the two factors. Conventionally, contraceptive information is passed from woman to woman. Usually, women communicate their experiences of frightening and inconvenient side effects with little anatomical or physiological knowledge to help understand what is happening to their bodies. As contraceptive use is skewed towards women, there is a need to reach out to women and men with correct and complete information.

A sexual and reproductive health ecosystem comprises the interaction of the following individuals: women and adolescent girls, their male partners and families, health care providers, and other community influencers. Individuals within this ecosystem regularly make choices and influence decisions that affect reproductive outcomes. The basis of these decisions is attitudinal-behavioural and socio-cultural factors. In addition to social interactions, there are other market factors such as physical distance to the nearest service provider, cost of contraceptives, or access to information about the benefits of specific products. The factors outlined above collectively contribute to health (Ashton, Giridhar, Holcombe, Madon, & Turner, 2015). Family planning decisions by women, households and healthcare providers are shaped by interpersonal interactions and associated factors rather than the preferences of individual women.

1.5 Barriers to Contraception Use

1.5.1 Socio-cultural issues

Culture has a considerable influence on the reproductive intentions of couples. In most Indian states, especially north India, there is a widespread preference for bearing a male child (Hall, Stephenson, & Juvekar, 2008). The relatively high degree of social and economic dependence of women on sons in a patriarchal society like India is a contributing factor to the high level of fertility in the country (Singh, Ram, & Ranjan, 2007). According to a study by Hajason et al. (2013) spousal dynamics and extended family influence are associated with contraceptive use. Mishra, Nanda, Speizer, Calhoun, Zimmerman, & Bharadwaj (2014) supported this finding through their study that shows men play a crucial role in family planning decision-making, particularly in the highly gender-stratified populations. Engaging men is more egalitarian, as it may influence contraceptive use in contexts where they are the household decision-maker. In a deeply patriarchal society, the support of male members often leads to a change in conservative views in the entire household, thereby allowing women more autonomy and freedom of movement (WHO & International Telecommunication Union, 2014).

Studies in India, Bangladesh, Nepal, Pakistan and some African countries demonstrate that family planning programmes need to engage men and address gender-equitable attitudes using peer outreach workers through in-depth interpersonal communication,

mass media or new communication channels such as mobile phones (Despandee & Lee, 2014). There is a consensus among family planning researchers that it is important to have improved communication skills between couples and shared decision-making, as those factors play a significant role in the use of family planning methods (Hartmann, Gilles, Shattuck, Kerner, & Guest, 2012; Mishra et al., 2014; Prata et al., 2017). Similarly, positive conversations about family planning and frequent communication about family and relationship issues are critical to ensure support from men for a woman's perspective.

1.5.2 Attitude towards contraceptive use

The family planning methods are not always acceptable because of the possible side effects, perceived unattractive attributes or the discipline their use demands. When supplies and services are not readily available, it becomes difficult for people to practise or adopt family planning even when they are inclined to do so. Primary barriers in the uptake of spacing methods of birth control are usually mistaken beliefs and myths regarding the mechanisms and their possible side effects (Hall et al., 2008). Myths and misconceptions regarding different methods are commonly passed along by word of mouth from woman to woman and limit women's interest in using these methods (Mishra et al., 2014). Social norms of sexual self-control and modesty also determine the low use of family planning methods (Hall et al., 2008). A study by Rai and Unisa (2013) revealed that absence of menstruation after pregnancy and breastfeeding practices are leading causes for not using any contraceptive. Opposition to use, health concerns and fear of side effects, are significant hurdles to using contraceptive methods that might effectively provide protection against pregnancy.

1.6 Role of Communication

The well-being of a woman, her family and community depends on access to quality health information and education. It is common to use information, communication and technology for engaging, educating, and informing the community about family planning/reproductive health, HIV/AIDS and other health issues. Preliminary work on evaluating theoretically-based family planning intervention was undertaken by Shattuck et al., (2011) - one of the few evaluations that determined the effectiveness of peer-educators for challenging gender norms and improving spousal

communication. The same study indicated that peer educators were an important catalyst for improving spousal communication. It also highlighted the link between communication as an important factor and increased the use of family planning.

One of the functions of media is to influence the community. Communication acts as a catalyst for diffusion of knowledge about family planning and reinforces its availability (Krenn, Cobb, Babalola, Odeku, & Kusemiju, 2014). The availability of timely, accessible, accurate and relevant information plays an essential role in shaping knowledge and attitudes, which in turn are a driver of health-related change (BBC Media Action, 2013). Thus, media can be used to correct false beliefs through harnessing social influences such as providing accurate information about the possible advantages of family planning experienced by other couples. The potential for such information to influence behaviour can be increased if the content is relevant and resonates with its target audience, and the source of information is trusted and credible (Ashton et al., 2015).

In India, there is an association between better access to media and a decrease in reported acceptability of domestic violence, the preference for giving birth to a son, and increased contraceptive use; the relationship becomes stronger with the education of women (Arokiasamy, 2002; Ashton et al., 2015). Reducing autonomy among the majority of Indian women adversely affects health-seeking behaviour. Mobile phones serve as an enabler for women to participate in not only their own health care but also that of their families (DeSouza, Rashmi, Vasanthi, Joseph, & Rodrigues, 2014). User-friendly mobile phone-based health tools have opened new opportunities to provide women with information that is essential for their health and well-being. For example, the Mobile for Reproductive Health (m4RH) mobile phone service in Kenya and Tanzania has reached several demographic segments. Women are the majority of users of m4RH services (61% in Kenya, 56% in Tanzania), though men also represented a large portion of users and reported seeking information on contraceptive methods for themselves as well as their female partners (L'Engle et al., 2013). mHealth tools have the unique ability to reach out to disadvantaged women living under conservative patriarchal regimes (Zakar, Zakar, Qureshi, & Fischer, 2014). Health education through mobile phones can reach more women when phones are in the hands of health workers and when the information is abundant, affordable and

easy to use (BBC media Action, 2013). According to Croxson and Rowntree (2017), accessing information on a mobile phone has high appeal and rational benefits for women in that mobile phone use helps women persuade gatekeepers (such as husband and mothers-in-law) that access to a mobile phone will benefit the entire household. Thus, technology-based communication tools can help in initiating dialogue at a community level that could lead to disseminating information, as well as and negotiating and mediating the use of family planning.

1.7 Evolution of mHealth

According to Eysenbach (2001), eHealth is an evolving field in the intersection of medical informatics, public health and business. It refers to health services and information delivered or enhanced through the internet and related technologies. In the eHealth survey by WHO and International Telecommunication Union (2014) mHealth is defined as the medical and public health practice using devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices, to support the achievements of health objectives. In the same survey, mHealth Alliance describes mHealth as the universal use of mobile devices in the world to improve health outcomes using communication technology to deliver innovative medical and health services with health information. According to Crutzen and Vluggen (2017), mHealth is the use of mobile computing and communication technologies for the delivery of health services and information.

The present research focuses on the educational use of mobile phones, in line with *mHealth* – meaning use of mobile media for seeking or receiving health information. The terms ‘mHealth’ and ‘mobile-phone led health tools’ are interchangeably used in this research. The mHealth initiatives focused on in this research are those designed to facilitate access to information and raise awareness about family planning and contraception among rural Indian populations, so that families and individuals can take better control of their health.

1.7.1 Rising trend of mHealth for mobile-mediated health behaviour change

Technology, especially wireless communication, is crucial to finding solutions and tackling critical health, social, environmental and development challenges. According to Mechael and Donner (2013), using mobile phone technologies for disseminating

health information facilitates better health impacts as messages reach more people in less time. According to WHO's eHealth Survey (2011), the four most frequently reported mHealth delivering mechanisms were health call centres (59%), emergency toll-free telephone services (55%), managing emergencies and disasters (54%), and mobile telemedicine (49%). The expansion and adoption of new methods of communication provide new opportunities for delivering health-behaviour change interventions.

A review by Fjeldsoe, Marshall, and Miller (2009) of preliminary evidence of health behaviour change interventions delivered via SMS texting, showed that the use of mobile telephone SMS for delivering behaviour change interventions had positive short-term behavioural outcomes for supporting ongoing clinical care behaviour change. However, that review also suggested further research is required to evaluate interventions for preventive health behaviours that incorporate mobile phone technology found to affect behavioural outcomes and improves people's acceptance towards technology. In addition, due to the lack of pre- and post-test designs, the overall quality of studies in this emerging field of research needs to improve to allow the full potential of this medium to be explored.

Empirical evidence shows that studies conducted to date on mobile technologies and health behaviour, have focused primarily on clinical care interventions among people with illnesses, such as diabetes, asthma and hypertension interventions (Hamine, Gerth-Guyette, Faulx, Green, & Ginsburg, 2015) and medication adherence (Anglada-Martinez et al., 2014). There is limited focus on promoting preventive health behaviour such as smoking cessation (Riley et al., 2011), curbing alcohol consumption (Kazemi et al., 2017), weight loss, diet, physical activity, or condom use (Taylor et al., 2007).

An extensive review of the use of mobile phones for disease management, particularly in the management of diabetes, asthma and hypertension shows some positive outcomes (Hamine et al., 2015). Results from the mobile disease management studies are positive, particularly in the case of diabetes management interventions. Significant improvements in health outcomes were found among patients, including improving glycaemic control in diabetes patients, improving blood pressure in hypertensive patients, and reducing weight in overweight and obese patients (Marcolino et al.,

2018). A study by Anglada-Martinez et al. (2015) showed that mHealth tools can potentially improve medication and appointment adherence to facilitate management of asthma and hypertension. This study also showed that SMS is commonly used as a mobile tool to provide appointment reminders and these reminders are scheduled within a few days of the appointment. The easy-to-use appointment interventions resulted in a significant increase in appointment adherence.

Studies on smoking cessation also show that intervention delivery is common via SMS or mobile videos of role models and their quitting experiences. These interventions have shown quit rates ranging from 8% to 60% with some interventions having a follow-up period ranging from 4 weeks to twelve months (Free, 2013; Riley et al., 2011; Whittaker et al., 2008). A systematic review of randomised control trials also showed a significant short-term increase in self-reported quitting (Riley et al., 2011). A systematic review of mHealth-based interventions for alcohol and substance use indicates that a wide range of mHealth interventions and tools are being developed and used to address substance use (Kazemi et al., 2017). To support people to reduce substance use, these interventions and tools have many features such as ease and convenience of using the tools, goal-setting and follow-up reminders. This review shows that mHealth tools for alcohol and substance abuse play a significant role in the prevention, treatment and aftercare of substance use. Dissemination of interventions for weight loss, diet and physical activity is common via personal digital assistants and mobile phones, predominantly SMS (Fjeldsoe et al., 2009). These weight loss, diet and physical activity interventions represent non-tailored weekly informational text messages to real-time diet and exercise monitoring with multiple daily customised messages. The interventions on weight loss show modest but significant weight loss and related outcomes.

A study by Family Health International (L'Engle et al., 2013) in Kenya and Tanzania showed that providing contraceptive information via a text message-based mobile phone service is an effective strategy for reaching young people and influencing their contraceptive behaviour. The wireless technologies reduced both the stress on health care providers and the overall cost of the healthcare services in the long-term, while enhancing users' productivity, retention and quality of life, in both cities and rural areas (Varshney & Vetter, 2000). A systematic review of mHealth interventions for

adolescent reproductive and sexual health showed that mHealth interventions have features such as on-demand sexual and reproductive health content, a reminder for follow-up, notification for test results, screening promotion, and regular counselling (L'Engle, Mangone, Parcesepe, Agarwal, & Ippoliti, 2016). These intervention features were provided using text messaging (SMS), mobile phone voice calls, video, and in few cases, multi-media applications. This review showed that mHealth interventions contributed to the prevention of risky sexual behaviour through promoting positive behaviours to support improved contraceptive adoption and medication adherence for HIV positive people, and encouraged the use of health screening and treatment services.

The literature discussed above indicates that feasibility, usability and engagement of mHealth tools by mobile phone for managing physical health in chronically ill adults, or supporting changes in health-related behaviour, are acceptable among people. The next section discusses opportunities, barriers and concerns related to the use of mobile phones for behaviour change.

1.7.2 mHealth for behaviour change: Opportunities and challenges

Mobile phone use for health communication shows great promise in improving traditional health communication in many ways. For example, it can provide personal and contextual information, it is interactive, and it can have better reach with an impact that is similar to face-to-face communication (Kreps & Neuhauser, 2010). The paragraphs below describe how mHealth tools are leveraging these opportunities to promote positive health behaviour.

mHealth can provide customised contextual and personalised health information to suit people's needs. It is readily available, unlike traditional communication approaches that are static and often 'one-size-fits-all'. The application of contextually-tailored information supports people to make better health decisions due to easy access and relevance at the family and community level. A study by Ramachandran (2013) supported that co-designing mHealth tools with its potential users, produces tools that are relevant to people's specific needs, preferences, and social contexts. The same study also showed that segmenting potential users of mHealth tools based on

their characteristics, interest and cultural orientation, helps in reducing communication barriers associated with literacy, language and culture.

Interactivity is an attribute of communication that strengthens the quality of health promotion (Kreps & Neuhauser, 2010). Classic health communication tends to focus on individual decision-making, that leads to one-way, generic risk-based messages to individuals. The use of multimedia in mHealth tools presents an opportunity to design and deliver health messages that are two-way, so that communication involves a real-time response from both receiver and sender. According to Population Services International (2004) in India, for a long time most HIV prevention communication focused on risk, which lead to misconceptions surrounding HIV transmission, poor personal risk assessment and negative attitudes towards condom use. That changed with a successful 'Balbir Pasha' behaviour change communication campaign by Population Services International, a non-governmental organisation. The Balbir Pasha campaign was shown on traditional mass media channels along with technology-based channel i.e. a HIV helpline. This helpline was an integral part of the campaign because it provided a solution to overcome barriers by providing counselling to the callers, referrals to HIV testing centres, and a source of information that was low-cost, anonymous and confidential.

Text messages, helpline and mobile apps for behaviour change are a few examples that take advantage of mass and interpersonal media and demonstrate change at the individual, institutional and population level (Higgs et al., 2014). Mixing media channels for health communication, such as mobile technology in combination with traditional media, allows for improvement of the quality of information and reach to large populations and geographies.

Challenges in developing and implementing mHealth interventions

Understanding the determinants of contraceptive use is essential in order to develop effective mHealth interventions for family planning. Psychosocial theories have been widely used to study health-related behaviours such as condom use (Albarracín, Johnson, Fishbein, & Muellerleile, 2001; Sheeran & Taylor, 1999). Having a theoretical basis for effective mHealth interventions is essential. The use of validated theoretical frameworks in the design and evaluation of mHealth interventions helps to understand

the utility of mobile phones in eliciting behaviour change; it offers strategies to design psychosocial theory-based interventions (McGloin & Eslami, 2014). However, there is insufficient empirical evidence on the use of behaviour theories and their reporting in mHealth interventions. Due to this, the effectiveness of mHealth research faces significant barriers. A systematic review by Buhi et al. (2013) indicated that only 25% of mHealth behaviour change interventions had a theoretical framework to guide the interventions. Similarly, a review of randomised control trials by White, Thomas, Ezeanochie and Bull (2016) revealed that 90% of the studies do not use any theory explicitly in design, implementation or analysis of mHealth programmes. This could be because the focus of research in mHealth has been on outcomes instead of underlying factors and mechanisms, such as behaviour change mechanisms or intervention rationales.

The lack of a theoretical basis while designing and evaluating mHealth interventions leads to poor measurement of results and insufficient scientific accuracy (Kreps & Neuhauser, 2010), because psycho-social theoretical frameworks allow for prediction and explanation of behavioural outcomes (Kwan, 2013). To adequately measure the impact of mHealth interventions, it is important to understand the pathway to the change. Empirical evidence on the use of theories and models in designing mobile-mediated behaviour change tools for smoking cessation (Ghorai, Akter, Khatun, & Ray, 2014; Riely et al., 2011), weight loss, diet and physical activity promotion (Riely et al., 2011), prevention of sexually transmitted infections (Lopez, Grey, Chen, Tolley, & Stockton, 2016; Rai, 2014), treatment adherence (Anglada-Martinez et al., 2014; Gandapur et al., 2016), disease management (Hamine et al., 2015) and HIV prevention (Lopez et al., 2016) has shown pathways to behaviour change.

However, educational interventions addressing contraception often have no stated theoretical base. There is very little theoretical or empirical data available on mobile-mediated tools for behaviour change or interpersonal communication supported by any theoretical framework (Stowell et al., 2018); the focus of such tools has been on information dissemination, training of frontline workers and monitoring using mobile phones (Tariq & Durrani, 2017; Winters, Oliver, & Langer, 2016). A meta-analysis by Lopez et al. (2016) is one of few studies published explaining the use of any theoretical

basis on strategies to improve adherence to hormonal contraceptives, communicating contraceptive effectiveness, and interventions to reduce unintended pregnancies.

The evidence described above suggests that there is a lot to be accomplished around communication for changing people's family planning behaviour using mobile phones. There is a gap in the knowledge and impact that mHealth tools have on practices related to family planning. Thus, to construct knowledge in order to understand people's actions, the foundation of the present study is embedded in a theory that is used to understand behaviour.

The present study investigates mobile phone-based health communication and draws upon theoretical ideas from psychology, communication, public health, and other disciplines. Similarly, it focuses on new skills and collaborations among experts in behaviour change psychology, public health, and information technology and communication. The multi-disciplinary nature of mHealth has its challenges, such as organising various tasks requiring different skills towards achieving a common objective. It is challenging to implement a trans-disciplinary mHealth intervention.

Ben-Zeev et al. (2015) have explained the necessity of having multidisciplinary teams in a mHealth project for the effective design, deployment and adaptation of any mHealth tool. The interdisciplinary nature of mHealth also provides challenges that are deep-rooted and theoretically complex. As explained above, evidence on behaviour change campaigns and theories forms the foundation of the present research study, which aspires to know the impact of mobile technologies on promoting healthy behaviours (and reduce unhealthy ones) in resource-constrained settings, with a particular focus on the rural state of Bihar in India (see section 3.4.1 and 3.4.2 in chapter 3). This study contributes to the advancement of theoretical knowledge of psychosocial theories, particularly the theory of planned behaviour. The present study harnesses the theoretical framework to not only learn from users' past behaviour but also predict future actions. The findings of the present study explore new theoretical concepts to create evidence as to what 'mobile phone' brings to the domain of contraceptive use.

1.8 The Rationale for the Study

mHealth is an enabler of change in the healthcare sector as the expansion and adoption of new methods of communication provide new opportunities for delivering health interventions. Developing countries are leveraging mobile phone technologies to provide health information and engage individuals in healthier behaviours. As mentioned, the focus of mHealth has been on outcomes rather than on underlying factors and other behaviour change mechanisms. Thus, the use of validated theoretical frameworks in the design and evaluation of mHealth interventions helps to understand the utility of mobile phones in eliciting behaviour change.

The prospect of mobile phone use as a development tool in an emerging economy such as India appears remarkable as internet reach is projected to increase from 32% in 2015 to 59% in 2020. "E-commerce in emerging markets: India Online" (2017) reports that the average income per person in India during 2014 was \$1,570 per year but could be twice that by 2025. Two-thirds of Indians are under the age of 35 and their phones give them access to the internet. By the end of 2014, smartphones accounted for one in five Indian mobiles, and just six months later they accounted for one in four. After China and America, India is now becoming the biggest market for online retailing. The online retail market in India is likely to grow more than seven times larger than its current state ("E-commerce in emerging markets: India Online," 2017). As compared to online retailing across the globe, the use of mobile phones for social development and behaviour change is still in a nascent stage. However, developing countries with low incomes and large populations are leveraging mobile phone technologies to provide health information and engage individuals in healthier behaviours to generate improved health outcomes. According to Gregory, Chidambaranathan, and Kumar (2011), in the next 15 years India will have more people accessing the internet than any other country. Infrastructure like roads, electrification and especially mobile phone networks, have been instrumental in the increase of wages in rural India. As a result, the increased access to information and demand for goods and services has led to the expansion and adoption of new methods

of communication, in turn driving new opportunities for community mobilisation and delivering preventive health messages amongst vulnerable populations.

1.8.1 Research aim and questions

The present research aims to contribute towards advancing theoretical knowledge of the theory of planned behaviour. The theory was used as a practical starting point in this research. The introduction chapter noted that mobile phones provide a new means of reaching people with health information and support. Chapter 2 focuses on the use of theoretical models for facilitating and measuring behaviour change for healthy behaviour. Collection and analysis of data allowed for the interpretation of information to answer the following research questions:

Research Question 1: How can the theory of planned behaviour be adapted to create a model that predicts decisions regarding family planning among Indian women?

Research Question 2: What other factors, not accounted for by the theory of planned behaviour, influence contraceptive use amongst women, and are those factors influenced by exposure to mHealth tools?

1.9 Research Methodology to Address Issues

I am interested in learning from the life experiences of research participants and socio-cultural context to gain insight into their behaviour and articulate their experience and perspectives. The mixed-method research design (Figure 1.1) used in this study emphasises the effect of psycho-social and cultural context on the behaviour of the research participants.

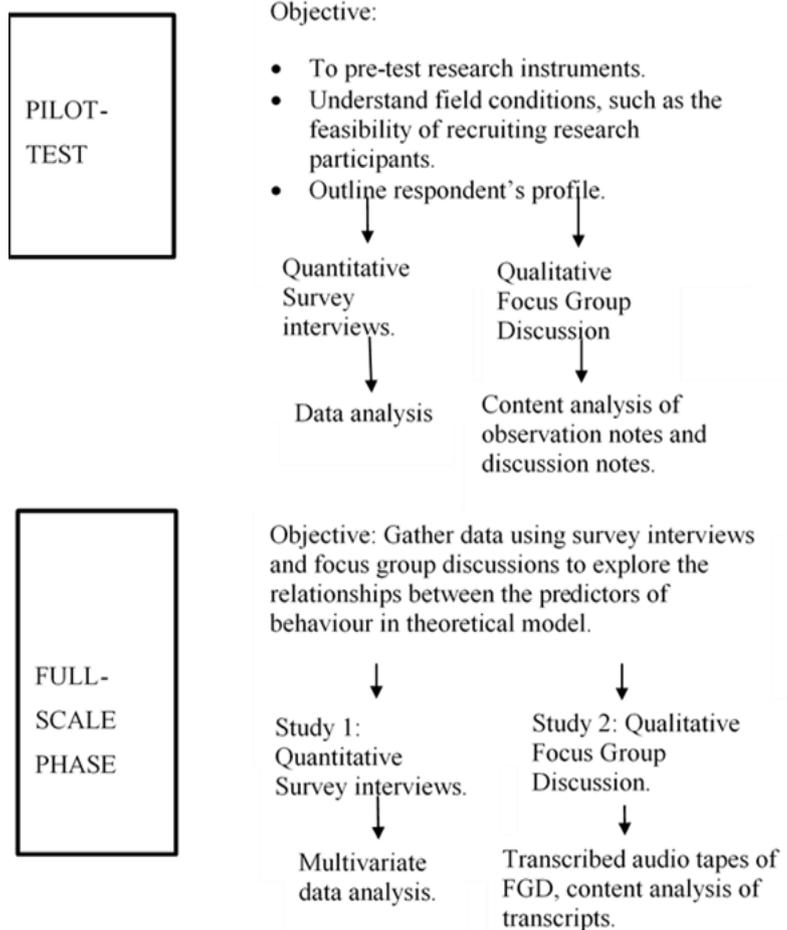


Figure 1.1 Overall research plan

To study the impact of mobile phone-based tools for family planning at individual and community levels, participant selection was from rural villages, semi-urban or urban informal settlements. In India, villages and settlements that are densely populated are preferred intervention areas for mHealth programmes because they have poorly structured houses, inadequate access to safe drinking water and sanitation, poor drainage, uncollected garbage, considerable breeding of flies and mosquitoes, poor lighting, and poor access to health facilities. The limited living conditions make people vulnerable to a broad spectrum of adverse health conditions such as malnutrition, delivery-related complications and post-partum morbidity. These disparities are the outcome of factors such as employment patterns, literacy levels, availability of health services, traditional customs, and gender status, all of which influence the use of reproductive health services.

The mHealth tools studied in the present research were aimed at married, sexually active and fertile women. Possible explanations for this could be, first, that the family planning programme in India is skewed towards women (as described in section 1.1),

with female methods of contraception (intrauterine devices, oral contraceptive pills, injectable contraceptives and female sterilisation) accounting for almost 93% of total contraceptive use. Second, according to the National Family Health Survey-4 in India, non-use of contraceptives among married women with a desire to postpone or end childbearing is 12.8%, which is higher than for sexually active unmarried women (Indian Institute of Population Sciences & Macro International, 2007). Third, there is social stigma associated with unmarried women being sexually active. Considering all these factors, married women were chosen as primary respondents for the present study.

The partners of primary participants were secondary participants in this research. In India the sexual and reproductive health ecosystem includes interaction with male partners and families. These individuals regularly make choices and influence decisions that affect women's reproductive outcomes (Ashton et al., 2015). The role of women and their partners as research participants was to share their experiences about using mobile phone-based health tools.

Given the challenging conditions in which research participants live, village-based health workers form an essential link between the community and the public health system. They are the first port of call and mediating agent for the health-related demands of deprived sections of the population, especially women, children, the elderly, and people with illnesses and disabilities.

1.10 Chapter Plan

This thesis has six chapters. Following the introduction, chapter 2 is a review of psycho-social theories for behaviour change, reviewing the academic literature on various psycho-social approaches currently used for changing health behaviour and uses expert interviews to gain insights about the mHealth interventions presently being designed and implemented in India (specific to family planning and reproductive health). By integrating models from existing theories and mHealth interventions, I develop and explain the research framework used in this research and develop hypotheses.

Chapter 3 is a critical analysis of the methods adopted, along with their theoretical and philosophical underpinnings. It provides a rationale for adopting the chosen processes and procedures to carry out sample selection, and the development of research instruments and statistical tools applied to data analysis. A pilot phase allowed for pre-testing research instruments, understanding the field conditions and outlining the respondents' profiles. The pilot was followed by quantitative and qualitative data collection.

Chapter 4 presents findings and interpretation of results. It includes the results from statistical analysis of quantitative data, explaining the variables measured, the types of data collected, descriptive statistics, and statistical analysis of the quantitative data, supported by qualitative findings. The research framework and hypotheses form the foundation of this chapter.

Chapter 5 presents insights from the pragmatic content analysis of the qualitative data gathered through focus group discussions with women and men.

Chapter 6 discusses the research findings and their contribution to theory, research and the future design of useful mHealth tools. It presents the theoretical, practical and methodological significance of this research study in the real world. This chapter also synthesises and summarises the results. It indicates the research limitations and provides suggestions for future research.

Chapter 2 Psycho-Social Theories in Practice: An Integrative Review

2.1 Method of Review

Examining past academic research allows for establishing the importance of theories and forming conclusions about their use in the field of behaviour change. Similarly, insights from expert consultation appropriately provide a practical account of mHealth interventions for preventive health, which is a developing field. This chapter reviews the academic literature and insights from face-to-face expert consultations with mHealth programme managers. Figure 2.1 outlines the method of integrative review (Torraco, 2016) that has been adopted in the present research.

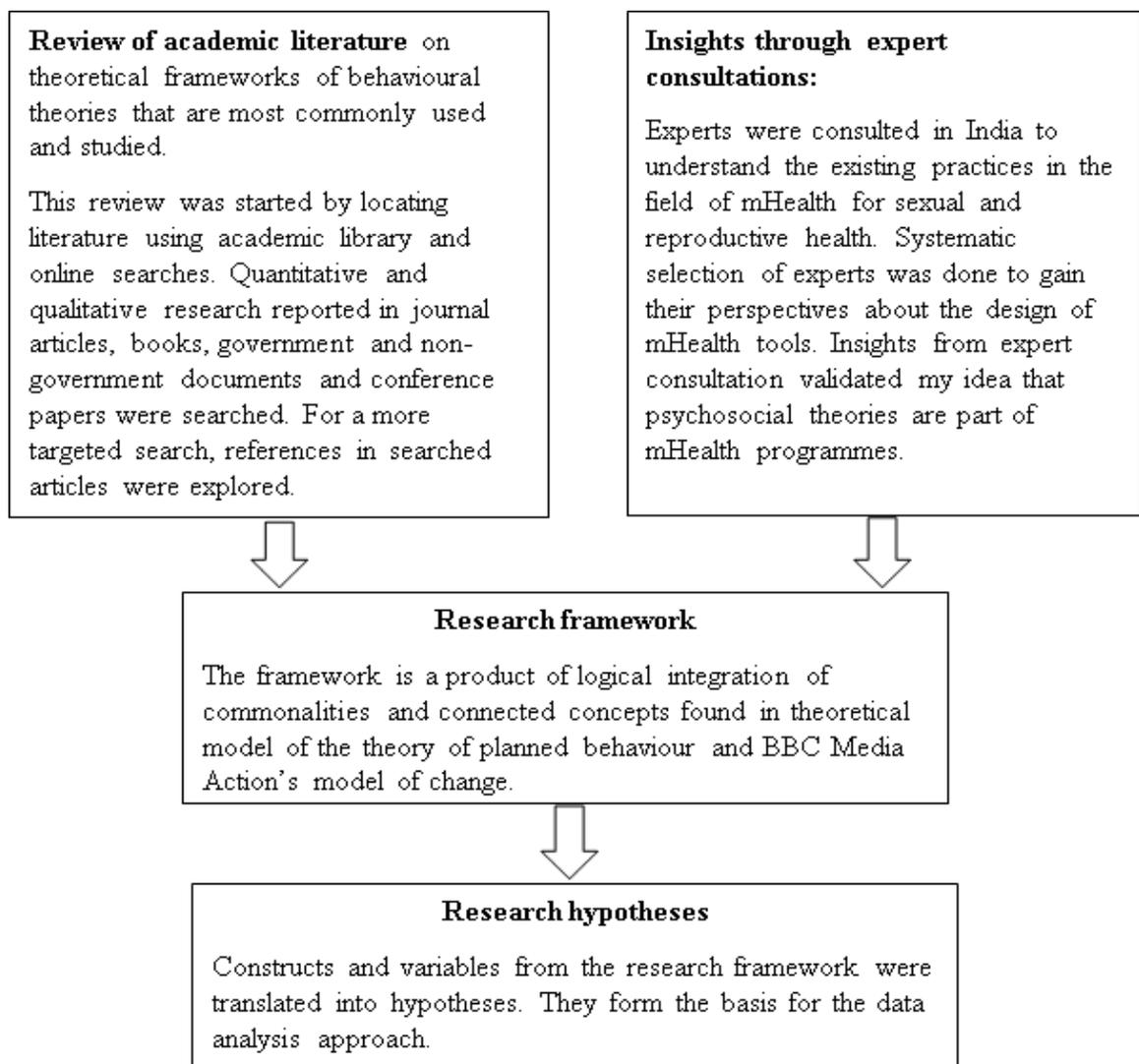


Figure 2.1 Method of Review

Riley et al. (2011) explained that theories do not depict behaviours completely in real time because they cannot explain differences *within* individuals over time when they have been tested by methods focused on *between*-person differences. That is, they cannot guide researchers to assess moment-by-moment changes in behaviour. Similarly, continuous and specific physiological, psychological, social and environmental inputs do not support mHealth-driven behaviour change interventions. These reasons make current health behaviour theories linear and static. Hence, an integration of literature and expert opinion was considered important. This decision led to a preliminary conceptualisation of a new framework in the present research rather than a re-conceptualisation of previous theoretical models. This new framework (discussed later in the chapter) is used to form research hypotheses and analysis of data in the present research.

2.2 Psychosocial Theories to Predict, Explain and Change Health Behaviour

According to a definition provided by Kerlinger (1973), a theory is a set of interrelated constructs (concepts), definitions and propositions that collectively present a systematic view of phenomena by specifying relations among variables to explain and predict events or situations. This definition is close to those of Curry and Mermelstein (2016) who wrote that psycho-social theories provide roadmaps to the significant factors that influence behaviour, articulate the relationships among the various factors, and consider when, where and how those factors operate. Similarly, Glanz, Rimer and Vishwanath (2015) showed that theories and models explain behaviour and suggest ways to achieve behaviour change.

The use of behavioural theories to explain health behaviour interventions is more than 50 years old, as theories explain how behaviour change occurs (Lopez et al., 2016). Each theory has specific cognitive and affective factors such as knowledge, attitudes, norms, goal-setting, self-efficacy and family support as proximal determinants of behaviour that are affected by socio-structural, cultural and personality factors (Sutton, 2001). To study decision-making in a social context, one needs to investigate relationships between individual cognitions, decisions and actions. Theories of how people make decisions are about cognition, how people think about the object of their decisions, ecosystems, and the social and personal outcomes of decisions and actions

(Ajzen & Klobas, 2013). According to Riley et al. (2011), health behaviour theories form the basis of not only many face-to-face counselling interventions but also mass media and social marketing efforts. Theories and models have served as the basis for many eHealth web and desktop and laptop computer interventions and have informed the customisation of interventions to the individual's baseline status.

In this section, theories are examined to represent their use in public health and social psychology. Selected health behaviour theories that are discussed in this section include the theory of planned behaviour (Ajzen, 1985), the health belief theory (Rosenstock, 1974), the trans-theoretical model or stage of change (Prochaska & Velicer, 1997), social cognitive theory (Bandura, 1986), the focus theory of normative conduct (Cialdini, Reno, & Kallgren, 1990) and Motivation and Opportunity as Determinants (MODE) theory (Fazio, 1990). The basis of theory selection in the present research is a trend in the use of health behaviour theories that focus on individual and interpersonal health behaviour.

2.2.1 Theory of planned behaviour

This theory was first described in 1985 and is now one of the most important modern theories in social psychology (Ajzen, 1985, 1991; Ajzen & Driver, 1991). It comprises theoretical constructs connected with individual motivational factors as determinants of the likelihood of performing a specific behaviour. Figure 2.2 shows the core model and the associations among variables in the theory of planned behaviour. The theory put forward three conceptually independent determinants of intention, specifically, attitudes, norms and perceived behavioural control.

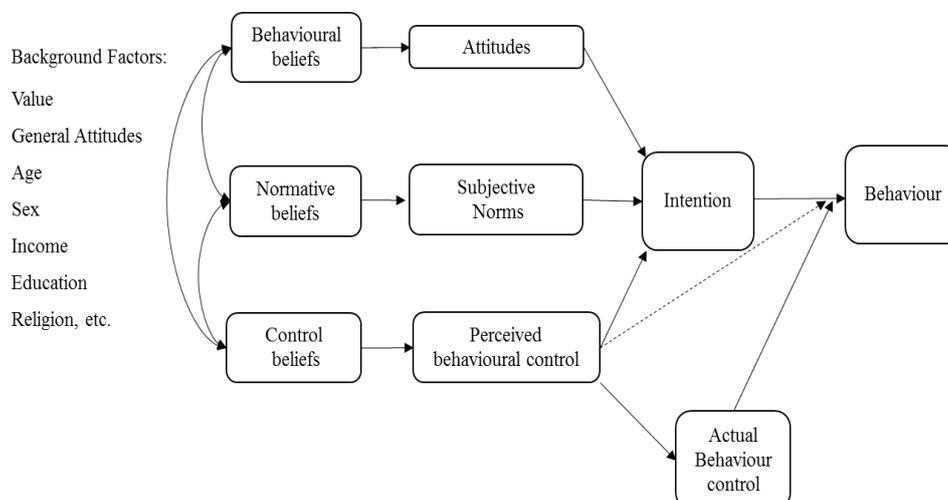


Figure 2.2 Theory of planned behaviour model

Ajzen (1991) stated that the attitude toward the behaviour “refers to the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question” (p. 188). The individual’s attitude is determined by beliefs about the outcomes or attributes of performing the behaviour (behavioural beliefs), weighted by evaluations of those outcomes or attributes (Montano & Kasprzyk, 2008).

The second predictor is a social factor termed the ‘subjective norm’. It refers to the ‘perceived social pressure to perform or not to perform the behaviour’. The subjective norm is an individual’s normative belief of whether important others think s/he should adopt a particular behaviour (Creanga, Gillespie, Karklins, & Tsui, 2011), which is guided by normative expectations of others and the motivation to comply with their expectations (Ajzen, 2002).

The third precursor of intention is the degree of perceived behavioural control, which refers to the perceived ease or difficulty of performing the behaviour, and it is assumed to reflect experienced as well as anticipated impediments and obstacles. According to Ajzen and Madden (1986), perceived behavioural control refers to the personal ability to have control over and above the environmental constraints. It is useful in predicting volitional behaviours but less useful in predicting behaviours that are not entirely within an individual’s volition.

The theory of planned behaviour focuses on the relation of attitudes, subjective norms and perceived behavioural control as predictors of behavioural intention, and these three predictors influence subsequent behaviour indirectly through intentions. The more favourable the attitude and subjective norms concerning the desired behaviour and the higher the perceived behavioural control, the more likely that a person will form an intention to adopt a behaviour. Intentions are expected to result in the person’s behavioural change to the extent that s/he is, in fact, capable of attaining his/her goals, that is, to the extent that s/he has actual control over the behaviour in question. Actual behavioural control is expected to moderate the effect of intention on behaviour.

Beyond the factors that constitute the theory itself, the theory recognises the potential importance of other variables, such as demographic characteristics (age, gender, race, religion, education, and income), personality traits, general attitudes and life values,

intelligence, emotions, and so forth. These variables are background factors in the theory of planned behaviour; they are expected to influence intentions and behaviour only indirectly by their effects on behavioural, normative, and control beliefs.

While individual-level factors are recognised as possible contributors to behaviour, structural factors if not addressed can contribute to no change in behaviour. For example, a study by Creanga et al. (2011) showed that inadequate availability of family planning services and universal health systems issues in resource-limited settings such as Uganda, reflected an association between structural factors and low rates of contraceptive use. Elements of the theory of planned behaviour have been of interest over several decades to demographers concerned with fertility decision-making (Ajzen & Klobas, 2013). However, the appropriateness of using social cognitive theories in non-Western settings has been questioned due to the diverse nature of cultural, social, economic and environmental conditions and how diversely health problems such as family planning are interwoven in these conditions (Mermelstein & Revenson, 2013). Health behaviour frameworks have also been criticised by Murray and Campbell (2003), who believed that the focus of these frameworks is on individual behaviours and they fail to consider important social, economic and political influences.

Application in health behaviour research

The theory of planned behaviour is one of the most frequently cited and influential models for the prediction of human social behaviour. Its popularity is understood by looking at its growth from the time it was first introduced till the present (Ajzen, 2011). Research programmes devised by psychologist Icek Ajzen rank among one of the highest scientific impact scores among US and Canadian social psychologists.

The theory is widely applied to understand and predict health-related behaviour (McEachan, Conner, Taylor, & Lawton, 2011), nutrition-related behaviour (Riebl et al., 2015), smoking behaviour (Topa & Moriano, 2010), alcohol consumption (Cooke, Dahdah, Norman, & French, 2014), physical activity (Hagger, Chatzisarantis, & Biddle, 2002), screening attendance (Cooke & French, 2008), risk behaviours such as the prevention of sexually transmitted diseases and unwanted pregnancy (Tyson, Covey, & Rosenthal, 2014), condom use (Albarracín et al., 2001; Sheeran & Taylor, 1999), and recycling of waste (Rhodes et al., 2014). Direct comparison of various social cognition

theories has described the theory of planned behaviour as the superior predictor of intentions and behaviour (Ajzen, 2011; Armitage & Conner, 2001; Godin & Kok, 1996; McEachan et al., 2011). Internet-based interventions based on theoretical frameworks are superior to interventions not based on a theoretical framework. Moreover, of all theory-based interventions, those that relied on the theory of planned behaviour had the most substantial impact (Ajzen & Klobas, 2013).

Despite the theory of planned behaviour being widely used and considered useful for explaining intention, perceived behavioural control and attitudes across health-related behaviour categories, it has some limitations (Ajzen, 2011; Armitage & Conner, 2001; Godin & Kok, 1996; McEachan et al., 2011). First, the efficiency of the theory of planned behaviour varies between self-reported and observed behaviour. However, it does not explain 80% of the variance in potential measures of actual behaviour. Second, the theory of planned behaviour does not take sufficient account of cognitive and affective processes such as emotions and rationality that are known to bias human behaviour. Since these cognitive and affective processes have a direct influence on behaviour, the possibility is insufficiently accounted for in the theory of planned behaviour. Third, past behaviour is usually considered a proxy for habit strength. The more frequently a behaviour has been performed in a stable context, the more it is said to habituate. Past behaviour and habit contribute to the prediction of future behaviour after accounting for predictors in theory (Sutton, 2001). However planned behaviour theory does not account for past behaviour and habit, thus making the theory's sufficiency assumption invalid. Fourth, the theory does not specify where a person's behavioural, normative and control beliefs originate. It merely points to a host of possible background factors that may influence the beliefs people hold – factors of a personal nature such as personality and values, demographic variables such as education, age and gender, and exposure to media and/or other sources of information. Most empirical studies assess a few demographic characteristics if only considered as control variables (Rhodes et al., 2014). In the theoretical model (Figure 2.2), background factors are expected to influence intentions and behaviour indirectly by their effects on the theory's more proximal determinants.

The theory of planned behaviour has come a long way over the years and contemporary researchers are now advancing the theory by applying it to new

behaviours in settings that are novel to study processes that may correspond with rational behaviour. In order to address the gaps in the theory of planned behaviour model, I have applied an additional step of reviewing the framework for behaviour change that is currently being used in mHealth tools for family planning (in section 2.3).

Application in existing health-information-technology evaluation frameworks

The Technology Acceptance Model (TAM) (Davis, 1989), TAM 2, and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Thong, Chan, Hu, & Brown, 2011), are promising models that have their foundations in the theory of reasoned action and the theory of planned behaviour. These models are popularly used in research on information systems, and IT acceptance in the health care industry, as well as outside of it (Holden & Karsh, 2010). Intentions are an integral determinant of the theory of planned behaviour that is being adapted by the abovementioned evaluation frameworks. These models use behavioural intention to use technology as the proximal determinant to understand the behaviour of IT use, which is also referred to as acceptance. In TAM and TAM2, acceptance is also conceptualised as end-user satisfaction. In these models, intentions are influenced by various other variables such as attitude, perceived ease of use, perceived usefulness, and behaviour control, however the TAM model does not measure subjective norms. Whereas in the unified theory of acceptance and use of technology, variables such as effort and performance expectancy, social influence beliefs and perceived characteristics of information technology, are mediators and moderators to intentions to use.

According to a review by Holden and Karsh (2010), the abovementioned health-information-technology evaluation frameworks have been applied and well documented, with the focus being on health information technology use and its acceptance among health care providers such as doctors, nurses and other clinicians. These have been used to measure the user satisfaction and thus acceptance of medical devices and prototypes such as spoken dialogue technology for making observations and taking notes during medical examinations, telemedicine technology, internet-based health applications, computerised nursing care plans, mobile picture archiving and communication systems, and mobile health care systems. These are just some of the technologies outlined in the abovementioned review. However, the Holden and

Karsh (2010) review does not consider studies that look at the end users of the health IT, but rather focus on the healthcare professionals that provide medical and clinical care. There is, therefore, a need to conduct a thorough review, and create more evidence on the use of evaluation frameworks in measuring behaviour change among end-users such as patients, and non-medical healthcare providers such as social workers or community health workers.

On the topic of health-information-technology evaluation frameworks, it is also relevant to discuss Socio-Technical Theory (Lamb & Kling, 2003). This is a popular approach to examine how organisational contexts constrain and enable individuals using information, communication and technologies. Lamb and Kling (2003) do not base the foundation of their theory on the theory of planned behaviour, but rather view information, communication and technology users as social actors characterised by four main dimensions: affiliations, environments, interactions, and identities. The social actor model allows for the conceptualisation and designing of information, communication and technology research. Using the social actor metaphor can help in gaining a deeper insight into people's interactions with technology, and with other people, groups, and organisations.

2.2.2 The health belief theory

This theory has been used to predict health-related behaviours and inform the development of interventions to change the behaviour. Its initial version was developed to understand why people did or did not use preventive services offered by public health departments. According to Champion and Skinner (2008) this theory posits that individuals will take some action to prevent illness if they believe they are susceptible, if the consequences of the illness are severe, and if the perceived benefits of the action outweigh the costs. It also explains that people's beliefs about whether or not they are at risk for a disease or health problem, and their perceptions of the benefits of taking action to avoid it, influence their readiness to take action. In 1974 Becker described the core constructs of health belief theory (as mentioned by Champion & Skinner, 2008). These include perceived susceptibility and severity, together with perceived benefits and barriers, while cues to action and self-efficacy are recent additions. The theory is a practical framework to develop health education strategies. Programmes based on this theory focus on a variety of health actions such

as promoting greater condom use (Hall, 2011), seat belt use (Morowatisharifabad, 2009), medical compliance (Jones, Smith, & Llewellyn, 2014), and health screening use (Johnson, Mues, Mayne, & Kiblawi, 2008). The theory has been applied most commonly to predict and explain cancer screening and HPV vaccination, where beliefs are considered to be more important than overt symptoms. However even after common use, Champion and Skinner (2008) concluded that little is known about the relationships among the constructs of this theory, such as whether they all directly predict behaviour or whether some beliefs mediate the relationships to behaviour.

2.2.3 Trans-theoretical model or stages of change

The trans-theoretical model, or stages of change, is a dynamic theory of behaviour change developed by Prochaska and Di Clemente at the start of the 1980s. The model proposes that people are at different stages of readiness to adopt healthful behaviours. The main components of the model are the six stages of change: 1. Pre-contemplation; 2. Contemplation; 3. Preparation; 4. Action; 5. Maintenance; and 6. Termination.

The change construct is a basic framework around which another process of change components and its monitoring are located (Taylor et al., 2007). To link the concepts with other theories, this model uses a temporal dimension. The model helps health educators tailor health messages and interventions to a specific individual or group according to the stage of change they are at. Nevertheless, it includes concepts that are similar to those used in other social cognition-based models, for example self-efficacy (Prochaska, Redding, & Evers, 2015). The precise format of this model and its intermediate stages of change construct has varied over time. The notion of readiness to change, and the stages, have been examined in health behaviour research. A review by Taylor et al. (2007) shows that this theory has been useful in explaining and predicting change for a variety of behaviours including dietary change, exercise and activity promotion, sexually transmitted disease and pregnancy prevention, breast cancer screening, alcohol use control, and treatment adherence.

The application of the trans-theoretical model is documented across behaviours in various populations. However, the model has its limitations. According to Prochaska et al. (2015), population trials based on this theory have not produced significant

prevention effects due to it being a social influence model. The same study also noted that, due to lack of awareness about the age at which intentional behaviour change begins, this model does not apply very well to children and adolescents. Lastly, due to the application of this model globally, it is important to determine the cultures in which this model can be applied effectively and, similarly, where it may require significant adaptation.

2.2.4 Social cognitive theory

Albert Bandura's social cognitive theory (1986) stresses the importance of learning through observation, imitation and modelling, together with the continuous interaction among behaviour, cognition and the environment. The key constructs of this theory are: firstly, cognitive influences on behaviour, such as self-efficacy, collective efficacy, outcome-expectations, and knowledge; secondly, environmental influences on health behaviour such as observational learning, normative beliefs, social support, and barriers and opportunities; and thirdly, supporting behavioural factors such as behavioural skills, intentions, reinforcement and punishment. Kelder, Hoelscher and Perry (2015) explained that, to apply social cognitive theory, the learner is encouraged to observe and imitate the behaviour of others to see positive behaviour practised, and increased capability and confidence to implement new skills and gain positive attitudes.

Social cognitive theory is a widely applied model of health behaviour to achieve personal and group-level changes, maintenance of behaviour changes, and relapse prevention. In the past it has been successfully applied to sex and sexuality education, tobacco use prevention, substance abuse prevention, and violence prevention (Kelder et al., 2015). A limitation of this theory is that in its application, environmental influences and the development of behavioural capability are often not measured adequately, possibly because the application of this theory to behaviour change is not always a logical or linear process. Moreover, it is difficult to change some factors on a personal level, for example self-efficacy, outcome expectations, social support, or opportunities.

2.2.5 The focus theory of normative conduct

The focus theory of normative conduct by Cialdini, Kallgren, and Reno (1991) explains the role of social norms in human behaviour. In social psychology, social norms refer to behaviour modelled by a group. According to Burchell, Rettie, and Patel (2013), the people in the group are socially influenced either to conform with the positive expectations of others', or show acceptance of information obtained from another as evidence about reality. Drawing on this distinction, norms are categorised in sub-types: injunctive norms, or what most others approve or disapprove; and descriptive norms, or what most others do. As people seem to be influenced by social norms, despite the fact that communication plays an important role in the creation of normative perception among people, it often leads them to behave in the way they think others behave (Cialdini et al., 1991). Over the years, health-related research framed by the focused theory of normative conduct, has looked at the role that social norms have played in the context of promoting environmentally beneficial behaviour, condom use, injection drug use, and alcohol consumption during pregnancy. Jensen and Bute (2010) have argued that there have been mixed results concerning the descriptive and predictive potential of the theory and suggest that some elements of the theory require further explanation.

2.2.6 Motivation and Opportunity as Determinants (MODE) theory

The MODE model (Fazio, 1990) aims to describe the multiple processes by which attitudes can affect judgement and behaviour. The model focuses on a basic distinction between two classes of attitude-to-behaviour and spontaneous-deliberative processes. Motivation and opportunity to engage in effortful cognitive processing serve as the major elements of these processes. The unstructured process highlights a mechanism by which attitudes can guide behaviour without the involvement of any conscious reflection on the part of the individual. There are situations in which individuals deliberate about the cost and benefits of pursuing action and, in doing so, consider their attitudes toward the behavioural alternative and decide upon a behavioural plan (Ajzen, 1985, 1991). Deliberation requires some expenditure of effort, so that the individual must be motivated to engage in the effortful analysis and must have the opportunity (i.e., the time and the resources) to do so. Opportunity, from the perspective of the MODE theory, is essentially a 'gating'

mechanism. If the opportunity exists, an individual can counter or even correct the influence of an automatically activated attitude. However, if the individual is fatigued or cognitively depleted, or if the situation demands an immediate response, then there will be little opportunity to engage in motivated deliberation. In that case, the judgement or behaviour is likely to be influenced by spontaneously activated attitudes, regardless of any relevant motivational concern. An analysis by Zabel, Zabel, Olson, and Carlson (2016) shows that MODE theory has served as a theoretical framework for understanding the attitude-behaviour relationship in a variety of domains, including interpersonal relationships, effective treatment of mental disorders, and the crafting of media messages for diet control and alcohol behaviour, as well as racial prejudice.

2.3 Expert Consultation: To Understand Existing Practices in the Field of mHealth (for sexual and reproductive health)

Consultation with experts was a critical step in this research, as it allowed an investigation into patterns and ideas that mHealth programme managers applied in designing and implementing mHealth tools. Consultation with the mHealth experts provided insights around their intentions behind developing mHealth tools and surface the stories about what people intended to do. Secondly, it helped to determine whether psychosocial theories are a component of mHealth tools. As result, the insights from expert consultation guided the development of research hypotheses.

Consultation was conducted based on the systematic selection of mHealth managers involved in maternal and reproductive health programmes, using a mHealth compendium (Mendoza, Levine, Kibuka, & Okoko, 2014) and an online search. A list was generated of non-government organisations (NGOs) working in the field of family planning in India, from which three organisations working in family planning were shortlisted based on a scale of mHealth operation (< 2 states), duration of implementation of mHealth programmes (<2 years), and the availability of the programme manager for consultation. mHealth programme managers were asked about the process of designing, implementing and evaluating mHealth intervention in maternal health contexts. Unstructured interviews were part of the consultation from which notes were taken that were later analysed to be presented in subsequent sections of this thesis. The exploratory questions that were answered through this process were:

Exploratory Question 1. To what extent are mHealth tools informed by the tenets of psychosocial theories?

This question investigated the design process of mHealth tools. Qualitative data gathered through consulting mHealth programme managers were synthesised to develop an understanding of how programme managers targeted change with these tools. The present research intended to develop an insight into the objectives of each programme, its current achievements, and programme outcomes against measures of success, compared with the theory of planned behaviour.

Exploratory Question 2. Are there features of mHealth programmes that are not informed by psychosocial theories but are predictive of contraceptive use among Indian women?

This question investigated factors that do have a direct impact on output behaviour and predictor of behaviour. Qualitative data from consultation with programme managers provided insights into outstanding successes or failures of the mHealth programme.

2.3.1 Intervention A: Health worker-assisted mHealth application.

Profile of expert

Representatives from BBC Media Action, New Delhi, India were involved in designing and evaluating mobile phone-mediated health tools.

Summary of the mHealth tool

BBC Media Action developed innovative mobile-phone mediated tools for community health workers in India. 'Mobile kunjji' and 'gupshup potli' were two tools that health workers used during their counselling sessions with rural families. The tool included an interactive voice response-based (IVR) mobile phone service and a deck of 40 illustrated cards on a key ring that contained life-saving information on maternal and child health, together with a unique toll-free number ('short code') giving access to the IVR service. During their counselling sessions, health workers used their phones to dial the numbers, linking them to audio content reinforcing the information illustrated on the card.

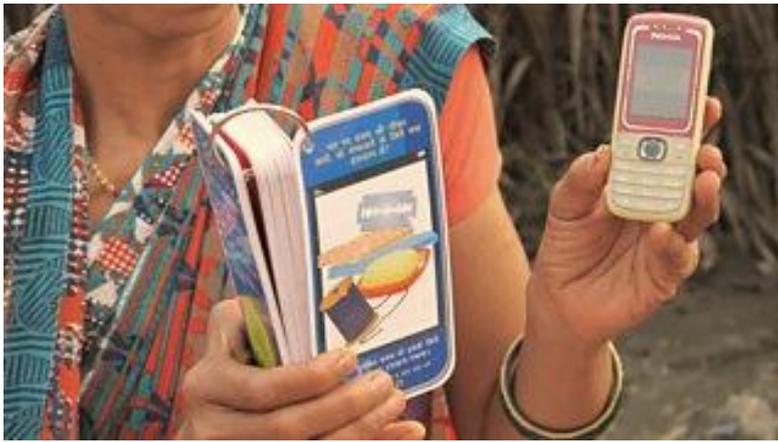


Figure 2.3 Mobile Kunji - Deck of cards and mobile phone

Rationale for developing a mobile phone-mediated tool

Outreach activities are part of comprehensive, multi-platform communication approaches in India. Combining mass media with interpersonal communication or other on-ground communication activities has a more significant impact than mass media interventions alone (Betrand, Babalola, & Skinner, 2012). In part, this effect occurs because the same information is reinforced in multiple ways, and because of the increased opportunities for discussion and debate. Thus, BBC Media Action engages in a range of interpersonal communication and community mobilisation activities. Using a 360-degree communication approach, BBC Media Action delivers its behaviour change communication to vulnerable groups.

Theoretical basis of mobile-phone mediated tool

Becker's health belief theory was the foundation of BBC Media Action's model of change. A tailor-made 'model of change' was created for each project to utilise media and communication driving healthier practices by influencing factors (such as knowledge, discussion, attitudes and social norms) for behaviour change. According to the BBC Media Action representative, they "begin the process by focusing on problems, and obstacles that stand in the way of useful change. The model of change focuses on the main health issue and the present scenario". Figure 2.4 shows the framework used for developing mobile-mediated health tools.

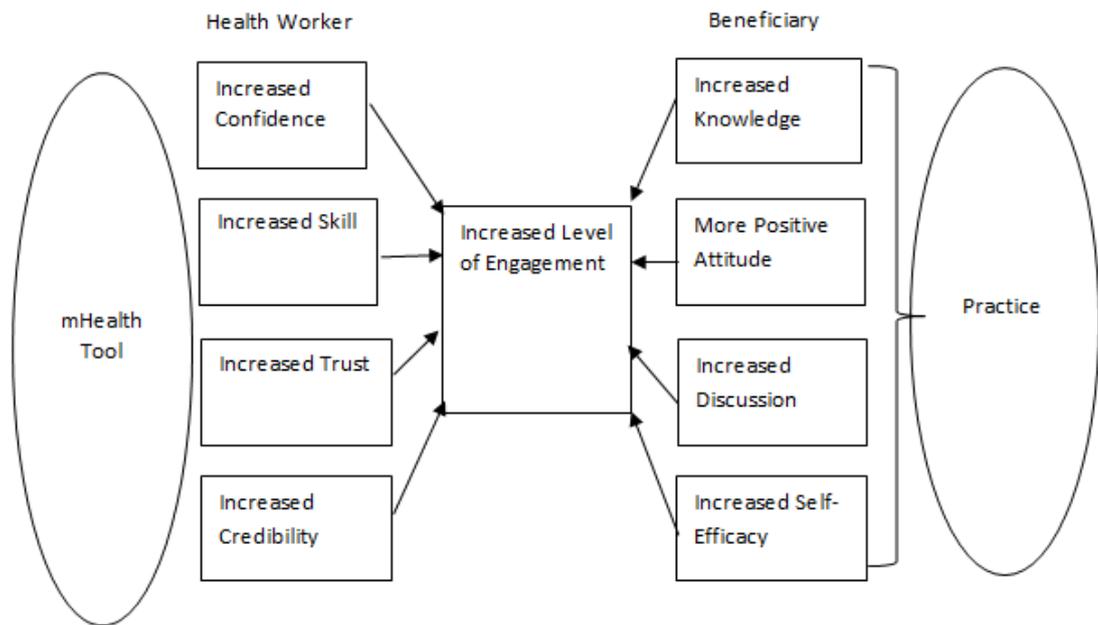


Figure 2.4 Change Model used to design mHealth tools-(“Full report - Mobile Kunji Usage and Engagement Study,” 2015)

2.3.2 Intervention B: Helpline for family planning

Profile of expert

The expert interviewed was a representative from the Indian Society of Healthcare Professionals (ISHP), New Delhi, India. ISHP has specific expertise in setting up and running health helplines for various international healthcare organisations. ISHP-run helplines are based in Uttar Pradesh, Karnataka and Delhi. ISHP call centres provide a short message service and calling service which alerts users of CycleTel.

Summary of an mHealth tool

A self-administered mHealth tool, CycleTel was a mobile phone application that offers a family planning method directly on a user’s mobile phone via a short message service. Women subscribed to CycleTel on the first day of their menses, after which they received daily follow-up text messages on their fertility status. Users also received text messages on other family planning and reproductive health methods, sexually transmitted infection, HIV prevention, and condom use (Rai, 2014).

Rationale for developing a mobile phone-mediated tool

ISHP’s helpline tele-counsellors facilitated an informed decision about family planning by providing information in a private space and in a personalised and authentic

manner. To achieve this objective, a call flow/algorithm and other counselling tools for call centre executives were designed to address challenges women as the end users faced in a particular geographical area, for example, family restriction, the generation gap, privacy, and liberty to talk or to make an informed decision. Other barriers and gaps such as literacy, education level, socio-economic category, marketing limitations and technology were considered in the development of content for the helpline counselling sessions.

Theoretical basis of the mobile phone-mediated tool

This helpline aimed to influence attitudes through personalised messaging.

Organisations outsourcing helpline work to ISHP already had information about the family planning behaviour and its psychosocial determinants among Indian men and women. Thus, ISHP used already existing information for designing the content of the counselling tools. Social determinants such as geographical area, socio-economic category, the profile of target audience, project outcomes, and the cost and duration of the project formed the basis of this family planning helpline. Women, as the target audience for family planning programmes, make calls to the helpline, so that the information is primarily shared by the caller.

Figure 2.5 outlines steps involved in the systematic process to help women achieve their desired family planning decisions and actions.

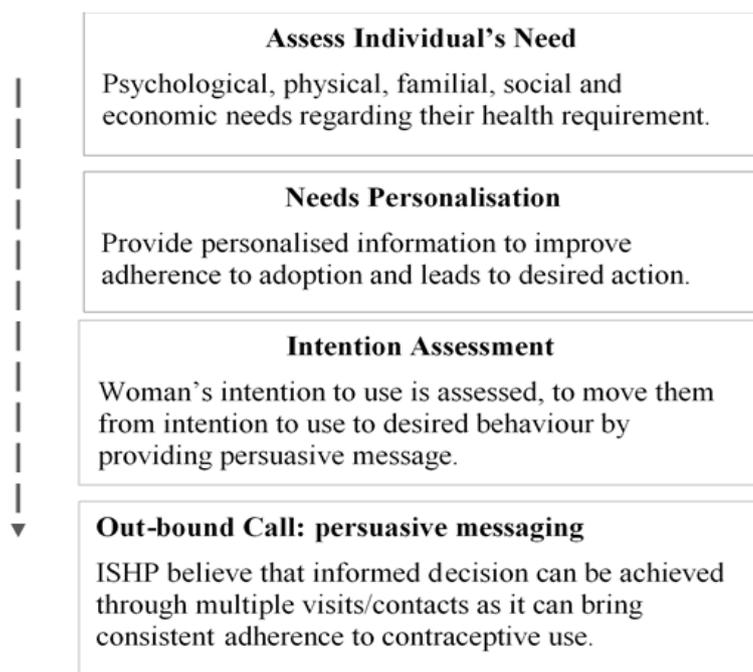


Figure 2.5 Behaviour change framework for family planning helpline

2.3.3 Intervention C: Technology-enabled incentive

Profile of expert

The expert interviewed was a representative from Population Services International, New Delhi, India. She led the women's entrepreneurship project where a technology platform TIKO card was used to improve maternal and neonatal health. Family planning was a significant component of the technology interface project. This programme started in October 2015 and therefore was in its infancy regarding data availability during the time of the consultation.

Rationale for developing a mobile phone-mediated tool

The intention of the programme was to have rewards-based platforms that motivate consumers to make positive choices. This reward platform is called 'Tiko'. Family planning products and services were bought and sold using Tiko points by women at the grassroots level. Tiko are virtual reward points earned through positive behaviour and spent just like real money in the local market. This puts a real value on positive behaviour, making it desirable and aspirational. Validation of purchase and selling of products and services happened over various channels (using technology platform TECKO Card), including apps, free-to-user SMS or missed calls, with accounts settled virtually and instantly. This tool acts as an enabler to facilitate the establishment of a system without too much supervision, which encourages entrepreneurship among women.

Theoretical basis of mobile phone-mediated tool

The mobile phone-enabled tool was based on the incentive theory of motivation (Killeen, 1982), rewarding people for doing the right thing through pulling women into action via external incentives. This is one of the major theories of motivation and suggests that behaviour is motivated by a desire for reinforcement or incentives. TECKO Card used symbolic rewards and financial gain as a motivation for behaviour. They also used change in consumer touch behaviour as a medium to measure the impact of visual and olfactory sensory cues provided through a mobile phone. Figure 2.6 shows the theoretical premise behind the technology-enabled incentive mechanism for increasing uptake of family planning products and services.

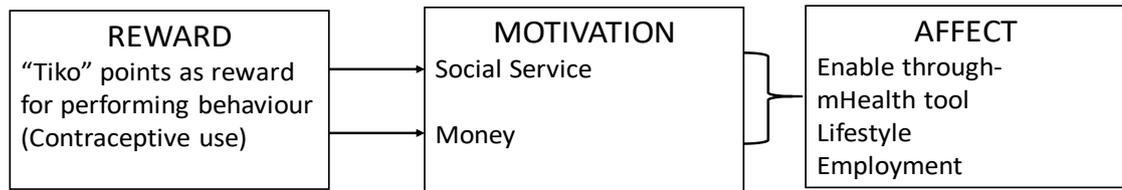


Figure 2.6 The theoretical premise behind technology enabled incentive mechanism

2.3.4 Insights from expert consultations

Exploratory questions (as outlined in section 2.3) were answered through comparing the three mHealth interventions. Figure 2.7 summarises the insights from these cases of mHealth. Insight from first exploratory question is that mHealth tools do consist of elements of various socio-psychological theories and are dynamic in design. This could be a possible reason that the desired behaviour is present among recipients of these tools. All the mHealth products (helpline, mobile platform and mobile-app) aim to achieve a similar purpose, that is, to increase uptake of contraceptives through targeting various predictors of behaviour using a theoretical model. Hence, the exploratory process validates the researcher’s idea that psychosocial theories are part of the mHealth programme. All three mHealth experts reported during the consultation that the models were explicitly considered in the development of mHealth tools. These models show different approaches to behaviour change with variation in the contexts, people, and settings and tasks involved in the development of tools.

An insight from the second exploratory question was that features of mHealth tools do have some impact on the output behaviour and predictor of behaviour among the target group. However, there are specific basic design and implementation challenges that programme managers have limited control over. For example, development of mHealth tools involves complex interdependencies due to expertise and knowledge required from a multidisciplinary team comprised of experts from fields such as technology, behaviour sciences, public health, social works and management. It is not always feasible for managers to use a large team of experts at every stage of mHealth intervention planning, development and evaluation.

Table 2.1 Summary of insights from exploratory questions

	Helpline for family planning	Technology enabled incentive	Health worker assisted mobile phone application
Theory	Theory of persuasion (to address attitude	The incentive theory of motivation	Model of change based on the health belief theory
Insight	These tools are dynamic. During the designing phase, these tools do not necessarily have any theoretical base. However, during the implementation of these tools, theoretical models are associated. Moreover, these tools were designed to respond to problems and challenges faced while implementing programmes in the field.		
Conclusion	Analysis of these tools and discussion with programme managers supports that these tools do have elements of psycho-social theories		

Meeting with mHealth experts gave me the opportunity to design the present research. As a result, the Bill and Melinda Gates Foundation — the funding agency for the mHealth project — gave permission for me to study mHealth tools in the project area. BBC Media Action — the implementing organisation of the mHealth programme in India — provided support for smooth data collection from project areas where mHealth tools are being implemented.

The mHealth tools studied in this research involved two mobile phone-based tools (i.e., Mobile *kunji* and *gupshup potli*) operated by frontline health workers having the technology and human interface. Mobile phone-based health tools are an ‘intervention’ in which a treatment (comprising the elements of intended behaviour, i.e., contraceptive use) is tested for how well it impacts intentions, which are measured based on the predictors of the theory of planned behaviour. So far there is not much evidence on what the underlying mechanisms of technology are and the technology-human interface (together) that bring about change in the health behaviour of people using mHealth tools.

2.4 Research Framework: Integration of Theory and Expert Consultations

Groundwork undertaken to review the literature and exploratory phase acted as a springboard for a more detailed analysis of psychosocial theories and how such theories are being applied to mHealth. As this study intended to measure the effect of mHealth tools, I started by finding out what the programme manager was trying to

achieve with the tools. Then I decided which impacts to measure using a conceptual framework.

Grant and Osanloo (2014) have described a conceptual framework as a visual representation of understanding about “how the research problem is explored, the direction of research, and the relationship between the different variables in a study” (pp.16–17). Framework is a layout of critical factors, constructs, or variables, and possible relationships between the factors. Figure 2.7 is a product of logical integration of commonalities and connected concepts presented in the model of the theory of planned behaviour and BBC Media Action’s model of change employed to design mHealth tools. The framework used in the present research is a visual display of my understanding of the research problem, the direction of the research, and the relationship between the diverse variables in the study. The conceptual framework is a fundamental part of my research design. It uses the theory of planned behaviour as the starting point to investigate constructs and presumed relationships among these concepts and factors. The purpose of this framework is to be a guiding process in developing my research hypotheses, which are described later in this chapter.

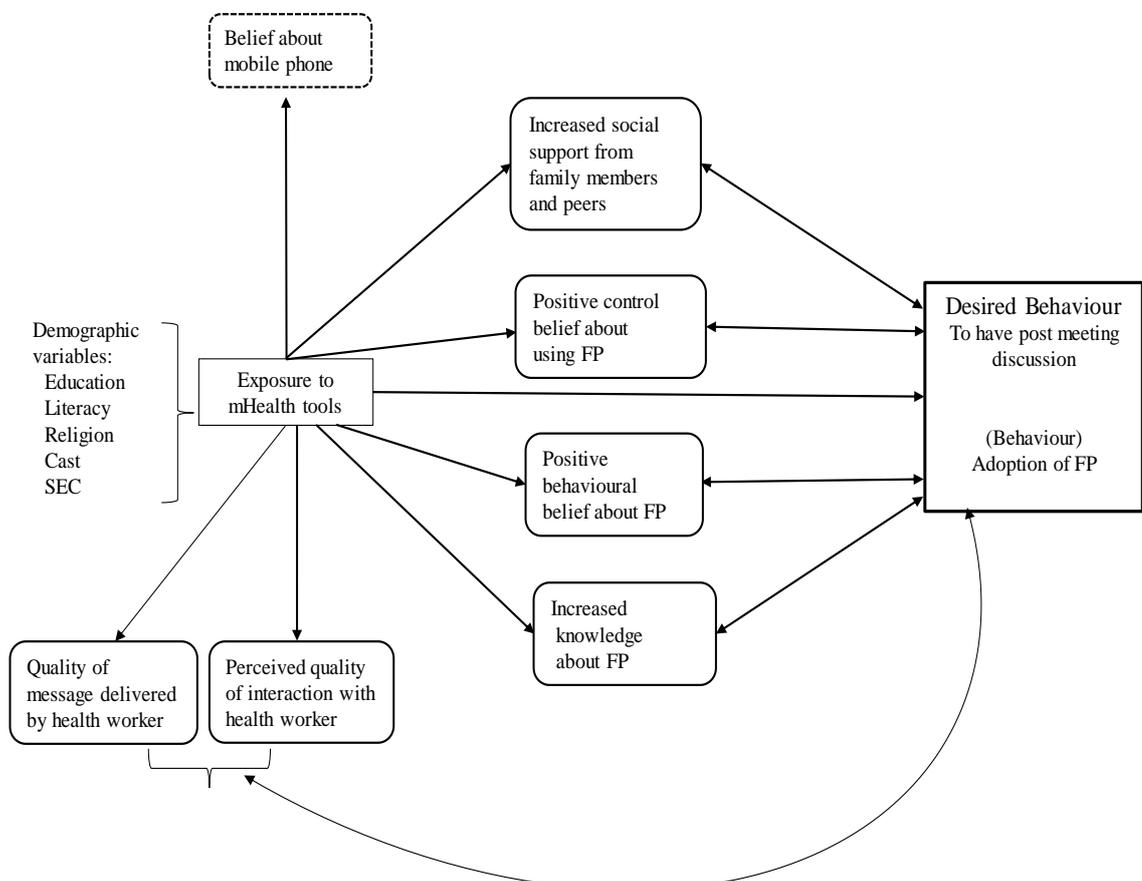


Figure 2.7 Research framework: Blending theory with practicality

Blending aspects from the theory of planned behaviour and model of change, this framework supported a more comprehensive assessment of the impact of mHealth tools on family planning behaviour. It is an assimilation of practical insights from real-time mHealth programmes and a successful behaviour change theory. The constructs in the framework form pillars for the present research. The individual requirement constructs in the present research reflect constructs that relate to individual motivation and capability factors such as belief and knowledge, that were adapted from the theory of planned behaviour. The intervening and dependent constructs were adapted from the model of change. Demographic variables referred to the characteristics of the research participants. According to the theory of planned behaviour, an individual requirement construct can potentially have a positive influence on behaviour. These individual constructs are affected by intervening and demographic constructs. Together they potentially have a positive influence on behaviour.

The present research did not aim to establish any causal relationships among the constructs because it required manipulation of independent variables in order to establish causality. Instead of having direct measures for predictors of behaviour (as it is outlined in the theory of planned behaviour), I used the desired behaviour as a proxy for outcome behaviour. The conceptual framework does not take intentions into account, because I planned to select research participants based on their current use or non-use of contraceptives. Similarly, proxy predictors were applied for attitude (belief) and social norms (social support). Hence, the theory of planned behaviour was used as a practical starting point for the development of the present research framework where some original components of the theory were adapted.

Beginning with theories, the following points to the nature of actual behaviour and predictors of behaviour in the context of the present research. These sections describe the operationalisation of all eight constructs through explaining the relationship with theory, the application in the intervention, and what influence they have on behaviour.

2.4.1 Desired behaviour as a proxy for outcome behaviour

The desired behaviour is a dependent construct adapted from the theory of planned behaviour. As explained by Ajzen and Klobas (2013), in order to apply the theory of planned behaviour, it is essential to have an appropriate behaviour criterion. The desired behaviour has a potentially positive influence on the outcome behaviour, that is, contraceptive use. In the present research, the outcome behaviour – the adoption of family planning – is benchmarked against the proxy (desired) behaviour, that is, improved communication for family planning among Indian family members.

Improved communication is defined as the discussion a woman has with her husband, extended family or friends after meeting the health worker. The communication between couples about family planning and the desired number of children is closely associated with successful contraceptive use. Researchers have been studying inter-spousal communication on planning, communication about the desired number of children, contraceptive methods, negotiation for using contraceptive and together coming to a joint decision (Najafi-Sharjabad, Yahya, Rahman, Juni, & Manaf, 2013; Samandari, Speizer, & O'Connell, 2010). Studies have demonstrated a strong positive association between spousal communication and use of contraceptive methods (Najafi-Sharjabad et al., 2013; Shattuck et al., 2011). A study by Samandari et al. (2010) showed that if a woman believes that her husband supports contraception, her odds of using it are increased.

Similarly, a systematic review of health intervention and its impacts (Marcolino et al., 2018; Stowell et al., 2018) showed that mHealth tools have a positive impact on outcome behaviours such as behavioural or lifestyle changes (e.g., sexual behaviour, smoking cessation, increase in physical activity), adherence to treatment and care (e.g., compliance with medication taking, data management, communication performance), disease management (e.g., time to diagnosis, time to treatment, changes in professionals' workload), attendance rates at healthcare appointments (e.g., among tuberculosis and HIV positive patients), knowledge (e.g., pre-diabetes perceptions, prostate cancer), and clinical outcomes (e.g., frequency of hypoglycaemic events, symptoms, deaths). Therefore, the present research quantitatively determines the impact of mobile phone-based health tools on improving communication for family planning among members of Indian families. This is investigated through

understanding the association of desired behaviour with measures of belief, subjective norms and behaviour control.

Therefore, based on the factors discussed here, the present research aimed to determine improved communication among the family members through measuring whether women had a discussion regarding family planning after meeting the health worker, with whom they talked, and the purpose of discussion (verification, approval, obtaining opinions, or information).

2.4.2 Social support as a proxy for norms

Norms are the presence or absence of formal or informal laws, regulations, and rules that affect behaviour (Population Services International, 2004). Norms are an individual requirement construct that is adapted from the theory of planned behaviour (Ajzen, 1985, 1991; Ajzen & Driver, 1991). In the present research social support was defined as a woman's belief about the support she receives from her husband and her extended family (such as mothers-in-law, own mother) to use family planning, which is needed to perform the desired behaviour. There is a consensus among social scientists (Kent de Grey, Uchino, Trettevik, Cronan, & Hogan, 2018; Najafi-Sharjabad et al., 2013; Reblin & Uchino, 2008; Samandari et al., 2010) that higher perceived support is associated with desirable mental and physical health outcomes, including a lower risk of cardiovascular disease, diabetes, hypertension and arthritis. It is most beneficial when it is not obvious and matches the receiver's needs.

A study by Samandari et al. (2010) found that husbands, peers and elders can influence the contraceptive choices of women. In a culture such as India's, where elders' viewpoints are highly regarded, their negative attitudes toward contraception can pose a significant barrier to use. According to a study by Hajason et al. (2013), mothers-in-law are key gatekeepers in determining young married women's access to maternal and reproductive health services. The embarrassment and taboo around discussing reproductive morbidity makes intergenerational communication especially difficult, so that community mobilisation approaches are used to enhance communication and increase the support of mothers-in-law in addressing young married women's health needs (Singh et al., 2007). A woman's perception that her in-laws support family planning use is essential for the formation of her intention to use a

contraceptive method (Najafi-Sharjabad et al., 2013). Differences in social support are observed between traditional and non-traditional women by the number of children a woman has. Samandari et al., (2010) showed that more traditional women tended to have a greater number of children and were highly influenced by their husbands, whereas less traditional women tended to have fewer children and may be influenced more by their peers.

According to Kent de Grey et al. (2018), social support is divided into two domains: perceived support, or people's subjective construal of the support they believe to be available to them, and received (or enacted) support, which is an aid provided by another person. The same study also noted that perceived and received support take varying forms; for example, informational support involves the provision of recommendations, advice and other helpful information. Tangible (or instrumental) support is the furnishing of financial, material or physical assistance, such as the provision of money or labour. Emotional (or appraisal) support involves the expression of affection, empathy, caring, and so on. Belonging (or companionship) support creates a sense of belonging and can involve the presence or availability of others for social engagement.

Therefore, based on the factors discussed here, the present research determined social support through measuring people who accompany women during health worker meetings, social support from husbands, and social support from mothers-in-law. It was assumed that receiving social support from family members and peers could have the potential to positively influence the desired behaviour.

2.4.3 Behavioural control to use contraceptive

According to Ajzen & Klobas (2013), behavioural control is the perception of ease or difficulty to undertake a behaviour. It is influenced by beliefs concerning whether one has access to the necessary opportunities and resources to perform the behaviour successfully. It can positively influence an individual's ability to perform a promoted behaviour. Behavioural control includes internal control factors, information, personal deficiencies, skills, abilities, emotions, and external control factors such as opportunities, dependence on others, and other potential barriers (Free, 2013). Together these factors facilitate or impede performing the promoted behaviour.

Thus, based on the discussion above, behavioural control is defined as an individual requirement construct adapted from the theory of planned behaviour. In the present research, it was applied as the control belief about using contraceptives that could potentially have a positive influence on the desired behaviour.

2.4.4 Beliefs about behaviour (contraceptive use)

Fishbein (2000) defined 'belief about behaviour' as the perceived positive or negative consequence of performing a behaviour and the subjective values or evaluations of the consequences. Together, behavioural beliefs that are readily accessible in one's memory lead to the formation of a positive or negative 'attitude toward the behaviour'. mHealth tools tailored to counteract negative beliefs about outcome behaviours could lead to an increase in the adoption of a desired behaviour and positive beliefs by up to 42% (Marcolino et al., 2018). Hence, the present research focused on behavioural beliefs as the perceived positive or negative consequences of using contraceptives, for example, condom interference with sexual pleasure, and subjective values or evaluations of these consequences, for example, a belief that people who use contraceptives end up with health problems. This construct was used as an individual requirement adapted from the theory of planned behaviour.

2.4.5 Knowledge about contraceptives

In the present research the construct of knowledge indicates how closely women's knowledge about family planning and contraception matches the promotional content in mHealth tools. The idea of contraceptives that is promoted through mHealth tools indirectly increases knowledge about family planning and contraceptives. The knowledge construct was adapted from the model of change and is an individual requirement. Any impact of knowledge is likely to have a positive and direct influence on the desired behaviour; this is in contrast to the findings (Indian Institute of Population Sciences & Macro International, 2007) which showed high levels of knowledge about contraception amongst the Indian population, yet low actual use of contraception. Studies have shown that, although knowledge is necessary for the use of contraception, it is not a sufficient factor in uptake, as behaviour works primarily through beliefs and behavioural control (Albarracín et al., 2001; Godin & Kok, 1996; McEachan et al., 2011).

Therefore, based on the factors discussed here, the present research determined that knowledge about contraceptives through women's opinions varied as to the meaning of family planning, the ideal gap between two births, the benefits of family planning, knowledge of contraceptives for limiting births, and the use of contraceptives for spacing births.

2.4.6 Quality of health worker

One's confidence in the quality of care in healthcare or mHealth is not limited to easy access or low costs. Health workers involved in delivering healthcare services form an essential part of this care (Chib, 2010). Objectively, this construct aims at investigating women's judgements about the features of the communication between her and the health worker, such as whether it is a two-way communication, informative and supportive. The present research focused on the quality of the health worker interaction from two viewpoints: first, the quality of the message; and second, the perceived quality of the interaction, with an assumption that these factors together support a woman's judgment about the overall effectiveness the health worker.

According to the model of change (as presented in section 2.3.1), the quality of the message is comprised of relevant and informative content that suits the health needs of the individual woman. Similarly, a woman's judgement about the quality of the interaction with a health worker entails trust, privacy, and the reliable and accessible source of information (BBC Media Action, 2015).

This construct was adapted from the model of change and was an intervening construct. Any impact of the above-mentioned two viewpoints is likely indirect and is positive on the desired behaviour. The perception of poor quality in health care acts negatively on the use of health services because being disease-free is of concern to people. The importance of quality perceptions and consumer trust has been implied in numerous health studies because of their strong effects on user satisfaction and continuance intentions (Akter, Ray, & D'Ambra, 2012; Mechael, 2009; UN Foundation-Vodafone Foundation Partnership, 2009).

2.4.7 Mobile phone and internet: Belief, access and ownership

Women's beliefs about mobile phones form an integral part of the present research. This construct allows investigating whether receiving health information on mobile

phones changes people's perception about mobile phones and the internet. This was an intervening construct adapted from the model of change and has a potentially positive influence on individual requirements (social support, behaviour control and belief about contraceptives).

According to the report by BBC Media Action (2013), India has a competitive and fast-growing mobile market, with a unique subscriber penetration of 56%. However, cost and cultural barriers have created a wide gender gap in both mobile phone ownership and internet use. According to a report by Croxson and Rowntree (2017), women in India are 59% less likely than men to own a mobile phone and 69% less likely to have used the internet in the last 90 days. Women face more challenges adopting mobiles and the internet than men, mainly due to social norms. Mobiles and the internet are either denied to women by gatekeepers or may seem less relevant and attainable. The same report also showed that a possible explanation for this disparity is because women are seen as being vulnerable to threats from the negative aspects of the web (posing risks to a family's reputation), and as having a lack of purchasing power, leading busy lives with little free time to learn or use technology, having smaller social circles, and having less confidence in learning digital skills. Based on the factors discussed here, the present research determined belief about the mobile phone through norms around mobile phones and women's perceived control about using a mobile phone, along with aspects of access, use and ownership of mobile phones.

2.4.8 Personal characteristics and background factors

In addition to its core focus on the impacts of mobile phone-based tools on desired behaviour and their relationship with beliefs, behaviour control and norms, the theory of planned behaviour provides a link between personal characteristics and other background factors (Ajzen, 1985, 1991; Ajzen & Driver, 1991). These various factors could influence behaviour by affecting the beliefs that give rise to norms, and perceived behavioural control. When a given background factor included in a survey was found to influence fertility behaviour, the theory of planned behaviour permits researchers to explain the finding by tracing the factor's effects on beliefs, norms, perceptions of control and desired behaviour. Conversely, when a given background factor fails to correlate with fertility, researchers could also explain the failure if the background factor is found to not effect the variables, in accordance with the theory of

planned behaviour (Ajzen & Klobas, 2013). The theory of planned behaviour does not suggest any specific factors, however; based on the results of prior research, potential background factors were included in the present research. Among the factors that are modelled as background factors in the present research are access to the health worker, education, gestation, number of children, religion, and caste. These factors provided an insight into women's beliefs about gender roles and the acceptability of having more children, general life values, such as the value of children and religiosity, as well as demographic characteristics such as education and socio-economic status. All the operating constructs in the present research are summarised in Table 2.2.

Table 2.2 Summary of operating constructs

Construct	Type of construct	Theory Applied	Influence	Intervention application
Outcome Behaviour/ Desired behaviour	Dependent construct	Theory of planned behaviour	The desired behaviour has the potential to influence the outcome behaviour positively	The actual use of contraception, improved communication for family planning among Indian family members after meeting the health worker
Norm	Individual requirement	Theory of planned behaviour	Have the potential to influence the desired behaviour positively	Receiving social support from family members and peers
Behaviour control	Individual requirement	Theory of planned behaviour	Have the potential to influence the desired behaviour positively	Control belief about using family planning
Belief about behaviour, i.e., family planning	Individual requirement	Theory of planned behaviour	Have the potential to influence the desired behaviour positively	Behavioural belief about family planning
Knowledge	Individual requirement	Model of change	Can have an indirect positive influence on the desired behaviour requirements	Knowledge about family planning
Quality of health worker	Intervening Constructs	Model of change	Can have a moderate positive influence on the desired behaviour requirements	Woman's judgment about the overall quality of interaction with the health worker
Belief about the mobile phone and perceived control to use	Intervening construct	Model of change	Can have a moderate positive influence on the individual requirement	Belief about mobile phone
Personal characteristics and background factors	Intervening measure	Theory of planned behaviour	Can have a moderate positive influence on the individual requirement	Demographic characteristics

2.5 Research Hypotheses

The present research was designed to answer the questions outlined in chapter 1 through testing hypotheses originating from the research framework (Figure 2.7). The theoretical and practical perspectives of the constructs in the framework were used to guide the development of research hypotheses. The research framework is an essential tool because it offers a bridge between theory and the research questions.

Research Question 1

How can the theory of planned behaviour be adapted to create a model to predict decisions regarding family planning amongst Indian women?

Operationalisation of research question 1

Exposure to mHealth tools and current use of family planning are expected to influence outcome behaviour, social support to use contraceptives, and behavioural beliefs about contraceptives and their use. Using the integrated research framework (as described in section 2.4), the present research identified important factors that guide research findings and discussion of the relationship between theory and research design. This question is answered through quantitative analysis of data collected from four categories of research participants (described in chapter 3). A comparative data analysis for the four categories of respondents forms the research findings (described in chapter 4).

Hypotheses

H1. Women exposed to mHealth tools are more likely to discuss family planning with their family members and peers as compared to women who are not exposed to those tools ('non-exposed').

H2. Perceived social support to use family planning is higher among women exposed to mHealth tools as compared to non-exposed.

H3. Positive behavioural beliefs about family planning are found among women exposed to mHealth tools.

H4. Increase in knowledge about family planning is positively related to exposure to mHealth tools.

Research Question 2

What other factors (not accounted by the theory of planned behaviour) influence contraceptive use amongst Indian women and are these factors influenced by exposure to mHealth tools?

Operationalisation of research question 2

By examining background factors such as personal characteristics and religiosity, together with demographic variables such as parity, socio-economic status and education, and behavioural, normative, and control beliefs about contraceptive use, the present research sought to identify important considerations that guide the research findings and discussion. This question is answered through quantitative and qualitative analysis (chapter 4 and 5) of data collected from research participants. A comparative data analysis for the four categories of research participants forms the research findings.

Hypotheses

H5.1. The quality of message delivered by a health worker appeals more to women exposed to mHealth tools than those not exposed.

H5.2. Women exposed to mHealth tools perceive the quality of interaction with the health worker as good, compared to those not exposed.

H6. Receiving health information on a mobile phone changes women's perceptions about mobile phones.

H7.1. Is there a difference between users and non-users of family planning in their access to health workers, socio-economic classification and education?

H7.2. Is there a difference between women exposed and not exposed to mHealth tools in their access to health workers, socio-economic classification and education?

Chapter 3 Research Method

3.1 Chapter Outline

Chapter 3 describes the methods adopted to investigate the research questions. The chapter begins by describing the philosophical perspective for the research drawn from the post-positivist paradigm. Then section three explains the factorial design and post-test-only quasi-experimental design of the research. Section four describes the characteristics of the research population and sample, the process of sample selection and the sample size. Section five describes the research instruments and variables and their measurement, provides definitions, and discusses links between the theoretical conceptualisation of constructs in the research framework (as explained in chapter 2). Section six provides a detailed explanation of the procedure involved in the collection of quantitative and qualitative data and also describes the development of research instruments through pilot-testing to establish the validity of the questionnaire and derive authentic results. Section 3.6.2 describes the process of quantitative surveying to collect primary data and presents a description of the tasks involved in conducting the survey. Section 3.6.3 provides details about the steps involved in conducting qualitative focus group discussions to gather real-life contextual understandings, multi-level perspectives and cultural influence. Section eight on analysing data explains measures taken to ensure validity and reliability of data and provides an outline of the data analysis process.

3.2 Research Philosophical Perspective

Philosophical assumptions about the social world guide research choices and their interpretations; however, the assumptions may not be empirically verifiable. According to Lincoln, Lynham, and Guba (2011), modern social science embraces various philosophical perspectives related to research methods and designs, to minimise subjectivity and capture the reality by emphasising avoidance of bias, human subjectivity and non-pertinent variables. This research draws its methodological approach from one such perspective, that is, the objective post-positivist paradigm.

The specific rationale for adopting this perspective is set out in this section.

Firstly, as a researcher, it was essential to have an assumption about the nature of reality and knowledge. This multidisciplinary research compelled me to undertake a context-specific investigation using a scientific approach towards what people are thinking while performing a specific behaviour. Hence, this research aimed to contribute towards advancing the theoretical knowledge of psychosocial theories, particularly the theory of planned behaviour through learning about family planning from people's behaviour. As Crotty (1998) mentioned, "things exist as meaningful entities independently of consciousness and experience, they have truth and meaning residing in them as objects" (p. 3). In the present line of inquiry, I thought that there was a need to discover several facts that were before us and to be discovered.

Secondly, post-positivism's influence on critical realism could be understood in Crotty's (1998) explanation that, "in order to come to an understanding of how people construct and maintain perceptions of the world it is important to measure reality in the naturalistic and critical form" (p. 217). Health behaviour involves social interactions at various levels that cannot be explained just by arranging facts in a chain of causality. An appreciation is needed of the diverse meanings that people place on their experience to allow an understanding of a socially constructed reality. Therefore, I investigated interactions and relationships using a conceptual framework (as explained in chapter 2) to find out what works, what solves a problem, or what helps women to make decisions. The evidence gathered through this research provided answers and moved me towards an understanding of the family planning domain. These aspects fit the post-positivist stance (Lincoln et al., 2011) that was adopted in the present research.

Thirdly, post-positivism is a value-loaded standpoint because the researcher's values could affect the research process. However, the same is not the case for positivist research (Lincoln et al., 2011). Hence, my belief about the role of values from a post-positivist perspective allowed me to distance myself from the research participants.

Finally, post-positivist research advocates a practical approach to collecting data using more than one method (Clark, 1998). Corresponding to Clark's thoughts, this research used a mixed method of data collection. To meet the research objectives, a quantitative method encompassing the post-positivist view was the predominant

method utilised in this research. A qualitative method allowed for information to be gathered in new areas to supplement the quantitative findings that would allow for better tailoring of future mobile phone-based health tools for family planning. The quantitative analysis comprised descriptive and inferential statistics and the qualitative analysis comprised classical content analysis.

3.3 Research Design

3.3.1 Factorial design

The research questions aimed to study the impact of mHealth tools on primary predictors of family planning behaviour. A 2x2 factorial design was applied to use multiple independent variables at the same time. The two independent variables were: 1) exposure to mHealth tools, with two conditions — exposed and not-exposed; and 2) contraceptive use, also with two conditions — user and non-user. Dependent variables such as beliefs, norms and behaviour control were predictors of contraceptive use.

According to Collins, Dziak, and Li (2009), a factorial design allows for presenting the simultaneous relationship between independent and dependent variables through examining both main effects and interactions. The main effect is the influence of a single independent variable upon the dependent variable, for example, measuring contraceptive belief among women exposed to mHealth tools. Similarly, an interaction occurs when the effect of one independent variable on the dependent variable varies according to the levels of another independent variable; for example, whether exposure to mHealth tools affects contraceptive beliefs and whether it varies across the users or non-users of contraceptives.

A between-subject factorial design was used to examine relationships between independent and dependent variables. Gergle and Tan (2014) point out that factorial designs can be either between subjects, within subjects, or both, in what is known as mixed factorial designs or split-plot designs. The underlying assumption of a between-subjects design is that there are small individual differences but significant differences between the groups. The benefit of between-subjects factorial design is that each participant is exposed to a single condition. As a result, it reduces the transfer of learning and knowledge across groups and thus minimises participant contamination. For example, in the present research the participants were grouped in four different

groups (discussed in section 3.4.4) assuming that they were similar on all other socio-demographic aspects. However, groups differed based on their exposure to mHealth tools and contraceptive use, along with a control group adhering to the original assumption about socio-demographic aspects. This approach prevented participants knowing about the members of the other groups and sharing their learnings from the intervention.

A between-subjects design was useful because it was easier to set up the experiment, especially with multiple independent variables. However, allocating participants into groups (A, B, C, and D) made randomisation complex (discussed in section 3.4.4). Another reason why the present research design did not have a within-subjects or any other factorial design was because participants did not have to go through multiple sessions, to reduce the chance of participant fatigue.

3.3.2 Quasi-Experiment

A quasi-experimental post-test-only approach was used in the present multidisciplinary enquiry on health behaviour. According to Harris et al. (2006) many published studies in medical informatics, infectious diseases and social sciences utilise quasi-experimental designs due to their suitability for measuring social variables. However, non-randomised designs such as the quasi-experiment, if used in research studies conducted in natural settings, lay themselves open to questions on attaining an acceptable internal validity. The following discussion explains the rationale for adopting a quasi-experimental design and the measures taken to strengthen the design.

Firstly, to establish potential links between exposure to mHealth tools (intervention) and contraceptive use (health outcomes), independent variables were not manipulated (Cook & Campbell, 1986). Thus, before measuring the dependent variables, independent variables were investigated through the segmentation of research participants, for which the participant recruitment process was carried out in several steps (explained in section 3.4.4 on sample selection). Since random assignment was not an option for these variables, a quasi-experimental design was chosen.

Secondly, in a quasi-experiment, participants are not randomly assigned to conditions (Cook & Campbell, 1986). Any post-test-only quasi-experiment consists of a treatment group and a non-equivalent comparison group. The comparison groups capture the counterfactual (Harris et al., 2006). In the present research, the treatment and comparison groups were examined from the same population using exposure and non-exposure to intervention as selection criteria. Due to sample selection from the same population, the characteristics of comparison groups were similar to the treatment groups. Hence, a systematic selection of research participants minimised differences between the groups and allowed for studying them at the same time (post-test-only).

Lastly, this research was carried out in a field setting to examine participants in their usual contexts (Cook & Campbell, 1986). Thus, the researcher had no control over the introduction of the intervention. The random assignment of research participants to either the intervention or comparison group was not possible. Moreover, since the intervention was already in progress at the time of the study, it was also not possible to carry out a pre-test to ensure equivalence at baseline. Consequently, the study relied on a post-test-only design (Gatara & Cohen, 2014). The post-test-only design allowed the researcher to evaluate the differences between the treatment groups (comprising women exposed to mHealth tools) and the comparison group (made up of women not exposed to mHealth tools).

Quasi-experiments are subjected to concerns regarding internal validity, because the treatment and control groups may not be comparable at baseline. Efforts to neutralise or minimise the threats to internal and external validity of the present research design were made through a) reducing the effect of non-randomisation, b) ensuring that non-equivalent comparison groups were formed using multiple independent variables (Sørliie & Ogden, 2014), and c) forming more than one comparison group that was a non-exposed group and internal comparison groups that included both users and non-users groups. At the same time, the elements in the design reduced the confounding variables. Confounders (that provide alternative explanations for the effects in a given study) were managed by stratified data analysis and using multivariable analysis such as ANOVA.

The present quasi-experiment adopted both quantitative and qualitative data collection. In spite of this research being a quasi-experiment, it does not support causal inferences and does not establish causal relationships between independent and dependent variables (as described in chapter 2); however, it does explain the interaction between variables through presenting their significant associations with norms, perceived behaviour control, knowledge, environmental variables, and family planning behaviour.

3.4 Research Setting and Sample

3.4.1 Location for data collection

Bihar is the third most populous state in India and accounts for 25% of the total national population. Based on 2011 India census figures, Bihar comprised 37 districts and included two metropolitan cities, 203 semi-urban and urban towns, and 39,073 rural villages. The geographical area comprising 80 villages in 58 blocks of eight districts in Bihar (Figure 3.1) was the location for data collection in the present research. The basis for the selection of these districts and blocks was the high percentage of backward caste population, the low literacy rate among women, highly flood-prone areas, and the current implementation of mHealth tools. Because the selected location also had poor maternal health indicators, including a high unmet need for family planning¹, it facilitated selection of comparison villages from the same districts. Controlling specific variables during participant recruitment (explained later) helped in reducing contamination between the groups and with other ongoing family planning activities.

¹ Unmet need for family planning: According to the World Health Organisation (1987), women with unmet needs are those who are fertile and sexually active but are not using any method of contraception, and report not wanting any more children or wanting to delay the next child. The concept of unmet need points to the gap between women's reproductive intentions and their contraceptive behaviour.

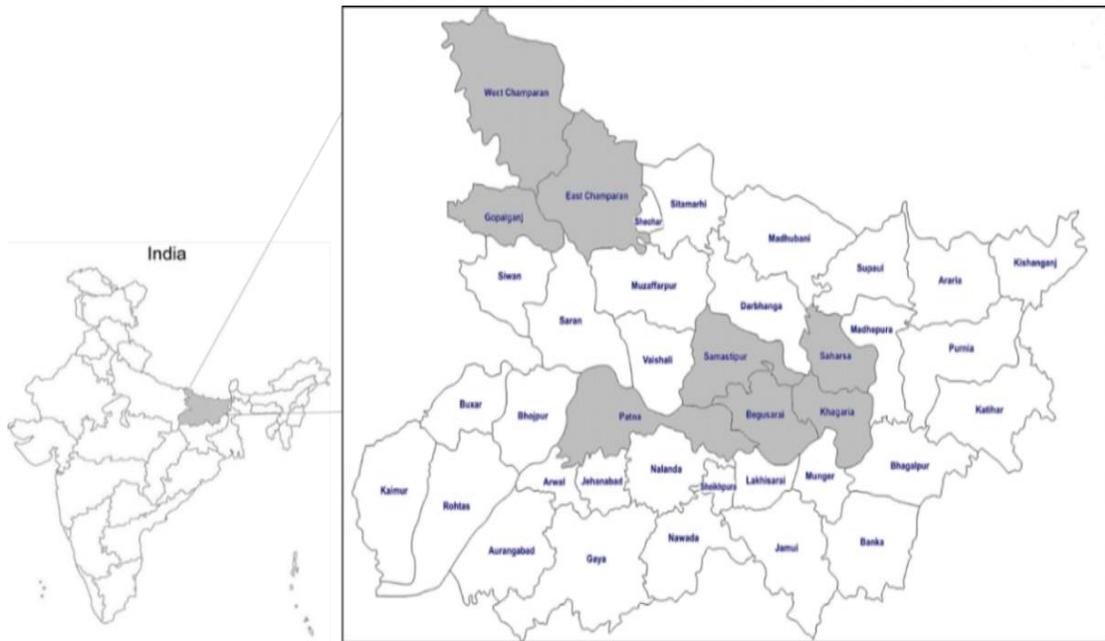


Figure 3.1 Geographical area of research

3.4.2 Characteristics of research participants

The socio-demographic profile, current use of the contraceptive method and access to a mobile phone were characteristics of research participants, as described in this section.

Demographic characteristics

As shown in Table 3.1, around 32% of research participants were pregnant at the time of the survey. Most of the women already had children, with 70% having between one and three living children, while 10% were childless. The majority of the women were Hindu (86%), and more than half (58%) belonged to the backward class. The highest proportion of research participants belonged to the poorest income quintile (71%), while only 10% were in the wealthiest quintile. A little over one-fourth of women (33%) had ever attended school (see Table 3.1).

The assessment of the household wealth status and socio-economic category was through creating a wealth index. The principal component to weight household status were the assets owned by a household and the dwelling characteristics. The total scores for each household were used to rank the individuals by dividing the sample into five quintiles representing five distinct hierarchical groups: poorest (E), poorer (D), middle (C), somewhat prosperous (B), and most prosperous (A).

Table 3.1 Demographic characteristics of the research participants (n = 767)

	N	%
Gestation		
Not Pregnant	516	67
Pregnant	251	33
Number of Children		
No Child	78	10
1—3 Children	537	70
4—6 Children	145	19
7—9 Children	7	1
Religion		
Hindu	663	86
Muslim	104	14
Caste ²		
Schedule Caste	198	26
Schedule Tribe	73	10
OBC	447	58
General	39	5
Another Caste	9	1
No Caste	1	0.1
Schooling		
No	510	67
Yes	257	34
Socio-Economic Status		
SEC A & B	80	10
SEC C	139	18
SEC D & E	548	71

² Caste is a system prevalent in India's society that can be thought of as a practised version of the varna system described in religious scriptures. The 'Forward' Castes denote the Hindu population who do not fall under 'Scheduled Caste' (SC), 'Scheduled Tribe' (ST), or 'Other Backward Castes' (OBC). 'Forward Caste' is synonymous with the 'General' class that is used often in India. The basic difference from the point of view of the Indian government is that SC, ST and OBC are positively discriminated through reservation/quotas in employment and educational institutions.

Current use of contraceptive methods

As shown in Table 3.2, the majority of research participants were using 'spacing' methods of family planning at the time of the survey. Almost one-fourth of women reported use of IUD (21%), condoms (27%) and oral contraceptive pills (26%). In contrast, fewer than one-fourth of women (19%) reported using the permanent method of family planning through female sterilisation. None of the women reported their husband having a vasectomy.

Table 3.2 Contraceptive methods currently used (N=388)

	N	%
Intra uterine device	89	21
Condoms	116	28
Oral contraceptive pill	108	26
Injectable	29	7
Female Sterilisation	79	19

An assessment of the current use of contraception included whether participants were using some contraceptive method at the time of the research, what type of method (oral contraceptive pills, condom, intra uterine device, female sterilisation, male sterilisation, injectable) and the duration of use (= < 6 months, > 6 months). The data for these two queries was obtained through self-reported information from the research participants. Family planning users in the present research were the group of women using contraceptives in the past six months or less.

Source of information on methods of family planning

Among the research participants, the popular sources of information were community health workers, for example accredited social health activists, auxiliary nurses and midwives, followed by health facilities and doctors (Table 3.3). This was measured by counting the number of times respondents mentioned each type of source.

Respondents could mention as many sources as they could remember.

Table 3.3 Number of times women mentioned different sources of information for family planning

Response option	Count
Community health workers	1570
Health facility and doctor	416
Dr Anita (lead character in mHealth tools)	112
Family members and friends	365

Access to mobile phone and internet

Of all research participants, 61% of women had access to a mobile phone and nine percent had an internet connection on their mobile phone. Of the women who had access to a mobile phone, more than one fourth (29%) owned a phone and more than half (61%) were sharing one with their husband (Table 3.4). All participants reported that they had met a health worker within the three months before the survey.

Table 3.4 Ownership of mobile phone and internet (N=540)

	N	%
Own a phone	158	29
Share husband's phone	329	61
Share within the family	53	10
Internet connection on mobile	47	9

Access to a mobile phone and internet was measured through assessing ownership or sharing of mobile devices. Questions about having a mobile phone at home and who owns it (own a phone, share with husband or family) were part of this query. The last question of the present enquiry was whether their mobile phone had internet connection.

3.4.3 Inclusion and exclusion criteria

Inclusion criteria and exclusion criteria were used to select the research participants for quantitative and qualitative data collection. According to Salkind (2010), participant inclusion criteria are critical in any research to address the research objective.

Appropriate inclusion and exclusion criteria in research optimises the external and internal validity of the study, improves feasibility, lower research costs, minimises

ethical concerns, enhances the homogeneity of the sample, and reduces confounding variables.

Methodological and ethical issues guided the inclusion and exclusion criteria. Participants' availability, the time they could devote to this research, and their ability to comprehend relevant information were essential for quality data. Women below the age of 18 and not married were excluded because the legal age of consent and marriage in India is 18 years. Anyone who fell outside the scope of the present research was not included. Having exclusion criteria enabled the researcher to administer the appropriate research tools among the relevant set of participants. The inclusion and exclusion criteria were employed before participants were invited into the survey and focus group discussions.

Other criteria for selecting primary respondents were gender, reported use of contraception, exposure to mHealth tools and literacy status. Participants in the comparison group did not have access to the mHealth tools. However other relevant dimensions (e.g., reported use of family planning methods, literacy status, living conditions and age) were similar to the treatment group. The inclusion criteria for the qualitative study was being partners of primary respondents, who were women in reproductive age living in mHealth programme areas.

3.4.4 Selecting research participants

Participants were selected using stratified sampling. Health worker estimates were generated based on the total health sessions conducted by them in the previous three months. Simple random selection of health workers was done from the sampling frame, followed by creating a list of villages serviced by the selected health workers. Second, the level of stratification occurred for research participants, where currently pregnant women and mothers of infants (6-36 months) in the health workers' catchment areas were enlisted. Stratifying the sampling frame assisted in ensuring a representative view of the usage of mHealth tools among the health workers and enabled the researcher to achieve the number of exposed and non-exposed women required for the study. Stratification assumed that the comparison group (i.e., non-exposed group) was present in catchment areas where the health worker has not used mHealth tools in the last three months as compared to the areas with higher usage of

mHealth. Figure 3.2 outlines the steps to implementing the stratified sampling frame in the present research.

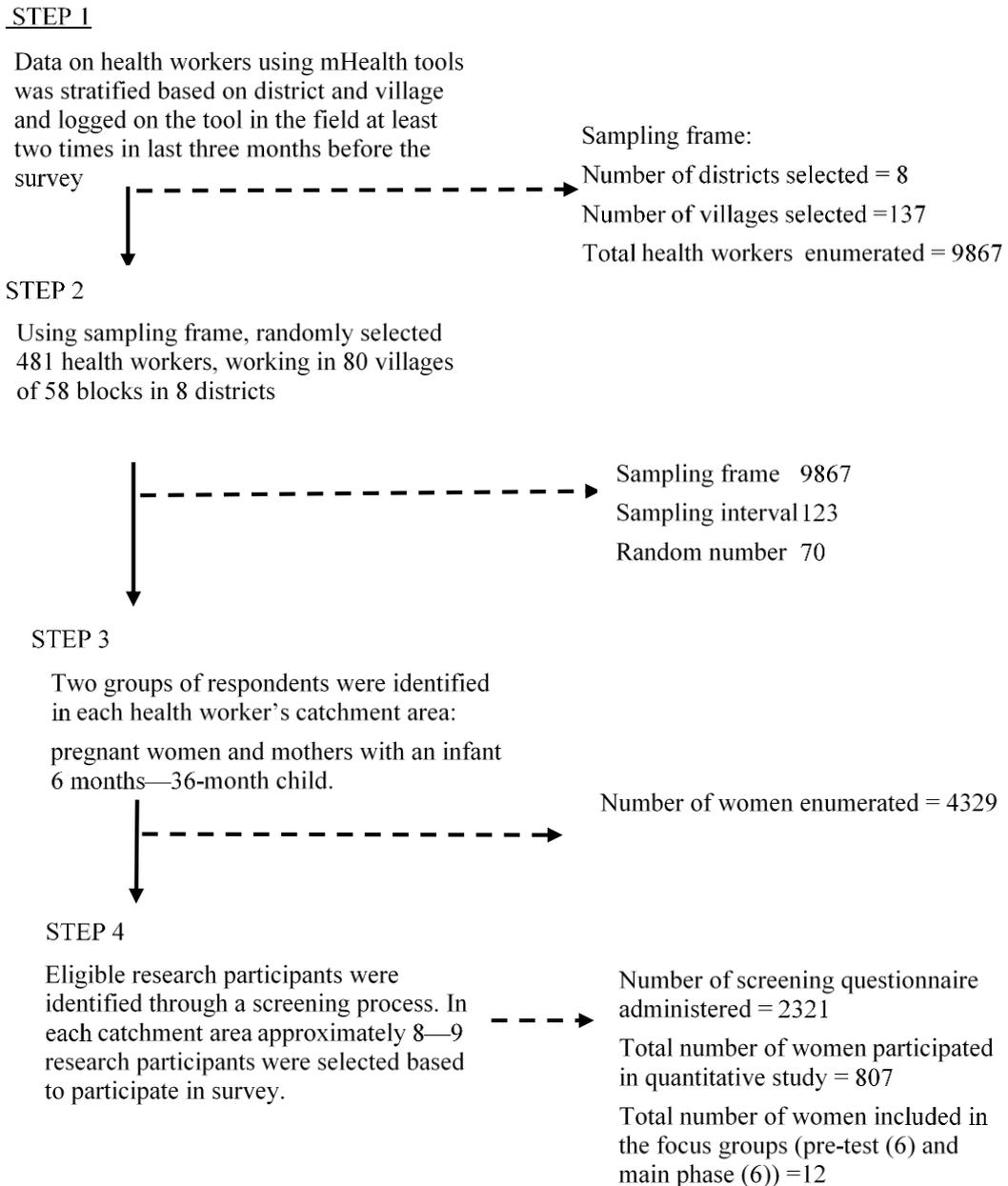


Figure 3.2 Stratified sampling plan

3.4.5 Sample size

Figure 3.3 shows the research phases, the distribution of the sample, and the sample size at various stages of the research. A total of 831 people from Bihar participated in the research. Of these, 46 women participated in the pilot phase, 40 of them in the survey and six in a focus group. The quantitative survey sample was 767, comprised of a treatment group of 378 and a comparison group of 389. Internal comparison groups

comprised 388 contraceptive users and 379 non-users. Participants made up four mutually exclusive groups based on their exposure to mHealth tools and contraceptive use. The two focus group discussions comprised six participants each. Both women and men participated in focus group discussions.

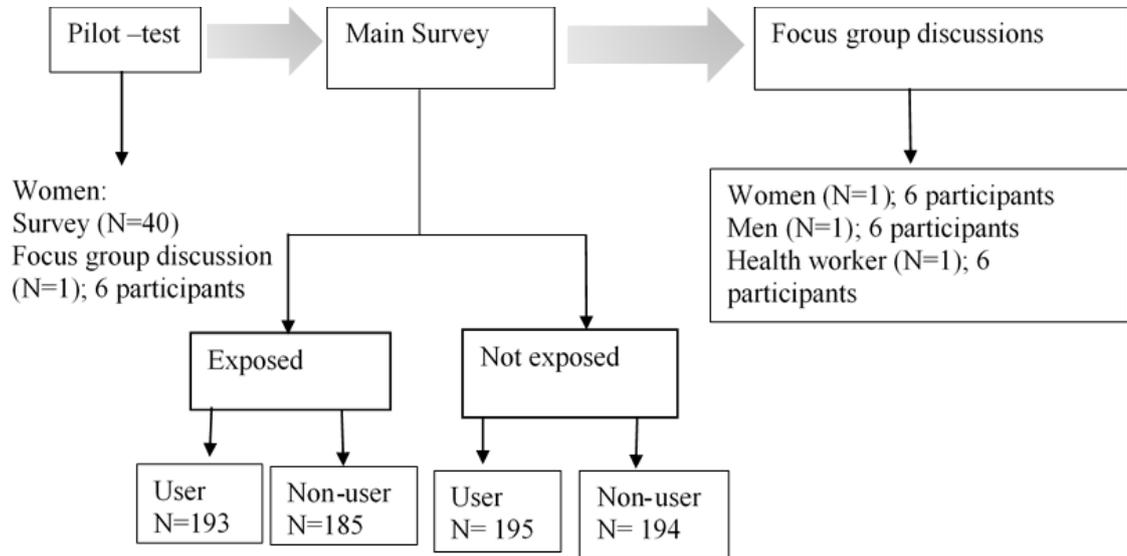


Figure 3.3 Research phases and distribution of sample

3.5 Research Instruments

Quantitative data has the potential to provide measurable evidence, establish (probable) mechanisms of process analysis and estimate changes in reciprocal causal associations over time (Creswell, Klassen, Plano, & Smith, 2011). In contrast, qualitative data provides an in-depth understanding of concepts through real-life contextual understandings and multi-level perspectives, including the impact of cultural influences. It also allows participants to express their views candidly and in detail on contentious and sensitive topics such as contraceptive use. Obtaining both qualitative and quantitative data from research participants provides richer information about reciprocal associations (Bishop, 2014). Therefore, in the present study inferences were drawn from both quantitative and qualitative data to elaborate on and further illustrate the results. Quantitative correlational data and qualitative data together helped the researcher to predict women's behaviour by understanding the impact of mobile-based health tools on various determinants of behaviour.

The survey questionnaire (Appendix A) consisted of closed-ended and Likert-type scale questions to gather quantitative data. It was adapted from the Indian government's

National Family Health Survey-3 (Indian Institute of Population Sciences & Macro International, 2007), BBC Media Action's usage and engagement study (BBC Media Action, 2015) questionnaire and the theory of planned behaviour (Francis et al., 2004). It included questions variously regarding the following: participant perception about level of engagement with health worker; the intention to receive social support for family planning; the relevance of a human interface in receiving information on family planning; knowledge, belief and use of family planning; ownership and use of various media; and the relevance of a technology interface in receiving information on family planning. Additional questions were added about exposure to mHealth tools and the current use of contraceptives. Other questions captured information regarding pregnancy, number of birth/s to date, socio-economic status, and ownership of and exposure to various media. Information on these various factors helped in gathering specific background information from research participants. The administration of research instruments employed a personal interviewing method where the questions were asked (for all participants) precisely as written, in the same sequence, and using the same questioning style.

The qualitative research used an open-ended discussion guide (Appendix B) to facilitate the group discussions. The questions in the discussion guide let the researcher gather responses on several aspects of mobile and internet use and decision-making in household matters. For example, questions were included regarding participant perceptions of the advantages of mobile phones and the internet, in what ways Indian couples decided on using a contraceptive, what couples thought about the information available on mobile phones, and insights into aspects of peoples' daily lives. All discussions were recorded and transcribed for content analysis. The findings from the content analysis are illustrated in chapter five.

3.5.1 Variables and measurement

As described in section 2.3.1, the impacts of the health worker-assisted mobile phone-based health tool were measured in the present research. These mHealth tools included components of technology and human interface. Usage and engagement study (BBC Media Action, 2015) explored the impact of human interface, that is, community health workers, on the health behaviour of women exposed to selected tools. The study showed increased trust, comprehension and acceptance of the

information women received from health workers equipped with mHealth tools. The same study also showed that tools maintained high value among health workers for the impact on workers' confidence and knowledge. As a result, health workers experienced an improved quality of interaction with women. However, there is no evidence that could explain the underlying mechanism of only technology or technology-human interface (together) and whether those could bring change in the health behaviour of women in need of family planning information and services.

Based on the constructs of the research framework as outlined in section 2.4 and Figure 2.7, the following section defines the variables and links between the theoretical conceptualisation and present example survey items for each measurement. These variables of behavioural outcomes — that is, adoption of family planning — were measured purely based on the responses given by the research participants. The research investigated multiple dependent variables, individual requirements constructs (that related to each individual's motivation and capabilities) and intervening variables.

Improved communication for family planning among various members of the family
Improved communication about family planning among various family members after receiving health information from a health worker was used as a proxy for the promoted/outcome behaviour construct in the present research. Table 3.5 outlines the measurements of the desired behaviour.

Table 3.5 Measurement of the desired behaviour

Application of construct in research	The desired behaviour is measured if a woman discusses family planning after receiving information through the mHealth tool
Type of multi-item measure	Dichotomous scored item (yes/no) and 5-point nominal scale
Example survey question	Have you ever discussed with husband regarding the desired number of children? What was the purpose of discussion?
Theory- application link	As the desired behaviour increases, individuals are more likely to perform the promoted or outcome behaviour

Receiving social support from husband, extended family and peers.

Norms are perceived pressures to comply with what an individual believes others in the social group believe about the promoted behaviour (Armitage & Conner, 2001). The construct of the social norm was applied as the support women receive from their husbands and extended family (mothers-in-law specifically) and peers. That support occurs either through the assistance a woman received in the form of instrumental support (i.e., tangible help that an individual woman receives), or informational support (i.e., help that an individual gets through information), from family members and peers (Seeman & Berkman, 1988). Table 3.6 outlines the measurements of social support used in the present research.

Table 3.6 Measurement of social support

Application of construct in research	Social support for adopting family planning: Environment around a woman reinforces her decision to adopt contraception
Type of multi-item measure	Dichotomous scores (yes/no) for multiple items 4-point nominal scale
Example survey question	Who was present when the health worker talked with you? Is your husband in favour of family planning? Is your mother-in-law in favour of family planning?
Theory-application link	As the amount of social support increases, individuals are more likely to perform the promoted or outcome behaviour

Control belief about using family planning

The investigation of women's perceived control to use a contraceptive happened through measuring their beliefs about (i) internal control factors, information, personal deficiencies, skills, abilities, and emotions, and (ii) external control factors (such as opportunities, dependence on others) and barriers. In the present research, people's expectation from contraceptives and their belief about contraceptives, formed the basis of control beliefs about using family planning. Table 3.7 and Table 3.8 outline the measurements of control belief in the present research.

Table 3.7 Measurement of control belief about *using* contraceptives

Application of construct in research (perceived control)	A woman's belief about what people expect from contraceptive use such as the consequences of adopting contraception
Type of multi-item measure	5-point Likert-type scale, scored 1 to 5 (strongly disagree to strongly agree)
Example survey question	Contraceptives can harm your womb Use of a contraceptive can make a woman permanently infertile
Theory-application link	As more favourable beliefs exist related to using family planning, individuals are more likely to perform the promoted or outcome behaviour

Table 3.8 Measurement of behavioural belief about family planning

Application of construct in research (behavioural belief)	Women's perception about belief about family planning that exists in their social group
Type of multi-item measure	5-point Likert-type scale, scored 1 to 5 (strongly disagree to strongly agree)
Example survey question	Children are God's gift, so it is a sacrilege to try and regulate that Birth spacing is women's business
Theory- application link	As more favourable behavioural beliefs exist that are related to the promoted behaviour, individuals are more likely to perform the promoted or outcome behaviour

Knowledge

Knowledge is defined here as facts accumulated through learning about objects, actions and events (Clarke, 2001). The construct of knowledge was applied through measuring women's opinions about family planning, birth spacing, the benefits of family planning, and different contraceptive methods. Table 3.9 outlines measurements of knowledge in the present research.

Table 3.9 Measurement of knowledge

Application of the construct in research	Knowledge about family planning measures, whether responses match with the idea of family planning promoted through mHealth tools
Type of multi-item measure	Nominal scale
Example survey question	What are the benefits of having a gap of three years or more between births?
Theory-application link	As knowledge increases, it can positively influence an individual's beliefs about contraceptives and their ability to use them or negotiate to use them, thus indirectly influencing desired behaviour, that is, discussion with family members

Quality of message delivery by a health worker

The present study focused on the perceived quality of messages delivered by the health worker using the mHealth tool. Quality was defined as women's judgment about the overall quality of the delivery of the content (two-way communication, relevant information, able to answer queries, and supportive) by the health worker. Empirically it was defined as the gap between the expected and perceived quality of the message delivered by the health worker. Table 3.10 outlines the measurements of knowledge in the present research.

Table 3.10 Measurement of quality of message delivery

Application of the construct in research	Quality of message delivery is measured as whether relevant information is provided by the health worker to address family planning queries asked by a woman
Type of multi-item measure	3- and 5-points ordinal scale
Example survey question	To what extent do you think the information that you received from the health worker during the last interaction was relevant to your family planning requirements?
Theory- application link	As the perceived quality of message delivery increases, it can moderate a positive influence on the individual's beliefs about contraceptives and their ability to use them or negotiate to use them, thus indirectly influencing desired behaviour, that is, discussion with family members

Quality of interaction

Quantitatively, the quality of interaction could be defined as a woman's judgement about the features of the communication between her and the health worker, such as

simple words, privacy and trust. Table 3.11 outlines measurements of the quality of interaction in the present research.

Table 3.11 Measurement of quality of interaction

Application of the construct in research	Perceived quality of interaction is achieved if a woman perceives the information given by the health worker as private, trustworthy, reliable and accessible
Type of multi-item measure	5-point Likert-type scale, score 1 to 5
Example survey question	Bipolar agree-disagree scale: I will not be ashamed of asking family planning questions of a health worker It is convenient to get health information through the health worker
Theory-application link	As the perceived quality of interaction increases, it can moderate a positive influence on an individual's beliefs about contraceptives and their ability to use them or negotiate to use them, thus, indirectly influencing desired behaviour, that is, discussion with family members

Acceptance of mobile phones

Croxson & Rowntree (2017) found that the beliefs of her social group influence a rural Indian woman's perception about mobile phones. These beliefs have a substantial effect on attitudes and behaviours relating to mobile access and use. This variable was designed to measure beliefs relating to the use of a mobile phone and its accessibility for health information. It is particularly important when considering the adoption or use of mobile technology. Table 3.12 outlines the measurements of mobile phone acceptance in the present research.

Table 3.12 Measurement of acceptance of mobile phone

Application of the construct in research	Acceptance of mobile phones is a woman's perception about mobile phones based on beliefs of her social group and belief about herself having the skills/ability to use a mobile phone for accessing health information.
Type of multi-item measure	4-point Likert-type scale, 1 to 4 (strongly disagree to strongly agree).
Example survey question	Women/men who use mobiles may become promiscuous. Getting health information on a mobile phone is convenient. I can speak privately to the doctor through the mobile phone.
Theory-application link	The more favourable beliefs about the mobile phone are, the more they can moderate the positive influence on individual requirements such as norms, perceived behaviour control and belief in family planning.

Demographic variables

Further analysis of the demographic information of research participants as described in section 3.4.2 helped in understanding the influence on predictors of behaviour.

Demographic variables (intervening variables) cannot directly, measure a sequence of cause and effect directly but may be combined with an independent variable to influence the dependent variable. These variables could have a positive influence on individual requirements such as knowledge, beliefs and perceived control.

3.6 Data Collection

For the present research the Auckland University of Technology Ethics Committee (AUTEC) granted ethics approval on 9 August 2016 (reference number 16/256).

Since the research was designed to study recipients of mHealth tools, it was essential to collect data from mHealth intervention areas. I met managers from organisations involved in funding and implementing the mHealth tool and successfully obtained approval to approach health workers. After the approval from the programme sponsor (Bill and Melinda Gates Foundation) and the implementing organisation (BBC Media Action) of the mHealth programme in India, data collection was initiated.

The large scale of the research (geographically and sample size) called for outsourcing specific tasks related to data collection. As the field work was in India, it had low operating costs. Before starting the fieldwork, an explanation of cost was provided to the AUT postgraduate office. A specialist data collection agency was involved in India

to ensure smooth field work. The field agency supported the development of the questionnaire application for the computer-assisted survey, data collection and conducting tasks such as managing field logistics, hiring field supervisors and researchers. Field supervisors were responsible for ensuring the recruitment of research participants, reviewing completed questionnaires and providing administrative support to the field researchers.

Considering the Indian social-cultural context, asking about contraceptive behaviour could make participants feel embarrassed. Hence certain steps were taken to ensure smooth data collection. Firstly, female field researchers were appointed to conduct the survey. Secondly, to show due respect for an individual's privacy, data were collected in settings where individuals did not face any unwanted interference and exposure. Thirdly, male and female focus groups were scheduled at separate locations and times. All these measures made respondents comfortable to share their experiences.

People participating in this research were not competent in English and some had limited ability to read and write. So, to respect the vulnerability of participants, all the research instruments and consent forms were bilingual and back-translated with questions in the Hindi language. All the questions were in clear and straightforward Hindi language, as appropriate to the participants' profile. Secondly, all the field researchers were hired from the research areas where they were familiar with the geography and dialect. According to local practice and approval from AUTECH, financial compensation (in Indian rupees) was paid to participants to acknowledge that the participant has taken time away from other obligations and may have incurred expenses, such as transportation or childcare, to meet the researchers.

Steps were also taken to reduce respondent bias. Family planning is a personal matter and participants might try to present themselves in the best possible light, potentially leading to social desirability bias. This bias involves respondents answering questions in a way that they think will lead to being accepted and liked by the researchers. In the present research this bias was minimised during focus groups through focusing on unconditional positive regard. This included phrasing questions to show it was acceptable to answer in a way that was not socially desirable. Indirect questioning included asking about what others think, feel and how they will behave. This approach

allowed focus group participants to project their own feelings onto others and still provide honest, representative answers. Due to my experience in family planning programmes, it was essential to mitigate the researcher bias during data collection. Accordingly, I tried to carry out the present research with a neutral and objective mind. I also pilot-tested the research instruments to reduce measurement bias.

3.6.1 Pilot-testing research instruments

The pilot-testing of research instruments helped in establishing the validity and reliability of the questionnaire. A focus group discussion and administration of the paper-based questionnaire were used to gather pilot data. For recruitment of the research participants, health worker visits to villages were used as a point to contact women. Pregnant women and mothers form the majority of a health worker's clientele because these groups have a high chance of adopting family planning. Hence the recruitment of participants happened in less time instead of selecting participants from the general population. All the women who showed interest in participating in the research were contacted at a time and place that was suitable to them. A consent form and project information sheet were administered in writing and explained verbally to the participants (Appendix C and D) to ensure voluntary and informed participation. Potential participants did not receive any follow-up invitations. However, a follow-up invitation for health workers was undertaken on a one-on-one basis.

To minimise errors during pilot-testing the research instruments, the principal researcher visited various field locations with the team of field researchers and their supervisors. Being with field teams helped the principal researcher in obtaining clarity on participants' perspectives. During these field visits, the principal researcher moderated focus group discussions with men, women and health workers. 'On-the-job' feedback was given by the principal researcher to the field researchers on improving the quality of data collection. After collecting the data, I gathered the completed paper-based questionnaires from field researchers and later prepared and organised the data for analysis. The pilot-testing of research instruments allowed for determining the suitability of questionnaire content and structure, and question structure and order. After analysing observation notes, focus group discussion notes, quantitative data and descriptive data, top-line findings and recommendations were concluded from the pre-test phase. Recommendations from the pilot-test were

incorporated in the development of the research instruments for the full-scale phase and helped in standardising the research instruments.

Recommendation from pilot-test phase

Screening and recruitment of research participants

Screening and recruitment questions were required to capture exposure to mHealth tools, contraceptive use and the ages of research participants. Hence, participant screening criteria were altered to age, contraceptive use and exposure to mHealth tools in the last three months. Having separate documents for screening and the questionnaire itself was leading to participant fatigue and mismanagement in the field. Accordingly, screening questions were merged with the main questionnaire and a survey questionnaire was developed for all four groups of research participants. Use of a 'skip' logic³ helped in asking the right questions with each participant group.

Standardising the structure of the survey questionnaire

There was a need to improve the sequencing of questions for a smooth flow of interaction between field researchers and participants. To make this happen, careful editing of response options, the 'skip' pattern, and question filters in the questionnaire were carried out by the principal researcher. For example, pre-test results suggested that among the research population abortion was used commonly as a method of birth control. Thus, abortion was included as a response option to the question on birth spacing.

Language of the questionnaire

The use of any language other than the regional dialect limited participants' ability to comprehend questions. Thus, recruitment of field researchers and supervisors was done from mHealth project areas, as those workers were familiar with local dialects as well as Hindi and the regional language.

Formulating questions

Pilot-testing allowed for assessment of the relevance of each question in relation to the research questions and hypotheses. Additional qualitative statements were introduced based on the focus group responses, including beliefs about

³ Skip logic is a feature that changes what question research participant is asked next based on how they answer the current question. Also known as "conditional branching" or "branch logic," skip logic creates a custom path through the survey that varies based on a respondent's answers.

contraceptives, intention to discuss family planning, and beliefs about the mobile phone. The limited use of spacing methods and widespread use of female sterilisation by women among pre-test participants matched the national data (Indian Institute of Population Sciences, 2017). Adoption of limiting methods happens after women experience multiple pregnancies, abortion, poor health, poor care of children, or are among a lower socio-economic group with poor financial conditions. Based on these various recommendations, response options were changed and questions rephrased.

Creating information areas

Focus group findings from the pre-testing showed that women would like to hear health messages through mobile phones used by a health worker (combination of human interface and technology), since a woman trusts the messages given by frontline health workers using a mobile phone. Moreover, this makes her feel pleased with the solution provided for her health problems. This key finding gave women the confidence to make behavioural statements on health workers, that is, human and technology interface through a mobile phone.

Combining quantitative and qualitative methods was used to present both theoretical and empirical progress drawn from analysing the primary data. Research settings and recruitment processes were similar to those used in the pilot phase.

3.6.2 Quantitative data collection

The processes and tasks involved in conducting the survey are outlined below in the order in which they were undertaken.

Development of a questionnaire application (App) for computer-assisted personal interviews

The integration of the paper-based research instruments (i.e., survey questionnaire along with project information sheet and consent form) into a software application was the first step towards developing a quantitative data collection instrument. A handheld device — a tablet installed with the research questionnaire app — was used by the field researchers to carry out face-to-face survey interviews. The computer-assisted personal interview is a recent method, gaining in popularity, where the field researcher uses an electronic device (tablet, smartphone or laptop computer) to move through the interview and record responses (Cindy, 2015; Dray, Dunsch, & Holmlind,

2016). The elements of utilisation and data quality in the computer-assisted personal interview are outlined in the Table 3.13.

Table 3.13 Computer-assisted personal interview as a method of collecting quantitative data for research

Elements of computer-assisted personal interview	Application in this research
Template design	Based on the standardised questionnaire, a data collection template was designed by an application developer. The loading of this template onto the devices of the field researcher enabled the recording of data from the interview on to the device.
Question types	The questionnaire form in the present research allowed for capturing single responses, multiple-choice responses, location and signature.
Hardware	Tablets were used by every field researcher to perform structured interviews for the survey and record responses.
Data collector training	Training of field researchers was less time-consuming because 'skip' patterns and field validation were taken care of by the data-collection device.
Data entry	The data was instantly digitised as it was entered into the tablet.
Quality control	The flow of questions was automated within the app, so the field researcher did not need to decide which question comes next. Many quality control measures were possible with computer-assisted surveying, such as checks and set constraints on answer ranges. The data was available right away in a digitised format to look for any other problems.
Data cleaning	A data cleaning process began after the first day of surveying.
Transportation & storage	Surveys were transported via the internet, then stored on a hard drive.
Time to data	Field teams securely uploaded data to a server on a nightly basis and collated data was available by day two of data collection.

Training of field researchers

The training of 11 people as field researchers and supervisors was facilitated by the principal researcher. Classroom training was followed by a day of field work for testing the functionality of the questionnaire application and the tablets. The outsourced field agency identified a team of field researchers and supervisors, as described in section 3.6 and 3.6.1, and organised the training venue and training logistics such as tablets uploaded with the questionnaire app.

Fieldwork

Quantitative data collection started with a team of researchers visiting villages and meeting selected health workers (as explained in section 3.4.4). Researchers accompanied health workers during their visit to the service users. Health workers typically conducted group meetings comprised of 10–12 women per group. That is, rather than conducting door to door visits, the field researchers contacted participants from these group meetings with health workers. After the completion of the health worker meeting, researchers introduced themselves, provided brief information about the research project, and made contact with women interested in participating in the research. The time and place for the meetings for the survey were arranged to suit the women. To ensure voluntary and informed participation, consent forms and project information sheets were administered through the tablet-based application and their contents were explained verbally to the participants.

After gaining consent, screening questions were asked in order to apply inclusion and exclusion criteria (as explained in section 3.4.3), and all those who met the inclusion criteria were then administered the survey questionnaire using computer-assisted personal interviewing (as described in the section above). Field teams uploaded data securely to a server managed by the outsourced agency on a daily basis and data was available to the principal researcher on the shared drive. To ensure the quality of data collection, the principal researcher personally visited 10 villages and observed researchers administering the questionnaire. Feedback was given to the field team using a checklist and observation notes. The outsourced agency provided twice-a-week status updates comprised of a weekly route plan of the field teams, the number of survey interviews conducted, types of respondent, and names of villages and districts covered. The status update helped in monitoring the fieldwork carried out by the outsourced agency.

Data entry

The outsourced agency shared a completed data set after five days of data collection. After the review and feedback from the principal researcher the agency provided cleaned data by putting it in the right template (provided by the researcher). Later, using the Statistical Package for Social Sciences (SPSS), the principal researcher created a cleaned data set by assigning values, variables cases and re-coded data.

3.6.3 Qualitative data collection

Venue selection

Group discussions with women and men were organised at the village level in a government building (either a school or a health facility) with prior approval from the responsible authority at the district and village level. The rationale behind choosing public places was that, at the village level, participants belonging to different strata of society were comfortable to come to these places compared to going to a private house for a group meeting. Measures were put in place so that individuals did not face any unwanted interference and exposure. These measures were necessary for the comfort and respect of an individual's privacy. Participants were informed in the beginning about the non-identifying clause and that their information would not be available to anyone who was not directly involved in the research.

Conducting focus groups

As with the survey, female field researchers were hired to recruit participants for the focus groups. The inclusion criteria for participants was the same as described in section 3.4.3. The principal researcher supervised participant recruitment. After obtaining consent from the participants, invitations were sent to join the principal researcher at the pre-selected venue at a time convenient for all participants. The principal researcher moderated the groups. These group discussions were recorded after taking consent from participants and tapes were later transcribed for content analysis.

3.7 Data Validation and Reliability

A good research design allows for drawing correct inferences about the covariation between the treatment variables. Risks to validity could influence accurate conclusions. The main kinds of validity are internal, external and construct validity. Internal validity refers to whether the effects observed in a study are due to the manipulation of the independent variable and not some other factor. External validity, containing procedural variables, represents how well the research generalises to a particular population. Construct validity refers to the extent to which a test captures a specific theoretical construct or trait, and it overlaps with some of the other aspects of validity (Creswell, 2012; Creswell et al., 2011; Sørli & Ogden, 2014). In the present

research, threats to internal validity were minimised through ensuring controlled, random assignment of research participants (as explained in section 3.4.4) and having a post-test-only quasi-experiment design (section 3.3.2). The approach to minimising threats to construct validity was through defining constructs used in the research framework, and discussing links between the theoretical conceptualisation, intervention application and possible influences on behaviour, as described in section 3.5.1.

Because the ongoing implementation of the selected mHealth tool for one group was compared to a control group, this could present a threat to the generalisability of the research findings. Possible threats to internal validity in the present research could be that the two groups were non-equivalent or that there could be differences in the intentions, attitudes, perceptions of behavioural control, and social norms surrounding those who do and do not adopt new technologies. These differences might result in confounding variations in contraceptive use. There may be other factors driving behaviour indicators, and therefore this research explored a variety of such factors as well. Another threat to validity in this research was that data was self-reported by the research participants. The method of self-reporting might create cognition among the respondents who were not exposed to mHealth tools, evoking socially desirable answers among the non-contraceptive users, rather than revealing their pre-existing state of mind.

Data reliability is a measure of the stability or consistency of data, or the ability of the research findings to be repeatable. It is important to have measures or observations in research instruments that can help in gathering reliable data. The pilot-testing of research instruments (as explained in 3.6.1) helped in establishing the validity and reliability of the questionnaire to derive results. During data collection, a streamlined process of administration of these instruments was ensured through the standardisation of research instruments (after the pre-test). As a result, the instrument had clear and unambiguous questions. Section 3.8 below gives some more information on the steps taken to ensure data reliability.

3.8 Planned Data Analysis

After completing fieldwork, the principal researcher had a cleaned quantitative data set and audio tapes from focus group discussions for analysis. The relationship between the findings of the quantitative and qualitative data was used to understand behavioural patterns reflecting the continued use of mHealth services and the degree of fulfilment of one's family planning needs and requirements through mHealth tools. Quantitative data was analysed using SPSS and the researcher manually analysed the qualitative data.

3.8.1 Quantitative analysis

With the data set built, the researcher began the process of analysing the data to address the research hypotheses. Firstly, for all questions, the researcher identified the response rates and response bias by creating a table for percentages of response to the survey and wave analysis response bias. Secondly, descriptive analysis such as measures of central tendency, were used for each question on the instrument. The descriptive analysis helped to identify the general trends in the data. Analysed data from questions about personal factors was used to develop a demographic profile of the research participants. Thirdly, findings were presented using the detailed results and inferential analysis. Data was analysed using inferential statistics to address research hypotheses by comparing groups and relating variables. The strength of relationships between variables was measured using correlational statistical procedures such as Chi-square test (where p is .05 or less), factor analysis, correlation analysis, and ANOVA (between-subject). Quantitative results are presented in chapter 4.

3.8.2 Qualitative analysis

The process of content analysis involved transcribing the audio tapes from the focus group discussions. A pragmatic content analysis of qualitative data was carried out using the directed content analysis approach for coding (Hsieh & Shannon, 2005). In directed content analysis, the initial coding scheme is defined prior to data analysis. In the present research, codes were derived from the research framework (as discussed in chapter 2 and 3). The main steps of content analysis included: reading transcripts as a whole to have a feel for the essence of participants' descriptions of experiences of

family planning and mobile phone use; using the predictors of behaviour (from the research framework Figure 2.7) as the initial coding categories; selecting participants' quotes supporting the particular coded category; reflecting on the central ideas extracted and synthesising participants' perceptions; and converting participants' experience of family planning and mobile phone use into a narrative. The data was grouped in ways that provided insights about women's and men's respective experience of family planning and mobile phone use. Chapter 5 presents relevant quotes illustrating individual experiences to support the identified themes. Although the qualitative analysis did not involve a full-scale thematic analysis, it has been used to augment the quantitative analysis, and to represent the discussion and general conclusions. An interpretation of quantitative and qualitative results is summarised in the discussion chapter (chapter 6).

Chapter 4 Quantitative Data Analysis and Findings

4.1 Chapter Outline

Chapter 4 outlines the research hypothesis and describes the method of measuring the variables, along with the descriptive statistics and inferential statistical analysis from quantitative data that were associated with the hypothesis. Figure 4.1 provides an overview of the integrated research framework, depicting potential relationships between various predictors of behaviour and associated hypotheses. The analysis and findings of the quantitative data is based on theory-based evaluation to observe paths of impact created by mHealth tools. These findings are further illustrated through qualitative data that are presented in chapter 5.

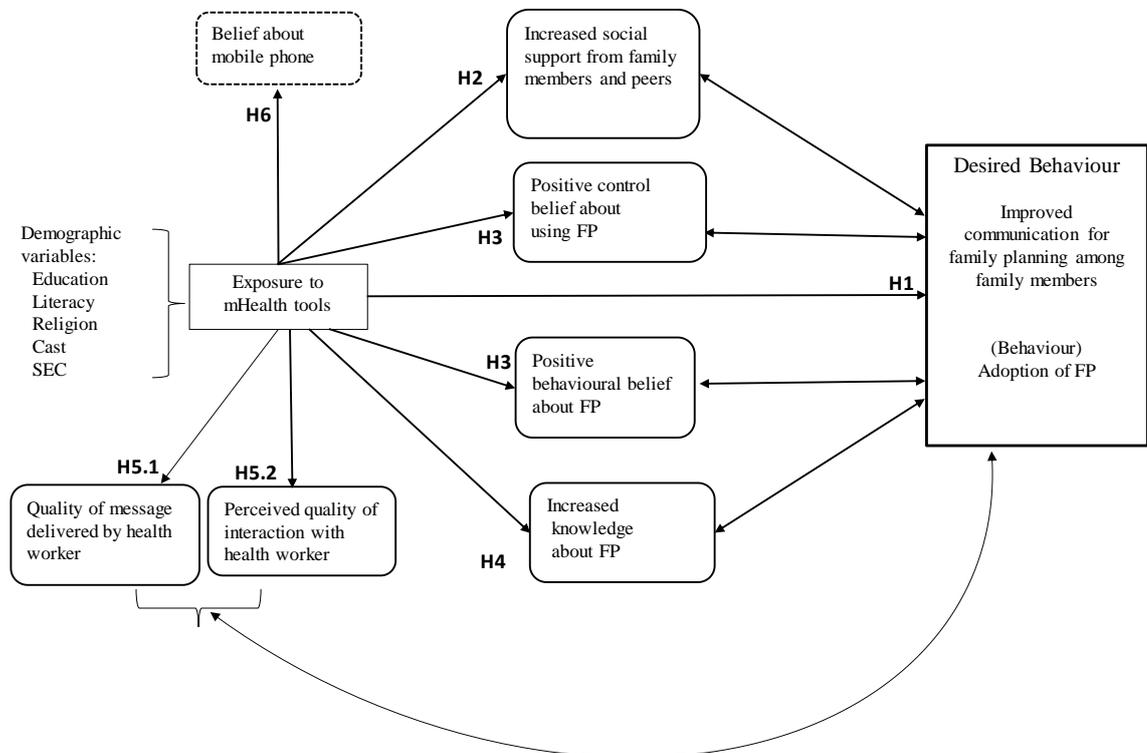


Figure 4.1 Research Hypothesis Framework

The data analysis in this chapter evaluates the extent of the influence that predictors of behaviour (beliefs, social norms, perceived behaviour control, and outcome behaviour) have on a woman's decisions about family planning. Quantitative data gathered from women who were either exposed or not exposed to mHealth tools were analysed to compare the difference in predictors of behaviour between the two groups. Within these comparison groups, there were internal comparison groups based on the current use of contraception, that is, users and non-users (section 3.3.1).

A quantitative questionnaire was used to assess measures of behaviour among these groups. Statistical analysis was used to measure variables such as the proportion of women discussing family planning after meeting the health worker, social support and awareness about family planning, and to distinguish between the possible effect of exposure to mHealth tools and contraceptive use. T-tests were used to analyse the relationship between selected variables and exposure to mHealth tools. The average scores of exposed and non-exposed groups were compared in order to assess the knowledge about family planning among the research participants. The relationship between exposure to mHealth tools and factors of positive behaviour belief about family planning, quality of interaction with the health worker and beliefs about mobile phones, were tested through between-subject ANOVAs. Data analysis in this chapter allowed findings as to whether exposure or non-exposure to mHealth tools is associated with predictors of family planning behaviour.

4.2 Hypothesis 1: Women exposed to mHealth tools are more likely to discuss family planning with their family members and peers as compared to women who are not exposed to those tools ('non-exposed')

As described in section 2.4.1, women's discussion of family planning after meeting the health worker was used as predictor variable to measure the desired behaviour, that is, improved communication for family planning among family members. Figure 4.2 shows the explanatory variables used to measure the relationship between improved communication for family planning among various family members and contraceptive use as a desired behaviour.

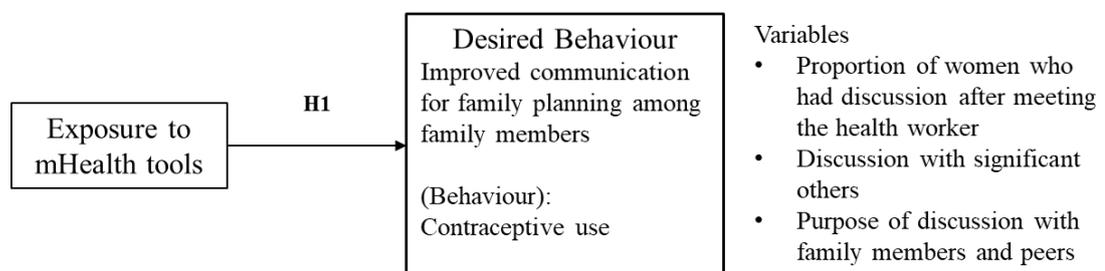


Figure 4.2 A measure of the desired behaviour

4.2.1 The proportion of women who had discussion after meeting the health worker

Figure 4.3 shows that 40% of women discussed family planning after exposure to mHealth tools, which was significantly more than those in the non-exposed group $\chi^2(1, N = 239) = 18.78, p < .01^*$. However, there was no significant difference between the contraceptive user and non-user groups, where slightly more non-users (53%) than users discussed family planning (50%). Moreover, a two-way contingency table analysis showed no interaction between discussing family planning, exposure to mHealth tools and contraceptive use, $\chi^2 = .32, p = .57$. It was apparent that having a discussion about family planning after meeting a health worker was related to exposure to mHealth tools.

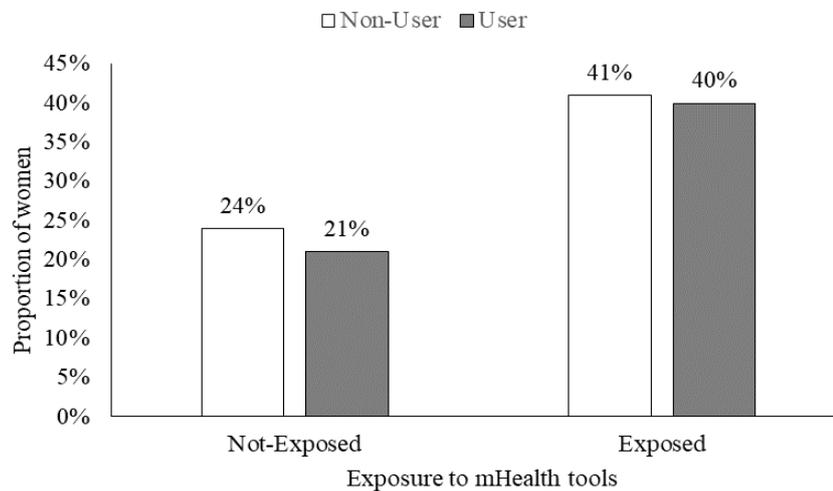


Figure 4.3 The proportion of women who discussed family planning

4.2.2 Discussion with significant others after meeting the health worker

As a follow-up to the above question, participants in all groups were asked to indicate with whom they discussed family planning. Figure 4.4 shows the proportion of women who discussed family planning with various family members and their peers. In the exposed groups, more than one third of participants discussed family planning with their partners/husbands (79%), a little over half with their mother-in-law (53%), and more than one quarter with a sister-in-law (28%). However, among non-exposed groups, fewer than half of the participants discussed family planning with their husband/partner (44%), and almost one quarter with their mother-in-law (24%). Among both groups, very few discussed family planning with a sister-in-law or their

friends. Participants' own mothers were a less frequent choice for discussion among both exposed and non-exposed groups.

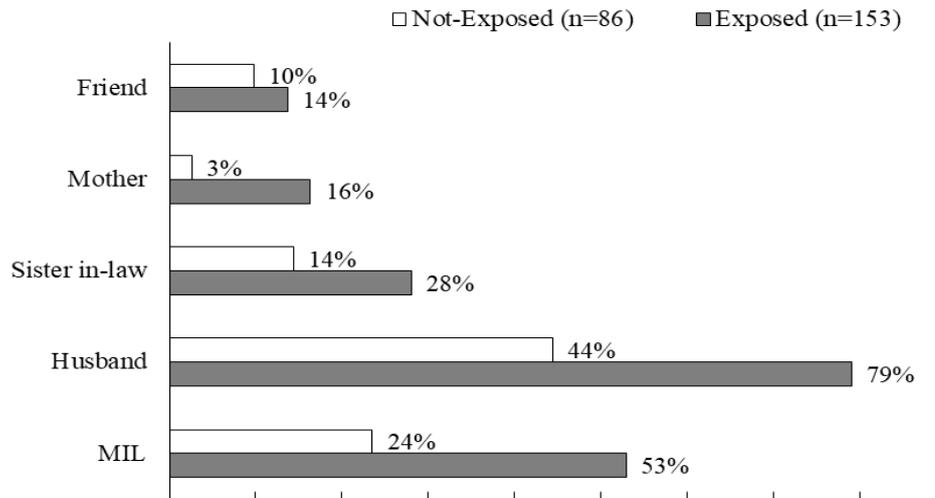


Figure 4.4 The proportion of women who discussed family planning with various people

One-way chi-square goodness of fit was used to test the main effect of exposure to mHealth tools on discussion with family and friend/s. Statistical tests were used to determine whether the effect was greater, less or remained unchanged across the various groups of participants. Test results were significant for discussion with mother-in-law, husband, sister-in-law and own mother, as the mean difference is significant among the two groups (see Table 4.1). Hence, a post-meeting discussion with mother-in-law, husband, sister-in-law and/or own mother was more among women in the exposed group as compared to the non-exposed group.

Table 4.1 Difference between exposed and non-exposed groups on discussion with family members and peers

	Main Effect of Exposure	Sig.
Mother-in-law	$\chi^2(1, N = 117) = 17.30$	$p < .01^*$
Husband	$\chi^2(1, N = 189) = 14.86$	$p < .01^*$
Sister-in-law	$\chi^2(1, N = 65) = 6.78$	$p < .01^*$
Mother	$\chi^2(1, N = 29) = 15.20$	$p < .01^*$
Friends	$\chi^2(1, N = 36) > .09$	$p = .31$

*. The mean difference is significant at the .05 level.

**. The mean difference is significant at $< .001$ level.

Data analysis using a two-way contingency table showed whether exposure to mHealth tools led to any discussion with family and friend/s among women using contraceptives. The variables were a post-meeting discussion with a family member or friend, exposure to mHealth tools, and contraceptive use. There was a significant interaction between exposure to mHealth tools and contraceptive use on discussion with mother-in-law, $\chi^2 = 3.65$, $p = .05^*$ and husband $\chi^2 = 3.75$, $p = .05^*$. This means that there was bigger effect of exposure on users than on non-users. However, there was only a marginal significant interaction of independent variables on post-meeting discussion with sister-in-law $\chi^2 = 3.44$, $p = .06^\dagger$. The interaction of contraceptive use and exposure was not measured for mothers-in-law because the cell size was smaller than five for certain groups

A t test was conducted to evaluate the difference between the means of exposed and non-exposed groups on improved family planning communication. The test variables were discussion with mother-in-law, husband and/or sister-in-law, and the grouping variable was exposure to mHealth tools. The t-test evaluates whether the mean value of the test variable for one group differs significantly from the mean value of the test variable for any other group.

The data in Table 4.2 indicates that, on average, more women in the contraceptive user group talked to their mother-in-law after being exposed to mHealth tools ($M = .61$, $SD = .49$) than those in the non-exposed group ($M = .35$, $SD = .48$). Similarly, on average, more women in the user group talked to their husbands after being exposed to mHealth tools ($M = .83$, $SD = .37$) as compared to non-users ($M = .65$, $SD = .48$). The test results were significant and matched the hypothesis.

Table 4.2 The simple effect of exposure to mHealth tools on discussion with mother-in-law, husband and/or sister-in-law among users of contraceptives

	t Test	Sig.
Mother-in-law	t (115) = 2.73	$p < .01^*$
Husband	t (115) = 2.23	$p < .05^*$
Sister-in-law	t (115) = .95	$p = .34$

* The mean difference is significant at the .05 level.

** The mean difference is significant at < .001 level.

4.2.3 Purpose of discussion with family members and peers

This question was a follow-up question for participants who discussed family planning with someone. Figure 4.5 shows women discussed family planning to seek approval or the opinion of family members or friends, or to verify information provided by the health worker. Figure 4.5 shows the differences between the exposed and non-exposed groups.

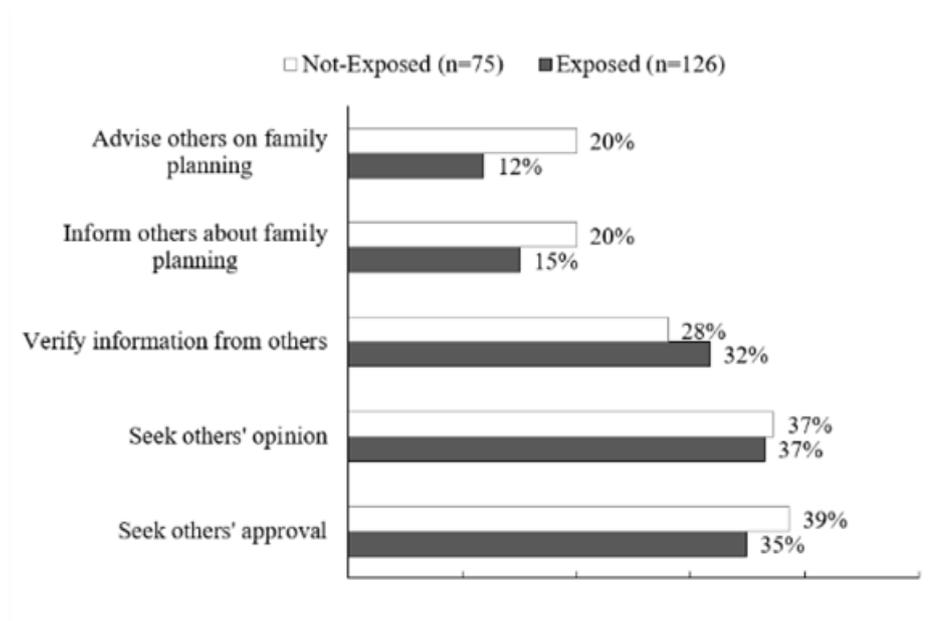


Figure 4.5 The proportion of women who discussed family planning for various purposes

A one-way chi-square goodness of fit tested the main effects of exposure and contraceptive use on the purpose of discussion, in particular whether the effect of exposure was more, less, or remained unchanged, among various groups of participants. Table 4.4 shows that mean difference was significant for seeking an opinion and verification of information. Hence more women in the exposed group sought opinions and verification of information than those in the non-exposed group. However, having a discussion to seek approval was marginally more common among women in the exposed group than those in the non-exposed group. A further test showed that the purpose of discussion remained unchanged between user and non-user groups.

Table 4.3 Difference between exposed and non-exposed groups on purpose of discussion

	Main Effect of Exposure	Sig.
Seek approval from others	$\chi^2(1, N = 73) = 3.08$	$p = .07^\dagger$
Seek another's opinion	$\chi^2(1, N = 74) = 4.37$	$p = .03^*$
Verify information from others	$\chi^2(1, N = 61) = 5.91$	$p = .01^*$
Inform others about family planning	$\chi^2(1, N = 34) = .47$	$p = .49$
Advise others on family planning	$\chi^2(1, N = 30) < .01$	$p > .99$

*. The mean difference is significant at the .05 level.

**. The mean difference is significant at < .001 level.

†. The mean difference is marginally non-significant at the .05 level.

A two-way contingency table analysis measured the interaction between exposure and contraceptive use and evaluated if any of the mentioned purposes of discussion (in figure 4.5) among users and non-user groups was associated with exposure to mHealth tools. The variables measured were post-meeting discussion, exposure to mHealth tools and contraceptive use. The result showed a significant interaction between exposure to mHealth tools and contraceptive use on the purpose of discussion to verify information, $\chi^2 = 6.83, p < .01^*$ (all other p 's > .05).

4.2.4 Result summary for hypothesis 1

In summary, the above results indicate that more women in the exposed group discussed family planning with their partner than those in the non-exposed group, with the purpose of seeking an opinion about contraceptives or verifying the information provided by the health worker. The results also showed that exposure to mHealth tools is associated with women having discussion with husbands and mothers-in-law. Similarly, the verification of information was significantly impacted by women's exposure to mHealth tools and contraceptive use.

4.3 Hypothesis 2: Perceived social support to use family planning is higher among women exposed to mHealth tools.

As the literature review suggests, a couple's joint contribution to decision-making influences utilisation of maternal health care and better reproductive health behaviour. Joint participation represents an inclusive, consultative and shared responsibility. This functionally suits Indian culture where women's status is traditionally attached to men's. For this study, social support is described as a woman's belief about the support she receives from her husband and mother-in-law to use

family planning. As shown in Figure 4.6, to test this hypothesis three explanatory variables were measured: a) people who accompany the research participant at the health worker meeting; b) support received from husband; and c) support from the mother-in-law. Support to use a contraceptive was measured among all the participants.

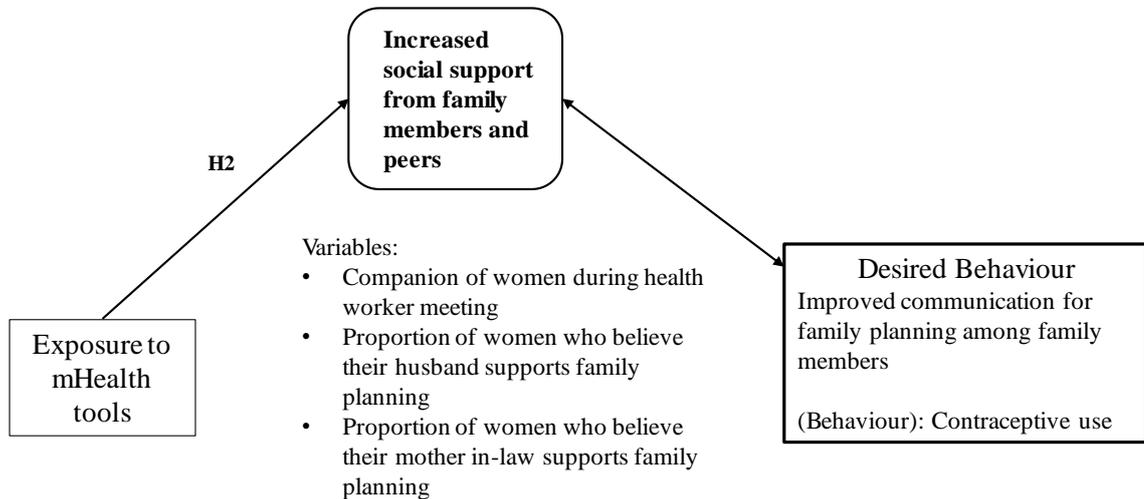


Figure 4.6 Measures of social support

4.3.1 Companion of women during health worker meeting

This section of the questionnaire asked participants to give information on their relationship with people who accompanied (may or may not be participating) them during the discussion with the health worker (either at the health facility or home). More than half (54%) of participants in the exposed group were accompanied by their mother-in-law, more than one third were accompanied by their husband or were by themselves (35%). In contrast, more women were by themselves (45%) in the non-exposed group, and fewer women were accompanied by their mother in-law, husband or sister-in-law than those in the exposed group (Table 4.4).

No significant difference was present among the women in user and non-user groups on companion choice during the health worker meeting. Similarly, there was no significant difference between exposed and non-exposed groups on companion choice during the health worker meeting. However, significantly more women in the exposed group were accompanied by peers (other women of their profile) than those in the non-exposed group $\chi^2 (1, N = 42) = 6.09, p = .01^*$ (all other p 's > .05). Given that the count size is small for peers (as shown in table 4.4) a chi square test may not be reliable.

Table 4.4. Difference between exposed and non-exposed groups on women being accompanied by various people during meeting with health worker

	Exposed (N=378)	Non-Exposed (N=389)	Main Effect	Sig.
	%	%		
Husband	35	34	$\chi^2 (1, N=265) = .00$	$p = .95$
Mother-in-law	54	48	$\chi^2 (1, N=393) = .73$	$p = .39$
Sister-in-law	29	24	$\chi^2 (1, N=200) = 1.28$	$p = .25$
Peers	8	3	$\chi^2 (1, N=42) = 6.09$	$p = .01^*$
Own mother/sister	3	2	$\chi^2 (1, N=19) = .05$	$p = .81$
Unaccompanied	35	43	$\chi^2 (1, N=301) = 3.61$	$p = .05^*$

*. The mean difference is significant at the .05 level.

** . The mean difference is significant at < .001 level.

A two-way contingency table analysis indicated that there were no interactions between exposure and contraceptive use on this variable.

4.3.2 Social support from husband

To gather data on support from husbands, research participants were questioned on: a) whether she (the research participant) ever discussed family planning with her husband; b) if the husband listened attentively and discussed the topic of family planning; and c) whether they had ever discussed the desired number of children they wanted to have? If women answered 'yes' to any of the above questions, then they were asked if their husband supported family planning. Data for all questions was in a 'yes' or 'no' form. The total number of women who said 'yes' to husband support is shown in Table 4.5.

A two-way, chi-square test was conducted to determine the pattern of women saying 'yes' and 'no' between the groups. Overall the results below suggest that husbands' support for contraceptive use did not become greater as a function of mHealth tools.

Table 4.5 Husband supports contraceptive use

	Yes (count)	No (count)	TOTAL
Exposed	155	78	233
Non- Exposed	163	66	229
TOTAL	318	144	462

Husband supports contraceptive use among women exposed to mHealth tools

A two-way, chi-square test was conducted. The result of the test was significant, $F(1, 233) = 30.34, p < .01^*$. Women in the group saying, 'yes their husband supports contraceptive use' was significantly greater than women saying 'no'.

4.3.3 Social support from mothers-in-law

Participants were asked about the support they received from their mother-in-law. Data was collected in 'yes' and 'no' form. Among the exposed group 51% of non-users and 76% of users perceived their mother in-law supporting them in family planning. However, among the non-exposed group, 42% of non-users and 69% of users perceived their mother in-law supporting them in family planning (Table 4.6).

Table 4.6 Number of women who perceive their mother in-law supports family planning

	Non-Exposed	Exposed
Non-User	81 (N = 194)	95 (N = 185)
User	135 (N = 195)	146 (N = 193)

A significant main effect of contraceptive use was found for perceived support from one's mother in-law, $\chi^2(1, N = 457) = 24.12, p < .01^*$. Perceived support from the mother-in-law was greater among women using contraceptives than non-users. However, there was no significant difference between the exposed and the non-exposed groups.

4.3.4 Result summary for hypothesis 2

The results suggest that social support from one's husband and mother in-law was similar between exposed and non-exposed groups. However, support from peers was associated with women's exposure to mHealth tools. These results indicated that

women in the exposed group perceived support from their husband. However, the husband's support to use contraceptives did not become greater as a function of women's exposure to mHealth tools. Similarly, perceived support from the mother-in-law was greater among women using contraceptives than among non-users. More women in the exposed group than those in the non-exposed group were accompanied to health worker discussions by young mothers (similar profile).

4.4 Hypothesis 3: Positive behavioural beliefs about family planning are found among women exposed to mHealth tools

Hypothesis 3 tests whether exposure to mHealth tools had any impact on behaviour control and belief about family planning behaviour in question that is using family planning. As described in chapter 2, belief about contraceptives is women's perception of beliefs that exist in their social group about family planning. These views may lead to the perceived positive or negative consequences of using contraceptives and the subjective values or evaluations of the consequences. In contrast, behavioural control is the perception of ease or difficulty to conduct the behaviour. Figure 4.7 is a visual representation of the direction of this hypothesis.

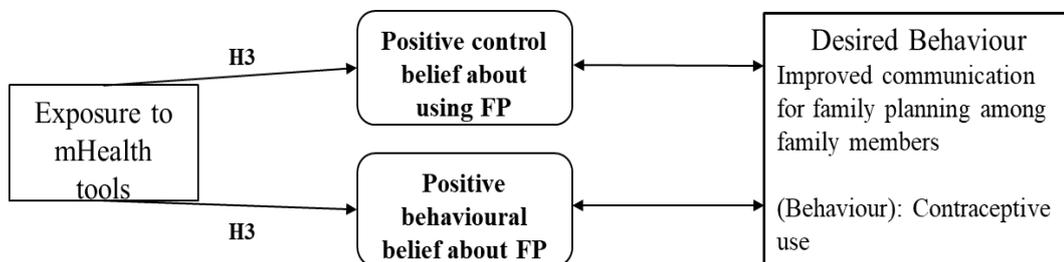


Figure 4.7 Measures of positive control and behavioural belief about family planning

Factor analysis and item analysis using the reliability procedure

The 15 questionnaire items included measures on internal control, information, personal shortcomings, skill, ability, emotion, and external control factors such as opportunities, dependence on others, and barriers to the use of family planning. These measures were analysed using principal axis factor analysis. Three criteria were used to determine the number of factors to rotate: a priori hypothesis that the measure was unidimensional; the scree plot; and the interpretability of the factor solution. The scree plot indicated that the initial hypothesis of unidimensionality was not supported. Based on the plot, two factors were rotated using a direct oblimin rotation procedure.

Table 4.7 shows the rotated solutions, yielding two interpretable factors: 1) normative and control belief; and 2) consequences of adopting contraception. The normative and control belief factors accounted for 46% of the item variance, and the consequences of adopting contraception belief accounted for 12.3% of the item variance. Even though the two items (contraceptives can produce deformed babies, and contraceptives are dangerous to women's health) are loading high on factor one, that is, the normative factor, I chose to put them in factor two because conceptually they fit better with the consequences of adopting contraception.

Table 4.7 Correlation between awareness, belief and use of family planning items and factors

Items	Factor	
	Normative and control belief	Consequences of adopting contraception belief
<i>Normative and control belief items</i>		
Children are god's gift, so it is a sacrilege to try and regulate childbirth.	.88	-.13
Condom interferes with sexual pleasure.	.79	.03
Birth spacing is women's business.	.76	-.06
A man should not have to worry about family planning.	.74	.00
Abortion is cheaper than using a contraceptive.	.69	.13
There is no need to use a contraceptive, as women can get an abortion.	.68	.13
Women choose not to adopt a method of family planning till they have a boy.	.58	-.05
<i>Consequences of adopting contraception belief items</i>		
Contraceptives can produce deformed babies.	.51	.39
Contraceptives are dangerous to women's health.	.43	.37
Contraceptives can harm the womb.	-.16	.92
People who use contraceptives end up with health problems.	-.16	.85
Use of a contraceptive can make a woman permanently infertile.	.09	.76
Contraceptives reduce women's sexual urge.	.21	.66
Abortion is convenient as compared to contraceptive use.	.33	.56
Contraceptives can cause cancer.	.28	.55

Coefficient alpha was computed to obtain the internal consistency estimate of reliability for the two resulting belief scales. The Cronbach's alpha for normative and control belief scale was .89. Similarly, Cronbach's alpha for the consequences of adopting contraception belief scale was .90.

4.4.1 Normative and control beliefs about family planning

A 2 (exposed vs non-exposed) x 2 (user vs non-user) between-subject analysis of variance (ANOVA) was conducted to evaluate the effect of exposure to mHealth tools (IV1) and usage of contraceptives (IV2) on women's normative and control beliefs about family planning (DV). The between-subject factors were exposure to mHealth tools with two levels—exposed and non-exposed—and contraceptive use with two levels—user and non-user. Table 4.8 shows mean scores for four groups of participants.

Table 4.8 Mean and standard deviation of beliefs about family planning by groups

	Exposed <i>M (SD)</i>	Non-Exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	3.69 (0.92)	3.78 (0.92)	3.74 (0.89)
Non-User	3.48 (0.98)	3.57 (0.85)	3.52 (0.91)
Total	3.59 (0.92)	3.67 (0.89)	

On average, women's normative and control beliefs about family planning did not significantly differ for the exposed ($M = 3.59$) or non-exposed ($M = 3.67$) groups. However, normative and control beliefs were less for women in the user group ($M = 3.74$) as compared to the non-user group ($M = 3.52$). Thus, a significant main effect of contraceptive use on belief about family planning was found $F(1,767) = 10.63, p < 01^*$, $\eta_p^2 = .01$. There was no significant interaction between exposure to mHealth tools and the usage of contraceptives on beliefs about family planning.

4.4.2 Beliefs about the consequences of contraception

Between-subject ANOVA was conducted to evaluate the effect of exposure to mHealth tools and usage of contraceptives on women's beliefs about the consequences of contraceptive use. Mean scores for four groups are shown in Table 4.9.

Table 4.9 Mean and standard deviation of beliefs about consequences of contraceptives by groups

	Exposed <i>M (SD)</i>	Non-Exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	3.59 (0.98)	3.78 (0.95)	3.71 (0.96)
Non-User	3.64 (0.98)	3.54 (0.90)	3.57 (0.93)
Total	3.62 (0.98)	3.66 (0.93)	

On average, women's beliefs about the possible negative consequences of contraceptive use did not differ significantly between women in the exposed ($M = 3.62$) and non-exposed groups. In contrast, on average, beliefs about the possible negative consequences of contraceptive use was lower among women in the user group ($M = 3.71$) than in the non-user group ($M = 3.57$). Thus, a significant main effect of contraceptive use on women's beliefs about the consequences of contraceptive was found where $F(1,767) = 4.55, p < .01^*, \eta_p^2 = .01$. There was no significant interaction between the exposure to mHealth tools and contraceptive use on beliefs about the consequences of contraceptive use.

4.4.3 Result summary for hypothesis 3

These results indicate no main effect of exposure to mHealth tools on the given predictor of behaviour. However, there was a significant difference between women in the user and non-user groups. As a result, a significant main effect of contraceptive use could be seen on both the factors' that is, belief about the consequences of contraceptives, and normative and control beliefs about family planning. More women in the non-user group believed in the possible negative consequences of using contraceptives than those in the user group. However, the women in the user group demonstrated more positive normative beliefs about family planning than the non-user group.

4.5 Hypothesis 4: Increase in knowledge about family planning is positively related exposure to mHealth tools

The increase in knowledge about family planning was assessed to see if the research participants' responses matched with the idea of family planning that was promoted through mHealth tools. This assessment was included to (1) indicate how closely

women’s awareness about family planning and contraception matched the promotional content in the mHealth tools and (2) evaluate whether increased awareness could have an impact on desired behaviour—that is, improved communication with others for family planning.

As shown in Figure 4.8, to test this hypothesis the following explanatory variables were measured among research participants: 1) rationale for family planning (limiting, spacing, or both); 2) perceived ideal gap between subsequent births; 3) perceived benefits of family planning; 4) awareness of contraceptive used for limiting births; and 5) awareness of contraceptive used for spacing births.

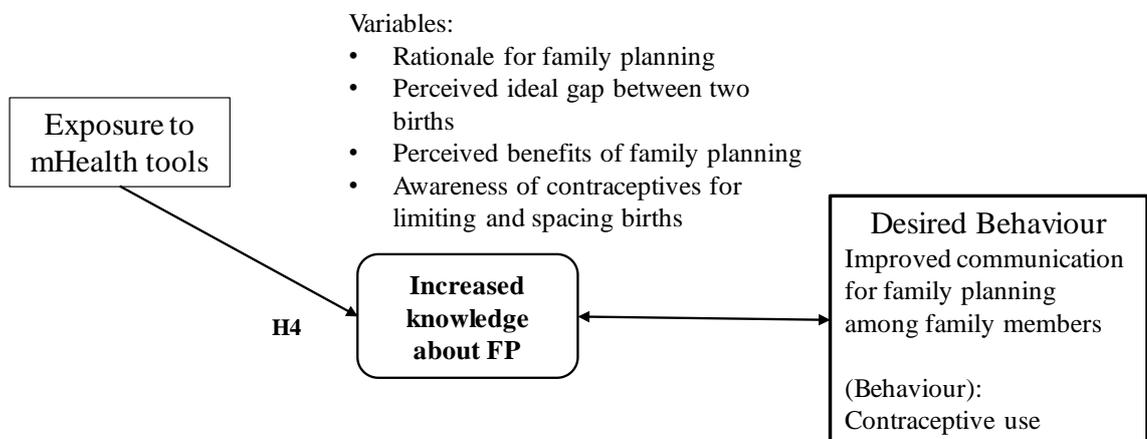


Figure 4.8 Measures of increase in family planning knowledge

4.5.1 Rationale for family planning

People’s rationale for family planning may differ across individuals. For example, a couple who desire to have a gap between their children could consider it as a medium for spacing, whereas a couple who had achieved their desired number of children could consider it as a medium for limiting childbirth. This variable measured the proportion of people who had a rationale for family planning. Family planning rationale was assessed by asking ‘what family planning means’ to research participants. There were three response options – limiting, spacing, both limiting and spacing, and do not know. A score was given for each response, for example, limiting = 1, spacing = 1, limiting and spacing = 1 whereas, a score of 0 was given to the ‘do not know’ response. Mean scores for the four groups of participants are shown in Table 4.10.

Table 4.10 Mean and standard deviation of rationale for family planning by groups

	Exposed <i>M (SD)</i>	Non-Exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	0.95 (0.22)	0.83 (0.38)	0.89 (0.31)
Non-User	0.88 (0.33)	0.74 (0.44)	0.81 (0.39)
Total	0.91 (0.28)	0.79 (0.41)	

A 2 (exposed vs non-exposed) x 2 (user vs non-user) between-subject ANOVA was conducted to evaluate the effect of exposure to mHealth tools and contraceptive use respectively on women's rationale for family planning. On average, more women in the exposed group associated some rationale with family planning ($M = .90$) than those in the non-exposed group ($M = .79$). That is, a significant main effect of exposure was found, $F(1,767) = 24.40$, $p < .01^*$, $\eta_p^2 = .03$. On average, more women in the user group did associate some rationale with family planning ($M = .89$) than those in the non-user group ($M = .81$). Thus, a significant main effect of contraceptive use was also found, $F(1,767) = 10.06$, $p < .01^*$, $\eta_p^2 = .01$. There was no significant interaction between mHealth tools, contraceptive use and the rationale for planning a family.

Beliefs about an ideal gap between subsequent births

Women were asked, 'according to them, what is the ideal gap between two children. The score of the dependent variable was 1 (2 years to > 4 years) and 0 (< 1 year to 2 years). The mean scores and standard deviation of the four groups of participants are shown in Table 4.11.

Table 4.11 Mean and standard deviation of knowledge about ideal gap between births by groups

	Exposed <i>M (SD)</i>	Non-Exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	0.98 (0.14)	0.95 (0.22)	0.96 (0.19)
Non-User	0.97 (0.18)	0.89 (0.32)	0.93 (0.26)
Total	0.97 (0.16)	0.92 (0.28)	

A between-subject ANOVA was conducted to evaluate the effect of exposure to mHealth tools and contraceptive use on knowledge about the ideal gap between subsequent births. On average, more women in the exposed group ($M = .97$) than non-

exposed group ($M = .92$) reported > 2 years as ideal gap. Similarly, more women in the user group ($M = .96$) reported > 2 years as ideal gap than non-user group ($M = .93$). A significant difference was found between exposed and non-exposed groups $F(1,767) = 11.74, p < .01^*, \eta_p^2 = .01$ and between users and non-user groups, $F(1,767) = 5.14, p < .01^*, \eta_p^2 < .01$. There was no interaction between mHealth tools, contraceptive use and women's view of an ideal gap between births.

4.5.2 Perceived benefits of family planning

All participants were asked about the benefits of having a gap of three years or more between children. The score of the variable was between 0 and 1. Depending on the number of benefits mentioned, a score was given to each participant (0 = no benefits, .25 = at least one benefit, .50 = two benefits, .75 = three benefits, 1 = four benefits). The closer the mean score is towards one, the more benefit that was perceived by the groups. Mean scores for the four groups of participants are shown in Table 4.12.

Table 4.12 Mean score of perceived benefits of family planning by groups

	Exposed <i>M (SD)</i>	Not- Exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	0.50 (0.26)	0.57 (0.29)	0.54 (0.28)
Non-User	0.49 (0.27)	0.48 (0.26)	0.49 (0.27)
Total	0.50 (0.27)	0.53 (0.28)	

A between-subject ANOVA was conducted to evaluate the effect of exposure and contraceptive use on the perceived benefits of family planning. On average, the perceived benefits of family planning did not differ significantly between the exposed ($M = .50$) and non-exposed ($M = .53$) groups. However, on average, women in the user group perceived significantly more benefits ($M = .55$) than the non-exposed ($M = .49$) group. That is, a significant main effect of contraceptive use was found $F(1,767) = 6.80, p < .05^*, \eta_p^2 < .01$. There was a significant interaction between exposure and usage of contraceptive on perception about the benefits of family planning, $F(1,767) = 3.72, p < .05^*, \eta_p^2 < .01$.

On average, a perception that there were benefits to family planning, was more common among users not exposed to mHealth tools ($M = .57, SD = .02$) than among

exposed users ($M = .50$, $SD = .02$). Hence, the simple effect of exposure to mHealth tools on the perception of the benefits of family planning was significant ($t(763) = 6.18$), $\eta_p^2 < .01$. However, there was no difference among the exposed and non-exposed non-users on perception of the benefits of family planning.

4.5.3 Knowledge of limiting contraceptive methods

This section of the questionnaire asked participants to give information about the methods available to stop having children (limiting). It was a multiple response question. Scores were given for each correct response (female sterilisation = .50, male sterilisation = .50) and all other responses; that is, intrauterine device, condom, contraceptive pills, injectable contraceptive, abortion, 'not aware of any method', and 'no response' were scored zero. The maximum score was one, and the minimum score was zero. Mean scores for the four groups of participants are shown in Table 4.13.

Table 4.13 Mean and standard deviation of knowledge about limiting contraceptives by groups

	Exposed <i>M (SD)</i>	Non-exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	0.48 (0.37)	0.50 (0.45)	0.49 (0.42)
Non-user	0.55 (0.54)	0.49 (0.50)	0.52 (0.52)
Total	0.52 (0.46)	0.49 (0.48)	

A between-subject ANOVA was conducted to evaluate the effect of exposure to mHealth tools and the use of contraceptives, on knowledge about contraceptive methods for limiting births. On average, none of the groups differed significantly from one another (exposed $M = .52$ and non-exposed $M = .49$), and currently using contraceptives and not using $M = .52$. There was no significant interaction between the exposure to mHealth tools and the use of contraceptives on knowledge of contraceptive use for limiting births.

4.5.4 Knowledge of contraceptive methods for spacing

This section of the questionnaire asked participants to give information on the methods available for keeping a gap between children (spacing). Multiple responses were possible. Scores were given for each correct response (intra-uterine device = .25, condom = .25, OCP = .25, injectable contraceptive = .25) and zero to all other

responses (that is female sterilisation, male sterilisation, abortion, 'not aware of any method' and 'no response'). For this question, the maximum score was one, and the minimum score was zero. Mean scores for the four groups of participants are shown in Table 4.14.

Table 4.14 Mean and standard deviation of knowledge about spacing contraceptives by groups

	Exposed	Non-exposed	Total
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
User	0.66 (0.25)	0.62 (0.30)	0.64 (0.28)
Non-user	0.60 (0.32)	0.59 (0.32)	0.59 (0.32)
Total	0.63 (0.29)	0.60 (0.30)	

A between-subject ANOVA was conducted to evaluate the effect of exposure to mHealth tools and the use of contraceptives on the knowledge of contraceptive methods for spacing.

On average, the knowledge of contraceptive methods for spacing did not differ significantly between the exposed ($M = .63$) and non-exposed ($M = .60$) groups. However, on average, women in the user group knew more methods of birth spacing ($M = .64$) than the non-exposed ($M = .59$) group. That is, a significant main effect of contraceptive use was found $F(1,767) = 4.86, p = .02^*, \eta_p^2 < .01$. There was no significant interaction between the exposure to mHealth tools and the use of contraceptives on the knowledge of contraceptive use for spacing births.

4.5.5 Result summary for hypothesis 4

The above results showed that participants' rationales for family planning matched with the ideas promoted through mHealth tools. On average, women in the exposed group had a better understanding than those in the non-exposed group. Similarly, women in the non-user group reported less understanding than users about the benefits of family planning. Exposure to mHealth tools and contraceptive use do have some impact on women's perception about the benefits of family planning or knowledge of limiting contraceptive methods. However, contraceptive use does have a significant relationship with women's knowledge about contraceptive methods for spacing birth.

4.6 Hypothesis 5.1: Quality of message delivered by health worker appeals more to women exposed to mHealth tools than those not exposed.

As described in Chapter one (section 1.4), health workers form an essential part of family planning service delivery. Objectively, this hypothesis was aimed at investigating a woman's judgement about the features of the communication between her and the health worker, that is, the quality of the message. There was an assumption that communication supports a woman's judgement about the overall excellence or effectiveness of the health worker. To test this hypothesis, two variables were measured: a) relevance of the information provided; and b) the ability of the health worker to address queries.

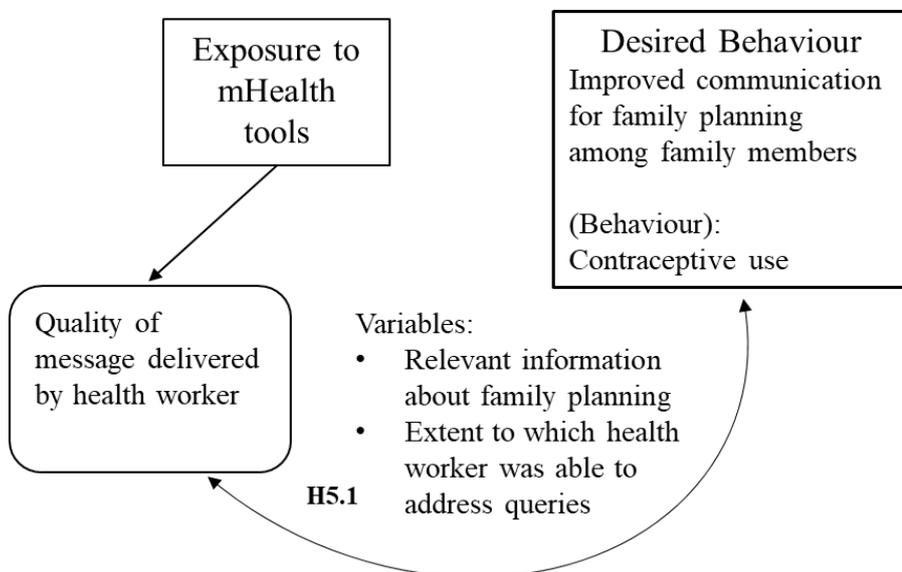


Figure 4.9 Measures for health worker appeal

4.6.1 The relevance of family planning information received from the health worker

A 2 (exposed vs non-exposed) x 2 (user vs non-user) between-subject ANOVA was conducted to evaluate the effect of exposure to mHealth tools and use of contraceptives on the relevance of information received from a health worker on family planning. The rating of the dependent variable was 1 to 3 (not at all relevant, somewhat relevant and completely relevant). Mean scores for the four group of participants are shown in Table 4.15.

Table 4.15 Mean and standard deviation of relevance of family planning information received from health worker by groups

	Exposed <i>M (SD)</i>	Non-Exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	2.55 (0.63)	2.47 (0.59)	2.51 (0.61)
Non-User	2.17 (0.70)	2.14 (0.76)	2.16 (0.73)
Total	2.37 (0.69)	2.31 (0.70)	

On average, exposed ($M = 2.37$) and non-exposed ($M = 2.31$) groups did not differ from each other. However, more women in the user group ($M = 2.51$) than non-users ($M = 2.16$) found relevance in the information they received from health workers. A significant effect of contraceptive use was found where $F(1,767) = 54.22$ and $p < .001^{**}$, $\eta_p^2 = .06$. There was no significant interaction between exposure and contraceptive use on women finding relevance in the information provided by the health worker.

4.6.2 The extent to which the health worker could address queries

A between-subject ANOVA was conducted to evaluate the effect of exposure to mHealth tools and use of contraceptive on perceived extent to which the health worker was able to address queries on family planning. The score of the dependent variable was from 1 to 5. Mean scores for the four groups are shown in Table 4.16.

Table 4.16 Mean and standard deviation of the extent to which health worker could address queries by groups

	Exposed <i>M (SD)</i>	Non-Exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	4.28 (0.97)	4.32 (0.98)	4.30 (0.97)
Non-User	4.07 (1.08)	4.06 (1.22)	4.07 (1.15)
Total	4.18 (1.03)	4.19 (1.11)	

On average, exposed ($M = 4.18$) and non-exposed ($M = 4.19$) groups did not differ from each other. However, the mean score for the user group was $M = 4.30$ as compared to non-users $M = 4.07$. That is, there was a significant difference between users and non-users as to the effectiveness of the health worker in addressing queries on family planning, $F(1,767) = 9.34$, $p < .01^*$, $\eta_p^2 = .01$. This meant that more women in the

user group felt that the health worker was able to address their queries adequately. There was no significant interaction between exposure and contraceptive use on women finding relevance in the information on family planning that they received from health workers.

4.6.3 Result summary for hypothesis 5.1

The above results suggested that, on average, the appeal of messages delivered by the health worker was similar between exposed and non-exposed groups. However, there was a significant difference between the user and non-user groups. More women in the user group found that the health workers provided relevant information and were able to address queries, whereas non-users did not feel that the health worker provided relevant information.

4.7 Hypothesis 5.2: Women exposed to mHealth tools perceive the quality of interaction with the health worker better than those not exposed

As described in chapter two (section 2.4.6), objectively this hypothesis was aimed at evaluating research participants' judgement about features of their communication with the health worker, with an assumption that the communication supports a woman's perception about the overall excellence or effectiveness of the health worker. The features were evaluated by measuring two factors, that the health worker is: a) a private and trustworthy source; and b) a reliable and accessible source.

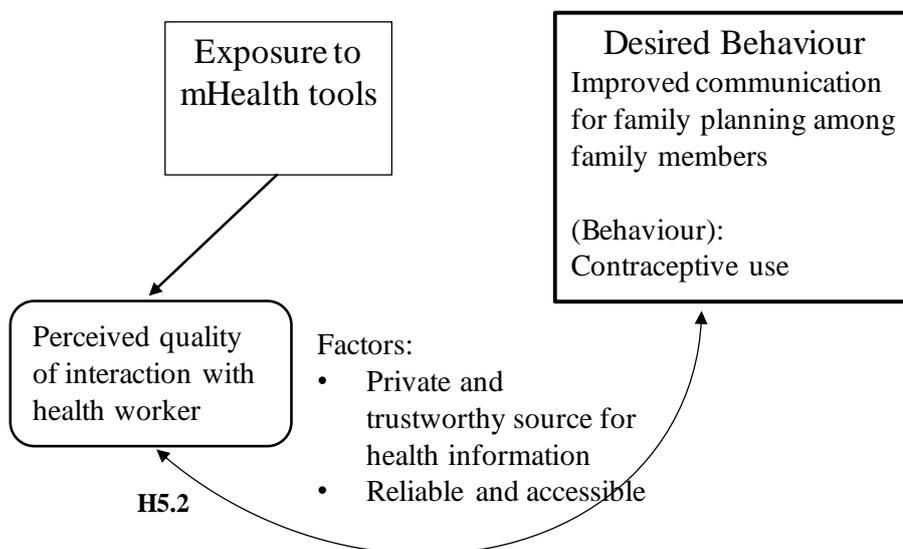


Figure 4.10 Measures of quality of interaction with a health worker

4.7.1 Factor analysis and item analysis using the reliability procedure

The 11 items from the perceived quality of interaction with the health worker measure were analysed using principal axis factor analysis. Three criteria were used to determine the number of factors to rotate – an a priori hypothesis that the measure was unidimensional, the scree plot and the interpretability of the factor solution. The scree plot indicated that the initial hypothesis of unidimensionality was not supported. Based on the plot, two factors were rotated using a direct oblimin rotation procedure. Table 4.17 shows the rotated solutions, yielding two interpretable factors – a) private and trustworthy source of health information, and b) a reliable and accessible information source. The private and trustworthy source of health information factor accounted for 32% of the item variance, and the reliable and accessible source accounted for 14% of the item variance.

Table 4.17 Correlation between perceived quality of interaction with health worker items and perceived quality factors

Items	Factors	
	Private and trustworthy source of health information	Reliable and accessible source
<i>Private, trustworthy source of information</i>		
Health information received through health worker is trustworthy.	.72	.03
I can talk privately to a health worker.	.70	.03
Health workers are a source of information for health matters.	.67	< .01
Health workers protect personal information.	.65	< .01
A health worker gives information according to health requirements.	.58	.03
Getting health information through the health worker is convenient.	.55	-.04
New health information is accessed through a health worker.	.53	< .01
I will not be ashamed of asking family planning questions to a health worker.	.26	-.47
<i>Reliable and accessible source of information</i>		
I do not believe messages by a health worker.	.03	.84
It is difficult to access information through health workers.	.05	.78
Health information given by health worker is unreliable.	.02	.74

Coefficient alpha was computed to obtain an internal consistency estimate of reliability for the two resulting perceived interaction quality scales. The Cronbach's alpha for private and trustworthy source of health information scale was .80. Similarly, Cronbach's alpha for a reliable and accessible source scale was .82.

4.7.2 Private and trustworthy source of information

A between-subject ANOVA was conducted to evaluate the effect of the exposure and the use of contraceptives on women's perception about the quality of interaction with the health worker as a private and trustworthy source of information. Mean scores for the four groups of participants are shown in Table 4.18.

Table 4.18 Mean and standard deviation of private and trustworthy sources of information by groups

	Exposed <i>M (SD)</i>	Non-Exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	4.03 (0.68)	4.03 (0.67)	4.03 (0.68)
Non-User	3.98 (0.74)	3.95 (0.71)	3.97 (0.72)
Total	4.01 (0.71)	3.99 (0.69)	

There was no significant effect of exposure (exposed $M = 4.0$) and contraceptive use (user $M = 4.0$) on the perception of health workers as a private and trustworthy source. There was no significant interaction between exposure to mHealth tools and contraceptive use on perceived quality of interaction with the health worker as a private and trustworthy source of information.

4.7.3 Reliable and accessible

A between-subject ANOVA was conducted to evaluate the effect of exposure to mHealth tools and use of contraceptives on women's perceptions of interactions with the health worker as reliable and accessible. Mean scores for four groups of participants are shown in Table 4.19.

Table 4.19 Mean and standard deviation of health worker as reliable and accessible by groups

	Exposed <i>M (SD)</i>	Non-exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	3.25 (1.21)	3.24 (1.15)	3.25 (1.18)
Non-User	3.32 (1.23)	3.21 (1.24)	3.27 (1.23)
Total	3.29 (1.22)	3.23 (1.19)	

There was no significant effect of exposure (exposed $M = 3.29$) and contraceptive use (user $M = 3.25$) on women's perceptions of the interaction with a health worker as reliable and accessible. There was no significant interaction between exposure to mHealth tools and contraceptive use on the perceived quality of interaction with the health worker as reliable and accessible.

4.7.4 Result summary for hypotheses 5.1 and 5.2

The above results suggest that exposed and non-exposed groups did not differ from each other on the perceived quality of the features of interaction with the health worker. Similarly, there was no significant difference between the user and non-user groups and their perceptions of the interaction with the health worker as reliable and accessible or private and trustworthy.

4.8 Hypothesis 6: Receiving health information on mobile phone changes women's perceptions of mobile phones

Women's beliefs about mobile phones formed an integral part of this research. This focus allowed for an understanding of the social norms around women using mobile phones and their perceived control in using a mobile phone. As described in section 2.4.7, due to cost and cultural barriers, women are commonly denied mobile phone and internet use by 'gatekeepers' such as husbands and in-laws. Hypothesis 6 investigated women's perceptions of mobile phones based on the beliefs of her social group and belief about herself having the skills or ability to use a mobile phone for accessing health information (Figure 4.11).

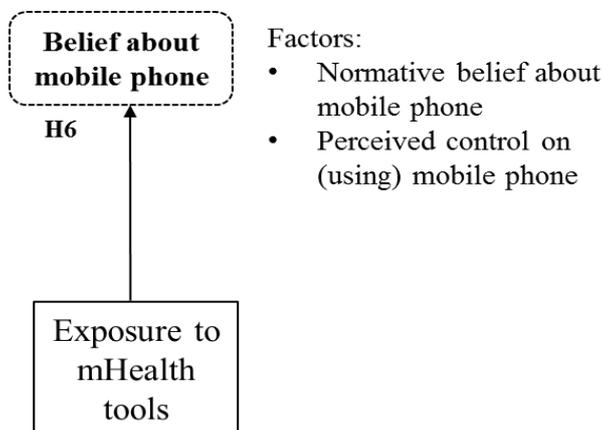


Figure 4.11 Measures of beliefs about mobile phones

4.8.1 Factor analysis and item analysis using the reliability procedure

The 13 items included measures of normative beliefs about mobile phones and women's beliefs about perceived control in using mobile phones. These measures were analysed using principal axis factor analysis. Three criteria were used to determine the number of factors to rotate – a priori hypothesis that the measure was unidimensional, the scree plot and the interpretability of the factor solution. The scree

plot indicated that the initial hypothesis of unidimensionality was not supported. Based on the plot, two factors were rotated using a direct oblimin rotation procedure. The rotated solutions, shown in Table 4.20, yielded two interpretable factors – normative beliefs about mobile phones, and perceived control over using a mobile phone. The normative belief about mobile phone factors accounted for 36.5% of the item variance, and perceived control over using a mobile phone accounted for 10.6% of the item variance.

Table 4.20 Correlation between normative belief and perceived control over using mobile phones (items and factors)

Items	<i>Factors</i>	
	Normative belief about mobile phone	Perceived control on (using) mobile phone
<i>Normative belief items (external control)</i>		
I do not believe messages on a mobile phone.	0.97	-0.11
Women/men who use a mobile may become promiscuous.	0.93	-0.09
Information cannot be received in the same way through a mobile phone.	0.86	-0.01
Health information on the mobile phone is unreliable.	0.81	0.01
Accessing information through a mobile phone is difficult.	0.71	0.10
New health information can be accessed through a mobile phone.	0.64	0.14
I will not be ashamed of asking family planning questions on the phone.	0.63	0.26
The mobile phone is a source of information for health	0.62	0.28
<i>Perceived control to use mobile phone items (internal control)</i>		
I like listening to health messages on a mobile phone.	-0.13	0.95
Health information received through mobile phones is trustworthy.	0.04	0.79
Getting health information through mobile phones is convenient.	0.18	0.71
This system protects information about my identity.	0.34	0.56
I can talk privately to the doctor on a mobile phone.	0.11	0.56

Coefficient alpha was computed to obtain an internal consistency estimate of reliability for all the scales. The Cronbach's alpha for normative belief about mobile phone scale was .94. Similarly, Cronbach's alpha for perceived control in using mobile phone scale was .89.

4.8.2 Normative belief about mobile phones

A between-subject ANOVA was conducted to evaluate the effect of exposure to mHealth tools and use of contraceptives on women's normative beliefs about mobile phones. Mean scores for the four groups of participants are shown in Table 4.21.

Table 4.21 Mean and standard deviation of normative beliefs about mobile phone by groups

	Exposed <i>M (SD)</i>	Non-Exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	2.36 (1.36)	2.29 (1.30)	2.33 (1.32)
Non-User	2.23 (1.36)	2.29 (1.27)	2.26 (1.31)
Total	2.30 (1.35)	2.23 (1.36)	

There was no effect of exposure and contraceptive use on women's normative beliefs about the mobile phone. Across all the four groups there was no significant difference between exposed ($M = 2.30$) and non-exposed, or between user ($M = 2.33$) and non-user. There was no significant interaction between exposure and contraceptive use on women's normative beliefs about the mobile phone.

4.8.3 Perceived control on using a mobile phone

A between-subject ANOVA was conducted to evaluate the effect of exposure to mHealth tools and the use of contraceptives on women's perceived control in using a mobile phone. Mean scores for the four groups of participants are shown in Table 4.22.

Table 4.22 Mean and standard deviation of perceived control in using mobile phone by group

	Exposed <i>M (SD)</i>	Non-exposed <i>M (SD)</i>	Total <i>M (SD)</i>
User	1.71 (1.30)	1.66 (1.31)	1.69 (1.30)
Non-user	1.70 (1.33)	1.68 (1.26)	1.69 (1.30)
Total	1.71 (1.31)	1.67(1.28)	

There was no effect of exposure to mHealth tools and contraceptive use on women's perceived control in using a mobile phone. None of the groups differed significantly from one another (exposed $M = 1.71$ and non-exposed $M = 1.67$), or between those currently using contraceptives $M = 1.69$ and not using. There was no significant

interaction between exposure to mHealth tools and contraceptive use on women's perceived control in using a mobile phone.

4.8.4 Result summary for hypothesis 6

The above results suggest that exposed and non-exposed groups had similar normative beliefs about mobile phones and they had similar perceived control in using a mobile phone. There was no significant difference between user and non-user groups in their perceptions of mobile phones.

In section 3.4.2 (chapter 3), I have discussed the characteristics of the research participants. However it is important to understand that there is some variation in these characteristics. According to the theory of planned behaviour, people's background factors could indirectly contribute to change in the predictors of behaviour. Hence, to gain some additional insights into the social 'ecosystem' of the research participants, hypotheses 7.1 and 7.2 aimed to understand the differences in demographic profile based on women's exposure to mHealth tools and contraceptive use. Through this hypothesis I investigated demographic and background characteristics such as access to health worker, socio-economic status, education, number of children, religion, and caste among women in exposed and non-exposed groups. The demographic differences between the two groups are illustrated in the tables below. This section presents the main characteristics of the exposed and non-exposed groups.

4.9 Hypothesis 7.1: Women in exposed and non-exposed groups have similar access to health workers, socio-economic classification and education.

4.9.1 Source of family planning information

Figure 4.12 shows that husbands were a popular source for seeking family planning information, followed by other family members and friends. The recall value of the lead character of mHealth tools was greater among women in the exposed group than the non-exposed group. Community health workers such as accredited social health activists, auxiliary nurses, and midwives, were most popular for family planning information among women in both exposed and non-exposed groups, whereas private

doctors and doctors at a government health facility were the least preferred sources for such information among women in both of those groups.

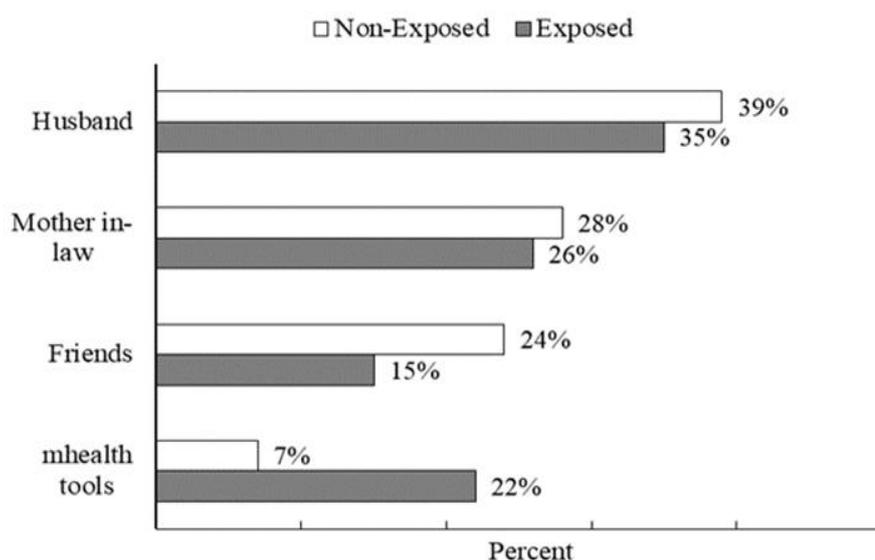


Figure 4.12 Source of family planning information among exposed women

4.9.2 Socio-economic status and education among exposed and non-exposed women

Table 4.23 shows that, in the non-exposed group, one-third of women were in the lowest wealth quantile, that is, socio-economic status D and E; in contrast, nearly half of the women in the exposed group held that status. More than one quarter of women had had some formal schooling in both the exposed and non-user groups.

Table 4.23 Access to the health worker, SEC and education among women exposed and non-exposed to mHealth tools

	Exposed (N=378)		Non-Exposed (N=389)	
	%		%	
The proportion of women falling in various SEC				
SEC A & B	12	(n=46)	9	(n=34)
SEC C	16	(n=60)	17	(n=65)
SEC D & E	42	(n=160)	75	(n=290)
The proportion of women went to formal school				
Did some formal schooling	35	(n=133)	32	(n=124)

4.9.3 Gestation and number of children among exposed and non-exposed women

Table 4.24 shows the number of children of women in the exposed and non-exposed groups. The proportion of women with no child was slightly greater in the non-exposed group than the exposed group. This could be because the latter wanted to get pregnant, so that they did not seek any information on family planning. Almost half of the women in both the exposed and non-exposed groups had 1–2 children. In contrast, a little over one quarter of the user and non-user groups had 3–4 children.

Table 4.24 The proportion of women who had children in exposed and non-exposed groups

	Exposed (N=378)	Non-Exposed (N=389)
	%	%
No child	9 (n=35)	11 (n=41)
1–2 children	47 (n=179)	48 (n=187)
3–4 children	35 (n=131)	33 (n=129)
5 or more children	9 (n=33)	8 (n=32)

4.9.4 Religion and caste difference among exposed and non-exposed groups of women

As shown in Table 3.1 in chapter 3, research participants were from two religious' communities: Hindu and Muslim. Hindu women formed 86% of the total sample. Data analysis in Table 4.25 shows that among the Muslim group of women, more than half (56%) were exposed to mHealth tools, and among Hindu women less than half (48%) women were exposed to mHealth tools.

Table 4.25 Religious composition of the exposed and non-exposed groups

	Exposed (N=378)	Non-Exposed (N=389)
	%	%
Hindu	85 (n=320)	88 (n=343)
Muslim	15 (n=58)	12 (n=46)

4.10 Hypothesis 7.2: Women in user and non-user groups have similar access to health workers, socio-economic classification and education.

4.10.1 Sources of family planning information

Figure 4.13 shows that husbands and partners were a preferred source for seeking family planning information, followed by one's mother in-law and friends. The recall of the lead character of mHealth tools was greater among users than non-users.

Community health workers such as accredited social health activists, auxiliary nurses, and midwives, were the most popular information sources for women in both the user and non-user groups, and private doctors and doctors at a government health facility were the least preferred sources of information among women in both of those groups.

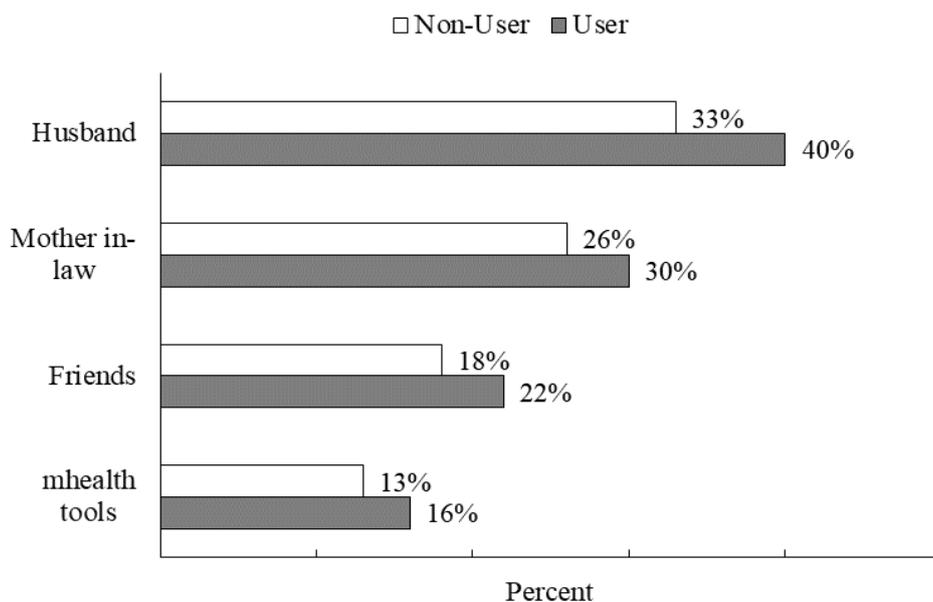


Figure 4.13 Source of family planning information among women using contraceptives

4.10.2 Socio-economic status and education among exposed and non-exposed groups of women

Table 4.6 shows that, in both the user and non-user groups, almost one third of women were in the lowest wealth quantile, that is, socio-economic status D and E. A little over one quarter of women had had some formal schooling in both the user and non-user groups. Hence, the overall social and educational status among the user and non-user groups was low.

Table 4.26 Difference between user and non-user of family planning on access to health workers, socio-economic status and education

	User (N=388) %	Non-User (N=379) %
The proportion of women falling in various SEC		
SEC A & B	10 (n=37)	11 (n=43)
SEC C	19 (n=75)	17 (n=64)
SEC D & E	71 (n=276)	72 (n=272)
The proportion of women having formal schooling		
Did some formal schooling	34(n=131)	33 (n=126)

4.10.3 Gestation and number of children among users and non-users of contraceptives

Table 4.27 shows the number of children that women had in the user and non-user groups. The proportion of women with no child was greater among women in the non-user group than the user group, possibly because the former wanted to get pregnant. More than half of the women in both the user and non-user groups had 1–4 children, and almost half of the women in the user group had 3–4 children. The reason behind this finding could be that some women had achieved their desired family size.

Table 4.27. The proportion of women who had children in user and non-user groups

	User (N=388) %	Non-user (N=379) %
No child	1 (n=5)	19 (n=71)
1–2 children	47 (n=181)	49 (n=185)
3–4 children	41 (n=159)	27 (n=101)
5 or more children	11 (n=43)	6 (n=22)

4.10.4 Religion of user and non-users of contraceptives

As shown in Table 3.1, research participants were from two religious' communities: Muslim and Hindu. Table 4.28 shows that among Muslim women, more were non-users (16%, N = 61) as compared to users (11%, N = 43). Whereas it was the other way round among Hindu women, where non-users (84%, N = 318) were less than users (89%, N = 345). This finding matches with the national average (Indian Institute of Population Sciences & Macro International, 2007).

Table 4.28 Religious composition of the user and non-user groups

	User (N=388) %	Non-User (N=379) %
Hindu	89 (n=345)	84 (n=318)
Muslim	11 (n=43)	16 (n=61)

4.11 Association between research hypotheses and findings

The research framework in Figure 4.14 shows that, of all the research hypotheses in the study, H1, H2 and H4 have the significant main effect of exposure of mHealth tools and are thus accepted. Table 4.29 provides the summary of all the results. The synthesis of these findings is presented in Chapter 6.

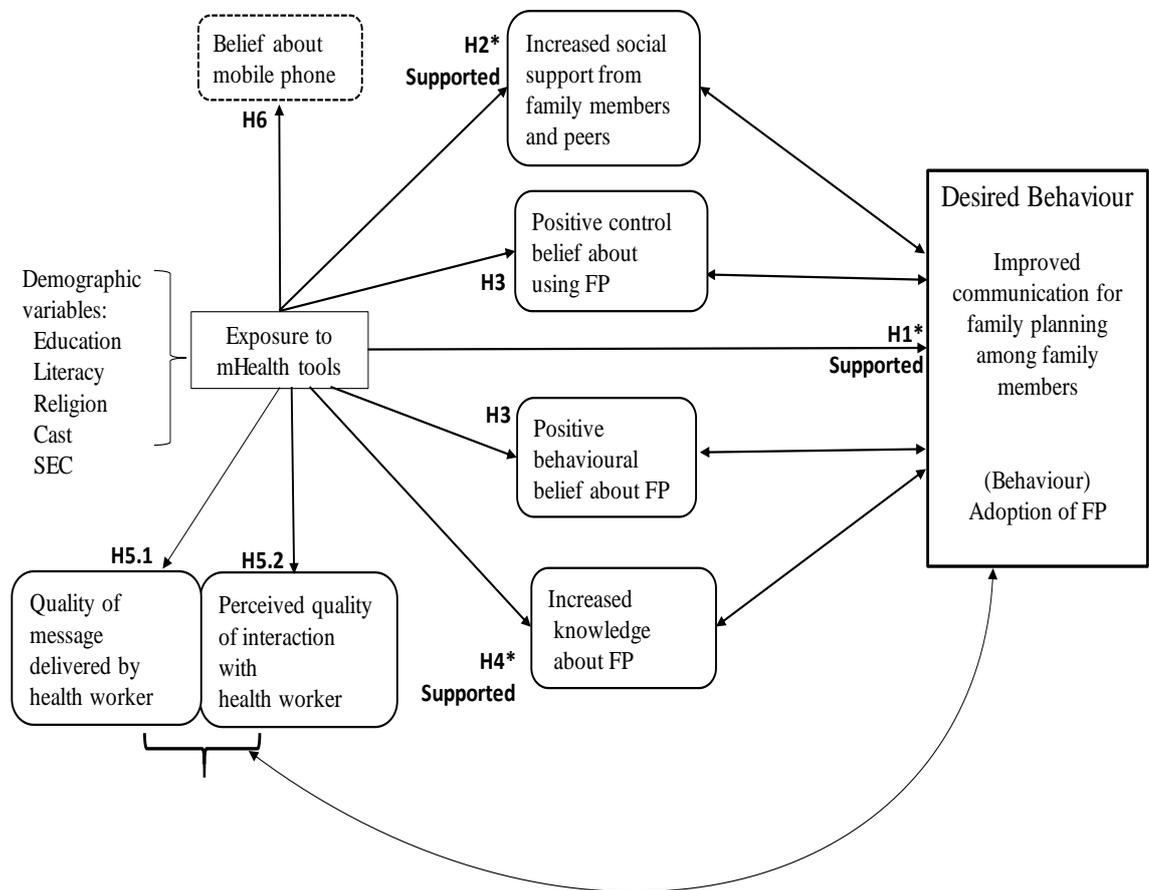


Figure 4.14 Research Hypothesis

*Significant relationship

Table 4.29 Summary of all the results

Hypothesis	Main effect exposure	Main effect contraceptive use	Interaction
H1. Women exposed to mHealth tools are more likely to discuss family planning with their family members and peers as compared to women who are not exposed to those tools ('non-exposed').			
Women discussed family planning after exposure to mHealth tools	*	+	+
Discussion with significant others after meeting the health worker	* (MIL, SIL, husband, mother)	+	* (MIL, husband)
Purpose of discussion	* (opinion & verify)	+	* Verify
H2. Perceived social support to use family planning is higher among women exposed to mHealth tools as compared to non-exposed.			
Companion of women during health worker meetings	* (Unaccompanied and other mothers)	+	+
Social support from husband	*	*	
Social support from mother-in-law	+	*	
H3. Positive behavioural beliefs about family planning are found among women exposed to mHealth tools.			
Normative and control belief about family planning	+	* (non-users more)	+
Belief about consequences of contraceptive use	+	* (non-users more)	+
H4: Increase in knowledge about family planning is positively related to exposure to mHealth tools			
Rationale for family planning	*	*	+
Beliefs about an ideal gap between subsequent births	*	*	+
Perceived benefits of family planning	*	*	*
Knowledge of limiting contraceptive methods	+	+	+
Knowledge of contraceptive methods for spacing	+	*	+

Hypothesis	Main effect exposure	Main effect contraceptive use	Interaction
H5.1. The quality of the message delivered by a health worker appeals more to women exposed to mHealth tools than those not exposed.			
Relevance of information received from health worker	+	*	+
Extent to which health worker could address queries	+	*	+
H5.2. Women exposed to mHealth tools perceive the quality of interaction with the health worker as good, those not exposed.			
Private, trustworthy source of information	+	+	+
Reliable and accessible	+	+	+
H6. Receiving health information on a mobile phone changes women's perception about mobile phones.			
Normative belief about mobile phone	+	+	+
Perceived control over using a mobile phone	+	+	+
H7.1. Women in exposed and not exposed groups have similar access to health workers, socio-economic classification and education.			
H7.2. Women in user and non-user groups have similar access to health workers, socio-economic classification and education.			

Chapter 5 Insights from Qualitative Data

5.1 Chapter Outline

The purpose of this chapter is to provide a richer understanding of the findings in the quantitative data (chapter 4) and help to broaden their interpretation through the lens of qualitative findings. A pragmatic content analysis of qualitative data was carried out by grouping text segments in ways that provided insights about women's and men's experience of family planning and mobile phone use. Using the structure of the quantitative findings (outlined in chapter 4), the following sections present relevant quotes illustrating individual experiences to support each of the identified themes. This chapter is not based on a full-scale thematic analysis. Rather, the content analysis informed the researcher about the participants' experiences of family planning and mobile phone use.

5.2 Content Analysis

As described in chapter 2, the present research has its foundation in a psychosocial theory-based research framework (Figure 2.7), hence I used a directed content analysis approach for coding the qualitative data (Hsieh & Shannon, 2005) (as outlined in section 3.8.2). In directed content analysis, the initial coding scheme is defined prior to data analysis. In the present research, codes were derived from the research framework (as discussed in chapter 2 and 3) which was based on the theory of planned behaviour (Ajzen, 1985) and BBC Media Action's model of change (as outlined in section 2.3.1).

The main steps of content analysis included: reading transcripts as a whole to have a feel for the essence of participants' descriptions of experiences of family planning and mobile phone use; using the predictors of behaviour (from the research framework Figure 2.7) as the initial coding categories; selecting participants' quotes supporting the particular coded category; reflecting on the central ideas extracted and synthesising participants' perceptions; and converting participants' experience of family planning and mobile phone use into a narrative.

To achieve rigor in the qualitative data analysis, I conducted the initial categorisation and coding. My research supervisors later confirmed the selection of the quotes in the

categories. The original transcripts were referred to, to understand participants' meanings. To produce insightful appraisals of participants' experience on family planning and mobile phone use, I made efforts to maintain the credibility, auditability and confirmability of the data. In establishing credibility, I made sure that the data analysis was an authentic reflection of participants' experiences and descriptions. Checks and balances (as discussed in section 3.6) were put in place to maintain auditability of the research process and analysis. For confirmability, I presented the findings along with the participants' quotes in this chapter.

The findings presented in this chapter are from two focus group discussions. The participants in these discussions were a) women from lower socio-economic groups and b) men from middle socio-economic groups in Bihar. Participants were aged between 20–32 years, married with children, and educated to primary or college level. Each focus group comprised six participants. Groups were moderated by the principal researcher. Group discussions were up to one-hour long. Discussions were audio-recorded in Hindi with participant permission, and then transcribed and translated verbatim into English.

5.2.1 Social pressure on young couples to prove fertility

The quotes below illustrate the pressure young couples face to prove their fertility, especially women. If a couple chooses to use contraceptives to delay pregnancy, other people commonly consider that there is some fault or problem with the woman, whose parents-in-law may insist on her having a medical check-up. Socially there has always been pressure on young couples to prove that they are fertile. Commonly young women become pregnant as soon as they marry. Pachauri (2014) noted that in India, childbearing is concentrated in the 20–29 year age group, which contributes up to 60% of total fertility.

आज के date में कम उम्र के शादी होता है, जैसे २२-२३ साल। तो उसमें अगर एक डेढ़ साल late हो गया तो उसमें उनको (माता पिता) लगता है की कोई default है, या फिर लड़की में दिकत है। सबसे पहले लड़की में ही दिकत लगता है, की इसको check कराओ। एक साल से ज्यादा हो गया तो जाओ इसको check-up कराओ।
(M6, 32, यूजर,)

मेरा ही experience है, एक बच्चा हुआ था पांच साल के अन्तर में, लेकिन इस बीच में दो-तीन साल के बाद घर से pressure पड़ने लगा। वो तो केवल हम दोनों (पति पत्नी) ही जानते थे कि क्या करना है, जो नहीं हो रहा है (बच्चा) pressure शुरू हो गया की डॉक्टर से पत्नी को दिखवा दो। तब सोचा की अब तो बताना तो पड़ेगा। वो तो हम दोनों ही जानते थे, personally problem नहीं था, लेकिन guardian सोचते थे की दिकत आ गया है जो इतना समय लग गया है।
(M4, 26, यूजर)

पहले कम उम्र में शादी होता था, एक दो साल husband wife मिला ही नहीं करते थे। Husband बहार है, पांच साल के बाद लड़की अपने ससुराल आती में आती थी। अभी तो एक दिन भी अलग नहीं रहते।
(M5, 28, यूजर)

These days' people get married at the age of 22—23 years. If there is a delay (in conceiving a child) even for 12—18 months, parents think there is a 'fault' (problem/issue). In the first place, they think the problem is with the girl, and she is taken to the doctor for a check-up. (M6, 32, user)

In my experience, within 2—3 years after the birth of my first child, my parents started to put pressure on us and asked us to take my wife to a gynaecologist for a check-up. However, we knew there is no problem in us (were using birth control methods). However, our parents (guardians) thought there is some problem and that is why there is delay in the second pregnancy. I had my second child five years after the birth of my first child. (M4, 26, user)

Earlier, the bride use to move to her in-law's house five years after her marriage, because people used to get married at a younger age. As a result, in the first few years they (young couple) did not meet (and have sex). Now couple do not live separately even for a day. (M5, 28, user)

5.2.2 Elder influence on contraceptive use decisions

Traditionally in rural India, a bride moved into her new husband's family home. There she was often subjected to the demands of her new family, especially her mother-in-law, including decision-making around family planning where the new wife herself may or may not be included. Men play a more significant role in decision-making in highly gender-stratified populations (Mishra et al., 2014). Family and community members (e.g. mothers-in-law and elders) may also play a role in decision-making.

आज कल पिताजी ही
चलता है। माँ है उसको
लगता है एक बच्चा और
हो जाये। पिताजी को
महौल का हिसाब किताब
पता होता है, तो वो माँ
को रोक देते है। औरत
का चले तो जनसँख्या
विस्फोट कर दें। (M6,
32, यूजर)

*In my family my father is the
head; my mother thinks we
(my wife and I) should have
one more child. My father
understands the world, so he
stops her. If we go by what
women say... then there will be
population explosion. (M6, 32,
user)*

उनको (माता पिता)
समझाना बड़ा मुश्किल
है। (M3, 20, नॉन-यूजर)

*It is challenging to make
parents understand. (M3, 20,
non-user)*

5.2.3 Socio-economic factors in family planning decision-making

Among male participants from the upper socio-economic level, discussion about contraception with one's wife and friends was considered normal. However, among female participants (from the lower socio-economic segment), discussion about family planning was not as common. While open communication and male involvement may seem intuitive and straightforward in the contraception decision, the findings from the present research showed that open discussion of sex could be taboo in marital relationships in rural India. A study by Hall et al. (2008) showed that the involvement of men in family planning decisions was not popular in certain segments of society. However, men and women do enquire about the contraceptive options the government has on offer. The same study also showed that awareness about contraceptives is slowly gaining ground in India with the introduction of change to approaches to family planning programming by the government. The mHealth tools

studied in this research are one such approach to encourage direct communication between women and their partners.

बहुत option दिया, दस तरह का तरीका (गर्भनिरोधक) दिए होते हैं। फिर एक select कर लेते हैं। फिर दोनों (पति पत्नी) आपस में बात कर लेते हैं। वो (पत्नी) सहेली से पूछ लेती है, हम भी दोस्तों से पूछ लेते हैं। और फिर दोनों (पति पत्नी) मिल के देख लेते हैं, जो अच्छा लगता है वह हम लोग (इस्तेमाल) करते हैं।
(M2, 29, यूजर)

हमने (family planning operation के लिए जाने से पहले) चर्चा की थी पति से... (F1, यूजर)

मेरे पति ने कुछ (कॉन्ट्रसेप्टिव) इस्तेमाल करने को नहीं कहा। (F4, यूजर)

(जब मैं ऑपरेशन करने गई थीं) मेरे पति तो मज़दूरी (काम) करने गए थे। (F5, यूजर)

मर्दाना (पति) अपने मन से करते हैं... (F2, नॉन-यूजर)

हम लोगो के तो लड़की के चक्कर में चार (लड़के) हो गए। (F1, यूजर)

There are various options available (for contraception). We (husband and wife) select one after we discuss with each other. She (wife) asks her friends, and we (men) also ask our friends. Then whatever the both of us like, we use it. (M2, 29, user).

(Before going for family planning operation) I did discuss with my husband... (F1, user)

My husband did not tell me to use anything (contraceptives). (F4, user)

My husband was at work (when I went for my family planning operation). (F5, user)

Men (husbands) do (use something) as and when they want to... (F2, non-user)

We (couple) now have four boys as we were trying for a girl... (F1, user)

5.2.4 Aspirations and rationale for planning family

Qualitative data from the present study shows that pro-active family planning is associated with better financial conditions, better women's health and the financially secure future of children. Many participants had a rationale for family planning. As a researcher it was not important what rationale they associate with planning a family, but it's about some rationale is associated with family planning. The qualitative data augments the quantitative findings from the present research, which showed that participants had some knowledge of contraceptive methods, and many

had learned about family planning through health workers, friends and doctors (as discussed in section 3.4.2, 4.9.1 and 4.10.1).

कम परिवार होने से उनको (बच्चों) शिक्षा भी सही से मिल जाती है, और जो भी property है मेरी वो उनको इस हिसाब से मिल जाती है की जिस से उनको खाने पीने या किसी भी चीज़ की परेशानी न हो। (M6, 32, यूजर)

Having a small family allows for sending children to get an education, and I can divide my property appropriately so that my children can have enough to eat and live without any trouble. (M6, 32, user)

परिवार सीमित रखने से आर्थिक व्यवस्था परिवार की ठीक रखी जा सकती है। (M1, 20, नॉन-यूजर)

We (husband and wife) can keep family finances properly arranged if we limit our family. (M1, 20, non-user).

...ढाई से पांच साल का अन्तर (दो बच्चों के बीच)...जब दोनों (बच्चों) के बीच अंतर होगा तो ठीक रहेगा ... माँ का दूध, माँ और बच्चे का स्वास्थ्य। (M4, 26, यूजर)

...two and a half years to five years of difference between the two births... A difference between two births is good for mother's milk for the baby, mother's health and for the health of the child. (M4, 26, user)

5.2.5 Day-to-day convenience of mobile phones

Low literacy rates among women, highly flood-prone areas and poor infrastructure, were some of the challenges that were part of the life of research participants. Having mobile phones gave the power of communicating with family members in places where basic infrastructure was limited, even if a person was away from home or in case of emergencies. Moreover, the internet on mobile phone offered users a level of on-the-go convenience not matched by standard phones.

Emergency बात है तो झट से call कर लो. कहीं आना जाना हो तो। (F3, नॉन-यूजर)

In case of emergencies I can call immediately. (F3, non-user)

(अगर कहीं ज़रूरी है तो) गाड़ी का इंतज़ामकर लेते है... (F5, यूजर)

(If it is important to go somewhere) I can organise a vehicle. (F5, user)

अस्पताल से बात कर लेते है.. (F6, नॉन-यूजर)

I can talk (doctor or a nurse) in a hospital. (F6, non-user)

... किसी को मोबाइल करके बुला लेते हैं... (F1, यूजर)

I can call someone on their phone and ask them to come over. (F1, user)

..बहुत बड़ा ऐतिहासिक परिवर्तन आया है... जैसे कभी भी बात कर सकते हैं, कहीं पे भी हो बता देते हैं की यहाँ है इस time पे घर आ जायेंगे। दूसरी बात की हमारी कोई भी ज़रूरत का सामान जो हमें नहीं मिल रहा है वो internet से खोज सकते हैं, खरीद सकते हैं, home delivery करके मँगवा भी सकते हैं। हमारी खेती में कौनसा रोग पकड़ लिया है वह भी देख सकते हैं। कौन सा खाद, बीज देना है। क्या rate चल रहा है वह सब निकल लेते हैं। (M6, 32, यूजर)

...there has been a significant historical change... such as I can talk whenever we want, can talk about where I am and by what time will be home, secondly, I can look up things on the internet, buy it and get it home-delivered. I can look for the diseases that can potentially damage my crop, what kind of fertilisers to use... (M6, 32, user)

5.2.6 Mobile phone a handy tool to access information and expand understanding

To negotiate price

Accessing information on mobile phones enabled participants to negotiate market prices for their crops.

(पहले) बनिया से पूछते थे, अब यह (इंटरनेट मोबाइल) clear बताता है की market में इसका दाम यह है। किसी businessman से पूछो की क्या rate है, तो वो अपना मुनाफा लगा के बताएगा। पर अब net से rate देख कर हम अपना फसल बेच देते हैं market में। (M6, 32, यूजर)

(Previously) I used to ask traders about the market rate of my crops; now this (mobile phone) tells me clearly. If you ask any trader, they will tell you the rates including their commission. Now, I sell crops in the market after checking the rates on the internet. (M6, 32, user)

Internet पर चीज़ों का rate देख लेते हैं, और फिर दुकानदार के साथ दाम और rate negotiate कर सकते हैं। जैसे की मोबाइल फ़ोन खरीदते समय.. (M3 20, नॉन-यूजर)

I'm able to negotiate with the shopkeeper based on the rates available on the internet. (M3, 20, non-user)

To improve crop production

Mobile phone internet enabled participants to gain insights into type of diseases that could potentially damage crops and find solutions to prevent those diseases.

हमारी खेती में कौनसा रोग
पकड़ लिया है वह भी देख
सकते है. कौन सा खाद, बीज
देना है। क्या rate चल रहा
है वह सब निकल लेते है।
(M6, 32, यूजर)

*I can look for the diseases
that can potentially damage
my crops, what kind of
fertilisers to use... (M6, 32,
user)*

To access sexual health information

Internet on mobile phones also helped participants in accessing information for 'delicate' health issues such as sexual health. It helped them to maintain privacy.

जैसे मान लीजिये के, lady
(पत्नी) को अगर पेल्विस
(gynaecological) में कोई
दिकत आ गयी, तो जानकारी
जिसे हम शेयर नहीं कर
सकते, गाँव के माहौल में
शर्म आती यही, तो उसी
(मोबाइल फ़ोन) पे देख लेते
है। (M6, 32, यूजर)

*Using the phone for accessing
information for health problems
— the ones that cannot be
shared with everyone, such as
gynaecological health matters.
(M6, 32, user)*

5.2.7 Immediate information access

Information available on mobile phones was accepted among both women and men because it was convenient, direct, and overcame time-related constraints. Participants also felt that the information through mobile phones was obtained first-hand by them, so that there was less contamination of the information. Receiving information on mobile phones helped them to ascertain the authenticity of the communication.

जैसे डॉक्टर से फ़ोन कर के
पूछ लेते है, ऐसा ऐसा करो
ठीक हो जायेगा. एक नेट
(टेक्नोलॉजी) का माध्यम ही
हुआ ना। कनेक्शन हो गया।
(डॉक्टर) सर से बात कर
लिया। (M6, 32, यूजर)

*I can ask the doctor by directly
calling him over phone. It is a
medium of technology only.
Connection is made by talking
to the doctor. (M6, 32, user).*

(पहले) पता चल जाता था, पर confirm नहीं होता था। अभी तो quick पता चल जाता है की यह चीज़ हो रही है (आसपास या जहाँन में) (M4, 26, यूजर)

(फ़ोन पर) सही जानकारी मिली, संतुष्ट है। जो suggestion मिलता है उसको practically करते हैं, अपनी safety के लिए। (M2, 29, यूजर)

अगर (मैं) खुद (फ़ोन पर संदेश) सुनूँगी तो ही विश्वास करूँगी। कोई और कहेगा तो नहीं। (F5, यूजर)

(फ़ोन पर) एक बार (सन्देश) सुनने से समझ नहीं आएगा, एक दो बार सुनना पड़ेगा। (F2, नॉन-यूजर)

(Previously) We could not ascertain information... now we quickly come to know exactly what is happening ... (M4, 26, user).

(On the phone) I obtained correct information... I used the suggestions (about family planning) for my safety. (M2, 29, user).

I believe the information on the phone only when I hear it, otherwise I will not... (F5, user)

... the first time I will not understand, I must listen to the phone message a couple of times, only then can I understand. (F2, non-user)

5.2.8 Mobile phones help to ascertain information available at village level

The findings showed that, in rural India, people use information on mobile phones to match with what they have heard from other people such as friends, family and health workers, and from other media channels such as newspapers. Participants liked to believe health information that was in the public domain. They believed that information available in the public domain was accessed by others such as doctors. The mobile phone helped them to ascertain the correctness of information.

...जैसे मोबाइल (फ़ोन) पे जो news मिलता है, और जो अखबार में मिलता है वो दोनों सेम रहता है। जो फ़ोन जानकारी देता है और जो लोग बोलते हैं वह लगभग same ही रहता है। (M2, 29, यूजर)

हेल्थ वर्कर (आशा) के पास मोबाइल फ़ोन होता है...हेल्थ

News that I get on the mobile phone and in the newspaper is same. Information that I obtain on the (mobile) phone and what people tell me is almost same. (M2, 29, user)

The health worker has her phone with her... Because the health

वर्कर (आशा) (हमारे) गाँव की होती है, कोई गलत बात थोड़े न बताएगी। (F1, यूजर)

worker is from my village, she does not give any wrong advice. (F1, user)

घरेलू उपचार हमने search किये। जैसे नीम की पत्ती, पपीते की पत्ती, और इसी चीज़ को डॉक्टर भी बोले। सुबह दौड़ कीजिये, वाक कीजिये, यह सब हम ने internet पेय search किया था। और यह सब डॉक्टर भी बोलें। तो इस लिए लगता है की जो भी वहाँ (internet) पे जानकारी है सही जानकारी है। (M6, 32, यूजर)

I searched for home remedies (on the mobile phone). Doctors tell me the same remedies. My phone tells me to go for walk in the morning. I have searched for all this information on internet. Doctors also tell me the same things, so I think the information available on the mobile phone is correct information. (M6, 32, user)

(मोबाइल फ़ोन पे सही जानकारी है) हमको इस लिए लगता है की internet से हम ले रहे है उसको सिर्फ हम ही नहीं ले रहे, हो सकता है उसको डॉक्टर भी ले रहा हो। (M5, 28, यूजर)

I think so (correct information is available on mobile phones), because not only am I accessing information through the internet (on my mobile phone), there is a possibility that the doctor is also obtaining it. (M5, 28, user)

5.2.9 Norms around mobile phone use

Ownership and sharing of a mobile phone

All male participants in the focus group owned a mobile phone, but that was not the case with female participants. Among women, only two of the six participants owned a phone, and the remaining participants were dependent on their husband's phone.

Sharing a mobile phone with family members was found to be common among the male participants.

हाँ, मैं करता हूँ (शेयर मोबाइल फ़ोन), पत्नी के साथ। (M1, 20, नॉन-यूजर)

Yes, I do share my phone with my wife. (M1, 20, non-user)

कभी-कभी कर लेते है (शेयर मोबाइल फ़ोन) (M5, 28, यूजर)

Sometimes I do share (my mobile phone). (M5, 28, user)

..जैसे उसके (पत्नी) के घर से फ़ोन आ गया मेरे फ़ोन पर, तो दी देते है फ़ोन , या उसके (पत्नी) के फ़ोन में balance नहीं होता तो हमसे मांगती है तो फ़ोन करने के लिए दे देते है। (M2, 29, यूजर)

Incoming outgoing (call) के लिए (इस्तेमाल करते है मोबाइल फ़ोन) (M4, 26, यूजर)

कोई भी relation से फ़ोन आ जाता है और वह बोलते है की उनसे (पत्नी से) बात करवा दो तो करवाना पड़ता है। (M6, 32, यूजर)

Calling के लिए केवल नहीं (इस्तेमाल करते), ऐसा नहीं है, और भी मामले के लिए होता है, जैसे Facebook, WhatsApp. फेसबुक पे कोई जानकारी आती है वह दिखते है। (M3, 20, नॉन-यूजर)

मनोरंजन के लिए भी इस्तेमाल करते है जैसे गाने सुन सुनते है, movie देखते है और wife के साथ भी शेयर करते है। (M5, 28, यूजर)

Sometimes a call comes on my phone for her (wife) from her parents or home. Then I give my phone to her. Or if there is no credit in her phone to call, she (wife) asks me to give my phone to her and I give it to her. (M2, 29, user)

(I use mobile phone only for) incoming and outgoing calls. (M4, 26, user)

If any relative calls and ask to talk to my wife, then I must give my phone to her. (M6, 32, user)

I use my mobile phone not only for calls but also to share (or show) any information to my wife that is available on Facebook and WhatsApp. (M3, 20, non-user)

For entertainment purposes— songs, movies. Moreover, I share it with my wife. (M5, 28, user)

Social disadvantage of keeping a mobile phone

Some female participants were scared of keeping a mobile phone because they thought it was a channel for men other their husbands to approach them. Some men found mobile phones a device that they could not switch off, and there was a fear among both men and women of receiving inappropriate content. Men also feared their phone being hacked or getting viruses in their phone.

Switch off भी नहीं कर सकते, कोई emergency हो जाये, या business का call आ जाये इस लिए। (M2, 29, यूजर)

झूठ machine है मोबाइल फ़ोन। होते कहीं पर है कह देते है कहीं और हैं। घर में सोए हुए होते हैं, बोल देते है किसी और शहर घूम रहे हैं। (M6, 32, यूजर)

(मोबाइल फ़ोन) का नुक्सान यह है की Facebook जैसी चीज़ों में बहुत गलत जानकारी भी आती है। कोई news देख रहे है तो उसमे बहुत antivirus भी आ जाता है, फ़ोन का नुक्सान भी होता। फ़ोन hack भी हो जाता है। Radioactivity के कारन health problem भी करता है। (M6, 32, यूजर)

(मोबाइल फ़ोन) खराब ऐसे है की कोई दूसरा आदमी फ़ोन कर ले, बात कर ले, रात में फ़ोन मिला दे तो दंड फंद बात कर ले। (F2, नॉन-यूजर)

दूसरा आदमी बात कर लेते है, गलत गलत बात कर लेते है। फिर (पति पत्नी में या पति और दूसरे आदमी में) झगड़ा हो जाता है। (F4, यूजर)

हम तो simple set (मोबाइल हैंडसेट) रखते है, कभी कोई कहीं से फ़ोन आता है, अगर कोई problem है तो। (M4, 26, यूजर)

I can not even switch off my phone, so what if there is an emergency, or I have a business call... (M2, 29, user)

(The mobile phone) is a machine that makes you lie...you might be sleeping at home and on the phone you say that you are not in town... (M6, 32, user)

A disadvantage of mobile phone is that you may find wrong content on Facebook, a virus might damage your phone, or someone can hack your phone, and radiation from mobile phone can create health problems. (M6, 32, user)

...what if some other man calls on my mobile phone in middle of the night and talks dirty... (F2, non-user)

Other men can call on mobile phones, can talk dirty. It could lead to a fight... (F4, user)

I always keep a simple handset to receive calls if there is any problem... (M4, 26, user)

5.2.10 Self-efficacy of using a mobile phone

Ability to operate a mobile phone (among women)

The women generally were familiar with basic mobile phone handsets (ones with keypads) and could operate a mobile phone to the extent of dialling a number to make a call.

शीशे वाला (मोबाइल फ़ोन
हैंडसेट चलना) नहीं आता...
(F3, नॉन-यूजर)

*I cannot operate mobile
phone with touchscreen...
(F3, non-user)*

मेरे पास बटन वाला (मोबाइल
फ़ोन) है, पर खराब है.... (F5,
यूजर)

*I have mobile phone that has
buttons... however, it is not
working... (F5, user)*

इस्तेमाल करती हूँ (मोबाइल
फ़ोन), बात कर लेते हैं (फ़ोन
पर) (F3, नॉन-यूजर)

*I use mobile phone... can
make a call (F3, non-user)*

मुझे (मोबाइल फ़ोन dial)
करना नहीं आता। (F1, यूजर)

*I cannot dial a number on a
mobile phone (F1, user)*

Ability to access different types of information from mobile phone

The men could comfortably access social media (Facebook, WhatsApp), entertainment (movies, music) and utilities such as maps, booking train tickets, and conducting general google searches on their mobile phones. One man accessed websites and used social media to gather health information.

... फेसबुक पे कोई जानकारी
आती है वह दिखते हैं, शेयर
करते हैं। (M3, 20-वर्ष, नॉन-
यूजर)

*...also, share (or show) any
information to wife that is
available on Facebook and
WhatsApp. (M3, 20-years,
non-user)*

News देख लिया, कोई चीज़ नहीं
मिल रही तो (मोबाइल फ़ोन) पर
search करके देख लिया, train
का ticket देख लेते हैं, map देख
लेते हैं, कहीं पहुंचे हैं, किस जगह
है. कहीं जाना होता है तो map
देख लेते हैं। (M6, 32-वर्ष,
यूजर)

*I use mobile phone to watch
news, map, booking train
tickets and search. (M6, 32,
user)*

*मनोरंजन के लिए भी इस्तेमाल
करते हैं जैसे गाने सुन सुनते
हैं, movie देखते हैं और wife
के साथ भी share करते हैं।
(M4, 26-वर्ष, यूजर)*

*For entertainment purpose:
songs, movies. (M4, 26, user)*

5.3 Summary

This chapter throws a light on the social and cultural influences on family planning decisions among men and women living in settings with poor infrastructure, limited medical facilities and easy access to telecom technology. The findings suggest that, in Indian joint families⁴, young couples face social pressure from the elders in their family in their contraceptive choices. Men's involvement in family planning decisions varied across socio-economic levels. While men from upper socio-economic segments considered it normal to discuss contraceptives with their wife and friends, that was not the case in lower socio-economic segments. Mobile phones provided another way to access information which participants found helpful to improve their day-to-day life (booking train tickets, calling friends and family in case of emergencies) and expanding their knowledge (for example, through information to improve farming methods or their cottage industry, checking market prices for crops, accessing sexual health information). Key considerations for many participants were that information on mobile phones helps them to ascertain information available at village level, because the information was accessed first hand and without any time lag.

It was apparent that there was a significant opportunity to introduce mHealth tools for family planning in rural areas of India. People had an appetite for using mobile phones for health information, and they also faced barriers to contraceptives use that were unlikely to be resolved on their own. As a holistic approach to tackling barriers to contraceptive adoption, using mobile phones may be suitable to address a range of barriers and trigger the uptake of contraceptives.

⁴ According to Sharma (2013) in a joint family people are related by marriage, birth, consanguinity or legal adoption, and share a common kitchen and financial resources on a regular basis. If two or more nuclear families live together under a common shelter, and share a common hearth, and a common purse, then this type of family is known as a joint family.

Chapter 6 Discussion and Conclusion

As established in Chapter 1, in India, socio-cultural and attitudinal barriers are largely responsible for discouraging contraceptive use. The use of interpersonal communication and mass media has shown a positive impact on reducing these barriers. However, working with women with limited resources to bring behaviour change using traditional ways was becoming challenging, because traditional channels of communication were becoming less effective. Where penetration of mobile phones and internet is at its peak, television, radio and print media are being replaced or substituted by mobile phones and computers, and the internet has changed the ways of accessing and sharing information. It was important to capitalise on these new channels of communication, in particular mobile phones, that affect everyone's life at a conscious and subconscious level. This prompted me to explore the impacts of mobile phone technology from psychological and sociological perspectives in an age where mobile phones are being used as health tools for empowering women to use contraception.

6.1 Integrated measurement framework: Empirical evidence

Research question 1 of the present study delved into the adaptation of the theory of planned behaviour (Ajzen, 1985) to create a model that could measure the influence of mobile-mediated health tools on the underlying mechanism of decision-making regarding family planning. Since humans are complex beings, there are various theories around developing content for traditional media. However, as explained in Chapter 2, there aren't many frameworks or models that could do justice to the complexities of human behaviour while at the same time being relevant for measuring the impact of mobile phone-based health tools. Thus, I developed a measurement framework (Figure 6.1) through careful integration of a traditional behaviour change theory (i.e. the theory of planned behaviour) and a practical model of change (the present industry standard). This logical arrangement of existing evidence into a broad hybrid framework combined behavioural principles with technological features that offered a bridge between the theory and the research hypotheses. This framework led me to investigate how technical support (from a mHealth tool) for behaviour change might impact an individual's social world and their decisions. The benefit of this

approach was that it addressed complex and real-time behaviour change and thus enabled evidence-based decision-making on designing and analysing mHealth interventions. Moreover, it allowed me to define the known behaviour change determinants from published theories from a broader context of mHealth, so that the linkages and correlations between the determinants of behaviour, outcome and exposure could be fully understood.

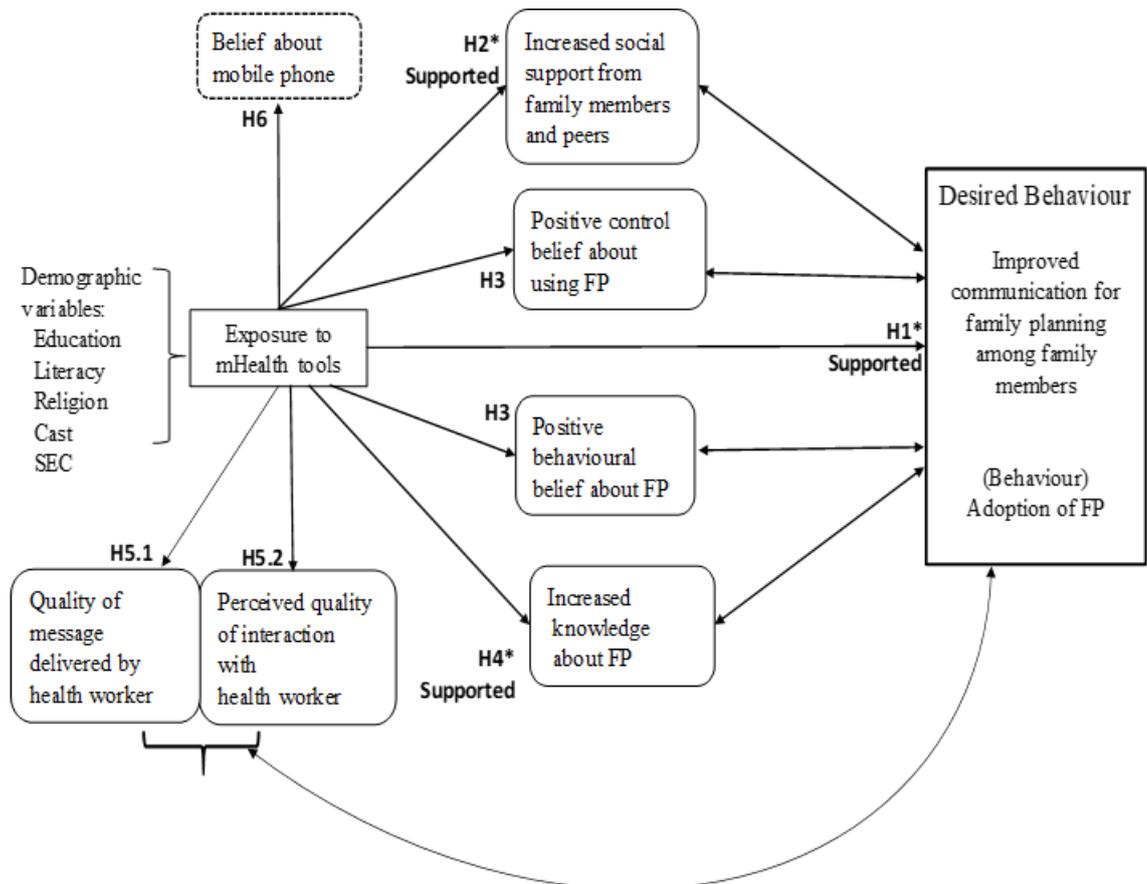


Figure 6.1 mHealth for behaviour change: Integrated measurement framework
*Significant association

As described in Chapter 4, the analysis of data from the original cross-sectional survey presented some significant statistical associations in support of the specific hypotheses. The overall assessment of the relationship between exposure to mHealth and predictors of behaviour showed strong associations for certain constructs. The following sections discuss the association between exposure to mHealth tools and determinants of behaviour.

The first significant finding of the present study showed a direct positive association between mHealth tools and women discussing family planning with their husbands, extended family or peers after meeting with the health worker (H1).

A second significant finding in the present study shows that mHealth tools significantly influenced the support women received from their husbands and extended family to use contraceptives (H2).

The third significant finding was a significant relationship between exposure to mHealth tools and women's knowledge about family planning (H4). This finding suggests that knowledge can have an indirect positive influence on a woman's ability to discuss family planning.

However, another finding was that there was no significant effect of mHealth tools on women's belief about having control to use a contraceptive. There was no difference in the perception of ease or difficulty to use family planning across the different groups of research participants. Moreover, research participants' perceived positive or negative consequence of using contraceptives and the subjective values or evaluations of these consequences had no significant relationship with exposure to mHealth tools. However, there is possibility that this predictor of behaviour could positively influence a woman's ability to discuss family planning with her husband and extended family members.

These various results do not show any significant relationship between exposure to mHealth tools and women's judgement about the features of the communication between her and the health worker, such as two-way communication or an informative and supportive attitude by the health worker. It is believed that women's judgement about the quality of communication could moderate a positive influence on the desired behaviour requirements, such as discussion with one's husband and extended family members. The results also show that there is no significant relationship between exposure to mHealth tools and women's belief about mobile phones and actual control to use them. However, it is believed that any beliefs about mobile phones could have a positive influence on women's control beliefs, social norms and beliefs about family planning.

In addition to its core focus on the relationship between constructs of belief, behaviour control, norms and behaviour, the theory of planned behaviour provides a link between personal characteristics and other background factors. These positively

influence the individual requirements in the process of behaviour change such as support, behaviour control and knowledge.

The following discussion presents the significant empirical results and threads them into a theoretical rationale from the findings for significant structural paths.

6.1.1 Empowering women to communicate openly about family planning

There was a significant direct impact of mHealth tools on women communicating with influential others about contraceptives and family planning (section 4.2). The findings provide evidence that mHealth tools have a significant association with women's ability to discuss family planning, as more women in the exposed group discussed family planning with a partner and extended family (i.e. mothers-in-law, sisters-in-law and own mothers) to seek an opinion about contraceptives or verify the information provided by the health worker. Participants commented that they used information on mobile phones to match with information they gathered from other people (such as family, friends, health workers) and other media channels (such as newspapers). This finding supports the idea that women's discussion with husbands or extended family is a common way of verifying the information they receive from other sources (such as mobile phone-based health tools or health workers). Having a discussion with a health worker helps them to seek the opinion of people who influence their decisions.

A conceptual premise for this finding could be that mobile phones are rapidly contributing to the change in people's motivations. In the rural state of Bihar in India (from where I collected data for this investigation), 32% of adult women own a phone, and 83% have access to one. In this region, mobile phones outnumber basic goods such as water taps and toilets. As discussed in Chapter 1 (section 1.8), India is on the way to having the highest proportion of people accessing the internet of any country. Infrastructure like roads and mobile phone networks have been instrumental in the increase of wages in rural India. As a result, there has been increased access to information and demand for goods and services, in turn driving increased purchasing power. This could have led to security among the younger and more vulnerable population, such as women, potentially resulting in increased emphasis on the value of self-expression through which they could emphasise free-choice and autonomy (Inglehart & Oyserman, 2004).

In addition, it is also important to understand that a reason why people do not have a discussion may be that they lack confidence, especially in sex-related topics. One thinks about what it is that they are going to bring to the table if they do not know enough about the topic. Alternatively, when women are exposed to mHealth tools through a health worker, they may feel more confident and well-informed to discuss advantages and reasons to use family planning with others (such as a partner). Therefore, when women have tools that prepare them for discussion, that gives them knowledge and confidence in what they can say and do—it strengthens their opinions and empowers them to share those.

Family planning research supports the finding that discussion of family planning increases the likelihood of the women using a modern contraceptive method, because increased communication helps a woman identify her husband's or partner's approval, leading to contraceptive use (Hartmann, Gilles, Shattuck, Kerner, & Guest, 2012; Mishra et al., 2014; Prata et al., 2017). Similarly, a woman's perception that her in-laws support family planning use is essential for the formation of her intention to use a contraceptive method (Sharjabad, et al., 2013; Samandari et al., 2010). A woman's ecosystem influences her (or the couple's) decisions that affect her reproductive outcomes.

Another possible reason for this direct relationship could be that technology provides women with the ability to build a consensus about important others in the family. For example, in Indian culture, major family decisions are influenced by dynamics with a partner, together with the influence of extended family. In such situations, the mobile phone gives women independence to access information which they may find helpful to expand their understanding. That information improves a woman's ability to have an open dialogue that is essential for not only their health but also that of their family. Access to information could lead to strong interpersonal interaction and enhance interspousal communication that may inspire husbands and partners to practise family planning. It could also allow an improved conversation with their extended family, which includes in-laws and parents. This conclusion aligns with previous research in this field. Kreps and Neuhauser (2010) noted that complementing community activities (such as face-to-face communication with peers and peer educators) with mHealth can strengthen the interactivity of health communication. A systematic review of the

impact of mHealth on behaviour outcomes (Marcolino et al., 2018; Stowell et al., 2018) showed that behavioural or lifestyle changes (for example, sexual behaviour, smoking cessation, increase in physical activity) or adherence to treatment and care (for example, compliance with medication taking, data management, communication performance) are positively affected by exposure to mHealth.

mHealth tools empower women to communicate with family members. This has important implications for developing mobile phone-based tools, as they can be used as a crucial communication channel that can be an effective method of increasing communication among family members about contraceptives. Thus, it can be implied that where women feel nervous talking about contraception, successful application of mHealth tools can strengthen the interactivity of the health communication and could increase the likelihood of using contraception. However, while it may improve health communication that can inform health decisions, it may be insufficient on its own to cause behaviour change.

6.1.2 The function of social norms in achieving behaviour change

A social norm is what others approve and disapprove of and can influence people's health-related choices and behaviours. In the context of social norms regarding health support, agreement to use family planning from a woman's husband, mother-in-law and/or peers is an important determinant to achieving behaviour change.

A significant relationship was found regarding the moderation of increased social support in achieving the desired behaviour, that is, discussing family planning. The results suggest that social support from husbands and mothers-in-law did not differ between exposed and non-exposed groups. However, women's exposure to mHealth tools was associated with the support women received from their peers. These findings are especially pertinent because the sample was made up mainly of poor, rural women, who are at an increased risk of not having their need for contraception met due to limited support from the social eco-system.

The possible reason for this mediation effect could be a two-way relationship between social norms and mHealth tools. Section 2.3 supplements these findings and gives insights into how these tools are informed by psychosocial theories that are predictive of contraceptive use among Indian women. Here, I find that social norms have

influenced the design of the mHealth tool and approach, that is likely to be applied during the use of these tools (figure 2.3). For example, knowing that the husband is a significant influence in a woman's life is addressed in the structure of the tool. Similarly, health workers who are demonstrating these tools are trained in how to bring up these discussions while using the tools.

Previous research has shown that influencers such as a husband and mother-in-law may not support women to adopt family planning because of various socio-cultural and knowledge-related barriers. The idea that exposure to mHealth tools increases a woman's chance of getting approval from her family and peers suggests that mHealth tools influence social norms. Social norms are indeed a powerful "lever of social influence" (Cialdini, 1991) and have been successful in shaping and influencing the conditions in which we live, thus shaping, in turn, our culture in relation to leading healthy lives.

The qualitative data showed that the information available on a mobile phone is accepted among women and men because it is convenient, direct and overcomes time-related constraints. Participants also felt that the information was obtained first hand by them, so there was less contamination of information. The mobile phone is a handy tool to access information and expand understanding. These findings will doubtless be much scrutinised, but an immediate dependable conclusion could be that general access to the mobile phone benefits the entire household, as technology-based communication tools can improve perceptions about family planning within the family and community (discussed further in a subsequent section).

It can, therefore, be implied that general access to health worker meetings and mobile phones influenced the opinion of women's partners and extended family members and community about family planning in general. The results of the present study offer empirical support for the thoughts expressed by Hajason et al. (2013) and Hartman et al. (2012) that the function of communication is to influence communities. Family planning messaging using text messages, helplines and mobile apps for behaviour change communication, can provide contextually tailored information and support for people to make better health decisions due to its relevance at the family and community level. mHealth tools can benefit from mass and interpersonal media

platforms and can demonstrate a change in norms at the individual, institutional and population level (Crutzen & Vluggen, 2017; Higgs et al., 2014). The conceptual premise that the mobile phone is a new channel to encourage shared decision-making around contraception, through enabling the attitude-behavioural and socio-cultural factors of people, is also very well supported through the findings in the present study.

6.1.3 Facilitate the exchange of knowledge to enrich personal experiences

In the theory of planned behaviour, knowledge is included as an antecedent to attitudes that influence behaviour (Ajzen, 1991). The present study used knowledge as a predictor of improved communication about family planning among various family members. I found mixed results regarding the impact of exposure to mHealth tools on knowledge regarding family planning. The quantitative results showed that women associate some rationale with family planning that matches with the idea promoted through mHealth tools. On average, women in the exposed group were more likely to have some clear rationale for using contraception than those in the non-exposed group. Women associate some meaning to family planning, such as spacing between two births or limiting childbirth, after attaining desired family size.

The results from this research are somewhat consistent with evidence from a systematic review by Pazol et al. (2015) suggesting that educational interventions significantly improve knowledge of contraception, attitudes about contraception, selection of effective contraceptive methods, and continued use of contraception. Communication grounded in behaviour theory and sensitive to local norms helps women make good family planning choices. Thus, the present findings may be explained by the fact that, in the context of poor and remote rural communities with challenging health care access, the mobile phone is a logical solution to improve access to information and services. Phones are technical objects that enable change in 'knowledge seeking', leading to having a positive and indirect influence on the desired behaviour.

In addition, it is also important to understand that technology such as the mobile phone brings the outside influences that people would not have been exposed to previously, because the world was not interconnected the way it is today. Due to a lack of fast and efficient channels of sharing information, people were not able to spread

knowledge and information and thus used to keep to themselves. However, now when people know something, they not only talk to people around them but commonly also talk to people in their social ecosystems to find out about things that work and do not work. Today, people are more interconnected; knowledge can be constructed and shared very quickly. It can be presented in attractive and exciting ways using interactive methods that can help people retain information for an extended time; thus, it allows them to put knowledge to practise as well. Therefore, the improved interconnectedness can help us understand the role of mHealth tools in augmenting the capability of women to obtain correct knowledge about contraceptives

A woman's well-being and that of her family and community can be ensured if she has access to quality health information and education. Chapters 1 and 2 reviewed the use of information, communication and technology for engaging, educating and informing individuals and communities about family planning and reproductive health, HIV/AIDS and other health issues. Family planning research has shown that while knowledge is necessary for the use of contraception, it is not a sufficient motivator, as behaviour works primarily through beliefs and behavioural control (Albarracin et al., 2001; Godin & Kok, 1996; McEachan et al., 2011).

6.2 The practical implication of understanding users and non-users of contraceptives

The research design allowed me to conduct additional analysis based on contraceptive use. As a result, key differences were identified between users and non-users. In the context of the present study, using contraceptives is a positive behaviour, hence an approach to persuasion in this situation could advance conditions where people are more likely to engage in positive behaviour. Family planning programmes can take these findings into account while designing communications for behaviour change, or can continue studying users and non-users. The following section discusses significant findings that could help in profiling an "ideal contraceptive user" in real family planning programmes.

6.2.1 Encourage purposeful discussion among family members

The findings showed that more women in user groups than non-users had a discussion with important others in their family. An important function of discussions about contraception is to verify the information.

Improved communication among family members on family planning could be associated with households that consider contraceptive use as positive 'practice', and where women feel more confident to talk about family planning. This finding also suggests that discussion among family members may play a positive role in the decision to continue or discontinue contraception, because the opinions of friends, mothers and husbands are considered more valuable or 'more valid' than the recommendations of clinicians, as the information provided by family and friends is through their personal experience. Thus, to encourage more discussion around family planning, future family planning programmes for contraceptive use should aim at positioning contraceptive and family planning as a positive behaviour that is acceptable in local society.

6.2.2 Gaining support from significant others in the family

The support a woman received from her partner and mother-in-law differed between users and non-users. The quantitative data analysis showed that perceived support from influential others in the family was greater among women using contraceptives than non-users. The qualitative data showed men's beliefs that they communicate and agree with their wife on matters surrounding family planning.

In contrast with male participants, women were comfortable in getting family planning services without involving their husbands. Only one woman reported that she discussed family planning with her husband before getting the (family planning) operation because she thought that her husband would support her. However, in this particular case we cannot rule out (any) discussion before using a contraceptive. These findings mirror those of previous studies that have examined the possible reasons for the difference between the groups of user and non-user groups (Samandari et al., 2010).

A possible reason for women using contraceptives could be that getting support from the husband and in-laws makes women feel encouraged and confident about their

decisions, and they feel it was an approved choice by significant others.

Encouragement, and emotional and practical support from partners, allow a woman to initiate or continue the use of contraception. The shared belief of a woman and family members in the benefits of birth spacing helps in successful family planning. It can thus be suggested that, if the partner has positive opinions about family planning and supports it in principle (believes in benefits of family planning) and in action (sharing information), women are more likely to involve them in family planning decision making.

Future studies might consider exploring the impact of family influence on couples who are in the reproductive stage. In addition, these findings can directly be applied to behaviour change communication design, particularly for people from cultures where the family has significant influence or where people live in extended families.

6.2.3 Greater perceived control over using contraceptives

Perceived control has been shown to positively influence an individual's ability to perform recommended behaviour (Free, 2013). In the context of this research, perceived control is a woman's ability to dismiss negative perceptions about contraceptives (of self or others). Women in the non-user group demonstrated fewer positive beliefs about contraceptive use than those in the user group. Similarly, more women in the non-user group believed in the negative consequences of using contraceptive than those in the user group.

These findings reveal that women who are successful in initiating and continuing using contraceptive methods have access to the necessary opportunities and resources to use family planning successfully. Based on their personal experiences, they can dismiss negative perceptions about contraceptives promoted by the people in their social ecosystem that could affect their opinion. In contrast, non-users lacked confidence in any contraceptive method and thus were not able to experience any of the above.

Future contraceptive programmes can apply ways to make women feel that they have autonomy over using contraceptives and empower them to make their own health decisions.

6.2.4 Better knowledge and acceptance of contraceptives

Non-users of family planning perceived family planning as less relevant to them and did not see enough reason for using contraceptives. They also had less knowledge about the possible benefits of family planning and various methods of contraception.

A lack of knowledge about contraceptive methods is often cited as a critical variable in determining contraceptive use. Incomplete and inaccurate knowledge about contraceptive methods could lead to fears about its side effects and may indirectly affect the decision around contraceptive use (Hall, et al., 2008; Thummalachetty et al., 2017). The findings observed in the present study mirror those of previous studies that have examined the effect of contraceptive knowledge on family planning decision-making, showing that information and rumours about the side effects of contraception influence women's decisions. Hence, factors like accurate knowledge about family planning, can exert a positive influence on contraceptive use. These findings may be explained by the fact that non-users do not know enough about family planning, hence they lack confidence and do not use it.

Due to the limited evidence on the impacts of mHealth programmes for behaviour change, it is recommended that future programmes focus on educating individuals and providing them with information that is simple to understand and in their local language.

6.2.5 Aware of relevant and useful communication with the health worker

The present study's finding showed interesting differences between user and non-user groups around health worker communications. More women in the user group than non-users thought that health workers provided relevant information and could address queries. As noted previously, quality perceptions and consumer trust are essential for behaviour change because of their powerful effects on user satisfaction and continuance intentions. It is encouraging to compare the present study with that of Daniel et al. (2008), who found that health workers provided personalised strategies to women to motivate and assist them in planning their family and adopt and sustain the use of contraceptives. Positive quality perception about health worker messages has the potential to reduce barriers and reinforce enabling factors through education and culturally sensitive behaviour change communications.

Given the challenging conditions in which rural Indian women live, village-based health workers form an essential link between the community and the public health system. They are the first port of call for the maternal and child health-related demands of deprived segments of the population, especially women, children and elders. Moreover, health workers are the mediating agent. Having a good relationship with the health worker opens up doors for women to seek support regarding health matters related to their children and themselves. So, future family planning programmes could make sure that health workers receive appropriate training and job aids so that they can build meaningful relationships with female clients. Doing so requires easy, simple and meaningful health tools such as mobile phones. These mHealth tools could help health workers to remain relevant and useful among women in their villages.

6.3 Limitations of the present study

The present research possesses both weaknesses and strengths. This section outlines some of the limitations of this research, with the following section discussing the strengths of the study. This review is not exhaustive but focuses on those factors that I feel are crucial to the study.

First, the sample was obtained from a fairly demographically limited population as most participants were young adults, female, and were from selected districts of Bihar. Different results may have been obtained if the sample had included a similar male to female ratio, participants of more varied age, and with greater proportions from other Indian states. Gathering results from a diverse population ensures that results can be generalised to wider populations. It may also be worthwhile to test the research framework on men and investigate the impact of mHealth tools and the influence of behavioural determinants in the framework on contraceptive use. It may be beneficial to include an equal female to male ratio and compare those factors on which females and males differ.

Secondly, based on the direction of the measurement framework in the present study, I tested only the direct impact of mHealth tools on determinants of outcome behaviour. However, I could have measured the association between the individual determinants of behaviour and outcome behaviour. Because the present study used the theory of planned behaviour as the starting point to investigate constructs and

presumed relationships among these concepts and factors, it did not directly measure all the predictors of behaviour such as intentions and attitudes that are present in the model of the selected psychosocial theory. As a result, inferences cannot be made about the attitudes and intentions of research participants in relation to family planning behaviour. There may be scope for future research to measure the effect of exposure to mHealth tools on the attitudes and intentions of women discussing family planning with their family members.

Thirdly, the findings reveal significant statistical associations in support of H1, H2 and H4 as distinct from the other hypotheses in the present research. There is scope for future testing of the causal direction underlying these associations using longitudinal experimental or quasi-experimental research designs. These would allow for measuring the moderating effects of social norms, knowledge and behaviour control on the relationship between improved discussion on family planning and exposure to mHealth tools.

Fourthly, a possible limitation of the quasi-experiment design of this study could be that the four groups of research participants may be dissimilar in terms of the intentions, attitudes, perceptions of behavioural control, and social norms surrounding those who do and do not adopt new technologies; these differences may result in confounding variations in contraceptive use. There may be other factors driving behaviour indicators, which I might not have explored, hence the generalisation of specific findings beyond the specific circumstance in this research is likely to be limited.

The focus groups in the present study were used purposefully in relation to the quantitative survey, however, the number of focus groups remained small (two groups), and a few of the participants' characteristics were dissimilar between the groups. Using Dworkin's (2012) recommendations for sample-size policy for qualitative survey, it is proposed firstly, that future research of a similar nature should have a greater number of group discussions than what were used in the present study. This will allow a deeper appraisal of the "lived experience" of the research participants, and maximise the chances of ruling out the negative and hypothetical cases in the data. The second proposal is to maintain homogeneity within and between group

characteristics to enable researchers to have an adequate assessment of the features that could be intrinsic to the issue and behaviour at hand, such as process, situations, subculture or set of social interactions, and help to project forward the outcomes of the research. However, increasing sample size is dependent upon the resources available, such as time, money and manpower. Hence, when more resources are allocated to achieving larger sample size and composition, there is greater assurance of sample adequacy in the qualitative data collection. The abovementioned recommendations could play an important role in future research that is embedded in the premises of post-positivist philosophy and committed to context-specific investigations, especially in establishing the quality, validity, generalisability (and thus trustworthiness) of the studies' qualitative elements.

The final limitation of the present study is that it relied upon self-report. Self-reported data has limitations such as, rather than revealing the pre-existing state of mind, it might create perception among the respondents who are not exposed to mHealth tools, evoking socially desirable answers among the non-contraceptive users. However, Siegel et al. 1998 have shown there are high levels of honesty in responding to a sexuality-related questionnaire. In addition, I assessed both subjective measures (such as the ability to use a contraceptive) and objective measures (such as knowledge about the side effects of contraception). Hence the limitations of using self-reported data are to some extent mitigated through the methodology adopted in this research.

6.4 Strengths of the present study

The present study examines a topic that is very relevant in times where human-technology interaction is at its peak. It is probably one of the first studies that has investigated the impact of mobile phone technology on the underlying mechanisms of behaviour change for family planning using primary data. As described in section 1.7.2, due to insufficient empirical evidence, mHealth faces significant barriers in developing mobile phone-based interventions that are based on behaviour theories. This study addresses this gap through bringing a deeper understanding of decision-making when exposed to mobile phone-based health tools, through the construction of knowledge about determinants that could affect behavioural outcomes and people's acceptance about mHealth tools. This knowledge could help mHealth designers, development professionals and other researchers to design and evaluate mHealth tools for maternal

and reproductive health, and explore the full potential of mobile phones as a medium for behaviour change.

The main advantage of this research is that it contributes to the development of a model for measuring the impact of mHealth tools. Using a scientific approach with an integrated review, the present study developed the measurement framework through a combination of academic literature and insights from expert consultations. The review of academic literature let me recognise the theoretical framework of psycho-social theories that are most commonly used and studied. Interviewing mHealth experts in India allowed me to gather experience-informed knowledge, which included locally-driven change ideas and assisted in understanding existing practices in the field of mHealth for sexual and reproductive health. This process validated my idea that psycho-social theories are relevant to mHealth programmes. This integrated review is not a re-conceptualisation of previous theoretical models; rather, it is a preliminary conceptualisation of a new framework. The commonalities and connected concepts found in the theoretical model of the theory of planned behaviour and model of change shared by experts, was then integrated logically into a framework/model. The constructs and variables of this framework can then translate into the hypotheses that formed the basis for the data analysis approach. Overall, this hybrid approach of integrated review can fill a critical gap in mHealth tool design, through collaboration between experts who can draw upon theoretical ideas (behaviour change psychology, public health, information technology and communication), those who know the potential of the tool, and those who know their community needs.

Another advantage of the present research study is that it provides a potential model-based research design to evaluate the efficacy and effectiveness of mHealth interventions in the early stage of the intervention. That factor could potentially save resources such as time and money to enhance the efficacy of the intervention. As demonstrated in the present study, through using factorial design the present quasi-experiment identifies determinants of behaviour that could potentially facilitate behaviour change in the target population. Statistical methods such as between-subjects analysis of variance were used to examine the individual and joint effects of an independent variable on dependent variables; for example, between-subject analysis of variance measures the effect of exposure to an mHealth tool on women's

control beliefs about family planning (DV). If the variations in control beliefs are related to exposure to mHealth tools, then maybe this determinant is critical for tailoring and personalising interventions to change one's behaviour from a non-user to a user of family planning. Hence, the type of research design used in this study could be of use in the early stages of an intervention, as it could help to prioritise one determinant over another. It also allows mHealth experts to determine which behavioural determinants the programme has the time, resources and ability to most effectively and quickly address. Later in the mature stage of the interventions, randomised trials can be used for refining the tool, where individuals are randomly assigned.

A mixed method of data collection also strengthens the findings of the present research. According to Yoshikawa, Weisner, Kalil, and Way (2008), the collection of data through mixed method study makes a suitable fit where there is limited information on measures such as the process of designing mHealth tools or determining the triggers and barriers to decision-making. Obtaining qualitative and quantitative data from the various participants gives a richer picture of reciprocal associations. Hence, the present study mixes and draws inferences from both quantitative and qualitative data. Quantitative correlational data and qualitative data together were used to determine the factors of women's behaviour that are affected by mobile-based health tools and their experiences with family planning mHealth tools.

A further strength of the present study was its large sample size (quantitative survey, $n=767$, and qualitative focus groups, $n=12$) that made me more confident about the findings. I did not conduct a power analysis in advance to estimate the sample size, while I did consider similar factors during the planning of this study, such as the validation of the sample through stratified sampling. However, a formal power analysis would have provided a stronger foundation for decisions around the desired sample size. The sample selected in the present study reflects the characteristic of the target population of the family planning programme in India. It allowed me to detect relevant differences between the participant groups and test hypotheses with greater precision and power. For methodological reasons, it was essential to have a large sample size in this research study. While deciding on the sample size aspects, such as whether the

groups were mutually exclusive, the type of variables being studied and the planned statistical analysis were considered. All of this was achieved without wasting resources such as time and money because the data was collected from high density population areas in India. Hence research participants were recruited in a short time. Also, the overall research operating cost in India was relatively inexpensive.

6.5 Theoretical and practical contribution and future research

The present transdisciplinary research has a theoretical and practical contribution. Overall, this research has contributed to the development of behaviour change theories and models. This thesis suggests that mHealth tools have a direct impact on desensitising women to have interpersonal communication about family planning. This direct impact is mediated by both the knowledge and support received from influential others and peers. The accumulated knowledge is both discovery and confirmation that allows for further development of adaptive models that could be based on theories of behaviour change and communication (Zoller & Kline, 2016).

Constructs such as norms, behaviour control and beliefs in the present model, are similar to the constructs of various health-information-technology evaluation frameworks such as the Technology Acceptance Model (TAM), TAM 2, and UTAUT. Similarly, desired behaviour was used as proxy to intentions in the proposed framework. However, TAM2 and UTAUT both use intentions as integral determinants of behaviour. There is a clear difference in the way the frameworks define and operationalise these constructs. Also, a review of the literature (page 39) highlights the role the health-information-technology evaluation framework has in gaining a deeper understanding into the acceptance of information technology and user satisfaction among doctors, nurses and other clinicians. However, there is little understanding about patients and non-medical healthcare providers such as social workers or community health workers. The present research strengthens the evaluation framework through creating evidence on the use of evaluation frameworks in measuring behaviour change through technology use, among women with an unmet need of family planning (the end-user). Through the review of literature and discussion, it is evident that the similarities of constructs strengthens their wider application in explaining end-user behaviour and acceptance of mHealth tools, especially in cases when they are non-clinical.

Through developing a theoretically grounded research framework, this research has produced a more complex understanding of the interaction between technology and human behaviour in the context of health. This advances our understanding of the everyday experience of health communication processes that have led to defining and making sense of personal experiences, interpersonal negotiation and cultural background. For example, the research framework and findings from the present research could be used in developing insights about levels and trends relating to behaviours, behavioural determinants and needs assessment, based on the potential risk involved and exposure to mHealth activities over time in the targeted population, such as men and women living in poor resource settings. Its application could be a combination of measuring the present level of behaviour determinants together with any change in these determinants over time in the targeted population. Thus, the use of validated theoretical frameworks in the design and evaluation of mHealth interventions could help to understand the utility of mobile phones in eliciting behaviour change.

Beyond academia, the significant findings of this study contribute to the knowledge that mobile phones are a powerful development tool in an emerging economy that drive new opportunities for community mobilisation and delivering preventive health messages amongst vulnerable populations. For example, the findings of this research enable a characterisation of the user's behaviour in terms of a predictive model, capturing the complexities and uncertainties associated with people's response. Using these findings, the content of the mHealth tools could be adapted as well as personalised to both the person and their family planning needs (spacing or limiting), and help women to choose a method of family planning suited to them. Section 6.3 in this chapter presents the practical implications of the research in detail.

The methodology implication of this project is that the current research design and method can assist in developing future academic and operational research for family planning programmes. The present study was a quasi-experiment where a 2x2 factorial design was employed as a proven research design for studies that have multiple independent variables. The two independent variables were exposed and non-exposed to mHealth tools, and each of these had two sub-groups: contraceptive use and non-use. Stratified sampling was used to select the research participants, based on the

groupings produced by the factorial design, allowing the creation of a pool of potential research participants who fell under the parameters of exhibiting the desired behaviour that was being researched. In addition, a mixed methods approach was used to collect and analyse data. The quantitative data helped me to conduct a theory-based evaluation and observe the patterns of impact that mHealth tools created on predictors of family planning behaviour (as explained in section 4.11). The qualitative data helped to broaden the interpretation of the quantitative findings.

6.6 Thesis conclusions and recommendation

The purpose of this multidisciplinary research was to determine the impact of mHealth tools for family planning through understanding the pathway to family planning decision-making, using a framework that had the theory of planned behaviour as its starting point. Returning to the research question posed at the beginning of this study, it is now possible to state that mHealth tools for behaviour change have foundations in psychosocial theories that can effectively impact the predictors of behaviour.

This study presents a systematic framework (figure 2.8) that could be used for understanding the interactions between key predictors of behaviour required for behaviour change. To test for replicability, the framework needs to be tested in other contexts. I believe this framework could be iteratively adjusted and refined to suit other contexts and settings. Because the components presented in the framework provide a guideline to intervention development, and due to the comprehensive nature of the psychosocial theories used, there is room for flexibility regarding the behaviour the interventions may address and the techniques that could be implemented to address them. The exploratory phase (as described in chapter 2) does not need to be replicated, but contextual research identifying specific barriers and enablers to behaviour change is important. These could be added to the framework along with the predictors from the theory of planned behaviour model and the corresponding model of change, specific to particular organisations. Hence, organisational planning to design and implement technology-based tools could base the designs and content of the tools on relevant theoretical principles using this framework.

The evaluation of family planning mHealth tools in the present research provides evidence that mHealth tools are successful in bringing impactful and broader changes through reaching out to populations living in resource-poor settings or lacking social authority and have the potential to improve communication about contraceptives at the family level. Considering that, in India, family planning is a topic that has not been discussed widely and openly among people, in families and in society at large, mHealth tools like these could be a game-changer. The present research also shows that mHealth tools have the potential to positively affect one of the difficult predictors of behaviour, that is, social norms. mHealth tools could play a significant role in changing norms around receiving support from influential others in the family, that is, husbands and mothers-in-law in rural India. Hence, for all those health topics for which social norms are a barrier, technology-based solutions or behaviour change communications could play an important role in bringing about the desired change. It would be interesting to evaluate these social changes that, in the absence of mobile-based tools, occur over a longer period and may not have deep reach and resilience.

Many behaviour change interventions are targeted at individuals, and in those cases the specific needs and approaches of a group could be addressed or measured through a specific construct in the research framework, one example could be a woman's chance of getting approval from her husband if the mHealth tools addresses the particular need (using a different packaging of the messages) that enable women and men to support each other on contraceptive use. An important aspect of the intervention is the packaging of the messages. It is therefore important to define and explain the constructs effectively to the production company who will be responsible for packaging of messages.

Finally, more investment should be made into mHealth programmes for family planning. Family planning saves lives through contributing to well-being at individual, family and social levels, by preventing unwanted pregnancies. Mobile phones have the potential for informing transient, remote and disadvantaged communities. They have the potential to speed up change at grassroots levels where the pace of decline in fertility is slow, in countries that are geographically large and more populous.

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Appendices

Appendix A: Survey questionnaire

SCREENER AND RECRUITMENT

Questionnaire No.					Date of interview	d	d	m	m	y	y	y	y
Starting Time (hrs)					Ending time (hrs)								
GPS Coordinates	Longitude								Latitude				
Name of Respondent													
Husband's/Father's Name													
Tola/Mohalla													
Village Name													
Gram Panchayat													
Block Name													
District													
Mobile number													

Good morning/afternoon/evening. My name is _____. I am here on behalf of a Research Agency. I am here to learn about how people in this area feel about some important health and social issues. We would like to talk to you and other people in your village about these issues. गुड मोर्निंग/आफ्टरनून/इवनिंग .मेरा नाम -----है.मैं एक रिसर्च एजेंसी की तरफ से हूँ. हम यहाँ पर इस बात को समझने कि कोशिश कर रहे हैं कि इस क्षेत्र में लोग कुछ महत्वपूर्ण स्वास्थ्य और सामाजिक मुद्दों के बारे में क्या राय रखते हैं.हम आपसे और आपके गाँव के अन्य लोगों से इन मुद्दों के बारे में बातचीत करना चाहेंगे.

AGE

Q1. What is your age? CODE ONLY ONE RESPONSE आपकी उम्र कितनी है? केवल एक उत्तर कोड करें		GO TO
More Than=18 years 18 साल या ज्यादा	1	GO TO Q2
Less Than 18 years 18 साल से कम	2	TERMINATE

EXPOSURE TO TOOLS

<p>Q2. When was the last time you discussed any health matter with a health worker (ASHA/AWW/ANM), it does not matter where you met her?</p> <p>आपने आखिरी बार किसी स्वास्थ्य संबंधी विषय पर किसी स्वास्थ्य कर्मी आशा/एडबलूडबलू/ एएनएम से कब बात की थी, उससे कोई फर्क नहीं पड़ता कि आप उससे कहां मिलें? ASK AND RECORD IN NUMBERS <input type="checkbox"/><input type="checkbox"/></p> <p style="text-align: center;">CODE BELOW</p>		
UPTO 30 DAYS AGO 30 दिनों में	1	GO TO Q3
>31 DAYS AGO 31 दिन से पहले	2	TERMINATE
DON'T KNOW/CANN'T SAY पता नहीं /कह नहीं सकते	3	

<p>Q3. Where did you discuss with the health worker (ASHA/AWW/ANM)? आपने स्वास्थ्य कर्मी (आशा/एडबलूडबलू/ एएनएम) से कहां पर बातचीत की? MORE THAN ONE RESPONSE</p>		GO TO
SHE VISITED MY HOME वह मेरे घर आई	1	GO TO Q4
I VISITED VHSND में वीएचएसएनडी गई	2	
I VISITED MOTHER'S DAY/BAL DIWAS में ममता दिवस/बाल दिवस पर गई	3	
SOME OTHER PLACE (PLEASE SPECIFY) कोई अन्य स्थान - कृपया स्पष्ट करें	88	

SHOW VISUAL SHOW CARD OF MOBILE KUNJI. Ask, Q4. Did the health worker (ASHA/AWW/ANM) play this message on her mobile phone? क्या स्वास्थ्य कर्मी (आशा/एडबलूडबलू/एएनएम) नें अपने मोबाइल फोन पर यह संदेश चलाया?		GO TO
YES हां	1	GO TO Q5
NO नहीं	2	
DO NOT REMEMBER याद नहीं	3	

SHOW VISUAL GSP CARD. Ask, Q5. Did the health worker (ASHA/AWW/ANM) played this message on speaker during the VHSND/ Mother's day or Bal Diwas? क्या स्वास्थ्य कर्मी (आशा/एडबलूडबलू/एएनएम) नें वीएचएसएन डे/ममता दिवस/बाल दिवस के दौरान यह संदेश स्पीकर पर चलाया ?		GO TO
YES हां	1	GO TO Q6
NO नहीं	2	
DO NOT REMEMBER याद नहीं	3	

Q6. Which topic did the health worker (ASHA/AWW/ANM) discuss with you during your interactions? आपसे बातचीत के दौरान स्वास्थ्य कर्मी (आशा/एडबलडबल/एएनएम) ने आपसे किस विषय पर चर्चा की? AIDED		GO TO	
	YES	NO	GO TO Q7
Q6A. IFA/ANEMIA आइएफए/एनिमिया	01	00	
Q6B. IMMUNIZATION टीका करण	01	00	
Q6C. FAMILY PLANNING परिवार नियोजन	01	00	
Q6D. DIARRHOEA दस्त	01	00	
Q6E. GROWTH MONITORING विकास जांच	01	00	
Q6F. PNEUMONIA निमोनियां	01	00	
Q6G. BIRTH PREPAREDNESS बच्चे के जन्म की तैयारी	01	00	
Q6H. COMPLIMENTARY FEEDING कम्प्लीमेन्ट्री फीडिंग	01	00	
Q6I. ANTENATAL CARE प्रसव पूर्व देखभाल	01	00	
Q6J. OTHERS (SPECIFY)----- -- अन्य - स्पष्ट करें	01	00	

FAMILY PLANNING USAGE:

Q7. Are you OR your husband currently using any method of family planning? क्या आप या आपके पति इस समय परिवार नियोजन का कोई तरीका इस्तेमाल कर रहे हैं? CODE ONLY ONE RESPONSE		GO TO
YES हां	1	GO TO Q8
NO नहीं	2	GO TO Q10

Q8. Which method of family planning are you OR your husband are currently using? आप या आपके पति इस समय परिवार नियोजन का कौन सा तरीका इस्तेमाल कर रहे हैं?		GO TO	
	YES	NO	IF CODED "YES" GO TO Q9 ELSE, GO TO Q10
Q8A. IUD आइयूडी	01	00	
Q8B. CONDOMS कंडोम	01	00	
Q8C. ORAL CONTRACEPTIVE PILL खाने वाली गर्भ निरोधक गोली	01	00	
Q8D. INJECTABLE इंजेक्शन	01	00	
Q8E. FEMALE STERILIZATION महिला नसबन्दी	01	00	
Q8F. MALE STERILIZATION पुरुष नसबन्दी	01	00	
Q8G. OTHERS (SPECIFY) अन्य - स्पष्ट करें	01	00	
Q9. Since when you OR your husband have been using any method of family planning? आप या आपके पति किस समय से परिवार नियोजन का कोई तरीका इस्तेमाल कर रहे हैं? ENTER NUMBER OF MONTHS <input type="checkbox"/> <input type="checkbox"/> CODE BELOW		GO TO	
Less than 6 month 6 महीने से कम	1	GO TO Q10	
More than 6 month 6 महीने से ज्यादा	2	TERMINATE	
Q10. RESPONDENT SELECTION KEY			
<i>SELECTION QUESTION</i>	<i>RESPONDENT CODE</i>	<i>RESPONDENT CATEGORY</i>	<i>SKIP</i>
IF, Q4 <u>OR</u> Q5 = 02, 03 AND IF, Q8= 00 (IN ALL)	1	<i>NOT EXPOSED,</i> FP NON-USER	If coded 'yes' in Q101

IF, Q4 <u>OR</u> Q5 = 01 AND IF, Q8= 00 (IN ALL)	2	EXPOSED, FP NON-USER	then GO TO Q102 otherwise go to Q104
IF, Q4 <u>OR</u> Q5 = 02, 03 AND IF, Q8 = 01 (ATLEAST ONCE)	3	<i>NOT EXPOSED,</i> FP USER	
IF, Q4 <u>OR</u> Q5 = 01 AND IF, Q8 = 01 (ATLEAST ONCE)	4	EXPOSED, FP USER	

SECTION 1: PREGNANCY AND NUMBER OF CHILDREN

Q101. Are you currently pregnant? क्या आप इस समय गर्भवती हैं? CODE ONLY ONE RESPONSE	CODE	GO TO
Yes हां	01	Q.102
No नहीं	02	Q.104
Don't Know पता नहीं	03	

Q102. How many months pregnant are you as of today? इस समय आप कितने महीने की गर्भवती हैं?		GO TO	
ENTER COMPLETED MONTHS PREGNANCY <input type="text"/> months		Q.103	
Do not Know/Cannot Say पता नहीं/कह नहीं सकते	99		
Q103. Other than this pregnancy, do you have any living children? इस प्रेगनेन्सी के इलावा क्या आपके कोई और बच्चे हैं? CODE ONLY ONE RESPONSE		CODE	GO TO
Yes हां	01	Q.105	
No नहीं	02	GO TO SECTION 2	

IF, Q10 CODED 3 OR 4, THEN ASK: Q104. Do you have any living children? क्या आपके बच्चे हैं? CODE ONLY ONE RESPONSE	CODE	GO TO
Yes हां	01	Q.105
No नहीं	02	GO TO SECTION 2
Q105. How many living children do you have? आपके इस समय कितने बच्चे हैं?		GO TO
ENTER NUMBER OF LIVING CHILDREN □□		Q.106
Q106. How old is your youngest living child? आपका सबसे छोटा बच्चा कितना बड़ा है? CODE ONLY ONE RESPONSE		GO TO
ENTER THE AGE IN COMPLET MONTHS □□ CODE BELOW		
0-06 months 0 - 06 महीनें	01	GO TO SECTION 2
07-18 months 07 - 18 महीनें	02	
19-23 months 19- 23 महीनें	03	
>=24 months 24 महीनें या ज्यादा	04	

SECTION 2: LEVEL OF ENGAGEMENT (ASK ALL)

Q. No.	Question and Filter	Coding Categories	Coding		Skip
		Option	Yes	No	
201.	Considering the last occasion, can you tell me who all were present (may or may not be participating in the discussion) with you when the health worker (ASHA/AWW/ANM) was having discussion with you at VHSND/MD/BD/ home? आखिरी अवसर को ध्यान में रखते हुए, कृपया बताएं कि जब वीएसएसएनडी/ममता दिवस/बाल दिवस/घर पर जब स्वास्थ्य कर्मी (आशा/एडबलूडबलू/एएनएम)आपके साथ चर्चा कर रही थी तो उस समय आपके साथ कौन था भले ही उन्होंने चर्चा में भाग ना लिया हो? MULTIPLE CODES POSSIBLE	201A. Husband पति	01	00	
		201B. MIL सास	01	00	
		201C. Sister in law ननद	01	00	
		201D. Other mothers किसी और की मां	01	00	
		201E. Own mother/Sister अपनी मां/बहन	01	00	
		201F. Only me केवल मैं	01	00	If coded 01, skip to 204
		201G. Other (Specify) अन्य स्पष्ट करें _____	01	00	
202.	Did anyone present during the discussion participate in the discussion? चर्चा के दौरान जो कोई उपस्थित था, क्या उसने चर्चा में भाग लिया?	Yes हां	01		
		No नहीं	02		
203.	Did anyone present during the discussion ask the health worker (ASHA/AWW/ANM) questions during the discussion? चर्चा के दौरान जो कोई उपस्थित था, क्या उसने चर्चा के दौरान स्वास्थ्य कर्मी (आशा/ एडबलू डबलू/ एएनएम)से कोई प्रश्न पूछे?	Yes हां	01		
		No नहीं	02		
		Don't Know/Can't Say पता नहीं /कह नहीं सकते	66		

SECTION 3: INTENTION TO DISCUSS (ASK ALL)

Q. No.	Questions and Filters	Coding Categories	Coding	Skip
301. A	After the discussion with the health worker (ASHA/AWW/ANM), did you further discuss any of the topics with others (within your family/outside your family)? स्वास्थ्य कमी (आशा/एडबलूडबलू/एएनएम) से चर्चा के बाद, क्या आपने किसी और से इसके बारे में चर्चा की?	Yes हां	01	Continue
		No नहीं	02	GO TO 302

Q. No.	Questions and Filters	Coding Categories	Coding		Skip
301. B.	With whom did you discuss the topic? उस विषय पर आपने किससे चर्चा की?		Yes हां	No नहीं	
		301a) Mother in law सास	01	00	
		301b) Husband पति	01	00	IF CODED '00' GO TO 302
		301c) Sister in law ननद/जेठानी	01	00	
		301d) Mother मां	01	00	
		301e) Friends दोस्त	01	00	
		301g) Any Others (specify) अन्य, स्पष्ट करें	01	00	

Q. No.	Questions and Filters	Coding Categories	Coding	Skip
301. C	What kind of discussion did you have with them? आपने उनके साथ किस प्रकार की चर्चा की?	Discussed to seek their approval उनसे अनुमती लेने के लिए चर्चा की	05	GO TO 307
		Discussed to seek their opinion उनकी राय लेने के लिए चर्चा की	04	
		Discussed to verify the information जनकारी की पुष्टि के लिए चर्चा की	03	
		Discussed to inform them उनको बताने के लिए चर्चा की	02	
		Discussed to advise them उनको सलाह देने के लिए चर्चा की	01	

302.	Have you ever discussed with your husband regarding desired number of children? क्या आपने अपने पति से इस बारे में कभी चर्चा की है कि कितने बच्चे होने चाहिए?	Yes हां	1	GO TO Q305
		No नहीं	2	
303.	Do you think you should talk to husband regarding desired number of children? क्या आप सोचती हैं कि आपको इस बारे में पति से बात करनी चाहिए कि कितने बच्चे होने चाहिए?	Yes हां	1	
		No नहीं	2	
304.	Do you think husband will listen attentively and discuss the topic? क्या आप सोचती हैं कि पति ध्यान से सुनेगा और विषय पर चर्चा करेगा?	Yes हां	1	
		No नहीं	2	

305.	Is your husband in favor of family planning? क्या आपके पति परिवार नियोजन के पक्ष में हैं?	Yes हां	1	
		No नहीं	2	
		Does Not Matter कोई फर्क नहीं	3	
		No Response कोई उत्तर नहीं	4	
306.	Do you discuss with your husband the choice of a contraceptive method? क्या आप गर्भ निरोधक तरीके के चुनाव के बारे में अपने पति से चर्चा करती हैं?	Yes हां	1	
		No नहीं	2	
307.	Is your mother-in-law in favor of family planning? क्या आपकी सास परिवार नियोजन के पक्ष में हैं?	Yes हां	1	Go to Q308
		No नहीं	2	Go to Q401
308.	Do you think you can discuss contraceptive use with your mother in law? क्या आप सोचती हैं कि आप अपनी सास के साथ गर्भ निरोधक तरीकों के इस्तेमाल के बारे में चर्चा कर सकती हैं?	Yes हां	1	Go to Q401
		No नहीं	2	

SECTION 4: HUMAN INTERFACE (ASK ALL)

Q. No.	Questions and Filters	Coding Categories	Coding	Skip
401.	<p>To what extent do you think the information that you received from the health worker (ASHA/AWW/ANM) during last interaction was relevant to your family planning requirement?</p> <p>आपको आखिरी चर्चा के दौरान स्वास्थ्य कर्मी (आशा/एडबलूडबलू/एएनएम) से चर्चा के दौरान जो जानकारी मिली, आपके विचार से वह आपके परिवार नियोजन की जरूरतों के लिए कितनी उपयुक्त हैं? CODE ONLY ONE RESPONSE</p>	<p>Not at all relevant बिल्कुल उपयुक्त नहीं</p>	01	
		<p>Somewhat relevant कृछ उपयुक्त</p>	02	
		<p>Completely relevant पूरी तरह उपयुक्त</p>	03	

402.	<p>Do you feel that the health worker (ASHA/AWW/ANM) was able to address your queries adequately or at least made an attempt to do so?</p> <p>क्या आपको लगता है कि स्वास्थ्य कर्मी (आशा/एडबलूडबलू/एएनएम) आपकी शंकाओं का जवाब देने में सक्षम थी या कम से कम उसने ऐसा करने की कोशिश की? CODE ONLY ONE RESPONSE</p>	<p>She answered my query satisfactorily</p> <p>उसने मेरी शंकाओं का संतोषजनक जवाब दिया</p>	05	
		<p>She gave me the reference/contact, from where I can get the correct information</p> <p>उसने मुझे संदर्भ/संपर्क दिया जहां से मुझे सही जानकारी मिल सकती थी</p>	04	
		<p>She later came back with the correct information</p> <p>वह सही जानकारी के साथ बाद में वापिस आई</p>	03	
		<p>She tried to respond but could not clear my doubts</p> <p>उसने उत्तर देने की कोशिश की लेकिन मेरी शंकाओं का समाधान नहीं कर पाई</p>	02	
		<p>She did not attempt to answer the queries</p> <p>उसने शंकाओं का उत्तर देने की कोशिश नहीं की</p>	01	

Q. No.	Statement	Response Option and Coding				
		Strongly Agree पूरी तरह सहमत	Agree सहमत	Neutral neither agree nor disagree ना सहमत ना असहमत	Disagree असहमत	Strongly disagree पूरी तरह असहमत
403. (1)	Health information received through ASHA/AWW is trust worthy. आशा/आंगनवाडी वर्कर से मिली जानकारी विश्वसनीय है	5	4	3	2	1
404. (2)	It is convenient to get health information through ASHA/AWW. आशा/आंगनवाडी वर्कर के द्वारा जानकारी लेना सुविधाजनक है	5	4	3	2	1
405. (3)	ASHA/AWW protects my personal information. आशा/आंगनवाडी वर्कर मेरी व्यक्तिगत जानकारी को बचाती है	5	4	3	2	1
406. (4)	I can privately talk to ASHA/AWW. मैं आशा/आंगनवाडी वर्कर से अकेले में बात कर सकती हूँ	5	4	3	2	1
407. (5)	ASHA/AWW are source of information for health matters. आशा/आंगनवाडी वर्कर स्वास्थ्य के विषयों के लिए जानकारी का अच्छा साधन हैं	5	4	3	2	1

408. (6)	I will not be ashamed of asking family planning questions to ASHA/AWW. मुझे आशा/आंगनवाडी वर्कर से परिवार नियोजन के बारे में प्रश्न पूछने में शर्म नहीं आएगी	5	4	3	2	1
409. (7)	It is difficult to access information through ASHA/AWW. आशा/आंगनवाडी वर्कर के द्वारा जानकारी प्राप्त करना मुश्किल है	5	4	3	2	1
410. (8)	I do not believe messages by ASHA/AWW. मैं आशा/आंगनवाडी वर्कर के संदेशों पर भरोसा नहीं करती	5	4	3	2	1
411. (9)	Health information given by ASHA/AWW is unreliable. आशा/आंगनवाडी वर्कर द्वारा दी गई स्वास्थ्य संबंधी जानकारी अविश्वसनीय है	5	4	3	2	1
412. (10)	New health information can be accessed through ASHA/AWW. नई स्वास्थ्य संबंधी जानकारी आशा/आंगनवाडी वर्कर के द्वारा प्राप्त की जा सकती है	5	4	3	2	1

413. (11)	ASHA/AWW gives information according to my health requirement. आशा/आंगनवाडी वर्कर मेरी स्वास्थ्य संबंधी जरूरतों के अनुसार जानकारी देती हैं	5	4	3	2	1
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SECTION 5: FAMILY PLANNING- KNOWLEADGE, BELIEF AND USE (ASK ALL)

Q. No.	Questions and Filters	Coding Categories	Coding	Skip
501.	What does family planning mean to you? आपके लिए परिवार नियोजन क्या मायने रखता है? If required, present response options Read out	Stop having more children और बच्चे होने से बन्द होना	01	
		Keep gap between two children दो बच्चों के जन्म के बीच में अन्तर रखना	02	
		Both of the above उपरोक्त दोनों	03	
		Don't know पता नहीं	99	
		Others Specify _____ अन्य स्पष्ट करें	88	
502.	According to you, what should be the ideal gap between two children? आपके अनुसार दो बच्चों के बीच आदर्श अन्तर कितना होना चाहिए? CODE ONLY ONE RESPONSE	More than 4 years 4 साल से ज्यादा	05	
		3-4 years 3-4 साल	04	
		2-3 years 2-3 साल	03	
		1-2 years 1-2 साल	02	
		1 year or less 1 साल या कम	01	

503.	What are the benefits of having gap of three years or more between two children? दो बच्चों के जन्म में 3 साल या ज्यादा अन्तर रखने के क्या फायदे हैं? POST CODE MULTIPLE OPTIONS POSSIBLE	Good health of mother मां की अच्छी सेहत	07
		Good health of child/ren बच्चे/बच्चों की अच्छी सेहत	06
		Good care of child/ren बच्चे/बच्चों की अच्छी देखभाल	05
		Good education for child/ren बच्चे/बच्चों की अच्छी शिक्षा	04
		Can spend money on child/ren बच्चे/बच्चों पर पैसा खर्च कर सकते हैं	03
		Financial well-being आर्थिक खुशहाली	02
		Mental peace मानसिक शान्ति	01
		Others (Specify) ----- अन्य स्पष्ट करें 88	

Q. No.	Questions and Filters	Coding Categories	Coding	Skip
504.	Can you tell us about some methods available to stop having more children (Limiting)? क्या आप और बच्चे होने से रोकने के लिए (सीमित करना) उपलब्ध कुछ तरीकों के बारे में बता सकती हैं? RECORD SPONTANEOUS RESPONSE MULTIPLE RESPONSE POSSIBLE IF REQUIRED Read out	IUD आइयूडी	07	
		Condoms कंडोम	06	
		Oral Contraceptive Pills खाने वाली गर्भ निरोधक गोली	05	
		Injectable इंजेक्शन	04	
		Female sterilization महिला नसबन्दी	03	
		Male sterilization पुरुष नसबन्दी	02	
		Abortion गर्भपात	01	
		Not aware of any किसी के बारे में नहीं जानते	66	
		No response कोई उत्तर नहीं	77	
		Others specify ----- ----- अन्य - स्पष्ट करें	88	

505.	<p>Can you please tell, some methods available for keeping gap between two children (Spacing)?</p> <p>क्या आप उपलब्ध कुछ तरीकों के बारे में बता सकती हैं जिनसे दो बच्चों के जन्म में अन्तर रखा जा सकें?</p> <p>RECORD SPONTANEOUS RESPONSE</p> <p>MULTIPLE RESPONSE POSSIBLE</p> <p>IF REQUIRED THEN AID</p>	Female sterilization महिला नसबन्दी	07
		Male sterilization पुरुष नसबन्दी	06
		IUD आइयूडी	05
		Condoms कंडोम	04
		Oral Contraceptive Pills खाने वाली गर्भ निरोधक गोली	03
		Injectable इंजेक्शन	02
		Abortion गर्भपात	01
		Not aware of any किसी के बारे में नहीं जानते	66
		No response कोई उत्तर नहीं	77
		Others specify -- अन्य - स्पष्ट करें	88

Q. No.	Statement	Response Option and Coding				
		Strongly Agree पूरी तरह सहमत	Agree सहमत	Neutral neither agree nor disagree ना सहमत ना असहमत	Disagree असहमत	Strongly Disagree पूरी तरह असहमत
	ASK ALL					
506. (1)	People who use contraceptives end up with health problems. जो लोग गर्भनिरोधक इस्तेमाल करते हैं वे स्वास्थ्य संबंधी समस्याओं में पड़ जाते हैं	1	2	3	4	5
507. (2)	Contraceptives can harm your womb. गर्भनिरोधक आपकी बच्चेदानी को नुकसान पहुंचा सकते हैं	1	2	3	4	5
508. (3)	Use of a contraceptive can make a woman permanently infertile. गर्भनिरोधकों का इस्तेमाल एक महिला को पूरी तरह बांझ बना सकता है	1	2	3	4	5
509. (4)	Contraceptives reduce women's sexual urge. गर्भनिरोधक महिला की यौन इच्छा शक्ति को कम कर सकते हैं	1	2	3	4	5
510. (5)	Abortion is convenient as compare to contraceptive use. गर्भनिरोधकों के इस्तेमाल के मुकाबले गर्भपात सुविधाजनक है	1	2	3	4	5
511. (6)	Contraceptives can cause cancer. गर्भनिरोधक कैंसर पैदा कर सकते हैं	1	2	3	4	5
512. (7)	Contraceptives can give you deformed babies. गर्भनिरोधकों से आपको विकृत बच्चे हो सकते हैं	1	2	3	4	5
513. (8)	Contraceptives are dangerous to women's health. गर्भनिरोधक महिला के स्वास्थ्य के लिए खतरनाक है	1	2	3	4	5

514. (9)	There is no need to use contraceptive, as women can get abortion. गर्भनिरोधकों की कोई आवश्यकता नहीं क्योंकि महिला गर्भपात करवा सकती है	1	2	3	4	5
515. (10)	Birth spacing is women's business. जन्म के बीच फर्क रखना महिला का अपना मामला है	1	2	3	4	5
516. (11)	Abortion is cheaper than using contraceptive गर्भनिरोधक इस्तेमाल करने के मुकाबले गर्भपात सस्ता है	1	2	3	4	5
517. (12)	Children are god's gift, so it is sacrilege to try and regulate that. बच्चे भगवान की देन हैं, इसलिए इसमें रूकावट डालना अपवित्र कार्य है	1	2	3	4	5
518. (13)	Condom interferes with sexual pleasure. कंडोम से यौन सुख का मजा कम होता है	1	2	3	4	5
519. (14)	A man should not have to worry about family planning. आदमी को परिवार नियोजन के बारे में चिन्ता नहीं करनी चाहिए	1	2	3	4	5
520. (15)	Women choose not to adopt method of family planning till they have a boy. महिलाओं को तब तक परिवार नियोजन का तरीका नहीं अपनाना चाहिए जब तक लडका ना हो जाए	5	4	3	2	1

SECTION 6: OWNERSHIP AND EXPOSURE TO VARIOUS MEDIA (ASK ALL)

Q. No.	Questions and Filters	Coding Categories	Coding	Skip
601.	Do you have TV at home?	Yes हां	01	
	क्या आपके घर पर टीवी है?	No नहीं	02	
602.	Do you ever watch TV?	Yes हां	01	
	क्या आप कभी टीवी देखती हैं?	No नहीं	02	
603.	Do you ever listen to radio?	Yes हां	01	
	क्या आप कभी रेडियो सुनती हैं?	No नहीं	02	

604.	Can you please tell me, Do you have mobile phone in home? कृपया बताएं कि क्या आपके घर में मोबाइल फोन है?	Yes हां	01	
		No नहीं	02	GO to Q701
605.	Mobile phone in your home is... आपके घर में जो मोबाइल फोन है वह	Personal आपका अपना है	03	
		Your Husband's आपके पति का	02	
		Share With Family परिवार का साझा	01	
606.	Do you have internet connection on mobile phone? क्या आपके मोबाइल फोन में इंटरनेट कनेक्शन है?	Yes हां	01	
		No नहीं	02	

Q. No	Question	Coding Category	Response Option				
			Everyday रोजाना	Atleast 2- 3 times a week कम से कम सप्ताह में 2-3 बार	Once in two weeks दो सप्ताह में एक बार	Once a month महीने में एक बार	Never कभी नहीं
607.	How often do you use your mobile phone for.....?						
	आप अपना मोबाइल फोन के लिए कब कब इस्तेमाल करती हैं?	607A. Making Voice Calls काल करने के लिए	5	4	3	2	1
		607B. Sending Text Messages टैक्स्ट मैसेज भेजने के लिए	5	4	3	2	1
		607C. Listening To Music संगीत सुनने के लिए	5	4	3	2	1
	(CIRCLE ONE RESPONSE FOR EACH)	607D. Clicking Pictures Through Camera कैमरे से फोटो खींचने के लिए	5	4	3	2	1
		607E. Playing Mobile Games मोबाइल गेम खेलने के लिए	5	4	3	2	1
		607F. Watching TV टीवी देखने के लिए	5	4	3	2	1
		607G. Listening To Radio रेडियो सुनने के लिए	5	4	3	2	1

		Ask only if 1 coded in 606 607H. Using Internet इंटरनेट इस्तेमाल करने के लिए	5	4	3	2	1
Q. No.	Questions and Filters	Coding Categories	Coding	Col Code			
608.	Have you ever used mobile phone for any kind of health information? क्या आपने कभी मोबाइल फोन का इस्तेमाल स्वास्थ्य संबंधी कोई जानकारी लेने के लिए किया है?	Yes हां	01				
		No नहीं	02				
609.	Have you ever used mobile phone to access family planning information? क्या आपने कभी मोबाइल फोन का इस्तेमाल परिवार नियोजन की जानकारी प्राप्त करने के लिए किया है?	Yes हां	01				
		No नहीं	02		GO TO Q701		
610.	In which of the following form do you access family planning information on mobile phone? इनमें से किन किन रूप में आप परिवार नियोजन की जानकारी मोबाइल फोन पर प्राप्त करते हैं? MULTIPLE OPTIONS POSSIBLE	SMS Updates एसएमएस अपडेट	01				
		Videos वीडियो	02				
		TV टीवी	03				
		Radio रेडियो	04				
		ASHA/AWW/ ANM आशा/एडबलूडबलू /एएनएम.	05				
		Dr. Anita डा. अनिता	06				
		I Do Not Access Information On Cell Phone में सैलफोन पर जानकारी एक्सेस नहीं करती	07				

SECTION 7: TECHNOLOGY INTERFACE (ASK ALL)

Q. No.	Statement	Response Option and Coding				
		Strongly Agree पूरी तरह सहमत	Agree सहमत	Disagree असहमत	Strongly Disagree पूरी तरह असहमत	Cannot Say कह नहीं सकते
701.	Health information received through mobile phones is trust worthy. मोबाइल फोन द्वारा प्राप्त की गई स्वास्थ्य संबंधी जानकारी विश्वसनीय है	4	3	2	1	0
702.	I like listening to health messages on mobile phone. मोबाइल फोन पर स्वास्थ्य संदेश सुनना मुझे पसंद है	4	3	2	1	0
703.	It is convenient to get health information through mobile phones. मोबाइल फोन द्वारा स्वास्थ्य की जानकारी प्राप्त करना सुविधाजनक है	4	3	2	1	0
704.	This system protects information about my personal identity. यह सिस्टम मेरी व्यक्तिगत पहचान की जानकारी को छुपाता है	4	3	2	1	0
705.	I can privately talk to doctor on mobile phone. मैं मोबाइल फोन पर डाक्टर से व्यक्तिगत तौर पर बात कर सकती हूँ	4	3	2	1	0
706.	Mobile phone is a source of information for health matters. मोबाइल फोन स्वास्थ्य संबंधी जानकारी का एक जरिया है	4	3	2	1	0
707.	I will not be ashamed of asking family planning questions on phone. फोन पर परिवार नियोजन के प्रश्न पूछने में मुझे शर्म नहीं आएगी	4	3	2	1	0

710.	I do not believe messages on mobile phone. मुझे मोबाइल फोन पर संदेशों में कोई विश्वास नहीं	4	3	2	1	0
711.	Women/Men who use mobile may become promiscuous मोबाइल इस्तेमाल करने वाले महिला/पुरुष असंयमी बन सकते हैं	1	2	3	4	0
712.	Health information on mobile phone is unreliable. मोबाइल फोन पर स्वास्थ्य संबंधी जानकारी अविश्वसनीय है	4	3	2	1	0
713.	New health information can be accessed through mobile phone. स्वास्थ्य संबंधी नई जानकारी मोबाइल फोन के द्वारा प्राप्त की जा सकती है	4	3	2	1	0

SECTION 8: DEMOGRAPHICS (ASK ALL)

Q. No.	Questions and Filters	Coding Categories	Coding	Skip
801.	Have you ever attended school? क्या आप कभी स्कूल गई हैं?	Yes हां	01	If coded 2 then skip to 803
		No नहीं	02	
802.	What is the highest level you completed? आपने किस स्तर तक शिक्षा प्राप्त की है?	Level स्तर		
803.	Can you read and write? क्या आप पढ़ लिख सकती हैं?	Yes हां	01	
		No नहीं	02	
804.	What is your religion? आपका धर्म क्या है?	Hindu हिन्दु	01	
		Muslim मुस्लिम	02	

		Sikh सिक्ख	03	
		Christian ईसाई	04	
		Others Specify अन्य स्पष्ट करें _____	88	

805.	Do you belong to a scheduled caste, a scheduled tribe, other backward class, or none of these? क्या आप अनुसुचित जाति, अनुसुचित जनजाति, अन्य पिछडा वर्ग से हैं या इनमें से किसी से नहीं?	Scheduled Caste अनुसुचित जाति	01	
		Scheduled Tribe अनुसुचित जनजाति	02	
		Other Backward Class अन्य पिछडा वर्ग	03	
		General जनरल/सामान्य	04	
		Other Caste अन्य जाति _____	88	
		No Caste कोई जाति नहीं	99	
806.	What language you speak other than Hindi? आप हिन्दी के इलावा और कौनसी भाषा बोलती हैं?	Only Hindi केवल हिन्दी	01	
		Bhojpuri भोजपुरी	02	
		Magahi मगही	03	
		Maithili मैथिली	04	
		Other Language अन्य भाषा _____	88	

807A.	<p>Some women take up jobs for which they are paid in cash or kind. Others sell things, have a small business or work on the family farm or in the family business.</p> <p>कुछ महिलाएँ ऐसा काम करती हैं जिसके लिए उन्हें नकद या किसी और रूप में भुगतान किया जाता है। अन्य चीजें बेचती हैं छोटा व्यवसाय करती हैं या घर के खेतों या व्यवसाय में काम करती हैं।</p> <p>In the last seven days, have you done any of these things or any other work?</p> <p>क्या पिछले सात दिनों में आपने इनमें से कोई चीज या कोई अन्य काम किया है?</p>	Yes हां	01	
		No नहीं	02	
807B.	<p>What is your occupation, that is, what kind of work do you mainly do?</p> <p>आप क्या काम करती हैं, यानि आप मुख्य रूप से किस प्रकार का काम करती हैं?</p>	Housewife गृहणी	03	
		Work in own field अपने खेतों में काम	02	
		Wage labourer दिहाड़ी मजदूर	01	
		Some other work (SPECIFY)--- अन्य काम, स्पष्ट करें	88	

808.	Socio Economic Status Questions	Score based on composite index of assets owned, have access at home, etc.	Circle
808A.	<p>Please take a look at this list and tell me which of these items do you have at home? (It could be owned by you, your family, or provided by the employer or it could be available in the house you live in; but it should be for the use of just you or your family)</p>	ELECTRICITY CONNECTION बिजली का कनेक्शन	01
		CEILING FAN छत का पंखा	02
		LPG STOVE गैस का चूल्हा	03
		TWO-WHEELER	04

<p>कृपया इस लिस्ट से देख कर बताएं कि इनमें से कौन कौन से आइटम आपके घर में हैं?(ये आपके अपने हो सकते हैं. आपके परिवार के, आपके आफिस/कम्पनी/नियोक्ता द्वारा दिया गया या जहां आप रहते हैं वहां पर उपलब्ध है , किन्तु यह सिर्फ आप या आपके परिवार के इस्तेमाल के लिए होना चाहिए)</p> <p>Explain, If Necessary: We have a standard list of items that we use in all kinds of cities and villages. So don't worry if an item appears irrelevant for you, or too ordinary- just go ahead and tell me which items you do have. We need this information just for survey purpose only.</p> <p>यदि आवश्यक हो तो बताएं: हमारे पास आइटमों की एक स्टैंडर्ड लिस्ट है जो हम सभी प्रकार के शहरों व गावों में इस्तेमाल करते हैं। इस बात की परवाह ना करें कि कोई आइटम आपके मतलब का नहीं है, या बहुत आम है , सिर्फ यह बताएं कि कौन कौन से आइटम आपके पास है। हमें यह जानकारी सिर्फ सर्वे के उद्देश्य के लिए चाहिए।</p> <p>Example: Do you have a _____ (item) in your home (in working condition)? क्या आपके घर में -----(आइटम पढ़ें) चालू हालत में है?</p> <p>Circle Items Owned/Have at Home. Tick the Item If owned. Add the number of ticks in the box.</p> <p>घर पर उपलब्ध आइटम को गोला लगाएं। यदि आइटम है तो टिक करें</p>	टू व्हीलर /दुपहिया वाहन		
	COLOUR TV कलर टीवी	05	
	REFRIGERATOR रेफ्रिजरेटर/फ्रिज	06	
	WASHING MACHINE वाशिंग मशीन	07	
	PERSONAL COMPUTER/LAPTOP पर्सनल कंप्यूटर/लैपटाप	08	
	CAR/JEEP/VAN कार /जीप/वैन	09	
	AIR CONDITIONER एयर कंडीशनर	10	
	Does your family own any agricultural land, by agricultural land I mean land that is currently under cultivation or plantation? क्या आपके परिवार के पास खेती की जमीन है, खेती की जमीन से मेरा मतलब है वह जमीन जिस पर इस समय खेती या बागवानी की जा रही हो?	AGRICULTURAL LAND खेती की जमीन	11
		TOTAL ITEM CATEGORIES CIRCLED	

808B.	<p>Could you tell me something about the person who makes the biggest contribution to the running of the household. CWE</p> <p>क्या आप उस व्यक्ति के बारे में कुछ बता सकती हैं जिसका घर चलाने में सबसे ज्यादा योगदान होता है। मुख्य कमाने वाले</p> <p>To what level has he studied?</p> <p>उन्होंने किस स्तर तक शिक्षा प्राप्त की है?</p>	Graduate/ Postgraduate: Professional स्नातक/ परा- स्नातक: पेशेवर	7
		Graduate/ Postgraduate: General स्नातक/ परा- स्नातक: सामान्य	6
		Some College (including Diploma but not Graduation) कॉलेज गये लेकिन स्नातक नहीं (डिप्लोमा शामिल करें)	5
		SSC/HSC एसएससी/ एचएससी	4
		School-5 to 9 years स्कूल 5-9 साल	3
		Literate but no formal schooling/ School -up to 4 years शिक्षित लेकिन कोई औपचारिक स्कूली शिक्षा नहीं/ स्कूल 4 साल तक	2
		Illiterate अशिक्षित	1

CLOSE AND THANK YOU

RECORD FINDINGS OF Q808 A and Q808 B IN THE GRID BELOW

SOCIO ECONOMIC STATUS GRID								
Chief Earner: Education मुख्य कमाने वाले व्यक्ति की शिक्षा (Q808B.)	Literate but no formal schooling / School - up to 4 years शिक्षित लेकिन कोई औपचारिक स्कूली शिक्षा नहीं/ स्कूल 4 साल तक			Some College (including Diploma but not Graduate / Graduation) कॉलेज गये लेकिन स्नातक नहीं (डिप्लोमा शामिल करें)			Graduate / Postgraduate: Professional स्नातक/ स्नातक/ परा- स्नातक: पेशेवर	
	Illiterate अशिक्षित	School-5 to 9 years स्कूल 5-9 साल	SSC/HS C एसएससी/ एचएससी	स्नातक नहीं	स्नातक/ परा- स्नातक: सामान्य	स्नातक/ परा- स्नातक: पेशेवर		
No. of Durables (Transfer from Q808A.) उपकरणों की संख्या	1	2	3	4	5	6	7	
None कोई नहीं	E3	E2	E2	E2	E2	E1	D2	
1	E2	E1	E1	E1	D2	D2	D2	
2	E1	E1	D2	D2	D1	D1	D1	
3	D2	D2	D1	D1	C2	C2	C2	
4	D1	C2	C2	C1	C1	B2	B2	
5	C2	C1	C1	B2	B1	B1	B1	
6	C1	B2	B2	B1	A3	A3	A3	
7	C1	B1	B1	A3	A3	A2	A2	
8	B1	A3	A3	A3	A2	A2	A2	
9+	B1	A3	A3	A2	A2	A1	A1	

Appendix B: Focus group discussion guide

INFORMATION AREA जानकारी क्षेत्र	QUESTIONS सवाल	Respondent प्रतिभागी
<p>Warm up शुरूआती तैयारी</p> <p><i>Daily routine and basic household information</i> रोजाना की दिनचर्या और घर के बारे में सामान्य जानकारी</p> <p><i>Family</i> परिवार</p>	<p>Thank you for agreeing to talk to us. I think it will be really easy to talk about other things if we know each other well first... so let's first talk about each of us, what we do etc...</p> <p>हमसे बात करने की सहमति देने के लिए आपका धन्यवाद। मुझे लगता है अन्य चीजों के बारे में बात करना वास्तव में आसान होगा यदि पहले हम एक दूसरे के बारे में जान जायें... इसलिए आइये पहले हम एक दूसरे के बारे में बात करते हैं, हम क्या करते हैं आदि...</p> <ul style="list-style-type: none"> • Could you please tell me your daily routine? How do you spend your time? • कृपया आप मुझे अपनी रोजाना की दिनचर्या बताएँ? आप अपना समय कैसे बिताते हैं? • Can you describe to me your typical day...the things you do from morning till evening? • क्या आप मुझे अपने एक आम दिन के बारे में बता सकते हैं... सुबह से लेकर शाम तो जो कुछ भी आप करते हैं? • What do you enjoy doing the most? What do you like? And what do you dislike/ hate, in your daily life? • आपको क्या करने में सबसे ज्यादा मज़ा आता है? आपको क्या पसंद है? और आपको अपनी रोजमर्रा की जिंदगी में क्या नापसंद है? • What are the things they cannot do without? • वे कौन सी चीजें हैं जिनके बिना वे कुछ नहीं कर सकते हैं? 	<p>ASK <u>ALL</u> <u>सभी से पूछें</u></p>

<p><i>Free time and leisure activities</i></p> <p>खाली समय और संबंधित गतिविधियां</p>	<p>ASK EACH RESPONDENT INDIVIDUALLY</p> <p>प्रत्येक रिस्पॉन्डेंट से अलग-अलग पूछें</p> <ul style="list-style-type: none"> • Let's talk about your family. • आइये अब हम आपके परिवार के बारे में बात करते हैं? • Is it a joint family? How many members are there in your family? Who all are there? • क्या यह संयुक्त परिवार है? आपके परिवार में कितने सदस्य हैं? वहां कौन-कौन हैं? • Do you have children? How many? Daughters? Sons? How old is/are (s)he/they? • क्या आपके बच्चे हैं? कितने हैं? बेटियां? बेटे? उनकी उम्र क्या है? • Do you get free time for yourself? When is that? • क्या आपको अपने लिए खाली समय मिलता है? कब? • What do you like to do in your free time? • आपको अपने खाली समय में क्या करना पसंद है? • What do you like to do for your entertainment? • आपको अपने मनोरंजन के लिए क्या करना पसंद है? <p>MAY DISCUSS ANY TOPIC FOR SOME TIME THAT THE RESPONDENT FEELS COMFORTABLE TALKING ABOUT</p> <p>कुछ समय के लिए किसी भी विषय पर चर्चा कर सकते हैं जिससे रिस्पॉन्डेंट बात करने के बारे में सहज महसूस करे</p> <p>MODERATOR TO MOVE ON ONLY WHEN RESPONDENT FULLY COMFORTABLE</p> <p>मोडरेटर को तभी शुरू करना है जब रिस्पॉन्डेंट पूरी तरह से सहज हो</p>	
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<p><i>Mobile Phone Access & Use</i> मोबाइल फोन पहुंच और इस्तेमाल</p> <p><i>Information Needs</i> जानकारी आवश्यकता</p>	<p>Now let us talk about mobile phones as they are very common these days.</p> <p>आइये अब हम मोबाइल फोन्स के बारे में बात करते हैं क्योंकि आजकल वे बहुत आम हैं</p> <ul style="list-style-type: none"> • How many of you own a mobile phone? Why did you get a mobile phone? • आपमे से कितनों के पास मोबाइल फोन है? आपने मोबाइल फोन क्यों लिया? • How often do you use a mobile phone? • आप मोबाइल फोन को कितने अंतराल पर इस्तेमाल करते हैं? • What do you use the mobile phone for? • आप मोबाइल फोन को किसलिए इस्तेमाल करते हैं? • Do you use the mobile phone to gain any health information? <p>PROBE: What kind of information do you ask for and/or receive over the mobile phone?</p> <p>क्या आप स्वास्थ्य जानकारी लेने के लिए मोबाइल फोन इस्तेमाल करते हैं? प्रोब- मोबाइल फोन पर आप किस प्रकार की जानकारी के लिए पूछते और/या प्राप्त करते हैं?</p>	<p><u>ASK WOMEN AND THEIR PARTNERS</u></p> <p><u>महिला और उनके साथियों से पूछें</u></p>
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<p><i>Impact of mHealth tool</i></p> <p>एमहैल्थ टूल का प्रभाव</p>	<ul style="list-style-type: none"> • What types of health information do you need the most? PROMPT: Have <u>YOU EVER</u> received family planning/ contraceptive information through mobile phone? PROBE: The information was in which form? PROMPT: Was it a voice application, text messaging (SMS), video and/or the application with the help of health worker. आपको किस प्रकार की स्वास्थ्य जानकारी की सबसे ज्यादा जरूरत है? प्रोम्प्ट- क्या आपको कभी मोबाइल फोन के जरिये परिवार नियोजन/ गर्भनिरोधक जानकारी मिली है? प्रोब- जानकारी किस रूप में थी? प्रोम्प्ट- क्या यह एक वॉयस एप्लीकेशन (बोलती आवाज), टेक्स्ट मैसेजिंग (एसएमएस), वीडियो और/ या स्वास्थ्यकर्मी के मदद के साथ एप्लीकेशन थी। • How often do you use these mHealth tools? Which tool do you use most often? • आप इन एमहैल्थ टूल्स को कितने अंतराल पर इस्तेमाल करते हैं? आप कौन से टूल को सबसे ज्यादा इस्तेमाल करते हैं? • What has been the impact of these mHealth tools on your life? • आपकी जिंदगी पर इन एमहैल्थ टूल्स के क्या प्रभाव रहे हैं? 	
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<p><i>mHealth tool use for family planning</i> परिवार नियोजन के लिए एमहेल्थ टूल इस्तेमाल</p>	<ul style="list-style-type: none"> • Have you gained information through the mobile phone that has aided you in using contraceptive? <p>PROBE: Has these family planning mHealth tool/s improved your life? If so, how?</p> <p>PROBE: Do you think that you are now more informed on contraceptives? Why do you think so?</p> <p>क्या आपने मोबाइल फोन के जरिये जानकारी ली है जिसने गर्भनिरोधक इस्तेमाल करने में आपकी मदद की है?</p> <p>प्रोब- क्या इन परिवार नियोजन एमहेल्थ टूल्स ने आपकी जिंदगी को बेहतर बनाया? यदि हां, कैसे?</p> <p>प्रोब- क्या आपको लगता है कि अब आपको गर्भनिरोधकों के बारे में ज्यादा जानकारी है? आपको ऐसा क्यों लगता है?</p>	<p><u>ASK WOMEN AND THEIR PARTNERS</u> <u>महिलाओं और उनके साथियों से पूछें</u></p>
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<p><i>Social support</i> सामाजिक सहयोग</p>	<ul style="list-style-type: none"> • Where did you learn about family planning-based mHealth tool/s? • आपको परिवार नियोजन आधारित एमहैल्थ टूल्स के बारे में कहां से पता लगा? • Have you taught anyone else family planning-based mHealth tool/s? • क्या आपने किसी को परिवार नियोजन आधारित एमहैल्थ टूल्स के बारे में सिखाया? • Do you use the mobile phone to contact any organization for family planning advice? If so, whom do you get in touch with? How often and for what reason? • क्या आप परिवार नियोजन सलाह के लिए किसी संस्था से संपर्क करने के लिए मोबाइल फोन इस्तेमाल करते हैं? यदि हां, तो आप किससे संपर्क करते हैं? कितने अंतराल पर और किस कारण के लिए? • Do your partner/ peer/ other family members have any opinion on information access to family planning on cell phone? PROBE: Why so? क्या आपके जीवनसाथी/ साथी/ परिवार के अन्य सदस्यों की सेल फोन पर परिवार नियोजन पर जानकारी लेने पर कोई राय है? प्रोब-ऐसा क्यों? 	<p>ASK ALL सभी से पूछें</p>
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<p><i>Health workers with mobile phone-based tools</i></p> <p>मोबाइल फोन आधारित टूल्स के साथ स्वास्थ्यकर्मी</p>	<ul style="list-style-type: none"> • Have you received information on family planning from any health worker through mobile phone? PROBE: Were you satisfied with the information provided? PROBE: Reasons for dis/satisfaction क्या आपको मोबाइल फोन के जरिये किसी स्वास्थ्यकर्मी से परिवार नियोजन पर जानकारी प्राप्त हुई है? प्रोब- क्या आप प्रदान की गई जानकारी से संतुष्ट थे? प्रोब- असंतुष्टि के लिए कारण • What is the one thing that you like most about family planning based mobile phone use? • वह कौन सी एक चीज है जो आपको परिवार नियोजन आधारित मोबाइल फोन इस्तेमाल के बारे में सबसे ज्यादा पसंद है? • What is the one thing that you like least about family planning based mobile phone use? • वह कौन सी एक चीज है जो आपको परिवार नियोजन आधारित मोबाइल फोन इस्तेमाल के बारे में कम पसंद है? 	<p>ASK ALL सभी से पूछें</p>
<p>CLOSE समाप्त</p>	<p>Thank you very much for talking to us today. I hope you found the discussion interesting and informative.</p> <p>आज हमसे बात करने के लिए आपका बहुत धन्यवाद। मुझे आशा है चर्चा आपको दिलचस्प और जानकारीपूर्ण लगी होगी।</p> <ul style="list-style-type: none"> • Is there anything else you would like to talk about before we close? • क्या हमारे समाप्त करने से पहले ऐसा कुछ है जिसके बारे में आप बात करना चाहेंगे? • If you have any questions, please ask and I will try and answer them to the best of my ability... • यदि आपके कोई सवाल हैं कृपया पूछें और मैं कोशिश करूंगा और अपनी सबसे अच्छी क्षमता के आधार पर उनके जवाब दूंगा.. 	

Appendix C: Questions for mHealth programme managers

Discussion with mHealth programme managers comprised of following questions:

1. Do programme managers keep any theoretical model in mind while designing mHealth tools? Why?

OR

What kind of theories we looked at while designing the tool/s?

2. What are the various predictors of behaviour we kept in mind while designing this mHealth tool?

What is the extent to which the mHealth tool/s target specific aspects predicted by the Theory of Planned Behaviour (TPB) or any other psycho social theory?

Appendix D: Participant information sheet



TE WĀNANGA ARONUI
O TĀMAKI MAKAU RAU

APPENDIX E- Participant Information Sheet

Date Information Sheet Produced:

जानकारी शीट पैज की जाने की तारीख

DD	MM	YY
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Project Title

परियोजना विषय

TO STUDY IMPACT OF mHEALTH TOOLS ON FAMILY PLANNING DECISION MAKING AMONG INDIAN WOMEN

भारतीय महिलाओं में मोबाइल फोन आधारित एमहेल्थ टूल्स का परिवार नियोजन के निर्णय पर प्रभाव

This is a research project being conducted by Preeti Tiwari at the Auckland University of Technology, Auckland, New Zealand. I am inviting you to participate in this research project because you are a woman intending to have children and living in India. The information will be gathered through a structured interview. Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

यह रिसर्च परियोजना ऑकलैंड यूनिवर्सिटी ऑफ टेक्नोलॉजी, न्यूज़ीलैंड प्रीति तिवारी द्वारा पर की जा रही है। मैं आपको इस रिसर्च परियोजना में भाग लेने के लिए आमंत्रित कर रही हूँ क्योंकि आप बच्चे पैदा करने की इच्छा रखने वाली महिला हैं और भारत में रहती हैं। जानकारी को एक साक्षात्कार के जरिये एकत्रित किया जायेगा। इस रिसर्च में आपकी भागीदारी पूरी तरह से स्वैच्छिक है। आप भाग लेने के लिए मना भी कर सकती हैं। यदि आप इस रिसर्च में भाग लेने का निर्णय लेती हैं, तो आप किसी भी समय भाग लेना बंद कर सकती हैं। यदि आप इस अध्ययन में भाग नहीं लेने का निर्णय लेती हैं या यदि आप किसी भी समय भाग लेना बंद कर देती हैं, तो आप पर कोई जुर्माना नहीं होगा या कोई नुकसान नहीं होगा।

What is the purpose of this research?

इस रिसर्च का उद्देश्य क्या है?

The purpose of this research is to help women receive knowledge about effective use of mobile phone for health specifically family planning. This will help them to make future decisions about their family size and access information through mobile phones. The information gathered will be used for my PhD project, academic publications or presentations.

इस रिसर्च का उद्देश्य महिलाओं को स्वास्थ्य के बारे में जानकारी प्रदान करना है, मुख्यतः महिलाओं को मोबाइल फोन के असाधारण इस्तेमाल के द्वारा परिवार नियोजन की जानकारी प्राप्त करने में मदद करना है। इससे उन्हें अपने परिवार के आकार के बारे में निर्णय लेने और मोबाइल फोन के जरिये जानकारी लेने में मदद मिलेगी। एकत्र की गई जानकारी को पीएचडी परियोजना, शैक्षिक प्रकाशन या प्रस्तुतिकरण के लिए इस्तेमाल किया जायेगा।

How was I identified and why am I being invited to participate in this research?

मेरी पहचान कैसे की गई और इस रिसर्च में भाग लेने के लिए मुझे ही क्यों आमंत्रित किया जा रहा है?

For this research I am interviewing selected women based on: 1) have at least two living children 2) their exposure to mHealth tools and 3) their contraceptive use. We contacted you at the health worker meeting in your village and you showed interest in participating in this research.

इस रिसर्च के लिए मैं इस आधार पर महिलाओं को आमंत्रित कर रही हूँ-1) जिनके कम से कम दो बच्चे हों 2) उन्हें एमहेल्थ टूल्स और 3) उनके गर्भनिरोधक इस्तेमाल के बारे में जानकारी हो। हमने आपके गांव में स्वास्थ्यकर्मी बैठक में आपसे संपर्क किया और आपने इस रिसर्च में भाग लेने में विलम्बरी दिखाई।

How do I agree to participate in this research?

इस रिसर्च में भाग लेने के लिए मैं कैसे सहमत हूँ?

Your participation in this research is voluntary (it is your choice) and whether or not you choose to participate will neither advantage nor disadvantage you. You are able to withdraw from the study at any time. If you choose to withdraw from the study, then you will be offered the choice between having any data that is identifiable as belonging to you removed or allowing it to continue to be used. However, once the findings have been produced, removal of your data may not be possible. You can participate in this research by signing the consent form attached with this form.

इस रिसर्च में आपका भाग लेना स्वैच्छिक है (यह आपकी पसंद है) और चाहे आप भाग लें या नहीं इससे आपको कोई फायदा या नुकसान नहीं होगा। आप किसी भी समय अध्ययन को छोड़ सकती हैं। यदि आप अध्ययन को छोड़ना चुनती हैं, तो आपको दो विकल्प दिये जायेंगे यानि आपसे संबंधित पहचान जानकारी को हटा दिया जाये या हस्तमाल करने की अनुमति है। हालांकि, एक बार परिणाम पेश हो जाये तो आपकी जानकारी हटाना संभव नहीं हो सकता है। आप इस प्रश्न के साथ दिये गये सहमति प्रश्न पर हस्ताक्षर करते हुए इस रिसर्च में भाग ले सकती हैं।

What will happen in this research?

इस रिसर्च में क्या होगा?

The procedure involves a one-time session with the field investigator. A list of questions that will be asked during the interview and your response is filled in the questionnaire attached with this form. The questionnaire will be presented to me in a tablet-based format. The information gathered will be used for my PhD project, academic publications or presentations.

प्रक्रिया में फील्ड सर्वेक्टरों के साथ एक बार का सत्र होगा। साक्षात्कार के दौरान कुछ सवाल पूछे जायेंगे और आपके जवाब इस प्रश्न के साथ जुड़ी प्रश्नावली में लिखे जायेंगे। प्रश्नावली को एक tablet के रूप में दिया जायेगा। एकर की गई जानकारी को पीएचडी परियोजना, शैक्षिक प्रकाशन या प्रस्तुतिकरण के लिए हस्तमाल किया जायेगा।

What are the discomforts and risks?

प्रातिभागेयों के लिए परेशानियां और जोखिम क्या है?

There are no known risks associated with participating in this research project. However, your information may be shared with representatives of the Auckland University of Technology or governmental authorities if you or someone else is in danger or if I am required to do so by law.

इस रिसर्च परियोजना में भाग लेने के साथ कोई बात जोखिम नहीं जुड़े हुए है। फिर भी, आपकी जानकारी को ऑकलैंड यूनिवर्सिटी ऑफ टेक्नोलॉजी के प्रतिनिधियों या सरकारी अधिकारियों को केवल इन सूरत में बताया जायेगा, यदि आप या कोई अन्य, खतरे में हो या यदि मुझे कानून के अनुसार ऐसा करने की जरूरत हो।

How will my privacy be protected?

प्रतिभागी □□□□□□□□ □□ □□□□□ □□□□ □□ □□□□□□?

All information collected in the study is confidential. Your name will not be identified after the interview. Non-identifiable ID numbers will be assigned and in the final report research findings will be presented in numbers and groups.

अध्ययन में एकर की गई सभी जानकारी गोपनीय है। साक्षात्कार के बाद आपके नाम की पहचान नहीं की जायेगी। ना पहचाने लायक आईडी संख्या दी जायेगी और अंतिम रिपोर्ट रिसर्च परिणामों को अंकी और समूहों में पेश किया जायेगा।

What are the costs of participating in this research?

इस रिसर्च में भाग लेने के लिए क्या कीमत/ खर्च है?

Your interview will last approximately 60 minutes. That is the only cost of participating in this research.

आपका साक्षात्कार लगभग 60 मिनट चलेगा। इस रिसर्च में भाग लेने के लिए बस यही कीमत/ खर्च है।

Will I receive feedback on the results of this research?

क्या मुझे इस रिसर्च का परिणाम पर प्रतिपुष्टि मिलेगी?

You will not receive individual feedback however if you want we can share results of this research. Findings of the study will be based on response of more than 100 women, men and health workers from different part of the country.

आपको व्यक्तिगत प्रतिपुष्टि नहीं मिलेगी फिर भी यदि आप चाहते हैं हम इस रिसर्च के परिणाम बता सकते हैं। अध्ययन के परिणाम देश के विभिन्न हिस्सों से 100 से ज्यादा महिलाओं, पुरुषों और स्वास्थ्यकर्मियों के जवाबों पर आधारित होंगे।

What do I do if I have concerns about this research?

युद्धे क्या करना है यदि युद्धे इस रिसर्च के बारे में कोई चिंता है?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Dr Jay Wood, Senior Lecturer, School of Social Sciences and Public Policy, Faculty of Culture and Society, Auckland University of Technology, jay.wood@auct.ac.nz, +64 9 921 9999 ext 8506.

इस परियोजना के प्रकार के संबंध में किसी चिंता को पहली बार में ही परियोजना पर्यवेक्षक, डाक्टर जे बुड, सीनियर लेक्चरर, स्कूल ऑफ सोशल साइंसेज एंड पब्लिक पॉलिसी, फैकल्टी ऑफ कल्चर एंड सोसायटी, ऑकलैंड यूनिवर्सिटी ऑफ टेक्नोलॉजी, jay.wood@auct.ac.nz, +64 9 921 9999 एक्सटेंशन 8506 को सूचित करना चाहिए।

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEK, Kate O'Connor, ethics@aut.ac.nz, 921 9999 ext 6038.

इस रिसर्च के आयोजन के संबंध में किसी चिंता को एग्जिक्यूटिव सेक्रेटरी ऑफ एयूटीईसी, केट ओ'कॉर्नर, ethics@aut.ac.nz, 921 9999 एक्सटेंशन 6038 को सूचित करना चाहिए।

Whom do I contact for further information about this research?

इस रिसर्च के बारे में अधिक जानकारी के लिए मैं किससे संपर्क करूँ?

Please keep this Information Sheet and a copy of the Consent Form for your future reference. You are also able to contact the research team as follows:

कृपया भविष्य में अपने किसी काम के लिए इस जानकारी शीट और सहमति प्रपत्र की प्रतिलिपि अपने पास रखें। आप रिसर्च टीम से नीचे दिये अनुसार भी संपर्क कर सकते हैं:

Researcher contact details

रिसर्चर संपर्क जानकारी-

Preeti Tiwari, प्रीति तिवारी preeti.tiw@outlook.com

Project Supervisor contact details

परियोजना पर्यवेक्षक संपर्क जानकारी

Dr. Jay Wood, डाक्टर जे बुड jay.wood@auct.ac.nz

Approved by the Auckland University of Technology Ethics Committee on 9th August 2016 AUTEK
Reference number 16/256

9 अगस्त 2016 को ऑकलैंड यूनिवर्सिटी ऑफ टेक्नोलॉजी एथिक्स समिति (अ.यू.टे.ए.स.) द्वारा मंजूर। अ.यू.टे.ए.स.
रिफरेंस संख्या:16/256.

Appendix E: Consent form to participate in structured interview



Project title: *The Impact of Mobile Phone Based mHealth Tools on Decisions Regarding Family Planning Among Indian Women*

परियोजना शीर्षक: भारतीय महिलाओं में मोबाइल फोन आधारित एमहेल्थ टूल्स का परिवार नियोजन के निर्णय पर प्रभाव

Project Supervisor: *Dr. Jay Wood*

परियोजना पर्यवेक्षक: डॉक्टर जे वुड

Researcher: *Preeti Tiwari*

रिसर्चर: प्रीति तिवारी

- I have read and understood the information provided about this research project in the Information Sheet dated -----
(dd) (mm) (yyyy)
- मैंने तारीख की जानकारी शीट में रिसर्च परियोजना के बारे में प्रदान की गई जानकारी को पढ़ कर समझ लिया है।
- I have had an opportunity to ask questions and to have them answered.
मुझे सवाल पूछने और उनके जवाब लेने के मौके दिये गये थे।
- I understand that my responses will be captured in the research questionnaire.
मुझे पता है कि मेरे जवाबों को रिसर्च प्रश्नावली में लिखा जायेगा।
- I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
मुझे पता है कि मुझे कोई नुकसान हुए बिना मैं खुद या किसी जानकारी को इस परियोजना के जानकारी लेने का काम पूरा होने से पहले किसी भी समय छोड़ सकती हूँ।
- If I withdraw, I understand that all relevant information including filled research questionnaire thereof, will be destroyed.
यदि मैं इस रिसर्च में भाग लेना छोड़ती हूँ, तो मुझे पता है कि सभी संबंधित जानकारी जिसमें भरी हुई रिसर्च प्रश्नावली शामिल है, को नष्ट कर दिया जायेगा।
- I understand that the information provided by me will be retained in the form of research data.
मुझे पता है कि मेरे द्वारा दी गई जानकारी को रिसर्च डाटा के रूप में सुरक्षित रखा जायेगा।
- I agree to take part in this research.
मैं इस रिसर्च में भाग लेने के लिए सहमत हूँ।
- I wish to receive a copy of the report from the research (please tick one): Yes No
मैं रिसर्च से रिपोर्ट की एक प्रतिलिपि प्राप्त करना चाहती हूँ (कृपया एक पर निशान लगायें): हाँ / नहीं

Participant's signature:

प्रतिभागी के हस्ताक्षर:

Participant's name:

प्रतिभागी का नाम:

Participant's Contact Details (if appropriate):

प्रतिभागी की संपर्क जानकारी (यदि उपयुक्त है) :

.....

.....

.....

Date:

तारीख:

Approved by the Auckland University of Technology Ethics Committee on type the date on which the final approval was granted AUTEK Reference number type the AUTEK reference number

9 अगस्त 2016 को ऑकलैंड यूनिवर्सिटी ऑफ़ टेक्नोलॉजी एथिक्स समिति (अ.यू.टे.ए.स.) द्वारा मंजूर। अ.यू.टे.ए.स. रिफरेंस संख्या:16/256.

Note: The Participant should retain a copy of this form.

नोट: प्रतिभागी को इस प्रपत्र की एक प्रतिलिपि लेनी चाहिए।

Appendix F: Consent forms for focused group discussion



Consent Form for Focused Group Discussion

फोकस ग्रुप डिस्कशन के लिए सहमति प्रपत्र

Project title: *The Impact of Mobile Phone Based mHealth Tools on Decisions Regarding Family Planning Among Indian Women*

परियोजना शीर्षक: भारतीय महिलाओं में मोबाइल फोन आधारित एमहेल्थ टूल्स का परिवार नियोजन के निर्णय पर प्रभाव

Project Supervisor: *Dr. Jay Wood*

परियोजना पर्यवेक्षक: डॉक्टर जे वुड

Researcher: *Preeti Tiwari*

रिसर्चर: प्रीति तिवारी

I have read and understood the information provided about this research project in the Information Sheet

dated -----

(dd) (mm) (yyyy)

मैंने तारीख की जानकारी शीट में रिसर्च परियोजना के बारे में प्रदान की गई जानकारी को पढ़ कर समझ लिया है।

I have had an opportunity to ask questions and to have them answered.

मुझे सवाल पूछने और उनके जवाब लेने के मौके दिये गये थे।

I understand that identity of my fellow participants and our discussions in the focus group is confidential to the group and I agree to keep this information confidential.

मुझे पता है कि मेरे साथी प्रतिभागियों की पहचान और फोकस ग्रुप में हमारी चर्चा ग्रुप के लिए गोपनीय है और मैं इस जानकारी को गोपनीय रखने के लिए सहमत हूँ।

I understand that notes will be taken during the focus group and that it will also be audio-taped and transcribed.

मुझे पता है कि फोकस ग्रुप के दौरान महत्वपूर्ण बातें लिखी जायेंगी और इसे ऑडियो-टेप और ट्रांसक्राइब/प्रतिलिखन भी किया जायेगा।

I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.

मुझे पता है कि मुझे कोई नुकसान हुए बिना मैं खुद या किसी जानकारी को, इस परियोजना के जानकारी लेने का काम पूरा होने से पहले किसी भी समय छोड़ सकती हूँ।

I understand that the information provided by me will be retained in the form of research data.

मुझे पता है कि मेरे द्वारा दी गई जानकारी को रिसर्च डाटा के रूप में सुरक्षित रखा जायेगा।

- If I withdraw, I understand that while it may not be possible to destroy all records of the focus group discussion of which I was part, the relevant information about myself including tapes and transcripts, or parts thereof, will not be used.

यदि मैं इस रिसर्च में भाग लेना छोड़ती हूँ, तो मुझे पता है कि जिस फोकस ग्रुप डिस्कशन में मैंने भाग लिया था उसके सभी रिकार्ड्स को नष्ट करना संभव नहीं हो सकता है, लेकिन मेरे बारे में संबंधित जानकारी जिसमें टेप और ट्रांसक्रिप्ट्स, या कुछ अन्य चीजों को इस्तेमाल नहीं किया जावेगा।

- I agree to take part in this research.

मैं इस रिसर्च में भाग लेने के लिए सहमत हूँ।

- I wish to receive a copy of the report from the research (please tick one): Yes No

मैं रिसर्च से रिपोर्ट की एक प्रतिलिपि प्राप्त करना चाहती हूँ (कृपया एक पर निशान लगायें): हाँ / नहीं

Participant's signature:

प्रतिभागी के हस्ताक्षर:

Participant's name:

प्रतिभागी का नाम:

Participant's Contact Details (if appropriate) :

प्रतिभागी की संपर्क जानकारी (यदि उपयुक्त है) :

.....

Date:

तारीख:

**Approved by the Auckland University of Technology Ethics Committee on 9th August 2016 AUTECH
 Reference number 16/256**

**9 अगस्त 2016 को ऑकलैंड यूनिवर्सिटी ऑफ़ टेक्नोलॉजी एथिक्स समिति (अ.यू.टे.ए.स.) द्वारा मंजूर। अ.यू.टे.ए.स. रिफरेंस
 संख्या:16/256.**

Note: The Participant should retain a copy of this form.

नोट: प्रतिभागी को इस प्रश्न की एक प्रतिलिपि लेनी चाहिए।

Appendix G: Socio demographic characteristics of sample (percent)

	<u>Exposed</u>		<u>Non-Exposed</u>	
	User (n=193)	Non-User (n=185)	User (n=195)	Non-User (n=194)
Socio-economic category				
SEC A & B	14 (n=27)	10 (n=19)	5 (n=10)	12 (n=24)
SEC C	21 (n=41)	18 (n=33)	17 (n=34)	16(n=31)
SEC D & E	64 (n=125)	72 (n=133)	77 (n=151)	72 (n=139)
Ever attended school	39 (n=75)	31 (n=58)	29 (n=56)	35 (n=68)
Currently Pregnant	0	70 (n=129)	0	63 (n=122)
Number of children				
No Child	2 (n=3)	17(n=32)	1 (n=2)	20 (n=39)
1-2 children	47 (n=90)	48 (n=89)	47 (n=91)	50 (n=96)
3-4 children	40 (n=77)	29 (n=54)	42 (n=82)	24 (n=47)
5 = < children	12 (n=23)	5 (n=10)	10 (n=20)	6 (n=12)
Religion				
Hindu	88 (n=169)	82 (n=151)	90 (n=176)	86 (n=167)
Muslim	12 (n=24)	18 (n=34)	10 (n=19)	14 (n=27)
Caste				
SC	25 (n=49)	23 (n=43)	30 (n=58)	25 (n=48)
ST	7 (n=13)	14 (n=25)	7 (n=14)	11 (n=21)
OBC	60 (n=115)	57 (n=105)	60 (n=117)	57 (n=110)
General	7 (n=14)	5 (n=10)	3 (n=5)	5 (n=10)
Other Caste	0.5 (n=1)	1 (n=2)	0.5 (n=1)	3 (n=5)
No Caste	0.5 (n=1)	(n=0)	(n=0)	(n=0)

Access to Mobile phone

	Exposed (n=278)		Non-exposed (n=262)		Total
	User	Non-User	User	Non-User	
Own a phone	34	31	38	55	158
Share husband's phone	98	85	75	71	329
Share within the family	15	15	9	14	53
Total	147	131	122	140	540

Internet connection on mobile phone

	Exposed (n=278)	Non-Exposed (n=262)
User	16 (11%)	8 (7%)
Non-User	6 (5%)	17 (12%)