



THE UNIVERSITY OF
SYDNEY

**A mixed methods assessment of mHealth, nutrition behaviour
change communication and unconditional cash transfers in
rural Bangladesh: a gender-based approach.**

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A PhD Dissertation

A thesis submitted to the University of Sydney in
fulfilment of the requirements of the degree of
Doctor of Philosophy

Sydney School of Public Health
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The University of Sydney

24 January 2023

Declaration and statement of authentication

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis and sources have been acknowledged. This thesis is an original work of my research and contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

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Date: 24 January 2023

Abstract

Gender equality is a prerequisite for health and wellbeing of women. There is data linking women's empowerment and nutrition program outcomes, however, there is a lack of evidence as to how evaluate the impact of programs on women's empowerment in low-and-middle income settings. Cash transfers can be used as a gender-sensitive development tool, however, more thorough evidence is needed to understand the pathways to empowering women. mHealth interventions, whilst seeking to improve women's health outcomes, rarely consider gender in design. Many agricultural and home gardening interventions aim to improve the nutritional status of women and children by focusing on women as the recipients of the intervention and make assumptions that women will be empowered as a result.

This research aims to assess the impact of nutrition BCC and unconditional cash transfers delivered on a mobile platform on women's empowerment. A large component of this study is embedded in a randomised controlled trial in northern Bangladesh – the Shonjibon Cash and Counselling (SCC) Trial. This thesis provides evidence on how various mHealth interventions have affected gendered power inequalities informs how mHealth interventions can be designed to be gender-transformative and offers new methods to assess impacts of mHealth interventions on gendered power inequalities. This thesis also explores the influence of a home gardening, nutrition BCC and cash transfer pilot study on women's empowerment. The overall purpose of this thesis is to generate evidence for best practices for programmers and policy makers when assessing women's empowerment in nutrition interventions that aim to empower women in low and middle-income countries.

We used a mixed methods approach. A systematic review was used to assess the impact that mHealth interventions have on gender relations. Qualitative methods were used to investigate potential changes in women's empowerment in a pilot study in rural Bangladesh and to explore women's experience of decision-making at the start of the SCC Trial. Quantitative analysis of Bangladesh Demographic and Health Survey (BDHS) provided the characteristics of women who do not participate in decision-making.

The systematic review revealed that no mHealth programs appraised gender from the outset and that programmes could have positive and negative impact on gender relations. Chapters 2 and 3 provide the basis for developing the SCC women's empowerment protocol. Analysis of BDHS data showed a picture emerged of young women and girls who are married, leave school, and move to their husband's home containing many household members, leaving them with little agency.

This thesis has highlighted the importance of assessing the impact of nutrition-specific and -sensitive interventions on women's empowerment. My PhD research provides evidence of the significance of evaluating impact of the SCC Trial and adds to the methodology of assessing the relationship between mHealth, nutrition BCC and transfers and women's empowerment.

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Thesis including published works declaration

This thesis includes five original papers. Three have published in peer-reviewed journals and two manuscripts have been submitted for publication and are in the final stages of review. The core theme of the thesis is to assess the impact of the Shonjibon Cash and Counselling Trial in women's empowerment.

The ideas, development and writing up of all the papers in the thesis were the principal responsibility of myself, the student, working within the School of Public Health, Faculty of Medicine, and Health under the supervision of A/Professor Neeloy Ashraful Alam and Professor Michael J Dibley. For all analyses presented in this thesis, the candidate planned the research, designed the studies, analysed the data, interpreted results as well as drafted and revised the manuscripts for submission to peer-reviewed journals. The candidate wrote and compiled this thesis. The inclusion of co-authors reflects the fact that the work came from active collaboration between researchers and acknowledges input into team-based research.

Student name: Elizabeth Kathleen Kirkwood

Date: 24 January 2023

I hereby certify that the above declaration correctly reflects the nature and extent of the student's and co-authors' contributions to this work. As supervisor for the candidature upon which this thesis is based, I can confirm that the authorship attribution statements above are correct.

Main Supervisor name: Associate Professor Neeloy Ashraful Alam

Date: 24 January 2023

Ethical Clearance

Ethical clearance was not required for the secondary analyses of the Bangladesh Demographic and Health Survey (BDHS) data presented in Chapter 6. All the BDHS data are available in the public domain and participants have been de-identified. The Institutional Review Board Findings Form and National Research Ethics Committee approval for BDHS 2017-18 are found in the Appendix.

Ethical clearance for the Shonjibon Cash and Counselling Trial (published protocol presented in Chapter 4 and qualitative findings in Chapter 5) were obtained from the Human Research Ethics Committee (HREC), University of Sydney, Australia and from the International Center for Diarrhoeal Disease Research (icddr,b) (PR-17106) are in the Appendix.

A certificate of completion for my National Institutes of Health Office of Extramural Research “Protecting Human Research Participants” (Certificate 2649913) is also found in the Appendix.

Publications during enrolment and authorship attribution statement

Chapter 2
<p>Kirkwood EK, Clymer C, Imbulana K, Mozumder S, Dibley MJ, Alam NA. (2021). The Role of mHealth Interventions in Changing Gender Relations: Systematic Review of Qualitative Findings.</p>
<p>EKK designed and led the study, analysed the data, and wrote the drafts of the manuscript. This systematic review was conducted with my co-authors. A/Prof Alam reviewed the manuscript and gave guidance as senior author. All other authors (CC, KI, SM, and NAA) read, critically revised, and approved the final manuscript; and met the International Committee of Medical Journal Editors criteria for authorship.</p>
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<p>EKK and NAA conceptualized the design of the manuscript with MJD contributing. NAA and MJD conceptualized and designed of the main study with A.B and M.L contributing. GA, MK, and AB supervised data collection. EKK and NAA analyzed the data and developed the manuscript. MJD, GA, WK and ML critically reviewed the draft paper. All the authors read, critically revised, and approved the final manuscript; and met the International Committee of Medical Journal Editors criteria for authorship.</p>
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Chapter 4

<p>Kirkwood EK, Dibley MJ, Hoddinott JF, et al (2021) Assessing the impact of a combined nutrition counselling and cash transfer intervention on women’s empowerment in rural Bangladesh: a randomised control trial protocol.</p>
<p>EKK drafted the paper and designed the study tools and main conceptual ideas. NAA and MJD made continuous contributions and supervised the design of the study and the overall writing. All other authors (JFH, TH, TLL, TT, MMH, AI, JK, NBA, SU, NG, SM, MMI, GA, KEA, and SEA) were involved in the development of the main study design and methods; read, critically revised, and approved the final manuscript; and met the International Committee of Medical Journal Editors criteria for authorship.</p>
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<p>EKK drafted the paper, conceived the main conceptual ideas, and designed the gender tools that guided this study. NAA and JK supervised data collection. NAA and MJD made continuous contributions and supervised the design and the overall writing. All other authors (MMH, AI, TT, TH, JFH, TLL, SM, NG, MI, KEA, SEA) were involved in the development of the main study design and methods; read, critically revised, and approved the final manuscript; and met the International Committee of Medical Journal Editors criteria for authorship.</p>
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<p>Chapter 6</p>
<p>Kirkwood EK, Raihana S, Dibley MJ, Alam NA. Women's participation in decision-making: analysis of Bangladesh Demographic and Health Survey Data 2017-2018.</p>

EKK designed and conducted the research, analysed the data, wrote the paper, and was primarily responsible for the manuscript's final content. MJD provided critical guidance on statistical analysis, and SR also provided significant guidance on statistical analysis. NAA provided advice on the overall paper, and MJD, SR and NAA critically reviewed the manuscript. All authors read and approved the final manuscript.

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Other publications during candidature

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Conference presentations

Oral Presentation

- *“Conducting Qualitative Research on Sensitive Topics in Low Income Rural Setting in South Asia”.*

TQR The Qualitative Report Conference, Nova Southeastern University, Florida, **USA**,
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- *“How does a combined nutrition counselling and cash transfer intervention impact women and their level of empowerment? A study protocol from rural Bangladesh”.*

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- *“Can a combined agriculture and nutrition behaviour change intervention improve women’s empowerment in rural Bangladesh? A feasibility study”.*

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- *“What barriers do women face when producing food in homestead gardens in Kurigram, Bangladesh?”.*

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- *“How does a combined nutrition counselling and cash transfer intervention impact women and their level of empowerment in rural Bangladesh?”.*

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Abbreviations

BCC	behaviour change communication
BDHS	Bangladesh Demographic and Health Survey
GBV	gender based violence
icddr,b	International Center for Diarrhoeal Disease Research, Bangladesh
IPV	intimate partner violence
LMIC	low- and middle-income country
SCC	Shonjibon Cash and Counselling (Trial)
UCT	unconditional cash transfer
WHO	World Health Organization

Chapter 1: Introduction

1.1 Global gender-based inequalities influencing women's empowerment

Gender equality is a fundamental human right and prerequisite for the health and wellbeing of women. However, globally gender inequality persists, and many challenges remain, with women disproportionately bearing the burden. Gender, the culturally defined roles, and responsibilities associated with one's biological sex are context-specific and characterise power relations between women and men (1). Gender inequality is a pervasive and insidious form of inequality that adversely influences health outcomes and all aspects of one's life. The Lancet conceptualised a series on gender in 2015 and, whilst undertaking initial research, were surprised by how little targeted effort and impact had been achieved at this intersection, despite compelling evidence that gender equality improves health and wellbeing (1). Gender is one of the most significant contributing factors and social determinants for health outcomes, yet gender is often not fully considered in global health (2).

Empowerment is dynamic, changeable and context specific and can be defined as the "processes by which those who have been denied the ability to make choices acquire such an ability" (3). To become empowered is a process of change and, according to Kabeer (2005), can be explored through the three closely related dimensions of agency, resources and achievements (3). Agency is the power and ability to make choices and decisions and put them into practice; resources enable choices to be carried out, and achievements are the result of agency (3). Global gender disparities exist and are evident in women lacking equitable access to resources and being prevented from participating in decision-making that directly affect their lives (4).

Globally, patriarchal societies, social influences and some governments still encourage and maintain gender inequalities that disadvantage women over men. This situation is evident from social determinants, such as education and economic autonomy, directly affecting women's empowerment. Poverty, gender inequality and disempowerment are intrinsically linked, with poverty compounding inequality. For example globally, in terms of gender inequity and education, 15 million girls of primary school age will never learn to read or write, compared to 10 million boys (5). A lack of education leads to fewer opportunities in the workforce. Women face gender-based discrimination in the workforce, with global participation in the paid work over 26% less than that of men (6). Women are more likely to earn less money, forcing them to live below the poverty line, and in many countries, husbands can still legally prevent their wives from working (5). These disparities flow onto asset ownership; for example, only 13% of agricultural land owners are women (5).

The United Nations Sustainable Development Goals aim to leave no one behind in the roadmap for change; however, vast differences in the level of empowerment between men and women remain. Sustainable Development Goal 5 focuses on gender equality and aims to end all forms of discrimination against women and girls everywhere. However, achieving gender equality is also integral to each of the 17 goals (7, 8). Women's empowerment should be seen as a fundamental goal and valued as an end in itself, not just as a tool for achieving other objectives (3). Empowering women is a necessary and critical step in achieving gender equality.

Gender inequality has health-related consequences that disproportionately affect women (2). Women in low and middle-income countries (LMICs) endure significantly more gender inequalities,

and these can be correlated with higher rates of neonatal and under-five mortality (9). The gender-based disadvantages start when young women cannot access family planning or have the agency to make such decisions about when to have children and how many children to have. When combined with the fact that women earn less or do not earn at all, this lack of financial autonomy makes them subsequently reliant on the male earner to enable them to seek treatment or obtain medicine. The most common cause of death for girls aged 15-19 years is pregnancy-related complications, and the primary reason for not seeking care is the cost of antenatal care is prohibitive (10). We know there are linkages between women's empowerment and health outcomes, however, several systematic reviews (13, 44, 45), show that there is no clear heterogeneity and cannot be substantiated often due to poor study design and methodology.

Disempowered women shoulder the burden of domestic labour, particularly in low and middle-income countries where for example, collecting water and fuel or exposure to solid fuel smoke for cooking has an extremely adverse effect on health outcomes for women and children (2). Globally women do over two and half times more domestic and unpaid care work than men , with the highest ratio being in South Asia, where women do six and half times more (5, 11). Women experience poor nutrition disproportionately more often than men; sixty per cent of those with chronic hunger are female (12). Research has shown that women in nearly two-thirds of 141 countries surveyed experienced more food insecurity than men (5). The biology of your sex can dictate nutritional needs, such as a woman's nutritional requirements during pregnancy. The sociocultural production and consumption of food also influence one's nutritional intake, making gender inequality a cause and consequence of malnutrition (12). This situation is evident by

differences in the intrahousehold allocation of food, where a woman's lower social status and lack of bargaining power within the household can see women eat least and eat last (13).

Gender-based violence against women and girls is a major public health challenge. Gender-based violence occurs across all nations and socioeconomic levels but is more widespread when women lack education, financial independence, and decision-making power (14). Young girls are at risk when forced into early marriage. Globally, in 2020, data revealed that 650 million girls had been married before 18 years of age, equating to one in five young women, adversely affecting the lives of twelve million girls each year (5, 15). The highest rates of early marriage are found in Sub-Saharan Africa (38%), South Asia (30%) and Latin America (25%) (16). In Bangladesh nearly 60% of women were married before turning 18, of which 22% were under the age of 15 (16). A report from the United Nations on gender equality states that many countries today have no legislation on gender-based violence or sexual harassment, and 37 countries exempt perpetrators of rape if they are married to the victim (5). This report also revealed almost one in five women had in the last 12 months experienced physical or sexual violence from an intimate partner (5). If a female child is born into poverty, she is more likely to be forced to marry at a young age, and therefore not receive an education, give birth at early age and is at higher risk of birth related complications and intimate partner violence (16).

1.2 Overview of mHealth, nutrition behaviour change communication and unconditional cash transfer programmes on gender

1.2.1 mHealth and gender

Mobile health, or mHealth, is a medical and public health practice supported by wireless technology or mobile devices (17). Mobile-based health solutions are gaining popularity as a way to reach those living in rural and regional areas by helping break down geographical barriers. They take health care and health information to those who would not otherwise be able to access health care in under-resourced settings (18-21).

Many mHealth programmes seek to enhance women's health in low- and middle-income countries, often addressing issues around maternal and child health (22-25). mHealth programmes can transform gender relations constructively by increasing access to health resources, encouraging spousal communication and improving women's decision-making ability (26). Interventions using mobile devices can enhance women's autonomy in seeking health services and health information, thus advancing their health-related decision-making (27).

Nonetheless, gender-based inequalities pose a challenge for women and mHealth. They have lower literacy and digital literacy rates than men and less access to mobile technology, preventing the uptake and effect of mHealth interventions (26, 28, 29). Globally, women are less likely to own a mobile phone than men, particularly women living in low-resource settings and rural areas (5, 30). If mHealth programmes do not incorporate a gender-sensitive approach from the outset, the interventions risk reinforcing men being the gatekeepers of information as the owners of the phones, the ones with access to the phone and with higher rates of digital literacy.

Women's use of mobile phones to access information via the internet has increased, with 58% of women in LMICs having access to mobile phones; however, this is still 234 million fewer women than men (48). Mobile phones can be life-enhancing tools for women, giving them autonomy and the ability to access information that would not be available to them otherwise, making them feel safer and more connected (48). mHealth has the potential to give women in remote areas greater prospects to access health information; however, to realise the full potential, there is a need for more robust evaluations (14).

A systematic review found that further rigorous investigation into the implementation and evaluation of mHealth was needed to establish whether mHealth programmes transform rather than strengthen gender inequalities (27). This research revealed that women face several barriers to participating in mHealth interventions, including social, financial, and digital literacy and needing approval from their partners (27). The key message is that when taking mHealth interventions to scale, it is essential to ensure that the intervention safeguards women and aims to transform gender inequalities rather than reinforce current gender inequities (27).

Gender inequalities adversely affect health, yet there is far less research into finding gender-responsive solutions (31). Despite the substantial evidence illustrating the way gender interacts both positively and negatively with nutrition BCC, cash transfer programmes and mHealth interventions, further and more thorough research is needed to ensure gender transformative change.

1.2.2 Nutrition behaviour change communication and gender

Research into the multifaceted connections between women's empowerment and nutrition is growing. A large and growing body of literature has revealed that gender inequity is a major contributing factor to ongoing food and nutrition insecurity, thus highlighting the need to promote gender equality to achieve adequate nutrition for all (32). Much evidence supports women's empowerment as a central component in addressing malnutrition and improving maternal and child nutritional status (33-37). Several studies reveal that enhancement in women's empowerment is associated with improved nutrition outcomes, just as disempowerment is correlated with adverse nutritional outcomes for women and children (33). Disempowered women are likely to have less control over resources, more time constraints and less access to health information (37). Gender inequalities drive health inequities, which are, in turn, amplified by poverty (38).

Women are often the beneficiaries of nutrition behaviour change communication (BCC) programmes, which are assumed to influence a women's level of empowerment. Whilst gender-specific nutrition interventions, such as iron-folic acid supplementation, address gender-based nutritional requirements of women, gender-sensitive programs address the underlying determinants of malnutrition and may enhance women's empowerment. Nutrition BCC can encourage women's empowerment by increasing participation and leadership, giving access to and control over resources such as cash transfers, support access to housing and addressing gender-based violence (23, 24).

Women, as primary caregivers, allocate resources at a household level, such as food, differently than men (33). Evidence has shown that women's empowerment is crucial for enhancing dietary diversity, infant and young child feeding and household caloric availability (39, 40). Empowered women can therefore allocate food to themselves and their children in an equitable way. The key factor is to have the agency and bargaining power to actively participate in decision-making at the household level on nutrition choices. An evaluation of a rights-based livelihood approaches to address malnutrition in Bangladesh showed a greatly reduced rates of stunting by using nutrition-specific and nutrition-sensitive approaches (41). The programme was more successful as it also addressed the underlying structural causes, such as gender inequality, which enabled women to increase their involvement in major decisions. Evidence from a randomised control trial in Bangladesh found that the combination of nutrition BCC and social protection (cash transfer) to women substantially decreased childhood stunting. But it also had sustained impacts, with evidence four years post programme revealing lower household poverty and maternal depression and decreased experience of intimate partner violence (42).

Despite the evidence linking women's empowerment and program outcomes, such as nutritional status, there is a lack of evidence documenting the impact of programs on women's empowerment (33). Two interventions, one in Tanzania and the other in Burkina Faso, integrated nutrition and women's empowerment, revealed that gaps remain as to which combination of interventions or dimensions of empowerment were most effective and, in turn, successful (34, 40, 43). Santoso et al. (2019), in a systematic review of evidence on women's empowerment and child nutrition outcomes, found no association, yet this was due to inadequate study design (44). Women's disempowerment is thought to further rates of child undernutrition in South Asia (45). A review of

the literature found the women's empowerment was generally associated with anthropometric outcomes for children, yet the findings were varied (45). The studies reviewed came from a variety of settings and the definition, concept and domains of women's empowerment differed across programs and the tools used to measure were diverse (45). The key message, supported by this evidence is the need for more rigour in gender transformative study design, to standardise the definition of women's empowerment, to incorporate gender analysis from programmatic inception and using context-specific validated tools to measure women's empowerment.

1.2.3 Unconditional cash transfers and gender

Unconditional cash transfer (UCT) programs provide beneficiaries, often women, with cash that has no formal requirements or conditions attached. Cash transfers have become an increasingly popular tool and social protection strategy for governments to help the most vulnerable and lift people out of poverty. Gender-responsive cash transfer programmes are vital to sustainably reducing poverty (46). When women receive a UCT, there is the potential to address gender-based discrimination via improvements in decision-making and advances in economic empowerment. Around 130 low and middle-income countries have at least one UCT programme, with many targeted to those living in extreme poverty (47). As UCTs are a relatively new form of social protection, less appraisal has taken place to assess the evidence of the impact of UCTs on women's empowerment (33).

Increasing significance is being placed on the gendered dynamics of cash transfers, with questions such as how do women spend the money, is this different to men, or does the additional cash change intrahousehold dynamics (48). Bastagli et al. (2016) reviewed 165 studies covering cash

transfer programmes in LMICs, and of these, 88 reported impacts on women, with 31 studies examining empowerment specifically (48). The key findings from this review of the evidence of the effects of cash transfers revealed that they could enhance women's decision-making power and choices, particularly those on marriage and fertility (48). Eight of the studies from Latin America and Africa examined women's agency in decision-making around household expenditure, with almost all studies reporting an increase in sole or joint decision-making power and greater autonomy in decision-making on expenditure (48). There were similar findings from a review of Pakistan's Benazir Income Support Program, an unconditional cash transfer targeting the ultra-poor, which found significant positive impacts on women's empowerment and decision-making control (49). However, Zambia's UCT Child Grant program assessed the program on women's empowerment by examining women's intra-household decision-making and found significant increases in the number of decisions made. But the increases were small across the domains assessed (50).

Several studies have investigated the linkages between cash transfers and a reduction in intimate partner violence (IPV) (42, 46, 51). Evidence has shown that reducing financial stress, poverty, and related conflict is key to decreasing IPV (46). Bastagli et al.'s review (2016) revealed cash transfers significantly reduce gender-based or intimate partner violence and physical abuse by male partners (47, 51). Six of these studies reported a decrease in emotional abuse; however, two reported an increase (48). The assumption is that the cash transfer decreases abuse as stress due to poverty is alleviated, and women experience more bargaining power (48). However, evidence from a cash transfer programme in Ecuador shows that the effect of the cash transfer is dependent on a woman's education relative to her partner; if the woman has equal or more education than her

partner, emotional violence can increase within the household (52). The key message is that cash transfer programmes need to be gender-responsive and monitor for positive and negative impacts on IPV. UCTs are a gender-sensitive development tool as women are often the recipients, yet whilst there are positive effects on women and girls, results vary, and more rigorous evidence is needed to understand the pathways to empowerment (53).

1.3 Purpose of this PhD research

The evidence described above demonstrates the importance of evaluating the interaction between women's empowerment and nutrition. The global gender-based inequities women face are many. There is data linking women's empowerment and nutrition program outcomes, however, there is a lack of evidence and consensus as to how to measure and evaluate the impact of programs on women's empowerment. Cash transfers can be used as a gender-sensitive development tool as women are often the beneficiaries, yet the results vary, and more thorough evidence is needed to understand the pathways to empowering women. mHealth interventions, whilst seeking to improve women's health outcomes, rarely consider gender in design or analysis and risk reinforcing current gender inequities rather being gender transformative. Rigorous evaluation is needed to explore the interconnected pathways between nutrition, mHealth, UCT interventions and women's empowerment.

This research aims to assess the impact of nutrition BCC and unconditional cash transfers delivered on a mobile platform on women's empowerment. A large component of this study is embedded in a randomised controlled trial in northern Bangladesh – the Shonjibon Cash and

Counselling (SCC) Trial (54). The overall purpose of this thesis is to generate evidence for best practices for programmers and policy makers when assessing women's empowerment in nutrition interventions that aim to empower women in low and middle-income countries.

1.4 Project delays

This thesis is intrinsically linked to a large National Health and Medical Research Council of Australia funded randomised controlled trial in Bangladesh, the SCC Trial, which uses a complex and innovative mobile health application to deliver nutrition behaviour change communications via text, audio, and video. While working with a globally renowned technical team in Myanmar that had already created the shell of the app we were going to use, developing the app to a highly functional working order took much longer than expected.

The WHO declared the outbreak of SARS COVID-19 a Public Health Emergency of International Concern on 30 January 2020 and a pandemic on 11 March 2020. The WHO declared the SARS COVID-19 pandemic just at the SCC trial's start following the completion of the household listing in February 2020. These events meant that all the field staff who had been trained and were ready to start enrolment had to go into lockdown from March until September 2020. After lifting the lockdowns, we had to re-recruit and re-train the staff and remove all the registered pregnant women from the database (approximately 3,200) and recommence the pregnancy surveillance.

For Chapter 6, I intended to present the quantitative baseline findings from the SCC Trial (the 5th paper), but this was impossible as COVID-19 delayed the collection of the baseline data survey. The University of Sydney offered students the option of submitting under emergency conditions for

those students whose research was severely impacted by the COVID-19 pandemic (as per the provision in the Thesis and Examination of Higher Degrees by Research Policy 2015). I considered submitting under emergency conditions, but with the help of my supervisor, I changed direction and to compensate for this lack of data decided to analyse demographic and health survey data. Therefore, Chapter 6 is a quantitative paper analysing Bangladesh Demographic and Health Survey Data exploring the characteristics of women that do not participate in decision-making at a household level. This paper assesses data at a national level and will give great insight into the characteristics of women unable to participate in household-level decision-making.

1.5 Research aims and questions

The key research question is what impact do nutrition BCC and unconditional cash transfer interventions, delivered on a mobile platform have on women's empowerment? The overall aim of my PhD research is to assess the impact of a combined nutrition BCC and unconditional cash transfer intervention, delivered on a mobile platform on women's empowerment in rural Bangladesh.

Specific research questions guided this study:

1. What influence do mobile health (mHealth) applications have on gender relations?
2. How feasible is combining nutrition behaviour change communication, home garden training and support with a social safety net payment? Does this combination of interventions impact women's empowerment?
3. What is the most appropriate methodology to measure the impact of the SCC Trial on women's empowerment?
4. What is the current status of women's decision-making ability at the start of SCC Trial?
5. What characteristics impede women from participating in household decision-making?

1.6 Research implementation framework

I planned the following five manuscripts for publication to answer these specific research questions.

Paper No	Project Title	Contribution to PhD Thesis	Chapter
1	What role do mHealth interventions play in changing gender relations? A systematic review of qualitative findings.	This paper is a systematic review of the impact of mobile health (mHealth) applications on gender relations in low-and-middle-income countries between 2013-2020. This review identifies the potential influence that mHealth can have on gender dynamics and justifies why it is important to investigate the impact of the SCC Trial, which utilises mHealth, on women's empowerment and gender relations. <i>This paper addresses thesis question 1.</i>	2
2	A combined agriculture and nutrition behaviour change intervention can improve women's empowerment: A feasibility study in rural Bangladesh.	This paper assesses the feasibility of a pilot study that combined agricultural training, nutrition behaviour change communication and unconditional cash transfer delivered on a mobile platform in rural Bangladesh. Beyond assessing the feasibility of this pilot study, we also found evidence that this combination of interventions showed the potential to influence women's empowerment.	3

		<p>Based on these signs of potential change in women's empowerment and our literature review, we developed a protocol for the SCC Trial.</p> <p><i>This paper addresses thesis question 2.</i></p>	
3	<p>Assessing the impact of a combined nutrition counselling and cash transfer intervention on women's empowerment in rural Bangladesh: a randomised control trial protocol.</p>	<p>This paper describes the study protocol evaluating women's empowerment in the SCC Trial. It describes the theory of change which informed the development and design of specifically tailored tools and provided the framework, approach, and methodology used in the fieldwork.</p> <p><i>This paper addresses thesis question 3.</i></p>	4
4	<p>Women's participation in household decision-making in rural Bangladesh: Qualitative findings from Shonjibon Cash and Counselling Trial baseline evaluation.</p>	<p>This paper documents the qualitative findings from the baseline from the SCC Trial and describes the current status of women's input in decision-making.</p> <p><i>This paper addresses thesis question 4.</i></p>	5
5	<p>Determinants of women's participation in decision-making in Bangladesh:</p>	<p>This paper presents analyses of the Bangladesh Demographic and Health Survey (2017-2018), which examines</p>	6

	<p>evidence from Demographic and Health Survey Data 2017-2018.</p> <p>Women's participation in decision-making analysis of Bangladesh Demographic and Health Survey Data 2017-2018.</p>	<p>the characteristics and determinants of women's ability to participate in household decision-making. This paper provides insight using nationally representative survey data on the barriers for women to participate in decision-making.</p> <p><i>This paper addresses thesis question 5</i></p>	
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1.7 The structure of the thesis

This PhD thesis comprises seven chapters. Two chapters are published works (2 and 4), and chapters 3, 4 and 5 have been submitted to journals and are under peer review.

Chapter 1 sets the background and context for the study and reports on global gender-based inequalities influencing women's empowerment and offers an overview of nutrition behaviour change communication, cash transfer programmes and mHealth on gender. Then follows the purpose of this PhD research, COVID-related delays impacting the thesis, research aims and questions, research implementation framework and the structure and layout for the thesis.

Chapter 2 reports the results of a systematic review that presents evidence that gender-based inequalities can present challenges when implementing mHealth interventions. No mHealth programs appraised gender from the outset. As mHealth is a critical component of the SCC intervention, this review provides vital evidence to inform the development of the protocol to assess the impact of the SCC Trial on women's empowerment.

Chapter 3 explores women's experience in a small pilot study which aimed to improve maternal and child nutrition behaviours for women in low-income families in rural Bangladesh. The study incorporated an unconditional cash transfer, agricultural training, and nutrition counselling which we delivered on a mobile platform. The results suggest that the intervention has planted the seeds of change for women's empowerment in rural Bangladesh.

Chapters 2 and 3 provide evidence that there might be statistically significant impacts on women's empowerment from combined mHealth, cash transfers and nutrition behaviour change. These chapters provide the rationale for developing the SCC women's empowerment protocol.

Chapter 4 presents the protocol for how we will assess the impact of the SCC Trial on women's empowerment. This study protocol describes the tools we will use to evaluate women's empowerment in a randomised controlled trial of a package of nutrition-specific and nutrition-sensitive interventions in rural Bangladesh.

Chapter 5 provides qualitative evidence from the SCC Trial's baseline data on the current status of women's participation in decision-making. Agency and the ability to participate in decision-making are proxies for empowerment. This assessment will be used as a baseline to evaluate whether the SCC Trial impacts women's ability to participate in decision-making.

Chapter 6 uses national-level survey data from the Bangladesh Demographic and Health Survey to quantitatively analyse the characteristics of women who do not participate in household decision-making.

Chapter 7 provides an integrated discussion, including a summary of the main findings, the thesis contributions to knowledge, implications of findings, limitations of this research and the overall conclusions of the study.

1.8 Study Setting – Sirajganj, Bangladesh

Bangladesh is situated in South Asia and has a population of over 166 million people (55). The average life expectancy at birth is 73 years, with women and men living on average to 75 and 71 years of age respectively (55, 56). In Bangladesh the total fertility rate is 2.4 children per woman, with one third of women having their first baby between 15-19 years of age (55). Just over half of all births are attended by a skilled birth attendant (57). The maternal mortality rate was 173 deaths (per 100,000 live births) in 2017, for reference Australia's rate was 6.4 (55, 58). Eighteen babies (per 1000 live births) will die in the first month of life and 29 children (per 1000 live births) will die before the age of five (59).

The median age of first marriage for women is 16 years, in spite of the legal age of marriage being eighteen years (57). One in three women reported being married by the age of 15 (57). Three quarters of women drop out of school after marriage (57). Rates of education are higher for those with greater wealth and those living in urban areas, however 21% of females and 18% of males have received no education (57). Seventy percent of women are literate, with younger women more likely to have attained higher levels of education than older women (57). Almost half the women were employed, with the majority working in the rural sector (poultry farming or cattle raising) (57).

In terms of economic indicators, 14.3% of the population live on less than \$1.90 USD per day, with one in five living below the national poverty line (55, 59). One in ten women (over the age of fifteen) have a bank account (57). Over 10% of the population experience severe food insecurity (55).

Approximately 1 in 3 children under five experience impaired growth due to poor nutrition and recurrent infections and are stunted as a result (57).

The SCC trial takes place in the Ullahpara and Kamarkhanda subdistricts in the Sirajganj district in northern Bangladesh (Figure 1) (60). There are approximately 155,000 households in the study area of which over 90% are living in rural communities (54). Almost half the households have electricity connected. The economy is largely reliant on agricultural production and known for textiles and weaving. Over 40% of households in Sirajganj Rates are living in poverty and cannot purchase sufficient food to satisfy daily nutritional intake requirements (61). Over 40% of children under the age of 2 are stunted (57). Literacy rates for men sit at 45% and for women 39%.



Figure 1. Political map of Bangladesh (60).

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Chapter 2: The Role of mHealth Interventions in Changing Gender Relations: Systematic Review of Qualitative Findings

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Review

The Role of mHealth Interventions in Changing Gender Relations: Systematic Review of Qualitative Findings

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Abstract

Background: The rapid and widespread growth of mobile technologies in low- and middle-income countries can offer groundbreaking ways of disseminating public health interventions. However, gender-based inequalities present a challenge for women in accessing mobile technology. Research has shown that mobile health (mHealth) interventions can affect gender relations in both positive and negative ways; however, few mHealth programs use a gender-sensitive lens when designing, implementing, or analyzing programs.

Objective: This systematic review aims to identify and summarize the findings of qualitative research studies that explore the impact of mHealth interventions on gender relations as a result of participating in such initiatives in low- and middle-income countries.

Methods: We performed a systematic literature review to examine empirical evidence of changes in gender relations attributed to participation in an mHealth intervention in low- and middle-income countries. Peer-reviewed articles were included based on whether they evaluated an mHealth intervention and were published between 2013 and 2020. Articles using mHealth that solely targeted health workers, did not assess a specific intervention, used mobile technology for data collection only, or were formative or exploratory in nature were excluded. The search terms were entered into 4 key electronic databases—MEDLINE, EMBASE, PsycINFO, and Scopus—generating a comprehensive list of potentially relevant peer-reviewed articles. Thematic analysis was used to identify, analyze, and report the themes that emerged from our data.

Results: Of the 578 full-text articles retrieved, 14 (2.4%) were eligible for inclusion in the study. None of the articles appraised gender from the outset. The articles uncovered findings on gender relations through the course of the intervention or postprogram evaluation. Most studies took place in sub-Saharan Africa, with the remainder in South and Southeast Asia. The articles focused on maternal and child health, HIV diagnosis and treatment, and reproductive health. This review found that mHealth programs could enhance spousal communication, foster emotional support between couples, improve women's self-efficacy and autonomy in seeking health information and services, and increase their involvement in health-related decision-making. Despite the positive impacts, some mHealth interventions had an adverse effect, reinforcing the digital divide, upholding men as gatekeepers of information and sole decision-makers, and exacerbating relationship problems.

Conclusions: These results suggest that given the rapid and persistent upscale of mHealth interventions in low- and middle-income settings, it is imperative to design interventions that consider their impact on power dynamics and gender relations. Future research is needed to fill the evidence gaps on gender and mHealth, acknowledging that women are not passive beneficiaries and that they need to actively participate and be empowered by mHealth interventions.

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KEYWORDS

mobile health; mHealth; gender relations; systematic review; low- and middle-income countries; mobile phone

Introduction

The rapid and widespread growth of mobile technologies, especially in low- and middle-income countries (LMICs), offers an innovative mechanism for disseminating public health interventions [1-3]. The extensive use of mobile devices can reduce the geographical barriers often faced in rural and regional areas, encouraging their inclusion in health care and health-related interventions [1,4]. Mobile phones offer the potential to improve health care by providing accessible, sustainable health care for underserved communities, contending with underresourced health care systems in low- and middle-income settings [5,6]. Over 750 million people, or 10% of the global population, still do not have access to a mobile broadband network [7]. This primarily affects those living in rural and remote areas of LMICs [7]. A further 3.3 billion people who live within the reach of a mobile broadband network do not use mobile internet because of financial barriers, lack of awareness of mobile internet and its potential benefits, and lack of skills or confidence in using mobile internet [7]. Many digital-based health programs aim to improve women's health in LMICs, often focusing on maternal and child health [8-11]. However, gender-based inequalities pose a challenge for women, who experience lower literacy rates and less access to mobile technology, inhibiting the uptake and impact of health interventions delivered via digital platforms [12-14].

Mobile health (mHealth) is defined by the World Health Organization as any "medical and public health practice supported by mobile devices" [15]. Evidence suggests that mHealth interventions effectively enhance treatment adherence and appointment compliance and can be used as a tool to assist with data collection [2,4]. Research has also shown that mHealth interventions can transform gender relations positively by improving access to health resources, increasing women's decision-making ability, and supporting spousal communication [12]. mHealth interventions have the potential to increase women's autonomy in seeking health services and health information, thus enhancing their health-related decision-making [16]. This is because mHealth interventions alter traditional mechanisms for communication with health care professionals and, as such, can reduce or eliminate women's reliance on spousal approval and financial support to access health services and afford confidentiality and anonymity.

A systematic review by Jennings and Gagliardi [16] revealed the need for a further rigorous investigation into mHealth in terms of implementation and evaluation to establish whether mHealth programs transform rather than reinforce gender inequalities, and this review builds upon these findings [16]. The review highlighted that women face multiple barriers to participating in mHealth interventions, including social, financial, and digital literacy and the need for spousal approval [16]. Research on the effect of mHealth interventions on men's and women's interactions highlighted that when scaling up mHealth interventions, it is critical to ensure that the intervention

targets the transformation of gender relations and does not reinforce existing gender inequities [16].

The term gender refers to the socially constructed characteristics of women and men and the behavioral norms, relationships, and roles associated with identifying as female or male [17]. Gender relations can be defined as how "a culture or society defines rights, responsibilities, and the identities of men and women in relation to one another" [18]. The relationships between men and women are also influenced by political, economic, religious, environmental, and sociocultural constructs [19]. Therefore, gender significantly affects people's experiences of and access to health care [17].

It is becoming increasingly evident that mHealth can improve the lives of many; however, there is limited research examining the influence of these interventions on gender-based power dynamics and existing inequalities and their impact on women's access to health resources [16,20]. However, evidence supports the use of a gender equity lens in designing and analyzing digital programs [20]. In their review of findings from a cohort of implementation research projects in LMICs, Sinha and Schryer-Roy [20] argued that gender and power analyses are essential when designing and implementing digital interventions [20]. Although researchers have noted several positive impacts of mHealth interventions on gender relations, including increased communication between opposite-sex partners, enhanced female autonomy, improved female social status, and increased access to health resources [16], evidence has also suggested that these programs may unintentionally perpetuate the digital divide and enhance pre-existing power imbalances, exacerbating gender inequalities [12,16,21]. Evidence suggests that a lack of gender analysis and health equity when designing, implementing, and evaluating digital interventions can exacerbate or create new health inequity and gender inequalities [20]. However, the absence and low quality of available literature limit analysis on this issue [16]. As the number of mHealth interventions continues to increase, further research is required to illuminate their impact on gender relations, particularly in low- and middle-income settings.

This systematic review aimed to identify and summarize the findings of qualitative research studies that explore the impact of mHealth interventions on gender relations as a result of participating in such initiatives. Are gender relationships adequately assessed when implementing mHealth interventions? This paper examines empirical evidence of changes in interactions between women and men attributed to their participation in an mHealth intervention in an LMIC. In doing so, it aimed to illuminate the risks and benefits of using mHealth interventions in the context of gender relations in LMICs.

Methods**Inclusion Criteria**

In our review, we included research studies published in peer-reviewed journals that met the following criteria: (1) the

study used qualitative research methods to evaluate an mHealth intervention; (2) the study documented findings on the impact of an intervention on gender relations for intervention participants; (3) the study was published in English between January 2013 and December 2020; and (4) the mHealth intervention was conducted in an LMIC, as defined by the 2020 World Bank classification [22].

Studies were excluded if they were conducted in upper- or upper-middle-income countries, published in a language other than English, gray literature, and non-peer-reviewed or unpublished reports (dissertations and conference abstracts). We also excluded publications that did not specifically assess an mHealth intervention, studied mHealth interventions that solely targeted health workers, used mobile technology for data collection only, and were nonintervention studies such as formative research or exploratory studies.

The systematic review is registered with PROSPERO (International Prospective Register of Systematic Reviews; CRD42021218001).

Search Strategy

The research team conducted a preliminary literature search to identify appropriate search terms relevant to the scope of our review. The electronic search of the Scopus database was the primary means of collating the initial list of appropriate terms. All authors compiled and agreed on relevant search terms and expanded the list to include synonyms and variations in spelling classified under 3 key areas: mHealth, maternal health-related and child health-related terms, and gender relations, as listed in [Textbox 1](#). The key search terms (using Boolean operators) were then entered into 4 key electronic databases—MEDLINE, EMBASE, PsycINFO, and Scopus—generating a comprehensive list of potentially relevant peer-reviewed articles.

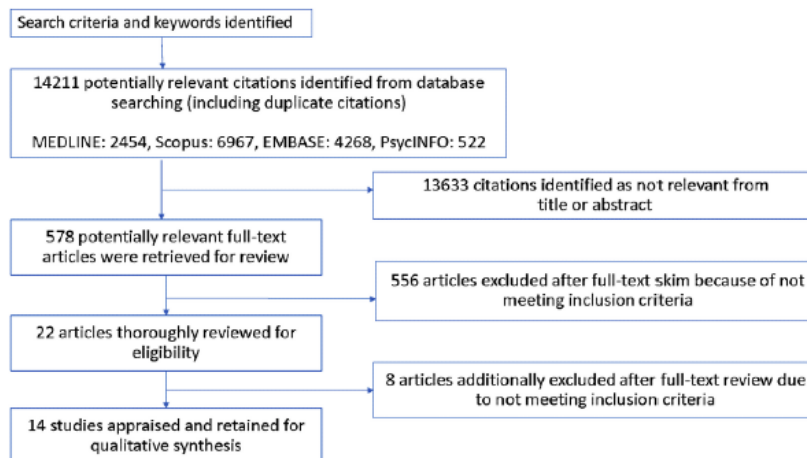
Textbox 1. Search strategy for electronic databases.

Search category and search terms (searched using Boolean operator AND)
<p>Mobile phones</p> <p>"Mobile phone(s)," "cell phone(s)," "cellular phone(s)," "mobile," "phone," "mobile-based," "mobile applications," "SMS," "text," "text-message," "audio message," "smartphone," "eHealth," "mHealth," and "mobile health"</p>
<p>Maternal health-related and child health-related interventions</p> <p>"Health," "maternal," "child," "birth(s)," "delivery," "child," "obstetric," "pregnancy," "neonatal," "antenatal," "anaemia," "pre-eclampsia," "HIV," "AIDs," "malaria," "abortion," "tuberculosis," "postpartum," "family planning," "sexual," and "reproductive"</p>
<p>Gender relations</p> <p>"Gender," "women," "female," "relation," "interaction," "equity," "inequity," "equality," "inequality," "men," "male," "participation," "empower," "sex roles," "women's role," "men's role," "gender role," "autonomy," "violence," "gender-based violence," "intimate partner violence," "domestic violence," "safety," "literacy," "economic," "mobility," "status," "access," "capacity," and "communication"</p>

Title, Abstract, and Article Screening

The research team independently reviewed titles and abstracts obtained from the initial results of the electronic databases. The researchers compiled a list of all potentially relevant articles. If the title and abstract did not provide sufficient information, the full-text article was retrieved, saved in Endnote, and assessed for eligibility. Full-text articles were independently skim-read by 4 research team members and included or excluded as per

the criteria. The research team shared a Microsoft Excel spreadsheet containing citations and their findings and discussed their results. Any inconsistencies were examined and adjusted based on the consensus of all authors, resulting in a finalized list of publications for review. The search and screening process is outlined in the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [23] flow diagram in [Figure 1](#).

Figure 1. Search screening and flowchart. mHealth: mobile health.

Study Appraisal

The final list of the selected studies is shown in the *Characteristics of Included Studies* section. All authors systematically appraised each study, and information was extracted and recorded under the following categories: article number, author, journal, year of publication, description of mHealth intervention, country, study's primary objective, study design, sample size (qualitative and quantitative), and findings on gender relations.

Quality Assessment

Each study was independently reviewed by the research team. We assessed qualitative studies using the Critical Appraisal Skills Programme Qualitative Research Studies checklist [24]. Each paper was appraised to grade the quality of evidence using the 10 questions listed in the *Characteristics of Included Studies* section. A score was assigned for each study. The research team debated any discrepancies in scores until all team members agreed to all scores represented. For question 7 regarding ethical considerations, the paper was awarded a score if the research was approved by an institutional ethics committee or review board. Overall, the literature was of high quality and used appropriate methodologies, recruitment strategies, and research designs. All the articles discussed the value of the research and provided a clear statement of the aims and findings. Most of the literature includes appropriate methods for data collection and analysis; however, very few articles discussed reflexivity. The results are presented in the *Characteristics of Included Studies* section.

Synthesis Process

Each researcher independently reviewed the findings on the influence of mHealth on gender relationships. Data from each publication were coded manually by all 4 researchers, identifying key text that captured the effect of mHealth on gender relations and aligned with our research question. Each researcher read each article several times, made preliminary notes to document and analyze the initial findings, and provided

a framework for emerging themes. We reviewed the results using thematic analysis to identify, analyze, and report themes within our data set [25]. The researchers met to share emerging themes to decide how to present the key thematic synthesis findings.

We present our findings based on the framework by Jennings and Gagliardi [16] and report our results under 3 key themes: positive transformative influences, negative transformative influences, and nontransformative influences. Positive transformational influences on gender relations empower women and enhance gender relations. Negative transformational influences disempower or adversely affect relationships. Nontransformative influences perpetuate rather than challenge gender-based disparities [16].

Results

Literature Search and Review Process

A total of 14,211 articles were retrieved using our search terms, and the titles and abstracts were reviewed for relevance. Of these 14,211 articles, 578 (4.07%) full-text and peer-reviewed articles were retrieved for review. The articles were skimmed and reviewed for eligibility, with 96.2% (556/578) of articles being excluded because of the absence of an evaluation of an mHealth intervention, the mHealth intervention targeting health workers, lack of reported findings on gender relations, or the study not being conducted in an LMIC. Additional screening of the remaining 22 articles led to a further 8 (36%) articles being excluded because of insufficient information, unclear methodology, or general information regarding mHealth interventions.

Characteristics of Included Studies

A total of 14 publications were included in the final list of articles [26-39]. Of these 14 studies, 3 (21%) were conducted in Bangladesh, 1 (7%) in Vietnam, and 1 (7%) in India. The remaining interventions were conducted in sub-Saharan Africa, including 29% (4/14) of studies in Kenya, 21% (3/14) of studies

in Uganda, 7% (1/14) of studies in Ghana, and 7% (1/14) of studies in Malawi. All selected studies were sourced from electronic databases and found in peer-reviewed journals. The mHealth interventions focused on several health areas, including agriculture and nutrition counseling; maternal, neonatal, and infant health care; sexual and reproductive health; HIV or AIDS and antiretroviral treatment; intimate partner violence (IPV); and health-linked unconditional cash transfers. The mHealth apps used in these studies involved SMS text messages, automated SMS text messages, automated voice messages, access to hotlines and counseling call centers, and interactive voice response (IVR) technology. All studies focused on assessing barriers to and facilitators of mHealth interventions, such as feasibility, acceptability, accessibility, and appropriateness. All studies described short-term findings, with no studies examining the long-term ramifications of the intervention. Approximately half of the studies included

interviews with both women and their male partners. In-depth interviews were the most commonly used method for data collection; however, few studies used focus group discussions (the data collection methods are detailed in Table S1 in [Multimedia Appendix 1](#) [8,26-32,34,36-39]). A summary of the characteristics of the 14 included studies is shown in [Table 1](#) (see [Multimedia Appendix 1](#) [8,26-32,34,36-39] for the detailed characteristics of selected studies). [Table 2](#) provides summary of quality scores for selected articles based on Critical Appraisal Skills Programme checklist. [Table S2](#) in [Multimedia Appendix 1](#) provides details for each of the CASP questions and answers for each paper. [Table S3](#) illustrates each paper by thematic coding - positively transformational, negatively transformational and non-transformational. [Table S4](#) and [S5](#) illustrate end-user involvement from each intervention and data collection methods.

Table 1. Characteristics of selected studies.

Study	Journal	Description of mHealth ^a intervention	Primary objective	Sample	Key findings on gender relations
Alam et al [26]; Bangladesh	International Journal of Environmental Research and Public Health	Provided women with nutrition counseling, support, and information for home gardens and an unconditional cash transfer delivered on a mobile platform	To assess the feasibility and acceptability of the intervention that aims to improve the health of women and children in rural Bangladesh	Qualitative: 20 women and 6 project workers; quantitative: 58 women	<ul style="list-style-type: none"> Positive transformative: increased spousal communication, further enhanced by mobile phone (received from the project), and cash transfer strengthened independent financial decision-making by women, as well as joint financial decision-making Nontransformative: some women were not free to go to the market to withdraw funds or open a mobile banking account
Alam et al [27]; Bangladesh	JMIR mHealth and uHealth	Pregnant women, new mothers, and their family members accessed weekly voice or SMS text messages and used a 24-hour hotline to contact physicians who provided support on maternal and child health care	To describe the experiences of subscribers and the perceptions of physicians who provided consultations through the <i>Aponjon</i> service, focusing on access, acceptability, usability, benefits, and challenges	Qualitative: 8 women, 8 husbands of female subscribers, and 11 medical physicians; quantitative: 3894 subscribers	<ul style="list-style-type: none"> Positive transformative: increased women's autonomy in seeking health services; women were not as reliant on men to arrange medical advice or appointments; increased involvement of male partners in health care, resulting in informed decision-making and increased joint health-related decision-making
Atukunda et al [28]; Uganda	AIDS and Behavior	SMS text messages were sent to nominated social support persons of individuals who were HIV positive to help adherence to antiretroviral treatment	To examine individual characteristics and socio-cultural dynamics that explain trends in social support and adherence to an SMS text message-based antiretroviral intervention	Qualitative: 10 social supporters; quantitative: 63 participants who were HIV positive and 45 patient-identified social supporters	<ul style="list-style-type: none"> Positive transformative: improved relationships between participants, particularly if the support person was of a different gender Negative transformative: SMS text messages were sometimes a trigger for relationship problems; the response to the intervention was highly sensitive to existing relationship issues, with support person efforts being perceived negatively, particularly if the support person was the married partner
Brinkel et al [29]; Ghana	Tropical Medicine and International Health	Parents or caregivers accessed health information via an mHealth interactive voice response system to support them in caring for children who were sick	To evaluate user experiences with the interactive voice response system	Qualitative: 37 mothers; quantitative: 37 mothers	<ul style="list-style-type: none"> Positive transformative: increased women's health-related knowledge, thus increasing their decision-making ability to make informed decisions regarding the health of their children
Brown et al [30]; Kenya	AIDS and Behavior	Automated SMS text messages were sent to new mothers to notify them of infants' HIV test results and when infants who were HIV negative were eligible for retesting	To evaluate mothers' experiences receiving HIV Infant Tracking System-enhanced early infant diagnosis services (acceptability, benefits, and areas for improvement)	Qualitative: 137 women	<ul style="list-style-type: none"> Positive transformative: increased women's autonomy in seeking health services because of reduced financial costs, and travel time increased male involvement Negative transformative: reinforced gender divide for women who were illiterate as it increases reliance on the husband to read the message Nontransformative: women's burden of work and competing responsibilities, and limited resources made it difficult to attend the clinic

Study	Journal	Description of mHealth ^a intervention	Primary objective	Sample	Key findings on gender relations
Campbell et al [31]; Uganda	AIDS and Behavior	SMS text messaging-based intervention that sent messages to individuals who were HIV positive requesting a return to the clinic after abnormal test	To document the experiences of participants who were HIV positive regarding the SMS text messaging-based intervention in rural Uganda and propose a framework for acceptance of mHealth apps	Qualitative: 43 women and men who were HIV positive	<ul style="list-style-type: none"> Positive transformative: new means of engaging partners in communication; SMS text messages fostered a sense of closeness and appreciation of emotional support from the partner
Decker et al [32]; Kenya	BMJ Global Health	Women at risk of IPV ^b used the myPlan app, a safety decision-making and planning mHealth app tailored to the Kenyan context for prevention and response to gender-based violence	To evaluate the efficacy of the app on safety and health outcomes of the myPlan app and intervention	Qualitative: 30 women; quantitative: 352 (n=177 intervention and n=175 control in a 2-arm RCT ^c)	<ul style="list-style-type: none"> Positive transformative: increased women's knowledge on safety and rights concerning IPV; enhanced feelings of confidence and resilience; and enabled women to make informed decisions related to their safety, mitigate violence, and deescalate potentially harmful situations with their partners
Hazra et al [33]; India	Journal of Health Communication	Voice messages sent to husbands covering topics such as antenatal care, postnatal checkups, early initiation of breastfeeding, clean cord care, and delayed bathing	To examine whether the distribution of information on maternal and child health to husbands would enhance men's knowledge and result in the adoption of healthy behaviors	Qualitative: 10 male participants and their wives and 2 FGD ^d with health care workers; quantitative: 881 husbands	<ul style="list-style-type: none"> Positive transformative: increased male knowledge of women's health, thus increasing informed decision-making and communication between couples Negative transformative: reinforcement of traditional gender roles as men alone were provided messages and did not always share information with female partners
Huda et al [34]; Bangladesh	JMIR mHealth and uHealth	Pregnant women and new mothers were provided with a free mobile device and received interactive voice messages, direct nutrition counseling from a call center, and an unconditional cash transfer via mobile banking	To determine the feasibility, acceptability, and appropriateness of the intervention designed to improve nutrition during pregnancy and the first year of life for women and children in rural Bangladesh	Qualitative: 21 participants; quantitative: 340 pregnant or recently delivered women	<ul style="list-style-type: none"> Positive transformative: increased women's ability to translate health-related information into practice; increase in spousal communication Nontransformative: traditional duties and gender-based roles were noted as a barrier to access (restricted movement outside the house and lack of ability to go to the marketplace to access cash)
Ilozumba et al [8]; Uganda	JMIR mHealth and uHealth	SMS text messaging platform designed to provide participants with information regarding upcoming antenatal care visits and recommendations on reproductive health practices	To outline the assumptions of the program designers and contrast their assumptions with empirical data to better understand facilitators and barriers related to the outcomes of the program	Qualitative: 15 female participants, 11 male participants, FGDs with 50 village health team members, and interviews with 6 health service providers	<ul style="list-style-type: none"> Positive transformative: increased male involvement in maternal health decision-making (men own phones); increased women's ability to demand health services, enhancing joint health-related decision-making Negative transformative: male partners were noted as a barrier by some, as they were not intended primary beneficiaries, thus reinforcing gender differentials in women's decreased levels of mobile phone ownership and lower rates of female literacy
McBride et al [36]; Vietnam	Journal of Public Health	mMom is an mHealth platform that sends SMS text messages to improve women's health during pregnancy by encouraging their use of health services	To determine whether implementation of a low-cost mHealth intervention could increase ethnic minority women's access to maternal, newborn, and child health services	Qualitative: 60 female participants and 8 individual interviews with community health workers	

Study	Journal	Description of mHealth ^a intervention	Primary objective	Sample	Key findings on gender relations
Nyemba-Mudenda and Chigona [37]; Malawi	Information Technology for Development	The Mobile System for Safe Motherhood is a toll-free hotline, interactive voice response, and SMS text messaging system designed to provide pregnant women with maternal health-related information, tips, and appointment reminders	To assess whether the use of mobile phones in maternal health can enable capability outcomes and outline the factors that facilitate and restrict the outcomes from being enabled	Qualitative: 46 (26 female participants, 4 community volunteers, 4 midwives, 4 health facility managers, and 4 stakeholders); 32 IDIs ^e and 2 FGDs)	<ul style="list-style-type: none"> Positive transformative: increased husbands' interest and engagement in maternal and infant health, increased health-related joint decision-making, and enhanced women's empowerment to make informed decisions about health care Positive transformative: women empowered by health information gained the support of husbands, spousal communication improved as they listened to messages on the shared phone, and male knowledge of and involvement in maternal care and support of women's access to health services increased Negative transformative: increased arguments with male partners; women could not adapt all recommendations as gender roles prohibited the woman from resting when pregnant
Shelus et al [38]; Kenya	International Perspectives on Sexual and Reproductive Health	mHealth app designed to assist women in tracking their menstrual cycles to plan or prevent pregnancy	To explore women's experiences with using the CycleBeads app and how this experience varied based on how the participant learned about the app	Qualitative: 28 female app users; quantitative: 185 female app users	<ul style="list-style-type: none"> Positive transformative: increased women's knowledge of fertility and tracking of the menstrual cycle, enhanced confidence in preventing pregnancy, improved communication with their sexual partner, and increased health-related joint decision-making
Vellozo et al [39]; Kenya	MHealth	Tablet-based app developed for use by providers during consultations with couples who were HIV serodiscordant, which derives data from, women via SMS text messages to assist health workers in providing counseling on safe conception options	To assess the acceptability and feasibility of the Safer Conception Intervention for Partners app	Qualitative: 19 couples who were HIV serodiscordant and 5 health care providers; quantitative: 74 couples who were HIV serodiscordant	<ul style="list-style-type: none"> Positive transformative: increased women's knowledge, which enabled more informed decisions regarding health, strengthened communication with partners, and increased health-related joint decision-making between partners Negative transformative: a report of verbal and physical abuse was related to a misconception about the source of SMS text messages

^amHealth: mobile health.

^bIPV: intimate partner violence.

^cRCT: randomized controlled trial.

^dFGD: focus group discussion.

^eIDI: in-depth interview.

Table 2. Summary of quality scores for selected articles based on Critical Appraisal Skills Programme checklist (N=14).

Item number	Items	Articles, n (%)
1	Clear statement of aims	14 (100)
2	Appropriate methodology applied	14 (100)
3	Appropriate research design	14 (100)
4	Appropriate recruitment strategy	14 (100)
5	Appropriate data collection methods	11 (79)
6	Reflexivity noted by researchers	1 (7)
7	Ethical issues are taken into consideration	10 (71)
8	Sufficiently rigorous data analysis	13 (93)
9	Clear statement of findings	14 (100)
10	Discusses the value of research	14 (100)

Measuring Influence on Gender Relations

None of the studies we reviewed specifically appraised gender relationships from the outset. However, 21% (3/14) of studies examined relationships between women and men: the study by Campbell et al [29] on the acceptance of an SMS text message-based intervention for people living with HIV asked questions about how the intervention affected relationships; the examination by Decker et al [30] of a safety decision-making app for women at risk of IPV studied relationship quality and changes in self-efficacy; and the study by Hazra et al [33] considered the change in the relationship between husband and wife when the husband was the recipient of SMS maternal and child health voice messages. The remaining 79% (11/14) of studies uncovered findings on gender relations through the course of the intervention or postprogram evaluation and did not assess long-term changes that occurred because of the intervention. Half of the evaluated studies interviewed women only, and the other half interviewed women and men (sexual partners and spouses).

Half of the studies included in this review interviewed both women and men. Recent studies have highlighted the value of interviewing both partners as responses can often differ [40,41]. The inclusion of both partners in the interviews is a *hotly debated* topic in family studies. Dyadic interviews can lead to richer information and more evidence gathered as couples feed off each other, provide more information, and offer different perspectives. However, one partner can dominate the discussion and may limit the freedom of the other to respond truthfully. Using participant observation and observing the interaction between men and women in the interview itself may provide results in decision-making, gender relations, and negotiations between couples.

Positive Transformative Influence on Gender Relations

Spousal Communication

This review of the literature revealed several positive ways in which mHealth interventions could transform gender relations. Our findings showed improved spousal communication on an everyday basis when learning together and regarding health-related information. Several studies reported an increase in everyday communication [26,31]. During the postprogram

analysis, the study by Alam et al [26] assessing the feasibility of a nutrition intervention that used mHealth and provided women in rural Bangladesh with a mobile phone showed that daily communication with their spouse increased. Women spoke of the benefits of communication: "I can call [my husband] in case of any problem using this mobile phone. I have been benefited as my husband has one mobile phone that he always keeps with him and carry wherever he goes. Now, if my husband goes outside, he calls me in my phone if necessary, isn't it good for me?" [26]. In a trial of an SMS text messaging-based intervention for people living with HIV in rural Uganda, Campbell et al [31] also found that the intervention fostered a new means of engaging partners to communicate regularly by phone.

When the mHealth intervention contained a training component, gender relations transformed as couples spent time learning together (agricultural and nutrition training), which would not usually occur in many countries because of the gendered division of labor. The study by Alam et al [26] observed that women worked with their husbands to create homestead gardens, fostering collaboration and communication. Spousal communication increased as couples discussed the health information provided by the mHealth intervention [33,36,37]. In India, Hazra et al [33] found that male participants, recipients of voice messages on maternal and child health, said they would discuss how to follow health-related instructions with their wives, as per the intervention's recommendations. One of the fathers would record the messages and play them back to discuss healthy practices with his wife [33]. In Vietnam, McBride et al [36] also found that ethnic minority women shared SMS text messages on maternal and child health with their husbands, thus enhancing communication between couples. According to the study by Nyemba-Mudenda and Chigona [37], couples in Malawi would read SMS text messages and listen to interactive voice messages on maternal health together, share and discuss information, and report enhanced communication on health-related topics. In addition to discussing health information, women in several studies reported an increased ability to communicate openly with male partners on sexual and reproductive health topics [38,39]. Increased communication between partners improved their ability to cooperatively use contraceptive choices [38,39]. In Kenya, an mHealth app called

CycleBeads was designed to assist women in tracking their menstrual cycles to plan for or prevent pregnancy [38]. Women using the app described improved communication with their sexual partners, saying, "He thinks I don't want to have sex with him. But after showing him this application, even he knows it's unsafe to have unprotected sex" [38]. Another study in Kenya used SMS text messages to promote safer conception for couples who were HIV serodiscordant and reported similar outcomes, affirming that male reproductive health knowledge improved mutual communication with their partners regarding conception strategies [38].

Emotional Support From Partner

The literature also showed that mHealth interventions enhanced emotional support between couples [30-33,37]. Brown et al [30] presented findings from their SMS text messaging-based intervention in Kenya, which aimed to improve the early diagnosis of infants who were HIV positive. SMS text messages sent to women provided new opportunities for male partners to communicate emotional support to their partners. The study by Campbell et al [31] found that individuals who were HIV positive in rural Uganda stated that the SMS text messages fostered a sense of closeness and appreciation of emotional support from their partners. Interaction with partners and family members altered; when one husband was asked whether the messages brought any changes to his relationship with his wife, he replied that they fostered a sense of trust: "We got to love each other more...we keep communicating on the phone...and this change of heart started with the message" [31]. In Malawi, women using an SMS text messaging and toll-free hotline on maternal health said that the discussion of information provided a sense of support from their husbands [37]. Decker et al [32] reported that the myPlan mHealth app in Kenya, an interactive tool that survivors of IPV can use to aid in safety decision-making, reduced decisional conflict within relationships. Women became more resilient and learned to mitigate violence and abuse from their partners [32]. Modes of spousal communication were transformed as women learned how to de-escalate potential violence: "now when he comes home, I study his mood so that I know how to handle him in order to avoid the chaos" [32].

Decision-making

Numerous studies revealed that men were becoming more involved in maternal and child health, which is traditionally seen as a domain of women [30,35,36]. The study by McBride et al [36] revealed that men in Vietnam exhibited a new interest in maternal and child health and supported their wives in attending neonatal health services. The study by Ilozumba et al [35] reported similar findings, stating that men's involvement had an unintended positive consequence in Uganda, and by receiving SMS text messages, they became more involved in maternal health care. By participating in mHealth interventions, men increased their health-related knowledge associated with women's and children's health [33,42]. This knowledge enhanced informed decision-making on the part of men and fostered health-related decision-making between partners [26,33,35,36,42]. Owing to the gendered divide in mobile phone ownership, several studies reported having to enroll men in

maternal and child health programs as women did not own phones [33,35]. In India, Hazra et al [33] ascertained that mHealth messages sent only to men improved joint decision-making with their partners. Alam et al [42] also observed enhanced health-related joint decision-making between couples in Bangladesh following the use of the *Aponjon* maternal and child health care hotline [42]. In Uganda, when men enrolled in a maternal SMS text messaging-based intervention intended for women, their increased involvement led to an increase in joint health-related decision-making [35].

Increased Male Involvement: Resource Allocation

On the basis of gender roles, men are often the primary household decision-makers and have greater access to resources. However, male partners provided additional financial support to women when provided with information regarding women's and children's health [29,30,36,37]. The study by Alam et al [26] combining nutrition and agricultural counseling with an unconditional cash transfer reported that women made decisions, either on their own or in conjunction with their husbands, about how the cash transfer would be spent, thus altering gender roles. A phone-based intervention supporting parents to care for children who were sick in Ghana was perceived as a mechanism of reducing the barrier of women not having control over financial resources and not making decisions without their husbands' support [29]. The intervention provided women with information and allowed them to participate in health-related decision-making [29].

In rural Bangladesh, 14% (2/14) of mHealth studies provided unconditional cash transfers to women and revealed barriers to receiving cash. The obstacles included women having no national identity card to open a web-based banking account or not being able to go to the market (prohibited or culturally unacceptable) to withdraw money. However, the studies by Alam et al [26] and Huda et al [34] found that women received support from husbands, male family members, or children to open accounts or collect money from mobile banking agents in the marketplace. The funds received through this program provided women with cash that they could spend on food, medicine, and other supplies, with most women deciding how to spend the money themselves [34]. Women and men cooperated and made decisions jointly about expenditure, whereas, previously, they would not necessarily have had such inputs. These mHealth interventions demonstrate that they can economically empower women, overcome obstacles, use mobile banking, and access financial resources.

Autonomy in Seeking Health Information and Access to Services

The literature showed that, overall, mHealth interventions have the capacity to increase women's autonomy in seeking access to health care and improve access to health information. mHealth interventions can reduce gender-based barriers, such as spousal permission, lack of freedom of movement, the necessity for male accompaniment, and requiring financial support [26,29,30,35,37-39,42]. Studies suggest that when women have increased health-related knowledge, they become more empowered to demand essential health services and quality care [35,37].

In Bangladesh, based on interviews with both women and men after the intervention, Alam et al [42] found that when women could access an mHealth hotline independently, it increased their autonomy in seeking health services. Women found the hotline convenient, could act independently, and make calls on their own; they were no longer reliant on men to arrange medical advice or appointments. In Kenya, where women used the myPlan IPV prevention app, this was also the case as women reported building resilience and confidence in discussing IPV and gaining support, knowledge, and access to the available services [32]. Men are often the key decision-makers in rural Ghana, with women not always having access to reliable health information and services or control over household resources. Women participating in an IVR system in Ghana reported that the IVR provided them with trustworthy information, which enabled them to have more control over their health care and that of their children and empowered them to make independent health-related decisions [29].

Self-efficacy

Our findings also revealed that mHealth programs increased women's independence in seeking access to health services and led to positive changes in women's self-efficacy. Despite the low rates of female phone ownership, Nyemba-Mudenda and Chigona [37] reported that women gained self-confidence and skills by communicating via mobile phones, reducing the gendered digital divide [37]. In gaining health-related knowledge, women found that their confidence was enhanced, as was their capacity to put this knowledge into practice [34,37-39,43]. Women in Vietnam who participated in an SMS text messaging-based program on maternal and child health felt empowered by this newfound knowledge, made informed decisions about health care, and were more confident in their interaction with community health workers [36]. In Malawi, women were provided with maternal health knowledge and support and subsequently empowered to request a health service or attention from a health care worker; in contrast, before the intervention, they would "settle for whatever assistance was given" [37]. In Ghana, Brinkel et al [29] found that health information contributed to empowerment, altered gender relations, and challenged women's low decision-making abilities. In Kenya, an IPV safety app motivated a woman to sell clothes [32]. As a result of earning additional income, the woman could buy food for her children and no longer had to wait for her partner, thus providing autonomy in financial decision-making, when previously her husband would beat her if she asked for money for food [32].

Negative Transformative Influence on Gender Relations: Relational Conflict and Decision-making

Despite the improvements discussed so far, mHealth interventions have the potential to exacerbate or ignore the persistent gender-based barriers that women face [30,31,33,35,37]. In Uganda, the study by Atukunda et al [28] reported an increase in conflict between couples while taking part in an SMS text messaging-based HIV support program. The trial used SMS text messages sent to a nominated social support person of an individual who was HIV positive and aimed to improve antiretroviral adherence [28]. Although the authors

noted that the relationship turmoil was not a direct result of the intervention itself, the SMS text messages may have been a trigger as relations between some of the couples either stalled or became turbulent, exemplified by feelings such as lack of trust, unsupportive behavior, resentment, suspicions of infidelity, stigma, or fear of disclosure of HIV status. One of the women reported, "He shouts at me for constantly asking him about his medicines every day, so I stopped asking about them. He doesn't listen to me at all and says I nag him" [28]. The intervention proved to be a catalyst, exacerbating relationship problems, particularly if the support person was the spouse of the person who was HIV positive. Velloza et al [39] recounted an instance of verbal and physical abuse in an SMS text messaging intervention in Kenya, which supported a safer conception for couples who were serodiscordant and living with HIV when a male partner believed that the SMS text message was from a former partner. In Malawi, community attitudes toward a maternal and child mHealth intervention were suspicious as they thought the intervention was "a satanic gimmick to get blood from pregnant mothers' bodies and kill the babies," which led to conflict between husbands and wives [37]. Some men forbade or stopped their wives from using the service, forcing them to leave the intervention [37]. Women would obey their husbands out of fear and respect or run the risk of being forced out of the house [37].

Nontransformative Influence on Gender Relations

Gender Gaps in Literacy

Evidence also indicates that mHealth programs could be nontransformative and reinforce gender-based inequalities. An mHealth trial in Kenya used SMS text messages to remind mothers to take their babies to the clinic for HIV testing; however, some women were illiterate and unable to read or understand the SMS text messages [30]. When literacy rates are lower among women, reliance on SMS text messages reinforces gender divisions and women's dependence on husbands to enable access to information.

Men as Gatekeepers of Technology and Information

A maternal and child health app in India sent SMS text messages to only men, reinforcing the role of men as gatekeepers of information and decision-makers in the family [33]. Although some men shared and discussed the information, a substantial number of men did not. Some men stated that they "did not feel the need" to discuss the messages; others said they were busy at work or just not interested in such messages, which was thought of as women's business and knowledge that the mother should already know [33]. One of the studies indicated that low female ownership of mobile phones could reinforce reliance on men and the conduit a woman must go through to obtain mHealth information. In Uganda, men were enrolled to receive SMS text messages on maternal and child health targeted at women; although for some, this increased male involvement in reproductive health decisions, it also proved to be a barrier for some women. A Ugandan woman enrolled in a study reported not receiving any antenatal care until the seventh month of pregnancy as "her husband had not given her permission," illustrating that her husband had been a barrier to her seeking health services [35].

Discussion

Principal Findings

We reviewed the impact of mHealth interventions on gender relations in LMICs based on studies published between 2013 and 2020. Our results demonstrate that mHealth interventions have the potential to improve women's health, enhance digital literacy, positively affect women's empowerment, and enhance gender relationships. The findings also revealed that mHealth programs could reinforce gender divisions, exacerbate domestic conflict, and reinforce the dominance of men as key decision-makers and gatekeepers of knowledge and mobile technology. Gender-based digital divide, women's lack of access, and digital literacy have been well documented. However, despite the increase in the use of mHealth apps, most studies continue to focus on the feasibility and acceptability of such interventions, with none of the reported studies explicitly assessing the positive or negative impact of the intervention on gender relations.

Despite these data limitations, several key findings emerged. The studies revealed that mHealth interventions could positively affect spousal relationships and enhance communication and decision-making on health-related topics. Messages on maternal and child health sent via mHealth platforms to either the woman or man's phone were listened to and shared between couples. The new knowledge gained was discussed, and communication between couples improved. Several studies reported starting a dialogue on sexual and reproductive health, topics traditionally seen as "women's business." In Kenya and Uganda, mHealth programs targeting people living with HIV found that communication and emotional support between couples were enhanced [31,39]. Another program in Kenya, targeting safety for women at risk of IPV, was reported as being transformative for relationships as women gained skills to communicate with their partners in new ways and mitigate the risk of IPV [32].

The review found that mHealth interventions improved men's health-related knowledge associated with women's and children's health, and this knowledge increased informed health-related decision-making on the part of the men and fostered health-related decision-making between partners. Men either received the messages or were the owners of the phone that their partners needed to access, and therefore, the sometimes unintentional inclusion of the husband had the positive effect of accelerating access to health care. Our findings also suggest that mHealth interventions have the ability to increase male partners' understanding of women's health, thus enabling them to act as facilitators to increase women's access to health services and information by providing either financial or emotional support. Mobile phone ownership is still low in some parts of Malawi and particularly so for women. Many women in this intervention relied on their husbands' phones to receive the messages, with this male involvement being described as a "paradigm shift" [37].

Engaging men in mHealth interventions can increase their ability to make informed decisions related to their female partners' or children's health [44]. Furthermore, male participation in mHealth interventions can increase joint health-related

decision-making between partners and enhance health-related communication, translating into better health practices. Participants in a mobile phone-based messaging service in maternal and newborn health in Afghanistan reported that involving fathers was beneficial, and joint decision-making between wives and husbands increased [45]. The "Super Abbu" (Super Dad) pregnancy and infant hotline in Pakistan was inundated with calls from fathers, with approximately 40,000 calls within the first 2 months, illustrating the need to include fathers and engage men for optimal health outcomes for women and children [46].

In many households, men are the primary household decision-makers and have greater access to income. Several studies reported changes in power dynamics over financial matters, particularly if the intervention incorporated cash transfers [26,34]. Women gained financial autonomy and control over income as recipients of cash transfers. Women were no longer as reliant on men for financial support for health and nutrition decision-making, enhancing control over financial resources and input into decisions regarding expenditure.

This review established that mHealth interventions can increase women's autonomy in seeking access to health care and improve access to health information. mHealth interventions can reduce gender-based barriers, such as requesting financial support, gaining spousal approval, and the need for male accompaniment. The literature also suggests that women's participation in mHealth interventions can increase women's autonomy in accessing health services and health information. Furthermore, these interventions can empower women to translate their knowledge into practice. Thus, mHealth interventions can enhance women's active care-seeking behavior, increase their ability to adopt healthier practices, and enhance their confidence to demand better quality care. In Nepal, research has found that telemedicine could overcome gender-based barriers to accessing health services in rural Nepal [47]. These conclusions concur with our findings, revealing that women's participation in mHealth interventions could increase women's autonomy in seeking health services through reduced travel restrictions, time, and financial costs [47]. Our findings also revealed that women reported an increased sense of self-efficacy with health-related knowledge and were more empowered and confident in their decision-making ability [44]. Increasing evidence suggests that digital health positively influences health equity [20].

Despite these positive impacts, we reported on several gender-based barriers. mHealth interventions can have an adverse effect, reinforcing the digital divide and upholding men as gatekeepers of information and sole decision-makers. Interventions can reflect and reinforce existing gender-based inequities such as the digital divide or hinder access to resources or information. mHealth can emphasize women's reliance on men to access technology [44]. A recent study on an mHealth maternal nutrition intervention from Burkina Faso revealed that although the researchers did not focus their research on gender at first, it proved to be highly relevant to their study [48]. Mothers who took part in the nutrition intervention stressed that they were "not empowered to make nutrition-based decisions that incur costs...nutrition-related request can spark marital strife" [48]. This illustrates the risk that mHealth interventions

can pose in increasing women's reliance on men for economic resources.

When mHealth interventions strengthen the role of men as gatekeepers, controlling access to mobile phones and information received, as women have lower literacy rates than men, this increases a woman's dependency on men and can lead to conflict. Previous studies have shown that mHealth interventions can lead to increased tension between couples and domestic disputes and precipitate IPV [16,49]. However, few studies have evaluated or reported on its potential harm. Unintended consequences can occur when gender dynamics are not assessed. An mHealth intervention promoting contraceptive use in rural Bangladesh noted an increase in reports of IPV linked to participation in the program, a conflict that may have resulted from women receiving phone calls from an unknown number [49]. Another study from Ghana assessed the impact of family planning on gender relations and reported increased tension in relationships, with men reporting that they feared that their wives would be unfaithful as they now used contraception [50]. These findings highlight the need to monitor the intended and unintended consequences of mHealth interventions on gender relationships.

The findings of this review have several limitations. Qualitative data are largely context specific, making these findings nongeneralizable to broader settings. Similarly, as gender relations are highly dependent on sociocultural factors, generalizability and transferability may be further limited. In addition, it is possible that some literature was overlooked as

the search was limited to journal articles published in English and to those available electronically. Furthermore, this search did not include any gray literature or unpublished sources. Despite these limitations, our research team applied a comprehensive and robust search strategy to enhance the rigor of this review.

Program

Given the rapid, persistent upscale of mHealth interventions in low- and middle-income settings, it is imperative for intervention teams to design these interventions while considering their impact on health equity, power dynamics, and gender relations. Efforts should be made to promote positive impacts while mitigating negative effects. To promote the positive impact of mHealth interventions on gender relations, rigorous formative research is needed to assess the context-specific requirements of the intervention and the participants. The key to this is involving the end user to inform and co-design interventions to ensure that they are appropriate, feasible, and safe in the context in which they are implemented. Thorough monitoring and evaluation throughout the course of the intervention are also recommended. Researchers must design gender-transformative mHealth interventions to truly affect change and not exacerbate existing gender inequalities [12,51]. Future research is required to fill the evidence gaps in gender and mHealth, acknowledging that women are not passive beneficiaries and need to actively participate and be empowered by mHealth interventions. These interventions require rigorous assessment from a gender perspective, from design and implementation to evaluation, to explore their impact on women and men from the outset.

Conflicts of Interest

None declared.

Multimedia Appendix 1

Supplementary material.

[\[DOC File, 150 KB-Multimedia Appendix 1\]](#)

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Abbreviations

IPV: intimate partner violence

IVR: interactive voice response

LMIC: low- and middle-income country

mHealth: mobile health

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PROSPERO: International Prospective Register of Systematic Reviews

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Chapter 3: A combined agriculture and nutrition behaviour change intervention can improve women's empowerment: A feasibility study in rural Bangladesh.

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Can a Combined Agriculture and Nutrition Behaviour Change Intervention Improve Women's Empowerment? A Mixed Methods Feasibility Study in Rural Bangladesh

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Can a Combined Agriculture and Nutrition Behaviour Change Intervention Improve Women's Empowerment? A Mixed Methods Feasibility Study in Rural Bangladesh

Abstract

Many agricultural and home gardening interventions aim to improve the nutritional status of women and children in low- and middle-income countries by focusing on women as the recipients of the intervention and make assumptions that women will be empowered as a result. This paper examines the potential impact of an intervention study that combined home garden training and support, and nutrition behaviour change communication, with a social safety net payment, on women's empowerment in rural Bangladesh. We assessed the implementation of this study in terms of feasibility, acceptability, and practical application. Twenty in-depth interviews were conducted with randomly selected women that took part in the study. Qualitative data was coded using thematic analysis (Braun & Clarke 2006) and the results presented using the following five indicators: control over use of income, input into productive decisions, respect among household members, self-efficacy, and input into nutrition and health care decisions. Our study showed that a combined nutrition-specific (nutrition counselling) and nutrition-sensitive (agricultural training and unconditional cash transfer) intervention, delivered on a mobile platform, to women from low-income families in rural Bangladesh was feasible and acceptable. The study further revealed evidence on behaviour change across five key indicators related to women's empowerment. The study highlights the potential for such an intervention to impact women's empowerment and provides insight for the aid in the design of larger-scale trials implemented in similar settings.

Keywords

women's empowerment, feasibility, nutrition-sensitive agriculture, behaviour change communication, mHealth, social safety net, qualitative methods, in-depth interviews

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Can a Combined Agriculture and Nutrition Behaviour Change Intervention Improve Women's Empowerment? A Mixed Methods Feasibility Study in Rural Bangladesh

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Many agricultural and home gardening interventions aim to improve the nutritional status of women and children in low- and middle-income countries by focusing on women as the recipients of the intervention and make assumptions that women will be empowered as a result. This paper examines the potential impact of an intervention study that combined home garden training and support, and nutrition behaviour change communication, with a social safety net payment, on women's empowerment in rural Bangladesh. We assessed the implementation of this study in terms of feasibility, acceptability, and practical application. Twenty in-depth interviews were conducted with randomly selected women that took part in the study. Qualitative data was coded using thematic analysis (Braun & Clarke 2006) and the results presented using the following five indicators: control over use of income, input into productive decisions, respect among household members, self-efficacy, and input into nutrition and health care decisions. Our study showed that a combined nutrition-specific (nutrition counselling) and nutrition-sensitive (agricultural training and unconditional cash transfer) intervention, delivered on a mobile platform, to women from low-income families in rural Bangladesh was feasible and acceptable. The study further revealed evidence on behaviour change across five key indicators related to women's empowerment. The study highlights the potential for such an intervention to impact women's empowerment and provides insight for the aid in the design of larger-scale trials implemented in similar settings.

Keywords: women's empowerment, feasibility, nutrition-sensitive agriculture, behaviour change communication, mHealth, social safety net, qualitative methods, in-depth interviews

Introduction

There are significant linkages between nutrition outcomes and women's empowerment (Cunningham, Ruel et al. 2015, FAO 2019, Heckert, et al. 2019). The nutrition sensitivity of interventions, such as nutrition-sensitive agricultural programs, can be further enhanced when they improve women's empowerment (Ruel & Alderman, 2013). Women's empowerment, a complex and dynamic notion, can be conceptualized, in simple terms, as the ability to exercise agency and to make strategic life choices (Kabeer, 2005). Nutrition-sensitive interventions address underlying determinants of malnutrition; approaches include agricultural programs, cash transfers, and nutrition education. When combining nutrition-sensitive approaches with

nutrition-specific interventions, nutrition-focused outcomes have enhanced impact and scalability (Ruel et al., 2018). The Lancet Maternal and Child Nutrition series highlighted three ways in which nutrition-sensitive interventions could impact women working in agriculture: by improving women's control and access to resources, work balance (both positive and negative) and time needed for agricultural activities, and women's health and nutrition, that is, exposure to pesticides or an imbalance between energy intake and expenditure (Ruel & Alderman, 2013). According to Ruel et al. (2018), nutrition-sensitive agriculture programs have more successful nutritional outcomes when combined with nutrition behaviour change communication and focus on improving women's empowerment.

Bangladesh has made significant progress in reducing food insecurity; however, around one in four remain food-insecure, with nearly one-third of children under the age of five stunted due to chronic malnutrition (National Institute of Population, Training et al. 2020). Nearly 13% of Bangladeshi women are overweight and experience chronic energy deficiency (National Institute of Population, Training et al. 2020). In South Asia, including Bangladesh, gender discrimination, and inequitable food allocation for women and children within households is a key contributing factor in sustained high rates of malnutrition (Quisumbing, 2007). In rural Bangladesh, men go to the marketplace to buy food and women cook food and prepare meals for the family, eating least and last (Blum, et al. 2019; Lentz, 2018).

In 2019, the World Bank reported 36% of Bangladeshi women worked in paid labour (*World Bank Indicators - Labor force participation rate, female (% female population 15+)*; Bangladesh, 2019). With restrictions on mobility and limited access to the workforce due to gender-based constraints, women in Bangladesh can face limited control over economic resources and have restricted spending power and limited decision-making ability. Social protection such as cash transfers targeted at women can encourage women's economic empowerment and enhance decision-making ability, with the overarching supposition that control over cash will lead to greater investment in children's health and education (de la O Campos, 2015; Ruel & Alderman, 2013). When women are engaged in nutrition-sensitive programs that utilize social safety nets, aspects of women's empowerment can improve, such as changes in gender roles, and intrahousehold bargaining power (Ruel & Alderman, 2013).

The home gardens, the area directly around the household, can make a vital contribution to the diet of rural poor by increasing vegetable production, dietary diversity, and intake for households (Ferdous et al., 2016). Evidence shows that involving women in agricultural activities can improve dietary diversity and household food security and has the potential to cultivate empowerment (Cunningham, Ploubidis et al., 2015; Cunningham, Ruel et al., 2015). However, the communal value placed on the restriction of women in public spheres remains one of the greatest challenges to increasing women's choices in agriculture, from production and access to services, and marketing (Hillenbrand, 2010).

Women living in rural areas have shown an interest in home gardens as they use land around the household (which is convenient), do not involve travel, and can potentially allow balance with childcare and other household duties. Hellen Keller International's (HKI) training program on home gardening promotes women's empowerment via small-scale agriculture and aims to improve women's and children's nutrition outcomes (Hillenbrand, 2010). Hillenbrand (2010) reports that, despite women's empowerment not being an explicit aim of the HKI program, changes in gender-based power dynamics occurred; for example, intra-household relations changed with an increase in women's participation in household decision-making (Haselow et al., 2016). The widespread applicability, popularity, and acceptance of home garden programs in Bangladesh may also be due to programs deliberately not challenging existing gender norms and patriarchal power structures (Hillenbrand, 2010; Patalagsa et al., 2015). A recent study reported that a home garden and nutrition program in Bangladesh positively contributed to women's empowerment, showing increases in control over the use of

income, greater influence in decision-making regarding garden activities and household food choices, and a greater sense of self-efficacy and recognition in the community (Patalagsa et al., 2015).

When evaluating lessons learned from nutrition-sensitive agriculture, Ruel et al. (2018) noted that mostly observational studies reported the linkages and mediating role of women's empowerment with nutrition and agriculture). A trial in Bangladesh examined the association between agricultural production, nutrition outcomes, and gender, and established that combined interventions had greater impact than isolated ones, with women's empowerment improving for all participants (Ahmed et al., 2020). These findings illustrate the synergies between gender, nutrition, and agriculture.

We conducted a mixed methods pilot study that aimed to assess the feasibility and acceptability of an intervention package combining home garden training and nutrition behaviour change communication, with a social safety net payment among poor households in rural Bangladesh. Nutrition behavior change communication encourages change and helps to promote behaviours that foster health and wellbeing and can improve nutrition knowledge, practice, and potentially health outcomes (Briscoe & Aboud 2012; Hoddinott et al., 2018). The overall results have been published elsewhere (Alam et al., 2020). This paper analyses the feasibility outcomes of the project related to change in women empowerment.

This group of authors are interested in understanding the impact of public health interventions focusing on women and children, on women's empowerment. In particular, the lead author was involved in this project as part of her PhD research, which focuses on using a gender lens to assess public health interventions and their programmatic impact on women's empowerment. Elizabeth has worked closely with colleagues in Bangladesh and has a keen interest in gender-based inequities across a range of health outcomes, with the intention of improving the health status of women and children in low- and middle-income countries.

This paper will contribute to the knowledge on potential impact of multicomponent interventions using health education, agricultural training, and social safety nets on women's empowerment.

Materials and Methods

Methods and Data Collection

Participants

The characteristics of study participants are shown in Table 1. Approximately half the women were aged 15-24 years (48%), with the other half 25-34 years (47%). Nearly all the women had children under the age of two (90%). Husbands were the main income earners for the family (96%), working in skilled labour (14%) and unskilled labour (41%).

Table 1

Participant and household characteristics

	n=58	
	n	%
Woman's characteristics		
Age of women by category	28	48.3
15-24 years	27	46.6
25-34 years	03	5.2
35-44 years	03	5.2

Age of children by category		
0-23 months	52	89.6
24-59 months	6	10.4
Husband current working status	56	96.5
employed	2	3.5
unemployed	2	3.5
Husband's occupation		
Unskilled labourer	24	41.4
Skilled worker	24	41.4
Small business/trade	6	10.3
Service holder	2	3.4
Other	2	3.4

The Intervention

In this paper we report the findings related to the feasibility and behaviour change of women around women's empowerment; here we have provided a brief summary of the project to give a context to the readers. We conducted a feasibility study in two villages in Kurigram, Northern Bangladesh. A feasibility study is a preliminary assessment of the practicality of broad aspects of a proposed project. The study area is in a food insecure and impoverished region of the country (*Updating Poverty Maps of Bangladesh*, 2015). We mapped and identified households in the study area with women of reproductive age and children under the age of five. This multi-component intervention was developed based on formative research (Bentley et al., 2014). Formative research, conducted during the development phase of the intervention, explores the socio-cultural aspects of the study community to create a deeper understanding and inform the study design. We developed a community-based intervention that combined agricultural training with a focus on home gardens and nutrition BCC activities that aimed to improve maternal and child nutrition. Nutrition BCC activities included fortnightly household visits from trained nutrition counsellors to counsel them and their husbands on the appropriate diet for pregnant and lactating women and children. The counsellors used a smartphone app with embedded text, videos, and pictorial messages to aid in the nutrition counselling. Group counselling sessions were also supplied to the women and their husbands and mothers-in-law during the first month of the intervention. The intervention ran for a total of six months.

Households were determined to be eligible based on information from the Bangladesh Agricultural Extension Programme and were situated in one of the most food insecure and impoverished areas in the country (Alam et al., 2020). Households in the study areas were listed, mapped, and screened to identify the poorer households with women of reproductive age and children under five. In August of 2017, we enrolled sixty eligible households in the study via a mobile phone registration. We provided each woman with a mobile phone; this enabled the low-income families to communicate with agricultural extension workers and the community nutrition program. Project agriculture workers provided information to women and family members using a smartphone app to illustrate homestead gardening techniques, selection of crops, and the nutritional aspect of crops. Trained agriculture workers visited each household to provide training for the woman and her husband on homestead gardening support. A trained

nutrition counsellor made fortnightly house visits to counsel women and husbands, using the smartphone app (text, video, and pictorial format) to convey messages on diet during pregnancy, breastfeeding, and for children under five. The phones had the bKash (largest mobile banking in Bangladesh) mobile banking app installed, and this facilitated the monthly payment of an unconditional cash transfer (BDT1200 / GBP10 / USD12) to each woman enrolled in the study. We assessed the feasibility and acceptability of combined agriculture- nutrition education and counselling and unconditional cash transfer intervention in a mixed methods pilot study using in-depth interviews and key-informant interviews. The detail design of the pilot intervention has been published (Alam et al., 2020).

Qualitative Data Collection

We used in-depth interviews with mothers to capture the richness and individuality of responses. We explored the participants' perceptions and experiences of the intervention. Qualitative methods were used as they are the most appropriate process of systematic inquiry and enable in-depth exploration of the respondents' participation in the intervention. Thematic analysis was used to identify and analyse key themes from the data (Braun & Clarke, 2006).

In this paper, we have reported the findings from the in-depth interviews with randomly selected women (n=20) in registered households and explored their experiences partaking in the intervention. Women were interviewed alone, with no other people present. Data collection guidelines were pre-tested on a sub-sample of women in the study area and used to guide interviews. Flexible guidelines ensured any feedback could be explored in detail. The interviewer made a digital audio recording of each interview which was transcribed in Bangla and translated into English. Spot checks of recordings and transcriptions took place to ensure the quality and accuracy of work by a senior health social scientist (Alam) fluent in Bangla and English. We have also used data from an end of project survey (n=58) where relevant, to complement the qualitative findings.

The Ethical Review Committee of the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) approved the study (Ref. PR-16075). Additional ethics approval from the University of Sydney was not required as the icddr,b has an international standards ethics review and therefore a separate ethics approval was not required. Informed consent was obtained from each participant. Before the audio recording interviews, interviewees gave verbal consent which was audio recorded. We assured interviewees that their participation was entirely voluntary, and all information provided would be de-identified, ensuring anonymity and privacy of the information shared.

Conceptual Framework

Our results are organized using The Project Level Women's Empowerment in Agriculture Index (Pro-WEAI) as a framework. The Pro-WEAI measures the empowerment of women, agency, and inclusion in the agriculture sector (Malapit et al., 2019). It is an internationally validated index, developed to adapt to project-specific contexts and has been piloted in Bangladesh (Alkire et al., 2013; Malapit et al., 2019). The Pro-WEAI uses Kabeer's definition of empowerment which focuses on the ability of individuals to make choices; "a process of change during which those who have been denied the ability to make choices acquire such an ability" (Kabeer, 1999 p. 435). Agency, or the ability of the individual to make considered choices, is at the centre of the framework and revolves around interrelated dimensions of resources, agency, and achievements. We did not use the Pro-WEAI tool to collect data; however, we analyzed post programmatic data using this index as a framework to

structure and organize our findings and have coded the qualitative data using the following five indicators:

1. *Control over the use of income*: women and men's control over cash transfer from the intervention and income generated as a result of the intervention (i.e., from home gardens), and decision-making re expenditure.
2. *Input into productive decisions*: the contribution of women and their decision-making ability regarding agricultural production, home gardening, and livelihoods.
3. *Respect amount household members*: intrahousehold relationships and women's communication skills.
4. *Self-efficacy*: a woman's level of confidence, feeling of achievements, and self-satisfaction.
5. *Input into nutrition and health care decisions*: women's utilization of knowledge gained from the intervention and subsequent agency and decision-making ability on health and nutrition choices (Malapit et al., 2019).

Data Analysis

Qualitative data: We transcribed audio-recorded Bangla interviews verbatim using MS Word files. A research assistant translated the transcripts that were checked by the Bangla-speaking last author for accuracy. We used Bernard's framework to conduct thematic analysis (Bernard et al., 2017), with themes generated from the data categorized under several key domains. Initially, we developed a priori codebook based on the interview guidelines and indicators within the Pro-WEAI framework. The first author manually coded one interview following this codebook which was consulted and verified by an experienced qualitative researcher (last author). The first author then manually coded all interviews. Whilst coding, we maintained the flexibility of including any additional relevant themes related to the objective of this study, maintaining both deductive and inductive coding as well as inter-coder reliability. The thematic codes were categorized before being grouped under five themes, each relating to one of five indicators from the Pro-WEAI (Malapit et al., 2019). We then compiled the text about the five indicators in separate files. We coded the transcripts and analyzed the data using MAXQDA software (Software, 2019).

Quantitative data: We used SPSS version 21 to perform descriptive statistical analysis to produce frequency tables. The quantitative data generated was used to complement the in-depth qualitative data. We evaluated the participants' socio-demographic characteristics, receipt and use of cash transfer, women's mobile phone usage, participation in agricultural and nutrition counselling, and type of information received.

Results

Our study revealed evidence of the feasibility of the intervention on behaviour change across five key areas related to women's empowerment: control over use of income, input into productive decisions, respect among household members, self-efficacy, and input into health and nutrition decisions. We have structured our analysis using five Pro-WEAI indicators as a framework to report our results.

Control Over the Use of Income

Income from Intervention

Women received the cash via bKash mobile banking app. Three women reported that they did not have a National Identity card required to set up the account and the bKash account was in the name of their husband or brother. One woman reported that her husband refused to allow her to go to market; he withdrew the funds and handed the money to her. Another woman did not go to the marketplace but stated there was no problem if she so desired to go to market. One would accompany her brother to the marketplace for him to withdraw the funds, while another woman stated convenience as the reason that her husband withdrew the cash.

My husband withdrew it and gave it to me.

Q: Why did your husband withdraw the money? Why not you?

Is there any restriction for you to go to the market? My husband is often in the market, so it's more convenient. I don't have any restrictions (Woman, 20 years).

All women had support from their husbands to collect cash if they were not able to go to the marketplace. Regardless of who withdrew the funds, all women received the cash transfer and stated they controlled and had input into the spending of the funds. Women reported being able to spend the funds as they wished and when needed without permission or objections from their husbands. One woman went as far as asking the interviewer as to why her husband would object.

Everyone has good comments on my receiving money from this project. I can spend money as I wish, my husband says nothing. Now, I can buy anything that I prefer for my child. There is no need to ask for money from my husband. I, myself, spend my own money (Woman, 19 years).

Husbands would spend the money in the marketplace as directed by their wives, with several women instructing their husbands to purchase nutritious foods particularly for young children: items such as milk, eggs, fish, meat, and vegetables. Two women reported using the cash to buy medicine when their child was sick. When asked about planned expenditure for the money, all women stated that they would purchase food and vegetable seeds.

Q: Did your husband withdraw both times? Yes.

Q: Did he hand the money to you after withdrawing? Yes.

Q: What did you do with the money?

I told my husband to buy vegetables, fruits from the market, and I bought leaf seeds. Buy and eat vegetables, fish, eggs, meaning any nutritious food. Buy seeds and grow vegetables. And if possible, buy and rear ducks, and chickens (Woman, 22 years).

Income Earned as a Result of the Intervention

The combination of the cash transfer and agricultural training enabled all of the women to establish homestead gardens, which allowed them to earn supplementary income. The

establishment of homestead gardens was primarily the women's domains, managed with support from their husbands and advice and supervision from agricultural counsellors. Several women had successful harvests and the produce grown was eaten by the family. Excess produce was sold at the market, providing an additional income source for the women.

Q: Did vegetable gardening give you any benefit, and did you ever sell farmed vegetables before? Is this the first time?

Yes, we ate vegetables and sold it. No, I didn't do this before; this was the first time I had a good harvest. I could've bought chickens, ducks, goats with a little more money. 2 or 3 thousand taka more (Woman, 22 years).

Our quantitative survey at the end of the project revealed further supporting information. All the women in the survey received a mobile phone from the intervention and successfully received the cash transfer via bKash mobile banking app. Most women reported using the mobile phone to make and receive calls (98%). Many women would withdraw the funds from the BKash agent (40%); however, most withdrawals were made by the husbands (57%). For details see Table 2 below.

Table 2

Cash transfer via bKash mobile banking and mobile phone use

	n=58	
	n	%
Mobile Phones		
Used mobile phones for calls	57	98.3
Sent SMS with mobile phone	2	3.4
Cash		
Received cash via bKash	58	
Woman withdrew cash	23	100
Husband withdrew cash	33	39.7
Relative withdrew cash	5	56.9
Amount of cash received monthly		8.6
1200 Taka cash only	45	77.6
1200 Taka plus service charge	13	22.4
Expenditure of cash		
Purchased seeds	13	22.4
Purchased fertilizer	10	17.2
Purchased foods	53	91.4
Child's education/study	3	5.2
Other (small livestock, fencing, health, medicine, clothes for children)	34	58.6

Input into Productive Decisions

As part of the agricultural training, women were encouraged to establish homestead gardening. This project enabled women to participate, make decisions, and access information that would provide a guide for decisions around production. The women received training and could impart information to their husbands and provide input into various activities such as the establishment of garden beds. Many women worked together with their husbands and other family members to establish garden beds. The women communicated new knowledge by giving instructions to other family members, demonstrating substantial input in the establishment of homestead gardens. One woman when asked about what activities she did not know about before the intervention reported:

I didn't know I had to dig 1.5 feet deep and use manure, fertilizer. The tree roots will be healthy and will better yield fruits.

Q: Did you work alone on the beds or the others helped you?

Mother-in-law, sister-in-law, husband helped me. I told them how to.... No, I told my husband how to make the beds.

Q: Did you teach others around you about these things?

Yes, I told them that if you dig 1.5 feet deep and use dry manure, then you will grow better gourds (Woman, 22 years).

The project agriculture workers facilitated discussions about the benefits from the women's input into decisions regarding market garden production. Men have more control over household decision-making, yet women made decisions about household gardens on a comparatively independent basis. When asked if her husband ever objected to her gardening, one woman communicated that her husband did not object as they did not have to buy vegetables and everyone was happier, as their child could eat them.

Another component of the agricultural training encouraged women to diversify livelihoods and buy chickens or ducks to use for eggs, meat, and additional income. Many women, solely or jointly with husbands, participated in decision-making around raising poultry and other small animals. With the cash transfer or additional funds earned by homestead gardens, several women bought between one to three chickens and others planned to do so.

If we buy chickens, ducks, this project will have more improvements. Q: Why will rearing chickens, ducks give you benefits?

If chickens and ducks lay eggs, they will hatch, and we can eat and sell them when they grow up. This will give us a huge profit (Woman, 19 years).

In one instance, a woman reported having saved 600 Taka and wanted to purchase a goat. When asked whether she could buy a goat for 600 taka, she replied that she could not, but she would take additional money from her husband. One woman recounted that when her chickens were bigger, she could sell them and give the money to her husband if he found himself in financial trouble.

Respect Among Household Members

In this indicator, we found evidence of changes in intrahousehold relationships. During the first month of the intervention, group nutrition counselling was provided to women and their husbands and mothers-in-law. The agricultural training sessions provided women with new knowledge and skills in a supportive environment. This new standing in the household

empowered women to participate in internal household communications and work with their husbands to achieve goals.

It's not enough that we know, husbands need to know too. The husbands do work.

Q: Did your husband help you with planting the vegetables? Husband helped...he planted vegetables (Woman, 20 years).

The intervention provided women with a mobile phone to enable communication with the intervention staff. All women reported that they did not own a mobile phone before the intervention, yet their husbands did own a phone. The mobile phone also provided a new asset for the women that enhanced communication channels with family members. One woman reported that the mobile phone now enabled her to talk to her parents. The phone also facilitated an increase in spousal communication. When asked what benefits owning a mobile brought, one woman said:

I got one mobile, I can get messages on the mobile, apa (my sister) can talk to us from Dhaka, and we can get necessary information. I know how to use it. I can talk with mobile, read messages, can talk to my husband... I keep the mobile with me (Woman, 22 years).

Self-Efficacy

The intervention led to a sense of achievement and confidence for many of the women. The social standing of the women in the community changed when neighbors saw what they were doing with gardens and came to ask for information.

People around us are seeing us and growing vegetables.

Q: Is there anyone who didn't receive advice but planted vegetables? Did they come to you for information?

They talked to us and planted (Woman, 22 years).

Satisfaction came from having access to information and achieving home gardening goals: having a good harvest, eating a more diverse array of vegetables, and gaining expertise and ability that the women did not have before. Most women reported that the advice and information they received was important as they had inadequate knowledge, skills, and resources to plant like this before. Many women conveyed an increase in confidence by explaining how they were now able to grow, plant, and harvest vegetables. When asked if the new methods of planting were beneficial, one woman said:

Yes, because we didn't know of this method of planting vegetables before, the vegetables grow better if this method is used. I planted gourd on the sand beds, the yield was extremely high. Yes, I couldn't grow vegetables before, but now I can, and I'm happy (Woman, 20 years).

Women gained knowledge and spoke of their ability to communicate the information. Women saw the advice as essential as due to the knowledge, skills, and self-confidence they acquired.

I couldn't plant like this before. The advice is more important, because we don't know anything...I learned about children's nutrition and getting better yield for vegetables because they (nutrition counsellors) gave me advice. My household has improved with the money. I can feed myself, and my child; they were prevented from undernutrition at least to some extent (Woman, 20 years).

Input into Nutrition and Health Decisions

The nutrition counselling helped formulate an understanding of what vegetables to consume for the nutrition and health of their families, particularly young children. This new information empowered women to have a greater say in health and nutrition-related decisions within the household.

Women had greater input into their own healthcare choices. The mobile app was used to illustrate breastfeeding techniques and the information provided the impetus to make better decisions around their own health care needs.

They (nutrition counsellor) showed us how to breastfeed the child, through mobile phone... If there was any disorder with breasts, I showed them. They said to apply hot press on the breast to make it soft and to wash with hot water before breastfeeding the child (Woman, 25 years).

Several women expressed an understanding of the importance of the health and nutrition counselling messages and the long-term ramifications.

Suppose our children don't get nutrition when they are young. The children are married off at an early age, like 12/14 years of age. I can't give education to the children. Now we can give education and nutrition to the children and improve their lives (Woman, 20 years).

We asked the women which they found more useful – the money, or the advice provided by the program, with many reporting that the advice was more important, as it enabled women to become actively involved in nutrition and health care choices and boosted their decision-making ability.

Advice, because if we didn't get the advice, we wouldn't be able to plant vegetables. If we didn't receive the money, we wouldn't be able to buy seeds... Before, I didn't know that I had to feed the children rice three times a day, that I had to feed them with all kinds of vegetables (Woman, 22 years).

All beneficiaries received counselling from a nutrition counsellor. Most received counselling every week (85%), whilst a few received counselling on a fortnightly basis (15%). When asked about the topics covered, the majority received information on breastfeeding (88%) and complementary feeding (95%). One in five conveyed receiving information on other topics such as nutritious foods.

Discussion

Our feasibility study showed that a combined nutrition-specific (nutrition counselling) and nutrition-sensitive (agricultural training and unconditional cash transfer) intervention, delivered on a mobile platform, to women from low-income families in rural Bangladesh was

feasible and acceptable. The study also indicated potentials of impacts for such a combination of intervention on women's empowerment in a larger trial implemented in similar setting. This study provides insight to aid in the design of larger-scale trials.

Post programmatic analysis revealed evidence that the intervention's behaviour change communication messaging has led to change women's behaviour across five key areas related to women's empowerment. Firstly, women reported an increase in control over the use of direct income from the unconditional cash transfer. Women gained access to financial services by having a mobile banking account (bKash) opened in their name, enabling them to have new equitable access to mobile banking facilities. When women received the cash from bKash mobile banking account, their husbands would mostly withdraw it. In rural Bangladesh, men have greater social mobility and would visit the market more often to do the shopping. Whilst many women could go to the marketplace, community attitudes, social norms, and gender expectations may provide a barrier as women experience inequitable access to markets and financial services. However, women reported that their husbands were cooperative and supportive in obtaining the cash, giving them the funds to spend as they desired. Women gave directions to their husbands as to how to spend the money, demonstrating agency in purchasing decisions.

In poor rural households in Bangladesh, women traditionally have little control over productive resources such as land and money (Patalagsa et al., 2015). A change in power dynamics seemed evident when our data indicated that a woman could sell her chickens and give the money to her husband if he was in financial trouble. Several women reported that they no longer had to ask for money from their husband nor seek permission before spending the funds, indicating autonomy and control over the use of income and illustrating that by being part of the intervention, women were contributing economically to the family finances.

Findings from this study revealed that intrahousehold relationships, and in particular, spousal communication, improved as a result of the intervention. Women shared new skills and knowledge and worked together with their husbands to build garden beds for planting seedlings. The establishment of home gardens would often involve the entire household: husbands, sisters-in-law, and mothers-in-law. Women actively contributed to homestead gardens and described a sense of achievement not possible without the knowledge, skills, and resources they had gained. Women's social standing in the community changed; they had new information to communicate. An increase in self-efficacy and confidence was evident; community members would ask women questions and then plant gardens in similar ways. The contribution and exchange of knowledge and increased capacity fostered a sense of self-worth. A trial in Burkina Faso evaluated a nutrition-sensitive program consisting of agricultural training, health and nutrition BCC, and promotion of women's access to and use of land via community-focused activities. It found compelling evidence that women's empowerment is a pathway to improve child nutritional status (Heckert et al., 2019). The study revealed evidence that enhanced spousal communication made the largest contribution to a reduction in childhood wasting. Our study also found evidence of improved spousal communication as a result of the behaviour change communication: husbands and wives

creating gardens together.

Our intervention supplied phones to women as part of the social transfer and facilitated connectivity and exchange of information. Owning a mobile phone led to an increase in women's communication with husbands and family members, as well as agriculture and nutrition counsellors. Whilst mobile phone ownership in Bangladesh is high, the engendered digital divide is apparent, with 86% of men and 61% of women owning mobile phones, and with women from poorer households even less likely to own a mobile phone (Khatun et al., 2017; Rowntree, 2020). Tran et al.'s (2015) findings align with our study results and highlight that women's lives can be enhanced by mobile phone ownership by way of enhanced

connectivity: communicating with people and financial services and having access to information. Mobile phones can be a vehicle for women to reframe their roles in their households or positions in society, as digital literacy empowers women by newfound connectivity (Tran et al., 2015).

In this study, we found that nutrition counselling empowered women to have greater input into nutrition and health care decisions. After the intervention, women spoke of knowing the importance of eating a range of nutritious foods that provide vitamins and nutrients to keep their children healthy and became actively involved in decisions regarding how often to feed children and the importance of dietary diversity. The advice and training women received fostered agency and led to practical action, enabled by cash transfer. A study from Nepal investigated the relationship between women's empowerment in agriculture and production diversity on maternal and child nutrition outcomes and found positive association between overall empowerment and control over income with greater diversity in maternal diet (Malapit et al., 2015).

We recommend the inclusion of women's empowerment and gender sensitization as an explicit aim for nutrition-focused agriculture interventions, as this is likely to make programs even more effective and lead to improvements in nutrition outcomes (Patalagsa et al., 2015; Ruel et al., 2018). Baliki et al. (2019) analysed the impact of an integrated home garden intervention on vegetable production and consumption in Bangladesh and found positive changes in women's empowerment three years post-program, providing correlational evidence on social impact beyond the agriculture and nutrition sphere of the intervention. This approach is in alignment with The Government of Bangladesh's Second National Nutrition Plan (2016 – 2025), which prioritizes nutrition-sensitive approaches, such as advancing women's empowerment (Bangladesh, 2019).

The interpretation of our study has some limitations. We predominantly used qualitative data and did not interview all family members. Future program analysis should include interviews with men and key household members such as mothers-in-law, to elucidate a more comprehensive understanding of the feasibility of the intervention from a household perspective. This study was a pilot study, and as such, the results are not necessarily replicable or generalizable in nature. To advance these interventions, we need further exploration of the intended and unintended consequences of nutrition-sensitive agriculture interventions on women working in the agriculture sector such as overburdening women with workload, time use, energy expenditure, and balancing household obligations and childcare. However, our study has strength to generate feasibility outcomes that can inform the design of a large-scale trial.

Abbreviations

- BCC – behaviour change communication
- bKash – Bangladeshi Mobile Banking App
- HKI – Helen Keller International
- icddr,b – International Centre for Diarrhoeal Disease Research, Bangladesh
- Pro-WEAI – Project-Level Women's Empowerment in Agriculture Index
- WEAI – Women's Empowerment in Agriculture Index

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BMJ Open Assessing the impact of a combined nutrition counselling and cash transfer intervention on women's empowerment in rural Bangladesh: a randomised control trial protocol

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ABSTRACT

Introduction There is growing interest in assessing the impact of health interventions, particularly when women are the focus of the intervention, on women's empowerment. Globally, research has shown that interventions targeting nutrition, health and economic development can affect women's empowerment. Evidence suggests that women's empowerment is also an underlying determinant of nutrition outcomes. Depending on the focus of the intervention, different domains of women's empowerment will be influenced, for example, an increase in nutritional knowledge, or greater control over income and access to resources.

Objective This study evaluates the impact of the Shonjibon Cash and Counselling (SCC) Trial that combines nutrition counselling and an unconditional cash transfer, delivered on a mobile platform, on women's empowerment in rural Bangladesh.

Methods and analysis We will use a mixed-methods approach, combining statistical analysis of quantitative data from 2840 women in a cluster randomised controlled trial examining the impact of nutrition behaviour change communications (BCCs) and cash transfers on child undernutrition. Pregnant participants will be given a smartphone with a customised app, delivering nutrition BCC messages, and will receive nutrition counselling via a call centre and an unconditional cash transfer. This study is a component of the SCC Trial and will measure women's empowerment using a composite indicator based on the Project-Level Women's Empowerment in Agriculture Index, with quantitative data collection at baseline and endline. Thematic analysis of qualitative data, collected through longitudinal interviews with women, husbands and mothers-in-law, will elicit a local understanding of women's empowerment and the linkages between the intervention and women's empowerment outcomes. This paper describes the study protocol to evaluate women's empowerment in a nutrition-specific and sensitive intervention using internationally validated, innovative tools and will help

Strengths and limitations of this study

- This paper describes the study protocol evaluating women's empowerment in a nutrition-specific and nutrition-sensitive randomised controlled trial and will help fill the evidence gap on pathways of impact for women's empowerment and highlight areas to target for future policy and programming.
- Formative research guided this mixed-methods approach.
- We have designed specifically tailored tools, based on a theory of change, and using an internationally validated index that has been piloted in Bangladesh.
- We are not using the Project-Level Women's Empowerment in Agriculture Index in full as we interview women only for the quantitative component and will not calculate the Gender Parity Index, which is an index that sheds light on the sense of intra-household inequality; however, we will explore this with qualitative research.

fill the evidence gap on pathways of impact, highlighting areas to target for future programming.

Ethics and dissemination Ethical approval has been obtained from the International Centre for Diarrhoeal Disease Research (Ref. PR 17106) and The University of Sydney (Ref: 2019/840). Findings from this study will be shared in Bangladesh with dissemination sessions in-country and internationally at conferences, and will be published in peer-reviewed journals.

BACKGROUND

To define women's empowerment is not straightforward, nor is it easy to measure across the different domains and phases of a woman's life. Empowerment is 'the process of enhancing an individual's or group's capacity to make purposive choices and to transform

those choices into desired actions and outcomes'.¹ The United Nations defines women's empowerment as having five key components: 'women's sense of self-worth; their right to have and to determine choices; their right to have access to opportunities and resources; their right to have the power to control their own lives, both within and outside the home; and their ability to influence the direction of social change to create a more just social and economic order, nationally and internationally'.²

Gender, socially constructed roles assigned by sex, is one of the keynote determinants of health outcomes,³ making gender equality and the rights of women an imperative goal in global public health. Gender inequality and restrictive gender norms are, according to the Lancet 2019 series on Gender Equality, Norms and Health, 'powerful but separate determinants of health and well-being'.³ Sustainable Development Goal (SDG) 5 aims to achieve gender equality and to empower all women and girls, ending discrimination in all forms, from violence to forced marriage, and experience full active participation and equal rights in all spheres of life—politically, economically and socially.⁴ Out of the 17 SDGs, 11 entail indicators related to gender.

Much progress has been made towards gender equality and the empowerment of women globally. Yet, the potential for women to fully participate as 'agents of change' is still limited due to persistent social, economic and political inequalities.⁵ Women continue to be constrained by norms, beliefs and customs through which societies differentiate between women and men.⁶ Contextual forms of oppression include patriarchal societies and institutions, as well as lack of opportunity due to socioeconomic circumstances such as poverty. Violence, including intimate partner violence (IPV), disproportionately affects women. Worldwide, a third of women report experience physical or sexual IPV.⁷ Women subjected to IPV suffer poor mental and physical health, and their children show poorer health, nutrition and development outcomes.⁸ Evidence suggests that the combination of cash transfers and behaviour change communication (BCC) can increase women's bargaining power and poverty-related emotional well-being and can lead to a reduction in IPV.⁸

Interventions to improve the health and nutrition literacy of women and, in particular, counselling through mobile phone applications can make a positive impact on women's empowerment. Mobile health (mHealth) interventions have the potential to improve a woman's confidence and decision-making skills in communicating with healthcare professionals. However, a systematic review revealed the need for a further rigorous investigation into mHealth, in terms of implementation and evaluation, to establish whether mHealth programmes transform rather than reinforce gender inequalities.⁹ When a woman receives additional resources, such as cash transfers, and is the target of an mHealth programme, this can challenge gender norms within relationships and exacerbate gender disparities.⁹ There is limited evidence on the adverse effects of mHealth, such as expanding the digital

divide and gender-based power imbalances, and this lack of evidence emphasises the need to monitor the impact of mHealth interventions on gender relations and women's empowerment.⁹

The Lancet Series on Maternal and Child Nutrition also advocates the use of cash transfers and social safety net programmes, which are increasingly the preferred approach to support households living in chronic and extreme poverty.¹⁰ When targeted at women, social protection can promote women's economic empowerment and enhance decision-making ability, with the overarching assumption that control over cash will lead to greater investment in children's health and education.^{10 11} When women are engaged in nutrition-sensitive programmes that use social safety nets, certain aspects of women's empowerment are augmented, such as changes in gender roles and intrahousehold bargaining power.¹⁰

We plan to conduct a study, embedded in a cluster randomised control trial (RCT) that assesses a multifaceted nutrition intervention that aims to reduce childhood stunting—the Shonjibon Cash and Counselling (SCC) Trial.¹² This protocol paper presents the way we will measure the impact of the SCC Trial on women's empowerment.

Developmental interventions and women's empowerment in Bangladesh

Although Bangladesh has made remarkable reductions in rates of poverty, almost one in four of the population still live in poverty (24.3% in 2016).¹³ In 2018, the agriculture sector accounted for 40% of total employment.¹⁴ In most low-income countries, women account for almost half of the agricultural labour force; however, in Bangladesh, women exceed 50% of the agricultural labour force.¹⁵ In rural Bangladesh, social constructs such as gender roles of women and men powerfully drive household food consumption.¹⁶ A nationally representative sample from Bangladesh found that women's empowerment increases dietary diversity and availability of calories at a household level.^{17 18} The Government of Bangladesh and development organisations have shown a keen interest in combining nutrition counselling and cash transfers to improve maternal and child nutrition.¹⁹

In rural Bangladesh, 84% of households have access to a mobile phone.²⁰ A study in Bangladesh revealed women using Aponjon, a mobile messaging-based service providing information about mother and babies, had higher rates of autonomy in accessing mobile phones, although two-thirds of the women resided in urban areas. mHealth consultations may help address sociocultural gender norms and empower women as they were able to discuss personal health issues on the phone with female doctors who are infrequently found in rural communities.²⁰ The need to collect sex-aggregated, valid, comprehensive and standardised empowerment data is therefore imperative not only to achieve SDG 5 but also to enable the consistent measurement of women's empowerment indices.^{21 22}

Objectives and hypotheses

This study evaluates the impact of a combined nutrition counselling and an unconditional cash transfer RCT (SCC Trial), delivered on a mobile platform, on the level of empowerment of women in rural Bangladesh. This study will assess women’s experience of empowerment and disempowerment throughout the SCC trial.

The primary hypothesis is that in a community-based cluster RCT of a mobile phone-based nutrition BCC and unconditional cash transfer given to women in low-income families in rural Bangladesh, women’s empowerment will increase as measured by an increase in mean women’s empowerment scores (by an average percentage of 20) from the baseline to the end of the 24-month intervention, compared with women in the control arm.

The secondary hypotheses are that the mobile phone nutrition BCC and unconditional cash transfer compared to usual programmes will (1) increase control over income and economic resources, (2) improve input and decision-making power in nutrition and health care choices, and (3) decrease the acceptance and experience of IPV.

SCC Trial: women’s empowerment theory of change

Empowering women is not an explicit goal of the SCC Trial; however, women gain access to nutrition counselling, cash transfers and a mobile phone; the use of these resources can empower women. We constructed the theory of change to illustrate how the SCC Trial will impact on women’s empowerment outcomes. It outlines the barriers, intervention details, intermediate outcomes, outcomes and impact pathways (figure 1).

The SCC Trial intervention is delivered on a mobile platform. Women receive an mHealth interactive app—messages, audio and video, quizzes—as well as gestational age specific counselling from the call centre. They also receive cash via Bkash mobile banking app. The principal rationale of the theory of change causal pathway to impact is that the SCC Trial will lead to an increase in

women’s empowerment for those women participating in the intervention arm.

The Project-Level Women’s Empowerment in Agriculture Index (Pro-WEAI)²¹ indicators, discussed in detail later, appear in the theory of change across the outcomes. We will use the six indicators from the Pro-WEAI to calculate the women’s empowerment index and include (1) control over use of income, (2) input into productive decisions, (3) autonomy in income, (4) decision-making power on nutrition and healthcare, (5) respect among household members and (6) attitudes towards IPV.

One of the barriers to nutrition faced in rural Bangladesh is limited access to nutrition and infant and young child feeding (IYCF) information. Women in the SCC Trial intervention arm receive nutrition, IYCF and livelihood BCC delivered on a mobile app and nutrition counselling from the call centre. The intermediate outcome is woman’s acquisition of new BCC/nutrition knowledge, contributing to increased input into and decision-making power about health and nutrition choices for herself and her family (indicator 4). Improvements in communication also occur (spousal, intrahousehold and community) as new knowledge is discussed and shared, including ways to put the messages into action (indicator 5). One’s ability to make decisions is a measure of empowerment.²³ New knowledge can be used as leverage and bargaining power and enhance decision-making abilities across a range of areas such as livelihoods, household expenditure and decisions on productive assets, that is, what crops to farm (indicators 2–4).

The SCC Trial setting is in one of the poorest regions in Bangladesh. Families face barriers such as food insecurity and lack of financial resources. When a woman is the recipient of a cash transfer, the intermediate outcome is increased control over the use of income (indicator 1). Cash transfers, targeted at women, have the potential to improve livelihoods, alleviate poverty, enhance food security and increase women’s empowerment.¹⁰ Spousal communication is also strengthened as discussion ensues as to how to spend the

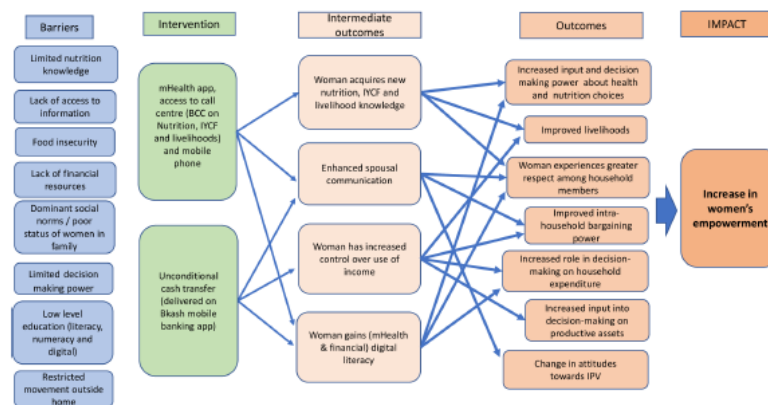


Figure 1 SCC Trial: women’s empowerment theory of change (adapted from De Silva *et al*⁵⁰). BCC, behaviour change communication; IYCF, infant and young child feeding; SCC, Shonjibon Cash and Counselling.

additional income (indicator 4). The outcomes for women receiving an unconditional cash transfer include a strengthened ability to contribute to and participate in financial decision making. This decision making covers health and nutrition choices, household expenditure, productive assets, livelihood choices (ie, homestead gardening, buying chickens to raise for eggs, meat and income; indicators 1–4).

IPV includes behaviour that is physical, psychological, sexual, or abusive or controlling in nature.²⁴ There is evidence that the combination of additional income from cash transfers combined with BCC can increase women's bargaining power and poverty-related emotional well-being.⁸ Changing attitudes, from within the family unit, as women participate and learn from intervention activities, has the potential to lead to a change in the acceptability of IPV, linked to a woman's right to bodily integrity.²⁵ Women may also experience an increase in respect and self-efficacy and subsequent reduction in acceptance of IPV (indicator 6).

Study design

We will embed this study on women's empowerment within the SCC Trial. The SCC Trial will recruit pregnant women and follow-up over 24 months of an expected 2840 mother–child dyad, from recruitment in early pregnancy until the child is 18 months of age. The intervention will run for 36 months, depending on the time of enrolment and gestation, and the age of the child.

METHODS

This study will use a mixed-methods approach with data gathered on women's empowerment from participants in the SCC Trial. This protocol paper will adhere to the SPIRIT (Standard Protocol Items: Recommendations for

Interventional Trials) and Tidier guidelines for clinical trial protocols^{26–28} to ensure rigour in protocol content.

Study setting

We will conduct the study in two subdistricts of Sirajganj, Ullapara and Kamarkhanda, in northern Bangladesh (figure 2). Employment in Sirajganj is predominantly in agriculture (51%), with 25% working in services and 23% in industry.²⁹

Eligibility criteria

All married women between 15 and 49 years, who are permanent residents of the study area and provide consent to participate and test positive with pregnancy urine test kit (Excel) (whose gestational age is ≤ 90 days), are eligible to participate in the SCC Trial.

Intervention: Shonjibon¹ Cash and Counselling Trial

A separate protocol paper provides details of the design of the SCC Trial.¹² Briefly, the SCC Trial aims to assess the effectiveness of nutrition BCC (delivered via call centre counselling and specifically tailored mobile app) combined with unconditional cash transfers in reducing the prevalence of stunting (length for age < -2 Z) in children at 24 months. We will use a longitudinal cluster randomised controlled trial to determine the effectiveness of unconditional cash transfers and mobile BCC to reduce child undernutrition in Sirajganj district in northern Bangladesh, one of the poorest regions in the country according to the World Food Programme Poverty Maps.³⁰ Both quantitative and qualitative approaches will be employed to address the study objectives.

¹Shonjibon stands for Shustho Notun Jibon in Bangla; translated, it means 'healthy new life'.

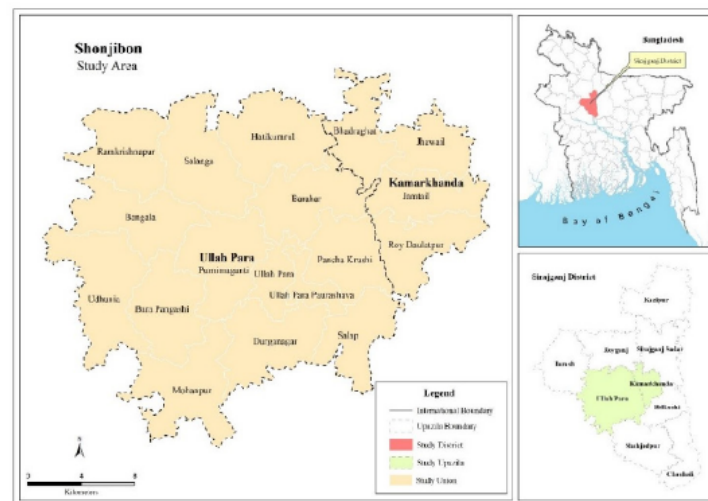


Figure 2 Sirajganj, Bangladesh, Shonjibon Cash and Counselling study site.

The SCC Trial intervention arm receives (1) nutrition BCC delivered on a specially tailored app on a smartphone (audio, video and animation); (2) direct nutrition counselling from a call centre; and (3) unconditional cash transfer of 1000 Taka (US\$12.50) received monthly via BKash mobile banking app. The control arm will receive a mobile phone and the current government of Bangladesh health and nutrition services. The participants in the control arm receive a mobile phone as the trial is interested in the effects of the messages, nutrition counselling and cash transfer delivered on a mobile platform, as opposed to the non-specific effects of a mobile phone.

Study outcomes

The primary study outcome will be the difference in women's empowerment scores in the intervention arm as compared with the control arm of the SCC Trial. Secondary study outcomes will include (1) control over income and economic resources, (2) input and decision-making power in nutrition and healthcare choices, and (3) experience and attitude towards IPV.

Outcome measurements

The SCC trial will collect data across the main module of the Pro-WEAI (12 indicators) as well as the additional health and Pro-WEAI Nutrition and Health Module. However, six of the Pro-WEAI indicators are likely to be directly impacted by the SCC trial; therefore, we will develop a composite women's empowerment indicator based on the following: (1) control over the use of income, (2) input in production decisions, (3) autonomy in income, (4) decision-making power about women and children's health and nutrition, (5) respect among household members and (6) attitudes towards IPV (online supplemental appendix table 1). We will also measure women's and family members' perceived and lived experiences related to women empowerment qualitatively (online supplemental appendix table 1).

1. Control over the use of income. We will measure control over the use of income by asking questions from Pro-WEAI; these questions are significant as the SCC Trial gives an unconditional cash transfer to the woman. Quantitative questions assess a woman's input into decision making on all sources of household income. Qualitative interviews will explore local perceptions of intrahousehold harmony and communication skills, issues related to withdrawing the cash, and perceptions and experience of control and expenditure of the money.
2. Input in productive decisions. These Pro-WEAI questions centre around input into household decision making on areas such as livelihood choices (activities the household participates in, such as agricultural activities, home gardens, etc), employment and household purchases.
3. Autonomy in income. This includes a series of vignettes, validated by cognitive testing, using a series of

hypothetical scenarios to assess motivation as to how income is used.

4. Decision-making ability about health and nutrition choices. We will examine responses from the Pro-WEAI Nutrition and Health Module regarding confidence and participation in decisions about nutrition and infant feeding, as well as a range of issues affecting women and children, such as whether to consult a doctor when ill to dietary choices when pregnant.
5. Respect among household members. Questions in this indicator pertain to a woman's spouse or other household members on respect and trust within relationships, and level of comfort in disagreeing with household members.
6. Intimate partner violence. Previous research in Bangladesh has found that cash transfers and BCC can reduce IPV.⁸ We will measure a woman's attitude towards IPV using the Pro-WEAI as well as the direct experience of IPV using the questions from the Violence Against Woman and Girls 2015 Survey.^{31 32} We will also conduct in-depth interviews to explore the woman's attitudes and perceptions of IPV qualitatively.

Participant recruitment and timeline

A household census in the study area will record the names and contact details of all women who agree to participate, and we will enter their details into an electronic system. The system will generate for each participant with a unique ID number and quick response code. SCC surveillance workers will then conduct door-to-door visits each month to identify women that have missed two menstrual periods in a row. The woman will then undertake a pregnancy test (using a urine test kit (Excel)). We will invite women who test positive for pregnancy to participate in the study with appropriate informed written consent. Based on experience with our pilot study, we anticipate 95% of the mothers will consent. Qualitative and quantitative data will be gathered at the start of the intervention and at endline (online supplemental appendix table 2).

Allocation of clusters

Our study site has over 1100 villages, which would be adequate to cover the anticipated sample size. Each cluster encompasses two to four villages and consists of ~1000 households and ~4500 population. We will use a fixed randomisation scheme to assign treatments to eligible clusters, with a uniform allocation ratio of treatments, stratified by union. The sample size will consist of 104 clusters, total women (n=2840) allocated to two parallel groups (n=1420) with 20 mother-infant dyads per cluster. Each cluster consists of one to four adjacent villages with a minimum population of 600 households per cluster with 454 villages in our study area for clustering. A subsample of the households from a purposively selected subset of clusters will be chosen for qualitative data.

The intervention and control groups will receive similar maternal and child health and nutrition services



from the government, and the critical difference will be the nutrition BCCs with cash transfers on a mobile platform received by women in the intervention arm. The study design will control for potential observed and unobserved confounding factors as there will be an adequate number of clusters randomly allocated to the treatment groups. The geographical separation of clusters will limit the contamination of the intervention arm. We will use STATA V17 software to generate the random allocation sequence. We are unable to mask the treatment arm due to the nature of the intervention.

Sample size and power

The sample size for our trial is fixed by the primary hypothesis in the main SCC Trial, which estimated a total sample of 2184 mother–infant pairs from 104 clusters.¹² We can find no reports of intracluster correlation coefficients (ICCs) for the women’s empowerment indicators we plan to use. Therefore, we estimate that the fixed trial sample size will provide at least 80% power to detect a 20% increase in women’s empowerment, assuming 30% of women are empowered and a high ICC of 0.2. Assuming a lower ICC of 0.05, we will have 90% power to detect a 13% increase in women’s empowerment.

Data collection methods

The SCC Trial will collect key household data and nutrition indices, while this study collects data on women’s empowerment using the Pro-WEAI, whose focus is measuring agency for which there are limited, if any, standardised measures.²¹ We will include the Pro-WEAI Nutrition and Health Module and supplementary questions regarding IPV. The qualitative component will be tailored to context-specific issues and guided by formative research.

Quantitative data

We will collect the women’s empowerment indicators in household surveys at the baseline and the endline of the 24-month study in the intervention and non-intervention arms. We will pretest all questions before the commencement of the study. We will use the validated short version of Marlowe-Crowne’s social desirability scale,³³ which is based on a subset of 13 items from the original scale. We will calculate a social desirability score by adding up the number of socially desirable answers, out of the 13 questions. The potential range of the score will be from 0 to 13, and we will create three categories with a score of 0–4 graded as a low score, 5–9 as a medium score and 10–14 as a high score (online supplemental appendix table 3). The questionnaire assesses whether social desirability bias or the tendency of respondents to answer questions in a way viewed favourably by the research team has influenced the data collected. We will train the field researchers in detecting social desirability bias in qualitative data and limit bias by properly introducing the study to the respondents, building rapport and asking context-specific probing questions following the recent

framework described by Bergen and Labonté.³⁴ We will follow the process throughout the research.

Qualitative data

The study uses qualitative analysis to elicit a local understanding of women’s empowerment and the linkages between the SCC Trial and women’s empowerment outcomes. We will generate qualitative data on women’s and men’s perceived and experienced change in empowerment through longitudinal qualitative semistructured in-depth interviews. We will also interview key family members as suggested by the women, for example, husband or mother-in-law.

We will explore the myriad of ways that women and men perceive and describe empowerment in their communities. A purposive sample will be interviewed approximately 2 months after the start of the intervention and at the endline of the SCC Trial. Due to the highly sensitive nature of the topics, a separate team of interviewers, from a different Upazila, will be trained to collect data on women’s empowerment and IPV. We will train the team in line with the ethical and safety procedures as per the WHO’s guidelines.³⁵ The training will cover measures such as changing topics and asking a decoy nutrition question if anyone comes into the interview space and having details of referral and support services for women affected by or experiencing IPV.

Pro-WEAI

The Pro-WEAI measures the empowerment of women, agency and inclusion in the agriculture sector.²¹ It is a standardised, survey-based internationally validated index developed to adapt to project-specific contexts and has been piloted in Bangladesh.^{17 21} This study uses Kabear’s conceptual framework of empowerment that focuses on the ability of individuals to make choices, ‘a process of change during which those who have been denied the ability to make choices acquire such an ability’.^{36 37} Agency or the ability of the individual to make considered choices is at the centre of the framework and revolves around inter-related dimensions of resources, agency and achievements. This framework underpins the Pro-WEAI.²¹ This study will collect data from women, across 12 indicators that are equally weighted (figure 3), with the addition of the Project-specific Nutrition and Health Module.

Intimate partner violence

The Pro-WEAI includes questions on a woman’s attitude to IPV. We will collect additional data about personal experience and behaviour-specific questions regarding IPV, as opposed to her perceptions thereof. We took these questions from the WHO Violence Against Women and Girls Survey (Bangladesh 2015).³² We will also ask questions relating to cyberviolence.³⁸

Health and nutrition

The Pro-WEAI offers the option of adding project-specific modules, and for this study, we will add the Nutrition

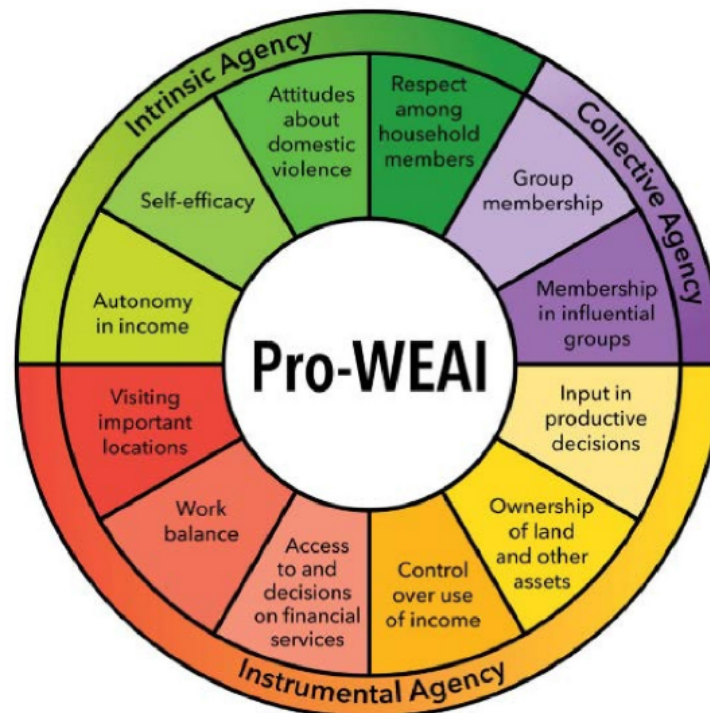


Figure 3 Pro-WEAI: 3 domains of empowerment and 12 indicators.²¹ WEAI, Project-Level Women's Empowerment in Agriculture Index.

and Health Module. This module asks questions about decision making about nutrition and health indices for women and children.

Data collection and management

Intervention and evaluation staff will be separated from and will not know the trial hypothesis to minimise assessment bias. Android tablets will be used in the field to enable interactive data collection. During each evaluation interview, the data collectors will be guided and navigated by the software. As soon as the field staff complete each interview, they will upload the data to the server at International Centre for Diarrhoeal Disease Research (icddr, b). The data will be retained on the tablet and copied/merged with files at icddr, b, with android tabs being synchronised with the server daily. We will systematically scrutinise the captured data and address any discrepancies as they occur. Qualitative narrative data will be captured in digital audio recorders and stored in the server from where we will check for quality and improvement for future interviews.

Quantitative data analysis

Data analysis will be by intention to treat. The women's empowerment composite index scores will be categorised as the percentage of women as empowered or

disempowered. For each empowerment indicator, individuals are classified as adequate or inadequate based on Pro-WEAI predetermined thresholds. Women are considered empowered if four out of six indicators are adequate. We will also analyse impact of SCC intervention on individual indicators to assess increases or decreases in empowerment as not all indicators will respond or be impacted in the same way.

Analyses will be conducted at the mother–infant dyad level but will be adjusted for the cluster randomisation.³⁹ Primary analyses will compare the prevalence of women's empowerment at the end of the trial using Pearson's χ^2 tests and 95% CIs for the group difference, adjusted for clustering and generalised linear mixed models for non-continuous outcomes (eg, logistic mixed models for binary outcomes, for example, percentage of women's empowerment). Models will include treatment group as a fixed effect, infants as a random effect to account for repeated measurements, and community cluster as a random effect to account for cluster effects. We will also assess if the women's empowerment level at baseline, age, education, and presence or absence of a mother-in-law in the household modify the empowerment response to the intervention by testing for interactions between the intervention and these factors. STATA will be used for all analyses.



Qualitative data analysis

We will record all interviews using digital audio recording devices. Interviews will be transcribed verbatim in Bangla by the research team at icddr, b. We will maintain quality control by checking the transcripts at random intervals to ensure the quality and accuracy of transcriptions. Data will be coded using thematic analysis approach.⁴⁰ We will use NVivo software to organise, code, categorise and compile the data. Qualitative methods offer an effective way of describing in-depth, complex and varied perceptions of empowerment within the local context. They will also aid with the interpretation of individual indicators within the quantitative data. Data triangulation by using different sources of data will add strength to the analysis.⁴¹

Data and safety monitoring board

An independent data and safety monitoring board (DSMB) will be formed to assess the completeness and quality of data and to ensure data are compliant with recruitment and retention goals. The DSMB will also assess any factors that might affect the study outcome or compromise the confidentiality of the trial data. Any unintended effects of the trial will be reported to the board.

Patient and public involvement

The development of the research question and outcome measures was informed by participants' priorities, experience and preferences based on our formative research and pilot study, whereby we engaged the local community and sought their views about the proposed intervention. Participants were involved in the design of the study by taking part in the formative research. Participants were not involved in the recruitment and conduct of the study. The key trial findings will be disseminated to study participants through meetings with community gatekeepers and local administration. In this RCT, the burden of the intervention was assessed by participants themselves as we undertook a pilot study.

Dissemination plan

Lessons learnt from this study will be shared in Bangladesh with dissemination sessions in-country. Internationally, key findings will be shared with stakeholders, results will be presented at conferences and published in international peer-reviewed journals.

Access to data

The SCC investigators will have access to all data and the right to analyse and publish data. Datasets will be shared after all personally identifiable information has been removed and to keep the identification of study subjects in confidence. The datasets generated and analysed during the study will be available from the corresponding author on reasonable request.

Ethics approval and consent

We have obtained approval for the SCC Trial from the ethical review committee of the icddr,b (Ref. PR 17106),

and the human ethics committees at The University of Sydney (Ref: 2019/840).

We will train the women on the use of smartphones as well as the nutrition counselling application. We will store the data obtained on the use of the application with access to limited authorised project staff. Trained field staff will educate the women about the safety procedures for receipt and use of money. We will record responses anonymously and by identification number. We will maintain the confidentiality, privacy and anonymity of the participants.

Project field workers will explain the nature, purpose, benefits, risks and process of the trial to potential participants as they register themselves in the surveillance system if they meet the inclusion criteria. We will train them to obtain written informed consent (in Bangla) from all intervention participants. Participation in the research will be voluntary, and the respondent will have every right to withdraw anytime throughout the programme without any obligation, loss or penalty. We will explain the participant's rights before collecting any data.

DISCUSSION

The main goal of this study is to evaluate the impact of a combined nutrition counselling and unconditional cash transfer intervention, delivered on a mobile platform, on women's empowerment in rural Bangladesh. We recognise that women's empowerment is an essential goal in global public health and the key to sustainable development. It is therefore crucial that, in complex and large-scale nutrition interventions such as the SCC Trial, we measure pathways of impact across the domains of women's empowerment. The 2013 Lancet Series on Maternal and Child Nutrition proposed using interventions that raise women's overall level of empowerment.¹⁰ Research has shown evidence of the impact of various development interventions on women's empowerment.^{42–44} A 2018 analysis of surveys from 54 countries observed that in critical aspects of family relationships, four out of five women did not hold agency.⁴⁵ Cunningham *et al*⁴⁶ note that women lack not only the resources to make significant decisions leading to better health and nutritional outcomes but also, when disempowered, lack the autonomy and decision-making power within the household to make these critical decisions, having a multiplier effect on family and community.

This study has several strengths; first, it is embedded within a cluster RCT that aims to assess the effectiveness of a nutrition BCC combined with unconditional cash transfers in reducing the prevalence of stunting. Another strength lies in the use of a mixed-methods approach—obtaining qualitative and quantitative data. We gain further advantage from the use of tools tailored specifically for this intervention; tools that are based on formative research, wide-ranging literature review and piloted in Bangladesh, providing accurate, comprehensive and appropriate methodology.

The Pro-WEAI is designed to assess the impact evaluation of agricultural development projects.⁴⁷ The SCC Trial is not an agricultural intervention; however, women in Bangladesh characteristically do postharvest activities and processing yet do not classify themselves as agricultural workers. It is in this context that we are using the index to survey women in Bangladesh whose livelihoods are bound to the agricultural sector.⁴⁸ Alkire⁴⁹ describes the Pro-WEAI as an ‘information platform’ that is applicable in broader contexts other than exclusively agricultural interventions.⁴⁹ The core elements of the SCC women’s empowerment index, a customised tool, will provide translatable results—using measures and indices that allow global comparisons.

When the Pro-WEAI is used in full—women and men are interviewed—this enables the calculation of the Gender Parity Index, which measures empowerment and disempowerment within the household. The limitation of not interviewing men is that we may not capture the sense of intrahousehold inequality—are the women at least as empowered as the men in their households? We will account for this by ensuring that qualitative exploration delves into the extent to which the disempowerment observed is attributable to gender norms versus other causes. The SCC Trial does not directly focus on women’s empowerment nor contest existing gender norms or patriarchal power structures. However, the study participants—the recipients of the cash transfer, nutrition counselling and smartphone—are women. This study will identify where gaps in empowerment occur and will highlight key areas of disempowerment and which domains help facilitate or hinder nutrition outcomes.

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Contributors EKK drafted the paper and designed the study tools and main conceptual ideas. AA and MJD made continuous contributions and supervised the design of the study and the overall writing. All other authors (JFH, TH, TLL, TT, MMH, AI, JK, NBA, SU, NG, SM, MMI, GA, KEA and SEA) were involved in the development of the main study design and methods; read, critically revised and approved the

final manuscript; and met the International Committee of Medical Journal Editors criteria for authorship.

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1 Appendix

2 Table 1: SCC women's empowerment summary index components

Shonjibon Trial resources	Pathway	Outcome variable / index components
mHealth app, access to call centre (BCC on Nutrition, IYCF and livelihoods) and mobile phone	Instrumental Agency (Power to)	1. Control over use of income (G2) 2. Input in production decisions (G2)
	Intrinsic agency (power within)	3. Autonomy in income (G8(a)) 4. Decision-making power on nutrition and health care (X) 5. Respect among household members (G7) 6. Attitudes toward IPV (G9)
Unconditional cash transfer (delivered on Bkash mobile banking app)		

3

4 Table 2: Data collection timeline

Methods	Participants	timeline
<i>Semi-structured in-depth interview at the household level</i>		
In-depth interviews with women	1) Pregnant women 2) Mothers of children <1 month 3) Mothers 1-5 months 4) Mothers of children 6 – 59 months	➤ At the start of SCC Trial ➤ Endline
In-depth interviews with family members	1) Mother or mother-in-law of women 2) Husband of women	➤ At the start of SCC Trial ➤ Endline

1

	3) Other key family members as directed by the woman interviewed	
<i>Pro-WEAI Survey questions</i>		
Survey questionnaires	Female intervention recipients	➤ Baseline ➤ Endline

5

6 Table 3: Social Desirability Bias

Directions: Read each item and decide whether it is true (T) or false (F) for you.			
		True	False
1	It is sometimes hard for me to go on with my work if I am not encouraged.		
2	I sometimes feel resentful when I don't get my way		
3	On a few occasions, I have given up doing something because I thought too little of my ability		
4	There have been times when I felt like rebelling against people in authority even though I knew they were right		
5	No matter who I'm talking to, I'm always a good listener		
6	There have been occasions when I took advantage of someone		
7	I'm always willing to admit it when I make a mistake		
8	I sometimes try to get even rather than forgive and forget		
9	I am always courteous, even to people who are disagreeable		
10	I have never been irked when people expressed ideas very different from my own		
11	There have been times when I was quite jealous of the good fortune of others		
12	I am sometimes irritated by people who ask favours of me		
13	I have never deliberately said something that hurt someone's feelings		

7

2

Chapter 5: Women's participation in household decision-making:
Qualitative findings from the Shonjibon Trial in rural Bangladesh.

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Abstract

A key element of empowerment is the ability to participate in household decision-making. This study presents the qualitative results from the Shonjibon Cash and Counselling Trial baseline process evaluation. We conducted forty-one in-depth interviews with pregnant women. The key findings that emerged; women jointly participated in financial decision-making with their husbands; men made the final decision regarding healthcare, and women solely made choices regarding infant and young child feeding. Our findings revealed that women felt that they needed to discuss their plans to go outside the house with their husbands, many perceived a lack of importance in the community towards women's participation in decision-making. This study documents current contextual information on the status of women's involvement in household decision-making and intrahousehold power dynamics at the start of the Shonjibon Cash and Counselling Trial in rural Bangladesh.

Keywords

Women, household decision-making, qualitative, cash transfer, mHealth, nutrition behaviour change communication, Bangladesh

Introduction

One's decision-making ability can be used as a gauge to measure agency (1, 2). A key component of empowerment is the ability to participate in household decision-making involving household purchases, financial decisions, and the ability to move about freely (2, 3). Gender equality is a fundamental human right, and power imbalances within the household directly affect interpersonal relationships and agency (4). Women's empowerment centres on the ability of individuals to make choices, "a process of change during which those who have been denied the ability to make choices acquire such an ability" (5, 6). Women's empowerment, including active participation in decision-making, is positively associated with improved dietary quality, dietary diversity, within households yet will vary with individuals across the life course (7). Women's empowerment does not give advantage to individuals in a similar way, with gender bias favouring boys emerging during adolescence (7). When women and men at a household level are engaged in decision-making, this directly supports greater well-being for society, households and individuals (8).

Cash transfers targeted at women can stimulate women's economic empowerment and improve agency and decision-making ability (9, 10). Social safety net programs that increase women's control of such income are also associated with better nutrition outcomes for themselves and their families (11). When women are involved in nutrition-sensitive programmes that use cash transfers, certain aspects of women's empowerment are enhanced, such as changes in gender roles and intrahousehold bargaining power (10). However, there is some evidence on the impact of unconditional cash transfers on women's empowerment, a study of cash transfer programme in Pakistan found positive impacts on

some of the variables that are used to measure women's empowerment and ability to participate in decision making (12).

The influence of women's empowerment on child nutritional status and health outcomes for women and children is increasingly recognised (13). Evidence shows that when women experience inadequate decision-making power and lack control over resources, it contributes to undernutrition for themselves and their children (13). Research from Bangladesh has revealed disempowerment of women is strongly associated with maternal undernutrition and low birth weight babies (14). A systematic review in South Asia found relative differences in household members' bargaining power, income, food behaviours, social status, and interpersonal relationships determined their food allocation and reflected social and cultural gender-based discrimination (15). These studies highlight the need for a more context-specific evaluation of the role of women's decision-making ability and health outcomes.

Gender inequality and food systems are interconnected. The 2020 Global Nutrition Report revealed that adequate and appropriate nutrition could promote gender equality through improved health outcomes, increased education attainment, and greater economic participation (11). Gender equality contributes positively to household food security, whilst the disempowerment of women exacerbates food insecurity (16). Just and equitable food systems need to recognise women's fundamental role in food systems, particularly in low and middle-income countries, and work toward outcomes that empower women and girls (17). Thus, it emphasises the importance of gender equality as a means to achieve health outcomes and as an end goal.

Globally, women have less input and agency than men, as demonstrated by their ability to participate in decision-making (18). Women of low socio-economic status in South Asia

experience barriers to exercising their ability to have authority over decisions that directly impact their lives (19). Studies from India revealed that women who experienced higher socio-economic status and were employed had more input in important household decisions (20, 21). Bangladeshi women face gender-based inequities which impede their ability to participate in the decision-making process. These inequities are further reflected in the disproportionate access of women to education and employment, their limited access to food and health care and their lesser say in household decision-making powers (22-24). This study aims to explore women's participation in intra-household decision-making at the baseline of the Shonjibon Cash and Counselling Trial in rural Bangladesh (25).

The Shonjibon Cash and Counselling Trial

The Shonjibon¹ Cash and Counselling (SCC) Trial is a longitudinal cluster randomised controlled trial evaluating the impact of unconditional cash transfers with nutrition counselling on pregnant women's birth outcomes in rural Bangladesh (25). The SCC Trial plans to improve nutrition knowledge and influence maternal and child nutrition practices through behaviour change communication (BCC). The intervention arm receives (1) nutrition BCC delivered on a specially tailored app on a smartphone (audio, video, and animation); (2) direct nutrition counselling from a call centre; and (3) unconditional cash transfer of 1000 Bangladeshi Taka (approximately US\$12.50) received monthly via BKash mobile banking app. The mobile app is called "Soi Barta", which translates from Bangla to mean "message from a friend". The BCC entails women downloading the "Soi Barta" app with help from the study team and throughout their pregnancy and birth will receive gestational age specific nutrition focused weekly messages or messages tailored to the age of their child. The SCC Trial

¹ Shonjibon stands for Shustho Notun Jibon in Bangla; translated, it means 'healthy new life'.

recruited pregnant women (2840 mother-child dyads) and will follow up with up over 24 months, from recruitment in early pregnancy until the child is 18 months of age. Women in the control arm receive a mobile phone and the current government of Bangladesh health and nutrition services.

The SCC trial aims to assess the effectiveness of nutrition BCC when combined with unconditional cash transfers in reducing the prevalence of stunting (length for age < -2 Z) in children at 24 months (25). The study setting is in Sirajganj, a district in northern Bangladesh, one of the poorest regions in the country, according to the World Food Programme Poverty Maps (26). Both quantitative and qualitative approaches were employed to address the study objectives. Separate protocol papers describe the design details of the SCC Trial (25, 27).

This paper documents a section of the baseline process evaluation findings from the SCC Trial; to understand the status of women's decision-making at the start of the trial and in order to be able to assess changes in women's empowerment in terms of their input into decision-making, agency, and self-efficacy at the close of the study.

Methods

This study used a qualitative approach to gathering data from women in the SCC Trial. Married women aged between 15 – 49 years who were permanent residents of the study area and had a positive pregnancy test (gestational age under 90 days) area were enrolled (25). As part of the baseline process evaluation, we conducted forty-one in-depth interviews with pregnant women. The implementation team provided a list of potential households from the project. Researchers approached households and invited them to be part of this study. Women were purposively selected and interviewed approximately two months after the start of the intervention. The researchers purposively selected interviewees from Ullapara and

Kamarkhanda upazillas (sub-districts) located in Sirajganj, Bangladesh, between January and March 2021. The field team from the International Center for Diarrhoeal Disease Research, Bangladesh (icddr,b) conducted the interviews, and consisted of an experienced anthropologist, along with three local (female) researchers. Each interview lasted between forty-five minutes to one and a half hours and were conducted within the home.

Data Analysis

We recorded interviews using digital audio recording devices. The research team transcribed interviews verbatim in Bangla at icddr,b and entered data into Microsoft Word files. A researcher from icddr,b translated the transcripts into English. Quality control was maintained by NAA (senior health social scientist), who checked the transcripts at random intervals to ensure the accuracy of transcriptions. EKK undertook initial coding and discussed coding details with Bangla-speaking NAA and J.K. We coded the data using a thematic analysis approach (28). NVivo software (V12) was used to organise, code, categorise and compile the data (29).

Results

In analysing the in-depth interview data, several key themes centred on decision-making emerged: women's input into financial decisions, participation in health-related decision-making; the overall importance attributed to women's contribution to the decision-making process in the household and community; and decisions regarding freedom of movement.

Financial decision making

Money from the intervention

In the first fifteen in-depth interviews, out of forty-one interviews, participants had no experience with cash transfer as the initial payment had not taken place at the time of the

interview. Nineteen women reported receiving an unconditional cash transfer via the bKash mobile banking app. We asked the women who would withdraw the funds from the bKash agent, usually located at the local marketplace. Most of the women stated that their husbands primarily withdrew the cash. In some cases, women withdrew the money as the bKash agent's shop was close to their home. In a few instances, the brother-in-law, father-in-law, son or another male family member withdrew the cash.

"As it is the work of outside of the home and I rarely go outside, so (the work is done by the people [males] who regularly go outside)" (Mother (recently delivered), 32 years)

For spending the cash, most women needed to inform or discuss the purpose of expenditure with their husbands or other family members. *"For buying small and tiny things, it is not necessary. However, for buying or spending for a big and expensive thing, it is mandatory to discuss with him (husband)" (Pregnant woman, 25 years)*. When asked who would spend the cash and on what, one woman said her husband would use the money on food, *"He will buy food with the money which will heal my body."* (Pregnant woman, 36 years). Women felt if they did not discuss the cash expenditure, they might face marital disharmony in their relationship.

Women noted that in very few instances, they did not need to explain to their husbands or family members, using the rationale that they directly received the cash. A few women stated that they were free to spend the cash transfer as they wished without limitations. One woman who had not yet received the money said, *"I can spend as much as I want. If I spend this money, he will not say anything. If I don't spend, he won't say anything."* (Pregnant women, 34 years). Several women reported that they could spend any remaining funds after

purchasing food without asking their husbands' permission. The women told of being free to spend the money as they liked, as their husbands know they do not spend money unnecessarily. However, one woman emphasised that it was more advantageous that she received the money as it would enable her to eat; *"It's a little better if they give me money. I am a poor woman; I can eat if I have my own money"* (Pregnant women, 25 years).

Household income

Two of the women interviewed earned income; one ran a tailoring shop, and the other ran a poultry business from home, making four or five hundred Bangladeshi Takas per month (approximately 5 or 6 USD, average monthly wage 95 – 140 USD (30)). When asked whether they would spend this income on their own or in consultation with their husband, one reported handing over the income to her husband. The husband managed all the household income, and she informed us, *"I don't have any other opinion"* (Pregnant woman, 36 years). Another woman reported needing to tell her husband about the purpose of expenditure for general household income.

"He has trust in me that I will not do anything wrong. ...with the money... (without informing him)." (Pregnant women, 34 years).

Health-related decision-making

The "Soi Barta" mobile app delivers nutrition, health-related messages, and access to counselling from a call centre to women. Even though the women had only recently enrolled in the SCC Trial, they viewed the app positively, with one woman saying, *"The Soi Barta has given me a lot of things"* (Pregnant woman, 36 years). Women reported consulting with men when making health-related decisions. However, if a family member became sick, many

women reported that their husbands would decide alone whether to take them to the doctor or hospital.

"I had a stomach ache before, then I felt bad, I brought medicine, I didn't feel well after eating. Then he said, 'I will take you to the doctor, I will take you and see'" (Pregnant woman, 36 years)

"The decision would be made by my husband. As he is here, so he will make the decision" (Pregnant woman, 24 years)

Whilst men may ultimately decide on the need for medical care; several women stated they had input into the decision-making process, discussing the problem together to make the best decision. However, when probed further, if the woman's husband did not allow her to seek care, she would not disobey his directive.

"We both have to make a decision. Q: Will he value your decision? A: Yes.... If he doesn't let me go, I won't go" (Pregnant women, 25 years)

"Decisions are taken by my husband and me – both of us. I suppose, he is the principal decision-maker. The main decisions are taken by my husband" (Pregnant women, 32 years)

In some cases, older family members and relatives who were living close by were the key decision-makers regarding medical treatment. One woman reported that as her husband was away, working in Dhaka, her father-in-law would make the decision regarding medical treatment, and her mother-in-law would accompany her to the hospital if she required medical attention. Whilst another woman's brother-in-law was living in an adjacent house, so the decision regarding medical treatment would be taken by him.

"Decisions are taken by the guardian of the family, by my father-in-law. No matter whether he eats in this house or other house. He is the guardian of the family"
(Pregnant women, 20 years)

"My younger sister-in-law's husband takes decision while my husband is away. We called him and, as I am currently pregnant, I needed to tell him before going for any ANC check-up" (Pregnant women, 32 years)

Food and Nutritional decisions

In most households, women were the primary decision-makers regarding what foods would be cooked and eaten. Women cooked what they had directed their husbands to buy and what was seasonally available from the market, as they traditionally do not go to the marketplace. If a husband were away for work, the father-in-law would ask in advance what items such as onions, salt, cumin, and ginger were required, and he would then go to the market to purchase what was needed.

"Women make most of the decisions when it comes to cooking. However, some men in the house do not understand. If at any time the food doesn't taste good to them, they quarrel. Again, not all men in the house are the same, and not all women are the same" (Pregnant woman, 36 years)

However, in other households, decisions as to what foods to purchase were decided by both women and men.

"We both make decisions together. I told him again that there was no onion, no chili, he had to bring it; He brought it.... I asked him, "What will I cook? will I put potatoes

in the curry? will I cook the fish? I ask him these.... Q. Both of you decided together?

A. Yes" (Pregnant women, 25 years)

All women reported deciding what to cook with the foods available, though this was mitigated by domestic workload and time factors.

"Cooking items are adjusted according to work pressure. It can be seen that if the pressure is high, some light items (will be) cook(ed) on this day, and when the work pressure decreases, another item is cooked that day. Women make most of the decisions" (Pregnant woman, 36 years)

Decisions on infant and young child feeding

Women spoke of understanding what foods their children liked and ate. When asked who decides what foods to cook for the baby or how much to feed the baby, all women responded that they alone made such decisions.

"These decisions are mine. Because I am the mother of the child. Q. Do you make this decision alone? A. Yes." (Pregnant women, 32 years)

Decision-making about movement

For some women, sociocultural norms restricted the freedom to move outside the home. Women needed to discuss their plans to go out with their husbands before going somewhere. One woman said she could not go out without her husband's permission; however, she liked to ask him and said that he also wants to be asked as he thinks that "wherever she goes, she tells me" (Pregnant women, 24 years). She said that her husband looked after her, offered to buy medicine for her when she was not well and encouraged her to go out and purchase medicine on her own.

"I can't go; I have to ask him... if there is necessary work, he will let me go and if there is no need, he does not permit it ... When I told him to go to the clinic, he said, "You are unwell, you don't need to go, I will buy medicine." And buy it. This month I said, "I'll go to buy medicine this time." Then he said, "If you feel well, get courage then go." Later I dared to go." (Pregnant woman, 36 years)

Perceived importance of women's decision-making in the community

We asked women how they thought other families in their local area or village valued the importance of women's opinions when making decisions. Attitudes differed depending on the type of decision being made. Decisions regarding nutrition, such as cooking and feeding children, were decided solely by women. Men ultimately made the "big decisions" such as building a house or whether to sell cows. Responses varied, with many women saying that they felt in three out of ten households in their local area, women had a voice and were listened to, leading to joint decision-making.

"Men will do whatever they decide. Then listen to the women a little... many care about women's words. Most husbands and wives will make decisions together. And if the man doesn't, he decides alone" (Pregnant women, 24 years)

However, nearly half of the women felt that women had no voice in decision-making in seven out of ten households in their local area. When asked about assigning weight to a women's opinion within a family, one woman responded, "Big or small whatever the decision it is taken solely by them (the male)" (Pregnant women, 25 years)

One woman summed up the value and significance attributed to women's input into decision-making by saying, "A little less isn't it? Because they are 'girls', so in any work, they are given

little importance" (Pregnant women, 25 years). Another woman responded when asked whether it was ok not to care about a women's opinion or whether she would like to see a change in households that did not listen to women.

"I want that. As a woman, if I don't understand the pain of another woman, what else do I understand" (Pregnant women, 32 years)

"Those who are good consult their wives" (Pregnant women, 34 years)

The overall opinion of women interviewed was that men in their community do realise that a woman's input into decision-making is valuable. Yet ultimately, the man had the power to decide whether or not to listen and give weight to the woman's opinion or make decisions on their own.

Discussion

This study documents the current contextual information on the status of women's participation in household decision-making and intrahousehold power dynamics at the start of the Shonjibon Cash and Counselling Trial in rural Bangladesh. We explored perceptions, attitudes or practices that may perpetuate gender inequality and lack of participation in decision-making to qualitatively assess the SCC intervention's impact on the women in the trial. From a woman's perspective, our findings detail the present state of power dynamics and relationships within the households to identify any disparities that occur along gender lines to enable us to assess any changes that may arise from the SCC Trial interventions.

It is imperative to assess if an intervention, such as the SCC Trial, can influence changes in women's agency and decision-making ability. Survey data from 54 countries revealed that eight in ten women do not have agency in many critical aspects of their relationships (31). A

recent report from The United Nations showed that only around half of the married or partnered women globally can freely make their own decisions about health care, contraceptive use or sexual relations (32). Gender inequalities often disadvantage health outcomes for women due to the lack of decision-making autonomy (4).

Our study revealed that most women's husbands would withdraw the unconditional cash transfer from the BKash agent and then jointly decide how to spend the cash. Ultimately, the husband or senior male family member determines health-related decisions. Women experienced more agency regarding decisions about the nutrition of their families as they alone usually decided on what to cook for their families and what to feed infants and young children. The status of women is a determinant of child nutrition outcomes, with studies from South Asia and Sub-Saharan Africa confirming that enhancing women's status can have a powerful impact on child nutritional outcomes (33). When a woman has agency, dietary quality, dietary diversity, and the intake of nutrients at a household level are enhanced (7).

Women in our study reported their husbands would collect the cash from the bKash agent in the marketplace. In many parts of Bangladesh, it is socially unacceptable for women to go out due to purdah (female seclusion) and the restricted movement for women (34). In contrast, a cash transfer programme in Nepal specified that women needed to collect the transfer personally each month; they could only receive the transfer at home if they were physically incapable of collecting it (35). Yet another study in Nepal found that young married women could not go to the marketplace due to gender-based social norms and therefore had to rely on their husbands or mother-in-law to spend the cash (36). In Kenya and Zimbabwe, women stated that they could not collect cash transfers if they could not produce a national identity card. While they could nominate people to collect the cash, the public perception

was that a woman should collect the money (37). Analysis of the unconditional cash transfer in Pakistan directed to women found that women in the programme experienced more freedom of movement, such as the ability to travel alone to relatives or see health care; however, these associations were not statistically significant (38).

Our research revealed that most women would jointly discuss the expenditure of the cash transfer and that their husbands would spend the money in the marketplace. Cash transfer programmes in Latin America have found that when women are the recipients of cash transfers and have a larger share of household income, they do not necessarily lead to a more significant say in household expenditure (38, 39). A review of The Government of Zambia's unconditional cash transfer programme aimed at mothers with children under five living in poverty found that most household expenditure decisions were made by males, particularly if the decision was seen as important (40). This finding differs from an unconditional cash transfer program that aimed to improve low birth weight in rural Nepal, which found women could independently decide how to spend the cash transfer yet not decide on other household income (36). However, further analysis of this intervention revealed that women needed to spend the unconditional cash transfer as suggested; otherwise, they risked being chastised by their husbands, mothers-in-law, or community members (36). The Livelihood Empowerment Against Poverty programme in Ghana is large-scale social protection targeted at those who live in extreme poverty (41). Women in the programme would use the money to take care of their children and use it for household expenses without asking their husbands for permission or needing their husband's money. In some cases, women even reported loaning money to their husbands. An unconditional cash transfer programme in Kenya that promotes women's social and economic empowerment found that women were more likely to make decisions about household expenditure after receiving the cash transfer (42).

Our findings showed that whilst women had input into health care decisions, overall, men had the final say in decision-making. And when probed further, there was acceptance of this cultural norm to accept men's role in decision-making, and women would not disobey their husband or senior male family member's directive. A review of nationally representative surveys in South Asia revealed that in Nepal, India and Bangladesh, most women's health care decisions were made without participation (43). However, women receiving a transfer from Zambian Government's Child Grant Programme indicated that they were in charge of making decisions regarding their health care (40).

Our findings reveal that women alone made decisions about what to cook for their families and directed their husband's food purchases at the market. An unconditional cash transfer programme supporting poor mothers in Zambia reported similar findings as women said they were responsible and in charge of domestic decisions regarding food choices, household chores and children's well-being (40). This finding reflects women's agency in making decisions around food as they alone made the decisions about infant and young child feeding. However, another study from India randomly allocating a cash transfer to a man or woman found no evidence for the cash transfer program's influence on household consumption but did find evidence for programmatic impact on gender equalisation within household decision-making processes (44).

Evidence on the impact of cash transfers on a woman's decision-making ability is varied, and programmes should not assume that if a woman receives a cash transfer, this will equate to changes in household decision-making ability. A review of a cash transfer programme in Egypt found that for women with no formal education, cash transfers reduced women's control over decision-making (45).

Sociocultural factors influence decision-making, and many cash transfer programmes are assessed by asking recipients, mainly women, who make the decisions, with few studies interviewing both women and men within the household (38). However, an analysis of cash transfer programmes in Kenya, Ghana, Zimbabwe and Lesotho revealed that social protection programmes could positively impact decision-making empowerment (46).

The SCC Trial enables women to access new resources such as the cash transfer, nutrition knowledge and mobile health technology. Studies assessing the impact of cash transfers from Sub-Saharan Africa and the Middle East revealed that the recipient's confidence and psychosocial well-being improved in relation to others and at an individual level (46, 47). By monitoring studies and assessing if they improve the status and confidence of women, programs can augment nutrition outcomes whilst improving the status of women at the same time.

A strength of this study is that qualitative data will enable us to capture a deeper understanding into women's participation in decision-making. This study has some limitations to consider when interpreting the findings. The lead author, EKK, does not speak Bangla; the transcriptions were checked randomly for quality and accuracy by Bangla speaking senior author (NAA). This study was conducted in a poor, rural community in Northern Bangladesh; therefore, these findings are not generalisable. However, our objective was not to generate generalisable findings but to shine light on the nuance of women's experiences and perceptions around decision-making.

Conclusions

This study documented women's participation in decision-making at the start of the SCC Trial to provide critical information that will enable us to assess the impact of the trial. Baseline

process evaluation data will provide valuable insight to help us assess changes in women's agency and decision-making ability. All women have the right to be empowered, identify their needs, act upon them, and control their lives (5, 48). To improve health outcomes for women and children, we know women need to participate in decision-making fully (18). Evidence has shown that interventions utilising cash transfers and behaviour change communication can potentially increase women's autonomy and agency and alter intrahousehold power dynamics; therefore, monitoring these effects to fill the evidence gap on impact pathways is essential. These findings can be used in future cash transfer programmes to foster positive changes in women's decision-making ability, in particular relating to household decisions.

Contributors

EKK drafted the paper, conceived the main conceptual ideas and designed the gender tools that guided this study. NAA and J.K. supervised data collection. NAA and MJD made continuous contributions and supervised the design and the overall writing. All other authors (MMH, AI, TT, T.H., JFH, TLL, S.M., N.G., MI, KEA, SEA) were involved in the development of the main study design and methods; read, critically revised, and approved the final manuscript; and met the International Committee of Medical Journal Editors criteria for authorship.

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Disclosure statement

The authors report there are no competing interests to declare.

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Chapter 6: Women's participation in decision-making: analysis of
Bangladesh Demographic and Health Survey Data 2017-2018.

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Abstract

Background: Decision-making is a key component of empowerment. Gender based inequities prevent women from participating in decision-making. Sustainable development goal 5 aims to achieve gender equality, yet if women are not able to participate in decision-making this goal cannot be achieved.

Methods: This study is a secondary analysis of the 2017-8 Bangladesh Demographic Health Survey Data. We examined women's participation in no-decisions against a set of independent variables to determine the factors associated with not participating in any decisions.

Results: The adjusted multivariable logistic regression revealed women aged 15 – 19, with no children who lived in larger households were significantly more likely to not participate in any household decisions. We found a strong association with women's inability to participate in decision-making if they were employed and not paid in cash, they did not use a mobile phone for financial transactions or have exposure to print media. The results also suggest that women who agree with at least one reason for husband's beating their wife are at risk of not participating in any decision-making.

Conclusions: This study provides valuable insights into the characteristics of disempowered women that do not take part in decision-making at the household level. By identifying vital sociodemographic determinants, we can look at ways to promote inclusive and women's active participation in decision-making and to identify program modifiable indicators for future research.

Keywords:

decision-making, Bangladesh Demographic and Health Survey 2017-18, women's empowerment, agency.

Background

To participate in decision-making is fundamental right; however, women do not always experience agency when it comes to decision-making across various areas. Discriminatory socio-cultural practices often attribute a lower status to women than men, preventing women from sharing in decision-making. Worldwide, when women are disempowered and unable to share equal rights, they cannot determine their future and make life decisions. We must address gender inequities to enable women to actively participate in decision-making to achieve inclusive and sustainable development. The Sustainable Development Goals, specifically SDG 5, aim to achieve gender equality and empower all women and girls. This goal cannot be achieved if women are prevented from actively participating in decision-making (1).

Decision-making ability is a key aspect of empowerment. Gender inequalities and the subsequent power imbalances impact interpersonal relationships and an individual's agency (2). Participation in decision-making is an indicator used to measure agency (3). A woman exercises empowered decision-making when she can speak freely, influence critical decisions, and act upon the choices she makes. A frequent conceptualisation of women's empowerment is their participation in decision-making regarding household purchases, economic decisions, and freedom of movement (3, 4). When empowered, one has agency or the ability to control aspects of one's life, to identify needs and act upon them (6, 7). An analysis of survey data from 54 countries revealed that eighty per cent of women did not have agency in crucial aspects of interpersonal relations (8).

When women actively participate in decision-making, they have more control over legal, familial, and interpersonal aspects of their and their children's lives (9, 10). However, in many

countries, cultural norms prohibit women from taking decisions at the household level (5). When women and men are involved in decision-making at a household level, this directly promotes the enhanced well-being of both individuals, households and society (11). Age and family structure are powerful determinants contributing to decision-making, with agency increasing with age (12, 13). A study from Nepal found that women's age, employment, and the number of children were positively associated with autonomy in decision-making, whilst noting variations across different regions (12). Acharya et al. pointed out that the higher the level of education a woman had was positively associated with autonomy in making decisions about their health care (12). However, they also noted the wealthier the woman was, the less likely she was to have autonomy regarding health care decisions (12). In Guatemala, a study revealed that education and employment make one more likely to participate in final decisions (14).

Participation in decision-making in health care, in particular reproductive health care, is imperative for improved health outcomes for women and children (12). The impact of gender equality and women's agency on child nutritional status and health outcomes for women and children is increasingly recognised (15). Women's agency is positively associated with enhanced dietary quality, dietary diversity, and the intake of nutrients at a household level (15). However, around half of married or partnered women can freely make their own decisions about health care, contraceptive use or sexual relations (1).

In many parts of South Asia, women have less power and agency than men, and this is reflected in their participation in the decision-making process (12). Women in Pakistan have lower social status than men, and this inequity is revealed in the way that women have less authority to make decisions about their own lives (16). In India, women also experience lower

socioeconomic status, with research finding that women who work have greater input in important household decisions (17, 18).

Bangladesh has made substantial improvements in the status of women and is the best-performing country in South Asia in closing the gender gap. The Global Gender Gap Report measures the gaps between men and women accessing resources and opportunities. Bangladesh is ranked 65th globally; however, many gender parity gaps remain (19). These gaps include participation in the economy and labour force and attaining the education and skills needed for technical and professional work (19). Bangladesh is a patriarchal society, and male dominance and gender inequities hinder the ability of women to have a voice and actively participate in the decision-making process. Bangladeshi women experience unequal access to food, education, health care, and employment opportunities (20). Reports indicate women in Bangladesh have a limited role in household decision-making, including control over household assets and resources (19, 21). Age is key in enabling women to participate in household decision-making, with younger women having less agency (21). Yet a wide-ranging set of circumstances, such as education, household wealth, and marriage age, characterise women's lives and can encourage or hinder their opportunities and choices (3).

Much research explores women's empowerment, in which decision-making is key. Many studies assess the impact of agency in decision-making on health, such as maternal nutrition, low birth weight, quality of antenatal care and diet (22-27). Other papers focus on women's decision-making ability and utilisation of maternal health care or level of autonomy in household decision-making (12, 28). A smaller number of studies focus on the key enabling attributes that empower women to fully participate in decision-making (3, 11, 21, 29, 30). This study investigates the factors associated with women not participating in decision-

making at the household level using data from the Demographic and Health Survey of Bangladesh, 2017-18.

Methods

This study is a secondary analysis of the 2017-8 Bangladesh Demographic Health Survey Data (BDHS) (31). The BDHS is a nationally representative survey sample at an urban and rural level across the eight administrative divisions of the country.

The survey is a two-stage stratified sample of households. The primary sampling unit is an enumeration area (EA) which covers approximately 120 households. In the first stage, the survey team selected 675 EAs with probability proportional to EA size. Of these EAs, 425 were in rural and 250 in urban areas. A complete listing of households enabled the second stage of systematic sampling, which selected approximately 30 households in each EA, equating to 20,250 chosen households. Three clusters were eliminated due to flooding, and successful surveys were carried out in 672 clusters from 20,160 households.

The demographic characteristics include age, the number of usual household members and the number of children; economic factors include employment, type of employment, having a bank account, use of a mobile phone for banking and household wealth; health and social status, including the level of education for women and men and attitude toward wife beating; and lastly access to information via print or electronic media.

This survey was conducted across 2017 – 2018, and for this study, we examined data from 18,984 currently married women aged 15 – 49 years. Interviewers asked currently married women who usually made specific decisions and if they decided by themselves or jointly with their husbands.

Conceptual framework

Theoretical frameworks can explain the linkages between potential key sociodemographic determinants and women's participation in decision-making. We adapted Mahmud et al.'s framework where the process of empowerment is demonstrated across four dimensions; demographic, economic factors, health and social status, and access to information (3). Women's empowerment and participation in decision-making is shaped by several factors and these four dimensions represent the setting and resources that influence empowerment (3).

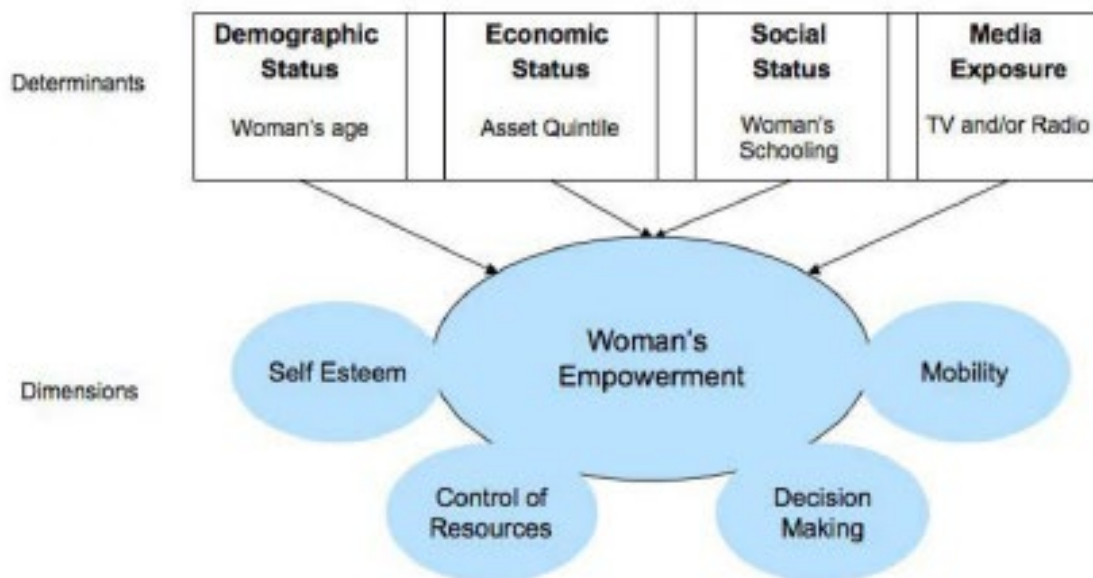


Figure 1. Determinants and dimensions of married women's empowerment (3)

Definition of variables

Outcome variable

The outcome variable for this study was currently married women who do not participate in decision-making at a household level. Interviewers asked currently married women aged 15-49 years who usually make specific decisions regarding 1) their health care and 2) major

household purchases, and 3) visits to their family or relatives. The questions covered whether the woman made the decision either by themselves or jointly with their husband, mainly their husband, someone else or other people. We coded women as 'not participating in decisions' if they answered that their husband or someone else made all three decisions. If women participated alone or jointly with their husbands in one or more of the decisions, we categorised them as 'participating in decision-making'. Our categorical outcome variable was 'women who participate in no decisions', and we coded the variable as "1 = no decisions" and "0 = some or all decisions".

Exploratory variables

We based the selection of variables on potential confounders from previous research into women's participation in decision-making. Explanatory variables were categorised under four key areas per the theoretical framework: demographic, economic status, health and social status, and access to information.

Demographic variables included woman's age (in 5-year groupings), sex of household head, age at first-year marriage (recoded as 5-year groupings), number of household members (recoded as 1-2 people, 3-4 people, three or more), number of living children (recoded as none, 1-2 children, three or more), and residence (urban or rural and administrative division [geographic location]).

Economic variables consisted of employment (currently working or not working), type of employment (recoded as "employed for cash" = cash and in-kind or and "employed not for cash" = not paid or paid in-kind), wealth quintile (grouped according to the relative wealth of the household), having a bank account, and using a mobile phone for financial transactions.

Health and social status variables included attitudes toward wife-beating (we combined "don't know" with "no" as all responses coded as "don't know" were less than 3 % in response). For regression, we created a variable "agrees with at least one reason" (agrees with husband is justified in hitting wife if she goes out without telling him or neglects the children or refuses sexual intercourse or burns food). We also considered women's education level (none, primary, secondary, higher) and husbands' education level (none, primary, secondary, higher). For the husband's education, "don't know" was combined with "no education" as the don't know/missing response rate was 0.1%.

Access to information variables comprised exposure to media in the last week (recoded to "print sources" = newspaper/magazines or "electronic sources" = radio/TV).

Statistical analysis

We examined women's participation in no-decisions against a set of independent variables to determine the factors associated with not participating in any decisions. We conducted all statistical analyses using STATA 17 Software (32). We used the survey estimation commands (svy) to allow for the cluster sampling design of the survey and to allocate the sampling unit and survey weights. Descriptive statistics were used to explore the distribution of weighted frequencies for all potential explanatory variables. The binary outcome variable was participation in 'no decisions', and we used it for all logistic regression analyses. Bivariable and multivariable survey-weighted logistic regression generated the odds ratio (OR), 95% confidence intervals (95% CI) and *p*-values. We applied univariate logistic regression to estimate the unadjusted association between women participating in no-decisions and potential explanatory factors. We then selected factors showing an independent association with $p < 0.05$ for the multivariable logistic regression model.

We created survey-weighted multiple logistic regression models to specify the association of all possible determinant variables as a function of a set of explanatory variables. We used a backward stepwise method in the multivariable logistic regression to determine the relative independent factors that predict women's participation in no-decisions. To conduct backward stepwise regression, we started with all potential explanatory factors for women participating in no-decisions. We removed non-significant variables beginning with the variable with the least significant association (the one with the highest p -value) in a step-by-step process until all variables remaining had significant p -values (less than 5%; p -value < 0.05). The final multivariable model included one non-significant variable (women's education level) often associated with women's participation in decision-making (33, 34). We reported and examined the adjusted OR (aOR) with 95% CI for all variables and interpreted statistical significance as $p < 0.05$.

Ethical considerations

The Demographic and Health Study Data is freely available via the DHS website (<https://www.dhsprogram.com/data>). All data from the DHS is de-identified to maintain the privacy of respondents. The DHS survey and procedures are approved and assessed by the Institutional Review Board (IRB) at ICF International. All participants gave informed consent before participating in the survey.

Results

The survey included 18,894 currently married women who had been asked about their participation in decision-making in the BDHS 2017-8. Of these women, 2,256 reported not participating in any of the three decisions asked. The overall percentage of women participating in no decisions was 11.9%.

The mean \pm SD age of currently married women was 31.1 ± 3.45 years. Almost one-third of respondents (31.6%) were married between 10 – 14 years, with ninety per cent married by 20. Over half of the households were large (five or more members), about one-third had three to four members, and only 5.5% had one to two members. Males were the head of most households (86%). 10.2% of the women had no children, 53.7% had 1 or 2 children, whilst 35.9% had three or more children. The majority of respondents lived in rural areas (71.7%). Forty-seven per cent of women were currently employed, with the majority working for cash (82.9%). Only 12.3% of women had and used a bank account.

Sixty per cent of women owned a mobile phone, with 14.3% of those using the phone for financial transactions. Women reported that they did not think men were justified in beating their wife if she went out without telling him (92.3%), neglected the children (90.1%), argued with their husband (86.2%), refused to have sexual intercourse with him (97.2%), and if the wife burns food when cooking (98.9%). Twenty per cent of women agreed with at least one reason to justify wife-beating. Over half the women's husbands had either no education (21.8%) or had attained primary level (30.2%) education, with one in three (29.9%) achieving secondary level and 16.3% attaining higher education. Over one-third of women were not exposed to TV or radio the past week, and ninety per cent did not access newspapers or magazines, equating to 66.2% of women exposed to no media in the past week (Table 1).

Table 2 shows the unadjusted and adjusted odds ratios of factors associated with women who did not participate in decision-making. Age showed a strong positive association with not participating in decision-making. Young women aged between 15 and 19 had a significantly higher odds ratio and were less likely to make any decisions (OR 6.18, 95% CI 5.14 - 7.44). The inability to participate decreased with age but rose slightly in the 45–49-year age bracket.

Female household heads had a protective effect and reduced the risk of participating in no decision-making (OR 0.7, 95% CI 0.58 - 0.84). A larger number of household members (5 plus) was associated with women being significantly less likely to participate in decision-making (OR 2.77 95% CI 2.09 - 3.67). If women had no children, they had higher odds of not having to participate in decision-making (OR 2.62, 95% CI 2.28 - 3.01). There was a slight association between a woman's place of residence with women residing in rural areas who were less likely to partake in decision-making (OR 1.34, 95% CI 1.18 - 1.53).

Results suggested that if a woman was unemployed (OR 1.74, 95%CI 1.54 - 1.96) or employed not for cash (OR 2.58, 95% CI 2.11 - 3.17), she was likelier to not participate in decision-making. Women not having or not using a bank account was associated with the outcome of no participation in decision-making (OR 2.18, 95% CI 1.81 - 2.64). There is a slight association between mobile phone ownership (OR 1.47, 95% CI 1.33 - 1.62) and using the phone for financial transactions (OR 1.74, 95% CI 1.4 - 2.17) and the outcome variable. If a woman agreed with any of the justifications for wife-beating, there was a small association with not partaking in decisions. Women that were not exposed to print media, as opposed to electronic media, in the last week were also more likely not to participate in any decisions (OR 1.27, 95% CI 1.06, 1.53). Women's and men's education levels were significant in the unadjusted regression. Interestingly, women with higher education levels were slightly more likely to not participate in decision-making (OR 1.34, 95% CI 1.09 - 1.64).

The adjusted multivariable logistic regression revealed a strong association between younger women and not participating in decision-making (aOR 3.42, 95% CI 2.16, 5.4) and similarly for residing in larger households of 5 or more people (aOR 5.22, 95% CI 2.56 - 10.65). There was also an association between having no children (aOR 1.32, 95% CI 0.87 - 2) and not

participating in decision-making. We found a strong correlation with women's inability to participate in decision-making if they were employed and not paid in cash (aOR 2.06, 95% CI 1.56 - 2.72). There was a similar association if they did not use a mobile phone for financial transactions (aOR 1.56, 95% CI 1.08 - 2.27) or have exposure to print media (aOR 1.39, 95% CI 0.85, 2.27). The results suggest that women who agree with at least one reason for beating their wife (aOR 1.41, 95% CI 1.07 - 1.84) are also likely at risk of not participating in any decision-making.

Discussion

The prevalence of women not participating in decision-making was 11.9% of currently married women aged 15-49 years. This analysis of nationally representative data revealed that the odds of women in Bangladesh not participating in any household decisions (regarding their health care, household purchases and visits to family or relatives) were significantly higher for women aged 15 – 19. The odds of not participating in any decisions across all three categories were significantly higher for young women with no children who lived in larger households (5 plus members). Ninety per cent of women surveyed were married by the age of 19. Almost one-third of girls reported being first married between 10 and 14 years of age, and nearly sixty per cent married between 15 and 19. These findings provide critically important guidance to policymakers on how to target women's empowerment programs and areas to target to enable girls and women to gain agency and actively participate in decision-making.

Several other South Asian studies support our findings, including those from Bangladesh, Nepal, Pakistan, and India (11, 12, 30, 35-37), which found empowerment and participation in decision-making increased with a woman's age. Young girls are subject to intrahousehold

power relations and have limited to no decision-making ability and agency due to their young age (37). In a patriarchal society, female adolescents lack agency and personal choice and are often married to older men. As age is a non-modifiable risk factor, it is the situations to which young women are subject that are modifiable such as age at first marriage. The results confirm the significant factor is age; however, we acknowledge that 90% of young women in Bangladesh will be married by the age of 19.

Globally, Bangladesh has one of the highest child marriage rates, which has increased due to the COVID-19 pandemic as schools closed and the economy was adversely impacted (38). Another study also found that marriage at an early age was significantly associated with women's empowerment and participation in decision-making (39). In Bangladesh, child marriage is deeply entrenched in tradition, poverty and gender inequality (40). A girl born into a poor household and coerced into early marriage will likely be forced out of school, have children at an early age, endure complications during pregnancy and childbirth and experience violence more so than a girl that marries later and lives in a household with higher income (41). Thus, encouraging girls to marry later, gain an education that gives a greater chance of earning a higher income can improve agency and participation in decision-making. Young married women without children are often not considered a "complete member" of the in-laws family until they have had a child, preferably a son, which cements the familial ties and can increase agency and standing within the family (39). Programmes can aim to delay childbearing, so as to avoid motherhood in childhood, and work with household decision-makers such as mothers-in law's to dispel fears of infertility if the newly married couple postpone their first pregnancy (39).

The Government of Bangladesh introduced the Female Secondary Stipend and Assistance Program in 1994. A recent review found that this programme kept girls in school, improved education outcomes, delayed marriage, and increased employment prospects (42). This review also observed enhanced contraceptive use and reduced fertility rates. As cost is often a barrier to keeping girls in school, it is imperative to maintain this stipend programme. UNICEF has recently worked in the secondary education sector, developing vocational training to reduce adolescents leaving school and establishing a life skills curriculum (43). Thus, it is essential to adequately fund and leverage large-scale targeted interventions to prevent child marriage, delay childbearing and keep girls in school.

Bangladesh has made progress with the Female Secondary Stipend and Assistance Program, yet the rates of child marriage remain high. Bangladesh has one of the world's highest rates of child marriage (ranked 8th) and is currently home to approximately 38 million child brides (44). Whilst child marriage is illegal, law enforcement and punishment are absent as the practice is deemed socially acceptable (45). The key contributing factors to child marriage are lack of education, poverty and shortage of economic opportunities and socio-cultural gender-based inequities (46). To address these challenges requires commitment, renewed focus, and funding of programmes to change the practice allowed by social norms by planning, developing, implementing, and evaluating social and behaviour change communication programs at all governmental levels.

Our results confirm that living in a larger household of 5 or more was significantly associated with the inability of young women to participate in any household decisions. Another study assessing 2014 DHS data from Bangladesh also found women living in large households were more likely to be disempowered (30). Another significant association was women had no

children of their own. Young women with no children living in large family groups lack the agency to participate in decisions. Other research from Bangladesh and Pakistan had similar results, where the more children a woman had were significantly associated with women's empowerment and being able to participate in decision-making (11, 30).

Our study also showed that women employed and not paid in cash were considerably less likely to participate in decision-making. Of the women surveyed, 47% were currently employed, and of these, 17% were not paid in cash and were mainly working in the agricultural sector (31). Gender based occupational segregation, due to age, educational attainment, and geographic location contribute to women being employed and paid other than cash (47). Our findings were significant in the unadjusted regression regarding women's employment. Other studies assessing DHS data in several countries in Asia revealed women doing paid skilled work were positively associated with being empowered, participating in decision-making, and having greater freedom of movement and financial autonomy (11, 35, 48). Further findings from Bangladesh revealed that not working was adversely associated with empowerment (30). A DHS analysis from Bangladesh, India and Nepal on women's participation in health care decisions revealed that women employed for cash had a greater say in household decision-making than non-working women or those working but not paid in cash (36). Also, an analysis of Pakistan DHS data assessing the determinants of women's empowerment found that skilled and unskilled workers were significantly associated being empowerment (11). The BDHS reported that of those women who earn cash, one-third independently decide how to spend their earnings, with 60% jointly deciding with their husband and 8% saying their husband decides (31).

We found that not using a mobile phone for financial transactions was associated with not participating in decision-making. Sixty per cent of women in Bangladesh own a mobile phone, yet only fourteen per cent of women use the mobile for financial transactions. However, only 12% of women reported having an active bank account. These are proxy indicators of empowerment, such as owning a mobile phone, having a bank account, and digital financial literacy are reflections of social status, financial independence, and autonomy (31). Mobile finance and banking can result in enhanced financial inclusion and financial welfare for women. Evidence has shown that mobile phones used for financial purposes can positively affect women's economic empowerment (49).

Our results found a significant association between a woman agreeing with at least one reason for a husband beating his wife. These findings indicate that women who agree that any form of wife beating is justified have a lower sense of self-worth, which disempowers them in their households and interpersonal relationships (31). In 2014, almost one in three women agreed with at least one reason for wife-beating; this reduced to one in five women in 2017-18. Other research revealed that women who disagree with all reasons for wife-beating have greater self-esteem and are more likely to participate in all decisions (29). Another analysis of BDHS data demonstrated that female participation in household decision-making is significantly correlated with the justification of wife-beating (50). These findings suggest that policymakers and programmers should utilise interventions developed and proven to empower women and lead to greater participation in decision-making, and these methods that may help to reduce domestic violence against women.

This study found that women not exposed to print media (newspapers or magazines) at least once a week were associated with women participating in no-decisions. An analysis of DHS

data from Pakistan found that access to information (frequency of watching TV, listening to the radio and reading newspapers) was also associated with the ability to make decisions (11). Evidence from Bangladesh showed that a lack of exposure to media was significantly associated with disempowerment (30). Further studies from Bangladesh highlighted that women's exposure to information made them more likely to participate in decision-making (29). These findings underscore the importance of women having access to information.

Our results found education for women and men was significantly associated in the non-adjusted regression but not significant in the adjusted regression. We looked at the level of education and adjusted for age and found no effect. However, other analyses of Bangladesh DHS data have observed women's education was significantly associated with empowerment (30). Evidence from Pakistan assessing the determinants of women's empowerment also found that a higher level of education for both men and women was significantly associated with the ability to participate in decision-making and women's empowerment (11). Education provides knowledge and skills which can enhance confidence and self-efficacy (51).

Our analysis highlights the need to firmly implement the Bangladeshi Government's national plan to build a society without violence against women and children by 2025. This action should start with enforcing legislation, enabling legal recourse, and justice for victims and victims' perpetrators held accountable (52). Increased reports of violence against women during the COVID-19 pandemic make the need for action even more urgent. Strategies should stress principles of universal human rights and question inequitable gender norms more broadly and not only in the context of violence against women (53).

Overall, our study emphasises the need for targeted interventions encouraging young girls to stay in school and marry when older. National policy must address the underlying

determinants, such as social norms and patriarchal structures, that inhibit women from having a voice and protect young girls who have no agency.

Limitations

Limitations to consider with this study when interpreting the findings is this was a cross-sectional survey, and we cannot attribute causality to factors associated with women not participating in decision-making. The data analysed in this study is quantitative, and there is no qualitative data to help explore the perceptions and experiences of those women who do not participate in decision-making. The DHS survey questions are directed to women, and in the context of male-headed households, one needs to consider whether the answer of yes to "joint decision-making" is the case or if the woman felt compelled to agree. To gain a deeper understanding of this data, complementary information generated through qualitative methods would be useful to explore the context-specific social and cultural characteristics of those surveyed.

Conclusions

This study provides valuable insights into the characteristics of disempowered women that do not take part in decision-making at the household level. The odds of not participating in any decisions were significantly higher for young, primarily married girls and women who have no children and live in larger households. Other significant factors for women include being in employment (but not paid in cash), not using mobile banking, not reading print media, and agreeing with at least one justification for wife beating. By identifying vital sociodemographic determinants, we can look at ways to promote inclusive and women's active participation in decision-making and to identify program modifiable indicators for future research. Gender transformative, household and community-based approaches will

enable women to participate, occupy decision-making space, and gain control over their own lives.

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Authors contributions

EKK designed and conducted the research, analysed the data, wrote the paper, and was primarily responsible for the manuscript's final content. MJD provided critical guidance on statistical analysis, and SR also provided significant guidance on statistical analysis. NAA provided advice on the overall paper, and MJD, SR and NAA critically reviewed the manuscript. All authors read and approved the final manuscript.

Availability of data and materials

The datasets analysed during the current study are available through the Demographic and Health Survey website [<https://www.dhsprogram.com/data>]

Institutional Review Board Statement

We accessed the data via the DHS website (<https://www.dhsprogram.com/data>) and was accessed on 22 November 2021

Informed Consent Statement

Informed consent was obtained from all subjects involved in the DHS study.

Data Availability Statement

Data used for this analysis is openly available through the DHS website (<https://www.dhsprogram.com/data> (accessed on 22 November 2021)), and all data is de-identified for anonymity.

Consent for publication

Not applicable

Competing interests

All authors declare no competing interests

Table 1 Characteristics of currently married women (aged 15-49) who were asked about participation in decision-making (n = 18,984)

Characteristic	n	%
Demographic Status		
Age		
15-19	2006	10.6
20-24	3435	18.1
25-29	3445	18.1
30-34	3308	17.4
35-39	2699	14.2
40-44	2109	11.1
45-49	1983	10.4
Mean age (SD)	31.1	9.1
Sex of household head		
Male	16628	87.6
Female	2356	12.4
Age at first marriage		
10-14	6008	31.6
15-19	11121	58.6
20-24	1559	8.2
25 plus	297	1.6
Number of household members		
1 to 2	1035	5.5
3 to 4	7325	38.6
5 plus	10625	56.0

Number of living children

0	1978	10.4
1 or 2	10196	53.7
3 or more	6810	35.9

Residence

Urban	5378	28.3
Rural	13607	71.7

Division

Barishal	1056	5.6
Chattogram	3414	18.0
Dhaka	4864	25.6
Khulna	2205	11.6
Mymensingh	1468	7.7
Rajshahi	2645	13.9
Rangpur	2248	11.8
Sylhet	1085	5.7

Economic status**Employment**

Currently employed	8921	47.0
Not currently employed	10064	53.0

Types of employment in the last 12 months

Employed for cash (cash only and cash and in-kind)	8,460	82.9
Employed not for cash (not paid and in-kind)	1,661	17.1

Household wealth index

Lowest quintile -poorest	3473	18.3
Second - poorer	3730	19.6
Middle	3846	20.3
Fourth - richer	3985	21
Highest quintile - wealthiest	3951	20.8
Mean household wealth index (SD)	3.1	1.4

Women have and use a bank account.

No	16648	87.7
Yes	2336	12.3

Women who own mobile phone

No	7560	39.8
Yes	11425	60.2

Women who use a mobile phone for financial transactions

No	9785	85.7
Yes	1638	14.3

Health and social status

Attitude toward wife beating –**women agree that husband****is justified in hitting his wife if she:****Goes out without telling him**

No	17,515	92.3
Yes	1,469	7.7

Neglects the children

No	17112	90.1
Yes	1872	9.9
Argues with husband		
No	16369	86.2
Yes	2615	13.8
Refuses to have sexual intercourse with him		
No	18446	97.2
Yes	539	2.8
Wife burns food		
No	18771	98.9
Yes	214	1.1
Agrees with at least one reason		
No	16,185	79.9
Yes	3,942	20.1
Agrees with all reasons		
No	20,045	99.6
Yes	82	0.4
Women's education level		
No education	2497	15.5
Primary	5904	31.1
Secondary	7681	40.5
Higher	2452	12.9
Husband's education level		
No education	4130	21.8
Primary	6080	32.0

Secondary	5675	29.9
Higher	3098	16.3
Media Exposure		
Weekly exposure to mass media at least once		
a week:		
Exposed to electronic media (radio / TV)		
No	6618	34.9
Yes	12367	65.1
Exposed to print media		
(newspaper/magazines)		
No	17197	90.6
Yes	1787	9.41
Exposed to no media		
No	12565	66.2
Yes	6419	33.8

Table 2 Unadjusted and adjusted odds ratio of factors associated with women's participation in no decision-making

Characteristics	Unadjusted OR(95%CI)	p-value	Adjusted OR (95%CI)	^a p-value
Demographic Status				
Age				
15-19	6.18 (5.14, 7.44)		3.42(2.16, 5.4)	
20-24	2.68 (2.25, 3.20)	0.0000	1.86 (1.25, 2.77)	0.0000
25-29	1.54 (1.27, 1.87)		1.36 (0.96, 1.93)	

30-34	reference		reference	
35-39	1.17 (0.94, 1.45)		1.18 (0.77, 1.81)	
40-44	0.99 (0.79, 1.26)		0.45 (0.25, 0.8)	
45-49	1.27 (1.01, 1.59)		1.13 (0.65, 1.97)	
Sex of household head				
Male	reference			
Female	0.7 (0.58, 0.84)	0.000		
Age at first marriage				
10-14	0.86 (0.7, 1.04)			
15-19	1.08 (0.9, 1.29)	0.0000		
20-24	reference			
25 plus	0.43 (0.26, 0.72)			
Number in household				
1 to 2	reference		reference	
3 to 4	1.29 (0.98, 1.71)	0.0000	2.36 (1.17, 4.74)	0.0000
5 plus	2.77 (2.09, 3.67)		5.22 (2.56, 10.65)	
Number of living children				
0	2.62 (2.28, 3.01)		1.32 (0.87, 2)	
1 or 2	reference		reference	
3 or more	0.68 (0.6, 0.77)	0.000	0.66 (0.47, 0.92)	0.0000
Residence				
Urban	reference			
Rural	1.34 (1.18, 1.53)	0.000		
Division				
Barishal	reference			

Chattogram	1.02 (0.82, 1.28)	
Dhaka	0.78 (0.62, 0.98)	0.0000
Khulna	0.89 (0.69, 1.14)	
Mymensingh	0.77 (0.58, 1.02)	
Rajshahi	0.87 (0.66, 1.14)	
Rangpur	0.76 (0.58, 0.98)	
Sylhet	1.45 (1.12, 1.89)	

Economic status

Employment

Employed	reference	
Not employed	1.74 (1.54, 1.96)	0.000

Types of employment in the last 12 months

Paid cash	reference		reference	
Not paid cash	2.58 (2.11, 3.17)	0.000	2.06 (1.56, 2.72)	0.0000

Household wealth index

Lowest poorest	reference	
Second poorer	1.17 (0.99, 1.39)	
Middle	1.28 (1.07, 1.54)	0.062
Fourth richer	1.19 (1.0, 1.42)	
Highest wealth	1.05 (0.88, 1.26)	

Women have and use a bank account.

Yes	reference	
No	2.18 (1.81, 2.64)	0.000

Women who own mobile phone

Yes	reference	
No	1.47 (1.33, 1.62)	0.000

Women use mobile for financial transactions.

Yes	reference		reference	
No	1.74 (1.4, 2.17)	0.000	1.56 (1.08, 2.27)	0.018

Health and social status

Attitude toward wife beating – women agree with the following reasons:

Goes out without telling him

No	reference	0.0004
Yes	1.36 (1.14, 1.62)	

Neglects the children

No	reference	0.0161
Yes	1.23 (1.05, 1.44)	

Argues with husband

No	reference	0.0001
Yes	1.34 (1.17, 1.53)	

Refuses to have sexual intercourse with him

No	reference	0.0004		
Yes	1.56 (1.19, 2.05)			
Wife burns food				
No	reference	0.048		
Yes	1.54 (1.09, 2.18)			
Agrees with at least one reason				
No	reference	0.000	reference	0.014
Yes	1.28 (1.14, 1.44)		1.41 (1.07, 1.84)	0.0135
Agrees with all reasons				
No	reference	0.0601		
Yes	1.73 (0.98, 3.08)			
Women's education				
No education	reference		reference	
Primary	1.20 (1.01, 1.43)		1.08 (0.68, 1.74)	
Secondary	1.53 (1.29, 1.82)	0.000	1.15 (0.73, 1.82)	0.9022
Higher	1.34 (1.09, 1.64)		1.04 (0.58, 1.86)	
Husband's education				
No education	reference			
Primary	1.37 (1.18, 1.43)			
Secondary	1.57 (1.36, 1.83)	0.000		
Higher	1.35 (1.11, 1.63)			

Media Exposure

Weekly exposure to mass**media:****electronic media****(radio/ TV)**

No	1.11 (0.98, 1.25)	0.094
Yes	reference	

print media**(newspaper/magazines)**

No	1.27 (1.06, 1.53)	0.01	1.39 (0.85 – 2.27)	0.0101
Yes	reference			

Exposed to no media

No	1.08 (0.96, 1.21)	0.205
Yes	reference	

1*Significant at P < 0.05; **Significant at P < 0.001

^a The multivariable model was adjusted for sex of household head, age at first marriage, residence, division, employment status, household wealth index, women having and using a bank account, attitude toward wife-beating (goes out without telling, neglects children, argues with husband, refuses sexual intercourse with husband, wife burns food), agrees with all reasons for wife-beating, husband's education and exposure to print or electronic media.

Abbreviations: OR odds ratio, aOR adjusted odds ratio, 95%CI confidence intervals

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Chapter 7: Discussion

7.1 Chapter overview

This chapter discusses the main research findings, the contribution to knowledge and the implications from these findings, strengths, and limitations, followed by conclusions. The chapter has six sections. The first section covers the overview; the second encapsulates the thesis's main findings; the third outlines the thesis' contributions to knowledge; the fourth discusses the overall policy and practice implications of the results and directions for future research; the fifth presents the research's strengths and limitations; and the sixth presents the conclusions.

7.2 Main findings

In this thesis, we examined how to assess the impact of the SCC Trial on women's empowerment in rural Bangladesh. One of the most significant findings to emerge from this study is how vital it is to use a gender lens to assess the impact of complex and innovative public health interventions on women's empowerment. Gender is one of the most significant contributing factors and social determinants for health outcomes, yet gender is often not fully considered in global health. What is striking is that the global health community are aware of the undeniable evidence that shows gender equality enhances health and well-being. However, there has been minimal effort to address gender-based inequities and, therefore, minimal impact in this space (1-3).

7.2.1 mHealth interventions impact on gender relations

This research has shown that mHealth interventions influence gender relations. mHealth applications have grown in popularity, particularly in low and-middle income countries, as a way of disseminating public health messages from insufficiently resourced health care systems to those in rural or hard-to-reach geographical settings. The findings from the

systematic review (Chapter 2) revealed that it is vital to evaluate the gendered impact of mHealth interventions. However, from the studies reviewed, not one intervention specifically appraised gender relations from the outset. These findings highlight the need to assess mHealth programmes' impact on gender relations from the outset.

7.2.2 Measuring programmatic impact on women's empowerment

This study confirmed that interventions targeting women and providing nutrition, health and economic development could affect women's empowerment (4-7). A review of post-programmatic data from combined nutrition and home gardening intervention delivered on a mobile platform (Chapter 3) revealed evidence of behaviour change across five critical areas linked to women's empowerment: control over the use of income, input into productive decisions, respect among household members, self-efficacy and input into nutrition and health care decisions. Empowering women is not an explicit goal of the study in Chapter 3; however, women gain access to nutrition counselling, cash transfers and a mobile phone; the acquisition of these resources and participation in the trial has the potential to influence women's empowerment. The research protocol presented in Chapter 4 reveals specifically tailored tools based on a theory of change and using an internationally validated index that has been piloted in Bangladesh (4, 8). This protocol provides valuable evidence in the way to assess a complex and large-scale nutrition intervention and measure pathways of impact across various domains of women's empowerment.

7.2.3 Women's participation in household decision-making in Bangladesh

The third key finding from this research has been reiterating the inherent importance of the ability of women to take part in decision-making. Chapter 5 presented the qualitative baseline process evaluation findings from the SCC Trial and answered the question of the

current status of women's decision-making ability at the start of the trial. These findings provide valuable data that will be used to compare changes in women's empowerment at the end of the trial.

Chapter 6 investigated the factors associated with women who do not participate in decision-making at the household level. This analysis of Bangladesh Demographic and Health Survey data (2017-18) found that women who did not participate in any decisions were likely to be young, married, not have children, and live in households with five or more people. And if employed, they were also more likely not to be paid in cash, not use a mobile phone for financial transactions, have no exposure to print media, and agree with at least one reason justifying a husband beating his wife. This analysis of current nationally representative data highlights the need to keep girls in school, enable them to gain an education to have more employment opportunities and delay the age at first marriage.

7.3 Contribution to new knowledge

This thesis has highlighted the importance of assessing the impact of nutrition-specific and -sensitive interventions on women's empowerment. My PhD research is unique in that it provides evidence of the significance of evaluating impact of the SCC Trial and adds to the methodology of assessing the relationship between mHealth, nutrition BCC and UCTs and gender-based outcomes.

7.3.1 mHealth interventions impact on gender relations

My PhD research has shown that women experience gender-based inequalities such as lower literacy rates and less access to mobile technology than men, preventing the uptake and effect of mHealth interventions. The systematic review (Chapter 2) revealed that digital-based health programmes often aim to improve women's health; however, the role gender

inequities play in mHealth interventions is often overlooked. This, to our knowledge, is only the second review of the impact of mHealth on gender relations. This review's results revealed how mHealth interventions could transform or reinforce gender roles. The positive transformative impacts of mHealth included improved spousal communication, enhanced joint decision-making, greater involvement of men in health care decisions, increased autonomy for women when seeking health information and improved access to health services (9-16). The negative transformative impacts involved relational conflict, reinforcement of men's role as sole decision-makers, and lack of trust or suspicion as a result of the mHealth intervention (11-13, 15-18). Non-transformative influences on gender relations consisted of reinforcing men as the gatekeepers to information and technology and upholding the status quo of the gender-based digital divide (12, 13, 16). The increase in the use of mHealth interventions is well documented; however, this research found no programmes expressly set out to assess the impact on gender. This systematic review established the importance of assessing mHealth interventions on gender relations and the need to carefully monitor and evaluate the impact mHealth can have on health equity, power dynamics and gender relations. Women are not passive beneficiaries of mHealth interventions, and this review demonstrates the need to examine and consider both positive and negative influences on gender relations.

7.3.2 Measuring programmatic impact on women's empowerment

This research contributes evidence to guide methodological approaches when undertaking an evaluation of the programmatic effects on women's empowerment. The theory of change in the SCC protocol paper (chapter 4) clearly illustrates how and why a change in women's empowerment might be expected to occur in the context of the SCC Trial in Bangladesh. This protocol was used to guide the collection of qualitative evidence from the SCC Trial presented

in Chapter 5. This thesis contributes to a theoretical model to guide and extend the use of tools such as the Pro-WEAI and their application in assessing women's empowerment beyond an agricultural agenda.

Women's empowerment and nutrition outcomes are intrinsically linked, particularly for maternal and child nutrition, yet the way empowerment is measured and the evidence linking empowerment to nutrition is not yet clear (19). The evidence on these linkages is inconclusive, mainly due to poor study design, thus reiterating the need to clearly define and measure women's empowerment from programmatic inception. The evaluation methodology used in this research will contribute to improved programmatic design and shed light on which domains of empowerment will be influenced by the SCC Trial interventions, advancing both theoretical knowledge and practical application.

7.3.3 Women's participation in household decision-making in Bangladesh

A woman's ability to participate in decision-making is an integral tenet of empowerment (20). This thesis explored women's participation in decision-making in Bangladesh. Firstly, I presented the findings from in-depth interviews with women enrolled in the SCC Trial. The baseline process evaluation data will enable us to evaluate changes in women's agency and decision-making ability at the endline of the SCC Trial. Several key themes emerged focused on decision-making: women's input into financial decisions, participation in health-related decision-making, the overall importance attributed to women's contribution to the decision-making process and lastly, decisions regarding freedom of movement. "Big" decisions were made solely by the males in the family. Nearly half of the women felt that women in their local area had no or limited voice in decision-making in seven out of ten households in their community. When asked about the value of a woman's contribution, one woman highlighted

the gender bias when saying, "A little less isn't it? Because they are *girls*". The overall message was that a woman's input into decision-making was seen as having value, yet ultimately men were in a position of power to make the final decision.

This PhD research has established the key characteristics of women that participate in no aspects of household decision-making from the analysis of nationally representative data from Bangladesh (Chapter 6). A picture emerged of young women and girls who are married, leave school, and move to their husband's home containing many household members, leaving them with no agency or ability to participate in decision-making. Other significant factors for women not participating in decision-making included employment type (not paid in cash), not using mobile banking, not reading print media, and agreeing with at least one justification for wife beating. The implication of these findings is clear, keep girls in school, delay the age of marriage and delay having children to avoid motherhood in childhood. The insights gained from this study highlight the urgent need to address child marriage and empower young girls. There is a long way to go before girls can choose when to marry, have an education and maintain the right to bodily autonomy.

7.4 Implications of findings

7.4.1 Policy Implications

This thesis has highlighted the importance of gender and the impact of public health interventions on gender. There is still an urgent need to place gender firmly in the design, methodology and implementation of public health policy. Governments and policymakers need to recognise the crucial role that gender plays in public health and act accordingly. Many governments utilise mHealth programmes around the world, yet this PhD research has clearly illustrated that gender is not fully considered in the design, implementation, and monitoring

of mHealth interventions. This research calls for the need to include gender transformative approaches at a policy level and for governments to actively challenge gender-based inequalities, discriminatory norms, and practices (21, 22).

The results indicate nutrition interventions and unconditional cash transfer programmes can influence women's empowerment. The Government of Bangladesh's Second National Nutrition Plan (2016 – 2025) highlights nutrition-sensitive approaches, such as advancing women's empowerment as central to achieving nutrition outcomes (23). The Bangladesh Government also recognises a strong gender dimension to food insecurity and malnutrition (23). Women in Bangladesh experience disempowerment by way of a lack of decision-making over household income and resources as well as an unsupportive social environment. The research findings support the Government's policy to utilise "gender conscious program operations and mechanisms" to improve women's decision-making ability and enhance access to resources such as social protection (23). They also fully support the development of gender-responsive policies to increase women's empowerment and ensure the programmes that ensure comprehensively assess the impact of interventions on women's empowerment.

A systematic review of school stipend programmes in Bangladesh found them highly effective at decreasing the occurrence of child marriage (24). The Government of Bangladesh introduced a cash transfer programme to keep girls in school, and a recent review found this programme successful by improving education outcomes, delaying marriage, and enhancing employment prospects (25). It also increased contraceptive use and reduced fertility rates (26). Poverty and the cost of education are often an impediment to keeping girls in school. The need to keep girls in school has been made more urgent as the COVID-19 pandemic has

worsened the situation for many women and girls, intensifying existing inequalities (27). With COVID-19 forcing more families into poverty, it is imperative to maintain the school stipend programme. The policy should also encourage women's financial inclusion and could be interlinked with the school stipend programme. Only twelve per cent of women in Bangladesh have a bank account or financial institution, which is a direct reflection of their lack of financial independence, autonomy and place in society (28).

Bangladesh has one of the highest child marriage rates in the world, with 2017-18 data revealing over 30% of women married between the ages of 10 and 14, and 59% of women were married between 15 – 19 years of age (28). Another analysis from Bangladesh found that if a woman or girl marries early, she is less likely to be empowered and participate in decision-making (29). In Bangladesh, child marriage is profoundly ingrained in cultural beliefs and traditions (30). This social acceptance is further compounded by poverty, where a girl born into a poor household and pressured into early marriage will leave school and give birth at an early age. The girl is at risk of experiencing complications during pregnancy and childbirth and an increased likelihood of experiencing gender-based violence (31). The COVID-19 pandemic has adversely affected Bangladesh as schools close, and the economy is negatively impacted, putting more girls at risk of child marriage (32).

As revealed in Chapter 6, young Bangladeshi women experience little agency or decision-making ability and are particularly vulnerable to being married at a young age. Child marriage, or marriage before 18 years of age, is a breach of human rights and a potent symbol of gender inequality (24). On paper, child marriage has been illegal in Bangladesh since 1929, when the adoption of the Child Marriage Restraint Act was implemented; however, the law is poorly enforced, and girls under 18 can still marry with parental consent and with permission from

the courts (33). The Government of Bangladesh needs to enforce current laws and uphold the legal age of marriage to truly implement the national plan to build a society without the mistreatment of women and girls.

If Sustainable Development Goal 5.3, to end child marriage by 2030, is to be achieved in Bangladesh, further interventions addressing harmful norms such as social and cultural practices that promulgate gender inequality will be required. This study highlights the need for systemic change and for governments and policymakers to do their part in empowering women and strengthening advocacy to make gender equality in policy and practice central to their agenda.

7.4.2 Implications for practice

International development programmes are progressively more aware of the role of gender in public health practice. Programmers are starting to realise that for sustainable change to occur, the underlying causes of gender-based inequalities need to be addressed. Public health interventions need to use a gender-transformative approach and embed women's empowerment strategies within programmes to improve health and well-being. The last decade has seen an increase in interest in how gender equality contributes to programme outcomes; however, it is essential to broaden the focus and consider how development programmes contribute to gender equality (34).

This research has provided insight into the influence of mHealth interventions on gender and has raised important questions about the lack of gender-based evaluation. The key message is that when taking mHealth interventions to scale, it is necessary to ensure that the interventions safeguard women and aim to transform rather than reinforce current gender inequities. Women are not passive recipients of mHealth interventions, and it is necessary to

ascertain and promote positive impact whilst mitigating adverse effects. This thesis provides an important message for programmers to be more rigorous in study design and embrace a gender transformative approach to study design. It also identifies the need for public health practitioners to incorporate gender analysis from programmatic inception and use context-specific validated tools to measure women's empowerment. Rigorous formative research is required to assess gender-based context-specific requirements for intervention participants as well as intervention outcomes. Crucial to this is designing interventions to ensure they are appropriate, feasible and safe. Thorough monitoring and evaluation throughout the course of the intervention are also recommended. The approach to "gender" in public health programmes needs to move beyond gender-sensitive actions or acknowledgement that gender disparities exist to be gender transformative and work to address the underlying causes of gender-based discrimination for sustainable change.

The protocol paper in Chapter 4 described the pathway for assessing the impact of the SCC trial on women's empowerment. The findings from this research will provide a greater understanding of which domains of empowerment the SCC Trial may influence. This research stresses the need to evaluate the impact of nutrition interventions on women's empowerment, particularly if they target women as beneficiaries.

As with policymakers, we suggest that programme-makers utilise gender transformative approaches from programmatic inception and design to implementation, monitoring, and evaluation. This analysis has highlighted that further evidence is needed to clarify the underlying relationship between women's empowerment and health outcomes, and this lack of evidence is attributed to inadequacies in the study design (19).

The insights gained from this study support a collaborative approach to solving gender-based inequalities to utilise a household and community-based approach to programming. Programmers should not burden women or girls with being the lone agents for change and use inclusive strategies working with men, women, boys, and girls to advance gender equality for all. Men and boys must play a vital part in solving gender inequality (35). Moreover, programmes need to aim to empower women as a central tenet and not only a means to achieve other development and health outcomes. Empowering women should be an intrinsic goal in itself.

7.4.3 Future research

This PhD research brought to the fore important questions around assessing women's empowerment for future research. This thesis has shed light on the ways mHealth programmes impact gender relations. Future research needs to fully document potential programmatic effects and work to mitigate negative impacts whilst leveraging the positive impacts. Despite the fact that mHealth programmes deliver promising gender-transformative outcomes, mHealth interventions need to consider gender from the outset and policymakers, and programmers need to examine the best way to do this. There is an urgent need to develop tools to evaluate gender-based impact, so that intervention participants are not put at risk and best practices can enhance the positive outcomes of mHealth programmes.

Consensus on definitions and refinement of tools

Further research should be undertaken to evaluate public health programmes on gender and to develop a full picture of programmatic impact. There are many unanswered questions on the unique, dynamic, and context-specific role gender plays in public health interventions. Further testing and refinement of the tools used to assess the impact on health interventions

are essential. Additional questions remain on how best to define and measure women's empowerment. Forthcoming studies need to refine the tools used to measure empowerment whilst acknowledging these need to be tailored for each setting and programmatic goal. Of importance to both policy and practice is the need for research-based evidence generated that will lead to the design, implementation, and eventually scale-up of the most effective interventions to improve women's empowerment. Future research should carefully select project-specific women's empowerment indicators in context-specific ways and use a longitudinal study design to analyse pathways of impact.

There is a lack of official metrics to measure women's empowerment, leaving the question of how we measure and understand the scope and scale of gender inequalities if there is no consensus on how to measure them (36). Researchers need to work together to form a consensus to then address the lack of data and generate sex-disaggregated data. For without robust data, we cannot monitor progress and without data, what will policymakers use to guide programming as they cannot assess unintended or intended impacts of interventions? The data generated will also serve to leverage programmes that improve women's empowerment.

Sustainability and measuring long-term impact

Research has shown that there is a short to medium term impact of public health interventions on gender. An RCT in rural Bangladesh that combined cash transfers and nutrition programming found that women experienced a reduction in intimate partner violence (IPV) four years after the study finished (37). These findings suggest the need to broaden the assessment of programme outcomes.

Neither cash transfers alone, nor food transfers with or without complementary nutrition programming, showed sustained impacts on IPV. Evidence suggests that cash with complementary nutrition programming sustained IPV reductions through persistent increases in women's bargaining power, costs to men of perpetrating violence, and men's emotional well-being, thus reiterating the need to assess long-term programmatic impacts.

Agency and decision-making

There is ample room for further progress in advancing women's agency and ability to participate in decision-making beyond the household level. The question remains as to how to reduce power imbalances and gender differences in the ability to make decisions about one's own life. Forthcoming programmes need to foster women's participation in decision-making and help women gain agency to make decisions about strategic life choices instead of accepting existing gender inequities. Future research needs to establish the best practice as to how to address these structural and systemic barriers.

It is imperative to assess the impact of interventions, that combine mHealth, nutrition BCC and UCTs, such as the SCC Trial interventions, as we know they can influence changes in women's empowerment. The status of women is a determinant of a range of health outcomes. Beyond the basic definition of women's empowerment, we need to consider an intersectional approach – that gender is dynamic, will change over time, and be influenced by race, ethnicity, age, class, and religion.

7.5 Strengths and Limitations

The systematic approach to the review of mHealth intervention's influence on gender relations (Chapter 2) is a robust methodology. A strength of this research lies in the tools we have adapted to measure women's empowerment. We have used the Project Level Women's Empowerment in Agriculture Index as the key component for measuring the impact of the SCC trial on empowerment (Chapter 4). This tool is an internationally validated pilot tested in Bangladesh. Another strength is the protocol is based on a theoretical framework based on a theory of change.

A limitation of this study is that the data we present is from rural Bangladesh and is not, therefore, representative of urban empowerment. This thesis set out to assess the impact of the SCC Trial on women's empowerment and also hoped to present the baseline quantitative data. Due to the delays that the trial faced, the data was not yet available. However, data from the Bangladesh DHS was presented to capture national-level information on women's participation in decision-making.

7.6 Conclusion

This research highlights the importance and urgent need to address the persistent social, economic, and political gender-based inequalities that women still face today. We need systematic change to address gender bias and restrictive norms. The concept of gender equality should not be seen as an 'add-on' to health interventions but rather as a state that fundamentally shapes and determines health outcomes and well-being for everyone. Public health programmes need to consider and incorporate gender every step of the way, using gender as the centrepiece for policymaking, design, implementation, and evaluation.

One of the key messages from this research is that we can no longer sit in "a deafening silence"; we need to drive change (38). The global health community agrees on the need to address gender inequality, yet no action or accountability is put in place, leaving gender as "everyone's" problem but nobody's responsibility (39). We need evidence-based policies that national leaders can use to guide gender transformative change. As researchers, we need to work toward filling research gaps and finding best practices for addressing gender-based discrimination and progressing gender equality.

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37. Roy S, Hidrobo M, Hoddinott J, Koch B, Ahmed A. Can transfers and complementary nutrition programming reduce intimate partner violence four years post-program? Experimental evidence from Bangladesh. *The Journal of Human Resources*. 2022.
38. Lane R. Sarah Hawkes: shining a gender lens on global health. *The Lancet*. 2019;393(10189):2385.
39. Hawkes S, Allotey P, Elhadj AS, Clark J, Horton R. The Lancet Commission on Gender and Global Health. *The Lancet*. 2020;396(10250):521-2.

Appendices

Appendix 1: Response to reviewer's comments for Chapter 2 - The Role of mHealth Interventions in Changing Gender Relations: Systematic Review of Qualitative Findings

Comment: I recommend including a statistic on the use of mobile devices in rural and regional areas.

Response: We thank the reviewer for this comment and have added a statistic as suggested – Line 25.

“Over 750 million people, or 10 per cent of the global population, still do not have access to a mobile broadband network (5). This primarily affects those living in rural and remote areas of low-and-middle income countries (5). A further 3.3 billion people who live within reach of a mobile broadband network do not use mobile internet due to financial barriers, lack of awareness of mobile internet and its potential benefits, and lack of skills or confidence to use mobile internet (5)”.

Comment: I would elaborate on how “mHealth interventions have the potential to increase a woman’s confidence in communicating with health care professionals and enhance health-related decision-making skills.”

Response: We have amended the sentence as follows– Line 40

“mHealth interventions have the potential to increase women’s autonomy in seeking health services and health information, thus enhancing their health-related decision making (10). This is because mHealth interventions alter traditional mechanisms for communication with healthcare professionals and, as such, can reduce or eliminate women’s reliance on spousal approval, financial support to access health services and afford confidentiality and anonymity”.

Comment: What classifies as “substantial” evidence? Has a “gender equity lens” been empirically evaluated? Have research designs been of high-quality? Further detail here would be helpful to the reader to understand the merits of this statement.

Response: We have taken the reviewers comments into consideration and the manuscript now reads (Line 63):

There is, however, evidence to support using a gender equity lens to design and analyse digital programmes (14). In their review of findings from a cohort of implementation research projects in LMICs, Sinha and Schryer-Roy (2018) argue that gender and power analyses are essential when designing and implementing digital interventions (14). While researchers have noted several positive impacts of mobile health interventions on gender relations, including increased communication between opposite-sex partners, enhanced female autonomy, improved female social status, and increased access to health resources (10), evidence has also suggested that these programmes may unintentionally perpetuate the digital divide and enhance pre-existing power imbalances, exacerbating gender inequalities (7, 10). Evidence suggests lack of gender analysis and health equity when designing, implementing, and evaluating digital interventions can exacerbate or create new health inequity and gender inequalities (14).

Comment: Following the use of mHealth as an abbreviation for mobile interventions, I suggest keeping terminology consistent (e.g., only using mHealth)

Response: We have adjusted the text accordingly.

Comment: Suggest including a sentence or two on the relevance of low-and-middle-income settings

Response: Added text:

Mobile phones offer the potential to improve health care by providing accessible, sustainable health care for underserved communities, contending with under resourced health care systems in low-and-middle-income settings (5, 6) (Line 22):

METHODS

Comment: Did the review adhere to best practice conduct and reporting guidelines

Response: Text added: *The search and screening process is outlined in PRISMA (18) Flow Diagram in Figure 1. (Line 121):*

Comment: A completed ENTREQ checklist should be included as supplementary material.

Response: We have attached the ENTREQ checklist as an appendix.

Comment: Why was the start date Jan 2013? Is there a rationale for the timeframe selected?

Response: We are building on the first known gender mHealth systematic review conducted by Jennings and Gagliardi in 2013 – we had mentioned this in the first draft and amended to read (Line 46 & 137)

Jennings' review included literature up to 2013 and we review the subsequently published literature:

Jennings and Gagliardi's (2013) systematic review revealed the need for a further rigorous investigation into mHealth, in terms of implementation and evaluation, to establish whether mHealth programmes transform rather than reinforce gender inequalities and this review builds upon on these findings (12).

Comment: As the review examined low-and-middle income countries, excluding non-English papers is likely to have reduced sample size.

Response: Thank you for this observation and we appreciate the need to include papers not in English which require additional time, resources, and skills to translate studies from many

languages, this is time consuming and needs additional resources and therefore on practical grounds we excluded these papers.

Comment: Include an example of database search results (e.g., Medline) to promote transparency and enable replication.

Response: We have attached a search strategy and results as supplementary material.

Comment: What software was used for downloading and screening retrieved records? (e.g., EndNote)

Response: Endnote

Comment: Figure 1. Include reasons for full-text exclusions. Include Fig. 1 in the results section.

Response: We have added reasons for exclusion and moved figure to Results section. (Page 6)

Comment: Table 1 is quite long. I suggest providing a summary table in the results section and including a longer table as supplementary material.

Response: We thank the reviewer for this comment and assume that they are referring to Table 2 - Characteristics of selected studies (as Table 1 is the search terms). We have edited this table and provided the full-length table as a supplementary material Appendix 1.

Comment: Was interrater reliability calculated?

Response: All reviewers agreed on the full text papers included, each author reviewed, rated and coded papers independently.

Comment: What was your research question?

Response: *Are gender relations adequately assessed when implementing mHealth interventions?* The objective and research question are located on page 3 / Line 78.

Comment: Table 3. Should be included in the results section with a brief description of study quality outlined in-text.

Response: Table 3 has been moved to the results section (Page 11).

We appreciate the comments due to space limitations; we have followed example of many other systematic reviews with critical appraisal checklist table detailing the quality of each study (Appendix 2)

Comment: Recommend including a supplementary table of individual study quality assessments to enable critical appraisal and replication in future research.

Response: We have added an additional table - Appendix 2 - detailing individual study quality assessments.

RESULTS

Comment: Listing the references of the included studies is not needed esp. if these are summarised in Table 2.

Response: The list of references has been removed.

Comment: The results are presented clearly and the thematic analysis using Jennings and Gagliardi's framework provides a useful summary of the reviewed evidence - a visual summary of these themes would add value to the readability/interpretation of the results

Response: A visual summary of themes has been added - Appendix 3

DISCUSSION & CONCLUSIONS

Comment: I would be interested to learn how many of the reviewed interventions worked with local communities to design their mHealth intervention.

Response: We thank the reviewer for this comment, please see Appendix 4 detailing if the intervention was co-designed with users / local communities.

Comment: I recommend commenting on the quality of evidence reviewed (e.g., data collection methods, reflexivity, ethical considerations, rigorous data analysis etc.) and areas for improvement to ensure the field moves toward more rigorous research.

Response: Appendix 2 details and describes quality of the studies reviewed. In addition, we did not find evidence on reflexivity.

Reviewer:

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Comment: The cited protocol is not strong enough to show that "Many digital-based health programmes aim to improve women's health in low- and middle-income countries, often focusing on maternal and child health".

Response: We have taken the reviewers comments into consideration and added additional references to support this statement.

Chen, H., Chai, Y., Dong, L., Niu, W., Zhang, P. (2018). Effectiveness and appropriateness of mHealth interventions for maternal and child health: Systematic review. *JMIR mHealth uHealth*, 6(1): e7 doi: 10.2196/mhealth.8998

Lee, S. H., Nurmatov, U. B., Nwaru, B. I., Mukherjee, M., Grant, L., Paglari, C. (2016). Effectiveness of mHealth interventions for maternal, newborn, and child health in low-and-middle income countries: Systematic review and meta-analysis. *Journal of Global Health*, 6(1): 010401. doi: 10.7189/jogh.06.010401

Sondaal, S. F., Browne, J. L., Amoakoh-Coleman, M., Borgstein, A., Miltenburg, A. S., Verwijs, M., & Klipstein-Grobusch, K. (2016). Assessing the Effect of mHealth Interventions in

Improving Maternal and Neonatal Care in Low- and Middle-Income Countries: A Systematic Review. PLoS one, 11(5), e0154664. <https://doi.org/10.1371/journal.pone.0154664>

Comment: Please state the reasons of using '2013 January' as the beginning of the included articles.

Response: As mentioned, while responding to the previous reviewer's comment – see text line 46 and 137.

We are building on the first known gender mHealth systematic review conducted by Jennings and Gagliardi in 2013 and have amended text accordingly to highlight the rationale.

Comment: CASP Qualitative Research Studies checklist was used to assess the quality of the included studies. Please move the Table 3 to results section. Then, the quality of the included studies should be described in results section. For example, some items (5, 6, 7,8) were not fulfilled in your assessment. Please describe why these items were not fulfilled among the included studies. Also, in the discussion section, the influence of those unfulfilled items on the result of this review should be discussed.

Response: We have moved Table 3 as suggested by the reviewer. We have also added an additional table in the appendix detailing the CASP results for each paper Appendix 2, as well as Appendix 4 which describes end user involvement and Appendix 5 details qualitative methods and participants interviewed. It is beyond the scope of this paper to discuss in detail all the methodological weaknesses of each paper. Please see reviewer F's comments above.

Comment: Please state the research question before methods section.

Response: We have added the research question as directed on Line 80.

Comment: Regarding of the characteristics of included studies, it is vital to show the method of data collection

Response: We listed this in table 2 characteristics of included studies, including data collection in the original submission. We have added an additional table Appendix 5 to the appendix detailing data collection methods, including who was interviewed for each study.

Comment: Some studies interviewed only women, while the other interviewed both men and women. Please discuss the influence of women-only interview and men-women interview on the results of this review.

Response: We appreciate this comment the main objective of our study is to document changes in gender relations as a result of participating in an mHealth intervention. Further analysis of the influence of the difference in types of respondents is a methodological response beyond the scope of our objective and would be an excellent topic for future research.

We added additional text on Line 204.

“Half of all the studies included in this review interviewed both women and men. Recent studies highlight the value of interviewing both partners as responses can offer differ (37, 38). The inclusion of both partners in interviews is a ‘hotly debated’ topic in family studies. Dyadic interviews can lead to richer information and more evidence gathered as couples feed off each other, provide more information, and offer different perspectives. However, one partner can dominant the discussion and may limit freedom of the other to respond truthfully. Using participant observation and observing the interaction between men and women in the interview itself may inform results on decision-making, gender relations, and negotiations between couples”.

Comment: "Access to resources also changed in Kenya, where an IPV safety app motivated one woman to sell clothes (21). As a result of earning additional income, the woman could buy food for her children and no longer had to wait for her partner, thus providing

autonomy in financial decision-making, when previously her husband would beat her if she asked for money for food (21)." Male involvement was not noted in your presentation.

Response: This sentence has been amended and moved to LINE 340

In Kenya an IPV safety app motivated one woman to sell clothes (31). As a result of earning additional income, the woman could buy food for her children and no longer had to wait for her partner, thus providing autonomy in financial decision-making, when previously her husband would beat her if she asked for money for food (31).

Comment: Any sub-them generated under the theme: non-transformative influence on gender relations?

Response: We have added 2 sub themes under “non-transformative” category: Gender gaps in literacy and Men as gatekeepers of technology and information – see LINE 370 and 377.

Comment: Please provide suggestions on how to promote positive impacts whilst mitigating negative effects of mHealth intervention on gender relations.

Response: Whilst this is not the focus of our analysis, we have Additional text has been added to LINE 491.

“In order to promote the positive impact of mHealth interventions on gender relations rigorous formative research is needed to assess context specific requirements of the intervention and for the participants. Key to this is involving the end-user to inform and co-designing interventions to ensure they are appropriate, feasible and safe in the context in which they are implemented. Thorough monitoring and evaluation throughout the course of the intervention is also recommended”.

Comment: Please use the term consistently, SMS, text messages, SMS messages, SMS based intervention.

Response: The text has been amended accordingly

Comment: the authors presented the quality assessment tool, which should be moved to the Methods section.

Response: The text has been moved as suggested.

Comment: 3. As suggested by other reviewer, the authors should provide a 'brief description of study quality outlined in-text'. A single sentence 'The results are presented in Table 3' is not appropriate.

Response: We thank the reviewer for this suggestion and have added text as follows: "Overall, the literature was of high quality and utilised appropriate methodologies, recruitment strategies and research designs. All articles discussed the value of the research and provided a clear statement of aims and findings. The majority of the literature included appropriate methods for data collection and analysis; however, very few articles discussed reflexivity."

Comment: 4. The authors claimed that it was beyond the scope of this paper to discuss in detail all the methodological weaknesses of each paper. In turn, the overall methodological quality should be discussed as it could affect the credibility of the results of this review.

Response: We appreciate this comment and overall methodological quality is important in these articles however due to word limitations, we have described the methodological strengths and weaknesses in the table using the Critical Appraisal Skills Programme Qualitative Research Studies checklist and added the text below: "Overall, the literature was of high quality and utilised appropriate methodologies, recruitment strategies and research designs. All articles discussed the value of the research and provided a clear statement of aims and findings. The majority of the literature included appropriate methods for data collection and analysis; however, very few articles discussed

reflexivity.”

Comment: 5. Although the authors claimed to amend the terms such as SMS, text messages and SMS messages, inconsistency is still revealed. For example, line 195-199, was there a difference between 'SMS based intervention' and 'mobile-based maternal and child health messages'?

Response: Thank you for this suggestion – in many cases we were using the wording used by the authors of the paper. For example, the Campbell paper refers to the intervention as a “SMS based intervention” . The terms "SMS" or "SMS message" are often used interchangeably, however we have changed the text where appropriate to “SMS message”. The term "SMS" can refer to either the service itself or a message sent using that service. In the instance where we used the term “mobile-based maternal and child health messages” we have changed the text to “SMS maternal and child health voice messages”.

Comment: Line 235-237, ethnic minority women shared SMS messagescouples in Malawi would read SMS's and listen to Was SMS messages equal to SMS?

Response: The text has been adapted as follows “ethnic minority women shared SMS messages on maternal and child health with their husbands, enhancing communication between the couple. According to Nyemba-Mudenda et al. [28], couples in Malawi would read SMS messages and listen to the interactive voice messages on maternal health together...”

Comment: Line 283, what was the different between 'maternal SMS messaging intervention' and 'SMS based intervention'?

Response: As mentioned above, we have changed the text to read ‘maternal SMS based intervention’.

Comment: Again, in Line 333-334, 'SMS-based programme on maternal and child health' was different from 'maternal SMS messaging intervention' and 'SMS based intervention'?

Response: SMS based programme on maternal and child health encompassed SMS messages, interactive messages requesting women respond to questions and linkage to software that enable communication with community health workers and the text 'maternal SMS messaging intervention' has been changed to SMS based intervention.

Comment: Last but not least, Line 351, SMS notifications were different from SMS and SMS messages?

Response: We have amended the text to "SMS messages"
It seems that the authors did not check the whole manuscript carefully. The inconsistency is also noted in Table 2. Please revise and check carefully in order not to influence the process of review. We are confident after responding to comment 5, we are confident that the reviewer will be satisfied that all inconsistencies have been resolved.

Appendix 2: Entreq checklist and multimedia appendix for Chapter 2 -

The Role of mHealth Interventions in Changing Gender Relations:

Systematic Review of Qualitative Findings

ENTREQ checklist mHealth gender systematic review

No. Item	Guide questions/description	Reported on Page #
1. Aim	State the research question the synthesis addresses	Title & page 3
2. Synthesis methodology	Identify the synthesis methodology or theoretical framework which underpins the synthesis, and describe the rationale for choice of methodology (e.g. meta-ethnography, thematic synthesis, critical interpretive synthesis, grounded theory synthesis, realist synthesis, meta-aggregation, meta-study, framework synthesis)	4
3. Approach to searching	Indicate whether the search was pre-planned (comprehensive search strategies to seek all available studies) or iterative (to seek all available concepts until they theoretical saturation is achieved)	4
4. Inclusion criteria	Specify the inclusion/exclusion criteria (e.g. in terms of population, language, year limits, type of publication, study type)	4
5. Data sources	Describe the information sources used (e.g. electronic databases (MEDLINE, EMBASE, CINAHL, psycINFO), grey literature databases (digital thesis, policy reports), relevant organisational websites, experts, information specialists, generic web searches (Google Scholar) hand searching, reference lists) and when the searches conducted; provide the rationale for using the data sources	4
6. Electronic Search strategy	Describe the literature search (e.g. provide electronic search strategies with population terms, clinical or health topic terms, experiential or social phenomena related terms, filters for qualitative research, and search limits)	4 Supplementary file
7. Study screening methods	Describe the process of study screening and sifting (e.g. title, abstract and full text review, number of independent reviewers who screened studies)	5
8. Study characteristics	Present the characteristics of the included studies (e.g. year of publication, country, population, number of participants, data collection, methodology, analysis, research questions)	7 Appendix 1
9. Study selection results	Identify the number of studies screened and provide reasons for study exclusion (e.g. for comprehensive searching, provide numbers of studies screened and reasons for exclusion indicated in a figure/flowchart; for iterative searching describe reasons for study exclusion and inclusion based on modifications to the research question and/or contribution to theory development)	6
10. Rationale for appraisal	Describe the rationale and approach used to appraise the included studies or selected findings (e.g. assessment of conduct (validity and robustness), assessment of reporting (transparency), assessment of content and utility of the findings)	10-11
11. Appraisal items	State the tools, frameworks and criteria used to appraise the studies or selected findings (e.g. Existing tools: CASP, QARI, COREQ, Mays and Pope [25]; reviewer developed tools; describe the domains assessed: research team, study design, data analysis and interpretations, reporting)	10-11 Appendix 2-5
12. Appraisal process	Indicate whether the appraisal was conducted independently by more than one reviewer and if consensus was required	10

13. Appraisal results	Present results of the quality assessment and indicate which articles, if any, were weighted/excluded based on the assessment and give the rationale	10-11
14. Data extraction	Indicate which sections of the primary studies were analysed and how were the data extracted from the primary studies? (e.g. all text under the headings)	5
	"results /conclusions" were extracted electronically and entered into a computer software)	5
15. Software	State the computer software used, if any	5
16. Number of reviewers	Identify who was involved in coding and analysis	5
17. Coding	Describe the process for coding of data (e.g. line by line coding to search for concepts)	5-6
18. Study comparison	Describe how were comparisons made within and across studies (e.g. subsequent studies were coded into pre-existing concepts, and new concepts were created when deemed necessary)	6-7
19. Derivation of themes	Explain whether the process of deriving the themes or constructs was inductive or deductive	5
20. Quotations	Provide quotations from the primary studies to illustrate themes/constructs, and identify whether the quotations were participant quotations of the author's interpretation	12-13
21. Synthesis output	Present rich, compelling and useful results that go beyond a summary of the primary studies (e.g. new interpretation, models of evidence, conceptual models, analytical framework, development of a new theory or construct)	17-20

* Reference: Tong A, Flemming K, McInnes E, Oliver SA, Craig J. Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. BMC Medical Research Methodology 2012, 12:181.

Multimedia Appendix 1

Table S1. Detailed characteristics of selected studies.

Author(s) Year Journal Country	Description of mHealth intervention	Primary objective	Design	Sample	Key findings on gender relations
(1) Alam <i>et al.</i> 2020 (26) <i>International Journal of Environmental Research and Public Health</i> Bangladesh	A multi-component intervention that provides women with nutrition counselling, support and information for home gardens and an unconditional cash transfer, delivered on a mobile platform, with the aim of improving the health of women and children in rural Bangladesh.	To assess the feasibility and acceptability of the intervention, which combined a cash transfer with agricultural training and nutrition counselling for the participants and project workers.	Single group, post-test using mixed methods	Qualitative: 20 women, 6 project workers Quantitative: 58 women	Positive transformative: Increased spousal communication, further enhanced by mobile phone (received from the project), cash transfer is given to women strengthened independent financial decision making as well as joint financial decision making, the new knowledge on nutrition and home-gardening fostered an increase in communication and cooperation between wife and husband. Non-transformative: Some women were not free to go to the market to withdraw funds or open a mobile banking account.
(2) Alam <i>et al.</i> 2019 (27) <i>JMIR mHealth and uHealth</i> Bangladesh	Pregnant women, new mothers, and their family members can access weekly voice or SMS messages and utilise a 24-hour hotline to contact doctors who provide support on maternal and child health care.	To describe the experiences of subscribers and the perceptions of doctors who provided consultations through the <i>Aponjon</i> service, focusing on access, acceptability, usability, benefits, and challenges.	Single group, pretest design, post-test using mixed methods.	Qualitative: 16 families: 8 women subscribers, 8 husbands of female subscribers, and 11 medical doctors (9 females and 2 males) Quantitative: 3894 subscribers to <i>Aponjon</i>	Positive transformative: Increased women's autonomy in seeking health services empowered them to discuss maternal and child health issues; women were not as reliant on men to arrange medical advice/appointments. Increased involvement of male partners in health care resulting in informed decision-making and increased joint health-related decision making.

(3) Atukunda et al. 2017 (28) <i>AIDS and Behavior</i>	SMS notifications are sent to nominated social support persons of HIV individuals to help adherence to antiretroviral treatment.	To examine individual characteristics and socio-cultural dynamics that explain trends in social support and adherence to a SMS based antiretroviral intervention.	Randomised control trial pilot study, Dual group, pretest design using mixed methods.	Qualitative: 10 social supporters Quantitative: 63 HIV positive participants (randomised into 2 types of SMS reminder and control group) and 45 patient identified social supporters.	Positive transformative: Improved relationships between participants, particularly if the support person was of a different gender. Negative transformative: SMS messages were sometimes a trigger for relationship problems; the response to intervention was highly sensitive to existing relationship issues, with support person efforts perceived negatively, straining relationships, and fostering feelings of resentment, particularly if the support person was the married partner.
Uganda					
(4) Brinkel et al. 2017 (29) <i>Tropical Medicine and International Health</i>	Parents or caregivers can access health information via a mHealth interactive voice response system to support them in caring for sick children.	To evaluate user's experiences with the interactive voice response system (adherence, usability, perceived opportunities, and barriers)	Single group, pretest design, post-test using mixed methods.	Qualitative: 37 mothers (focus group) Quantitative: 37 mothers	Positive transformative: Increased women's health-related knowledge, thus increasing their ability to make informed decisions regarding the health of their children. The information empowered women and gave them more control and greater input in decision making about health care for themselves and their children.
Ghana					
(5) Brown et al. 2019 (30) <i>AIDS and Behavior</i>	Automated SMS messages sent to new mothers to notify them when their infants' HIV test results are available and when HIV-negative infants are eligible for retesting.	To evaluate mothers' experiences receiving HIV Infant Tracking System-enhanced early infant diagnosis services (acceptability, benefits, and areas for improvement)	Dual group, post-test, embedded in cluster randomised control trial. Qualitative methods.	Qualitative: 137 women.	Positive transformative: increased women's autonomy in seeking health services due to reduced financial costs and travel time increased male involvement (financial support and encouragement), resulting in facilitation of earlier clinic appointments. Negative transformative: Reinforce gender divide if women are illiterate as increases reliance on the husband to read the message, and husband not always around. Non-transformative: Women's burden of work and competing responsibilities, and limited resources made it difficult to attend the clinic.
Kenya					

<p>(6) Campbell et al. 2017 (31) <i>AIDS and Behavior</i> Uganda</p>	<p>SMS based intervention that sent messages to HIV positive people requesting a return to the clinic after abnormal laboratory test (low CD4 count).</p>	<p>To document HIV+ participants experience in an SMS based intervention in rural Uganda and propose a framework for technology acceptance for mHealth applications targeting low-literacy populations in resource-limited settings.</p>	<p>Single group, post-test clinical trial.</p>	<p>Qualitative: 43 HIV positive women and men</p>	<p>Positive transformative: new means of engaging partners to communicate, and SMS fostered a sense of closeness and appreciation of emotional support from the partner.</p>
<p>(7) Decker et al. 2020 (32) <i>BMJ Global Health</i> Kenya</p>	<p>Women at risk of IPV utilise myPlan app, a safety decision making and planning mHealth app that is tailored for the Kenyan context for prevention and response to gender-based violence.</p>	<p>To evaluate the efficacy on safety and health outcomes of the myPlan app and intervention.</p>	<p>Dual group, pre and post-test, 2 arm RCT, mixed methods.</p>	<p>Qualitative: 30 women at risk IPV Quantitative: 352 (n=177 intervention, n=175 control in 2 arm RCT)</p>	<p>Positive transformative: Increased women's knowledge on safety and rights concerning IPV, enhanced feelings of confidence and resilience and enabled women to make informed decisions related to their safety, mitigate violence, and deescalate potentially harmful situations with their partners.</p>
<p>(8) Hazra et al. 2018 (33) <i>Journal of Health Communication</i> India</p>	<p>Voice messages are sent to husbands covering topics such as antenatal care, postnatal checkups, early initiation of breastfeeding, clean cord care, and delayed bathing.</p>	<p>To examine whether the distribution of information on maternal and child health to husbands would enhance the man's knowledge, trigger discussions with wives/family members and result in the adoption of healthy behaviours.</p>	<p>Dual group, post-test using mixed methods</p>	<p>Qualitative: 10 male participants and their wives, 2 FGD with healthcare workers Quantitative: 881 husbands (428 intervention / 453 control) and 956 women (478 intervention and 478 control)</p>	<p>Positive transformative: Increased male knowledge of women's health, thus increasing informed decision-making and communication between couples. Negative transformative: Reinforcement of traditional gender roles as men alone were provided messages and did not always share information with female partners, strengthening men's role as the sole decision-maker and gatekeepers of information, husbands did not share information as not interested or maternal health information not seen as men's business.</p>

(9) Huda et al. 2018 (34) JMIR mHealth and uHealth Bangladesh	Pregnant women and new mothers were provided with a free mobile device through which they received interactive voice messages, direct nutrition counselling from a call centre, and an unconditional cash transfer via mobile banking	To determine the feasibility, acceptability, and appropriateness of a multifaceted intervention package designed to alter perceptions on nutrition during pregnancy and the first year of life for women and children in rural Bangladesh.	Single group, pretest and post-test design using mixed methods	Qualitative: 21 participants (7 pregnant women, 7 women recently given birth, 5 husbands and 2 mothers-in-law) Quantitative: 340 pregnant or recently delivered, lactating women.	Positive transformative: Increased women's ability to translate health-related information into practice, increase in spousal communication as new knowledge shared with husband, navigating the mobile banking app also enhanced communication and cooperation between wife and husband. Non-transformative: Traditional duties and gender-based roles were noted as a barrier to access (restricted movement outside the house and lack of ability to go to the marketplace to access cash, did not have an ID card to open a bank account).
(10) Ilozumba et al. 2018 (8) JMIR mHealth and uHealth Uganda	SMS platform designed to provide participants with information regarding upcoming antenatal care visits and recommendations on reproductive health practices	To outline assumptions of the program designers and contrast their assumptions with empirical data to better understand facilitators and barriers related to the outcomes of the program.	Single group, retrospective qualitative study	Qualitative: 15 female participants, 11 male participants, FGDs with 50 village health team members and interviews with 6 health service providers.	Positive transformative: Increased male involvement in maternal health decision making (men own phones), Increased women's ability to demand health services and quality of care, enhancing joint health-related decision making. Negative transformative: Male partners were noted as a barrier by some, as they were not intended primary beneficiaries, thus reinforcing gender differentials in women's decreased levels of mobile phone ownership and lower rates of female literacy, consolidating males as decision-makers in matters of reproductive health.
(11) McBride et al. 2018 (36) Journal of Public Health Vietnam	mMom is a mHealth platform that sends SMS messages designed to improve women's health during pregnancy and new motherhood by encouraging their use of maternal and neonatal health services and through increased awareness of risk factors.	To determine whether implementation of a low-cost mHealth could increase ethnicity minority women's access to maternal, newborn, and child health services.	Single group, post-test design qualitative study	Qualitative: 60 female participants (4 FGDs and 30 IDIs) and 2 FGD and 8 individual interviews with community health workers.	Positive transformative: Husbands increased interest and engagement in maternal and infant health, increased health-related joint decision making, enhanced women's empowerment to make informed decisions about health care.

<p>(12) Nyemba-Mudenda et al.</p> <p>2017</p> <p>(37)</p> <p><i>Information Technology for Development</i></p>	<p>The Mobile System for Safe Motherhood (MSSM) is a toll-free hotline, interactive voice response, and SMS system designed to provide pregnant women with maternal health-related information, tips, and appointment reminders.</p>	<p>To assess whether the use of mobile phones in maternal health can enable capability outcomes and outline the factors that facilitate and restrict the outcomes from being enabled.</p>	<p>Single group, post-test design qualitative study</p>	<p>Qualitative: 46 (26 female participants, 4 community volunteers, 4 midwives, 4 health facility managers, 4 stakeholders (32 IDIs and 2 FGDs)</p>	<p>Positive transformative: Women empowered by health information (self-confidence and expression) and in turn gained the support of husbands (male involvement in maternal care seen as a paradigm shift), spousal communication improved as they listened to messages on the shared phone, increased male knowledge and involvement on maternal care and support women's access to health services.</p>
<p>Malawi</p>					<p>Negative transformative: Increased tension and arguments with male partners being a barrier to participate in the intervention; women could not adapt all recommendations as gender roles (such as doing all household chores for extended family) prohibited the woman from resting when pregnant, arguments with husbands over the "satanic" MSSM app and subsequently some men forbade their wives from being part of the intervention, and if they were involved refused to allow them to go to clinic or community volunteer.</p>
<p>(13) Shelus et al.</p> <p>2017</p> <p>(38)</p> <p><i>International Perspectives on Sexual and Reproductive Health</i></p>	<p>mHealth application designed to assist women in tracking their menstrual cycles to plan or prevent pregnancy.</p>	<p>To explore women's experiences with using the CycleBeads application and how this experience varied based on how the participant learned about the app.</p>	<p>Single group, pretest and post-test design using mixed methods</p>	<p>Qualitative: 28 female participants</p> <p>Quantitative: 185 female app users</p>	<p>Positive transformative: increased women's knowledge on fertility and tracking menstrual cycle, and enhanced confidence on preventing pregnancy, improved communication with their sexual partner and increased health-related joint decision making.</p>
<p>Kenya</p>					

(14) Velloza <i>et al.</i>	Tablet-based application developed for use by providers during consultations with HIV serodiscordant couples which, in part, derives its' data from fertility information and sexual behaviour, sent by women via SMS to assist health workers in providing counselling on safe conception options.	To assess the acceptability and feasibility of the Safer Conception Intervention for Partners application	Single group, post-test design using mixed methods	Qualitative: 19 heterosexual HIV serodiscordant couples and 5 healthcare providers Quantitative: 74 heterosexual HIV serodiscordant couples	Positive transformative: Increased women's knowledge, which enabled more informed decisions regarding health, strengthened communication with partners, increased health-related joint decision making between partners. Negative transformative: One report of verbal and physical abuse was related to a misconception about the source of SMS messages.
2019					
(39)					
<i>MHealth</i>					
Kenya					

Table S2 . Critical Appraisal Skills Programme (CASP) Questions										
	Was there a clear statement of aims?	Is a qualitative methodology appropriate?	Was the research design appropriate to address the aims of the research?	Was the recruitment strategy appropriate to the aims of the research?	Was the data collected in a way that addressed the research issues?	Was reflexivity noted by the researchers?	Have ethical issues been taken into consideration?	Was the data analysis sufficiently rigorous?	Is there a clear statement of findings?	Is the value of the research discussed?
Alam <i>et al.</i>, 2020	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Alam <i>et al.</i>, 2019	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Atukunda <i>et al.</i>, 2017	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Brinkel <i>et al.</i>, 2017	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Brown <i>et al.</i>, 2019	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Campbell <i>et al.</i>, 2017	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Decker <i>et al.</i>, 2020	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Hazra <i>et al.</i>, 2018	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Huda <i>et al.</i>, 2018	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Ilozumba <i>et al.</i>, 2018	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
McBride <i>et al.</i>, 2018	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes
Nyema-Mudenda <i>et al.</i>, 2017	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Shelus <i>et al.</i>, 2017	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Velloza <i>et al.</i>, 2019	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes

Table S3. Thematic Analysis			
	Positively transformational influences	Negatively transformational influences	Non-transformative influences
Alam <i>et al.</i>, 2020	Yes	Yes	
Alam <i>et al.</i>, 2019	Yes		
Atukunda <i>et al.</i>, 2017	Yes	Yes	
Brinkel <i>et al.</i>, 2017	Yes		
Brown <i>et al.</i>, 2019	Yes	Yes	Yes
Campbell <i>et al.</i>, 2017	Yes		
Decker <i>et al.</i>, 2020	Yes		
Hazra <i>et al.</i>, 2018	Yes	Yes	
Huda <i>et al.</i>, 2018	Yes		Yes
Ilozumba <i>et al.</i>, 2018	Yes	Yes	
McBride <i>et al.</i>, 2018	Yes		
Nyema-Mudenda <i>et al.</i>, 2017	Yes	Yes	
Shelus <i>et al.</i>, 2017	Yes		
Velloza <i>et al.</i>, 2019	Yes	Yes	

Table S4. End-user involvement	
	Was the intervention co-designed with users / local communities?
Alam <i>et al.</i>, 2020	Yes, extensive formative process outlined by authors
Alam <i>et al.</i>, 2019	Yes, extensive formative research prior to pilot
Atukunda <i>et al.</i>, 2017	No
Brinkel <i>et al.</i>, 2017	No
Brown <i>et al.</i>, 2019	No
Campbell <i>et al.</i>, 2017	No, but designed based on a prior acceptability survey
Decker <i>et al.</i>, 2020	Yes, community-participatory formative process used to adapt the myPlan app to fit local context prior to piloting / rollout
Hazra <i>et al.</i>, 2018	No
Huda <i>et al.</i>, 2018	No
Ilozumba <i>et al.</i>, 2018	No
McBride <i>et al.</i>, 2018	No, but held FGDs and interviews with CHWs and women regarding what was 'lacking' with prior interventions / methods of communication to inform mHealth intervention
Nyema-Mudenda <i>et al.</i>, 2017	No
Shelus <i>et al.</i>, 2017	No
Velloza <i>et al.</i>, 2019	No, but reviewed the prototype with mHealth users prior and adapted accordingly

Table S5. Data collection methods		
	What qualitative methods were used?	Who was involved? *
Alam <i>et al.</i>, 2020	In-depth interviews	In-depth interview with women only.
Alam <i>et al.</i>, 2019	In-depth interviews	In-depth interviews conducted with both women subscribers and their husbands.
Atukunda <i>et al.</i>, 2017	In-depth interviews	In-depth interviews conducted with 'social supporters' of the mHealth user (i.e., men and women)
Brinkel <i>et al.</i>, 2017	Focus group discussions	Focus group discussions held with mothers only.
Brown <i>et al.</i>, 2019	In-depth interviews	Interviews held with women only.
Campbell <i>et al.</i>, 2017	In-depth interviews	Interviews held with both men and women.
Decker <i>et al.</i>, 2020	In-depth interviews	Interviews held with women only.
Hazra <i>et al.</i>, 2018	In-depth interviews	In-depth interviews held with both women and their husbands.
Huda <i>et al.</i>, 2018	In-depth interviews; FGDs	In-depth interviews held with women and their husbands. FGDs held with mothers-in-law.
Ilozumba <i>et al.</i>, 2018	In-depth interviews	Interviews held with both men and women.
McBride <i>et al.</i>, 2018	In-depth interviews; FGDs	Interviews and FGDs held with women only.
Nyema-Mudenda <i>et al.</i>, 2017	In-depth interviews; FGDs	Interview and FGDs held with women only.
Shelus <i>et al.</i>, 2017	In-depth interviews	Interviews held with women only.
Velloza <i>et al.</i>, 2019	In-depth interviews	Interviews held with both men and women.

* This does not include any data collected from healthcare workers, etc – only women +/- their male partners.

Appendix 3: Ethics approval from icddr,b for A combined agriculture and nutrition behaviour change intervention can improve women's empowerment: A feasibility study in rural Bangladesh - Appendix for Chapter 3.



Memorandum

31 October 2016

To: Ms Gulshan Ara
Principal Investigator of research protocol # PR-16075
Nutrition and Clinical Services Division (NCSB)

From: Professor K Z Mamun 
Chairman
Ethical Review Committee (ERC)

Sub: Approval of research protocol # PR-16075

Approval Date: 31 October 2016
Expiration Date: 30 October 2017
Review Type: Full Committee Review
Risk Level: No more than minimal
Project type: New Project

Thank you for your memo dated 25 October 2016 attaching the modified version of your research protocol # PR-16075 entitled "Feasibility of an integrated agriculture and nutrition behavior change intervention to improve maternal and child nutrition in rural Bangladesh" addressing the issues raised by the committee in its September 2016 meeting held on 17 October 2016, at 3:00 pm, at the RA meeting Room, 3rd floor of the Main Building, icddr,b to the satisfaction of the Committee. I am pleased to inform you that your protocol is **approved**. You will be required to observe the following terms and conditions in implementing the research protocol:

1. The research protocol is approved for 12-month period from the date of approval of the protocol by the Ethical Review Committee. The Federal regulations require review of an approved study not less than once per 12-month period. To comply with federal regulations, a continuing review application must be submitted to the IRB Secretariat for this study to continue beyond 30 October 2017.

All necessary materials for continuing review must be reviewed with sufficient time for review and issuing continued approval before the expiration date. Failure to initiate a continuing review application in a timely fashion may result in discontinuation of study activities until approval can be renewed. Performing study activities, including data analysis, beyond the expiration date results in noncompliance of federal regulations.

2. The ERC approval shall automatically be revoked after one year if the protocol is not started. After one year, you shall have to seek approval for revalidation of the protocol by the ERC before starting.
3. You should notify the IRB Secretariat of the start date of the protocol for updating in the integrated Navision system. The protocol start date will not be updated in the Navision system until receiving information from you.

Appendix 4: Response to reviewers for Chapter 4 - Assessing the impact of a combined nutrition counselling and cash transfer intervention on women's empowerment in rural Bangladesh: a randomised control trial protocol.

Response to reviewers' comments

To: The Editor BMJ Open

Manuscript ID: bmjopen-2020-044263

Type of manuscript: Article

Title: Assessing the impact of a combined nutrition counselling and cash transfer intervention on women's empowerment in rural Bangladesh: A randomised control trial protocol.

Thank you for arranging a review of the manuscript. We thank both reviewers for their constructive feedback. Below, we have addressed point-by-point the comments from the reviewers and detailed the changes we have made to the manuscript. As directed, we have uploaded the revised version with Track Changes as well as a clean copy of the manuscript.

Reviewer 1

General Comment: *How do the quantitative and qualitative aspects complement each other in testing the theory. Most of the quantitative portion of the research is very detailed, but the qualitative research lacks clarity.*

Response: We thank the reviewer for the suggestion. We hope that with edits, as detailed below, that the paper now clearly shows the way the qualitative and quantitative aspects complement each other, and the more detailed qualitative research section is clear and concise.

Comment: *In some places (e.g. the abstract introduction), it is not clear if the outcome of importance is nutrition or empowerment.*

Response: We agree to this comment and have adjusted the text in the abstract as follows: "Introduction: There is growing interest in assessing the impact of health interventions, particularly when women are the focus of the intervention, on women's empowerment. Globally, research has shown that interventions targeting nutrition, health, and economic development can affect women's empowerment. Evidence suggests that women's empowerment is an underlying determinant of nutrition outcomes. Depending on the focus of the intervention, different domains of women's empowerment will be influenced for

example an increase in nutritional knowledge, or greater control over income and access to resources.”

We feel the objective of this study (p3/line 55) further clarifies the outcome: “This study evaluates the impact of the Shonjibon Cash and Counselling trial that combines nutrition counselling and unconditional cash transfer intervention, delivered on a mobile platform, on women’s empowerment in rural Bangladesh.”

The introduction is acknowledging the intrinsic connection and positive feedback loop that women’s empowerment and nutritional status share.

Comment: *There is a lack of clarity around the mobile phone as a part of the intervention or not.*

Response: We thank the reviewer for this comment and deleted the sentence have adjusted the text as suggested to clarify the intervention:

“When a woman receives additional resources, such as cash transfers and is the target of a mHealth program this can challenge gender norms within relationships and exacerbate gender disparities”

Comment: *In figure 1, the mobile phone does not seem like it should be in the intervention column since the control group gets the mobile phone. You deal with this better in the description about the Bangladesh context, where you describe mHealth as the intervention rather than the phone itself.*

Response: Thank you, this is a valid point as both the intervention and control group receive a mobile phone. Both groups receive a mobile phone to minimize the non-specific effects of owning a mobile communication device. We have however adjusted the text to read as below (removing the emphasis on the mobile phone itself): “Women receive an mHealth interactive app – messages, audio and video, quizzes – as well as counselling from the call centre” We have adjusted Figure 1 accordingly.

Comment: *How will the quantitative and qualitative studies complement each other. The quantitative analysis is very straightforward, a basic comparison without additional exploration of mechanisms other than different outcomes, though it is nice that there are so many outcomes covering many different facets of empowerment. There are many questions that could be asked from a quantitative perspective, but these questions are not indicated in the research plan.*

Response: Thank you for this comment. The qualitative data will complement and contextualize the quantitative findings, for example men and other family members are not interviewed for the quantitative survey. We will explore women's, men's and other household members lived experience and perceived changes relating to the intervention, which cannot be captured through the quantitative data. We have attached the qualitative interview guidelines as an appendix. The last question we believe to refers to qualitative perspective and not a quantitative perspective and answered accordingly.

Comment: *What if women do not recommend another individual in the household to be interviewed?*

Response: We anticipate that a proportion of women will recommend someone in their household to be interviewed. If women do not recommend other household members to be interviewed that is completely acceptable and up to each individual woman as to what questions they wish to answer and if they are comfortable referring other household members.

Comment: *What are the specific questions beyond: "women and men's perceived and experienced change in empowerment" and "explore the myriad of ways that women and men perceive and describe empowerment."*

Response: We have added the qualitative interview guidelines as supplementary material

Comment: *What hypotheses are you looking to test/confirm in your qualitative data? These should be differentiated from the quantitative hypotheses. If you are looking to test the same hypotheses through triangulation, what will be your conclusion if you find contradictory results in the qualitative and quantitative methods?*

Response: We thank the reviewer for this question. The overall hypothesis in our qualitative research is to explore the barriers, facilitators, and perceptions of women's' empowerment, and as such we are not expecting to examine a specific hypothesis. As we are exploring the barriers and facilitators, they do not need to match a hypothesis, nor we will triangulate the data as we anticipate the qualitative findings will be complementary to our quantitative data.

Comment: *Qualitative research should have enough information for a COREQ checklist or something similar.*

Response: We are reporting on a mixed methods study protocol in this paper and have followed the SPIRIT and Tidier guidelines, the international standard for the reporting clinical trial protocols, as suggested by the journal

Comment: *It is not clear how participants will be recruited or even a target sample size*

Response: We will select our participants for qualitative survey based on purposive sampling technique from within the households participating in the survey. Participants include women and family members such as husbands and mothers-in-law.

Comment: *Is there a short-term measurement and a long-term measurement? If the long-term outcome refers to the feedback loop, see previous section above.*

Response: We thank the reviewer for this question and opportunity to clarify Figure 1. We have adjusted the box headers in Figure 1; we have changed “short term outcomes” to “intermediate outcomes” and “long term outcomes” to “outcomes” as we are not using short term measurements. We have also adjusted any related text accordingly.

Comment: *Figure 1 is much more complex than what you are able to test in the intervention. Maybe highlight which parts are covered by the quantitative and qualitative analysis.*

Response: We have assigned a letter to all outcomes in Figure 1 and added a sentence clarifying which outcomes are covered by qualitative and quantitative analysis. The text reads: “Outcomes a, c, e, g, i, j and k will be analysed from a quantitative and qualitative perspective. Outcomes b, d, f and h will be explored qualitatively”.

Comment: *How do you know gestational age is <90 days? Ultrasound?*

Response: We will conduct household surveillance and list all the women of reproductive age currently not pregnant. Our surveillance worker will then conduct door-to-door bi-monthly visits to identify women missing two menstrual periods in a row. All such woman will undergo a pregnancy test with a sensitive pregnancy urine test kit (Excel®). We will invite women to

participate who test positive in the study. We will only enrol women who have become pregnant since our last visit (<60 days).

Comment: *What sort of bias is introduced by excluding women who learn they are pregnant after 90 days?*

Response: We do not expect selection bias from only recruiting women who are in their first trimester of pregnancy due to the active pregnancy surveillance methods detailed above. If the recruitment used a passive system and participants self-detected their pregnancy it is possible that less empowered women might present later. But our active home-based surveillance system will provide equal access to pregnancy tests irrespective of the women's autonomy to seek health care services.

Comment: *Line 242 – are there 3 trial arms or are these three interventions all given to the treatment group? Not clear.*

Response: Thanks to the reviewer for this question. We have changed the text to clarify as follows: "The SCC Trial intervention arm receives: 1) nutrition BCC delivered on a specially tailored app on a smartphone (audio, video, and animation), 2) direct nutrition counselling from a call centre and 3) unconditional cash transfer of 1000 Taka (USD 12.50) received monthly via BKash mobile banking app."

Comment: *It is not clear why the primary and secondary hypotheses are divided as such. In particular, a decrease in IPV seems very important and could be elevated to a primary outcome. I would think your primary and secondary outcomes should be linked to their importance in the theoretical model or some sort of data reliability issue, but I don't see those connections.*

Response: Our primary hypothesis is to measure the impact of the SCC Trial on women's empowerment. Our secondary hypothesis reflects the individual components that combine to form our composite index. Changes in IPV and whilst not the main outcome, is a very important outcome and will be explored quantitatively and qualitatively in great detail. The primary and secondary outcome are linked to the theoretical model of empowerment and the theory of change. The intervention will impact individual indicators in different ways and therefore the secondary outcomes are the individual indicators that form the composite index or primary outcome measure.

Comment: *Outcome measures: are you only using 1 composite measure and not examining the sub-measures? It would be useful to see the questionnaire of outcome variables.*

Response: We thank the reviewer for this question. Our main outcome measure is a change in empowerment as measured by the composite measure. This composite measure is made up of 6 individual indicators or sub-measures which will also be examined individually and complemented with the qualitative research. Please find the questionnaires for each of the indicators in the appendix.

Comment: *Decision-making ability about health and nutrition choices seems more like an outcome related to the effectiveness of the main intervention rather than an exploration of empowerment. The rest of your paper focuses on intrahousehold type empowerment between spouses rather than empowerment in the world. I suggest cutting this to keep focused on intra-household dynamics.*

Response: Whilst decision-making ability about health and nutrition choices may seem more like an outcome related to the main intervention rather than an exploration of empowerment, the focus of our questions is on women's agency and changes in agency over the course of the intervention. Our questions focus on a woman's instrumental agency, and their ability to have input into the health care, nutrition related decision-making process. The indicator (Indicator 4 - Decision-making power on nutrition and health care) is also linked to intrahousehold relationships which we explore under Indicator 5 - Respect among household members, and both will be complemented with our qualitative exploration.

Comment: *Your outcome variables are very broad in covering all kinds of empowerment measures. I would like one paragraph/section/sentence – whichever makes the most sense -- on each of the 6 aspects of the Pro-WEAI. Keep them in the same order throughout the paper.*

Response: We thank the reviewer for this comment. Due to word limitations some of the indicators were combined, we have now separated the indicators for clarity and have added one sentence on each aspect of the Pro-WEAI and we will keep them in order throughout the paper.

Comment: *You could add heterogeneity analysis to the quantitative analysis: do women who are more or less empowered at baseline benefit more from the intervention? Are women with mothers-in-law in the household more or less empowered?*

Response: We agree with the reviewer that we should examine key baseline factors as potential modifiers of the women's empowerment response to the intervention. We have expanded the description of the analysis of the quantitative data as follows:

"Quantitative Data Analysis

Data analysis will be by intention to treat. The women's empowerment composite index scores will be categorized as the percentage of women empowered or disempowered. For each empowerment indicator individuals are classified as adequate or inadequate based on Pro-WEAI predetermined thresholds. Women are considered empowered if 4 out of 6 indicators are adequate. We will also analyze the impact of SCC intervention on individual indicators to assess increases or decreases in empowerment scores, as not all indicators will respond or be impacted in the same way.

Analyses will be conducted at the mother-infant dyad level but will be adjusted for the cluster randomization (Hayes & Moulton, 2009). Primary analyses will compare the prevalence of women's empowerment at the end of the trial using Pearson's chi-square tests and 95% confidence intervals for the group difference, adjusted for clustering and generalized linear mixed models for non-continuous outcomes (e.g. logistic mixed models for binary outcomes e.g. percentage of women's empowerment). Models will include treatment group as a fixed effect, infants as a random effect to account for repeated measurements, and community-cluster as a random effect to account for cluster effects. We will also assess if the women's empowerment level at baseline, age, education and presence or absence of mother-in-law in the household modify the empowerment response to the intervention by testing for interactions between the intervention and these factors. STATA® will be used for all analyses."

Reference

Hayes HJ, Moulton LH. Cluster randomised trials. Boca Rato:US: Taylor & Francis; 2009.

Reviewer 2

Comment: *The trial is embedded in another cluster randomized trial aimed at assessing the impact of a combined nutrition counselling and cash transfer intervention on stunting in rural Bangladesh...the authors have not referenced the main trial protocol paper.*

Response: We thank the reviewer for this suggestion. The SCC Trial Protocol paper was not published at the time of submission of this paper. The reference to the main trial protocol has now been added. The SCC trial will measure the impact of combined nutrition counselling and cash transfers on stunting and will not measure women's empowerment component. We will analyze women's empowerment as a stand-alone study using theoretical framework discussed in this paper. We hope that the revised version of this manuscript will make a significant contribution to the literature on the impact on complex and innovative nutrition interventions on women's empowerment.

Comment: *What is the basis for the primary outcome – average 20 percent increase in empowerment score?*

Response: Previous reports of studies examine the impact of a single interventions on women's empowerment indicate an impact of 10 to 15% (ref). We have hypothesized a larger impact because we are testing multiple interventions.

What is the power of the study to detect this difference with a given sample size?

Response: The sample size is fixed by the primary hypothesis in the main trial. This means we have a total of 104 cluster with 21 participants per cluster (ref for protocol paper). There are no reports of intra cluster correlation coefficients for the women's empowerment. A recent survey from Bangladesh (ref) suggests about 30% of women are empowered using the same indicators we plan for our trial. We calculated the minimal detectable difference assuming 90% power for a range of possible icc values.

At a low icc of 0.001 we have 90% power to detect a 5% improvement in women's empowerment. The minimum detectable difference decreases as the assumed icc and with a very high icc of 0.2 our fixed sample size could still detect a 22% increase in women's empowerment with 90% power and a 19% increase in women's empowerment with 80% power.

We have added the following paragraph to clarify the adequacy of our sample size.

“Sample size and power

The sample size for our trial is fixed by the primary hypothesis in the main Shonjibon Cash and Counselling trial, which estimated a total sample of 2184 mother-infant pairs from 104 clusters (ref for protocol paper). We can find no reports of intra cluster correlation coefficients (icc) for the women’s empowerment indicators we plan to use. Therefore, we estimate that the fixed trial sample size will provide at least 80% power to detect a 20% increase in women’s empowerment assuming 30% of women are empowered (ref) and a high icc of 0.2. Assuming a lower icc of 0.05 we will have 90% power to detect a 13% increase in women’s empowerment.”

Comment: *The authors intend to assess the impact of the intervention on empowerment using WEAI which has been designed to assess the empowerment in agriculture. As the intervention includes cash transfer with nutrition counseling, they should also assess more specifically women’s empowerment in nutrition (Please see: Narayanan, Sudha, et al. "Developing the women's empowerment in nutrition index in two states of India." Food Policy 89 (2019): 101780.)*

Response: We thank the author for this suggestion. The WEAI is designed to assess the impact of interventions on empowerment in agriculture. The majority of our study participants work in agriculture and the women participate in post-harvest activities and their livelihoods are clearly tied to the agricultural sector. The Pro-WEAI is an updated version of the WEAI that measures women’s empowerment in project specific contexts, and has additional module designed to assess women’s empowerment and agency in the domains of health and nutrition decisions. The health and nutrition module is comprised of seven indicators that assess a woman’s agency and decision-making ability and covers key components that we will monitor. We have carefully considered the WENI as suggested by the reviewer and whilst the WENI and Pro-WEAI have common ground, for our purposes we feel the Pro-WEAI health and nutrition module covers questions in alignment with the focus of our study and fits with the rest of the Pro-WEAI modules we are using.

Comment: *The Introduction should clearly state that the current study is a part of the SCC Trial.*

Response: We have amended the manuscript as follows: “We plan to conduct a study, embedded in a cluster randomised control trial that assesses a multifaceted nutrition

intervention on childhood stunting - Shonjibon Cash and Counselling Trial (SCC). This protocol paper presents the way we will measure the impact of the SCC trial women's empowerment.

Comment: *The statement 205 describing IPV is unclear.*

Response: We have amended the text as follows, "IPV includes behaviour that is physical, psychological, sexual or abusive or controlling in nature"

Comment: *Study outcomes lines 250-253: The outcomes should not include direction of effect. For example, the outcome is 'control over income and economic resources', not 'an increase in control over income and economic resources.*

Response: We thank the reviewer for this suggestion and have amended the study outcomes as follows: "Secondary study outcomes will include 1) control over income and economic resources; 2) input and decision-making power in nutrition and health care choices; 3) experience and attitude toward intimate partner violence."

Comment: *Social desirability questions (Appendix table 3): it is not clear whether this will be scored and what score would qualify as social desirability.*

Response: We will use a score and we have added the following text in the sub-section on Data Collection Methods – Quantitative data

"We will use the validated short version of the Marlowe-Crowne Social Desirability Scale [ref], which is based on a subset of 13 items from the original scale. We will calculate a social desirability score by adding up the number of socially desirable answers, out of the 13 questions. The potential range of the score will be from 0-13 and we will create three categories with a score of 0-4 graded as a low score, 5-9 as a medium score, and 10-14 as a high score."

Reynolds WM. Development of reliable and valid short forms of the Marlowe-Crowne Social Desirability Scale. *J Clin Psychol* 1982;38(1):119-125. [doi: 10.1002/1097-4679(198201)38:1<119::AID-JCLP2270380118>3.0.CO;2-I]

Comment: *It is mentioned that a project specific module Pro-WEAI would be used. Has this been validated?*

Response: The Pro-WEAI has been validated, this paper describes the adaptation and validation of a project-level WEAI. Five projects in the portfolio were used to validate this version of the pro-WEAI, with 4 of the projects piloted in Bangladesh.

<https://www.sciencedirect.com/science/article/pii/S0305750X19301706>

Comment: *Line 373-4. More details about the DSMB need to be provided including the composition, any interim analyses planned. What are the adverse events that are anticipated? How will these be recorded / reported?*

Response: We have provided further information re the DSMB as suggested: “An independent data and safety monitoring board (DSMB) will be formed to assess the completeness and quality of data and to ensure data is compliant with recruitment and retention goals. The DSMB will also assess any factors that might affect the study outcome or compromise the confidentiality of the trial data. Any unintended effects of the trial will be reported to the board.”

Potential adverse events that could occur, from a gender-based perspective, could be an increase in relationship conflict or male backlash, however, based on our pilot study (<https://mhealth.jmir.org/2018/7/e156/>), we find this to be unlikely and studies have shown an improvement in spousal relationships.

Appendix 5: Ethics approvals from The University of Sydney and icddr,b for Chapter 4 - Assessing the impact of a combined nutrition counselling and cash transfer intervention on women's empowerment in rural Bangladesh: a randomised control trial protocol.

Thursday, 19 December 2019

Prof Michael Dibley
School of Public Health: Public Health; Faculty of Medicine and Health
Email: michael.dibley@sydney.edu.au

Dear Michael,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application. I am pleased to inform you that after consideration of your response, your project has been approved.

Details of the approval are as follows:

Project No.:	2019/840
Project Title:	A community based cluster randomized controlled trial to determine the effectiveness of unconditional Cash transfers and mobile behaviour change communications to reduce child under nutrition in one sub-district of Bangladesh
Authorised Personnel:	Dibley Michael; Ali Nazia Binte; Goodwin Nicholas; Huda Tanvir; Agho Kingsley; Ara Gulshan; Arifeen Shams El; Hasan Mohammad Mehedi; HODDINOTT JOHN; Iqbal Afrin; Islam Munirul; Laba Tracey-Lea; Muthayya Sumithra; Tahsina Tazeen; Alam Ashraful;
Approval Period:	19 December 2019 to 19 December 2023
First Annual Report Due:	19 December 2020

Documents Approved:

Date Uploaded	Version Number	Document Name
04/12/2019	Version 1	Guideline for follow-up interviews
31/10/2019	Version 2	Participant info and consent Version 2 Clean
27/09/2019	Version 1	All Data collection tools
27/09/2019	Version 1	Protocol

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
 - Serious or unexpected adverse events (which should be reported within 72 hours).
 - Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).

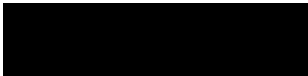


- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.


Please contact the Ethics Office should you require further information or clarification.

Sincerely,



Associate Professor Rita Shackel
Chair
Human Research Ethics Committee (HREC 3)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) [National Statement on Ethical Conduct in Human Research \(2007\)](#) and the NHMRC's [Australian Code for the Responsible Conduct of Research \(2007\)](#)



Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Elizabeth Kirkwood** successfully completed the NIH Web-based training course "Protecting Human Research Participants".


Date of completion: 02/12/2018.

Certification Number: 2649913.

Memorandum

06 December 2017

To: Ms Tazeen Tahsina
Principal Investigator of research protocol # PR-17106
Maternal and Child Health Division (MCHD)

From:  Shafiqul Alam Sarker, MD, Ph.D
Chairperson
Research Review Committee

Sub: Approval of research protocol # PR-17106

Thank you for your memo dated 04 December 2017 attaching the modified version of your research protocol # PR-17106 titled "A community based cluster randomized controlled trial to determine the effectiveness of unconditional Cash transfers and mobile behaviour change communications to reduce child under nutrition in one sub-district of Bangladesh"; version no. 2.0; dated 04 December 2017; addressing the issues raised by the Committee in its November 2017 meeting held on 06 November 2017 to the satisfaction of the Committee. Accordingly, the Committee approved the research protocol to proceed subject to the approval of the Ethical Review Committee (ERC).

Terms of approval

1. The research protocol is approved for 12-month period from the date of approval of the protocol by the Ethical Review Committee. Approval for further continuation of the research work, if needed, shall be obtained before expiration of the initial approval.
2. You should notify the IRB Secretariat of the start date of the protocol for updating in the integrated navigation system. The protocol start date will not be updated in the navigation system until receiving information from you. Therefore you will not be able to operate budget code and continue spending funds under the research protocol.
3. The RRC approval shall automatically be revoked after one year if the protocol is not started. After one year, you shall have to seek approval for revalidation of the protocol by the RRC & ERC before starting the protocol.
4. This approval is only valid whilst you hold a position at icddr,b; and in the event of your departure from the Centre, a new Principal Investigator will be designated for the research protocol.
5. You should notify the RRC and the ERC immediately of any serious or unexpected adverse effects on participants or unforeseen events that might affect continued acceptability of the protocol.

6. Any changes to the research protocol require the submission (in prescribed form) and approval of an amendment/addendum. Substantial variations may require a new protocol.
7. Continued approval of this protocol is dependent on your periodically updating the Centre's database for the protocol to show the progress; and a final report/completion report should be submitted at the conclusion of the protocol.
8. You shall submit a report for time extension of the protocol (in prescribed form) if you are unable to complete the protocol activities within the time mentioned in the protocol.
9. You are responsible for systematic storage and retention of the original data pertaining to the research protocol; and the ownership of data after certain period shall be determined as per Centre's rules and regulations.
10. The RRC should be notified if the protocol is discontinued before the expected date of completion.

I wish you all the success in conducting the research protocol.

Thank you.

Cc: Senior Director, MCHD
Senior Manager, Budget & Planning, Finance

Contribution by the Members of the Scientific Team:

Members' Name	Contribution								
	Research idea/ concept	Study design	Protocol writing	Respond to external reviewers' comments	Defending at IRB	Developing data collection Tool(s)	Data Collection	Data analysis/ interpretation of results	Manuscript writing
Tazeen Tahsina	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Shams El Arifeen	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Munirul Islam	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Michael J Dibley	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Tanvir M Huda	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Mohammad Mehedi Hasan	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Afrin Iqbal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ashraful Alam	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Gulshan Ara	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Jasmin Khan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Elizabeth Kirkwood	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Consent Form: Listing and Surveillance

Written informed consent form for participants (ever married women aged 15-49 years) to be interviewed during listing and surveillance

Protocol Title:	A community based cluster randomized controlled trial to determine the effectiveness of unconditional Cash transfers and mobile behaviour change communications to reduce child under nutrition in two sub-district of Bangladesh
Protocol number:	PR-17106
Principal investigator:	Tazeen Tahsina
Organization:	Maternal and Child Health Division (MCHD) of icddr,b

Purpose of the research

Assalamualaikum/Adab,

We are working at the International Centre for Diarrheal Diseases Research, Bangladesh (icddr,b). We are doing research for the betterment of maternal and child health in different part of the country including your area. This project activity is implementing in two upazilas of Mymensingh district with the financial assistance of University of Sydney. As part of it, we are listing all ever married women from all households in your community. The information collected from you will be more effectively used for the betterment of the society.

Why invited to participate in the study?

You are being asked to participate in this study because you are 15-49 years of age ever married women and also resident of this area. Moreover, we believe that you can help us in this research by providing valuable information.

What is expected from the participants of the research study?

If you agree to participate in this study, we will periodically assess you for several times.

For the first time we will ask you some questions regarding you and your family, your pregnancy status, contraception use etc. It will take 10-15 minutes of your time for the interview.

We will come again to collect some additional information after 2 months, and also do your pregnancy test on that time.

Risk

There will be no risks related to your participation in this study.

Benefits

Participation in this study may not benefit you directly. Even after that, the information that you will share will be very useful to further improvement of health status of your area.

Privacy, anonymity and confidentiality

We would keep all information confidential. Only the investigators of this research and Ethical Review Committee (ERC) will have an access to the information. All the information will be kept in a locked cabinet in our Dhaka office. We will not use you name anywhere in the study, instead we will use a number to keep your information confidential.

Future use of information

Anonymous or abstracted information and data may be shared with the researchers at Dhaka. However, this will not conflict with or violate the maintenance of privacy, anonymity and confidentiality of information identifying participants in any way.

Right not to participate and withdraw

Your participation in the study is voluntary, and you have the sole authority to decide for or against your participation. You would also be able to withdraw from participation any time during the study, without showing any cause. Refusal to participate in the study or withdraw yourself from the study will not cause you any harm and it will not cause any change in your regular healthcare seeking from different government and private facilities.

Principle of compensation

As mentioned earlier, your participation in this study is completely voluntary and you will not get any payment for participating in this study.

Answering your questions/ Contact persons

Tazeen Tahsina, Maternal and Child Health Division, icddr,b is the Principal Investigator of the study. If you have questions about this study, you may communicate with her by calling 9827043 or +880-1747-219821. And if you have any question regarding your right or benefit to participate in the study you can also contact icddr,b IRB coordinator, Mr. M. A. Salam Khan by calling 9827084 or +880 1711428989. Thank you for the cooperation.

Confirmation of Consent

I agree to participate in this research study

I do not wish to enrol in this study at this time (stop, thank participant)

Signature or left thumb impression of participant

Date

Signature of the PI or his/her representative

Date

(NOTE: In case of representative of the PI, she/he shall put her/his full name and designation and then sign)

Consent Form: Enrollment of Intervention arm women

Written Informed Consent Form for intervention arm participants (ever married and currently pregnant women aged 18-49 years) to be interviewed during enrollment

Protocol Title: A community based cluster randomized controlled trial to determine the effectiveness of unconditional Cash transfers and mobile behaviour change communications to reduce child under nutrition in two sub-district of Bangladesh

Protocol number: PR-17106

Principal investigator: Tazeen Tahsina

Organization: Maternal and Child Health Division (MCHD) of icddr,b

Purpose of the research

Assalamualaikum/Adab,

We are working at the International Centre for Diarrhoeal Diseases Research, Bangladesh (icddr,b). We are doing a household based research in the poor rural household to assess the effectiveness of mobile phone nutrition behaviour change communication combined with unconditional cash transfers in reducing the prevalence of stunting in children at 24 months. This project activity is implementing in two upazilas of Mymensingh district with the financial assistance of University of Sydney.

Why invited to participate in the study?

From our previous survey (surveillance) we came to know that you are a permanent resident of this area, your age is between 18-49 years and you are currently married pregnant women. We believe that you will be a suitable candidate for this study. For this we are inviting you to participate in this study.

Enrollment of women (What is expected from the participants of the research study?)

If you agree to participate in this study, we will take 50-60 minutes to enroll you in this project. We will give you a smart phone and with active SIM card. The phone will be preloaded with an app (Soibarta), from which you will receive different nutrition, health and livelihood related videos 5 days of a week. Apart from that, a trained nutrition counselor will call you in every two weeks and advice you on different nutrition and health related issue. We will also provide a specific amount of money via bKash in your mobile phone in every month. If you agree to participate, we will follow you up from now on till 18 months of your child. You will get all the facilities throughout this period. We hope that we can also learn something from you during this period of time.

Risk

There will be no or minimum risks related to your participation in this study.

Benefits

We believe that, by actively participate in the study and follow the app and call centre messages regularly, you will be able to learn about good practices during pregnancy and lactation. Which will help to improve the nutrition status of you and your child. The study findings will be very useful to further improvement of nutrition and health status of your area and throughout the country.

Privacy, anonymity and confidentiality

We would keep all information confidential. Only the investigators of this research and Ethical Review Committee (ERC) will have an access to the information. All the information will be kept in a locked

cabinet in our Dhaka office. We will not use your name anywhere in the study, instead we will use a number to keep your information confidential.

Future use of information

Anonymous or abstracted information and data may be shared with other researchers within and outside the country. However, this will not conflict with or violate the maintenance of privacy, anonymity and confidentiality of information identifying participants in any way.

Right not to participate and withdraw

Your participation in the study is voluntary, and you have the sole authority to decide for or against your participation. You would also be able to withdraw from participation any time during the study, showing a valid cause. In this case you will have to fill up an exit form while withdrawing. Refusal to participate in the study or withdraw yourself from the study will not cause you any harm and it will not cause any change in your regular healthcare seeking from different government and private facilities.

Principle of compensation

As mentioned earlier, your participation in this study is completely voluntary and you will not get any payment for participating in this study.

Answering your questions/ Contact persons

Tazeen Tahsina, Maternal and Child Health Division, icddr,b is the Principal Investigator of the study. If you have questions about this study, you may communicate with her by calling 9827043 or +880-1747-219821. And if you have any question regarding your right or benefit to participate in the study you can also contact icddr,b IRB coordinator, Mr. M. A. Salam Khan by calling 9827084 or +880 1711428989. Thank you for the cooperation.

Confirmation of Consent

I agree to participate in this research study (start enrolment)

I do not wish to enrol in this study at this time (stop, thank participant)

Signature or left thumb impression of participant

Date

Signature of the PI or his/her representative

Date

(NOTE: In case of representative of the PI, she/he shall put her/his full name and designation and then sign)

Assent form: Enrollment of Intervention arm women

Written informed assent form for intervention arm participants (on behalf of ever married women aged 15 to below 18 years, an adult appropriate family member) to be interviewed during enrollment

Protocol Title: A community based cluster randomized controlled trial to determine the effectiveness of unconditional Cash transfers and mobile behaviour change communications to reduce child under nutrition in two sub-district of Bangladesh

Protocol number: PR-17106

Principal investigator: Tazeen Tahsina

Organization: Maternal and Child Health Division (MCHD) of icddr,b

Purpose of the research

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We are working at the International Centre for Diarrhoeal Diseases Research, Bangladesh (icddr,b). We are doing a household based research in the poor rural household to assess the effectiveness of mobile phone nutrition behaviour change communication combined with unconditional cash transfers in reducing the prevalence of stunting in children at 24 months. This project activity is implementing in two upazilas of Mymensingh district with the financial assistance of University of Sydney.

Why invited to participate in the study?

From our previous survey (surveillance) we came to know that you are a permanent resident of this area, your age is between 15-18 years and you are currently married pregnant women. We believe that you will be a suitable candidate for this study. For this we are inviting you to participate in this study.

Enrollment of women (What is expected from the participants of the research study?)

If you agree to participate in this study, we will take 50-60 minutes to enroll you in this project. We will give you a smart phone and with active SIM card. The phone will be preloaded with an app (Soibarta), from which you will receive different nutrition, health and livelihood related videos 5 days of a week. Apart from that, a trained nutrition counselor will call you in every two weeks and advice you on different nutrition and health related issue. We will also provide a specific amount of money via bKash in your mobile phone in every month. If you agree to participate, we will follow you up from now on till 18 months of your child. You will get all the facilities throughout this period. We hope that we can also learn something from you during this period of time.

Risk

There will be no or minimum risks related to your participation in this study.

Benefits

We believe that, by actively participate in the study and follow the app and call centre messages regularly, you will be able to learn about good practices during pregnancy and lactation. Which will help to improve the nutrition status of you and your child. The study findings will be very useful to further improvement of nutrition and health status of your area and throughout the country.

Privacy, anonymity and confidentiality

We would keep all information confidential. Only the investigators of this research and Ethical Review Committee (ERC) will have an access to the information. All the information will be kept in a locked

cabinet in our Dhaka office. We will not use your name anywhere in the study, instead we will use a number to keep your information confidential.

Future use of information

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Principle of compensation

As mentioned earlier, your participation in this study is completely voluntary and you will not get any payment for participating in this study.

Answering your questions/ Contact persons

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Confirmation of Consent

I agree to participate in this research study (start enrolment)

I do not wish to enrol in this study at this time (stop, thank participant)

Signature or left thumb impression of participant

Date

Signature or left thumb impression of the guardian

Date

Signature of the PI or his/her representative

Date

(NOTE: In case of representative of the PI, she/he shall put her/his full name and designation and then sign)

Consent Form: Enrollment of Control arm women

Written informed consent form for control participants (ever married and currently pregnant women aged 18-49 years) to be interviewed during household survey

Protocol Title:	A community based cluster randomized controlled trial to determine the effectiveness of unconditional Cash transfers and mobile behaviour change communications to reduce child under nutrition in two sub-district of Bangladesh
Protocol number:	PR-17106
Principal investigator:	Tazeen Tahsina
Organization:	Maternal and Child Health Division (MCHD) of icddr,b

Purpose of the research

Assalamualaikum/Adab,

We are working at the International Centre for Diarrheal Diseases Research, Bangladesh (icddr,b). We are doing research for the betterment of maternal and child health in different part of the country including your area. This project activity is implementing in two upazilas of Mymensingh district with the financial assistance of University of Sydney. The information collected from you will be more effectively used for the betterment of the society.

Why invited to participate in the study?

From our previous survey (surveillance) we came to know that you are a permanent resident of this area, your age is between 18-49 years and you are currently married pregnant women. We believe that you will be a suitable candidate for this study. For this we are inviting you to participate in this study.

Enrollment of women (What is expected from the participants of the research study?)

If you agree to participate in this study, we will take 20-25 minutes of your time for the interview. We will give you a basic phone and an active SIM card. If you agree to participate, we will follow you up from now on till 18 months of your child. You can avail regular health GoB health services throughout the period. We hope that we can also learn something from you during this period of time.

Risk

There will be no or minimum risks related to your participation in this study.

Benefits

Participation in this study may not benefit you directly. Even that, the information that you will share will be very useful to further improvement of health status of your area and throughout the country.

Privacy, anonymity and confidentiality

We would keep all information confidential. Only the investigators of this research and Ethical Review Committee (ERC) will have an access to the information. All the information will be kept in a locked cabinet in our Dhaka office. We will not use you name anywhere in the study, instead we will use a number to keep your information confidential.

Future use of information

Anonymous or abstracted information and data may be shared with other researchers within and outside the country. However, this will not conflict with or violate the maintenance of privacy, anonymity and confidentiality of information identifying participants in any way.

Right not to participate and withdraw

Your participation in the study is voluntary, and you have the sole authority to decide for or against your participation. You would also be able to withdraw from participation any time during the study, showing a valid cause. In this case you will have to fill up an exit form while withdrawing. Refusal to participate in the study or withdraw yourself from the study will not cause you any harm and it will not cause any change in your regular healthcare seeking from different government and private facilities.

Principle of compensation

As mentioned earlier, your participation in this study is completely voluntary and you will not get any payment for participating in this study.

Answering your questions/ Contact persons

Tazeen Tahsina, Maternal and Child Health Division, icddr,b is the Principal Investigator of the study. If you have questions about this study, you may communicate with her by calling 9827043 or +8801747219821. And if you have any question regarding your right or benefit to participate in the study you can also contact icddr,b IRB coordinator, Mr. M. A. Salam Khan by calling 9827084 or +8801711428989. Thank you for the cooperation.

Confirmation of Consent

I agree to participate in this research study (start enrolment)

I do not wish to enrol in this study at this time (stop, thank participant)

Signature or left thumb impression of participant

Date

Signature of the PI or his/her representative

Date

(NOTE: In case of representative of the PI, she/he shall put her/his full name and designation and then sign)

Assent form: Enrollment of Control arm women

Written Informed Assent Form for control participants (on behalf of ever married women aged 15 to below 18 years, an adult appropriate family member) to be interviewed during household survey

Protocol Title:	A community based cluster randomized controlled trial to determine the effectiveness of unconditional Cash transfers and mobile behaviour change communications to reduce child under nutrition in two sub-district of Bangladesh
Protocol number:	PR-17106
Principal investigator:	Tazeen Tahsina
Organization:	Maternal and Child Health Division (MCHD) of icddr,b

Purpose of the research

Assalamualaikum/Adab,

We are working at the International Centre for Diarrheal Diseases Research, Bangladesh (icddr,b). We are doing research for the betterment of maternal and child health in different part of the country including your area. This project activity is implementing in two upazilas of Mymensingh district with the financial assistance of University of Sydney. The information collected from you will be more effectively used for the betterment of the society.

Why invited to participate in the study?

From our previous survey (surveillance) we came to know that you are a permanent resident of this area, your age is between 15-18 years and you are currently married pregnant women. We believe that you will be a suitable candidate for this study. For this we are inviting you to participate in this study.

Enrollment of women (What is expected from the participants of the research study?)

If you agree to participate in this study, we will take 20-25 minutes of your time for the interview. We will give you a basic phone and an active SIM card. If you agree to participate, we will follow you up from now on till 18 months of your child. You can avail regular health GoB health services throughout the period. We hope that we can also learn something from you during this period of time.

Risk

There will be no or minimum risks related to your participation in this study.

Benefits

Participation in this study may not benefit you directly. Even that, the information that you will share will be very useful to further improvement of health status of your area and throughout the country.

Privacy, anonymity and confidentiality

We would keep all information confidential. Only the investigators of this research and Ethical Review Committee (ERC) will have an access to the information. All the information will be kept in a locked cabinet in our Dhaka office. We will not use you name anywhere in the study, instead we will use a number to keep your information confidential.

Future use of information

Anonymous or abstracted information and data may be shared with other researchers within and outside the country. However, this will not conflict with or violate the maintenance of privacy, anonymity and confidentiality of information identifying participants in any way.

Right not to participate and withdraw

Your participation in the study is voluntary, and you have the sole authority to decide for or against your participation. You would also be able to withdraw from participation any time during the study, showing a valid cause. In this case you will have to fill up an exit form while withdrawing. Refusal to participate in the study or withdraw yourself from the study will not cause you any harm and it will not cause any change in your regular healthcare seeking from different government and private facilities.

Principle of compensation

As mentioned earlier, your participation in this study is completely voluntary and you will not get any payment for participating in this study.

Answering your questions/ Contact persons

Tazeen Tahsina, Maternal and Child Health Division, icddr,b is the Principal Investigator of the study. If you have questions about this study, you may communicate with her by calling 9827043 or +8801747219821. And if you have any question regarding your right or benefit to participate in the study you can also contact icddr,b IRB coordinator, Mr. M. A. Salam Khan by calling 9827084 or +8801711428989. Thank you for the cooperation.

Confirmation of Consent

I agree to participate in this research study (start enrolment)

I do not wish to enrol in this study at this time (stop, thank participant)

Signature or left thumb impression of participant

Date

Signature or left thumb impression of the guardian

Date

Signature of the PI or his/her representative

Date

(NOTE: In case of representative of the PI, she/he shall put her/his full name and designation and then sign)

Consent Form: Evaluation of all women

Written Informed Consent Form for participants (ever married and currently pregnant women aged 18-49 years) to be interviewed during household survey

Protocol Title:	A community based cluster randomized controlled trial to determine the effectiveness of unconditional Cash transfers and mobile behaviour change communications to reduce child under nutrition in two sub-district of Bangladesh
Protocol number:	PR-17106
Principal investigator:	Tazeen Tahsina
Organization:	Maternal and Child Health Division (MCHD) of icddr,b

Purpose of the research

Assalamualaikum/Adab,

We are working at the International Centre for Diarrheal Diseases Research, Bangladesh (icddr,b). We are doing research for the betterment of maternal and child health in different part of the country including your area. This project activity is implementing in two upazilas of Mymensingh district with the financial assistance of University of Sydney. As part of it, we are interviewing some of the currently pregnant women who already gave consent to participate in our study in your community. The information collected from you will be more effectively used for the betterment of the society.

Why invited to participate in the study?

From our previous survey (surveillance) we came to know that you are a permanent resident of this area, your age is between 18-49 years and you are currently married pregnant women. You also agree to participate in the study for next 24 months. So we are inviting you to participate in this interview. We believe that you can help us in this research by providing valuable information.

Methods and Procedures (What is expected from the participants of the research study?)

If you agree to participate, our data collectors will interview you for several times.

- **Baseline survey:** For the baseline survey, I will visit today and tomorrow and will collect some information regarding you and your family's socio-economic conditions, nutritional knowledge, food security, women empowerment, domestic violence, depression, care seeking practice during pregnancy, delivery & after birth. Which will take 50-60 minutes of your time for the interview.
- **Anthropometry:** A data collection team will visit every month for measuring you and your child's height and weight. These visits are expected to take 10 minutes of your time.
- **Cohort follow up:** Another data collection team will regularly follow up and collect information about your dietary habit, breastfeeding practice, IYCF, morbidity. These follow up visits is expected to take 30 minutes of your time.

We hope that your provided information will be very helpful for us.

Risk

There will be no or minimum risks related to your participation in this study.

Benefits

The information you will provide is very much important for us. The study findings will be very useful to further improvement of nutrition and health status of your area and throughout the country.

Privacy, anonymity and confidentiality

We would keep all information confidential. Only the investigators of this research and Ethical Review Committee (ERC) will have an access to the information. All the information will be kept in a locked cabinet in our Dhaka office. We will not use your name anywhere in the study, instead we will use a number to keep your information confidential.

Future use of information

Anonymous or abstracted information and data may be shared with other researchers within and outside the country. However, this will not conflict with or violate the maintenance of privacy, anonymity and confidentiality of information identifying participants in any way.

Right not to participate and withdraw

Your participation in the study is voluntary, and you have the sole authority to decide for or against your participation. You would also be able to withdraw from participation any time during the study, showing a valid cause. In this case you will have to fill up an exit form while withdrawing. Refusal to participate in the study or withdraw yourself from the study will not cause you any harm and it will not cause any change in your regular healthcare seeking from different government and private facilities.

Principle of compensation

As mentioned earlier, your participation in this study is completely voluntary and you will not get any payment for participating in this study.

Answering your questions/ Contact persons

Tazeen Tahsina, Maternal and Child Health Division, icddr,b is the Principal Investigator of the study. If you have questions about this study, you may communicate with her by calling 9827043 or +8801747219821. And if you have any question regarding your right or benefit to participate in the study you can also contact icddr,b IRB coordinator, Mr. M. A. Salam Khan by calling 9827084 or +8801711428989. Thank you for the cooperation.

Confirmation of Consent

I agree to participate in this research study (start the interview)

I do not wish to enrol in this study at this time (stop, thank participant)

Signature or left thumb impression of participant

Date

Signature of the PI or his/her representative

Date

(NOTE: In case of representative of the PI, she/he shall put her/his full name and designation and then sign)

Assent form: Evaluation of all women

Written Informed Assent Form for participants (on behalf of ever married women aged 15 to below 18 years, an adult appropriate family member) to be interviewed during household survey

Protocol Title:	A community based cluster randomized controlled trial to determine the effectiveness of unconditional Cash transfers and mobile behaviour change communications to reduce child under nutrition in two sub-district of Bangladesh
Protocol number:	PR-17106
Principal investigator:	Tazeen Tahsina
Organization:	Maternal and Child Health Division (MCHD) of icddr,b

Purpose of the research

Assalamualaikum/Adab,

We are working at the International Centre for Diarrheal Diseases Research, Bangladesh (icddr,b). We are doing research for the betterment of maternal and child health in different part of the country including your area. This project activity is implementing in two upazilas of Mymensingh district with the financial assistance of University of Sydney. As part of it, we are interviewing some of the currently pregnant women who already gave consent to participate in our study in your community. The information collected from you will be more effectively used for the betterment of the society.

Why invited to participate in the study?

From our previous survey (surveillance) we came to know that you are a permanent resident of this area, your age is between 15-18 years and you are currently married pregnant women. You also agree to participate in the study for next 24 months. So we are inviting you to participate in this interview. We believe that you can help us in this research by providing valuable information.

Methods and Procedures (What is expected from the participants of the research study?)

If you agree to participate, our data collectors will interview you for several times.

- **Baseline survey:** For the baseline survey, I will visit today and tomorrow and will collect some information regarding you and your family's socio-economic conditions, nutritional knowledge, food security, women empowerment, domestic violence, depression, care seeking practice during pregnancy, delivery & after birth. Which will take 50-60 minutes of your time for the interview.
- **Anthropometry:** A data collection team will visit every month for measuring you and your child's height and weight. These visits are expected to take 10 minutes of your time.
- **Cohort follow up:** Another data collection team will regularly follow up and collect information about your dietary habit, breastfeeding practice, IYCF, morbidity. These follow up visits is expected to take 30 minutes of your time.

We hope that your provided information will be very helpful for us.

Risk

There will be no or minimum risks related to your participation in this study.

Benefits

The information you will provide is very much important for us. The study findings will be very useful to further improvement of nutrition and health status of your area and throughout the country.

Privacy, anonymity and confidentiality

We would keep all information confidential. Only the investigators of this research and Ethical Review Committee (ERC) will have an access to the information. All the information will be kept in a locked cabinet in our Dhaka office. We will not use your name anywhere in the study, instead we will use a number to keep your information confidential.

Future use of information

Anonymous or abstracted information and data may be shared with other researchers within and outside the country. However, this will not conflict with or violate the maintenance of privacy, anonymity and confidentiality of information identifying participants in any way.

Right not to participate and withdraw

Your participation in the study is voluntary, and you have the sole authority to decide for or against your participation. You would also be able to withdraw from participation any time during the study, showing a valid cause. In this case you will have to fill up an exit form while withdrawing. Refusal to participate in the study or withdraw yourself from the study will not cause you any harm and it will not cause any change in your regular healthcare seeking from different government and private facilities.

Principle of compensation

As mentioned earlier, your participation in this study is completely voluntary and you will not get any payment for participating in this study.

Answering your questions/ Contact persons

Tazeen Tahsina, Maternal and Child Health Division, icddr,b is the Principal Investigator of the study. If you have questions about this study, you may communicate with her by calling 9827043 or +8801747219821. And if you have any question regarding your right or benefit to participate in the study you can also contact icddr,b IRB coordinator, Mr. M. A. Salam Khan by calling 9827084 or +8801711428989. Thank you for the cooperation.

Confirmation of Consent

I agree to participate in this research study (start the interview)

I do not wish to enrol in this study at this time (stop, thank participant)

Signature or left thumb impression of participant

Date

Signature or left thumb impression of the guardian

Date

Signature of the PI or his/her representative

Date

(NOTE: In case of representative of the PI, she/he shall put her/his full name and designation and then sign)

Appendix 6: Project Level Women's Empowerment in Agriculture Index questionnaire, intimate partner violence and qualitative questions for Chapter 4 - Assessing the impact of a combined nutrition counselling and cash transfer intervention on women's empowerment in rural Bangladesh: a randomised control trial protocol.

PROJECT-LEVEL WOMEN'S EMPOWERMENT IN AGRICULTURE INDEX
NUTRITION AND HEALTH MODULE
PILOT VERSION
MAY 2018

These survey modules are a DRAFT version of the nutrition and health module of the project-level Women's Empowerment in Agriculture Index (pro-WEAI). The survey questions, format, and required portions are subject to change as the pro-WEAI continues to develop. Updated survey modules may be available from the pro-WEAI team.

Pro-WEAI is a survey-based index for measuring empowerment, agency, and inclusion of women in the agriculture sector. It is being developed jointly by the International Food Policy Research Institute (IFPRI), the Oxford Policy and Human Development Initiative (OPHI), and thirteen partner projects in the portfolio of the Gender, Agriculture, and Assets Project, Phase 2 (GAAP2). The tool helps agricultural development projects assess women's empowerment in a project setting, diagnose areas of women's disempowerment, design strategies to address deficiencies, and monitor project outcomes. Pro-WEAI is an adaptation of the Women's Empowerment in Agriculture Index (WEAI), originally developed in 2012 by IFPRI, the United States Agency for International Development (USAID), and OPHI.

The pro-WEAI nutrition and health module helps agricultural development projects with nutrition-related objectives to understand how they empower women in the area of nutrition and health. The module measures women's agency in relation to nutrition and health decisions and outcomes. It is targeted at mothers with young children (under age 2).

For more information about pro-WEAI, please visit weai.ifpri.info or email Hazel Malapit at h.malapit@cgiar.org.

MODULE X. NUTRITION AND HEALTH										
HOUSEHOLD ID					RESPONDENT ID					
<p>Now I'd like to ask you some questions on making decisions about your health and nutrition.</p> <p>[Note for survey adaptation: Based on specific needs, projects may wish to provide more detailed response categories for other non-household family members (response code 96) listed for question GX.01 and GX.03. Example additions might include, RESPONDENT'S MOTHER (if outside household)...81; RESPONDENT'S MOTHER-IN-LAW (if outside household)...82; A SENIOR CO-WIFE (if outside household)...83; ABSENT HUSBAND...84. These response codes should be in the 80s.]</p>	<p>When decisions are made about [ACTIVITY], who normally takes the decision?</p> <p>ENTER UP TO THREE (3) MEMBER ID's</p> <p>IF RESPONSE IS MEMBER ID (SELF) ONLY → GX.03</p> <p>OTHER CODES: NON-HH, NON-FAMILY MEMBER.....94 NON-HH, FAMILY MEMBER (SPECIFY RELATIONSHIP TO RESPONDENT).....96 NOT APPLICABLE.....98</p>			<p>To what extent do you participate in decisions regarding [ACTIVITY]?</p> <p>CIRCLE ONE</p>		<p>How confident do you feel to make decisions about [ACTIVITY]?</p> <p>CIRCLE ONE</p>		<p>When decisions are made regarding [ACTIVITY], who would you prefer made the decision?</p> <p>ENTER UP TO THREE (3) MEMBER ID's</p> <p>OTHER CODES: NON-HH, NON-FAMILY MEMBER.....95 NON-HH, FAMILY MEMBER (SPECIFY RELATIONSHIP TO RESPONDENT).....96 NOT APPLICABLE.....98</p>		
WOMAN'S HEALTH AND NUTRITION										
		GX.01	GX.02	GX.03	GX.04					
		ID #1	ID #2	ID #3	ID #1	ID #2	ID #3	ID #4	ID #5	
A	Whether or not you consult a doctor or go to a clinic when you are ill?				NOT AT ALL.....1 SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT.....4	NOT AT ALL.....1 SOMEWHAT.....2 VERY CONFIDENT.....3				
B	How much you can rest when you are ill?				NOT AT ALL.....1 SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT.....4	NOT AT ALL.....1 SOMEWHAT.....2 VERY CONFIDENT.....3				
C	What foods to prepare every day?				NOT AT ALL.....1 SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT.....4	NOT AT ALL.....1 SOMEWHAT.....2 VERY CONFIDENT.....3				
D	What foods (available in the house) you can eat?				NOT AT ALL.....1 SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT.....4	NOT AT ALL.....1 SOMEWHAT.....2 VERY CONFIDENT.....3				
E	Whether or not you have a/another child?				NOT AT ALL.....1 SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT.....4	NOT AT ALL.....1 SOMEWHAT.....2 VERY CONFIDENT.....3				
F	Whether or not you use a contraceptive method (such as birth control pills, condoms, hormonal shot, or sterilization)?				NOT AT ALL.....1 SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT.....4	NOT AT ALL.....1 SOMEWHAT.....2 VERY CONFIDENT.....3				
<p>GX.05 Have you been pregnant or given birth within the past 2 years*? (Includes currently pregnant women)</p> <p>[Note for survey adaptation: The timeframe highlighted for GX.04 should be altered to reflect the program implementation period, such that women are only being asked this question if they were pregnant after the start of program implementation. Ideally, this same timeframe should be used at all surveys.]</p>										
								YES.....1		
								NO.....2 → GX.05		

G	Whether you consulted a doctor or went to a clinic during your current or most recent pregnancy?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3			
H	How much you worked during your current or most recent pregnancy?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3			
I	How much you could rest during your current or most recent pregnancy?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3			
J	Whether you could eat eggs during your current or most recent pregnancy?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3			
K	Whether you could consume milk or milk products during your current or most recent pregnancy?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3			
L	Whether you could eat meat, poultry or fish during your current or most recent pregnancy?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3			
M	How much you worked when your youngest child was being breastfed?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4 NOT APPLICABLE98	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3			
N	How much you could rest when your youngest child was being breastfed?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4 NOT APPLICABLE98	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3			
O	Whether you could eat eggs when your youngest child was being breastfed?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4 NOT APPLICABLE98	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3			
P	Whether you could consume milk or milk products when your youngest child was being breastfed?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4 NOT APPLICABLE98	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3			
Q	Whether you could eat meat, poultry or fish when your youngest child was being breastfed?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4 NOT APPLICABLE98	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3			

The next set of questions asks about making decisions about your YOUNGEST child.		When decisions are made about [ACTIVITY], who normally takes the decision?			To what extent do you participate in decisions regarding [ACTIVITY]?		How confident do you feel to make decisions about [ACTIVITY]?		When decisions are made regarding [ACTIVITY], who would you prefer made the decision?		
[Note for survey adaptation: Based on specific needs, projects may wish to provide more detailed response categories for other non-household family members (response code 96) listed for question GX.05 and GX.07. Example additions might include RESPONDENT'S MOTHER (if outside household)...81; RESPONDENT'S MOTHER-IN-LAW (if outside household)...82; A SENIOR CO-WIFE (if outside household)...83; ABSENT HUSBAND...84. These response codes should be in the 80s.]		ENTER UP TO THREE (3) MEMBER ID# IF RESPONSE IS MEMBER ID (SELF) ONLY → GX.07 OTHER CODES: NON-HH, NON-FAMILY MEMBER95 NON-HH, FAMILY MEMBER (SPECIFY RELATIONSHIP TO RESPONDENT).....96 NOT APPLICABLE98			CIRCLE ONE		CIRCLE ONE		ENTER UP TO THREE (3) MEMBER ID# OTHER CODES: NON-HH, NON-FAMILY MEMBER95 NON-HH, FAMILY MEMBER (SPECIFY RELATIONSHIP TO RESPONDENT).....96 NOT APPLICABLE98		
CHILD HEALTH AND NUTRITION		GX.06			GX.07		GX.08		GX.09		
		ID #1	ID #2	ID #3					ID #1	ID #2	ID #3
A	Whether your child is taken to a clinic or a doctor is consulted when he/she is sick?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3					
B	Whether your child gets vaccinations?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3					
C	Whether your child visits the health clinic to see if he/she is growing well?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3					
D	How to feed your child when he/she is sick?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3					
E	Who will care for your child when you need to go outside the home for an extended period of time?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3					
F	Sending your child to school?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3					
G	(If child is ≥6 months of age.) Whether or not your child is offered eggs to eat?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3					
H	(If child is ≥6 months of age.) Whether or not your child is offered milk or milk products, other than breastmilk?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT3					

I	(If child is >6 months of age.) Whether or not your child if offered meat, poultry or fish?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT ...4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT ..3			
GX.10 Do you have a child less than 2 years of age? [Note for survey adaptation: The timeframe highlighted for GX.08 should be altered to reflect the program implementation period, such that women are only being asked this question if the child was born after the start of program implementation. Ideally, this same timeframe should be used at all surveys.]							YES 1 NO..... 2 → GX.09		
J	Whether to breastfeed your child?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT ...4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT ..3			
K	When to stop breastfeeding your child?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT ...4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT ..3			
L	When to start giving foods and liquids (other than breastmilk) to your child?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT ...4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT ..3			
M	(If child is >6 months of age.) Whether or not your child is fed foods prepared or bought especially for children that adult household members do not eat or drink, such as fortified cereals or baby foods?				NOT AT ALL1 SMALL EXTENT2 MEDIUM EXTENT3 TO A HIGH EXTENT ...4	NOT AT ALL1 SOMEWHAT2 VERY CONFIDENT ..3			

The next set of questions asks about making decisions and your ability to obtain the types of food, medicine and other items that you want for you and your child. [Note for survey adaptation: Based on specific needs, projects may wish to provide more detailed response categories for other non-household family members (response code 96) listed for question GX.09. Example additions might include RESPONDENT'S MOTHER (if outside household) ...81; RESPONDENT'S MOTHER-IN-LAW (if outside household)...82; A SENIOR CO-WIFE (if outside household) ...83; ABSENT HUSBAND...84. These response codes should be in the 80s.]				When decisions are made whether or not to purchase [PRODUCT], who generally makes the decision? ENTER UP TO THREE (3) MEMBER ID#s OTHER CODES: NON-HH, NON-FAMILY MEMBER 95 NON-HH, FAMILY MEMBER (SPECIFY RELATIONSHIP TO RESPONDENT) 96 NOT APPLICABLE 98			You may acquire an item that you need in a variety of ways, such as purchasing or cultivating it or having someone purchase or cultivate it for you. When you need [PRODUCT], can you usually acquire it?		
				GX.11			GX.12		
				ID #1	ID #2	ID #3			
A	Small amounts of food, for example smaller than 5 kg						YES.....1 NO.....2 NOT APPLICABLE98		
B	Larger amounts of food, for example larger than 5 kg						YES.....1 NO.....2 NOT APPLICABLE98		
C	Eggs						YES.....1 NO.....2 NOT APPLICABLE98		
D	Milk or milk products						YES.....1 NO.....2 NOT APPLICABLE98		
E	Meat, poultry or fish (including organ meats)						YES.....1 NO.....2 NOT APPLICABLE98		
F	Special foods for children (i.e., foods prepared or bought especially for children that adult household members do not eat or drink, such as fortified cereals or baby foods) that programs or health workers tell you should be consumed						YES.....1 NO.....2 NOT APPLICABLE98		
G	Any nutritious foods that a program or health worker told you to eat or drink						YES.....1 NO.....2 NOT APPLICABLE98		
H	Medication, vitamins or supplements for children						YES.....1 NO.....2 NOT APPLICABLE98		
I	Medication, vitamins or supplements for yourself						YES.....1 NO.....2 NOT APPLICABLE98		
J	Clothing for children						YES.....1 NO.....2 NOT APPLICABLE98		
K	Clothing for yourself						YES.....1 NO.....2 NOT APPLICABLE98		
L	Toiletries, such as soap and toothpaste						YES.....1 NO.....2 NOT APPLICABLE98		

Appendix C: Pro-WEAI survey modules

MODULE G. WOMEN'S EMPOWERMENT IN AGRICULTURE INDEX – Pilot Pro-WEAI Version

MODULE G1. INDIVIDUAL IDENTIFICATION

G1.01. HOUSEHOLD IDENTIFICATION:		G1.04 TYPE OF HOUSEHOLD	MALE AND FEMALE ADULT.....1 FEMALE ADULT ONLY.....2
G1.02. NAME OF RESPONDENT CURRENTLY BEING INTERVIEWED (ID CODE FROM ROSTER IN SECTION B HOUSEHOLD ROSTER):		G1.05. OUTCOME OF INTERVIEW: CIRCLE ONE	COMPLETED.....1 HOUSEHOLD MEMBER TOO ILL TO RESPOND/COGNITIVELY IMPAIRED...2 RESPONDENT NOT AT HOME/TEMPORARILY UNAVAILABLE.....3 RESPONDENT NOT AT HOME/EXTENDED ABSENCE.....4 REFUSED.....5 COULD NOT LOCATE.....6
SURNAME, OTHER NAME:			
G1.03. SEX OF RESPONDENT:	MALE.....1 FEMALE.....2	G1.06. ABILITY TO BE INTERVIEWED ALONE: CIRCLE ONE	ALONE.....1 WITH ADULT FEMALES PRESENT.....2 WITH ADULT MALES PRESENT.....3 WITH ADULTS OF BOTH SEX PRESENT.....4 WITH CHILDREN PRESENT.....5 WITH ADULTS OF BOTH SEX AND CHILDREN PRESENT.....6

HOUSEHOLD IDENTIFICATION (IN DATA FILE, EACH SUB-MODULE (G2-G8) MUST BE LINKED WITH A HH AND RESPONDENT ID)	HOUSEHOLD ID							
	RESPONDENT ID							

MODULE G2: ROLE IN HOUSEHOLD DECISION-MAKING AROUND PRODUCTION AND INCOME

Now I'd like to ask you some questions about your participation in certain types of work activities and on making decisions on various aspects of household life.	Did you [NAME] participate in [ACTIVITY] in the past 12 months (that is, during the last [one/two] cropping seasons), from [PRESENT MONTH] last year to [PRESENT MONTH] this year?	When decisions are made regarding [ACTIVITY], who is it that normally takes the decision? ENTER UP TO THREE (3) MEMBER IDs IF RESPONSE IS MEMBER ID (SELF) ONLY → G2.05 OTHER CODES: NON-HH MEMBER.....94 NOT APPLICABLE.....96 → NEXT ACTIVITY	How much input did you have in making decisions about [ACTIVITY]? USE CODE G2↓	To what extent do you feel you can participate in decisions regarding [ACTIVITY] if you want(ed) to? CIRCLE ONE	To what extent are you able to access information that you feel is important for making informed decisions regarding [ACTIVITY]? CIRCLE ONE	How much input did you have in decisions about how to use income generated from [ACTIVITY]? USE CODE G2↓	
ACTIVITY	G2.01	G2.02 ID #1 ID #2 ID #3	G2.03	G2.04	G2.05	G2.06	G2.07
A Staple grain farming and processing of the harvest: grains that are grown primarily for food consumption (rice, maize, wheat, millet)	YES.....1 NO.....2 → ACTIVITY B			NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4	NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4		
B Horticultural (gardens) or high value crop farming and processing of the harvest	YES.....1 NO.....2 → ACTIVITY C			NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4	NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4		

C	Large livestock raising (cattle, buffaloes) and processing of milk and/or meat	YES.....1 NO.....2 → ACTIVITY D					NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4	NOT AT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4		
D	Small livestock raising (sheep, goats, pigs) and processing of milk and/or meat	YES.....1 NO.....2 → ACTIVITY E					NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4	NOT AT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4		
E	Poultry and other small animals raising (chickens, ducks, turkeys) and processing of eggs and/or meat	YES.....1 NO.....2 → ACTIVITY F					NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4	NOT AT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4		

CODE G2	
LITTLE TO NO INPUT IN DECISIONS	1
INPUT INTO SOME DECISIONS	2
INPUT INTO MOST OR ALL DECISIONS	3
NOT APPLICABLE / NO DECISION MADE	98

	Did you [NAME] participate in [ACTIVITY] in the past 12 months (that is, during the last [one/two] cropping seasons), from [PRESENT MONTH] last year to [PRESENT MONTH] this year?	When decisions are made regarding [ACTIVITY], who is it that normally takes the decision? ENTER UP TO THREE (3) MEMBER IDs IF RESPONSE IS MEMBER ID (SELF ONLY) → G2.05 OTHER CODES: NON-HH MEMBER.....94 NOT APPLICABLE.....98 → NEXT ACTIVITY	How much input did you have in making decisions about [ACTIVITY]?	To what extent do you feel you can participate in decisions regarding [ACTIVITY] if you want(ed) to? CIRCLE ONE	To what extent are you able to access information that you feel is important for making informed decisions regarding [ACTIVITY]? CIRCLE ONE	How much input did you have in decisions about how much of the outputs of [ACTIVITY] to keep for consumption at home rather than selling? USE CODE G2↓	How much input did you have in decisions about how to use income generated from [ACTIVITY]? USE CODE G2↓	
ACTIVITY	G2.01	G2.02 ID #1 ID #2 ID #3	G2.03	G2.04	G2.05	G2.06	G2.07	
F	Fishpond culture	YES.....1 NO.....2 → ACTIVITY G			NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4	NOT AT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4		
G	Non-farm economic activities (running a small business, self-employment, buy-and-sell)	YES.....1 NO.....2 → ACTIVITY H			NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4	NOT AT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4		

H	Wage and salary employment (work that is paid for in cash or in-kind, including both agriculture and other wage work)	YES.....1 NO.....2 → ACTIVITY I					NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4	NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4		
I	Large, occasional household purchases (bicycles, land, transport vehicles)						NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4	NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4		
J	Routine household purchases (food for daily consumption or other household needs)						NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4	NOT ALL.....1 AT SMALL EXTENT.....2 MEDIUM EXTENT.....3 TO A HIGH EXTENT...4		

CODE G2	
LITTLE TO NO INPUT IN DECISIONS	1
INPUT INTO SOME DECISIONS	2
INPUT INTO MOST OR ALL DECISIONS	3
NOT APPLICABLE / NO DECISION MADE	98

5

HOUSEHOLD ID									
RESPONDENT ID									

MODULE G3(A): ACCESS TO PRODUCTIVE CAPITAL

Now I'd like to ask you specifically about your household's land.			
QUESTION	RESPONSE		
G3.01. Does anyone in your household currently own or cultivate land?	YES.....1 NO.....2 → G3.06, ITEM A		
G3.02. Who generally makes decisions about what to plant on this land?	ENTER UP TO THREE (3) MEMBER IDs: OTHER CODES: NON-HH MEMBER.....94 NOT APPLICABLE.....98	ID #1	ID #2 ID #3
G3.03. Do you [NAME] solely or jointly cultivate any land?	CIRCLE ONE	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4	
G3.04. Who generally makes decisions about what to plant on the land that you yourself cultivate?	ENTER UP TO THREE (3) MEMBER IDs: OTHER CODES: NON-HH MEMBER.....94 NOT APPLICABLE.....98	ID #1	ID #2 ID #3
G3.05. Do you own any of the land owned or cultivated by your household?	CIRCLE ONE	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4	

6

Now I'd like to ask you about a number of items that could be used to generate income.		Does anyone in your household currently have any [ITEM]?	Do you [NAME] own any [ITEM]?
ITEM		G3.06	G3.07
A	Large livestock (cattle, buffaloes)	YES.....1 NO.....2 → ITEM B	CIRCLE ONE YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4
B	Small livestock (sheep, goats, pigs)	YES.....1 NO.....2 → ITEM C	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4
C	Poultry and other small animals (chickens, ducks, turkeys)	YES.....1 NO.....2 → ITEM D	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4
D	Fish pond or fishing equipment	YES.....1 NO.....2 → ITEM E	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4
E	Non-mechanized farm equipment (hand tools, animal-drawn plough)	YES.....1 NO.....2 → ITEM F	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4
F	Mechanized farm equipment (tractor-plough, power tiller, treadle pump)	YES.....1 NO.....2 → ITEM G	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4
G	Non-farm business equipment (solar panels used for recharging, sewing machine, brewing equipment, fryers)	YES.....1 NO.....2 → ITEM H	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4
H	House or building	YES.....1 NO.....2 → ITEM I	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4
I	Large consumer durables (refrigerator, TV, sofa)	YES.....1 NO.....2 → ITEM J	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4

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		Does anyone in your household currently own any [ITEM]?	Do you [NAME] own any [ITEM]?
ITEM		G3.06	G3.07
J	Small consumer durables (radio, cookware)	YES.....1 NO.....2 → ITEM K	CIRCLE ONE YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4
K	Cell phone	YES.....1 NO.....2 → ITEM L	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4
L	Other land not used for agricultural purposes (pieces/plots, residential or commercial land)	YES.....1 NO.....2 → ITEM M	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4
M	Means of transportation (bicycle, motorcycle, car)	YES.....1 NO.....2 → MODULE G3(B)	YES, SOLELY 1 YES, JOINTLY 2 YES, SOLELY AND JOINTLY 3 NO 4

MODULE G3(B): ACCESS TO FINANCIAL SERVICES

Next I'd like to ask about your household's experience with borrowing money or other items (in-kind) in the past 12 months.	Would you or anyone in your household be able to take a loan or borrow cash/in-kind from [SOURCE] if you wanted to?	Has anyone in your household taken any loans or borrowed cash/in-kind from [SOURCE] in the past 12 months? CIRCLE ONE	Who made the decision to borrow from [SOURCE] most of the time? ENTER UP TO THREE (3) MEMBER ID's OTHER CODES: NON-HH MEMBER.....94 NOT APPLICABLE.....98	Who makes the decision about what to do with the money or item borrowed from [SOURCE] most of the time? ENTER UP TO THREE (3) MEMBER ID's OTHER CODES: NON-HH MEMBER.....94 NOT APPLICABLE.....98	Who is responsible for repaying the money or item borrowed from [SOURCE]? ENTER UP TO THREE (3) MEMBER ID's OTHER CODES: NON-HH MEMBER.....94 NOT APPLICABLE.....98						
LENDING SOURCES	G3.08	G3.09	G3.10			G3.11			G3.12		
			ID #1	ID #2	ID #3	ID #1	ID #2	ID #3	ID #1	ID #2	ID #3
A Non-governmental organization (NGO)	YES.....1 NO.....2 → SOURCE B MAYBE.....3	YES, CASH 1 YES, IN-KIND 2 YES, CASH AND IN-KIND 3 NO 4 SOURCE B → DON'T KNOW 97									
B Formal lender (bank/financial institution)	YES.....1 NO.....2 → SOURCE C MAYBE.....3	YES, CASH 1 YES, IN-KIND 2 YES, CASH AND IN-KIND 3 NO 4 SOURCE C → KNOW 97									
C Informal lender	YES.....1 NO.....2 → SOURCE D MAYBE.....3	YES, CASH 1 YES, IN-KIND 2 YES, CASH AND IN-KIND 3 NO 4 SOURCE D → KNOW 97									
D Friends or relatives	YES.....1 NO.....2 → SOURCE E MAYBE.....3	YES, CASH 1 YES, IN-KIND 2 YES, CASH AND IN-KIND 3 NO 4 SOURCE E → KNOW 97									

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E Group based micro-finance or lending including VSLAs / SACCOs	YES.....1 NO.....2 → SOURCE F MAYBE.....3	YES, CASH 1 YES, IN-KIND 2 YES, CASH AND IN-KIND 3 NO 4 SOURCE F → KNOW 97									
F Informal credit / savings groups (e.g., merry-go-rounds, tontines, funeral societies, etc.)	YES.....1 NO.....2 → G3.13 MAYBE.....3	YES, CASH 1 YES, IN-KIND 2 YES, CASH AND IN-KIND 3 NO 4 G3.13 → DON'T KNOW 97									

G3.13	An account can be used to save money, to make or receive payments, or to receive wages or financial help. Do you, either by yourself or together with someone else, currently have an account at any of the following places: a bank or other formal institution (e.g., post office)?	YES 1 NO 2 DON'T KNOW 97
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HOUSEHOLD ID							
RESPONDENT ID							

MODULE G5: GROUP MEMBERSHIP

Now I'm going to ask you about groups in the community. These can be either formal or informal and customary groups.		Is there a [GROUP] in your community?	Is this group composed of all male or female or mixed-sex members?	Are you an active member of this [GROUP]?	To what extent do you feel like you can influence decisions in this [GROUP]?	To what extent does this [GROUP] influence life in the community beyond the group?
GROUP CATEGORIES		G5.01	G5.02	G5.03	G5.04	G5.05
A	Agricultural / livestock / fisheries producer's group (including marketing groups)	YES 1 NO 2 DON'T KNOW 97 GROUP B	ALL MALE 1 ALL FEMALE 2 MIXED SEX 3 DON'T KNOW 97	YES 1 NO 2 GROUP B	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4
B	Water users' group	YES 1 NO 2 DON'T KNOW 97 GROUP C	ALL MALE 1 ALL FEMALE 2 MIXED SEX 3 DON'T KNOW 97	YES 1 NO 2 GROUP C	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4
C	Forest users' group	YES 1 NO 2 DON'T KNOW 97 GROUP D	ALL MALE 1 ALL FEMALE 2 MIXED SEX 3 DON'T KNOW 97	YES 1 NO 2 GROUP D	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4
D	Credit or microfinance group (including SACCOs / merry-go-rounds / VSLAs)	YES 1 NO 2 DON'T KNOW 97 GROUP E	ALL MALE 1 ALL FEMALE 2 MIXED SEX 3 DON'T KNOW 97	YES 1 NO 2 GROUP E	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4

E	Mutual help or insurance group (including burial societies)	YES 1 NO 2 DON'T KNOW 97 GROUP F	ALL MALE 1 ALL FEMALE 2 MIXED SEX 3 DON'T KNOW 97	YES 1 NO 2 GROUP F	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4
F	Trade and business association group	YES 1 NO 2 DON'T KNOW 97 GROUP G	ALL MALE 1 ALL FEMALE 2 MIXED SEX 3 DON'T KNOW 97	YES 1 NO 2 GROUP G	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4
G	Civic group (improving community) or charitable group (helping others)	YES 1 NO 2 DON'T KNOW 97 GROUP H	ALL MALE 1 ALL FEMALE 2 MIXED SEX 3 DON'T KNOW 97	YES 1 NO 2 GROUP H	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4
H	Religious group	YES 1 NO 2 DON'T KNOW 97 GROUP I	ALL MALE 1 ALL FEMALE 2 MIXED SEX 3 DON'T KNOW 97	YES 1 NO 2 GROUP I	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4
I	Other (specify): _____	YES 1 NO 2 DON'T KNOW 97 MODULE G6	ALL MALE 1 ALL FEMALE 2 MIXED SEX 3 DON'T KNOW 97	YES 1 NO 2 MODULE G6	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4	NOT AT ALL 1 SMALL EXTENT 2 MEDIUM EXTENT 3 HIGH EXTENT 4

HOUSEHOLD ID							
RESPONDENT ID							

MODULE G6. PHYSICAL MOBILITY

QUESTION	RESPONSE
	FOR G6.01 - G6.06: USE CODE G6↓
G6.01 How often do you visit an urban center?	
G6.02 How often do you go to the market / haat / bazaar?	
G6.03 How often do you go to visit family or relatives?	
G6.04 How often do you go to visit a friend / neighbor's house?	
G6.05 How often do you go to the hospital / clinic / doctor (seek health service)?	
G6.06 How often do you go to a public village gathering / community meeting / training for NGO or programs?	
G6.07. In the last 12 months, how many times have you been away from home for one or more nights (in other words, sleeping somewhere else for the night)?	
G6.08. In the last 12 months, have you been away from home for more than one month at a time?	YES.....1 NO.....2 IF RESPONDENT IS <u>MALE</u> →MODULE 67

CODE G6	
EVERYDAY	1
EVERY WEEK AT LEAST ONCE	2
EVERY 2 WEEKS AT LEAST ONCE	3
EVERY MONTH AT LEAST ONCE	4
LESS THAN ONCE A MONTH	5
NEVER	6

REMAINDER OF MODULE (G6.09-G6.08) SHOULD ONLY BE ASKED IF RESPONDENT IS FEMALE

Now I'd like to ask you some questions about different places you might visit.		Who usually decides whether you can go to [PLACE]?			Does your husband/partner or other household member object to you going <u>alone</u> to [PLACE]?	Under what circumstances would this person <u>NOT</u> object to your going to [PLACE] alone? CIRCLE <u>ALL</u> APPLICABLE	Do these objections prevent you from going <u>alone</u> to [PLACE]?
PLACE		G6.09			G6.10	G6.11	G6.12
		ID #1	ID #2	ID #3			
A	Urban center				YES.....1 NO.....2 → PLACE B	IF I HAVE COMPANY (RELATIVES, CHILDREN).....1 IF I CAN ARRANGE MY OWN EXPENSES (FOR TRANSPORT).....2 IF I FOLLOW PURDAH / DRESS ACCEPTABLY.....3 OTHER (SPECIFY).....4 UNDER NO CIRCUMSTANCES WOULD I BE ALLOWED TO GO.....5 → PLACE B	YES.....1 NO.....2
B	Market / haat / bazaar				YES.....1 NO.....2 → PLACE C	IF I HAVE COMPANY (RELATIVES, CHILDREN).....1 IF I CAN ARRANGE MY OWN EXPENSES (FOR TRANSPORT).....2 IF I FOLLOW PURDAH / DRESS ACCEPTABLY.....3 OTHER (SPECIFY).....4 UNDER NO CIRCUMSTANCES WOULD I BE ALLOWED TO GO.....5 → PLACE C	YES.....1 NO.....2
C	Visit family or relatives				YES.....1 NO.....2 → PLACE D	IF I HAVE COMPANY (RELATIVES, CHILDREN).....1 IF I CAN ARRANGE MY OWN EXPENSES (FOR TRANSPORT).....2 IF I FOLLOW PURDAH / DRESS ACCEPTABLY.....3 OTHER (SPECIFY).....4 UNDER NO CIRCUMSTANCES WOULD I BE ALLOWED TO GO.....5 → PLACE D	YES.....1 NO.....2
D	Visit a friend / neighbor's house				YES.....1 NO.....2 → PLACE E	IF I HAVE COMPANY (RELATIVES, CHILDREN).....1 IF I CAN ARRANGE MY OWN EXPENSES (FOR TRANSPORT).....2 IF I FOLLOW PURDAH / DRESS ACCEPTABLY.....3 OTHER (SPECIFY).....4 UNDER NO CIRCUMSTANCES WOULD I BE ALLOWED TO GO.....5 → PLACE E	YES.....1 NO.....2

E	Hospital / clinic / doctor (seek health service)				YES.....1 NO.....2 → PLACE F	IF I HAVE COMPANY (RELATIVES, CHILDREN).....1 IF I CAN ARRANGE MY OWN EXPENSES (FOR TRANSPORT).....2 IF I FOLLOW PURDAH / DRESS ACCEPTABLY.....3 OTHER (SPECIFY).....4 UNDER NO CIRCUMSTANCES WOULD I BE ALLOWED TO GO.....5 → PLACE F	YES.....1 NO.....2
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	Who usually decides whether you can go to [PLACE]?	Does your husband/partner or other household member object to you going alone to [PLACE]?	Under what circumstances would this person <u>NOT</u> object to your going to [PLACE] alone?	Do these objections prevent you from going <u>alone</u> to [PLACE]?
	ENTER UP TO THREE (3) MEMBER ID's IF RESPONSE IS MEMBER ID (SELF) ONLY → NEXT PLACE OTHER CODES: NON-HH MEMBER.....94 NOT APPLICABLE.....98		CIRCLE <u>ALL</u> APPLICABLE	
PLACE	G6.09	G6.10	G6.11	G6.12
	ID #1 ID #2 ID #3			
F	Temple / church / mosque	YES.....1 NO.....2 → PLACE G	IF I HAVE COMPANY (RELATIVES, CHILDREN).....1 IF I CAN ARRANGE MY OWN EXPENSES (FOR TRANSPORT).....2 IF I FOLLOW PURDAH / DRESS ACCEPTABLY.....3 OTHER (SPECIFY).....4 UNDER NO CIRCUMSTANCES WOULD I BE ALLOWED TO GO.....5 → PLACE G	YES.....1 NO.....2
G	Public village gathering or community meeting	YES.....1 NO.....2 → PLACE H	IF I HAVE COMPANY (RELATIVES, CHILDREN).....1 IF I CAN ARRANGE MY OWN EXPENSES (FOR TRANSPORT).....2 IF I FOLLOW PURDAH / DRESS ACCEPTABLY.....3 OTHER (SPECIFY).....4 UNDER NO CIRCUMSTANCES WOULD I BE ALLOWED TO GO.....5 → PLACE H	YES.....1 NO.....2

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H	Training for NGO / programs				YES.....1 NO.....2 → PLACE I	IF I HAVE COMPANY (RELATIVES, CHILDREN).....1 IF I CAN ARRANGE MY OWN EXPENSES (FOR TRANSPORT).....2 IF I FOLLOW PURDAH / DRESS ACCEPTABLY.....3 OTHER (SPECIFY).....4 UNDER NO CIRCUMSTANCES WOULD I BE ALLOWED TO GO.....5 → PLACE I	YES.....1 NO.....2
I	Outside your community or village				YES.....1 NO.....2 → MODULE G7	IF I HAVE COMPANY (RELATIVES, CHILDREN).....1 IF I CAN ARRANGE MY OWN EXPENSES (FOR TRANSPORT).....2 IF I FOLLOW PURDAH / DRESS ACCEPTABLY.....3 OTHER (SPECIFY).....4 UNDER NO CIRCUMSTANCES WOULD I BE ALLOWED TO GO.....5 → MODULE G7	YES.....1 NO.....2

HOUSEHOLD ID						
RESPONDENT ID						

MODULE G7: INTRAHOUSEHOLD RELATIONSHIPS

Now I'd like to ask you some questions about how you feel about some of other people in your household or family group and how you think they feel about you.		Do you [NAME] respect your [RELATION]?	Does your [RELATION] respect you?	Do you trust your [RELATION] to do things that are in your best interest?	When you disagree with your [RELATION], do you feel comfortable telling him/her that you disagree?	IS [RELATION] THE OTHER RESPONDENT WITHIN THIS HOUSEHOLD?	Is there a co-wife within your household?
ENTER MEMBER ID FOR EACH RELATION OTHER CODES: NON-HH MEMBER.....94							
RELATION		G7.02	G7.03	G7.04	G7.05	G7.06	G7.07
A	Husband / wife	ID #	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	YES...1 → RELATION C NO....2
B	Other respondent within the household	ID #	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	
C	IF RESPONDENT IS MALE: Father (or adapt this category to capture	ID #	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	YES...1 NO....2 → MODULE G8(A)

	other important relationship)					MALE → MODULE G8(A)	
	IF RESPONDENT IS FEMALE: Mother-in-law						
D	Most senior co-wife (the person who was in the household just before you, or, if you are the senior wife, the one who married into the household after you)	ID #	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	MOST OF THE TIME.....1 SOMETIMES.....2 RARELY.....3 NEVER.....4	

HOUSEHOLD ID							
RESPONDENT ID							

MODULE G8(A): AUTONOMY IN DECISION-MAKING

<p>Now I am going to read you some stories about different farmers and their situations regarding different agricultural activities. This question format is different from the rest so take your time in answering. For each I will then ask you how much you are like or not like each of these people. We would like to know if you are completely different from them, similar to them, or somewhere in between. There are no right or wrong answers to these questions.</p> <p>READ ALOUD EACH STORY, SUBSEQUENT QUESTIONS, AND RESPONSE CODES. NAMES SHOULD BE ADOPTED TO LOCAL CONTEXT AND BE MALE/FEMALE DEPENDING ON THE SEX OF THE RESPONDENT. THE ORDER OF TOPICS A-D SHOULD BE RANDOMIZED, AND WITHIN EACH TOPIC, THE ORDER OF STORIES 1-4 SHOULD BE RANDOMIZED.</p>		Are you like this person? CIRCLE ONE	Are you completely the same or somewhat the same? CIRCLE ONE	Are you completely different or somewhat different? CIRCLE ONE
STORY		G8.01	G8.02	G8.03
The types of crops to grow or raise for consumption and sale in market	A1	"[PERSON'S NAME] cannot grow other types of crops here for consumption and sale in market. Beans, sweet potato and maize" YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → A2 SOMEWHAT THE SAME.....2 → A2	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → A2
	A2	"[PERSON'S NAME] is a farmer and grows beans, sweet potato, and maize because her spouse, or another person or group in her community tells her she must grow these crops. She does what they tell her to do." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → A3 SOMEWHAT THE SAME.....2 → A3	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → A3
	A3	"[PERSON'S NAME] grows the crops for agricultural production that her family or community expect. She wants them to approve of her as a good farmer." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → A4 SOMEWHAT THE SAME.....2 → A4	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → A4
	A4	"[PERSON'S NAME] chooses the crops that she personally wants to grow for consumption and sale in market and thinks are best for herself and her family. She values growing these crops. If she changed her mind, she could act differently." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → B1 SOMEWHAT THE SAME.....2 → B1	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → B1
Livestock raising	B1	"[PERSON'S NAME] cannot raise any livestock other than what she has. These are all that do well here." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → B2 SOMEWHAT THE SAME.....2 → B2	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → B2

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	B2	"[PERSON'S NAME] raises the types of livestock she does because her spouse, or another person or group in her community tell her she must use these breeds. She does what they tell her to do." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → B3 SOMEWHAT THE SAME.....2 → B3	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → B3
	B3	"[PERSON'S NAME] raises the kinds of livestock that her family or community expect. She wants them to approve of her as a good livestock raiser." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → B4 SOMEWHAT THE SAME.....2 → B4	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → B4
	B4	"[PERSON'S NAME] chooses the types of livestock that she personally wants to raise and thinks are good for herself and her family. She values raising these types. If she changed her mind, she could act differently." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → C1 SOMEWHAT THE SAME.....2 → C1	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → C1

<p>READ ALOUD EACH STORY, SUBSEQUENT QUESTIONS, AND RESPONSE CODES. NAMES SHOULD BE ADOPTED TO LOCAL CONTEXT AND BE MALE/FEMALE DEPENDING ON THE SEX OF THE RESPONDENT.</p>		Are you like this person?	Are you completely the same or somewhat the same?	Are you completely different or somewhat different?
STORY		G8 01	G8 02	G8 03
Taking crops or livestock (incl. eggs or milk) to the market (or not)	C1	"There is no alternative to how much or how little of her crops or livestock [PERSON'S NAME] can take to the market. She is taking the only possible amount." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → C2 SOMEWHAT THE SAME.....2 → C2	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → C2
	C2	"[PERSON'S NAME] takes crops and livestock to the market because her spouse, or another person or group in her community tell her she must sell them there. She does what they tell her to do." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → C3 SOMEWHAT THE SAME.....2 → C3	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → C3
	C3	"[PERSON'S NAME] takes the crops and livestock to the market that her family or community expect. She wants them to approve of her." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → C4 SOMEWHAT THE SAME.....2 → C4	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → C4
	C4	"[PERSON'S NAME] chooses to take the crops and livestock to market that she personally wants to sell there, and thinks is best for herself and her family. She values this approach to sales. If she changed her mind, she could act differently." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → D1 SOMEWHAT THE SAME.....2 → D1	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → D1
How to use income	D1	"There is no alternative to how [PERSON'S NAME] uses her income. How she uses her income is determined by necessity." YES...1 NO....2 G8.03	COMPLETELY THE SAME...1 → D2 SOMEWHAT THE SAME.....2 → D2	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2 → D2

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generated from agricultural and non-agricultural activities	D2	"[PERSON'S NAME] uses her income how her spouse, or another person or group in her community tell her she must use it there. She does what they tell her to do."	YES...1 NO.....2 → G8.03	COMPLETELY THE SAME...1 → D3 SOMEWHAT THE SAME.....2 → G8.03	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT...2
	D3	"[PERSON'S NAME] uses her income in the way that her family or community expect. She wants them to approve of her."	YES...1 NO.....2 → G8.03	COMPLETELY THE SAME...1 → D4 SOMEWHAT THE SAME.....2 → G8.03	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT...2
	D4	"[PERSON'S NAME] chooses to use her income how she personally wants to, and thinks is best for herself and her family. She values using her income in this way. If she changed her mind, she could act differently."	YES...1 NO.....2 → G8.03	COMPLETELY THE SAME...1 → G8.04 SOMEWHAT THE SAME.....2 → G8.04	COMPLETELY DIFFERENT...1 SOMEWHAT DIFFERENT.....2

MODULE G8(B): NEW GENERAL SELF-EFFICACY SCALE

Now I'm going to ask you some questions about different feelings you might have. Please listen to each of the following statements. Think about how each statement relates to your life, and then tell me how much you agree or disagree with the statement on a scale of 1 to 5, where 1 means you "strongly disagree" and 5 means you "strongly agree." (Note: Randomize order of statements)

STATEMENTS	G8.04
A I will be able to achieve most of the goals that I have set for myself.	STRONGLY DISAGREE 1 DISAGREE 2 NEITHER AGREE NOR DISAGREE 3 AGREE 4 STRONGLY AGREE 5
B When facing difficult tasks, I am certain that I will accomplish them.	STRONGLY DISAGREE 1 DISAGREE 2 NEITHER AGREE NOR DISAGREE 3 AGREE 4 STRONGLY AGREE 5
C In general, I think that I can obtain outcomes that are important to me.	STRONGLY DISAGREE 1 DISAGREE 2 NEITHER AGREE NOR DISAGREE 3 AGREE 4 STRONGLY AGREE 5
D I believe I can succeed at most any endeavor to which I set my mind	STRONGLY DISAGREE 1 DISAGREE 2 NEITHER AGREE NOR DISAGREE 3 AGREE 4 STRONGLY AGREE 5

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E I will be able to successfully overcome many challenges.	STRONGLY DISAGREE 1 DISAGREE 2 NEITHER AGREE NOR DISAGREE 3 AGREE 4 STRONGLY AGREE 5
F I am confident that I can perform effectively on many different tasks.	STRONGLY DISAGREE 1 DISAGREE 2 NEITHER AGREE NOR DISAGREE 3 AGREE 4 STRONGLY AGREE 5
G Compared to other people, I can do most tasks very well.	STRONGLY DISAGREE 1 DISAGREE 2 NEITHER AGREE NOR DISAGREE 3 AGREE 4 STRONGLY AGREE 5
H Even when things are tough, I can perform quite well.	STRONGLY DISAGREE 1 DISAGREE 2 NEITHER AGREE NOR DISAGREE 3 AGREE 4 STRONGLY AGREE 5

MODULE G8(C): LIFE SATISFACTION

The following questions ask how satisfied you feel with your life as a whole, on a scale from 1 to 5, where 1 means you feel "very dissatisfied" and 5 means you feel "very satisfied."

STATEMENTS	G8.05
A Overall, how satisfied are you with life as a whole these days?	VERY DISSATISFIED 1 DISSATISFIED 2 NEITHER SATISFIED NOR DISSATISFIED 3 SATISFIED 4 VERY SATISFIED 5
B Overall, how satisfied with your life were you 5 years ago?	VERY DISSATISFIED 1 DISSATISFIED 2 NEITHER SATISFIED NOR DISSATISFIED 3 SATISFIED 4 VERY SATISFIED 5
C As your best guess, overall how satisfied with your life do you expect to feel 5 years from today?	VERY DISSATISFIED 1 DISSATISFIED 2 NEITHER SATISFIED NOR DISSATISFIED 3

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	SATISFIED 4 VERY SATISFIED 5
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HOUSEHOLD ID									
RESPONDENT ID									

MODULE G9. Attitudes about Domestic Violence

Now I would like to ask about your opinion on the following issues. Please keep in mind that I am not asking about your personal experience or whether the following scenarios have happened to you. I would only like to know whether you think the following issues are acceptable.		In your opinion, is a husband justified in hitting or beating his wife in the following situations?	
SITUATION		G9.01	
A	If she goes out without telling him?	YES 1 NO 2 DON'T KNOW 97	
B	If she neglects the children?	YES 1 NO 2 DON'T KNOW 97	
C	If she argues with him?	YES 1 NO 2 DON'T KNOW 97	
D	If she refuses to have sex with him?	YES 1 NO 2 DON'T KNOW 97	
E	If she burns the food?	YES 1 NO 2 DON'T KNOW 97	

Shonjibon Cash and Counselling IPV Questions

We know when two people marry, they usually share both good and bad moments. Now I would like to ask you some questions about how your current husband behaves with you. During our conversation if anyone interrupts us, we will change the topic.

CODE	QUESTION												
V 04	The next questions are about things that happen to many women, and has your current husband ever acted in the following manners?	A) if yes continue to B if no continue to next question		B) has this happened in the last 12 months? (If yes ask C and D if no ask D only)		C) in the past 12 months would you say that this has happened once, a few times or many times?			D) Did this happen before the past 12 months? If YES, would you say that this has happened once, a few times or many times?				
		Yes	No	Yes	No	once	few times(2-5)	many(5+)	no	once	few times(2-5)	many times (5+)	
		1	2	1	2	1	2	3	0	1	2	3	
PSYCHOLOGICAL / EMOTIONAL													
a)	Did your husband insult you in a manner by which you were humiliated or felt bad about yourself at any time?												
b)	Did your husband belittle or humiliate you in front of other people?												
c)	Did your husband do anything to scare or intimidate you on purpose (such as scream at you or break something)?												
d)	Did your husband verbally threaten to hurt you or act in a manner by which you were terrified?												

e)	Did your husband torture you for socializing with your neighbours or other women?				
f)	Did your husband threaten to marry other women?				
g)	Did your husband threaten to divorce you?				
V 04E	Did your husband torture you for keeping relation or communicating with your parental relatives?				
PHYSICAL					
V 05	Has your husband ever acted in the following manner?				
a)	Slapped, punched or threw something at you by which you were injured?				
b)	Pushed you, shoved you or pulled your hair?				
c)	Burnt you with hot things?				
d)	Threw acid intentionally?				
e)	Threw hot water / oil / milk / peas etc intentionally?				
f)	Kicked you, dragged you or beat you up?				
g)	Intentionally suffocated you or choked you by hand?				
h)	Intentionally burnt you?				
i)	Threatened you with or actually used a gun, knife or				

	any other weapon against you?				
j)	Hit you with a stick or any other heavy things?				
V 05E	Did your husband ever physically torture you during pregnancy or after childbirth?	yes - 1	no - 2	no answer - 3	not applicable - 4
SEXUAL					
V 08	Has your husband ever acted in the following manner?	A) if yes continue to B. If no skip to next item Yes / No	B) Has this happened in the past 12 months? (if yes ask C and D) yes / No	C) in the past 12 months would you say that this has happened once, a few times or many times? Once / few (2-5) / many (5+)	D) did this happen before the past 12 months? If yes, would you say that this has happened once, a few times or many times?
a)	Did you ever have sexual intercourse with your husband against your will?				
b)	Did you ever have sexual intercourse with your husband against your will in fear of future torture or any kind of harm?				
c)	Did your husband ever perform any unusual sexual behaviour which seems defaming or disgraceful to you?				
d)	Other kind of sexual torture?				
V 08E	During intercourse does your husband discuss about any contraceptive method you should use?				

V 08F	During intercourse does your husband use contraceptive methods which tends to hurt you or you do not approve of?				
V08G	During your pregnancy, even when there was prohibition from the doctor, did your husband try to have intercourse with you without consent?				
V 08H	Were you forced to have intercourse immediately after childbirth? (Between 4 weeks)				
V 08I	Have you suffered from any sexual torture or trauma during pregnancy period or post birth?				
ECONOMIC					
V 03	Has your current husband ever:	yes - 1	no - 2	no answer - 3	not applicable - 4
a)	refused to give you enough money for household expenses? (even though there is enough money and he has money for other things)				
b)	refused to give you pocket money?				
d)	pressure you to get money or belongings from your father's house dowry conditions?				
V03H	can you spend your earnings as you wish?				

V031	did he ever take your earnings forcefully?				if yes can ask whether in part (1) or in full (2)
------	--	--	--	--	---

SCC Women's empowerment protocol

Guidelines for in-depth interviews with enrolled pregnant women

mHealth Training/orientation (mHealth and digital literacy):

1. Did anyone trained you on using 'Soi Barta' mobile App? Please describe elaborately.
[PROBE: date, content and duration of the training, trainer, etc.]
2. Did you get any smart phone/device to use 'Soi Barta' mobile App? When have you got that?
How did you get that? Did you receive training on how to handle/operate it?
3. How was the training done on using 'Soi Barta' mobile App? Was that training sufficient for you? If yes, why? If no, why not and what could be?
4. Did you face any difficulties while getting the training? What kind of difficulties did you face?
How did you solve the difficulties?
5. Has taken part in this training and if these skills are new to you, has this lead to a change in your feelings about yourself? [Such as self-confidence]

Smart Phone Use:

[This project provides a mobile phone to support the children and mothers to care them through messages.]

6. Before getting this smart/touch phone, did you have any smart phone, or did you use any smart phone?
7. What do you use the phone for?
8. Does this phone make any difference in your communication with others? To what extent do you feel that this phone helped you with communication? Can you explain?
9. Do other members of your family or the community comment on you having this phone?
[changes in way women are seen in the community, pride at owning the new asset]
10. In your opinion, what is the attitude of the other members of your family [PROBE: Husband, in laws, or other members] towards using social media by you? Tell me your perception and experience, if you have any.
11. Has there been any tension in your household that has arisen since you have received the phone? Who with? Can you explain in detail? [IPV (intimate partner violence))/jealousy/suspicion/arguments]
12. Now you have a smart/touch phone, what issues do you face in using it? [PROBE: extra time for it, family members' jealous] How can you handle the issues?
- 13.

Nutrition Messages through 'Soi Barta' Mobile App and call centre:

14. Do you get video / SMS / picture with voice messages? Tell me about the most recent ones you received, the messages in your own words.
15. What are the changes have you made in you and your child's nutritional practices by getting the video messages; what you did not do and now doing?
16. Did you get call from the Call Centre? Please describe. [This project has a Call Centre for counselling the mother about child and mother.]
17. Did you share the call/information with others? [PROBE: husband, other family member, neighbour, friend] Why or why not?
18. What are the advantages/disadvantages of receiving call on you and your child's nutrition?
19. Did you call at Call Centre ever? Please tell us about your experience of calling to Call Centre.
20. How has this knowledge influenced your decision-making related to healthcare that your household makes?
21. Do women and men make any of these health care decisions together? If so, which ones?
22. Who makes the decisions about child feeding? Do women and men make any decisions about child feeding together? [i.e., when/what/how much to feed a child]
23. How important is a women's preference in these decisions? Would any one person have the final say? Do you think the ways decisions are made about food and feeding in your community are good or would you like to see changes? Why?
24. Has there been any tension in your household that has arisen since you have received the messages? Who with? Can you explain in detail? [IPV (intimate partner violence))/jealousy/suspicion/arguments]

Cash Transfer (control over the use of income, autonomy in income):

[This project provides some financial assistance every month to support the children and mothers to care them through bKash agent.]

25. Tell me about the last experience about getting cash through mobile App and/withdrawing cash. [PROBE: when the cash came, notification of money, time of withdrawing and person who withdraw, person keeps the money, purpose of spending money, etc.]
26. Who withdraw the last cash from bKash agent? [PROBE: husband, mother-in-law, and/or father-in-law, herself or others.] Why?
27. Usually who did withdraw cash from bKash agent? Why that person?
28. After receiving the last money, who kept the money? [PROBE: husband, mother-in-law, and/or father-in-law, herself or others.] Why?

29. Normally, after receiving the money, who kept the money? [PROBE: give it to someone such as husband, mother-in-law, and/or father-in-law, keep it under her control or others.]
30. Could you please tell me about any difficulties that you and/or your family member encountered in withdrawing the cash? Please describe the difficulties elaborately.
31. Generally speaking, are you able to use the money for whatever you wished to? Who do you consult to make the decision about spending the money? [PROBE: husband, or any other member]. Why is it important to talk to this person?
32. Do you both (wife and husband) make decisions over the use of the income together? How much influence/importance does each person have on the final say? [i.e., to what extent do you feel you can participate in decisions] Does this vary for other sources of income?
33. What do you think are the advantage/disadvantages of getting cash for improving you and your child's nutrition?
34. What are the changes have you made in you and your child's nutritional practices by getting the cash; what you did not do and now doing?
35. Has the cash changed how much input you have in decisions around income generation/livelihoods or other household decisions? [has the woman bought chickens or started home garden?]

Overall Opinion:

36. How do you feel about the SCC project? Can you please tell me in general how the Shonjibon project helped you personally?
37. Is there any from the project that was not so helpful or harmful for you personally? Can you please elaborate?
38. Have you noticed any changes in the way you and your husband communicate since this project has started? What topics do you discuss?
39. Have you noticed any changes in the way you and your mother-in-law/other family members communicate since this project has started? Who do you talk with? What topics do you discuss?
40. Do you have more input or make more decisions with the new knowledge/information you have gained? What aspect of the information learnt do you discuss/impart to your husband?
41. Do you feel that anyone in your household views you in a different way since this project started? And if so how [change in intra-household respect]?

Appendix 7: Protocol paper for the Shonjibon cash and counselling: a community-based cluster randomised controlled trial to measure the effectiveness of unconditional cash transfers and mobile behaviour change communications to reduce child undernutrition in rural Bangladesh.

STUDY PROTOCOL

Open Access



Shonjibon cash and counselling: a community-based cluster randomised controlled trial to measure the effectiveness of unconditional cash transfers and mobile behaviour change communications to reduce child undernutrition in rural Bangladesh

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Abstract

Background: Undernutrition is strongly associated with poverty - levels of undernutrition are higher in poor countries than in better-off countries. Social protection especially cash transfer is increasingly recognized as an important strategy to accelerate progress in improving maternal and child nutrition. A critical method to improve nutrition knowledge and influence feeding practices is through behaviour change communication intervention. The Shonjibon Cash and Counselling study aims to assess the effectiveness of unconditional cash transfers combined with a mobile application on nutrition counselling and direct counselling through mobile phone in reducing the prevalence of stunting in children at 18 months.

Method: The study is a longitudinal cluster randomised controlled trial, with two parallel groups, and cluster assignment by groups of villages. The cohort of mother-child dyads will be followed-up over the intervention period of approximately 24 months, starting from recruitment to 18 months of the child's age. The study will take place in north-central Bangladesh. The primary trial outcome will be the percentage of stunted children at 18 m as measured in follow up assessments starting from birth. The secondary trial outcomes will include differences between treatment arms in (1) Mean birthweight, percentage with low birthweight and small for gestational age (Continued on next page)

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(Continued from previous page)

(2) Mean child length-for age, weight for age and weight-for-length Z scores (3) Prevalence of child wasting (4) Percentage of women exclusively breastfeeding and mean duration of exclusive breastfeeding (5) Percentage of children consuming > 4 food groups (6) Mean child intake of energy, protein, carbohydrate, fat and micronutrients (7) Percentage of women at risk of inadequate nutrient intakes in all three trimesters (8) Maternal weight gain (9) Household food security (10) Number of events for child suffering from diarrhoea, acute respiratory illness and fever (11) Average costs of mobile phone BCC and cash transfer, and benefit-cost ratio for primary and secondary outcomes.

Discussion: The proposed trial will provide high-level evidence of the efficacy and cost-effectiveness of mobile phone nutrition behavior change communication, combined with unconditional cash transfers in reducing child undernutrition in rural Bangladesh.

Trial registration: The study has been registered in the Australian New Zealand Clinical Trials Registry (ACTRN12618001975280).

Background

Poverty and maternal and child nutrition

Undernutrition is strongly associated with poverty - levels of undernutrition are higher in poor countries than in better-off countries [1]. Of the world's 736 million extreme poor (those living on less than US\$1.90 a day or A\$ 2.60) in 2015, 368 million, or half of the total, lived in India, Bangladesh, Nigeria, Democratic Republic of Congo and Ethiopia. All of these countries also recorded very high levels of undernutrition [2]. Besides, there is growing evidence that, within countries, the poor suffer from higher rates of undernutrition than the non-poor. In 2017 in Bangladesh, 24% of people lived below the poverty line compared to 49% in 2000 [3]. Reflecting this decline in poverty has been a corresponding improvement in child undernutrition. Despite this progress, there remains an estimated 21 million people living in extreme poverty, and child stunting remains high in rural populations (30.8% for under-5 children), and especially amongst the poorest 20% of households (40.2% for under-5 children) [4]. More than 20% of newborns in Bangladesh have low birth weight, which is amongst the highest levels worldwide [5, 6]. The COVID-19 pandemic is expected to increase undernutrition in vulnerable households due to an increase in food insecurity and reduced curative and preventive health services [7]. Adequate nutrition during the critical 1000-day window from conception to 2 years of age ensures long-term health and survival [8, 9]. Stunting of child linear growth is largely irreversible after the age of 2 years and leads to lower cognitive and educational attainment, and lower-income and socioeconomic status [8, 10, 11]. Improving maternal nutrition is critical to reducing low birth weight and improving child undernutrition.

Cash transfers and maternal and child nutrition

The 2019 Lancet commission report, the 2008 and 2013 Lancet series on maternal and child nutrition, all strongly suggested the use of both nutrition-sensitive

and nutrition-specific interventions to address the underlying determinants of poor nutrition [9, 12–14]. Social protection especially cash transfer (defined as the provision of assistance in the form of cash) is increasingly recognized as an important strategy to accelerate progress in improving maternal and child nutrition because this addresses structural factors such as poverty and social vulnerability. A growing body of evidence indicates that cash transfer can increase demand for preventive health care, food consumption and dietary diversity [15–19]. Cash transfer will be a key tool to mitigate the potential negative effects of COVID-19 on nutrition [7].

Cash transfer can either be conditional, where beneficiaries must comply with a set of conditions, or unconditional, where no conditions are required to receive payments. "Soft conditions" have been used where beneficiaries are not penalised for non-compliance with the conditions but instead are encouraged by community workers to comply. The premise underlying cash transfer programs for maternal and child nutrition is to increase food consumption to improve nutrition. Cash transfer programs have been shown to increase demand for preventive health care, food consumption, dietary diversity, and improve overall health outcomes, including child mortality [15–19]. Also, when targeted at women, cash transfer can promote women's economic empowerment and enhance decision-making ability, with the overarching assumption that control over cash will lead to greater investment in children's health and education [13, 20].

Currently, many countries in Latin America, Africa, and Asia are using cash transfer to reduce stunting, wasting and anaemia. There is some evidence of significant positive impacts on anthropometric measures such as child weight-for-age, height-for-age, and birthweight although it is not consistent across programs [9, 15, 21]. A meta-analysis to examine cash transfers on nutrition

outcomes found small but non-significant impacts on height-for-age, and that conditional programs had similar results to unconditional cash transfers [13, 22]. As in most cases, the impact pathway is not analysed, so it is unclear why some cash transfer programs impact nutritional outcomes while others do not. There is also little evidence of the impact of cash transfer on important proximate and indirect outcomes such as caregiver feeding behaviours, practices and psychosocial care, the cost-effectiveness of cash transfer, the value of nutritional education, the value chains for nutrition, spill over effects (on women's empowerment, local markets, food production, local governance, etc.) and sustained inter-generational impact. Compare to conditional cash transfer there has been less research on unconditional cash transfers. The theory underpinning this approach is that the poor are rational actors, and the provision of additional income will encourage uptake of desired behaviours through which they will eventually emerge out of poverty. Another major argument for the absence of conditions in the poor countries is the poorly developed supply side in health, which would not be able to cope with increased demand resulting from a CCT program. In addition, the capacity for implementing conditional transfer is also much weaker in most developing countries.

Nutrition behaviour change communications

A critical method to improve nutrition knowledge and influence feeding practices is through behaviour change communication (BCC) intervention [23]. Recent studies of large-scale BCC interventions have found to improve IYCF practices in several countries [23, 24]. In Bangladesh, nutrition counselling is provided face to face by the frontline health workers. However, the coverage and the quality of such counselling remains an issue. In Bangladesh and other developing countries, mobile phones have been successfully used to inform, support and empower community health workers [25, 26]. Mobile phones are widely available in Bangladesh [26], and this channel has the potential to enhance communication about nutrition in large scale programs. There are currently more than ten recognised medical and health applications available in Bangladesh [27]. The Directorate General of Health Services of the government also has a health helpline 16,263 that provides advice as well as ambulance services [28]. In terms of mobile phone use, Bangladesh is the fifth largest market in Asia. Smartphone ownership and app use in Bangladesh is high, with 31% of the population possessing a smartphone, and this rate of use will likely increase to 75% by 2025. Adoption of mobile broadband is also expected to increase to 82% in 2025 [29]. These findings support that the population, including women of reproductive

age, are increasingly turning to mobile health platforms to receive health information rather than relying on face-to-face and paper-based delivery methods. This trend towards the use of mobile health opens up an opportunity to reach women who are less likely to engage with health care providers or are yet to do so. Population-based telephone counselling combines ease of access and privacy with the advantages of in-person individual counselling. All of these reduce potential barriers to treatment seeking. Last but not least, mobile counselling may be standardised and cost-effective for the delivery of in-person counselling.

Aims and hypothesis

The Shonjibon – Cash and Counselling (SCC) study aims to assess the effectiveness of unconditional cash transfers combined with a mobile application on nutrition counselling and direct counselling through mobile phone in reducing the prevalence of stunting (length-for-age $< -2 Z$) in children at 18 months. The primary hypothesis is that in a community-based, cluster-randomised controlled trial of women from food insecure populations, mobile phone-based nutrition behaviour change communications (BCC) and unconditional cash transfers will reduce the prevalence of child stunting at 18 months by 6.2% (40.2% control – 34.0% intervention, or 16% relative reduction) compared to usual programs. The secondary hypotheses are that mobile phone nutrition BCC and unconditional cash transfers compared to the usual programs will: a) increase maternal caloric intake and dietary diversity; b) reduce the rate of low birth weight and small for gestational age newborns; c) improve breastfeeding and complementary feeding practices, including dietary diversity, d) improve women empowerment, and e) be cost-effective in reducing child undernutrition.

Methods/design

Study design

The study is a longitudinal cluster randomised controlled trial (cRCT), with two parallel groups, and cluster assignment by groups of villages. Children born to participants during the study will be the unit for analysis and clustering within villages will be taken into account. We have designed a mixed-methods process evaluation as part of the study to examine the factors and roles of the different processes that might influence the outcome. The cohort of mother-child dyads will be followed-up over the intervention period of approximately 24 months, starting from recruitment to 18 months of the child's age (Fig. 1). This protocol has been written according to the recommendations of the SPIRIT 2013 statement [30]. Besides, the design of this

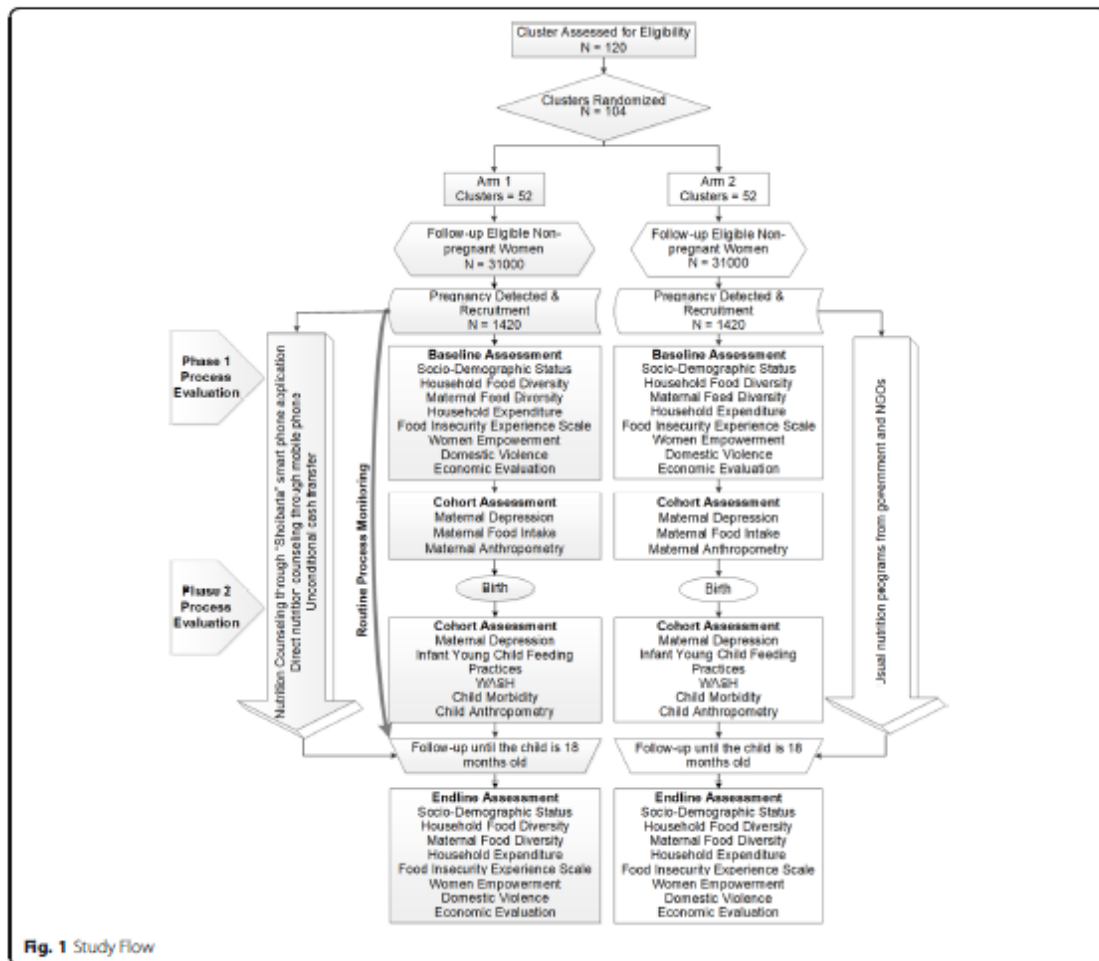


Fig. 1 Study Flow

clinical trial follows the requirements of the CONSORT statement.

Study setting

The study will take place in Ullahpara and Kamarkhanda subdistricts in the Sirajganj district, which is in north-central Bangladesh (Fig. 2). It is a part of the Rajshahi Division. The Ullahpara and Kamarkhanda subdistricts have combined populations of 0.68 million [31]. According to the latest census, there are about 155,000 households in our study area; among them, 92% are in rural communities. The average size of a household in Sirajganj district is 4.3 persons. About 47% of households have electricity connection. In rural households, around 43% of households have electricity connection. The median age for the male is 21.9 years and female is 22.0 years. The literacy rate of the population 7 years and above is around 42%.

The economy in the Sirajganj district is mostly agrarian and dependent on crop production. About 51% of the population relies on agriculture activities as their primary source of income. However, Sirajganj is also known for its textile industry. A large number of handloom and power loom industries have been established in the district over the last few years. About 40% of the households in the Sirajganj are poor (i.e. households with total expenditure equal to or less than the amount required to buy food sufficient to provide 2122 Kcal per person per day and minimal non-food items) [32]. The prevalence of stunting in Sirajganj is also high with > 40% of children 12–24 months stunted [4].

Cluster recruitment

Each cluster consists of an average of 750 households. Of total 552 villages (451 in Ullahpara and 101 in

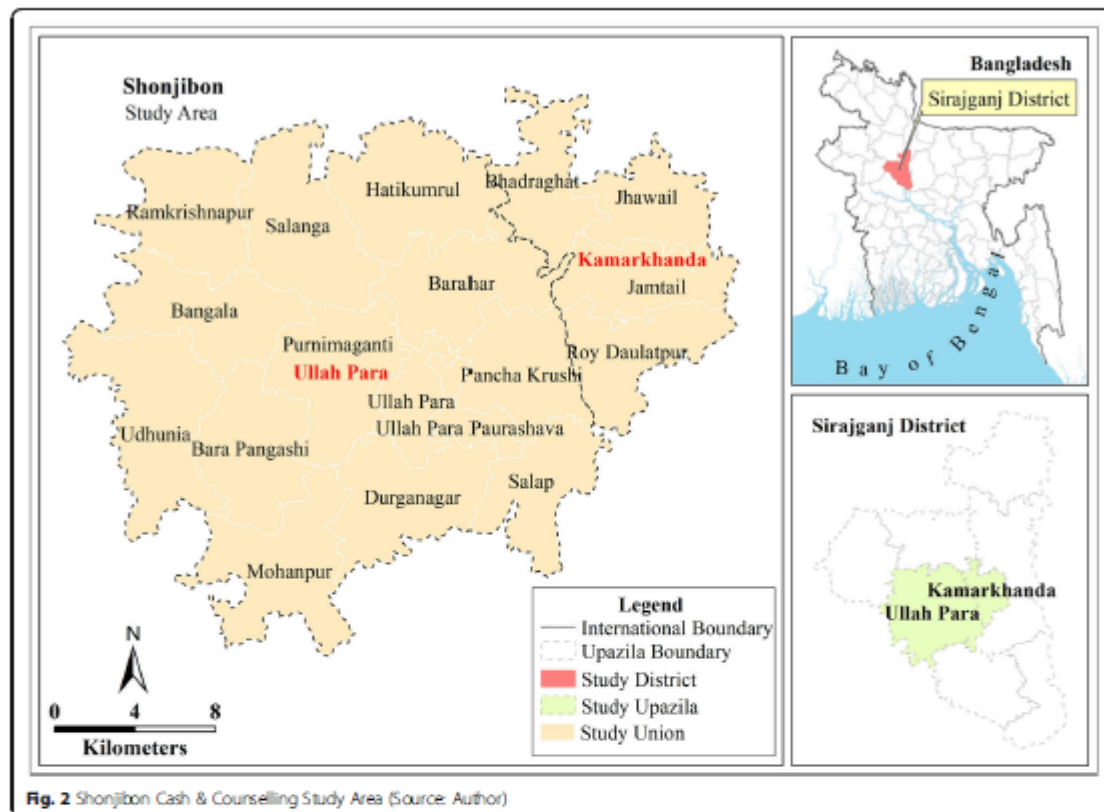


Fig. 2 Shonjibon Cash & Counselling Study Area (Source: Author)

Khamarkhanda) in our study area, we will include 389 accessible villages to give a total of 166 clusters, of which we will randomly select 104 clusters with an equal number of clusters in each arm of the trial (Fig. 1). The research team will request written approval for the study from the Directorate General of Health Service (DGHS) under the Ministry of Health & Family Welfare before allocating the clusters to the control or trial intervention.

Eligibility criteria for inclusion of cluster

We excluded any potential villages if there are any other maternal and/or neonatal interventions either by the government or non-government organisations in the area. We also excluded villages where access is challenging, for example, in flood-prone areas. All women aged between 15 to 49 years who are pregnant, whose gestational age is ≤ 90 days and who are permanent residents of the Shonjibon study area will be eligible.

Participants recruitment

We will recruit married women aged between 15 and 49 years who have not had any permanent method of

contraception (either the woman or her husband), are not using any family planning method and are a permanent resident of the study area.

Formative research

We will conduct formative research to identify women's and their families' perceptions, attitudes and existing practices that are crucial to understanding to implement the intervention. The topics the formative research will include maternal and child nutrition and diet, use of mobile phones by women, spending money on food for mothers and children, women's decision-making on family expenditure and child nutrition, and the role of persons within the family and the community. The findings will guide the production of the nutrition BCC material (text and video messages) to ensure they are culturally appropriate and acceptable to the community. We will test the messages and the mobile app in the community. The findings will help to finalise the baseline, follow up and adequacy survey tools.

We will conduct the research in three phases. *Phase one* involves in-depth interviews and free-listing exercises with women, their husbands and mothers-in-law to

generate information about existing practices and perceptions that will help develop the BCC materials. *Phase two* includes group discussions and in-depth interviews with women to assess the clarity and understandability of the BCC materials. Once the draft messages and videos are developed and embedded in the *Soi Barta* app (the mobile app that will be used in the study and described below), we will conduct *Phase three* of the formative research. In this phase, field researchers will visit the women and run the app on the smartphone to assess the women's response to the app and use of the smartphone. We will seek the women's feedback and suggestions on the appropriateness, attractiveness, clarity and design issues in individual and group interviews. We will also explore women's ideas on how to improve the app. The findings from these interviews will contribute to finalising the design of the app.

Description of the intervention

Intervention arm

Nutrition behaviour change communication through a smartphone application “*Soi Barta*” is a mHealth app designed to serve as a supportive health technology for mothers and young infants to meet their nutrition needs. The participants assigned to the intervention arm, with the help of the study team, will download the app on their mobiles and log in by inserting the registered mobile phone number. We will train the participants in the intervention arm to use the “*Soi Barta*” app during the enrolment visit. The app users will need to enter details of their last menstrual period or expected due date for the timing of notifications that are appropriate for the stage of their pregnancy. Users will receive two weekly animated/video/audio messages tailored to the stage of their pregnancy or the age of the child. The user receives the first section of the advice message as a push notification and is then encouraged to click on the notification to open the app and read the rest of the message (Fig. 3).

Nutrition behaviour change communication through mobile phone counselling service We will establish a mobile phone counselling service (*Soi Pushti Sheba*) to provide nutrition counselling to the women in the intervention arm of the trial and other members of their households. The “*Soi Pushti Sheba*” team will comprise of experienced nutrition counsellors “*Pushti Apa*”. All nutrition counsellors managing the “*Soi Pushti Sheba*” will be trained to follow a contextual counselling and problem-solving process to listen to and understand our participants, and to focus on practical actions to address nutrition needs. The nutrition counsellors will actively listen to the mother's belief and existing practices

including susceptibility, severity, barriers to action and perceived benefit of action. The counsellors will use a nonjudgmental and empathetic disposition on mother's perceptions. They will try to increase perceived susceptibility to and seriousness of a health condition by sharing information on the consequences of malnutrition on maternal and child health. They will also stimulate positive behaviour change by sharing knowledge on positive practices as a cue to action, highlighting motivational factors (sharing efficacy of positive nutrition practices in improving child growth and development) and enabling decision making through enhanced self-efficacy (empowerment through information sharing). The counsellors from “*Soi Pushti Sheba*” will use a life-course approach, from pre-conception and throughout the first 2 years of the child's life. The counsellor will mainly focus on diet and micronutrient during pregnancy, on breastfeeding, and Infant and Young Child Feeding Practices (IYCF). The study will provide thirty-six 20-min fortnightly counselling sessions. The frequency and duration of the counselling sessions have been fixed based on our experience from a previous pilot study [33]. The core content for each counselling session will be synchronised with the “*Soi Barta*” mobile application to ensure we provide similar messages through both the channels at the same period of the life cycle.

Unconditional cash transfer Through the participants' mobile phone, we will deliver a cash transfer of US\$12.5 per month, which is approximately 20% of the average monthly income of the poorest 40% of rural Bangladeshi households (~US\$60/m). The well-developed food markets in rural Bangladesh will ensure food products are available for households to purchase. We will use a soft conditional approach where we will ask the mothers to listen to the messages and participate in counselling. However, we will make the cash transfers irrespective of the participant's compliance. Project staff will follow up with mothers who do not participate to explore the reasons and reinforce the importance of the messages and counselling. Cash will be transferred directly to woman's mobile bank accounts using the bKash mobile banking service.

Comparison arm

Routine nutrition counselling for pregnant women and mothers of under-five children by BRAC and government programs will continue with the same schedule in the control arm as in the intervention group at antenatal clinics, delivery, and immunisation clinics. We will provide mobile phones to the control arm to balance out any non-specific beneficial effects from the family having a mobile phone. We will contact the family by phone to minimise differential loss to follow up. However,

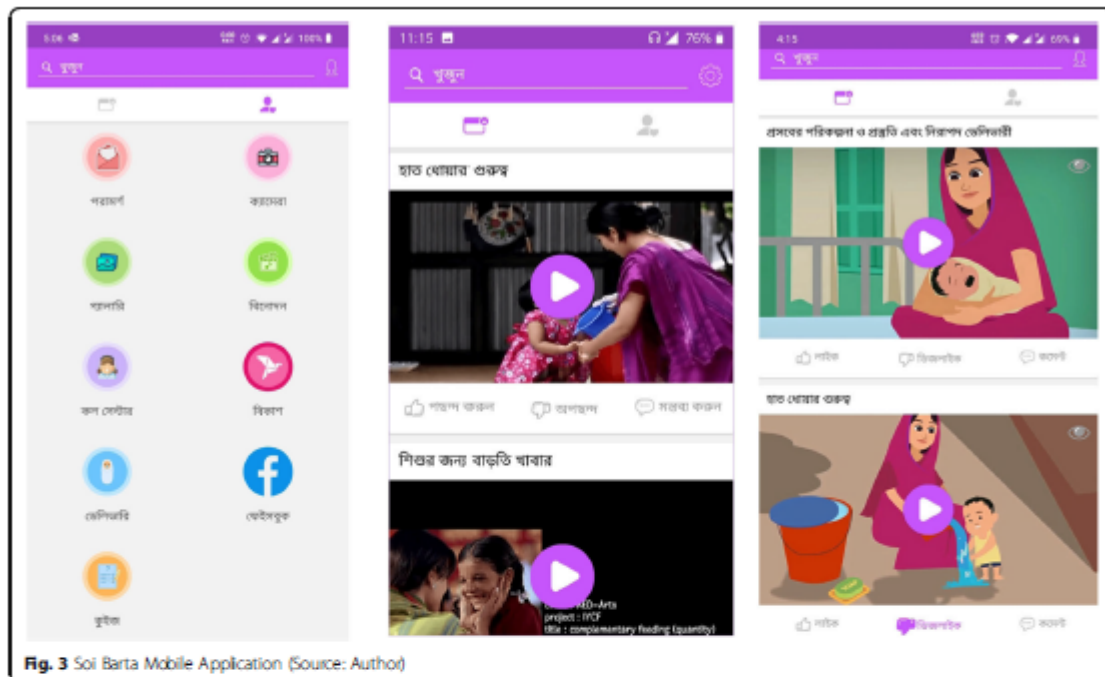


Fig. 3 Soi Barta Mobile Application (Source: Author)

experience with our previous trials indicates this is not likely to be a problem as low-income families' value repeated examinations conducted as part of the trial evaluations.

Trial outcomes

The primary trial outcome will be the percentage of stunted children (height-for-age < -2 Z) at 18 m as measured in follow up assessments starting from birth. The secondary trial outcomes will include differences between treatment arms in (1) Mean birthweight, percentage with low birthweight and small for gestational age (2) Mean child length-for age, weight for age and weight-for-length Z scores from birth until 9 m, 12, 15 and 18 m (3) Prevalence of child wasting (weight-for-length < -2Z) from birth until 18 m (4) Percentage of women exclusively breastfeeding and mean duration of exclusive breastfeeding monthly until 6 m (5) Percentage of children consuming > 4 food groups at 9, 12, 15 and 18 m (6) Mean child intake of energy, protein, carbohydrate, fat and micronutrients at 9, 12, 15 and 18 m (7) Percentage of women at risk of inadequate nutrient intakes in all three trimesters (8) Maternal weight gain per trimester (9) Household food security at baseline and end-line (10) Number of events for child suffering from diarrhoea, acute respiratory illness and fever (11) Average costs of mobile phone BCC and cash transfer, and benefit-cost ratio for primary and secondary outcomes.

Outcome measurements

Anthropometry To construct anthropometric indices and standard indicators including stunting (length-for-age < -2 Z), wasting (weight-for-length < -2 Z) and underweight (weight-for-age < -2 Z) we will use the 2006 WHO Growth Standard [34]. We will also assess growth velocity using the same growth standard.

Infant feeding practices To measure infant feeding practices, we will include questions about current breastfeeding status; ongoing use, timing and types of other liquids and solid foods; use of bottles for feeding; and information about who among family and friends are providing advice about infant feeding. We will assess breastfeeding self-efficacy with a validated five-level Likert scale [35]. To determine the level of social desirability and to adjust for this potential bias in our analyses, we will use the Marlowe-Crowne Social Desirability Scale [36].

Dietary intake Dietary intake data will be collected three times during pregnancy; at the end of the first trimester, the end of the second trimester and 1 month after delivery. We will use a validated Food Frequency Questionnaire (FFQ) with three months' recall to collect the usual dietary intake of pregnant women. The FFQ used in the MSAKI study in India will be adopted and validated in the local settings before use in the main

trail. Portion sizes of foods will be quantified using standard local utensils. Recipes used to prepare meals will be recorded, including amounts of raw food used and the preparation methods. The dietary interviewers will use the 24-h recall method for collecting child dietary intake information by recording all foods and the quantity consumed by the child in the 24 h before the interview. Our analysis will compare the nutrient density of the infant diets with the desired levels, and the percentage of mothers at risk of inadequate nutrient intakes will be estimated using the fixed cut-point approach with WHO/FAO estimated average nutrient requirements.

Food security We will assess household food security using the World Food Program's Food Insecurity Experience Scale, an indicator of household food access, which combines data on dietary diversity and food frequency using 12 months recall [37].

Child morbidity At scheduled monthly visits, trained interviewers will record maternal recall of symptoms in the preceding 2 weeks of common childhood illnesses (diarrhoea, acute respiratory illnesses and fever) using standard questions from Bangladesh Demographic and Health Survey (BDHS) [4].

Women's empowerment We will collect data on women empowerment at the baseline and end-line assessments of the trial using the Project-Level Women's Empowerment in Agriculture Index (Pro-WEAI) questionnaire [38]. We will develop a composite indicator based on the following: 1) control over the use of income; 2) input in production decisions; 3) autonomy in income; 4) decision making power about women and children's health and nutrition; 5) respect among household members and 6) attitudes toward IPV. The Pro-WEAI is used to measure empowerment of women, agency and inclusion in the agriculture sector [38], is a standardised, survey-based internationally validated index, and has been piloted in Bangladesh [38, 39].

Intimate partner violence The Pro-WEAI includes questions about a woman's attitude to intimate partner violence (IPV). Further data collection is required to determine precisely how cash transfers and nutrition behaviour change communication affects IPV. The additional questions ask about the personal experience rather than the women's perceptions of IPV. We will take the questions for this assessment from the Violence Against Women and Girls Survey (Bangladesh 2015) [40].

Maternal depression To measure any change in post-partum depression, we will use the Centre for Epidemiological Studies Depression Scale (CES-D). This twenty item self-report measure screens women for symptoms of emotional distress during pregnancy and the postnatal period.

Social, economic and demographic characteristics Data for social, economic and demographic characteristics will be collected in baseline questionnaires using Demographic and Health Survey methods which include an inventory of household assets to construct a wealth index [41] and the mother's socio-demographic and reproductive characteristics.

Economic evaluation We will conduct an economic evaluation, from the societal perspective, to assess the costs and cost-effectiveness of the intervention compared to usual care. Data sources and collection methods for the costs will include project records and surveys conducted throughout the follow-up period, and we will follow the WHO Costit modules to estimate the *costs of delivering the intervention* (start-up costs, staff, training, mobile phone service, cash transfers). We will estimate the average costs per individual in each treatment group throughout the follow-up. The economic evaluation will consist of a cost consequence analysis (CCA) and cost-effectiveness analysis (CEA). Cost consequences will include all outcomes listed in the study objectives. The CEA will focus on the incremental costs per Disability-Adjusted Life Years (DALYs) gained in terms of reductions in stunting.

Health-related quality of life (HRQoL) We will use the WHO-BREF tool at the baseline and end-line data collection. The tool has 26 questions from the WHO-100 QoL questionnaire covering various dimensions, each of which has five levels with categories depending on the type of questions asked.

Process evaluation

We will conduct a mixed-methods ongoing process evaluation to examine the implementation of the interventions, including delivery of messages, cash and nutrition counselling, to identify the contextual factors that affect the interventions, and to assess the reach of the interventions [42]. We will develop a Program Impact Pathway (PIP) to illustrate the possible routes of achieving the impact of the different intervention elements. The PIP will identify the possible causal links between the interventions and their intended impacts. It includes defining changes, linking processes, and identifying indicators to monitor progress towards the expected impacts. Thus, the PIP will guide the process evaluation

data collection. The data will be collected through in-depth interviews and focus group discussions with intervention recipients (mothers of infants, their husbands) and implementers (project officers, managers, and counsellors). We will collect the data longitudinally in three phases. The first phase of data collection will take place within 1 month of the onset of the intervention, while the second and the second and third phases of data collection will be at midline and end-line of the intervention. These methods will generate information about beneficiaries' response to the intervention, barriers to comply with the nutrition messages and use of cash, and any contextual factors that may influence the outcome. We will also collect information on variations in the accessibility and response to the intervention among the participating households or clusters and underlying factors for the differences will also be collected. In addition to the qualitative data, we will collect quantitative information as part of the regular project monitoring to assess intervention adequacy and reach. We will use the process evaluation data to make necessary adjustments to the intervention and to keep the program 'on-track' (formative use) and to interpret and explain outcome results (summative use) at the end of the trial [43].

Sampling frame and sample size

We require a sample size of 2184 mother-infant pairs (1092 per group) from 104 clusters recruited over 6 months to demonstrate a 6.2% difference in stunting prevalence between treatment groups (40.2% in control to 34.0% in the intervention or 16% relative reduction). The assumed stunting reduction is similar to that observed in a recent study in Bangladesh for face-to-face nutrition BCC plus cash transfers [unpublished data]. Taking account of the potential losses noted below; we would need to recruit 2840 pregnant women to ensure this sample size for the outcome assessment. In this calculation, we used 80% power, a standard two-tailed 5% significance level, a design effect of 1.28 (based on an estimate for stunted children age 12–24 months from the poorest 40% of households in the 2014 BDHS data and an intracluster correlation coefficient (ICC) of 0.0051 assuming a cluster size of 20. This sample size would detect a five-percentage point difference in the prevalence of low birth weight (LBW) between treatment groups with 80% power assuming an ICC of 0.01 and prevalence of LBW of 25% in the control group.

To calculate the estimated sample size, we made several assumptions. We expect the prevalence of stunting (length-for-age < -2 Z) of 40.2% in control clusters according to latest round of Bangladesh Demographic and Health Survey [4]. Each cluster will have two villages with an average population of 3000. Considering the crude birth rate of 23/1000 population over 12 months

[44], we expect that the average number of births will be approximately 34 over 6 months in each cluster. We expect to reach 90% of births through our surveillance system, which means that approximately 31 mother-infant dyads would be available per cluster over 6 months. From our experience in earlier trials, we expect to lose about 10% of pregnancies before birth, 5% of the recruited women will migrate out from the study area and 10% of pregnant women will deliver outside their village. We expect further losses from child deaths in the first 2 years of life.

Recruitment and consent of women

We will conduct a census in all households in the study area and record the names and contact details of all consenting women in an electronic system with a unique I.D. number. Our surveillance worker will then conduct door-to-door bi-monthly visits to identify women missing two menstrual periods in a row. All such woman will undergo a pregnancy test with a sensitive pregnancy urine test kit (Excel*). We will invite women to participate who test positive in the study with informed written consent. Based on experience with our previous research with similar design and settings, we expect at least 95% of mothers will consent.

Randomisation and allocation of treatments

The treatments will be assigned to eligible clusters using a fixed randomisation scheme with a uniform allocation ratio of treatments, stratified by unions. We will use Stata* software to generate the random allocation sequence. Stratification of clusters based on unions will ensure geographic balance across the study area neutralising the effect of contextual factors. It will also mean that both the intervention and control groups will receive similar maternal and child health and nutrition services from the government. The only difference between the treatment arms will be the mobile phone nutrition BCC with cash transfers in the intervention arm. This design will control for potential confounding factors (observed and unobserved) as we will randomly allocate an adequate number of clusters (104 in total) to one of the groups. Contamination of interventions will be constrained by geographic separation of clusters, and by the nature of the interventions (mobile phones and cash). The nature of the intervention precludes the masking of the treatments.

Evaluation

Data collection team

To minimise assessment bias because of a lack of trial blinding, we will separate the intervention and evaluation staff. During the training of the evaluation team, we will not reveal the trial hypotheses or interventions. Each surveillance worker will record the details of

married women aged 15–49 years in her village who consent to menstrual monitoring and monthly follow up. She will inform the study health worker if a woman reports two missed periods. The study health worker will then visit, validate the pregnancy through a pregnancy kit and enrol the woman. For surveillance and quantitative data collection, there will be 30 surveillance workers and 15 data collectors who will be supervised by three field supervisors. Also, we will form seven teams with each team consisting of two persons for child anthropometry measurements. There will also be two senior-level field data collectors for the 24-h dietary intake measurements in a sub-sample. At the central level, two senior researchers and three junior researchers will provide overall supervision and management of field activities and data collection.

Data collection schedule

Standard questions on infant feeding practices will be collected monthly until 9 months and every 3 months after that until 18 months (Fig. 4). Along with infant feeding practices, we will also record maternal recall of symptoms from the preceding 2 weeks of common childhood illnesses (diarrhoea, acute respiratory illnesses and fever) using standard questions from BDHS [4, 44]. Further, at baseline, we will collect data on social, economic and demographic characteristics along with household food security and maternal nutrition knowledge. We will measure household food security and maternal nutrition

knowledge at end-line. Specially trained interviewers will collect 24-h dietary recalls using standard methods from the mothers at baseline, in the third trimester and for the children at 9, 12, & 18 m (Fig. 4). Anthropometry will be collected within 72 h of birth and monthly until six months and then at 9, 12, & 18 m (Fig. 4). Trained research assistants will collect weight and height measurements using established methods [45]. We will conduct these standardisation exercises before and during data collection.

Electronic data collection tool

The team in the field will use an Android Tablet interactive data collection tool for data capture. The software navigates the data collectors during each specific evaluation interview. Once they complete an interview, the data are uploaded to the server at the International Center for Diarrheal Disease Research, Bangladesh (icddr) and merged with existing data. A copy of the data remains on the tablet. Tablets are synchronised with the server each day. We will monitor data regularly, to allow real-time adjustments for any data inconsistencies. A team of four, led by a lead researcher, will collect qualitative data. They will record the interviews then transcribe and translate them into English within a week of data collection.

Statistical analyses

Data analyses will be by intention to treat and by a statistician blinded to the treatment group to reduce

Life Cycle Stage	2-6 months before pregnancy	1st Trimester	2nd Trimester	3rd Trimester	24-72h after delivery	Child's 1 month	Child's 2 months	Child's 3 months	Child's 4 months	Child's 5 months	Child's 6 months	Child's 7 months	Child's 8 months	Child's 9 months	Child's 12 month	Child's 15 month	Child's 18 month	
Enrolment																		
Pregnancy Surveillance	X																	
Screening, Consent, Enrolment		X																
Intervention																		
Call Centre Counselling, Shohbata Mobile App, Cash Transfer		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Evaluation																		
Household Characteristics, livelihood, Hand Hygiene, Asset Saving debt and land, Household food diversity, Household food composition and non-food expenditure, Food Insecurity, Coping Strategies		X																X
Women and husband Characteristics & Birth History		X																
Women Nutrition Knowledge, Women Empowerment, Domestic Violence assessment		X																X
Maternal Depression		X										X				X		X
Maternal Care & morbidity, Essential newborn care and EBF							X											
Social desirability, Breastfeeding self-efficacy			X				X			X								
Food Frequency (FFQ) and Maternal Food Diversity			X	X		X												
IYCF Practices, Hand Hygiene, Child Morbidity						X	X	X	X	X	X	X	X	X	X	X	X	X
Maternal Anthropometry		X	X	X														
Birth Weight and Early Initiation of Breast Feeding					X													
Child Anthropometry						X	X	X	X	X	X	X	X	X	X	X	X	X
Economic Evaluation		X																X

Fig. 4 Schedule of enrolment, intervention and assessment

interpretation bias. We will conduct the analyses at the mother-infant dyad level and will adjust for cluster randomisation [46]. In primary analyses, we will compare the prevalence of stunting (length-for-age < -2 Z) in children at 18 months using Pearson's chi-square tests and 95% confidence intervals for the group difference adjusted for clustering. In secondary analyses, we will examine each outcome variable (birth weight, feeding patterns, and mean nutrient intakes) taking account of the repeated measurements within children by using separate mixed models. We will use linear mixed models for continuous outcomes (e.g. height-for-age Z) and generalised linear mixed models for non-continuous outcomes (e.g. binary outcomes such as exclusive breastfeeding). Models will include treatment group as a fixed effect, infants as a random effect to account for repeated measurements, and community-cluster as a random effect to account for cluster effects. We will use STATA* for all analyses.

Economic analyses

An economic evaluation will estimate the incremental cost-effectiveness ratio (ICER) from a societal perspective for mobile phone nutrition BCC plus cash transfer intervention compared to usual care. We will conduct the economic assessment in two phases: 1) Trial based evaluation to assess incremental costs and effects of adding this intervention to usual care; 2) Modelled analysis for estimating lifetime costs & disability for mothers and children. Costing templates (Costit) will be followed to record the financial and economic costs of our intervention. We will include all items of the program and household level costs in the tool. For the program cost, we will track all expenses incurred throughout the implementation period. We will distinguish fixed costs and variable costs. The fixed costs will cover the costs of developing the BCC content and mobile application, the costs associated with the cash transfer, the cost of the mobile phone. Variable costs will include the costs for intervention (reaching out to women), the maintenance of mobile phones, monitoring and troubleshooting. At end-line, we will use the program summary costs, which includes costs incurred for program implementation and for care-seeking at an individual level, to calculate the total cost. We will collect the costs of care-seeking during baseline, end-line and follow up visits during the intervention period. We will disaggregate costs of illness into two components – direct costs and indirect costs. Direct costs will include household expenditures related to treatment-seeking (medical expenses, such as physician's fee, drug costs, cost of hospital stay - both for the patient and accompanied person) along with non-medical expenses such as transport costs. Indirect costs will include information on loss of household productive

labour time (monetised loss of working hours) for patients and accompanying household members.

Data monitoring

Electronic data monitoring tool

We will develop an online monitoring system, which will provide real-time information on enrolment status, adherence of the data collectors with the evaluation schedule and quality of data for critical variables. This system will allow the field supervisors to monitor the performance of individual data collectors. All reports will be auto generated from the system and will be available for investigators' assessments.

Field monitoring and standardisation

In the field, our Field Research Assistant will observe the interviews and will take duplicate measurements to calculate intra- and inter-observer Technical Error of Measurement (TEM). We will also conduct standardisation sessions for field staff. In each session, we will ask data collectors to take duplicate measurements (weight, height, MUAC for women; weight, length, head circumference for children) on ten volunteers. We will calculate the intra- and inter-observer Technical Error of Measurement (TEM) and use the results to identify poor data collectors for re-training and additional field support.

Data safety and monitoring board

We will form an independent data safety and monitoring board (DSMB). It will assess the interim data, data quality, data completeness, adequacy of compliance with goals for recruitment and retention, and factors that might affect the study outcome or compromise the confidentiality of the trial data. We will notify the DSMB of any unintended effects of the trial intervention.

Access to data

All data will be accessible to the study investigators. The investigators will have the right to analyse and publish data. We will only share datasets externally after we have removed all personally identifiable information and with every reasonable effort to keep the identification of study subjects in the strictest confidence.

Dissemination plan

The research team will share the lessons learned from the study widely throughout Bangladesh and among global audiences. The authors will organise dissemination seminars to share the findings with the relevant stakeholders. We will present the intermediate and immediate results which support the hypotheses generated from the trial at national and international conferences and publish them in conference proceedings. We will publish the analysis of the outcomes in the form of internal

documents, working papers, and in international peer-reviewed journals. We will base authorship eligibility on recommendations of the international committee for medical journals editors (ICMJE).

Discussion

This study protocol describes a cluster randomised controlled trial of a cash and nutrition education-based intervention, to improve the nutritional status of children less than 2 years of age to reduce stunting. Poor nutritional status of children is a major global public health problem in low- and middle-income countries [47] accounting for 35% of under-5 child deaths and 33% of the disease burden in this age group [47]. It is a significant problem in Bangladesh, which has > 20% low birth weight [5], the second-highest prevalence of child underweight globally [48] and a very high prevalence of stunting [4]. Despite falls in poverty, the levels of extreme poverty, food insecurity and vulnerability remain high with 21 million people living in extreme poverty [3]. Developing effective combinations of nutrition-specific and nutrition-sensitive interventions will be integral components of efforts to develop sustainable development policies and programs for nutrition and to prevent stunting [13]. In recent years, there has been an increasing interest in the use of cash transfer to reduce malnutrition. In a previous study, we found that cash alone is unable to prevent child stunting, and only the combination of cash transfers plus nutrition BCC improved child growth to reduce stunting. However, both cash transfer and face-to-face nutrition counselling are expensive. So, it is of high priority to find a cost-effective delivery platform and to produce strong evidence that the interventions will work best in the Bangladesh country context. Without strong evidence, it would be difficult for policymakers to scale up such an intervention nationwide. The proposed trial will provide high-level evidence of the efficacy and cost-effectiveness of mobile phone nutrition behavior change communication, combined with unconditional cash transfers in reducing child undernutrition in rural Bangladesh. This trial of an innovative approach to enhancing the impact of cash transfers on child nutrition will be a leading study to show an efficacious and cost-effective approach to reducing maternal and child undernutrition in a low-income food insecure population.

Abbreviations

ERC: Ethical Review Committee; HREC: Human Research Ethics Committee; NHMRC: National Health and Medical Research Council

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Trial status

Participant recruitment for this study will begin in November 2020. The study recruitment is expected to end in May 2021.

Authors' contributions

MID, TH and AA are the lead researchers of this trial and conceptualized and designed the trial. All other authors (TT, MMH, AI, JK, GA, NBA, SU, ERK, TL, NG, SM, MI, KEA, JH, SEA) were involved in developing the study design and methods. The authors read, critically revised, and approved the final manuscript, and met the ICMJE criteria for authorship.

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Availability of data and materials

Not applicable.

Ethics approval and consent to participate

The Ethical Review Committee (ERC) of the icddr, and the Human Research Ethics Committee (HREC) of University of Sydney have granted ethics approval for this study. Any amendment to the protocol will be communicated to both the ERC. We will seek gatekeeper consent [46] from local governments before we allocate clusters to treatment groups. We will obtain written informed consent from each study participant, which will be in Bangla. We will also obtain informed consent from a parent or guardian for participants under 16 years old. The consent form will provide full disclosure regarding the study, from pregnant women during enrolment into the study. We will inform the women that they can drop out at any time without any penalty or loss of any benefits from the programme. We will strictly maintain the privacy, anonymity and confidentiality of the information provided by respondents. We will store all trial information in an encrypted database with all identifiers removed. Only associated investigators and data management team will have access to collected data. Auditing trial conduct will be done as per icddr rules. We will publish the trial findings in peer-reviewed journals towards the end of the study. We have registered the trial in the Australian New Zealand Clinical Trials Registry (ACTRN12618001975280).

Consent for publication

N/A

Competing interests

The authors declare that they do not have any competing interest.

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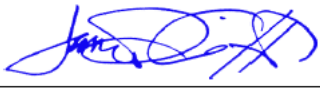
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Appendix 8: Ethical approval for Bangladesh Demographic and Health Survey, Chapter 6: Women's participation in decision-making: analysis of Bangladesh Demographic and Health Survey Data 2017-2018.

Institutional Review Board Findings Form
ICF IRB FWA00000845 (exp. 04/13/2019)

<p>Project Director(s): Sri Poedjastoeti and Gulnara Semenov</p> <p>Project Title: 2017 Bangladesh Demographic and Health Survey (BDHS)</p> <p>ICF Project Number: 132989.0.000.BD.DHS.02</p>
<p>Type of Review:</p> <p><input checked="" type="checkbox"/> New <input type="checkbox"/> Modification <input type="checkbox"/> Annual review</p>
<p>Findings of the Board:</p> <p><input checked="" type="checkbox"/> Project complies with all of the requirements of 45 CFR 46, "Protection of Human Subjects"</p> <p><input type="checkbox"/> Project is exempt from IRB review (See IRB Exemption Form)</p> <p><input type="checkbox"/> Project does not comply with all of the requirements of 45 CFR 46</p>
<p>Project Approved Until: <u>September 8, 2018</u></p> <p>Next Annual Review Date: <u>N/A</u></p>
<p> _____ Chair, Institutional Review Board</p> <p><u>October 16, 2017</u> Date</p>

(Revised 07/18/2014)



বাংলাদেশ চিকিৎসা গবেষণা পরিষদ
Bangladesh Medical Research Council

Ref: BMRC/NREC/2016-2019/324

Date: 10-09-2017

Mr. S N Mitra
Executive Director
Mitra and Associates
Commercial Plot- 35 (3rd-5th Floor)
Main Road- 01, Mirpur Circle-10
Senpara Porbata, Mirpur, Dhaka-1216.

Subject: Regarding renewal of the project.

Research proposal entitled “**The 2017 Bangladesh Demographic and Health Survey**” was submitted on 21st August, 2017 for renewal of the proposal.

As there are no changes in the previous protocol of 2014, renewal has been approved by the National Research Ethics Committee.

Thanking you,

(Dr. Mahmood-uz-jahan)
Director