

Examining Social Networks of Infant and Young Child Caregiving in Uganda and its
Association with Maternal Depression

Chien-Wen Kao

Submitted in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy
under the Executive Committee
of the Graduate School of Arts and Sciences

COLUMBIA UNIVERSITY

2020

© 2020

Chien-Wen Kao

All Rights Reserved

Abstract

Examining Social Networks of Infant and Young Child Caregiving in Uganda and its

Association with Maternal Depression

Chien-Wen Kao

Despite the growing global momentum and commitment to addressing child malnutrition over the past few decades, undernutrition in children remains a global health crisis, particularly in low- and middle-income countries (LMICs), and leads to deleterious physical and cognitive effects on children. The maternal social network has been linked to child development and health outcomes, partially through its effect on maternal depression, which in turn affects maternal behavior and child health. However, there is limited research in LMICs broadly and in Uganda specifically on the infant/young child caregiving social network, the social network through which mothers receive infant/young child caregiving assistance. This mixed-methods dissertation study piloted and refined a measure to capture this infant/young child caregiving social network in northern Uganda, and then examined sample descriptive data and the associations between networks' characteristics and maternal depression using a social network analysis (SNA) approach. We also qualitatively examined challenges, barriers, and facilitators to infant and young child caregiving social support. Results found the social network measure to be feasible, acceptable, and comprehensible, and refinements were added to further increase clarity and suitability to the cultural context. Quantitative analyses found higher maternal depression severity to be significantly correlated with lower support on several network characteristics including the average number of caregiving tasks people assisted with, the number of people helping with advanced tasks, and the network density. Further exploration showed that higher network density was also correlated with higher number of tasks alters assisted with. Qualitative

results found that mothers often experienced multiple ongoing challenges and barriers in their relationships, such as chronic spousal abuse and financial restriction, and highlighted a lack of systemic support and interventions to address these challenges. We also found several facilitators that helped mothers obtain much needed caregiving support, such as through their older children or Food for the Hungry, a non-profit organization. Though larger future studies are needed to corroborate findings, results of the study may inform interventions for maternal depression and child nutrition/health, identifying possible targets such as network density and highlighting the importance of addressing specific chronic barriers to caregiving social support. Lastly, we also developed a measure that may be used in future studies to examine caregiving networks as a mechanism of change in existing interventions.

Table of Contents

List of Tables and Figures.....	iii
Acknowledgements.....	iv
Introduction.....	1
Literature Review.....	4
Child Malnutrition and Health.....	4
Depression, Maternal Behaviors, and Child Health.....	5
Social Support: Relationship with Depression.....	6
Social Support: Relationship with Child Health and Maternal Behavior.....	7
Network Analysis of Maternal Caregiving Networks.....	8
Challenges, Barriers, and Facilitators to Infant and Young Child Caregiving Social Network.....	10
Conclusion.....	11
Methods.....	14
Overview.....	14
Human Subjects Approval.....	14
Participants.....	14
Procedure.....	15
Data Analysis.....	24
Results.....	36
Aim 1a. Feasibility, Acceptability, and Comprehensibility of the Social Network Measure.....	36
Aim 1b. Refinement of Social Network Interview Questions.....	37

Aim 2a. Descriptive Sample Data.....	48
Aim 2b. Associations Between Depression and Social Network Characteristics.....	54
Aim 3. Challenges, Barriers, and Facilitators to Infant and Young Child Caregiving Social Support.....	58
Discussion.....	77
Conclusion.....	88
References.....	90
Appendix A: Refined Infant and Young Child Caregiving Social Network Measure.....	105

List of Tables and Figures

Table 1. Interview Items and Underlying Network Concept.....	22
Table 2. Instrument Refinement Results.....	44
Table 3. Participant Characteristics.....	49
Table 4. Composition of Social Network.....	50
Table 5. Social Network Function.....	52
Table 6. Social Network Tie Strength.....	53
Table 7. Social Network Structure.....	53
Table 8. Spearman Bivariate Correlations Between Depression and Social Network Function, Tie Strength and Structure.....	57
Table 9. Challenges, Barriers, Facilitators Results.....	73
Figure 1. Association Between Number of Caregiving Tasks and Depression Severity.....	55
Figure 2. Association Between Number of People Providing Advanced Help and Depression Severity.....	55
Figure 3. Association Between Network Density and Depression Severity.....	56
Figure 4. Association Between Network Density and Number of Caregiving Tasks.....	57

Acknowledgments

First off, I would like to thank my advisor, Lena Verdeli, for her unfailing support over the past six years. She has taught me so much about not only research, but also about perseverance, creative problem-solving, and how to see the bigger picture. I really appreciate her warmth, wisdom, and humor, and her dedication to the work and compassion have been a constant source of inspiration.

I want to express my immense gratitude to my wonderful dissertation committee, Lena, Sonali Rajan, Bryan Keller, Barry Farber, and Ronit Kishon, for taking the time and effort to provide me mentorship throughout the past few years. I want to thank them for their insightful feedback on this project and providing a supportive environment for learning. A special thanks to Sonali and Bryan, who also served on my proposal and data defense committees for their support and guidance across all stages of the project that helped it come together.

I am also incredibly grateful to Debra and George Heinrich, whose generosity helped me be able to complete my studies. Their warmth and kindness always helped me feel supported, and I am thankful to have been able to get to know them. I also want to thank the Earth Institute's Advanced Consortium on Cooperation, Conflict and Complexity (AC4) and the Teachers College's administration and Office of Financial Aid for their generous support that funded this project and much of my doctoral studies, as well as AC4's Meredith Smith for her guidance along the way.

This project would not have been possible without the Food for the Hungry (FH) team, Moses Lubangakene, Godfrey Opiyo, Evelyn Apoto, Trisha Okenge, and Jackline Namirembe. I want to thank them for their support, for welcoming me in Uganda, and for taking the time and effort to help me with so many tasks along the way. A special thanks to Evelyn Apoto for being

with me in field and her guidance during the data collection/interview process. I also want to thank Roscoe Kasujja for his consultation on various questions on the project and Oroma Glory, Angie Obel, and Susan Alal for additional translation support.

This project relied on research assistants who worked on many tasks in the past few years: Neyamat Gurbans-Singh, Akash Wasil, Katherine Venturo-Conerly, Tanya Malik, Alice Cho, Bora Meraj, and Vildana Hodzic. I'm grateful for their tireless work and dedication to the project.

My lab mates at the GMH lab created a place of learning and collaboration that I am thankful for. A special thanks to Cheryl and Dalal for their time and effort with consultations on my dissertation and their encouragement along the way, and Bryan for his mentorship from the beginning of the program. A big thanks to my cohort for their friendship and camaraderie throughout this doctoral journey. In particular, thanks to Melanie, Philippa, Elsa, and Cheskie for their help sorting through logistics in finalizing my dissertation. I am lucky to have had Arielle as my cohort and lab mate and partner-in-crime, and I can't imagine how different this program would have been without her continual support and friendship. I am also grateful for my dissertation accountability partners, Marina and Arielle, whose encouragement and company was much appreciated and needed in completing this dissertation. A thank you to Marina for having been a welcoming presence from my first day on campus, and always being a source of warm support and sage advice.

I am so grateful to my parents, Catherine and Peter, for their unconditional love and support in everything that I do. They have always provided an environment of acceptance where they encouraged me to pursue my passions and interests, and they were there for me no matter what, whether I needed support, advice, or just a listening ear. To my brother, Eric, thank you for

being my confidante over these years, and teaching me about anything and everything. To my sister-in-law, Theresa, thank you for your constant encouragement, kindness, and help (and treats).

Finally, I want to express my thanks to the Ugandan mothers who participated in this study for taking the time to complete the interviews and for being willing to share their stories with me.

Introduction

The United Nations Sustainable Development Goals (SDG) 2 and 3 are to “end hunger, achieve food security and improved nutrition and promote sustainable agriculture... [and] ensure healthy lives and promote well-being for all at all ages” (WHO, 2015). Despite a global commitment to addressing child health, rates of undernutrition and child deaths have remained high. This is a major global health crisis, particularly in low- and middle-income countries (LMICs) in Sub-Saharan Africa. Globally, 205 million children under the age of five suffer from undernutrition, with 144 million of those being stunted, or below the fifth percentile in height for their age by the World Health Organization (WHO) Child Growth Standards (WHO, 2020). Undernutrition has significant and lasting consequences on children’s cognitive and physical development, and increases their susceptibility to diseases (UNICEF, 2013). In fact, it is estimated that 45% of deaths in children under five are linked to undernutrition. In addition to undernutrition, many children die from other preventable diseases or causes, such as diarrhea and malaria. These causes of death in children can be addressed by improving maternal behaviors related to child health and nutrition, including improving water and hygiene practices and infant and young child feeding practices (WHO, 2019).

One promising avenue for addressing child nutrition and health may be to target maternal depression. Maternal depression is particularly deleterious for the child and leads to problems in socioemotional development and nutritional status (Ashaba, Rukundo, Beinesmpaka, Ntaro, & LeBlanc, 2015), partially due to increased difficulty in depressed mothers in learning or implementing child caretaking behaviors and nutrition/hygiene practices (Patel et al., 2002; Rahman et al., 2007). In fact, a meta-analysis showed that if maternal depression were

eliminated, stunting globally could be reduced by 27% (Surkan, Kennedy, Hurley, & Black, 2011).

Inadequate social support may be a risk factor for maternal depression, and studies in several LMICs, including in Uganda, have pointed to this link (Norhayati, Hazlina, Asrenee, & Emilin, 2015; Kakyo et al., 2012). Especially for mothers of infants and young children, who require a high level of attention and care, practical social support assistance with child care may be particularly pertinent to maternal wellbeing and depression, and in turn, child health and development. Thus, further understanding social support around infant and young child caretaking assistance may inform interventions targeting maternal depression and child health.

There is limited research on effective interventions in LMICs to address maternal depression, which may in turn affect child health and development (Herba, Glover, Ramchandani, & Rondon, 2016; Patel, Flisher, Nikapota, & Malhotra, 2008). While there have been a few interventions targeting maternal depression with varying levels of success (Singla, Kumbakumba, & Aboud, 2015; Atukunda, Muhooze, Westerberg, & Iversen, 2019), sustaining gains in depressive symptom reduction following interventions has proven a more difficult task; however, sustaining these gains is necessary for interventions to effect long-term influence on child growth and development.

Expanding and increasing the quality of the mother's infant and young child caregiving social network, or her constellation of social relationships where she receives support with child care assistance, may be a sustainable approach to addressing maternal depression. Strengthening these caregiving networks may not only help improve mothers' depression, but also provide the community's next generation with a more nourishing social environment for physical and cognitive development. Better understanding these infant/young child caregiving social networks

and barriers and facilitators to building a strong network, as well as developing a tool to measure this infant/young child caregiving social network, would allow us to identify targets for future maternal and child health interventions. The developed tool would also allow us to assess the caregiving social network as a potential mechanism of change for existing interventions.

Few existing studies have sought to capture and map out infant and young child caregiving social networks in an LMIC, which may be highly culturally and context specific and look very different from networks in high-income countries. To the author's knowledge, no study has done so in Uganda. Uganda is an LMIC that experienced a devastating two-decade long civil war which displaced over a million people, primarily in northern Uganda; it has high national prevalence rates of both child stunting, at 29% (UDHS, 2017), and perinatal depression, at 43% prevalence (Kakyo, 2012; Rahman et al., 2013). In general, there has been limited research in Uganda on social support for mothers around infant and young child caregiving. Even outside of Uganda, existing research has mostly examined mothers' social relationships and interactions generically or indirectly, such as asking mothers to rate their general satisfaction with their social support on a Likert scale, instead of examining the characteristics of individual social network members and interactions. The current mixed-methods dissertation study sought to capture the social relationships through which mothers in northern Uganda receive caregiving assistance using a social network analysis (SNA) approach. The SNA approach can capture, map out, and characterize various types (e.g., advice-giving), intensity (e.g., frequency or quality), and organization (e.g., structure of ties) of complex social connections between members of a social network. We examined the composition, function, tie strength, and structure of Ugandan mothers' social networks through which they receive support with infant and young child caregiving assistance. We also looked at the association between these networks' characteristics

and maternal depression. Finally, we qualitatively examined challenges, barriers, and facilitators to infant and young child caregiving social support.

Literature Review

Child Malnutrition and Health

Despite the global commitment to strive towards the Sustainable Development Goals, there remains a high prevalence of malnutrition in children, specifically undernutrition. One in five children globally are stunted – a total of 144 million children – and one in fourteen or 47 million children are wasted, defined as below fifth percentile in weight over height.

Undernutrition leads to long-term negative physical and cognitive effects on child development and health, and accounts for nearly half (45%) of all deaths among children under five years of age each year, or 3.1 million children (UNICEF, 2019). Harmful effects of stunting are nearly irreversible if not corrected before the age of five, with the first two years of age being the most critical period.

While global rates of undernutrition are decreasing, they remain high in LMICs, and are, in fact, increasing in Africa, where there was a significant increase in the number of stunted children from 2000 to 2019, from 49.7 to 57.5 million (WHO, 2020). There are also high rates of children dying before the age of five. Children in Sub-Saharan Africa are fifteen times more likely to die before the age of five than children in high-income countries (United Nations Children’s Fund, 2018). In Uganda, as of 2016, there were high rates of undernutrition, with prevalence of stunting at 29% and severe stunting at 14%, in children under five years of age (UDHS, 2017; UBOS & ICF, 2017). According to UNICEF (2013), Uganda is ranked thirteenth across countries in the number of stunted children. Child mortality rates are also high, with

around 34 deaths per 1000 children for the infant mortality rate, or deaths before the age of one, and around 46 per 1000 for the under-five mortality rate (UNICEF, 2019).

Depression, Maternal Behaviors, and Child Health

Traditionally, child nutrition and health interventions have focused on education targeting determinants such as feeding and hygiene practices, but a promising new intervention target is maternal mental health, a key predictor of child health. A high prevalence of mothers in LMICs (19 to 25%) suffer from postpartum depression (Gelaye, Rondon, Araya, & Williams, 2016), and previous literature has shown an association between maternal depression and child development in LMICs. In fact, a meta-analysis of 17 studies in LMICs found that maternal depressive symptoms were associated with child growth impairment and suggested that eliminating maternal depressive symptoms would reduce the prevalence of underweight or stunted children globally by 23%-29% (Surkan, Kennedy, Hurley, & Black, 2011). A longitudinal study in Bangladesh corroborated this finding: Postpartum depressive symptoms predicted low child weight and antepartum depressive symptoms predicted child stunting (Nasreen, Kabir, Forsell, & Edhborg, 2013).

The relationship between maternal depression and child growth may be partially explained by maternal caregiving behaviors. For example, a study in Vietnam found that maternal mental distress was associated with child feeding practices and anthropometry (Nguyen, Menon, Rahul, and Ruel, 2011). While there are only a few studies in LMICs on this association, an extensive body of literature from high-income countries supports the link between maternal depression and maternal child caregiving behaviors. For instance, a study in Australia found that postnatal depression had a significant negative impact on breast-feeding duration (Henderson, 2003). A study on the caregiving behaviors of parents in the United States

found that depressed mothers were more likely to engage in unhealthy infant and young child feeding and sleep practices (Paulson, Dauber, Leiferman, 2006). Additionally, a meta-analysis of observational studies found significant differences in socioemotional aspects of parenting behaviors in depressed and non-depressed mothers (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). More specifically, depressed mothers were more likely to engage in negative (e.g., threatening the child) and disengaged (e.g., ignoring the child) parenting behaviors and less likely to engage in positive (e.g., offering praise) parenting behaviors.

Social Support: Relationship with Depression

Social support refers to the social resources that are either actually received (received social support) or perceived to be available (perceived social support). There are two main categories of social support examined in the health literature: emotional and instrumental, with informational social support either categorized separately or under instrumental support (Hopkins and Campbell, 2008, Gottlieb and Bergen, 2009, Thoits, 2011). Emotional support refers to demonstrations of love, encouragement, and empathy. Instrumental support is providing behavioral or material assistance, and informational support is the provision of facts or advice to address a problem (Thoits, 2011). Instrumental support may be particularly important when there are physical stressors that need to be addressed and specific support provision may depend on the life domain affected, such as material support when assets have been lost (Cutrona and Russell, 1990). For postpartum women in low-resource settings, instrumental support related to infant and young child caregiving may be particularly crucial (Negron et al., 2013).

Inadequate social support has frequently been identified as a risk factor for depression. Studies in both high-income countries (Boyce & Hickey, 2005; Chee et al., 2005; Green et al., 2006; Hunker et al., 2009; Escriba-Aguir & Artazcoz, 2011; Kozinszky et al., 2011; Lanes et al.,

2011; Lee et al., 2011; Quelopana et al., 2011; Sword et al., 2011; Eastwood et al., 2012) and LMICs (Aydin et al., 2005; Chee et al., 2005; Inandi et al., 2005; Husain et al., 2006; Wang & Chen, 2006; Dindar & Erdogan, 2007; Liabsuetrakul et al., 2007; Ege et al., 2008; Gausia et al., 2009; Yagmur & Ulukoca, 2010; Manuel et al., 2012; Norhayati et al., 2015) have consistently found lack of social support to be associated with postpartum depression. This association has also been found in studies in Uganda (Natamba et al., 2017). One study in Uganda specifically found that a lack of support from the husband was associated with depressive symptoms in postpartum mothers (Kakyo et al., 2012).

Social Support: Relationship with Child Health and Maternal Behavior

Maternal emotional, instrumental, and informational support have also been shown to be associated with child health and development. It has been found to be significantly associated with the child's overall health, asthma diagnosis, emergency visits in young children, injuries, cognitive development, and socioemotional wellbeing (Appleyard, Egeland, & Stoufe, 2007; Crosnoe & Elder, 2004; Heard, 2007; Rockhill et al., 2009; Stone, 2006; Jackson et al., 2000; Leininger et al., 2009; Ryan et al., 2009; Turney, 2013).

The relationship between maternal support and child health may be partially explained by a difference in maternal behaviors. Maternal behaviors are highly linked to child outcomes and in high-income countries, studies consistently find that higher levels of social support are associated with positive parenting practices, such as higher maternal responsiveness to child needs and parental warmth and monitoring. (Maguire-Jack & Showalter, 2016; McConnell et al., 2011; Taylor et al., 2008; Armstrong et al., 2005; Ceballo & McLoyd, 2002; Green et al., 2007; Jackson & Huang, 2000; Kotchick et al., 2005). These behaviors promote positive child

development and outcomes (Taylor et al., 2015; Thompson et al., 2006; Amato & Fowler, 2002; Grych & Fincham, 1993; Mann & MacKenzie, 1996; McGroder, 2000).

There is also some existing, but more limited, literature on the associations between social support, maternal behaviors, and child outcomes in LMICs. One study in Brazil, an upper middle-income country, found an association between social support and positive maternal behaviors among adolescent mothers (Diniz et al., 2015). Another study in Iran, also an upper middle-income country, found a relationship between social support and breast-feeding self-efficacy (Faridvanda, 2017). A study in Uganda observed a relationship between maternal social support and maternal feeding behaviors (Ickes et al., 2016).

Network Analysis of Maternal Caregiving Networks

Studies on maternal social support have largely involved social support scales that ask for ratings of perceived support, in which participants respond on a Likert scale to statements about support, such as the Multidimensional Scale of Perceived Social Support (Zimet et al., 1988). These measures do not look at the specifics of each member of the social network and their interactions with the mother. A social network approach not only captures more detailed information on each person and interaction, but also allows for characterization of the make-up, function, and structure of the people, relationships, and exchanges that constitute the social network — key information that may be linked to maternal depression and child health.

A social network refers to a person's constellation of social relationships and is a key influence on our health. Social networks shape health and health behaviors through social support interactions provided through social ties, such as sharing information and practical assistance (Berkman et al., 2000; Berkman & Kawachi, 2000). A social network approach measures the specifics of the social exchanges through these ties and the personal characteristics

of each member of the social network. A range of social network variables can then be examined, such as the network size, or total number of network members named; network composition, or the proportion of people with specific characteristics that make up the network; network function, or the type of help or support provided through the social ties; tie-strength, a measurement of the intensity or strength of individual social ties; and network structure, the ways in which the social ties are organized, such as the density of the social network. While social ties may be a primary source of health information, tangible support, and material resources in environments with limited formal supports, and social network studies may be particularly valuable in capturing the specifics of exchanges through these social ties, there has been limited research on social networks and health in LMIC settings (Kelly et al., 2014; Lomnitz, 1977).

In addition, there is limited research on social networks specific to infant and young child caregiving in both high-income countries and LMICs. Of the few existing social network studies in LMICs that focused on mothers, most did not specifically inquire about infant and young child care. The studies did ask for other relevant information, such as, people the mothers considered important (Adams et al., 2015), go to for support (Adams et al., 2002), prepared food with (Zelner et al., 2012), or went to for general advice (Fonseca-Becker & Valente, 2006). Two studies asked questions more related to child care: One study in Kenya on deworming drugs (Miguel & Kremer, 2003) asked parents to identify individuals with whom they “discussed child health issues,” while a study in India asked whether individuals in their network were “thought to have a special role in child care” and to name one person that, “if your child falls sick, and the nurse/health worker is not available, who would you (actively) seek/(passively) received advice from?”(Moestue et al., 2007). While these questions elicited a subset of maternal caregiving

social support network members, they focused mostly on informational support and did not characterize the specifics of the received support across a range of infant and young child caregiving domains that are key to child health/development in low-resource settings, such as feeding and hygiene behaviors. In addition, most of these aforementioned studies involved only a name generator question to elicit network members and a few questions about the demographics of each social network member, such as gender and education. Thus, these studies were only able to examine the network size and composition without capturing key social network characteristics, such as tie strength or network structure. Lastly, few LMIC studies have examined the relationship between maternal depression, a key risk factor for poor child development and health, and maternal social network characteristics, and none have examined its association with network function and density.

Challenges, Barriers, and Facilitators to Infant and Young Child Caregiving Social Network

Beyond quantitative characterization of the caregiving social network, it is also important to gain an in-depth understanding of challenges, barriers, and facilitators to infant and young child caregiving social support specific to a community — which may look very different in LMICS than high-income countries— to aid in informing future interventions within the specific cultural and socioeconomic context. A qualitative approach would be the optimal method to provide a rich understanding of this topic. Few LMIC studies have described the challenges in infant and young child caregiving social networks and the barriers and facilitators to accessing support. Most qualitative studies in LMICs looking at infant and young child caregiving social support only described the types of people who assisted the mother. One study in Tanzania by Mbekenga and colleagues (2011) examined informal support for first-time mothers. They found that it was important for first-time mothers to be provided with support by family members, or in

their absence, neighbors and friends, for infant and young child care as well as for self-care. Only a small section of the paper identified risk factors for poor support and found low social economic status and deviating from social norms as risk factors.

Conclusion

Despite a global commitment to addressing undernutrition in children, there are still 144 million children under five years old who are stunted, and once stunted, the negative physical and cognitive effects are difficult to reverse. Studies in the literature have shown that maternal depression is associated with child health and development, partially through depression's effects on maternal behaviors. Maternal social support is linked to maternal depression, as well as to maternal behaviors and child health. Given the level of care that an infant or young child requires and the importance of these early years in a child's development, social support surrounding infant and young child caregiving may be particularly critical for both maternal depression and child health/development. There are few studies looking at this infant and young child caregiving support in LMICs and in Uganda, particularly from a social network perspective. Also, existing network studies do not capture the range of infant and young child caregiving domains in which social support is provided, nor key social network variables such as network structure. They also do not examine the relationship between the infant and young child caregiving social network and maternal depression. Lastly, few LMIC studies have examined the challenges, barriers, and facilitators to infant and young child caregiving social support. Our study addresses these gaps in the literature by examining key infant and young child caregiving social network characteristics across a full range of domains of caregiving tasks, and qualitatively describing challenges, barriers, and facilitators to caregiving support in a sample of mothers in Northern Uganda.

Results may be particularly impactful for informing future studies and interventions for both maternal depression and child health/development in low-resource settings.

More specifically, we piloted and refined a measure to capture this infant and young child caregiving social network of mothers with children under 21 months of age in northern Uganda, quantitatively characterized the social network and its relationship to maternal depression, and qualitatively examined challenges, barriers and facilitators to obtaining this social support. For our infant and young child caregiving social network measure, we focused on domains of instrumental support, as this type of support has been shown to be significant in its impact on the mother (Gebusa et al., 2014; Sampson et al., 2015; Turney, 2013) and is able to be objectively captured in a social network measure. We used an egocentric social network approach, which examines network ties an individual, also called the ego, has with other people in their network, also called alters.

This study had three aims, as follows:

Aims and Hypotheses

Aim 1a. To pilot a social network measure that quantitatively captures the mother's social relationships involving infant and young child caregiving assistance, and to assess its feasibility, acceptability, and comprehensibility.

Aim 1b. To utilize qualitative and psychometric data to refine the measure.

Aim 2a. To provide descriptive sample data on infant and young child caregiving social network characteristics and maternal depression.

Aim 2b. To examine the relationship between maternal depression and key social network characteristics, including network size, composition, function, tie strength, and structure.

Hypothesis 2b. Lower depression scores will be associated with stronger social network characteristics.

Aim 3. To qualitatively examine challenges, barriers, and facilitators to mothers obtaining quality infant and young child caregiving assistance through their social ties.

Methods

Overview

We used a mixed-methods approach which utilized both qualitative and quantitative data to evaluate the social network measure, quantitative data to examine social network characteristics and its association with depression, and then qualitative data to examine challenges, barriers, and facilitators to infant and young child caregiving social support.

Human Subjects Approval

This study received approval by the Institutional Review Boards (IRB) at the home institution and in Uganda. It was first approved by the IRB at Teachers College, Columbia University. It then went through approval at the regional level in Uganda through the Gulu University Research Ethics Committee (GUREC), and then finally the Uganda National Council for Science and Technology (UNCST). Edits suggested by GUREC and UNCST were then approved by Teachers College's IRB.

Participants

Twenty-one participants were recruited in April 2018 from a village in Kitgum, Uganda where study collaborator FH was active in providing maternal health education and outreach. This was a convenience sample based on FH's existing relationship with the village. Key inclusion criteria were being over 18 years of age and being the primary caregiver of an infant or young child under the age of 21 months. In our study, all our caregiver participants were the mother of the child. An FH staff, with initials EA, who had established positive relationships with members of the community assisted with recruitment and the interview process to increase acceptability. Women from the village were gathered, and the study was explained to them by the current author (Chien-Wen Kao), with interpretation between English and Acholi Luo

provided by EA. Those who were interested in the study approached the author and were scheduled for an interview, where consent and screening procedures followed.

Procedure

Consent and confidentiality. Prior to the interview, the study and the consent form were explained. Participants were given the option of either signing or using a fingerprint for consent procedures to accommodate participants who may be less comfortable with written language. Consent was obtained for participation in the study, for audio-recording, and for future contact. Consenting to audio-recording and future contact was not necessary for study participation. If the participant provided study consent, the study interview was completed at that time. If the participant consented to audio-recording, the interview was recorded on a handheld audio recorder.

Participants were assigned an ID for their data, and their names were not recorded on the data. There was only one paper copy of the linkage between participant ID and names; that document was stored separately from the data, then shredded and discarded following completion of analyses. At the end of the interview, participants were compensated 5000 Ugandan Shillings (approximately \$1.36 USD) as suggested by the Ugandan UNCST IRB.

Safety protocols. If the participant scored above 10 on the Patient Health Questionnaire-9 (PHQ-9), a measure of depression (see further details under Measures section), psychoeducation about depression was provided in a culturally appropriate manner, including an explanation of the symptoms, normalizing of feelings, instilling hope and that there are many tools that can help with depression, and then offering a referral to a mental health clinic in the area if they were interested. If the participant scored above 20 on the PHQ-9, the same

psychoeducation was provided, and then they were connected to the mental health clinic and an initial appointment was set up to ensure they would be seen.

If a participant endorsed suicidal ideation during the interview, then the author conducted a more in-depth suicide risk assessment for participant safety. Suicidal ideation was identified through the PHQ-9 question 9, which reads, “How often have you been bothered by the following over the past 2 weeks: thoughts that you would be better off dead, or thoughts of hurting yourself in some way?”, and a further risk assessment was conducted for any responses above “0; not at all,” which were “1; several days,” “2; more than half the days,” or “3; nearly every day.” For the further risk assessment, content of thoughts around death and suicide, level of intent, method, plan, and any preparatory behaviors were determined using a brief version of the Columbia Suicide Severity Scale (Posner et al., 2008). If suicidal intent, or a higher level of risk, was endorsed, the participant was provided psychoeducation on suicidal ideation as a symptom of depression and an explanation of the need to contact a mental health clinic for further assessment. They were then connected by phone to the mental health clinic for a clinician there to conduct a further risk assessment. We followed their determination and guidance for next steps, and an in-person evaluation and appointment at the clinic was also scheduled for each of these participants.

For all participants who endorsed suicidal ideation on the PHQ-9, the author then completed a safety plan together with the participant. This included a plan to keep the environment safe; picking a “guardian angel” from their social support system who was nearby and accessible in a time of crisis, could empathize, provide support, and create a safe environment, and who could assist with child care if needed; identifying warning signs of distress such as thoughts, feelings, physical sensations, and behaviors; identifying coping

strategies “to relax and take your mind off these thoughts, such as praying, singing, listening to music, performing a physical task;” identifying people and social settings that may help them feel better, people that they feel comfortable reaching out to in a crisis; and identifying their reasons for living. The number to the mental health clinic was also provided in case of a crisis. A date was also set up for the FH staff EA to follow up with the participant in the community

Interview Approach. Individual interviews were conducted with each participant with the author and EA as the interpreter, guided by a semi-structured interview protocol. Individual interview was chosen as the format given the sensitive nature of the information being discussed – personal circumstances, difficulties in garnering infant and young child caregiving support, and mood. Prior to carrying out interviews, a meeting between the author and EA was held to go over the aims of the interview, the measures and interview guide, and the interpreter’s role.

EA and the author approached the interview as a team, following an interpretation style where the interpreter also provided input on the content of the conversations. EA had an established relationship with each of the participants and facilitated building an environment of trust and openness in the interview process. She was also familiar with the participants’ history and with the cultural norms, and she provided feedback as needed on whether phrasing of questions was culturally appropriate and acceptable to participants and provided explanation of culturally specific situations the participants referred to. This interview approach was based on the literature: Many believe that the “ideal” interpreting style falls between a “more passive style where the interpreter only acts as a conduit” and “a more independent style where the interpreter dominates the interview” (Wallin & Ahlstrom, 2006; Baker, 1981), such that the interviewer and the interpreter can act as a close team. Authors in the literature also recommend that the interpreter be someone who is connected to the community, trusted by them, and understands the

local culture (Baker, 1981; Hennings et al., 1996). This way, the interpreter can “incorporate an interpretation of cultural aspects of the interview situation” (Hennings et al., 1996).

All 21 participants consented to audio recording and interviews were recorded. The author’s questions and EA’s translation of the participants’ responses were then transcribed verbatim by research assistants NG and TM, who were master’s students in clinical psychology.

Measures. The interview was guided by a semi-structured mixed-methods interview protocol with a combination of close-ended questions as part of the quantitative social network measure and open-ended questions to evaluate the social network measure and to qualitatively assess challenges, barriers, and facilitators to obtaining support from the social network. The measure was pretested on a mother in English to evaluate wording of questions, comprehension, structure, and sequence of the interview, and her feedback was incorporated. The measure was then translated from English to Luo by a team of bilingual FH staff who were familiar with maternal and child health in the community but not part of this specific study. The translated measure was then reviewed by a mother in Uganda for comprehension, clarity, and acceptability. Lastly, it was evaluated by EA, who is an expert in maternal/child health in the community, for clarity and understanding before administration of the measure.

Demographic Information. Basic demographic information, including the participant’s age, total number of children they have, food insecurity in the household, age of the child, and whether the child was being breast-fed was collected for each participant. These questions were based on the Knowledge, Practice and Coverage Tool from the United States Agency for International Development’s (USAID) Maternal Child Survival Program and questionnaires from the Millennium Villages Project (Mitchell et al., 2018), a collaborative project between the

Columbia University Earth Institute, the United Nations Development Programme, and Millennium Promise.

Infant and Young Child Caregiving Social Network Measure.

Development of measure. We developed a concise measure to capture the mothers' social network involved in infant and young child caregiving assistance. The content of the questionnaire was informed by a review of previous literature. The structure and sequence of the social network questions were based directly on the social network questions from the General Social Survey (Burt, 1985) and the Social Network Analysis Project (SNAP) measure (Kelly et al., 2014), with name generator questions asking about social ties in the past six months, a name nominator narrowing down to five people, interpreter questions about the characteristics of each of the social network member and the nature of the assistance from them, and questions to assess the connectivity between members of the social network.

In contrast to the General Social Survey and the SNAP measure, our questions were created to specifically focus on social networks related to infant and young child caregiving as opposed to broadly on interpersonal connections. Key adaptations included prompting for individuals involved specifically in caring for the infant or young child in the name generator questions instead of about general support, asking about assistance with tasks and domains specific to infant and young child caregiving in the network function question, asking about the quality of the relationship around specifically infant and young child caregiving in the tie strength questions, and assessing whether members helped each other with infant and young child care for the internode/alter-alter ties as opposed to a general assessment of whether members knew each other. Further details of these adaptations are discussed below.

These were the two name generator questions used to elicit the people involved in providing caretaking assistance or information:

“Many people may be involved in the caretaking of a young child. Looking back over the last six months, that would be from (date for 6 months prior to interview date), who are the people who have helped with taking care of the child’s basic needs? For example, keeping the child clean (bathing, teeth brushing, disposing waste), feeding the child, playing with the child, holding the child, or taking care of the child when the child was sick?”

“Since (date for 6 months prior to interview date), who has provided information on how to take care of the child? For example, medical advice, information about the child’s eating or drinking, or information on how to keep the child clean (for example, family members, community leaders, experts in the community, doctors, neighbors)?”

Then, the list was narrowed to five people the participant deemed to be the most involved in caregiving; this helps to place a limit on the length and administration time of the measure. Subsequent items collected information about each of the five nominated network members and asked questions about personal characteristics of the member, such as age and gender, to inform network composition.

The infant and young child caregiving domains each alter assisted with were then assessed to inform network function. Domains inquired about were based on the literature on types of tasks involved in taking care of infants and young children and on the standard Knowledge, Practice, Coverage (KPC) questions, which included hygiene, feeding, and illness management domains that influence nutritional status and child health (CORE Group, 2000; Francis-Connolly, 2000; Logsdon & Usui, 2006). Questions about the quality of each relationship (tie strength) were adapted from questions in the existing literature in the areas of:

trust, satisfaction, affection from the child, and emotional closeness (Maselko et al., 2019; Reid & Taylor, 2015; Richardson et al., 2004; Stapleton et al., 2012). These domains were selected to measure diverse aspects of the participant's subjective experience of the quality of the relationship through which they receive support for infant and young child care. Satisfaction and trust were captured by the questions: "Overall, how happy are you with the way that he/she takes care of the child?" and "Overall, how much do you trust him/her to take care of your child?" The question to characterize the child's affection was edited from a study by Maselko, Hagaman, Bates, Bhalotra, ... Rahma (2019) to be slightly broader in scope, from their question of who the "baby likes being held by" to a broader "How much do you think the child likes him/her?" While the rest of the tie strength questions were specific to child care, one question on emotional closeness was included as the literature highlights the importance of emotional support in maternal support (Sampson et al., 2015). The question reads, "How emotionally close do you feel to him/her?"

Visual illustrations have been used in previous studies in Uganda to help participants understand Likert scale response anchors (Nakigudde et al., 2009). Our study used a simple visual of faces after consulting with local therapy providers. Faces ranging from a "sad" face for "not at all" satisfied to a "happy" face for "very much" satisfied, were used as a visual prompt to the Likert scale.

Lastly, internode infant and young child care assistance relationships between all members of the social network (both the participant/ego and network members/alters) were assessed to be able to calculate network structure variables, specifically network density and reciprocity. A binary yes/no question asked whether a member helped another with infant/young child caregiving, for example, "Do you help him or her to take care of the baby (e.g., by

providing instructions, information about the child or advice on how to take care of the child)?)” to assess ego/alter ties and “Does he/she help (name of another social network member)?” to assess alter-alter ties. See Table 1 for interview items and their underlying network concept.

Table 1

Interview Items and Underlying Network Concept.

Domain	Item	Network construct/concept
Name generator prompts	<p>“Many people may be involved in the caretaking of a young child. Looking back over the last six months, that would be from (date for 6 months prior to interview date), who are the people who have helped with taking care of the child’s basic needs? For example, keeping the child clean (bathing, teeth brushing, disposing waste), feeding the child, playing with the child, holding the child, or taking care of the child when the child was sick?”</p> <p>“Since (date for 6 months prior to interview date), who has provided information on how to take care of the child? For example, medical advice, information about the child’s eating or drinking, or information on how to keep the child clean (for example, family members, community leaders, experts in the community, doctors, neighbors)?”</p>	Network size
Name nomination	Of all the people named, who are the five people who have taken care of the child the most?	Network size
Name interpretation	<p>What is your relationship with him/her?</p> <p>What is his/her gender?</p> <p>How old is he/she by your best guess?</p>	Network composition
Infant and young child caregiving assistance	<p>Does he/she help with (check all that are true):</p> <p>Keeping the child clean (for example, bathing, teeth brushing, disposing waste) ____</p> <p>Feeding the child ____</p> <p>Playing with the child ____</p> <p>Holding the child ____</p> <p>Taking care of the child when the child was sick ____</p>	Network function

Domain	Item	Network construct/concept
	Helping with taking care of the child when you were busy, such as at work or out, or when you were sick _____ Helping with the child at night, during sleeping hours____ Giving medical advice _____ Giving information about the child's eating, nutrition, or water drinking _____ What else did they help with, if there's anything else?	
Frequency and length of time	On average, about how many days in a month does he/she help with taking care of the child? _____ days (0 ~ 31 days) How long have they been helping to take care of the child?	Tie strength
Satisfaction, trust, affection from child, emotional closeness	Overall, how happy are you with the way that he/she takes care of the child? Overall, how much do you trust him/her to take care of your child? On average, how much do you think the child likes him/her? How emotionally close do you feel to him/her?	Tie strength (perceived)
Relationships between members	Do you help him or her to take care of this child (e.g., by providing instructions, information about the child or advice on how to take care of the child)? Yes ___no___ Does he/she help 2. _____ with child caretaking (assistance or information)? Yes ___No___ Does he/she help 3. _____? Yes___No___ Does he/she help 4. _____? Yes___No___ Does he/she help 5. _____? Yes___No___	Network structure

Depression. The PHQ-9 was used to measure depressive symptomatology (Kroenke, Spitzer, & Williams, 2001). This is a nine-item measure of depression with each item

corresponding to the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition's (DSM-5) nine criteria for Major Depressive Disorder: "little interest or pleasure in doing things," "feeling down, depressed, or hopeless," "trouble falling or staying asleep, or sleeping too much," "feeling tired or having little energy," "poor appetite or overeating," "feeling bad about yourself or that you are a failure or have let yourself or your family down," "trouble concentrating on things, such as reading the newspaper or watching television," "moving or speaking so slowly that other people would've noticed or so fidgety or restless that you have been moving a lot more than usual," and "thought that you would be better off dead, or thoughts of hurting yourself in some way." Each item is rated on a 4-point scale (0, "Not at all"; 1, "Several days"; 2, "More than half the days"; and 3, "Nearly every day") for how often symptoms were experienced in the past two weeks. The PHQ-9 has been validated for use in Uganda (Nakku et al., 2016).

Evaluation of Social Network Questions. We sought to evaluate and refine the quantitative social network measure questions. Prompts about the social network questions were included throughout the interview to assess participant experience and their comprehension and acceptability of the questions, and to inform revisions of the measure. Prompts included: "Was that easy or hard to answer?" if there appeared to be difficulty with a question; "How sure are you of your answer?"; and at the end of questionnaire, participants were asked, "Were there any questions that were difficult to answer?"

Open-ended questions were also used to collect qualitative data to evaluate the social network measure. The questions included: "Can you describe a day where many people might work together to take care of the child?", which provides information to inform evaluation of both the name generator questions and network function question about caregiving tasks; Evaluation of the network function question was also informed by the following questions:

“What does ‘child caretaking’ mean to you?”, “Can you describe how that (child caretaking) might look like in a typical day for you?”, “What else did they help with, if there’s anything else?”

Challenges, Barriers and Facilitators in Infant and Young Child Caregiving Social Network. The interview also included qualitative questions about challenges, barriers, and facilitators to receiving needed infant and young child caregiving assistance from the social support network. Questions to assess challenges or barriers in receiving assistance from the social network included: “Is there anyone that makes it more difficult to take care of the child or doesn't agree with the way you take care of the child? Who are they and how so?”; “Is there anyone who you would like to help take care of your child more? How so?”. Questions to assess facilitators included, “How did they (member of social network) begin taking care of the child?”

In addition to these questions on the semi-structured interview guide, follow-up questions were used in response to participant responses as appropriate. For example, if a participant mentions a person, such as their husband or a family member who does not help with taking care of the child, they would be asked, “Can I ask why that is?” to explore barriers to receiving help from this person. As it became clear that spousal support was a common and often primary source of infant and young child caregiving support, if the spouse was not mentioned, participants were asked, “What about your husband/the child’s father? How does he help?”

In addition, quantitatively oriented questions also generated much qualitative data on barriers and facilitators, particularly the tie strength questions: “Overall, how happy are you with the way that he/she takes care of the child?”; “Overall, how much do you trust him/her to take care of your child?”; “On average, how much do you think the child likes him/her?”; “How emotionally close you feel to him/her (name of helper)?”

Data Analysis

Aim 1a. Feasibility, Acceptability, and Comprehensibility of the Social Network

Measure. Whether the administration of the questions proceeded smoothly informed feasibility of the measure. Any difficulties in the translation process also informed whether any questions were difficult to comprehend or to express in Acholi Luo. The feedback from the local expert, FH staff EA, when she evaluated the questions prior to administration was used to inform whether the questions would be acceptable and understandable to participants, and also able to meaningfully capture the targeted infant and young child caregiving social network concepts. When the measure was administered, feasibility and acceptability were assessed by the dropout rate, the time to complete the questionnaire, and observation of how comfortable participants appeared answering the questions. Follow-up questions around sensitive topics were discussed with FH staff EA to increase acceptability before asking the participant. Comprehensibility and acceptability of the measure was also assessed by whether the participants appeared to understand the questions and provided responses aligned with intended meaning of questions, and by responses to the prompts, “Was that easy or hard to answer?” and “Were there any questions that were difficult to answer?”

Aim 1b. Refinement of Social Network Interview Questions. Participant responses to prompts about whether questions were difficult to answer were used to identify questions that needed to be edited to be easier to understand and answer.

When participants had difficulty understanding questions or if questions did not yield relevant responses, different ways of asking the question were trialed until the participant understood the question to ensure that we obtained the relevant information, so that the quantitative data collected for subsequent analysis would be meaningful; the follow-up questions

trialed also informed the final wording of the questions in the instrument refinement process (see Results section below for details). In addition, EA was consulted to identify appropriate and culturally acceptable wording to use for interview questions and her feedback was also used to refine the measure. Note that while these efforts were made to most accurately capture the targeted responses during the interviews, the systematic evaluation and edits to the measure to produce a refined measure for future use were made after the data collection phase of this study, and so are not reflected in the quantitative data analyses in this study.

Name generator. Name generator questions were evaluated on whether they were able to successfully elicit a range of people who provided support with infant and young child caregiving. They were also evaluated on whether they were able to capture all the people in the mother's social circle who were important in infant and young child care provision, without missing key members. When people were mentioned in the interview that did not come up during the name generator questions, their involvement in child care was assessed to determine if the name generator question had missed identification of infant and young child caregiving members.

Infant and young child caregiving assistance domains. Responses to the open-ended questions on what caregiving means to the mothers, what a day of infant and young child caregiving and a day where different people helped with caregiving looked like were compiled to determine the domains of child caregiving that the mothers independently generated. All responses to the open-ended questions, "What did they help with?" and "Did they help with anything else?" for each network member were also compiled in the same way. These responses were evaluated and compared against the predetermined list of child care assistance domains on the measure to assess the adequacy of the list in matching the responses from the participants.

The predetermined domains in the piloted questionnaire were as follows: Keeping the child clean/hygiene, feeding the child, playing with the child, holding the child, taking care of the child when the child was sick, helping with taking care of the child when the mother was busy or sick, giving medical advice, and giving information about the child's nutrition, food or water intake/drinking, or breast-feeding. Using the participant responses, unnecessary domains were discarded and new domains not of the list were added.

Tie-strength questions. Cronbach's alpha was run to assess the internal consistency of the tie strength composite, which consisted of the four perceived tie strength items. Spearman correlations were run to assess inter-item associations of the four tie strength items and to identify if there were pairs of items with high correlation coefficients ($>.95$), pointing to redundancy.

An exploratory analysis was conducted using qualitative data to evaluate the validity of the tie strength questions in capturing the quality of the relationships. Given that qualitative data were available for all spouses named as a social network member but not for non-spousal network members, this analysis used only spousal data. Spousal challenges and barriers codes (obtained from results in Aim 3) pointing to negative aspects in the spousal relationship were counted for each participant; these included codes such as spousal maltreatment, alcohol abuse (e.g., "[He helps me with child care] two times only. Most of the time he is drunk. [He] is a drunkard...He doesn't go to the garden. I provide for my family. But despite this he still beat me up."), financial withholding (e.g., "I asked for money. He didn't give me to take the child to the hospital."), or conflicts around other women. As an example, if a participant shared about maltreatment and financial withholding by the spouse, the number of negative codes would be two. The logistical barriers code, which includes circumstances such as the spouse working far

away or having physical disabilities that get in the way of assisting, were not counted since they are factors outside of the spouse's control and may not be indicative of relational quality.

Spearman correlations were then calculated between the number of spousal challenges/barriers codes and each of the tie strength items. These correlations were then examined to look at the direction and strength of the correlation; a negative correlation, such that higher number of negative codes is correlated with lower tie strength scores, would provide some preliminary evidence of the validity of the tie strength items in capturing perceived relationship quality.

Aim 2a. Descriptive Sample Data. IBM's Statistical Package for the Social Sciences (SPSS) Version 25 was used for the quantitative analyses. Descriptive analyses, including the mean, standard deviation, and range of the participant characteristics, were conducted to characterize the sample. The variables included: participant age, their infant/young child's age in months, their total number of children including the infant/young child, and the number of months of food insecurity in the past year. Descriptive analyses of the total depression severity (PHQ-9) score was also calculated; within the PHQ-9, item 10 (participant functioning) was quantified. In addition, the percentage of participants who endorsed suicidal ideation, responding above "0; not at all" to the PHQ-9 question 9 "thoughts that you would be better off dead, or thoughts of hurting yourself in some way?" was calculated.

Descriptive analyses of network characteristics, described in further detail below, were then completed. All variables pertaining to alters were collapsed at the level of the participant by taking the mean across the participant's alters and all analyses were conducted at the participant level, because multilevel analyses were not appropriate at this sample size.

Network size. The network size was calculated as the total number of alters that the participant named in response to the name generator questions.

Social network composition. Social network composition variables describe the characteristics of the alters, and included the average age of the alters, proportion of men in the social network, whether the participant received spousal support and the proportion of the total support network that spousal support made up, the number of the participant's parents, children, other family members, and neighbors who provided support and the proportion of each of these relationships out of the total network, as well as the number of trained experts providing support and its proportion out of the total network. The average age of the alters was obtained by averaging the age of all named alters of each participant. The proportion of an alter characteristic, such as their gender or relationship to the ego, in the social network was obtained by dividing the number of alters with the characteristic by the network size (Djomba & Zaletel-Kragelj, 2016).

Social network function. A social network function variable captures the type of support provided through ties to alters, which in this study involved the type of infant and young child caregiving tasks that the alter helped with. The mean number of caregiving tasks across alters was calculated for each participant. As various infant and young child caregiving tasks require different levels of expertise and responsibility, infant and young child caregiving tasks were divided into three categories to explore these differences: Basic help included playing and holding the child which can be easily done without specialized or more extensive understanding of how to take care of the child; advanced help requires additional expertise and may more directly alleviate the mothers' burden, and included cleaning, feeding, taking care of the child when they are sick, taking care of the child if the mother is not available, and taking care of the child at night; and informational help included provision of medical or nutritional information.

The number of people providing the mother basic, advanced, and informational help was calculated for each participant.

Tie strength. Tie strength variables capture the quality and intensity of the relationship between the ego and their alters. Mothers were asked how frequently each alter helped with child caregiving (days per month), how long they had been caring for the child (months), and then four questions about their relationship with the alter answered on a 5-point Likert scale with anchors from 0-4. The four questions asked how satisfied they were with the alter's child caregiving help, how much they trusted the alter to take care of the child, how emotionally close they felt to the alter, and the level of affection they perceived the child to have towards the alter. The mean of these four questions was calculated for each alter and then the mean was calculated across alters to create a composite variable for each participant, also ranging from 0 to 4, of the overall tie strength of the perceived quality of their infant and young child caregiving social support. Given the unique importance of support from the spouse that is evident in the literature, an additional variable was created for the composite tie strength of the spousal tie (quality of spousal support) if the participant had named her spouse as a member of her infant and young child caregiving social network.

Social network structure. Lastly, social network structure variables capture the presence and organization of linkages between people (nodes) in a social network. Given that this is an egocentric social network, there are only a few network structure variables available. Two variables were created in this sample: the network density and reciprocity. Network density is defined as the number of links (social ties) over total possible links and can range from 0 and 1, with 1 indicating that all possible links between members of the network are present (Hanneman et al., 2005). Given the bidirectional nature of the caregiving network, where each member of the

social network can both give and receive help, the total possible number of links is given by the formula $n(n-1)$, with n being the total number of nodes or people in the network (Hanneman and Riddle, 2005). To illustrate through an example, if the participant (ego) names two people (A and B) who help her with infant and young child care (alters), n would be 3. The total number of possible links would be $3(3-1) = 6$. As A and B help the participant with child care, that accounts for two links. If A also helps B take care of the child and the participant also helps B take care of the child, two links are added, for a total of four links. Therefore, the network density would be $4 \div 6 = 0.67$. A secondary measure of density, egocentric network density, was calculated to exclude the ego/participant and the links between the ego and alters from the analyses. This measure is helpful for isolating the network density of only the connections amongst alters but is only able to be calculated for participants with at least two network members and excluded many of our participants. Therefore, it was used as a secondary measure for corroboration. In the literature, studies have used either formula for calculating density (Jennings et al., 1995; Mustanski et al., 2015). Reciprocity was also measured to assess the proportion of ego-alter ties where the relationship was bidirectional, or reciprocal, such that the participant also provided help to the infant and young child caregiving network member or instructions for taking care of the child. Reciprocity is calculated by the number of reciprocal ego-alter ties over total ego-alter ties, or the number of relationships between the mother and a member of her social network where they also received help from her for taking care of the child. A reciprocal tie could point to a relationship where network members may have a willingness to listen to the mother's instructions and feedback for caregiving and to collaboratively take care of the baby. Reciprocity can be seen as a subset of the data captured in the network density

variable, and together, reciprocity and the egocentric network density corresponds to the network density variable.

Aim 2b. Associations Between Depression and Social Network Characteristics. To explore the association between depression and social network characteristics, pairwise correlations were calculated between total PHQ score, network size, the average number of tasks the participant received help with, the number of people providing basic help, advanced help, and informational help, the quality/tie strength of spousal support, the network density and egocentric network density, reciprocity, the average frequency of help from alters, the length of time of caregiving, the tie strength composite, and the spousal tie strength composite. Given the small sample size without a known distribution, Spearman nonparametric correlations were conducted. The standard p-value of .05 or below was used as the cut-off for significance. As the spread of infant and young child care knowledge and help between members of the infant and young child caregiving social network may be linked to mother's willingness to trust the members with more tasks and may also empower members to assist with more tasks, we conducted a further exploration on the association of network density, egocentric network density, and reciprocity with the mean number of tasks social network members provided help with. No further models were built due to the small sample size.

Aim 3. Challenges, Barriers and Facilitators to Infant and Young Child Caregiving Social Support. We approached our qualitative analysis from a pragmatic paradigm using conventional content analysis (CCA; Hsieh & Shannon, 2005), an approach that is appropriate when existing theory or research literature is limited. In CCA, researchers inductively allow categories and themes to come from the data without preconceived categories. Transcripts were coded for themes that emerged as most salient and the number of participants with each code was

quantified and reported. Given that the data and transcriptions were based on the interpreter's translation, follow-up questions from the author were limited in their ability to adjust to specific language use in participants' responses, and participant utterances, speech patterns, and specific word use were not captured for more nuanced interpretive coding. However, this level of manifest analysis was sufficient for the specificity of the study question.

The author first read through all transcripts for familiarization with the data. After gaining an understand of the information available in the data, the research question for coding was finalized as "What are the challenges and barriers, as well as facilitators to social support around infant and young child care?" The coding process first involved open coding (i.e., identification/categorization of recurring patterns), going through the text line-by-line specifically looking for text that described challenges, barriers, and facilitators. After open coding a few transcripts, preliminary codes were compiled. Then all the transcripts were coded using these preliminary codes and new codes were added when new data did not fit into existing codes. All codes were then examined to finalize codes, with some codes being combined and some split up into separate codes. The codes were then inductively organized into a hierarchical structure by grouping together different codes that fit under the same theme and then themes under categories of challenges, barriers, and facilitators. Coding was first completed by the author to establish an initial codebook. Data analysis ceased when no new information or insight was forthcoming.

Research assistant NG then independently applied the codebook to code the text to establish inter-rater reliability. There was a high match rate in the coding between the author and NG. Any discrepancies in how the text was coded, any changes to the code structure, or changes to the themes or categories were discussed in meetings to come to an agreement and to establish

a final version of the codebook (Glaser & Strauss, 1967; Corbin & Strauss, 1990). All codes in the final version needed full consensus from both coders. As data were coded at the manifest level for a specific research question, Microsoft Word was sufficient for facilitating data management.

Given that a weakness of CCA may be in its limitations in capturing and considering the context in which the research takes place, we approached interviews with a local Ugandan FH staff EA, a trained professional who is familiar with the community and an expert in maternal and child health; she provided consultation on the cultural context of the community.

The results were reported based on the gold standard for reporting qualitative research as per O'Brien et al. (2014)'s recommendations. Excerpts from the interview were included to illustrate the codes. At times, the interpreter added the term "she said" before the translation of what the participant said, such as, "she said, 'my husband left'," or used the third-person form in her translation, for example, "her husband left" instead of "my husband left." In these cases, excerpts provided removed the "she said" or substituted the third-person format with the first-person format. In addition to the main research question, some noteworthy insights emerged from the text on depression, social support, and child caregiving that was also briefly summarized.

Results

Aim 1a. Feasibility, Acceptability, and Comprehensibility of the Social Network Measure

The translation process went smoothly, and no issues were raised about any question's comprehensibility. EA evaluated the questions prior to administration and determined all questions to be understandable, acceptable, and able to meaningfully capture the intended infant and young child caregiving social network concepts. No participant dropped out, such that 21 out of 21 participants completed the social network measure. The administration of the measure proceeded smoothly, with no difficulties arising. The questionnaire took a minimum of around 15 minutes and a maximum of around 50 minutes, with the length of time depending on factors such as how many people were named as social network members and how much qualitative data was collected for other research aims. Given that the interview time included both translation time and time spent collecting qualitative data, the interview time of only the quantitative social network questions administered directly in the local language may take only half the time as in this study, from 7.5 to 25 minutes. No participant had difficulty completing the interview due to the length of the measure.

Participants appeared comfortable answering all questions, and in fact, most freely expanded their answer to provide background and details beyond the direct scope of the question. Participants were also readily able to understand and answer questions without clarification of meaning. When inquired about the interview questions, no questions were flagged as difficult to answer, and participants appeared to have no difficulty with recall. In fact, participants were able to recall and provide a high degree of detail on interactions with network members, including providing the actual dialogue of conversations. One of the participants remarked that the interview questions were easy to answer because "I do this every day,"

referring to the care of her child. Further evaluation and edits to specific questions in the measure are provided below.

Aim 1b. Refinement of Social Network Interview Questions

Name Generators. The name generators successfully elicited network members in most participants, with a range of 0-9 network members. For participants where it did not elicit names, further prompts were trialed to inquire about different types of people who may have provided help, e.g., “What about your spouse, family members, neighbors, or community leaders?” Most participants still responded that no one helped, but in a few participants, prompting led to names of people whom the participant expressed provided very minimal help, such as a mother who reported that her husband “does not help,” “only buys soap” and “does nothing else.” To capture these instances, an additional question was added as a prompt for when no one is named, inquiring about the major relationships that were named as sources of caregiving support in this sample: “How does your spouse, other family members, or neighbors interact with the baby?” When people were mentioned later in the interview that did not come up during the name generator questions, their involvement in child care was assessed to determine if the name generator question had missed identification of infant and young child caregiving members. This further assessment was not able to elicit more caregiving social network members for reasons such as they did not provide help with child care or they helped before the period of the past six months; they were not cases of the name generator questions missing identification of caregiving social network members. Therefore, the name generator question appeared to adequately capture members of the infant and young child caregiving network.

Name Interpreter Questions. Participants had no difficulty identifying the alter’s relationship to them, age, and gender. No relationships were named that were not part of the

predetermined list of relationships in the question. For further clarification on alters who were spouses, we added a follow-up question of whether the spouse was the “parent to the baby?” Though it was not explicitly asked in our sample, no participant identified that their spouse was not the father to the infant/young child, and participants tended to speak about their spouse interchangeably as both their husband and the father of the child.

Infant and Young Child Care Assistance Domains. The options provided for the categories of child care assistance were compared to independently generated responses by the participants on what child care entails and the caregiving help they received. To illustrate as an example, the question:

“Can you describe a day where many people might work together to take care of the child?” generated the following response in a participant:

“When you wake up, you clean the child’s face, you prepare some food for the child, you bathe the child, the day goes on like that... It’s usually when the older children are at home. I wake up in the morning, go straight to the garden, they are the one to clean the face of the child, bathe the child, cook food for the child, not until I return. That is when the child comes back to me.”

Domains of infant and young child caregiving were compiled from the text quoted above and compared to the predetermined caregiving domains, which included: Keeping the child clean/hygiene, feeding the child, playing with the child, holding the child, taking care of the child when the child was sick, helping with taking care of the child when you were busy, such as when you were working or needed to leave the home, or when you were sick, giving medical advice, and giving information about the child’s nutrition, food or water intake/drinking. In this response, the participant’s response included “clean the child’s face” and “bathe the child,”

which fit with the predetermined domain of hygiene, and “prepare food for the child” and “cook food for the child,” which fit with the domain of feeding.

All predetermined infant and young child caregiving response domains in the piloted measure were independently generated by participants in response to the open-ended questions, with the exception of help during sleeping hours. Then, when inquired about this item, many mothers responded that others do not help during sleeping hours, because the infant and young child sleeps only with her. This item was removed, but as putting young children to sleep is often a labor-intensive task that spans beyond nighttime sleeping hours, a more general question on help with the infant/young child’s sleep, “Putting the child to sleep,” was included. In addition, a few other child care tasks were provided by the mothers that were not on the predetermined list, and the following were added as edits to the measure to cover the new domains: “Providing food for the child or for you, to help with breast-feeding,” “Watching the child with an understanding of when the child needs to be fed or cleaned, and when to return the child to you” and “Helping provide clothing, washing clothing, or helping dress the child.” In addition, helping provide information about breast-feeding was added to an existing question, with the final question reading: “Giving information about the child’s nutrition, food or water intake/drinking, or breast-feeding.” These additions were made from examining the qualitative data after all interviews were completed, so were not captured in the quantitative data for analyses.

Tie Strength Questions and Composite. The Cronbach’s alpha (Cronbach, 1951) for the tie-strength composite from the four tie strength items was .68; this was acceptable as it is relatively high for a scale with only four items, given that Cronbach’s alpha is positively correlated with number of items (Nunnally, 1994). The item-total correlations for the items: “Overall, how happy are you with the way that he/she takes care of the child?” (satisfaction),

“Overall, how much do you trust him/her to take care of your child?” (trust), “How emotionally close you feel to him/her” (emotional closeness), and “On average, how much do you think the child likes him/her?” (child affection) were .42, .44, .42, .73, respectively. These correlations were all well above the acceptable cut-off of .20 (Streiner, 2015).

Spearman correlations between the items ranged from .40 to .65 and showed that the items were strongly positively correlated; these correlations suggest that the questions captured related concepts but were not high enough to indicate redundancy of any item. The one exception was a .02 correlation between the emotional closeness item and the satisfaction item. To further explore and understand this low correlation, a scatterplot was examined to identify possible trends or bivariate outliers. Upon examining the scatterplot graph, two data points presented a big discrepancy in responses to these two questions and looked to be bivariate outliers. They also had Mahalanobis values of 3.06 and 6.42, which are considered very high and indicative of bivariate outliers. When these two data points were removed, there was a large impact on the correlation, and the correlation between the two variables increased to .38.

We examined the qualitative data for these two cases/participants. One of the participants rated a high satisfaction but low emotional closeness to her husband, who was “running mad” due to a neurological disease. When responding to the satisfaction item, she gave the rationale, “I have to be happy, because there is nothing else that I can ever do; other than how the way I am struggling to keep the child. So, I’m happy with it... like, nothing he can do about, I can do, about his condition.” This suggests her response may have been more indicative of how she feels she should rate her satisfaction given that the husband cannot address his condition that is interfering with his caregiving abilities. However, the intent of this question is to capture the actual level of current satisfaction. The other participant with an outlier response likewise

responded highly to the satisfaction question but low to the emotional closeness question, responding, “I am happy the way they helped me, but when I think about the children now and the way they are, that doesn’t make me happy at all. But I appreciate the effort they have given.” This suggests the participant may not be feeling very satisfied due to an issue around the children but responded based on the effort from the social network member instead of the actual assistance. The proposed change to the question is to add the clarification, “We are interested in understanding your current level of satisfaction with how he/she is taking care of the child, as opposed to how you think you should feel.”

For the tie strength question “How emotionally close you feel to him/her (name of helper)?” the interpreter provided feedback that there are two ways of interpreting the word “close” in Luo. To address this, the following clarification was added to the question, “such as feeling supported, feeling understood, or that you can discuss problems or exchange advice with them.” When alters named were children, the participant would sometimes respond that they were too young to confide in. “Not applicable” was added as a response option. Likewise, for the question, “On average, how much do you think the child likes him/her?” a few participants responded that they could not tell how much the infant/young child liked the alter because the child was too young, and “Not applicable” was added as a response option.

An exploratory analysis was conducted to triangulate the qualitative results on challenges and barriers with the tie strength questions by running a correlation between the number of codes pointing to challenges or barriers in the spousal relationship, such as spousal maltreatment and other conflicts, and each of the tie strength questions and the tie strength composite.

All tie strength items were negatively correlated with the number of these codes, meaning that the higher the number of challenges/barriers codes in the spousal relationship, the lower the

perceived rating of the quality of the relationship. The correlation coefficient between the number of challenges/barriers codes and the satisfaction, trust, affection from the child, and composite tie strength items were all within the moderate range, at $-.51$ ($n = 10$), $-.36$ ($n=10$), $-.42$ ($n=7$), and $-.40$ ($n=10$), respectively. The exception was the correlation for emotional closeness, which was in the weak range, at $-.14$ ($n=10$). The weaker correlation for closeness may be understandable as the qualitative data focused on caregiving support whereas the emotional closeness item inquired about general emotional support. These results provide some preliminary support for the validity of these tie strength items in capturing the quality of the support.

Even so, there may be evidence of some social desirability bias in a few participant responses to the tie strength questions, such that responses may be skewed towards the positive end. For example, one participant shared that her uncle's wife "likes blaming me that I'm the reason why my husband refused me" and refused to provide her money to bring her sick child to the hospital, but rated 3 out of 4 in her satisfaction with the way that the uncle's wife was taking care of the child and 4 out of 4 in how close she feels to her. While social desirability tendencies may be difficult to mitigate completely, a clause reminding participants about confidentiality was added in the questionnaire, stating "The names that you provide and any information that you provide about them will be kept confidential and will not be made available to anyone except the investigators of the study." Given that these changes to the tie strength questions that were made in instrument refinement after all interviews were completed, we will interpret quantitative findings based on these questions with lower confidence in this study.

Internode Relationship Questions. A few participants were noted to have difficulty initially understanding questions about internode relationships which asked whether members of their caregiving network helped each other take care of the infant/young child. They often

answered whether network members were generally helping each other and not specifically about taking care of the child. When participants did so, the question was clarified to ensure that we were capturing data on just the caregiving internode relationships. An explanation before the first set of these questions was added to increase clarity, “The following questions ask about whether the people you named received help from you with taking care of the baby or helped each other with taking care of the baby.” and each internode question also specified “taking care of the baby”; for example, “Does he/she help 2. (second network member) with taking care of the baby (e.g., assistance or information)?”

Qualitative Questions. Most qualitative questions were removed as they were specific to other aims in this study and not relevant for future research aiming to capture the infant and young child caregiving social network. However, one qualitative question was included to capture difficulties in the infant and young child caregiving social support. The current question, “Is there any one that makes it more difficult to take care of the child or doesn't agree with the way you take care of the child (list)?” failed to elicit responses in some mothers, perhaps due to a social desirability bias. Different ways of probing were trialed. Positively framed questions yielded more responses to this sensitive question, and the final question wording chosen was, “Ideally, how would you like the people you often interact with to help with child care?”

Specifying Timeline and Frequency of Assistance. Participants sometimes would provide names of people that helped before the past six months period. To check this before moving on to obtain more information about nominated network members, a question of when the person last provided assistance was added after the name generator questions. Members who did not help within the last 6 months will not have detailed information gathered. Also, some members assisted in only a few months out of the six months, such as if they were visiting to

help out, so the number of days of help per month was converted to a percentage over the last 6 months to account for these cases.

Miscellaneous Wording and Response Anchor Edits. Some minor changes to the wording of questions were made to increase comprehension, such as changing "about the child's eating or drinking" to "about the child's eating or what they drink." In addition, as most 5-point Likert scales in the literature use the anchors 1-5 instead of 0-4, this change was made in the measure. Lastly, as most participants answered verbally in response to the Likert-scale questions instead of pointing to the corresponding faces used as visual cues for the anchors, verbal labels were added to the Likert scale anchors: "not at all, not really, neutral or undecided, somewhat, very much." See Table 2 for a summary of key refinements to the measure, and refer to Appendix A for the final measure.

Table 2

Instrument Refinement Results

<i>Question domain</i>	<i>Quantitative Data</i>	<i>Qualitative Data</i>	<i>Proposed change to measure</i>
Name Generator Questions	Successfully elicited network members in most participants Elicited range of 0-9 networks members	For when no one names were elicited, different phrasing of inquiry was trialed Participants sometimes would provide names of people that helped before the six months period.	For when no network members were named, the following was added: "How does your spouse, other family members, or neighbors interact with the baby?" A question of when the person last provided assistance was added after the name generator questions.

<p>Infant Care Assistance Domains</p>	<p>All predetermined infant caregiving response domains in the piloted measure were independently generated by participants, with the exception of help during sleeping hours, where many mothers responded that the infant sleeps only with her</p>	<p>Help during sleeping hours was replaced by a more general question on help with the infant's sleep, "Putting the child to sleep."</p>
	<p>Participants generated some new domains not on the list</p>	<p>New domains were added:</p> <p>"Providing food for the child or for you, to help with breast-feeding"</p> <p>"Watching the child with an understanding of when the child needs to be fed or cleaned, and when to return the child to you"</p> <p>"Helping provide clothing, washing clothing, or helping dress the child."</p>
<p>Tie Strength Questions</p>	<p>Cronbach's Alpha for Tie Strength Composite – 0.68</p>	
	<p>Mixed methods: all items moderately negatively correlated with number of challenges in spousal relationship codes in qualitative data, except for emotional closeness: satisfaction (-.51), trust (-.36), affection from the child (-.42), emotional closeness (-.14), and composite tie strength (-.40)</p>	
	<p>Correlations between items ranged from .40 - .65, except for between satisfaction and emotional closeness (see below)</p>	

<p>Mixed methods: Satisfaction – emotional closeness correlation was .02; examined qualitative data for two multivariate outlier cases, without which the correlation rose to .38</p>	<p>Two participants’ responses indicated rating satisfaction as how they think they <i>should</i> feel given the circumstances, rather than how satisfied they are (e.g., “I have to be happy, because there is nothing else that I can ever do; other than how the way I am struggling to keep the child. So, I’m happy with it... like, nothing he can do about, I can do, about his condition.”)</p>	<p>Clarification was added: “We are interested in understanding your current level of satisfaction with how he/she is taking care of the child, as opposed to how you think you should feel!”</p>
---	---	---

Satisfaction – Item-total correlation: 0.42

Trust – Item-total correlation: 0.44

<p>Emotional Closeness – Item-total correlation: 0.42</p>	<p>The interpreter provided information on the two ways of interpreting the word “close” in Luo</p>	<p>The following clarification was added to the question, “such as feeling supported, feeling understood, or that you can discuss problems or exchange advice with them?”</p>
	<p>When alters named were children, the participant sometimes responded they were too young to confide in</p>	<p>“Not applicable” was added as a response option</p>

	<p>Affection from Child – Item-total correlation: 0.73</p>	<p>A few participants responded that they could not tell how much the infant/young child liked the alter when the child was too young</p>	<p>“Not applicable” was added as a response option</p>
	<p>Social desirability emerged as a possible concern in a few participants’ responses, with a few high ratings given despite qualitative data pointing to the contrary (e.g., participants reported uncle’s wife “likes blaming me that I’m the reason why my husband refused me” and refused to provide money to bring her sick child to the hospital, but provided 3 out of 4 rating in satisfaction)</p>	<p>A clause reminding participants about confidentiality was added in the questionnaire, stating “The names that you provide and any information that you provide about them will be kept confidential and will not be made available to anyone except the investigators of the study.”</p>	
<p>Internode Relationship Questions</p>	<p>A few participants had difficulty understanding the scope of the question, and often answered whether network members were generally helping each other and not specifically about taking care of the child</p>	<p>An explanation before the first set of these questions was added to specify “The following questions ask about whether the people you named received help from you with taking care of the baby or helped each other with taking care of the baby.”</p> <p>Each internode question also specified “taking care of the baby,” for example, “Does he/she help 2. (second network member) with taking care of the baby”</p>	
<p>Qualitative questions</p>	<p>The current question, “Is there anyone that makes it more difficult to take care of the child or doesn't agree with the way you take care of the child (list)?” failed to elicit responses in some mothers, perhaps due to a social desirability bias</p>	<p>A positively framed questions that elicited more responses was added instead: “Ideally, how would you like the people you often interact with to help with child care?”</p>	

Aim 2a. Descriptive Sample Data

Participant Characteristics. Data were collected from 21 participants. Key sociodemographic characteristics of the participants are summarized in Table 3. The mean of the participant age was 26.29 (SD = 6.70), with the youngest participant being 18 years old and the oldest at 38 years old. The average age of their infant or young child was 11.04 months (SD = 6.58), with the youngest being only one week old and the oldest being 20 months old. The mean number of children was 3.81 (SD = 3.28) including the infant/young child, with the lowest being one child and the most being nine children total. The mean months per year of household food insecurity was 2.86 months (SD = 3.02), and spans the total possible range, with the lowest being no months a year and the highest being every month of the year. Two participants declined to complete the PHQ-9, and the mean total PHQ-9 score for the remaining 19 participants was 14.21 (SD = 4.89), which is above the standard cut-off score for depression of 10 and in the moderate range of depression (Kroenke et al., 2001). The lowest score in the sample was 7, falling in the mild range (scores between 5-9) and the highest was 21, in the severe range (≥ 20). This sample had participants spanning each of the severity ranges, with the exception of the “0-4: minimal or none” range. Three participant scores fell in the mild range (5-9), seven in the moderate range (10-14), six in the moderately severe range (15-20), and three in the severe range (≥ 20). The mean functioning (PHQ-9 item 10) score was 2.17 (SD = .93), with a minimum of 1 and maximum of 3. Four out of nineteen (21%) participants endorsed thoughts of death on item 9, with all four endorsing a score of 1: “Several days.” Ten out of 19 participants met a tentative diagnosis of depression based off the DSM-IV (Kroenke et al., 2001).

Table 3*Participant Characteristics*

	<i>n</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Infant's Age	21	.25	20	11.04	6.58
Participant Age	21	18	38	26.29	6.71
Total Number of Children	21	1	9	3.81	2.38
Food Insecurity: Months a Year	21	0	12	2.86	3.02
Total PHQ Score	19	7	21	14.21	4.89

Social Network Characteristics.

Network size. The mean network size was 1.86 (SD = 1.98), such that the average number of members participants named as part of their infant and young child caregiving social network was 1.86. The lowest number of people named was 0 and the highest was 9.

Social network composition (see Table 4). The mean of the average age across the alters was 34.13 (SD = 13.85), with a minimum average alter age of 7 and a maximum of 65. The mean proportion of men in the social network was .56 (SD = .42, min = 0, max = 1), meaning that on average across participants, 56% of their total infant and young child caregiving social network was male.

The mean number of spouses providing support was .48, or in other words, 48% of women received caregiving help from their spouse. The mean proportion of the total social network that spouses accounted for was .31 (SD = .34), with a range of 0 to 1, meaning that on average, spousal support made up 31% of the total social network. For support from the participants' parents, the mean number of parents providing support was .19 (SD=.51, min = 0,

max = 2) and the mean proportion of the total social network was .13 (SD = .33, min = 0, max = 1), meaning that on average, parental support made up 13% of the total network. For support from the participants' children, the mean number was .29 (SD = .64, min = 0, max = 2) and the mean proportion of the total network was .14 (SD = .29, min = 0, max = 1), such that on average, children made up 14% of the total network. Within the category of "other family members," relationships named included mother-in-law, sister-in-law, brother-in-law, and uncle's wife. The mean number of other family members named was .29 (SD = .72, min = 0, max = 3) and the mean proportion out of the total network was .16 (SD = .32, min = 0, max = 1), meaning that on average, family members other than spouses, parents and children made up 16% of the total social network. The mean number of neighbors was .05 (SD = .22, min = 0, max = 1) and the mean proportion of the total network was .01 (SD = .05, min = 0, max = .2). Lastly, the mean number of trained experts or professionals providing support was .33 (SD = .48, min = 0, max = 1) and the mean proportion of the total support network was .25 (SD = .35, min = 0, max = 1), meaning that on average, trained professionals accounted for 25% of the total network. The percentage of mothers out of the whole sample that reported receiving support from their spouses, parents, children, trained experts, other family members, and neighbors were 48% (n = 10/21), 14% (n = 3/21), 19% (n = 4/21), 19% (n = 4/21), 19% (n = 4/21), and 5% (n = 1/21), respectively.

Table 4

Composition of Social Network

	<i>n</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Average Age	17	7	65	34.13	13.82

Proportion of Males in Network	17	0	1	.56	.42
Spouses (Number of)	21	0	1	.48	.51
Proportion of Spouses in Network	17	0	1	.31	.34
Parents Providing Support (Number of)	21	0	2	.19	.51
Proportion of Parents	17	0	1	.13	.33
Children (Number of)	21	0	2	.29	.64
Proportion of Children in Network	17	0	1	.14	.29
Other Family Members (Number of)	21	0	3	.29	.72
Proportion of Other Family in Network	17	0	1	.16	.32
Neighbors (Number of)	21	0	1	.05	.22
Proportion of Neighbors in Network	17	0	.2	.01	.05
Trained Experts (Number of)	21	0	1	.33	.48
Proportion of Trained Experts in Network	17	0	1	.25	.35

Social network function. The mean number of caregiving tasks participants received help with across alters was 3.41 (SD = 1.86, min. = 1, max = 6.5), such that on average, the number of tasks that alters helped with was 3.41, with the lowest being 1 task per alter and the highest being 6.5 tasks per alter. 67% (n = 14/21) of participants reported receiving basic infant and young child caregiving support, such as holding and playing with the baby, and 48% (n = 10/21) received more advanced support, such as feeding, bathing, cleaning, and taking care of the baby when they're sick. 67% (n = 14/21) received informational support on how to care for the child. The mean number of people providing basic help to the participants was 1.19 (SD = 1.29, min = 0, max = 5). The number of people providing advanced help was .90 (SD = .83, min = 0, max =

3). The number of people providing information on child caregiving was .76 (SD = 1.04, min = 0, max = 4).

Table 5

Social Network Function.

	<i>n</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Number of People Providing Basic Help	21	0	5	1.19	1.29
Number of People Providing Advanced Help	21	0	4	.76	1.04
Number of People Providing Information	21	0	3	.90	0.83
Average Number of Tasks Assisted With	17	1	6.50	3.41	1.86

Tie strength. The mean composite tie strength, the mean of the four tie strength items, was 3.22 (SD = .81, min = 2, max = 4) on a scale of 0-4, indicating a high level of perceived quality of the relationship. The mean level of satisfaction was 3.22 (SD = .92), mean level of trust was 3.33 (SD = .77), mean level of affection from the child was 3.11 (SD = 1.57), and mean emotional closeness to alter was 3.23 (SD = 1.28). An additional tie strength composite was calculated for spouses given the importance of spousal support that is evident in the literature. The mean tie strength composite for spousal support was 2.24 (SD = 1.65), which was lower than the tie strength composite across all alters. A separate marker of tie strength, frequency of help, was calculated as a ratio of days per month. The mean frequency that participants reported receiving help from alters, was .35 (SD = .32, min. = .04 , max = 1), or 35% of the time. Lastly, the mean length of time that the alter has been providing caregiving support was 8.89 months (SD = 6.97).

Table 6*Social Network Tie Strength*

	<i>n</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Average Frequency of Help (Days/Month)	17	.04	1	.35	.32
Caregiving Length of Time (Months)	17	.25	20	8.89	6.97
Satisfaction with Alter's Help (0-4)	17	1	4	3.22	.92
Level of Trust in Alter's Help (0-4)	17	2	4	3.33	.77
Level of Affection from Child for Alter (0-4)	12	0	4	3.11	1.57
Emotional Closeness to Alter (0-4)	17	0	4	3.23	1.28
Overall Tie Strength	17	2	4	3.22	.81
Tie Strength of Spousal Support	10	0	4	2.24	1.65

Network structure. Mean network density, or the number of existing ties over possible ties as a ratio ranging from 0 to 1, was .74 (SD = .28, min = .3, max = 1), meaning that 74% of possible ties were present. Mean egocentric network density was .29 (SD = .33, min = 0, max = .79), such that 29% of all possible ties between only the alters were present. Mean network reciprocity was .69 (SD = .43, min = 0, max = 1), such that 69% of ties between the ego and her alters were reciprocal.

Table 7*Social Network Structure*

	<i>n</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
--	----------	------------	------------	----------	-----------

Network Density	17	.30	1	.74	.28
Egocentric Network Density	10	0	.79	.29	.33
Network Reciprocity	17	0	1	.69	.43

Aim 2b. Associations Between Depression and Social Network Characteristics

Depression severity (total PHQ-9) scores were significantly negatively associated with the number of infant and young child caregiving tasks that the mother received help with, at $r(13) = -.64, p = .011$, such that help with more tasks is linked to lower depression scores (see Figure 1). Depression severity was also significantly negatively associated with the number of people the participant received advanced help from, at $r(17) = -.47, p = .043$, such that a higher number of people providing advanced help is linked to a lower depression score (see Figure 2). Though it was not significant at $p \leq .05$, the effect size of the correlation between depression and number of people providing basic help was in the moderate range, $r(17) = -.42, p = .075$. Given the small sample size, effect sizes may present a meaningful gauge of the strength of associations in addition to the p-value. Looking at network structure variables, depression was significantly correlated with the density of the social network, $r(13) = -.57, p = .026$, such that the more dense the participant's social network, the lower their depression score (see Figure 3). Egocentric network density was also significantly correlated with depression, at $r(7) = -.70, p = .037$. While not reaching significance, the correlation between depression and reciprocity was in the moderate range ($r = -.46, n = 15, p = .086$).

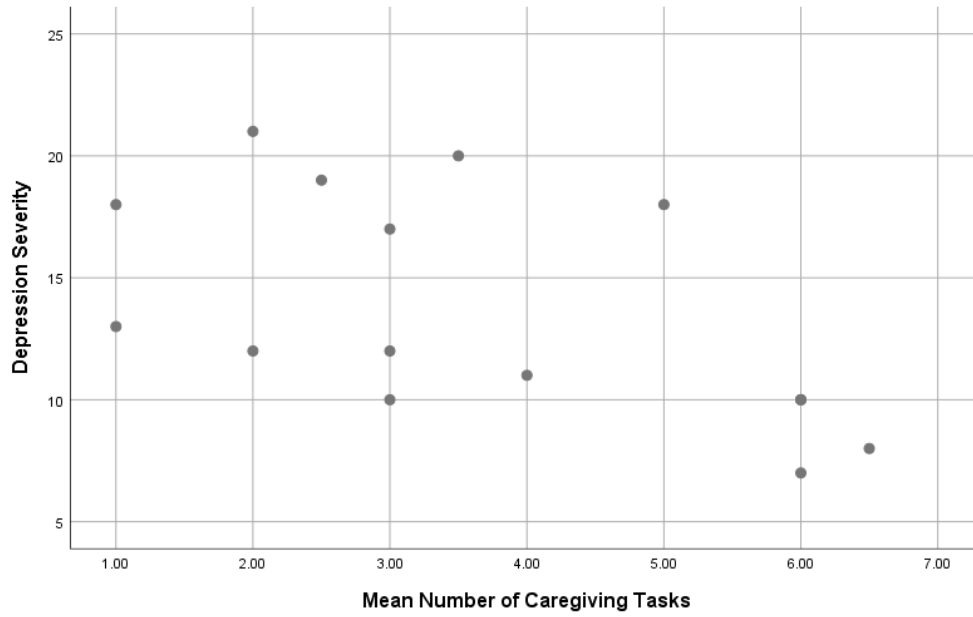


Figure 1. Association Between Number of Caregiving Tasks and Depression Severity

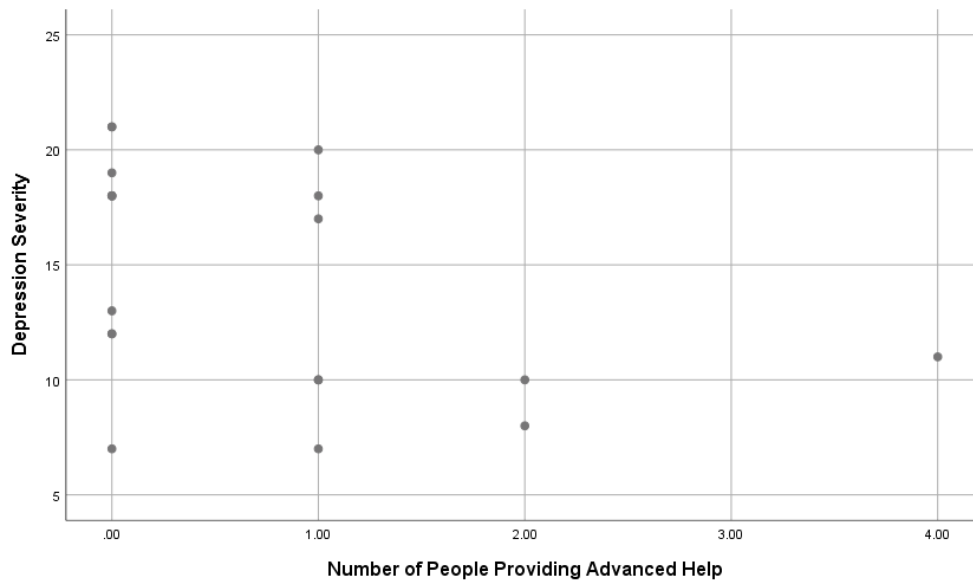


Figure 2. Association Between Number of People Providing Advanced Help and Depression Severity

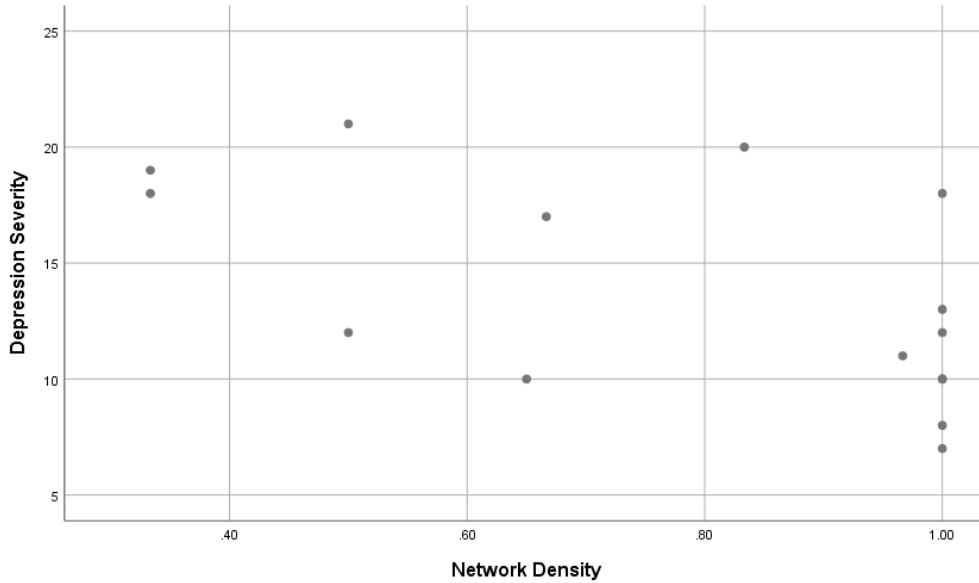


Figure 3. Association Between Network Density and Depression Severity.

Of note, while they were not significant, the direction of the relationships between depression and all other social network variables were in the predicted direction, with negative correlations between depression and network size, $r(17) = -.28$, number of people providing informational help, $r(17) = -.26$, length of caregiving time, $r(13) = -.13$, tie strength of spousal support $r(7) = -.23$, and overall tie strength, $r(13) = -.11$. The only exception was the very weak positive correlation between depression and average frequency of help from alters $r(13) = .06$.

We conducted a further exploration of the associations between the network structure variables and the mean number of tasks social network members helped with, and found that the mean number of tasks was strongly correlated with network density, at $r(15) = .70$, $p = .002$, such that higher network density is linked with higher number of tasks that alters help with (see Figure 4). Subsets of the network density variable, egocentric network density and reciprocity, were also both associated with number of caregiving tasks. See Table 8 for details on bivariate correlations between all variables, though study interpretation did not include correlations that were not specific to study aims.

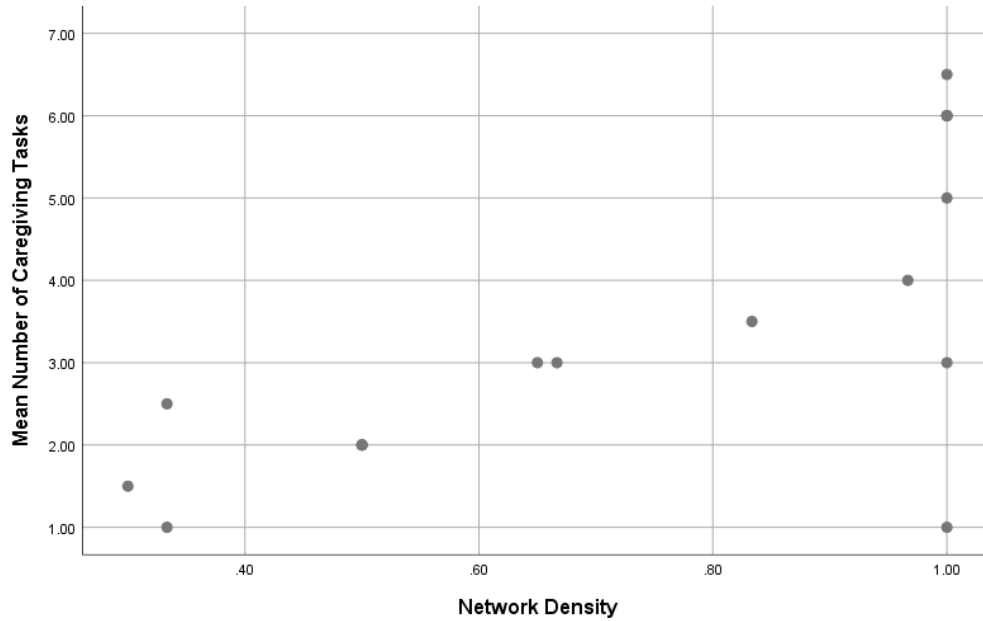


Figure 4. Association Between Network Density and Number of Caregiving Tasks.

Table 8

Spearman Bivariate Correlations Between Depression and Social Network Function, Tie Strength and Structure

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Total PHQ Score	—												
2. Network Size	-.28	—											
3. Number of People Providing Basic Help	-.42	.81**	—										
4. Number of People Providing Advanced help	-.47*	.68**	.83**	—									
5. Number of People Providing Information	-.26	.63**	.48*	.42	—								
6. Tie Strength of Spousal Support	-.23	-.50	-.20	-.17	.41	—							
7. Network Density	-.57*	-.35	.17	.31	.05	.82**	—						
8. Average Frequency of Help (Days/Month)	.06	.30	.65**	.56*	.06	.07	.22	—					

9. Overall Tie Strength	-.11	-.37	-.16	.06	.03	.91**	.37	-.09	—				
10. Average Number of Tasks Assisted With	-.64*	.08	.40	.64**	.46	.60	.70**	.39	.42	—			
11. Network Reciprocity	-.46	-.04	.45	.54*	.03	.59	.88**	.40	.18	.68**	—		
12. Caregiving Length of Time (Months)	-.13	-.50*	-.03	.02	-.27	.75*	.80**	.20	.40	.40	.65**	—	
13. Egocentric Network Density	-.70*	.31	.63	.66*	.65*	.65	.83**	.39	.89**	.83**	.68*	.52	—

*Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

Aim 3. Challenges, Barriers, and Facilitators to Infant and Young Child Caregiving Social Support

Interview excerpts provided below are using the interpreter’s translation. The percentages provided for each theme or code is the number of participants with the theme/code out of the total sample of 21 participants. As it was clear from the data that support from the spouse was a key source of infant and young child care assistance and that barriers to obtaining this support looked different than in other relationships, we looked at challenges/barriers to spousal support as a separate category from barriers to non-spousal support. This decision was cross-validated by the literature in which spousal support is often addressed as a distinct category of support that is essential to infant and young child care and maternal wellbeing (Leahy-Warren et al., 2011; Sampson et al., 2015). A summary table of the categories, themes, codes, and example excerpts can be found in Table 9.

Challenges and Barriers to Spousal Support. Many mothers interviewed voiced that their spouse was not providing adequate support, with a few remarking that the spouse provided “no support” at all. When challenges and barriers to obtaining spousal support were explored, a number of difficulties emerged, and were categorized into six themes: 1. Left or separated, in

which the mother and her spouse are separated and the spouse is providing no support in child care; 2. Interpersonal discord, in which there is disagreement or conflict in the relationship that gets in the way of child caregiving assistance; 3. Low financial support, in which the spouse provides low financial assistance or restricts financial resources available for the child's care; 4. Alcohol use, in which the spouse's alcohol use is problematic and interfering with child care help; 5. Physical or logistical constraints, in which there are external or physical constraints that make it difficult for the spouse to help; and 6. Refusal to help, in which the spouse does not provide help for no discernible reason other than that he is unwilling to. Some themes were split into more specific codes and are further described below.

Separation (n = 9/21; 43%). Multiple mothers reported that they are separated from the spouse. The most common reason coded for the absence of the spouse was that the spouse had *relationships with other women* (n = 4/21; 19%). The mothers spoke about their spouses leaving them for new wives and about their choosing to leave themselves because they were “no longer want[ed]” or because other women were brought into the home. Other times, the spouses had previous wives that they returned to. One mother shared about her situation, saying,

“The man that I produce with this child, have two women. And I'm the third person. So immediately after impregnating me, he's no longer coming home... After realizing that I was pregnant, I'm left alone, to take care of the child”

Another woman spoke about a new woman being brought into the home, and then having to leave the home because the new woman intended to harm her.

“But unfortunately, my husband brought in another woman, who started fighting me, using charms... Gave me poison one day to kill me, for the man. So, after that, he is now married

to the other woman, but for me, I cannot go back there... Because they wanted to kill me...He learned about it, but he did not do much.”

A few women cited *maltreatment* ($n = 3/21$; 14%) from the husband as the reason for separation. One woman talked about separating due to domestic violence, citing fear of returning to the spouse’s home because “that man will kill me.” She recounted her experience, sharing,

“He fought me to the point of death... Beating me with sticks, kicking me with his legs, boxing me with his hands...He fought me. I was in a coma... About to die. My home people follow up, took me to the hospital”

Lastly, a few women said that their *spouse left* ($n = 3/21$; 14%) them unilaterally. One woman said,

“The father of this child denied me. He refused me. Then my uncle picked me up.”

Another woman said that her husband left the home without notice and “up to now we don’t know where he is.”

Interpersonal discord ($n = 6/21$; 29%). Multiple mothers reported disagreement and conflict with the spouse presenting a challenge to caregiving support. One area of conflict was *complications around other women* the spouse was involved with ($n = 4/21$; 19%). One woman said,

“In most cases, what the point of our disagreement is he was married at first but separated with the first wife. Now this woman sometimes comes, and whenever she comes, that is where we disagree. That is where the problem comes... I get emotionally disturbed. Emotionally disturbed, so that affects the way I tend to my child.”

Another area of discord was in decisions around child care, or *divergent opinions on child care* ($n = 2$; 10%). One mother spoke about receiving criticism for her parenting, saying

that her spouse told her that he thinks she does not like their child, because she did not feed the child enough “good food,” but this was because she could not afford the food. Another mother spoke about having disagreements with her husband around taking the child to the hospital.

“I needed to take my child to the hospital. He did not support me with anything. Generally, I am not very happy, because most of the time, when my child is sick, that is where we disagree.”

Lastly, when asked about difficulties in obtaining help from their spouse, some women spoke about their experiences of *domestic violence* and maltreatment (n = 2/21; 10%). One woman said,

“I talk to him, let him at least first go to the garden in the morning then come back to go and drink. But he doesn’t listen. Instead he abuse me. When I start to talk to him, he abuse me.”

Low financial support (n = 7/21; 33%). Many women expressed that their spouse did not provide enough financial support or withheld financial support needed for the child’s care. One woman spoke about her husband refusing to help cover hospital fees when the child was sick. Another woman spoke about the difficulty of affording food for the family as the only provider in the home.

“It’s very difficult for us to even afford one meal a day. Because I’m the sole provider. The father does not stand by me.”

Alcohol use (n = 4/21; 19%). Several women cited their spouse’s alcohol use as a major barrier to them providing child care support. One woman shared that her spouse spent much of the day drinking instead of caring for the children.

“He doesn’t have any time for the children and so he wakes up in the morning, goes to drink, come back very late in the night when he’s drunk... His work is to drink.”

Another mother spoke about alcohol use affecting her trust in her husband's ability to care for the child, saying,

“But when he's drunk, I don't trust because he can easily make the child fall.”

Alcohol use was also mentioned in conjunction with both domestic violence and withholding of finances for a few mothers, creating an exacerbated home environment for obtaining adequate support. One woman spoke about difficulty providing for her children even when she is able to obtain finances due to her husband's alcohol use, saying, “He come and grabs the money from me, goes to drink with it.”

Another mother talks about the husband spending full days on drinking instead of providing for the family and then becoming physically violent when he is drunk.

“He wakes up in the morning and goes to drink. Comes back late in the evening, when he's totally drunk. He doesn't go to the garden. I provide for my family. But despite all of this he still beats me up. When he comes back when he's drunk, he beats me up.”

Another woman spoke about a similar situation, sharing,

“Wake up in the morning, go to the bar, drink there, come back, fight me - that is all he does... Just doing some casual labor to get money. But he does not bring the money home. All he does is get the money, go to drink, get the money, go drink, like that.”

Physical or logistical constraints (n = 3/21; 14%). For some spouses, there were physical or logistical constraints to providing child care support, such as when the spouse had to live far away for work, or had physical limitations due to disability. For example, one woman shared that her husband was blind and could no longer take care of the child for safety reasons, because the child would crawl away from him.

Refusal to help (n = 3/21; 14%). Lastly, some women cited their husband's refusal to help with child care for no clear reason.

“The father refused to go for the antenatal, because here, the set up within the medical facility is that when you're pregnant, it is the first visit, you need to go the both of you, the father and the mother of the unborn for the first visit. So, the father refused to go with me... I'm not so sure about the husband's status. Whether he is HIV-positive or not because I'm pondering why, why did he have to refuse going with me for the medical checkup.”

A few mothers talked about trying to enlist the husband's support, but not being listened to, saying,

“He doesn't listen. I told him to hold the child and play with the child, but he just says he has no time”

“I talk to him. I do talk to him, but my husband doesn't listen...I always talk to my husband, that we should be hard working, so that by the time our children start school, at least then we have something in the house. But this is a man who does not listen to me.”

Challenges and Barriers to Non-spousal Support. While most of the women lived near the husband's family or other family members, many reported significant barriers to receiving help from them. Major themes that emerged were: 1. Interpersonal discord, which often involved judgment or blame from others; 2. Low financial support, in which others were unwilling or unable to provide needed financial support for child care; 3. Lack of bond with the child, in which the lack of comfort or connection to the infant/young child led to limited support with child care; 3. Physical or logistical constraints, in which factors such as old age or living far away got in the way of provision of child care assistance; and 4. Culturally influenced

constraints, such as the social norm that boys in a household are not supposed to help with child care, that made it more difficult to receive child care support from others.

Interpersonal discord (n = 5/21; 24%). Many women reported interpersonal difficulties in their relationships with non-spousal members of their social network. Many lived close to their husband's family, as is common in this community, and reported difficulties in these relationships. Multiple women talked about their husband's family withholding help and directing complaints, judgments, and blame towards them, such as around the way that she cares for her child. When asked about the reasons her husband's family does not help with child care, one woman responded that it is because they "do not like [her]", explaining,

"There are three reasons that the reasons why they don't like me. One, that I'm older than the man. That is their argument. Two, that I'm learned, that I've gone to school. Yeah, I went to school, but the husband did not go to school. So, they say I'm learned, so I may overpower their son's possessions and other things. And then three, they want their son to marry another wife, not me."

Another woman shared that her father was not able to provide her support because her stepmother had an issue with her, because the stepmother was not able to have children of her own.

"My stepmother did not give birth to her own child, so she did not become a mother...She's been barren for the rest of her life...so she influenced my father a lot, to the point that my father does not even talk to me because each time she sees my father with me, she becomes very aggressive...so he can hardly come there."

Low financial support (n = 2/21; 10%). In a few cases, women talk about receiving basic support from the husband's family, such as food, but having difficulty getting financial help for

the child's other needs. One woman talked about not being able to obtain financial support for healthcare, saying,

“My child was not fine. And I approached the wife to my uncle to help me with the money to take the child to the hospital. She denied me the money. She didn't give me.”

Another remarked that her sister-in-law was not able to help because of her own financial limitations.

“She's also poor... She has many children in the house, that she is unable to help.”

Lack of bond with child (n = 3/21; 14%). A few women talked about people in their social network providing minimal support because of the lack of bond between them and the child. One woman who had recently moved in with her brother and her sister-in-law shared that her child was not used to the sister-in-law, which limits what she can help with.

“The child is not used to her. So it's very, very hard for her to carry the child and that can, like, talk to the child, make them laugh; but not carrying the child, not holding the child because the child is not used [to her].”

Physical or logistical constraints (n = 16/21; 76%). Many mothers cited physical or logistical constraints getting in the way of others helping them with child care, such as *distance* or people living too far away (n = 7/21; 33%); *loss/death* of close social supports who would have provided support (n = 4/21; 19%); *physical limitations* due to factors such as old age or disability (n = 6/21; 29%); or *lack of time* to help because of work, school, or other responsibilities (n = 7/21; 33%).

It is worth noting that many women did not live near their own family because it is common to move near the husband's family, and so are far away from the people they may be closest to who would have provided support.

Culturally influenced constraints (n = 5/21; 24%). Lastly, a few mothers reported difficulties in obtaining help from others because of culturally related reasons. For example, one mother has older children who are willing to help care for the infant/young child, but because they were boys, it was not socially acceptable for them to help with child care. Another mother talked about people in her community refusing to help her because they are from different clans.

“They are not willing to help... in this community where we are staying, our clan members are not here. My father came some time back, maybe due to the problem he had with the other clan’s people. The regular homeplace is not here... when we came back after my husband left, the residents of this place were saying I should move back to where my father came from. But I was born from here. I don’t know where my father came from... But now since my father is dead, people who have come in are saying that leave this place and go back to the father’s place. And I also don’t know where my father’s place is.”

Another mother had left her physically abusive husband and returned to her family, who were providing her caregiving support, but when her child fell sick, there was a cultural expectation and pressure for her to leave her family and bring the child back to the husband, despite it not being a safe environment. The interpreter provided an explanation of this expectation,

“In here, in the local setting, if you are now married, and the child is sick, you have to be in the [husband’s] home...In case, if the child is to die from the other side, it will bring a lot of issues. They will say ‘why did you go with my child to your home. If the child was to be here, the child would not be sick...The child wouldn’t have died’. So that would cause a lot of conflicts.”

In many instances, mothers were simultaneously experiencing multiple barriers to obtaining quality support from her social network. For example, one mother was receiving low levels of support from her mother. She shared that her mother is “a little helpless” and also “rude,” saying,

“She cannot carry the child herself. Unless I carry and give it to her, then she can’t play with the child.”

And,

“My mother is not like a lovely mother who likes children. She doesn’t like children. She always says her time is up, she cannot be with any child anymore... She’s rude. She’s a rude person. The children don’t like her.”

In addition to this, her mother was urging her to move back to where the father of the child is, saying,

“These children have their father. They should be taken back to their father’s home.”

However, the participant is unable to return to the husband, because

“On the other side, the father no longer wants me. He has married another woman. So, I’m here now.”

Lack of Structural and Systemic Support (n = 3/21; 14%). A few women had sought to address difficulties such as domestic violence and substance use by approaching authorities like the police and leaders in the community but had not been able to find effective support. One woman talked about difficulty obtaining help from authorities after experiencing domestic abuse.

“Yes, there was this scenario. We were going to some funeral in the neighboring village. He fought me, the man fought me... It was in the middle of the night that I decided to walk from that village back home. When I was moving home all I had in my mind was to reach home and

kill myself. But when I reached home, I found the children sleeping in the house, and I was like, even to do this to myself, where would my children be. That was the point that made me to break at least, and I walked to the authority, to the nearby authority. I had a dilemma with them, but they did not even help.”

Another woman tried to obtain help from her clan leaders for her husband’s domestic violence and alcohol abuse, sharing,

“I did two times; I forwarded the issue to the clan leaders. They even disciplined him, they beat him properly, but there is no change. Instead, when they beat him and the minute those people leave, he starts to fight me immediately. He retaliates.”

Facilitators and Barriers Mitigation. While there were many challenges and barriers to receiving adequate caregiving social support, a few mothers mentioned some barriers mitigators and facilitators to social support. These included 1. Shortening of distance to social support who could assist with caregiving; 2. Support from older children, in which children in the household became old enough to help with caring for younger children; 3. Attentiveness from others, in which people around them were attentive to the child’s needs and would take the initiative to check in on the family; 4. Gaining support through FH/local nonprofit organization interventions; and 5. Support from healthcare/medical workers.

Shortening distance to social support (n = 7/21; 33%). For some women, moving closer to their social support or having others visit or move in was a way they obtained needed infant/young child caregiving assistance. A few women reported receiving child care support from their family after returning home due to separation from the spouse. One mother shared that she began receiving support from her mother after she returned home when her husband married

another woman. Some women reported that family members would visit to help with child care. For example, one woman said,

“I had my sister who stayed with me for only two months when I first gave birth.”

Another spoke about her mother visiting to help,

“She makes frequent visit to us to check on us, so it’s in a week, I can say that she misses only two days, so five days a week.”

Support from older children (n = 5/21; 24%). Most mothers had several children, and mothers who had children who were old enough often reported these children were important sources of caregiving support. One mother spoke about her first two children helping with taking care of her youngest child, saying,

“Normally, when I’m busy, they feel sorry for the child when the child is crying. They come and carry the child. Immediately when I come back, they start helping me right away...I’m happy because they take care of the child in a good way. They love the child; they look at the child as their own sister.”

She also spoke about her older children helping other people with caring for the child, saying,

“She’s a sharp girl. Even when the father is carrying, she normally tell the father, that ‘Carry the child well. Don’t make her fall!’”

Another mother talked about her older children lessening the burden for her so she can bring food to the family.

“It’s usually when the older children are at home. I wake up in the morning, go straight to the garden. They are the one to clean the face of the child, bathe the child, food for the child, not until I return. That is when the child comes back to me.”

Another mother reported receiving little support from anyone but said that,

“The only person who helps me when I’m busy is the firstborn.”

One mother described how her son came to start taking care of the infant recently, saying,

“I put the child on bed. The child was on bed. So, he came around, he opened the bed to look at the child, and started playing. And he came and reported to me that the baby ‘can smile at me’... and that is how he got used to the child and how he started carrying the child like that.”

Attentiveness from others (n = 2/21; 10%). A few mothers reported that they received support from people in their social network who showed attentiveness to their needs. They were concerned about the mother and the child, showed initiative in checking in to see how they were doing, and then proceeded to help with various needed tasks. One mother talked about her neighbors frequently checking in on the child, saying,

“They’re always concerned about the child. They like asking about the child. They come physically to take on the child to verify how they’re doing...normally check on us. She takes on us when we’re in the hospital with the child.”

Another mother talked about her brother-in-law having been attentive since she was pregnant, saying,

“He’s been very close from when I was pregnant. For each antenatal visit, he would check in on me in the hospital, transport me and pick me up from the hospital, he would help with feeding the previous children. This one is only three months old and breast-feeding.”

FH/Nonprofit Organization Interventions (n = 8/21; 38%). Many of the women spoke positively about support from FH. They talked about getting help with information and education around child care, such as nutritional, hygiene, and health advice, as well as receiving some direct instrumental support from FH volunteers, such as being able to leave their child with a

volunteer when they were busy. Mothers mentioned several facilitators that helped them access FH services, including 1. *Easy accessibility* of support in their community and neighborhood, as FH staff regularly visited the community and also trained community members to be volunteers who helped educate others in the neighborhood; 2. *Trained household members*, or having a member of the household be trained as a volunteer, which creates direct access to knowledge around infant/young child care for the mother; and 3. An *effective follow-up system*, in which FH connects all the women of childbearing age to services, keeps track of when women are giving birth, and begins following up with them regularly after they give birth.

Easy accessibility ($n = 6/21$; 29%). Multiple women spoke about getting connected to FH when members of the community, such as neighbors, became FH trained volunteers who were easy to reach when support was needed. One woman said about an FH volunteer,

“We are neighbors... Down the road”

Another said,

“[His] home is just down here.”

Trained household members ($n = 3/21$; 14%). Relatedly, mothers talked about their spouses or themselves becoming FH volunteers, and this involvement led to ready access to information on how to care for their child.

Lastly, multiple women talked about FH’s *effective follow-up system* ($n = 4$; 19%) for making sure mothers and expecting mothers in the community were connected to programs. They then regularly followed up with each mother throughout pregnancy, birth, and thereafter.

One mother talked about how a FH volunteer disseminated information to mothers in the community, saying,

“He gathered the mothers, and give this information... Give the teaching... It was about different food types, different food groups, and danger signs... And how to take care of the child, how to feed the child.”

Another woman spoke about the way that FH followed up with her, saying,

“I started meeting with them right when I was still pregnant. By the time I went to the hospital to give birth, they were aware. So, when I came back immediately, they came to check on me. She came to check on me.”

Mothers were also provided regular follow-ups over a long period of time, with one mother saying, “I’ve been benefiting from [his] teaching for the last two years,” and another saying that the volunteer checks in with her three times a month.

Support from healthcare/medical workers (n=8/21; 38%). A separate facilitator of mothers getting access to caregiving support, particularly informational support, was through healthcare and medical workers. Multiple women talked about receiving information on topics such as nutrition, vaccinations, danger signs, and breast-feeding from healthcare workers. One woman expressed feeling immense gratitude for a medical worker who provided her antenatal care even though her husband refused to go with her, when it is normally a requirement that both parents are present to receive care.

“I went alone, explained my situation to [her], and even I wanted to abort the child. But [she] stood by me, talked to me, accepted me to do the checkup even without the father of the child, and that’s why I feel that she’s been the most closest person to me...It was [her] who helped me to deliver. So she cleaned the child after the delivery, gave me some health information on how to breast-feed the baby, and also the nutrition, when the child will be about six months, how I should introduce the child soft food.”

Other Insights. Though not coded as part of the research question, some mothers shared what would help with child care for them. Though not specifically related to infant and young child care, multiple women spoke about difficulty accessing education, adequate food, clothes, and healthcare due to financial constraints and a lack of affordable options. They spoke to the desire for programs and nonprofit organizations that would help finance these child care costs. In particular, many women talked about worrying about finances for their children’s future education costs.

A few mothers also shared about how difficulties in their relationships with those in their caregiving social network affected their mental health and their ability to take care of their children. One mother spoke about how conflicts with her significant other were distressing to her and had a negative impact on her parenting. Another mother spoke about how her uncle’s wife’s lack of financial support for the child’s health care, as well as her blaming comments, led to the mother experiencing low mood and thoughts of death. She reported that she had experienced thoughts of death the previous day, sharing,

“It was all yesterday. My child was not fine. And I approached the wife to my uncle to help me with some money to take the child to the hospital. She denied me the money. She didn't give me. And in most cases, she likes blaming me that she's not the reason why my husband refused me. And so that I don't hear that well, and that does not go well with me.”

Table 9
Challenges, Barriers, Facilitators Results

<i>Category</i>	<i>Theme</i>	<i>Code</i>	<i>Example Quote</i>
-----------------	--------------	-------------	----------------------

<i>Challenges and Barriers in Spousal Support</i>	Separation (n = 9/21; 43%)	Relationships with other women (n = 4/21; 19%)	“The man that I produce with this child, have two women. And I’m the third person. So immediately after impregnating me, he’s no longer coming home... After realizing that I was pregnant, I’m left alone, to take care of the child”
		Maltreatment (n = 3/21; 14%)	“He fought me. I was in a coma... About to die. My home people follow up, took me to the hospital ”
		Spouse left (n = 3/21; 14%)	”The father of this child denied me. He refused me. Then my uncle picked me up.”
	Interpersonal discord (n = 6/21; 29%)	Complications around other women (n = 4/21; 19%)	“In most cases, what the point of our disagreement is he was married at first but separated with the first wife. Now this woman sometimes comes, and whenever she comes, that is where we disagree. That is where the problem comes... I get emotionally disturbed. Emotionally disturbed, so that affects the way I tend to my child.”
		Divergent opinions on child care (n = 2; 10%).	“I needed to take my child to the hospital. He did not support me with anything. Generally, I am not very happy, because most of the time, when my child is sick, that is where we disagree... Sometimes, when I disagree with my husband, I feel discouraged.”
		Maltreatment (n = 2/21; 10%)	“I talk to him let him at least first go to the garden in the morning then come back to go and drink. But he doesn’t listen. Instead he abuse me. When I start to talk to him, he abuse me.”
	Low financial support (n = 7/21; 33%)		“It’s very difficult for us to even afford one meal a day. Because I’m the sole provider. The father does not stand by me”
	Alcohol use (n = 4/21; 19%)		“He wakes up in the morning and goes to drink. Comes back late in the evening, when he’s totally drunk. He doesn’t go to the garden. I provide for my family. But despite all of this he still beats me up. When he comes back when he’s drunk, he beats me up.”
	Physical or logistical constraints (n=3/21; 14%)		“My husband is blind; children are very naughty. I cannot leave the child with the husband, because this one is now a walking child. So, since he’s blind, he cannot help.”

Refusal to help
(n = 3/21; 14%)

“The father refused to go for the antenatal, because here, the set up within the medical facility is that when you’re pregnant, it is the first visit, you need to go the both of you, the father and the mother and the unborn for the first visit. So, the father refused to go with me... I’m not so sure about the husband status. Whether he is HIV-positive were not because I’m pondering why, why did he have to refuse going with me for the medical checkup.”

Challenges and Barriers in Non-spousal Social Support

<i>Category</i>	<i>Theme</i>	<i>Code</i>	<i>Example Quote</i>	
<i>Challenges and Barriers in Non-spousal Social Support</i>	Interpersonal discord (n = 5/21; 24%)		“There are three reasons that the reasons why they don’t like me. One, that I’m older than the man. That is their argument. Two, that I’m learned, that I’ve gone to school. Yeah, I went to school, but the husband did not go to school. So, they say I’m learned, so I may overpower their son’s possessions and other things. And then three, they want their son to marry another wife, not me.”	
	Low financial support (n = 2/21; 10%)		“My child was not fine. And I approached the wife to my uncle to help me with the money to take the child to the hospital. She denied me the money. She didn’t give me.”	
	Lack of bond with child (n = 3/21; 14%)		“The child is not used to her. So it’s very, very hard for her to carry the child and that can, like, talk to the child, make them laugh; but not carrying the child, not holding the child because the child is not used [to her].”	
	Physical or logistical constraints (n = 16/21; 76%)	Distance (n = 7/21; 33%)		“The elder sister is away; she is in Sudan. She would have been the one to help her. But she’s far away. She doesn’t.”
		Loss/death (n = 4/21, 19%)		“I don’t have any parents. Both my mother and the father are dead. So, I’m alone...The sister who looked after me died. So, I’m alone.”
		Physical limitations (n = 6/21; 29%)		“My mother is also a disabled person. Instead, I’m the one to help her.”
		Lack of time (n = 7/21; 33%)		“That usually, all my children are school going. The children are all going to school. So, I’m always alone with the child at home.”
	Culturally influenced constraints to helping (n=5/21; 24%)		“The social setting; boys don’t do other things. It’s the work of a girl, to do the things of like, cooking, bathing, the children; this, girls would do it.”	

Lack of Structural and Systemic Support

<i>Category</i>	<i>Theme</i>	<i>Code</i>	<i>Example Quote</i>
Lack of Structural and Systemic Support (n = 3/21; 14%)			“I did two times; I forwarded the issue to the clan leaders. They even disciplined him, they beat him properly, but there is no change. Instead, when they beat him and the minute those people leave, he starts to fight me immediately. He retaliates.”

Facilitators and Barriers Mitigation

<i>Category</i>	<i>Theme</i>	<i>Code</i>	<i>Example Quote</i>
	Shortening distance to social support (n = 7/21; 33%)		“ ... and have come back home [after separating from my spouse]. Currently I am staying with my mother who has since birth been helping me with the child”
	Older children (n = 5/21; 24%)		“It’s usually when the older children are at home. I wake up in the morning, go straight to the garden. They are the one to clean the face of the child, bathe the child, food for the child, not until I return. That is when the child comes back to me.”
	Attentiveness from others (n = 2/21; 10%)		“[The neighbors] are always concerned about the child. They like asking about the child. They come physically to take on the child to verify how they’re doing...Normally check on us. She takes on us when we’re in the hospital with the child.”
Facilitators and Barriers Mitigation		Easy accessibility (n=6/21; 29%)	“[The FH volunteer and I] are neighbors... Down the road”
	Food for the Hungry (FH)/NPO interventions (n = 8/21; 38%)	Trained household members (n=3/21; 14%)	“I volunteered myself, to be a trained mother who can go and train other people in town.”
		Effective follow-up system (n=4/21; 19%)	“I started meeting with them right when I was still pregnant. By the time I went to the hospital to give birth, they were aware. So, when I came back immediately, they came to check on me. She came to check on me.”
	Support from healthcare/medical workers (n=8/21; 38%)		“I went alone, explained my situation to [her], and even I wanted to abort the child. But [she] stood by me, talked to me, accepted me to do the checkup even without the father of the child, and that’s why I feel that she’s been the most closest person to me”

Discussion

Results of the study provided evidence that the infant and young child caregiving measure was feasible, acceptable, and comprehensible. The translation and administration processes both went smoothly, with no difficulties. The FH expert determined the measure to be acceptable, comprehensible, and able to meaningfully capture the targeted concepts. No participants dropped out or appeared to have difficulty or discomfort answering questions. The results also provided preliminary evidence for the validity of the name generator, caregiving tasks/network function question, and tie strength items of the measure; the name generator successfully elicited a range of members, the caregiving tasks matched well with the mothers' view of tasks involved in taking care of their young child, and the tie strength items showed acceptable psychometric properties and some evidence of validity through corroboration with the qualitative data. A range of edits were made to the measure based on participant responses to increase clarity of questions and to better capture infant and young child caregiving networks in the study's cultural context. This measure may be used by future studies seeking to capture the infant and young child caregiving social network to, for example, identify future intervention targets or mechanisms of change in existing maternal depression or child health interventions. Of note, the administration time would be largely decreased if administered in the local language, which would lead to increased feasibility for future larger studies.

Quantitative analyses in this sample provided characterization of the mothers' caregiving social network characteristics and insight into possible links between caregiving network characteristics and maternal depression severity. On average, mothers reported a low network size, with just under two people helping with child care for each mother. This is comparable to the network size found in a study of mothers in India, where mothers had on average around

three members in their network (Moestue et al., 2007). However, note that there were study differences in that the children in Moestue et al.'s study were older, the network captured was a general social network as opposed to one specifically around child care, and the study was set in a different region.

Though there was a low network size in our sample, members tended to assist with multiple caregiving tasks, with the average member helping with just under four tasks. As specific caregiving tasks have not been examined in the existing social network literature, it is difficult to compare these results to other samples'. A range of relationships was reflected among the people who helped with care. On average, spouses and other family members (outside of the participants' parents, children, and spouses) each made up a third of the social network, trained experts made up a fourth, and parents and children of the participant each made up around a seventh of the network. Most existing child health interventions target mostly the mother and the spouse; these results may point to the importance of targeting other members of the social network as well, such as extended family members. In Moestue et al.'s study, researchers found 16% of the network to be non-family members. Our study had a higher proportion of non-family members, which includes trained experts and neighbors, likely due to the FH program widely training neighborhood volunteers.

The mean network density in our sample was .74 and the mean egocentric density was .29. While we could not find existing LMIC studies on the density of social networks for mothers with young children, a study in the United States (U.S.) on mothers of children around five years of age found an egocentric network density of .48 for a personal network of people "important" to the mother (Jennings et al., 1995), and a study on Israeli mothers with a child between four to eight years of age found a .19 egocentric density in single mothers and .52 in two-parent mothers

for relationships the mothers identified as positive (Shechner et al., 2010). The egocentric density in our study of .29 was lower than in the Jennings et al. (1995) study and that of the two-parent mothers in the Shechner et al. (2010) study, but higher than the single-parent mothers in that same study. However, these densities are difficult to directly compare as our study specifically inquired about relationships between alters where child caregiving assistance was provided. If we had asked about whether any relationship existed between the alters like the other studies, the density likely would have been much higher as most participants' network members tended to live in the same community and were often family members to one another.

Our study found high ratings of perceived social support quality across satisfaction (3.22), trust (3.33), affection from the child (3.11), emotional closeness (3.23), and overall tie strength composite (3.22), out of a possible range of 0-4. However, there were lower ratings for the quality of the spousal support, with a 2.24 composite. Though the Jennings et al. (1995) study examined satisfaction across different categories of support, they also found high ratings, with 5.19 for informational support, 6.35 for tangible support, and 6.21 for interaction with child out of a possible range of 1-7.

Looking at associations between depression and social network characteristics, we found that lower depression severity was significantly correlated with higher average number of caregiving tasks by alters, number of people helping with advanced tasks, and network density. These associations were in line with our hypothesis that lower depression would be associated with stronger network characteristics. Given that depression was correlated with the mean number of tasks alters helped with and the number of people providing advanced help, but not with the number of people providing basic help, results may point to the importance of teaching network members to be able to carry out more domains of caregiving tasks, particularly more

advanced tasks, such as feeding and hygiene tasks and taking care of the child when they are sick. Doing so may help alleviate more of the caregiving burden off the mother. We did not identify studies in the literature that have looked at depression and network function in infant/young child caregiving networks (i.e., support on specific caregiving tasks), and future studies should examine these associations to corroborate findings.

We also did not identify studies examining depression and density of the caregiving network. The study by Shechner et al., (2010) did examine density and negative affect, a concept related to depression. They found a significant positive correlation between the density of “conflictual”/“negative” relationships and negative affect, but a non-significant relationship between the density of “positive” relationships and negative affect. While this points to a link between density and negative affect, they separately examined density of “positive” and “negative” relationship as opposed to overall density, rendering it difficult to compare their results to ours. They also did not examine the network density of specifically caregiving connections, but rather inquired more generally about whether the network members had a relationship with each other that was positive or conflictual.

A secondary exploration in our sample found a positive correlation between network density and the number of infant and young child caregiving tasks. This may be because increased caregiving assistance and information sharing among members of the network increases a mother’s willingness to trust the members with more tasks and may also empower members to help with more tasks. Reciprocity, a subset of this network density measure, was also positively associated with the mean number of caregiving tasks, meaning that when mothers were more able to provide help and information to their network members, the members helped with more tasks. As each mother best understands their infant/young child’s needs and a network

member's lack of understanding of child care may result in disastrous consequences, network members' willingness to listen and take in feedback may increase a mother's willingness to allow them to take on more child care responsibilities. The importance of this reciprocity is corroborated by the qualitative data where multiple mothers spoke about their spouses being unwilling to receive her advice, saying, "I tell him, but he doesn't listen." Network structure and density specific to infant/young child caregiving networks has scarcely been examined in the literature, and this may be a promising area of research. As our study's analyses were exploratory and with a small sample, it would be important for future larger studies to further examine network density and reciprocity to corroborate findings. The association between network density and both depression and number of infant/young child caregiving tasks suggests that it may be important for interventions to help facilitate connectivity in caregiving social networks, perhaps through psychosocial interventions from a systems perspective that may bring in multiple network members and facilitate communication, conflict resolution, and cooperation.

Maternal depression was not significantly correlated with any other social network variable, including network size and perceived social support ratings, which are variables that have been found to be linked to depression in a few studies in non-maternal populations (Kim, 2001; Houtjes et al., 2014). Though this was unexpected based on literature in the general population, a few other studies with mothers and perinatal women in the U.S. have likewise not found network size to not be significantly correlated with depression (Benson, 2012; Mercer & Ferketich 1988). For perceived tie strength, the lack of association with depression in our study could be due to a small sample size and lack of power in this study. Alternatively, given that the number of tasks alters helped with and the number of people providing advanced help did correlate significantly with depression, the non-significant tie strength results may be due to

perceived instrumental support being less important compared to actual received instrumental support in a low-resource setting. Future explorations may help clarify this question.

In the qualitative exploration of challenges, barriers, and facilitators to infant and young child caregiving support, themes under spousal challenges and barriers included: Separation, interpersonal discord, low financial support, alcohol use, physical or logistical constraints, and refusal to help, and themes under non-spousal challenges and barriers included: interpersonal discord, low financial support, lack of bond with child, physical or logistical constraints, and culturally influenced constraints. Results highlight a myriad of ongoing challenges and barriers that mothers in this community face. Particularly with spousal relationships, the many challenges identified are likely take a significant toll on the mothers, such as chronic spousal maltreatment, alcohol abuse, and low financial support or financial restriction. In addition, many mothers reported experiencing many of these challenges and barriers at the same time. An additional category that emerged from the analysis was the lack of structural and systemic support to address these aforementioned barriers, such as mothers who attempted to but were unable to receive effective support from authorities to address spousal maltreatment and alcohol abuse; this finding highlights the importance of increasing such programs and structural support. Overall, the qualitative data on challenges and barriers fits with the picture painted by the quantitative data of low overall infant/young child caregiving social support for mothers in this community.

Facilitators and barrier mitigation themes included: Shortening distance to social support, older children, attentiveness from others, food for the hungry interventions, and support from healthcare/medical workers. Mothers who had older children in the household spoke at length about the help these children provided and how they taught other members in the social network,

such as their fathers or grandparents, how to care for the infant/young child. Child health interventions may consider involving children in the household who are old enough to support the mother, especially for mothers experiencing low support from other sources. Many mothers spoke about the information and assistance they received from FH and healthcare workers, pointing to the positive impact of these formal sources of support. Lastly, FH's approach involving easy accessibility of volunteers in the community, which sometimes included the mothers themselves or their spouses, and their effective follow-up system may present an effective model for other non-profit organizations (NPOs) to reference.

While there is limited literature on barriers and facilitators to infant/young child caregiving social support in LMICs, a few studies in high-income countries have looked at similar questions. A study in the U.S. by Barkin et al. (2014) on this topic identified barriers including: the availability of trustworthy child care, cost of child care, being a transient population new to the area, and availability of family to help with child care, for example if family lived too far away. Some of these themes were similar to the experiences of mothers in our sample, including the lack of availability of trustworthy child care, being a transient population new to the area, and availability of family to help with child care, but there were differences in what these themes entailed for these two groups of mothers in distinct cultural and socioeconomic contexts. For example, for availability of trustworthy child care, mothers in Barkin et al.'s (2014) study spoke about not trusting the way people were taking care of their child, such as one participant speaking about her shock at seeing her mother holding the baby on her hips while doing dishes or another finding herself "overprotective" if their husband "doesn't do things just right." In our sample of mothers, the lack of availability of support often came from others' refusal to help, such as a participant's mother who "is rude" and "doesn't like

children,” or from other problems getting in the way of trustworthy help, such as a husband who had “gone mad” due to a neurological condition or another husband whom the mother did not trust when he is drunk as “he can easily make the child fall.” Mothers in our sample often did live close to family but were often far from family members who may be more willing to provide support; many mothers had moved near the husband’s family as is customary but were unable to identify people there willing to help. Cost of child care was not brought up in our sample of mothers, as paid child care was generally not an option in the socioeconomic setting.

Another study in Canada by Harrison, Neufeld, and Kushner (1995) identified a number of barriers to mothers’ use of social support, including the perception that the use of support would be a burden on others, lack of reciprocity (mothers expressing that they would not feel comfortable asking for help if they had not also helped out the social network member), reluctance to ask for support (and viewing it as a sign of inadequacy), and non-supportive messages from others such as judgment about the way the mother was approaching child care. There were limited overlapping themes with our study. This may be due to the differences in cultural and socioeconomic context, as well as a difference in the study question, with their study focusing on mothers’ internal barriers to seeking out existing sources of support and our study focusing more on external barriers to obtaining support, given the overall lack of available support. There was, however, similarity between the non-supportive messages that mothers in their study received and the judgment from others that also emerged in our data under the theme of interpersonal discord, with mothers in both studies receiving criticism from others around child care.

In the global effort to decrease child malnutrition, maternal depression has been proposed as a promising avenue of intervention and there has been a call for further research on maternal

mental health interventions and child undernutrition (Bhutta et al., 2013). Our study results highlight possible mechanisms of change for interventions targeting maternal depression and provides a social network tool for future studies to examine these possible mechanisms of change. More specifically, results pointed to the importance of several social network characteristics in relation to maternal depression, such as network density, number of tasks alters helped with, and number of people assisting with advanced support. There are existing psychosocial interventions for which these variables may be mechanisms of change. One example is interpersonal psychotherapy (IPT), which focuses on improving quality of relationships and social functioning to decrease distress and may address some of these areas by, for example, working on conflict resolution in interpersonal relationships or teaching mothers skills for acquiring assistance from their network. However, there have been few mediation or moderation studies in LMICs examining mechanisms of change for IPT or other maternal depression interventions. Exploring key infant/young child caregiving social network characteristics as possible mechanisms of change could help elucidate questions of *why* and *how* current interventions are effective and inform which specific components of interventions to focus on or to introduce to future maternal depression interventions.

Beyond its impact on maternal depression, infant/young child caregiving network characteristics may directly influence child outcomes. Maternal social support is a predictor of child health (Leininger et al., 2009; Ryan et al., 2009; Turney, 2013), and maternal social support specifically around child care, or the way multiple people may be working to take care of the basic needs of the child, may be even more important for providing a more nourishing environment for child growth and development. However, the relationship between infant/young child caregiving network characteristics and child outcomes was not examined in this study,

because child outcomes were not measured; this would be an interesting direction for future research.

Qualitative results highlighted the many challenges in infant/young child caregiving support that mothers faced, particular around support from the spouse, including spousal maltreatment, substance use, and financial restriction. The prevalence of these challenges may be indicative of gender inequality being an underlying issue. It follows that the UN's SDG 5, "achieve gender equality and empower all women and girls," (WHO, 2015) may be a particularly important area to address for improving maternal and child health in this community. Results also pointed to the importance of programs and structural changes to address these barriers in order to improve maternal and child health outcomes. There is limited implementation of effective substance use, domestic violence, or couples interventions in LMICs, and this may indicate a need to address implementation barriers and perhaps for policy-level changes (Daley et al., 2020; Giusto & Puffer, 2018; WHO, 2019).

Limitations of our study included the lack of a full content validation process with the local community for the infant and young child caregiving measure. Future studies could look to provide further validation of the measure, as well as utilize a larger study to assess reliability. In particular, the concept of "emotional closeness" may be culturally specific and should be further explored from the perspective of the community in future validation studies. In addition, due to the small sample size and the exploratory nature of the quantitative analyses, larger studies are needed to examine and corroborate associations between network characteristics and depression. Network data was also collapsed across each ego as the sample size did not allow for multi-level analyses, and future studies should examine data at the level of the alters as well to provide more detailed results. Our study was an egocentric network study from the perspective of a sample of

mothers (the egos) and captured only their social ties; we therefore did not capture all connections and interconnections within the community as in sociometric network analyses. Future directions may include doing so for a more comprehensive characterization of the network and to be able to examine additional network structure variables such as network centrality. Our study also framed social network support from a primarily positive perspective and did not quantify any negative aspects of caregiving support in our social network measure. Future studies may seek to elicit network members whom mothers perceive as “negative” social ties and explore perceptions of unwanted assistance from others.

In terms of participant recruitment, we utilized a convenience sample of women from one village who were already connected with maternal services through an NPO. While this was helpful for capturing the ways in which the NPO staff and volunteers were imbedded into the maternal social networks and also allowed for more thorough follow up with mothers who were referred to mental health care, these results may not fully generalize to other mothers in northern Uganda. The interviews in the study were also conducted with an interpreter providing translation between the interviewer and the participants, which may have introduced an additional possible source of error and limited the level of interpretation possible in the qualitative analysis. In addition, the FH staff who provided interpretation had an existing relationship with the participants through the FH programs in the community. While this likely helped the women feel more comfortable sharing in the interview, it may have led to filtering out certain content, especially about FH operations. There may be an increased social desirability bias because the women are in a position of depending on FH for maternal and child health support, and it may be difficult to ascertain the level of candidness in participant responses. However, as the study was introduced to participants as a Columbia University project and

participants were informed that study data would be accessible only to study personnel, some social desirability bias related to receipt of FH services may have been mitigated. Lastly, there may have been bias in EA's approach to each interview given that she knew each participant individually.

There are some additional points to consider in interpreting study results. Depression may lead to a negative bias in a mother's perception of social support, which may affect the accuracy of participants' report on the social network measure (Overall & Hammond, 2013). However, as the measure primarily focused on actual received support rather than perceived support, this bias may have been diminished. Depression may also lead to difficulties in help seeking behaviors or to distancing in social relationships. Combined with the cross-sectional design of the study, it is difficult to determine the directionality of the relationship between the social network variables and depression. In other words, it is difficult to ascertain whether social network variables impacted depression or vice versa.

Conclusion

Despite the growing global momentum and commitment to addressing child malnutrition over the past few decades, undernutrition in children remains a global health crisis, particularly in LMICs, and leads to deleterious physical and cognitive effects on children. The maternal social network has been linked to child development and health outcomes, partially through its effect on maternal depression, which in turn affects maternal behavior and child health. However, there is limited research in LMICs broadly and in Uganda specifically on the infant/young child caregiving social network, the social networks through which mothers receive infant/young child caregiving assistance. This mixed-methods dissertation study piloted and refined a measure to capture this infant/young child caregiving social network in northern

Uganda, and then examined sample descriptive data and the associations between networks' characteristics and maternal depression using a SNA approach. We also qualitatively examined challenges, barriers, and facilitators to infant and young child caregiving social support. Results found the social network measure to be feasible, acceptable, and comprehensible, and refinements were added to further increase clarity and suitability to the cultural context. Quantitative analyses found higher maternal depression severity to be significantly correlated with lower support on several network characteristics: average number of tasks people assisted with, number of people helping with advanced tasks, and network density. Further exploration showed that higher network density was also correlated with higher number of tasks alters assisted with. Qualitative results found that mothers often experience multiple ongoing challenges and barriers in their relationships, such as chronic spousal abuse and financial restriction, and highlighted a lack of systemic support and interventions to address these challenges. We also found several facilitators that helped mothers obtain much needed caregiving support, such as through their older children or FH (NPO) interventions. Though larger future studies are needed to corroborate findings, results of the study may inform future interventions for maternal depression and child nutrition/health, identifying possible targets such as network density and highlighting the importance of addressing specific chronic barriers to caregiving social support. Lastly, we also developed a measure that may be used in future studies to examine caregiving networks as a mechanism of change in existing interventions.

References

- Adams, A. M., Nababan, H. Y., & Hanifi, S. M. A. (2015). Building social networks for maternal and newborn health in poor urban settlements: a cross-sectional study in Bangladesh. *PLoS One*, *10*(4), e0123817.
- Armstrong, M., Birnie-Lefcovitch, S., & Ungar, M. (2005). Pathways between social support, family well being, quality of parenting, and child resilience: What we know. *Journal of Child and Family Studies*, *14*, 269-281.
- Aydin, N., Inandi, T., & Karabulut, N. (2005). Depression and associated factors among women within their first postnatal year in Erzurum province in eastern Turkey. *Women & health*, *41*(2), 1–12. https://doi.org/10.1300/J013v41n02_01
- Barkin, J. L., Bloch, J. R., Hawkins, K. C., & Thomas, T. S. (2014). Barriers to optimal social support in the postpartum period. *Journal of Obstetric, Gynecologic & Neonatal Nursing*, *43*(4), 445-454.
- Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., De Onis, M., Ezzati, M., ... & Maternal and Child Undernutrition Study Group. (2008). Maternal and child undernutrition: global and regional exposures and health consequences. *The lancet*, *371*(9608), 243-260.
- Benson, P. R. (2012). Network characteristics, perceived social support, and psychological adjustment in mothers of children with autism spectrum disorder. *Journal of autism and developmental disorders*, *42*(12), 2597-2610.
- Bhutta, Z. A., Das, J. K., Rizvi, A., Gaffey, M. F., Walker, N., Horton, S., ... & Maternal and Child Nutrition Study Group. (2013). Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?. *The lancet*, *382*(9890), 452-477.

- Boyce, P., & Hickey, A. (2005). Psychosocial risk factors to major depression after childbirth. *Social psychiatry and psychiatric epidemiology*, 40(8), 605–612.
<https://doi.org/10.1007/s00127-005-0931-0>
- Burcusa, S. L., & Iacono, W. G. (2007). Risk for recurrence in depression. *Clinical psychology review*, 27(8), 959-985.
- Ceballo, R., & McLoyd, V. C. (2002). Social support and parenting in poor, dangerous neighborhoods. *Child Development*, 73, 1310-1321.
- Chee, C. Y., Lee, D. T., Chong, Y. S., Tan, L. K., Ng, T. P., & Fones, C. S. (2005). Confinement and other psychosocial factors in perinatal depression: a transcultural study in Singapore. *Journal of affective disorders*, 89(1-3), 157–166.
<https://doi.org/10.1016/j.jad.2005.09.004>
- CORE Group. Knowledge, Practice and Coverage Survey–2000+. Washington, DC, October, CORE Group, 2000.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *psychometrika*, 16(3), 297-334.
- Crosnoe, R., & Elder, G. H. (2004). From Childhood to the Later Years: Pathways of Human Development. *Research on Aging*, 26(6), 623–654.
<https://doi.org/10.1177/0164027504268491>
- Daley, D., McCauley, M., & van den Broek, N. (2020). Interventions for women who report domestic violence during and after pregnancy in low-and middle-income countries: a systematic literature review. *BMC pregnancy and childbirth*, 20(1), 1-9.
- Diniz, E., Koller, S. H., & Volling, B. L. (2015). Social support and maternal depression from pregnancy to postpartum: the association with positive maternal behaviours among

- Brazilian adolescent mothers. *Early Child Development and Care*, 185(7), 1053-1066.
- Djomba, J. K., & Zaletel-Kragelj, L. (2016). A methodological approach to the analysis of egocentric social networks in public health research: a practical example. *Zdravstveno varstvo*, 55(4), 256–263. <https://doi.org/10.1515/sjph-2016-0035>
- Eastwood, J. G., Jalaludin, B. B., Kemp, L. A., Phung, H. N., & Barnett, B. E. (2012). Relationship of postnatal depressive symptoms to infant temperament, maternal expectations, social support and other potential risk factors: findings from a large Australian cross-sectional study. *BMC pregnancy and childbirth*, 12(1), 148.
- Ege, E., Timur, S., Zincir, H., Geçkil, E., & Sunar-Reeder, B. (2008). Social support and symptoms of postpartum depression among new mothers in Eastern Turkey. *The journal of obstetrics and gynaecology research*, 34(4), 585–593. <https://doi.org/10.1111/j.1447-0756.2008.00718.x>
- Escribà-Agüir, V., & Artazcoz, L. (2011). Gender differences in postpartum depression: a longitudinal cohort study. *Journal of epidemiology and community health*, 65(4), 320–326. <https://doi.org/10.1136/jech.2008.085894>
- Feiring, C., & And Others. (1987). The Relation Between Social Support, Infant Risk Status and Mother-Infant Interaction. *Developmental Psychology*, 23(3), 400-05. <https://doi.org/10.1037/0012-1649.23.3.400>
- Francis-Connolly E. (2000). Toward an understanding of mothering: a comparison of two motherhood stages. *The American journal of occupational therapy : official publication of the American Occupational Therapy Association*, 54(3), 281–289. <https://doi.org/10.5014/ajot.54.3.281>

- Gausia, K., Fisher, C., Ali, M., & Oosthuizen, J. (2009). Magnitude and contributory factors of postnatal depression: a community-based cohort study from a rural subdistrict of Bangladesh. *Psychological medicine*, 39(6), 999–1007.
<https://doi.org/10.1017/S0033291708004455>
- Gebuza, G., Kaźmierczak, M., Mieczkowska, E., Gierszewska, M., & Kotzbach, R. (2014). Life satisfaction and social support received by women in the perinatal period. *Advances in clinical and experimental medicine: official organ Wroclaw Medical University*, 23(4), 611-619.
- Giusto, A., & Puffer, E. (2018). A systematic review of interventions targeting men's alcohol use and family relationships in low-and middle-income countries. *Global Mental Health*, 5.
- Glozah, F. (2015). Exploring Ghanaian adolescents' meaning of health and wellbeing: A psychosocial perspective. *International Journal of Qualitative Studies on Health and Well-Being*, 10. <https://doi.org/10.3402/qhw.v10.26370>
- Green, K., Broome, H., & Mirabella, J. (2006). Postnatal depression among mothers in the United Arab Emirates: socio-cultural and physical factors. *Psychology, health & medicine*, 11(4), 425–431. <https://doi.org/10.1080/13548500600678164>
- Green, B., Furrer, C., & McAllister, C. (2007). How do relationships support parenting? Effects of attachment style and social support on parenting behavior in an at-risk population. *American Journal of Community Psychology*, 40, 96-108.
- Hammoudeh, D., Hamayel, L., Abu-Rmeileh, N. M. E., & Giacaman, R. (2013). Effect of infertility on women in the occupied Palestinian territory: a pilot qualitative study. *Lancet*, 382S4, S15.

- Hanneman, R. A., & Riddle, M. (2005). Introduction to social network methods. University of California, Riverside. CA (Online book).
- Harrison, M. J., Neufeld, A., & Kushner, K. (1995). Women in transition: access and barriers to social support. *Journal of Advanced Nursing*, 21(5), 858-864.
- Houtjes, W., van Meijel, B., van de Ven, P. M., Deeg, D., van Tilburg, T., & Beekman, A. (2014). The impact of an unfavorable depression course on network size and loneliness in older people: a longitudinal study in the community. *International journal of geriatric psychiatry*, 29(10), 1010-1017.
- Huang, C. Y., Costeines, J., Kaufman, J. S., & Ayala, C. (2014). Parenting stress, social support, and depression for ethnic minority adolescent mothers: impact on child development. *Journal of child and family studies*, 23(2), 255-262.
- Hunker, D. F., Patrick, T. E., Albrecht, S. A., & Wisner, K. L. (2009). Is difficult childbirth related to postpartum maternal outcomes in the early postpartum period?. *Archives of women's mental health*, 12(4), 211–219. <https://doi.org/10.1007/s00737-009-0068-3>
- Husain, N., Bevc, I., Husain, M., Chaudhry, I. B., Atif, N., & Rahman, A. (2006). Prevalence and social correlates of postnatal depression in a low income country. *Archives of women's mental health*, 9(4), 197–202. <https://doi.org/10.1007/s00737-006-0129-9>
- ICF U: Uganda Demographic and Health Survey 2011. Kampala, Uganda. 2011, UBOS and Calverton, Maryland: ICF International Inc.
- Inandi, T., Bugdayci, R., Dundar, P., Sumer, H., & Sasmaz, T. (2005). Risk factors for depression in the first postnatal year: a Turkish study. *Social psychiatry and psychiatric epidemiology*, 40(9), 725–730. <https://doi.org/10.1007/s00127-005-0949-3>

- Jackson, A. P., Brooks-Gunn, J., Huang, C., & Glassman, M. (2000). Single mothers in low-wage jobs: Financial strain, parenting, and preschoolers' outcomes. *Child development, 71*(5), 1409-1423.
- Jackson, A. P., & Huang, C. C. (2000). Parenting stress and behavior among single mothers of preschoolers: The mediating role of self-efficacy. *Journal of Social Service Research, 26*, 29-42.
- Kotchick, B. A., Shannon, D., & Heller, L. (2005). Predictors of parenting among African American single mothers: Personal and contextual factors. *Journal of Marriage and Family, 67*, 448-460.
- Jennings, K. D., Stagg, V., Connors, R. E., & Ross, S. (1995). Social networks of mothers of physically handicapped and nonhandicapped preschoolers: Group differences and relations to mother-child interaction. *Journal of applied developmental psychology, 16*(2), 193-209.
- Kim, O. (2001). Sex differences in social support, loneliness, and depression among Korean college students. *Psychological Reports, 88*(2), 521-526.
- Koverola, C., Papas, M. A., Pitts, S., Murtaugh, C., Black, M. M., & Dubowitz, H. (2005). Longitudinal investigation of the relationship among maternal victimization, depressive symptoms, social support, and children's behavior and development. *Journal of Interpersonal Violence, 20*(12), 1523. <https://doi.org/10.1177/0886260505280339>
- Kozinszky, Z., Dudas, R. B., Csatornai, S., Devosa, I., Tóth, E., Szabó, D., Sikovanyecz, J., Zádori, J., Barabás, K., & Pál, A. (2011). Social dynamics of postpartum depression: a population-based screening in South-Eastern Hungary. *Social psychiatry and psychiatric epidemiology, 46*(5), 413–423. <https://doi.org/10.1007/s00127-010-0206-2>

- Kreider, C. (2013). Social networks and participation of youth with learning disability, attention deficit disorder or autism spectrum disorder: A mixed-method study using personal network analysis and qualitative interview.
- Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *Journal of general internal medicine*, *16*(9), 606-613.
- Lanes, A., Kuk, J. L., & Tamim, H. (2011). Prevalence and characteristics of postpartum depression symptomatology among Canadian women: a cross-sectional study. *BMC public health*, *11*, 302. <https://doi.org/10.1186/1471-2458-11-302>
- Leahy-Warren, P., McCarthy, G., & Corcoran, P. (2011). Postnatal Depression in FirstTime Mothers: Prevalence and Relationships Between Functional and Structural Social Support at 6 and 12 Weeks Postpartum. *Archives of Psychiatric Nursing*, *25*(3), 174–184. <https://doi.org/10.1016/j.apnu.2010.08.005>
- Lee, C. Y. S., Anderson, J. R., Horowitz, J. L., & August, G. J. (2009). Family income and parenting: The role of parental depression and social support. *Family Relations*, *58*(4), 417-430.
- Lee, S. H., Liu, L. C., Kuo, P. C., & Lee, M. S. (2011). Postpartum depression and correlated factors in women who received in vitro fertilization treatment. *Journal of midwifery & women's health*, *56*(4), 347–352. <https://doi.org/10.1111/j.1542-2011.2011.00033.x>
- Leininger, L. J., Ryan, R. M., & Kalil, A. (2009). Low-income mothers' social support and children's injuries. *Social Science & Medicine*, *68*(12), 2113-2121.

- Logsdon, M. C., & Usui, W. M. (2006). The postpartum support questionnaire: Psychometric properties in adolescents. *Journal of Child and Adolescent Psychiatric Nursing, 19*(3), 145-156.
- Lovejoy, M. C., Graczyk, P. A., O'Hare, & Neuman. (2000). Maternal depression and parenting behavior: A meta-analytic review. *Clinical Psychology Review, 20*(5), 561–592.
[https://doi.org/10.1016/S0272-7358\(98\)00100-7](https://doi.org/10.1016/S0272-7358(98)00100-7)
- Maguire-Jack, K., & Showalter, K. (2016). The protective effect of neighborhood social cohesion in child abuse and neglect. *Child Abuse & Neglect, 52*, 29–37.
<https://doi.org/10.1016/j.chiabu.2015.12.011>
- Manuel, J. I., Martinson, M. L., Bledsoe-Mansori, S. E., & Bellamy, J. L. (2012). The influence of stress and social support on depressive symptoms in mothers with young children. *Social science & medicine (1982), 75*(11), 2013–2020.
<https://doi.org/10.1016/j.socscimed.2012.07.034>
- Maselko, J., Hagaman, A. K., Bates, L. M., Bhalotra, S., Biroli, P., Gallis, J. A., O'Donnell, K., Sikander, S., Turner, E. L., & Rahman, A. (2019). Father involvement in the first year of life: Associations with maternal mental health and child development outcomes in rural Pakistan. *Social science & medicine (1982), 237*, 112421.
<https://doi.org/10.1016/j.socscimed.2019.112421>
- Mbekenga, C. K., Pembe, A. B., Christensson, K., Darj, E., & Olsson, P. (2011). Informal support to first-parents after childbirth: a qualitative study in low-income suburbs of Dar es Salaam, Tanzania. *BMC pregnancy and childbirth, 11*(1), 1-10.
- McConnell, D., Breitkreuz, R., & Savage, A. (2011). From financial hardship to child difficulties: Main and moderating effects of perceived social support. *Child: care, health*

- and development*, 37(5), 679-691.
- McGroder, S. M. (2000). Parenting among low-income, African American single mothers with preschool-age children: Patterns, predictors, and developmental correlates. *Child Development*, 71, 752-771.
- Moestue, H., Huttly, S., Sarella, L., & Galab, S. (2007). 'The bigger the better'—mothers' social networks and child nutrition in Andhra Pradesh. *Public health nutrition*, 10(11), 1274-1282.
- Mustanski, B., Birkett, M., Kuhns, L. M., Latkin, C. A., & Muth, S. Q. (2015). The role of geographic and network factors in racial disparities in HIV among young men who have sex with men: an egocentric network study. *AIDS and Behavior*, 19(6), 1037-1047.
- Mercer, R. T., & Ferketich, S. L. (1988). Stress and social support as predictors of anxiety and depression during pregnancy. *Advances in Nursing Science*, 10(2), 26-39.
- Mitchell, S., Gelman, A., Ross, R., Chen, J., Bari, S., Huynh, U. K., ... & Makela, S. (2018). The Millennium Villages Project: a retrospective, observational, endline evaluation. *The Lancet Global Health*, 6(5), e500-e513.
- Nakigudde, J., Musisi, S., Ehnvall, A., Airaksinen, E., & Agren, H. (2009). Adaptation of the multidimensional scale of perceived social support in a Ugandan setting. *African health sciences*, 9 Suppl 1(Suppl 1), S35–S41.
- Nakirya, J. W. (2013). " Nigiina" s as Coping Mechanisms of Peri-urban Low-income Mothers in Kampala, Uganda. *Eastern Africa Social Science Research Review*, 29(1), 31-57.
- Nakku, J. E. M., Rathod, S. D., Kizza, D., Breuer, E., Mutyaba, K., Baron, E. C., ... & Kigozi, F. (2016). Validity and diagnostic accuracy of the Luganda version of the 9-Item and 2-Item Patient Health Questionnaire for detecting major depressive disorder in rural

- Uganda. *Global Mental Health*, 3.
- Nasreen, H.-E., Nahar Kabir, Z., Forsell, Y., & Edhborg, M. (2012). Impact of maternal depressive symptoms and infant temperament on early infant growth and motor development: Results from a population based study in Bangladesh. *Journal of Affective Disorders*. <https://doi.org/10.1016/j.jad.2012.09.013>
- Natamba, B. K., Mehta, S., Achan, J., Stoltzfus, R. J., Griffiths, J. K., & Young, S. L. (2017). The association between food insecurity and depressive symptoms severity among pregnant women differs by social support category: a cross-sectional study. *Maternal & child nutrition*, 13(3), e12351. <https://doi.org/10.1111/mcn.12351>
- Negron, R., Martin, A., Almog, M., Balbierz, A., & Howell, E. A. (2013). Social support during the postpartum period: mothers' views on needs, expectations, and mobilization of support. *Maternal and child health journal*, 17(4), 616-623.
- Nguyen, Menon, Rahul, and Ruel (2011). Maternal mental distress is associated with child feeding practices and anthropometry in Vietnam. Poster presentation at the Experimental Biology conference by IFRPI.
- Norhayati, M. N., Nik Hazlina, N. H., Asrenee, A. R., & Wan Emilin, W. M. A. (2015). Magnitude and risk factors for postpartum symptoms: A literature review. *Journal of Affective Disorders*, 175, 34–52. <https://doi.org/10.1016/j.jad.2014.12.041>
- Nunnally, J. C. (1994). *Psychometric theory* 3E. Tata McGraw-Hill Education.
- O'Brien, B. C., Harris, I. B., Beckman, T. J., Reed, D. A., & Cook, D. A. (2014). Standards for reporting qualitative research: a synthesis of recommendations. *Academic Medicine*, 89(9), 1245-1251.

- Overall, N. C., & Hammond, M. D. (2013). Biased and accurate: Depressive symptoms and daily perceptions within intimate relationships. *Personality and Social Psychology Bulletin*, 39(5), 636-650.
- Paulson, J. F., Dauber, S., & Leiferman, J. A. (2006). Individual and combined effects of postpartum depression in mothers and fathers on parenting behavior. *Pediatrics*, 118(2), 659. <https://doi.org/10.1542/peds.2005-2948>
- Posner, K., Brent, D., Lucas, C., Gould, M., Stanley, B., Brown, G., ... & Mann, J. (2008). Columbia-suicide severity rating scale (C-SSRS). *New York, NY: Columbia University Medical Center*.
- Quelopana, A. M., Champion, J. D., & Reyes-Rubilar, T. (2011). Factors associated with postpartum depression in Chilean women. *Health care for women international*, 32(10), 939–949. <https://doi.org/10.1080/07399332.2011.603866>
- Rahman, A., Fisher, J., Bower, P., Luchters, S., Tran, T., Yasamy, M. T., ... & Waheed, W. (2013). Interventions for common perinatal mental disorders in women in low-and middle-income countries: a systematic review and meta-analysis. *Bulletin of the World Health Organization*, 91(8), 593-601I.
- Rahman, A., Iqbal, Z., Bunn, J., Lovel, H., & Harrington, R. (2004). Impact of Maternal Depression on Infant Nutritional Status and Illness: A Cohort Study. *Archives of General Psychiatry*, 61(9), 946–952. <https://doi.org/10.1001/archpsyc.61.9.946>
- Reid, K. M., & Taylor, M. G. (2015). Social support, stress, and maternal postpartum depression: A comparison of supportive relationships. *Social science research*, 54, 246–262. <https://doi.org/10.1016/j.ssresearch.2015.08.009>

- Richardson, J., Day, M. N. A., Peacock, S., & Iezzi, M. A. (2004). *The Assessment of Quality of Life (AQoL) II Instrument Overview of the Assessment of Quality of Life Mark 2 Project* (No. 144/04). Monash University, Centre for Health Economics.
- Rodrigues, M., Patel, V., Jaswal, S., & De Souza, N. (2003). Listening to mothers: qualitative studies on motherhood and depression from Goa, India. *Social science & medicine*, 57(10), 1797-1806.
- Ryan, R. M., Kalil, A., & Leininger, L. (2009). Low-income mothers' private safety nets and children's socioemotional well-being. *Journal of Marriage and Family*, 71(2), 278-297.
- Sampson, M., Villarreal, Y., & Padilla, Y. (2015). Association between Support and Maternal Stress at One Year Postpartum: Does Type Matter? *Social Work Research*, 39(1), 49–60. <https://doi.org/10.1093/swr/svu031>
- Segal, Z. V., Pearson, J. L., & Thase, M. E. (2003). Challenges in preventing relapse in major depression: report of a National Institute of Mental Health Workshop on state of the science of relapse prevention in major depression. *Journal of Affective Disorders*, 77(2), 97-108.
- Shechner, T., Slone, M., Meir, Y., & Kalish, Y. (2010). Relations between social support and psychological and parental distress for lesbian, single heterosexual by choice, and two-parent heterosexual mothers. *American Journal of Orthopsychiatry*, 80(3), 283.
- Singla, D. R., Kumbakumba, E., & Aboud, F. E. (2015). Effects of a parenting intervention to address maternal psychological wellbeing and child development and growth in rural Uganda: a community-based, cluster-randomised trial. *The Lancet Global Health*, 3(8), e458–e469. [https://doi.org/10.1016/S2214-109X\(15\)00099-6](https://doi.org/10.1016/S2214-109X(15)00099-6)

- Stapleton, L. R., Schetter, C. D., Westling, E., Rini, C., Glynn, L. M., Hobel, C. J., & Sandman, C. A. (2012). Perceived partner support in pregnancy predicts lower maternal and infant distress. *Journal of family psychology : JFP : journal of the Division of Family Psychology of the American Psychological Association (Division 43)*, 26(3), 453–463. <https://doi.org/10.1037/a0028332>
- Streiner, D. L., Norman, G. R., & Cairney, J. (2015). *Health measurement scales: a practical guide to their development and use*. Oxford University Press, USA.
- Surkan, J, Kennedy C, Hurley, B, and Black, M. (2011). Maternal depression and early childhood growth in developing countries: systematic review and meta-analysis. *Bulletin of the World Health Organization* 2011; 89:608-615E. doi: 10.2471/BLT.11.088187
- Sword, W., Landy, C. K., Thabane, L., Watt, S., Krueger, P., Farine, D., & Foster, G. (2011). Is mode of delivery associated with postpartum depression at 6 weeks: a prospective cohort study. *BJOG : an international journal of obstetrics and gynaecology*, 118(8), 966–977. <https://doi.org/10.1111/j.1471-0528.2011.02950.x>
- Taylor, R. D., Seaton, E., & Dominguez, A. (2008). Kinship Support, Family Relations, and Psychological Adjustment Among Low-Income African American Mothers and Adolescents. *Journal of Research on Adolescence*, 18(1), 1-22.
- Taylor, Z. E., Conger, R. D., Robins, R. W., & Widaman, K. F. (2015). Parenting practices and perceived social support: Longitudinal relations with the social competence of Mexican-origin children. *Journal of Latina/o psychology*, 3(4), 193.
- Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of health and social behavior*, 52(2), 145-161.
- Thompson, R. A., Flood, M. F., & Goodvin, R. (2006). Social support and developmental

- psychopathology. *Developmental psychopathology*, 3, 1-37.
- Turney, K. (2013). Perceived instrumental support and children's health across the early life course. *Social Science & Medicine*, 95, 34-42.
- Uganda Bureau of Statistics (UBOS) and ICF. (2017). Uganda demographic and health survey 2016: key indicators report. *Kampala, Uganda*.
- UNICEF. Improving Child Nutrition: The Achievable Imperative for Global Progress; UNICEF: New York, NY, USA, 2013; pp. 1–14.
- UNICEF. (2019). Levels and trends in child mortality: report 2019. Estimates developed by the UN Inter-agency Group for child mortality estimation.
- United Nations Inter-agency Group for Child Mortality Estimation, Hug, L., Sharrow, D., Zhong, K., You, D., Unicef, ... & World Bank Group. (2018). *Levels & Trends in Child Mortality: Report 2018, Estimates Developed by the United Nations Children's Fund*.
- World Health Organization. (2015). Health in 2015: from MDGs, millennium development goals to SDGs, sustainable development goals.
- World Health Organization (WHO). (2019). Children: reducing mortality: fact sheet.
- World Health Organization. (2019). *Global status report on alcohol and health 2018*. World Health Organization.
- World Health Organization. (2020). UNICEF/WHO/The World Bank Group joint child malnutrition estimates: levels and trends in child malnutrition: key findings of the 2020 edition.
- Wusu, O. (2006). Interconnections among changing family structure, child rearing and fertility behaviour among the Ogu, Southwestern Nigeria: A qualitative study. *Demographic research*, 14, 139-156.

Yağmur, Y., & Ulukoca, N. (2010). Social support and postpartum depression in low-socioeconomic level postpartum women in Eastern Turkey. *International journal of public health*, 55(6), 543–549. <https://doi.org/10.1007/s00038-010-0182-z>

Appendices

Appendix A: Refined Infant and Young Child Caregiving Social Network Measure

We will now ask you a series of questions about who takes care of your child and what they do. There are no right or wrong answers. Please feel free to ask any questions and please let us know if anything is difficult to answer or to understand. The names that you provide and any information that you provide about them will be kept confidential and will not be made available to anyone except the investigators of the study.

Child Caregiving Social Network Measure

How old is the child, in months? ___ months

What is the gender/biological sex of the child? Female __ Male __

Has the child ever been breastfed? Yes __ no __

If so, for how many months were they breastfed exclusively? ___ months. For how many months were they breastfed in total? ___ months

How old are you, in years? ___ years

What is your relationship to the child?

Would you say you are one of the main caretakers of the child? Yes __ No __

How many children do you have in total (including this one)? ____

In the past year (12 months), how many months were there where you or a member of your household did not have two square meals a day (enough food)? ____ months (1~12 months)

Many people may be involved in the caretaking of a young child. Looking back over the last six months, that would be from ___ early last October ___ (date), who are the people who have helped with taking care of the child's basic needs? For example, cleaning the child (bathing, teeth brushing, disposing waste), feeding the child, playing with the child, holding the child, or taking care of the child when the child was sick?

Since ___ ___ (date), who has provided information on how to take care of the child? For example, medical advice, information about the child's eating or what they drink, or information on how to keep the child clean (for example, family members, community leaders, experts in the community, doctors, neighbors)?

Is there anyone else you can think of who has helped with taking care of the child?

If no one has been name, ask:

How does your spouse, other family members, or neighbors interact with the baby?

Of all the people named, who are the five people who have taken care of the child the most?

Write out each of the five names. When did they last provide help/assistance?

1. _____ Month of last assistance: _____
 2. _____ Month of last assistance: _____
 3. _____ Month of last assistance: _____
 4. _____ Month of last assistance: _____
 5. _____ Month of last assistance: _____
-

We would like to find out a little about each of these five people, starting with:

1. _____ (*from the above list*)

What is your relationship with him/her? (You can circle / choose more than one) He/ she is my:

Spouse/partner ___ If checked, parent to the baby? ___

Parent _____

Child _____

Sibling _____

Other family member _____

Coworker _____

Neighbor _____

Friend _____

Professional/trained expert _____

Other: _____

What is his/her gender?

Male ___ Female ___

How old is he/she by your best guess? ___ years old. Or, don't know ___

How long have they been helping to take care of the child? _____ Months.

Does he/ she help with (check all that are true):

Cleaning the child (for example, bathing, teeth brushing, disposing waste) ___

Feeding the child ___

Playing with the child ___

Holding the child ____

Taking care of the child when the child was sick ____

Helping with taking care of the child when you were busy, such as when you were working or needed to leave the home, or when you were sick ____

Putting the child to sleep ____

Providing food for the child or for you, to help with breast-feeding ____

Watching the child with an understanding of when the child needs to be fed or cleaned, and when to return the child to you ____

Helping provide clothing, washing clothing, or helping to dress the child ____

Giving medical advice ____

Giving information about the child's nutrition, food or water intake/what they drink, or breast-feeding

What else did they help with, if there's anything else?

On average, about how many days in a month does he/she help with taking care of the child?
____ days (0 ~ 31 days)

Convert to a percentage over the last 6 months: ____

Overall, how happy are you with the way that he/she takes care of the child?

We are interested in understanding your current level of satisfaction with how he/she is taking care of the child, as opposed to how you think you should feel.



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

Overall, how much do you trust him/her to take care of your child?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

On average, how much do you think the child likes him/her?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

Or, Not Applicable

How emotionally close you feel to him/her (name of helper), such as, feeling supported, feeling understood, or that you can discuss problems or exchange advice with them?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much
Or, Not Applicable

The following questions ask about whether the people you named received help from you with taking care of the baby or helped each other with taking care of the baby.

Do you help him or her to take care of the baby (e.g., by providing instructions, information about the child or advice on how to take care of the child)? Yes ___no___

Does he/she help 2. _____ with taking care of the baby (e.g., assistance or information)?
Yes___No___

Does he/she help 3. _____ with taking care of the baby? Yes___No___

Does he/she help 4. _____ with taking care of the baby? Yes___No___

Does he/she help 5. _____ with taking care of the baby? Yes___No___

Next, we would like to find out a little about:

2. _____ (from the above list)

What is your relationship with him/her? (You can circle / choose more than one) He/ she is my:

Spouse/partner___ If checked, parent to the baby? ___

Parent _____

Child _____

Sibling _____

Other family member _____

Coworker _____

Neighbor _____

Friend _____

Professional/trained expert _____

Other: _____

What is his/her gender?

Male ___ Female ___

How old is he/she by your best guess? _____ years old. Or, don't know _____

How long have they been helping to take care of the child? _____Months.

Does he/ she help with (check all that are true):

Cleaning the child (for example, bathing, teeth brushing, disposing waste) _____

Feeding the child _____

Playing with the child _____

Holding the child _____

Taking care of the child when the child was sick _____

Helping with taking care of the child when you were busy, such as when you were working or needed to leave the home, or when you were sick _____

Putting the child to sleep _____

Providing food for the child or for you, to help with breast-feeding _____

Watching the child with an understanding of when the child needs to be fed or cleaned, and when to return the child to you _____

Helping provide clothing, washing clothing, or helping to dress the child _____

Giving medical advice _____

Giving information about the child's nutrition, food or water intake/what they drink, or breast-feeding

What else did they help with, if there's anything else?

On average, about how many days in a month does he/she help with taking care of the child?
_____ days (0 ~ 31 days)

Convert to a percentage over the last 6 months: _____

Overall, how happy are you with the way that he/she takes care of the child?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

Overall, how much do you trust him/her to take care of your child?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

On average, how much do you think the child likes him/her?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much
Or, Not Applicable

How emotionally close you feel to him/her (name of helper), such as, feeling supported, feeling understood, or that you can discuss problems or exchange advice with them?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much
Or, Not Applicable

Do you help him or her to take care of the baby (e.g., by providing instructions, information about the child or advice on how to take care of the child)? Yes ___no___

Does he/she help 1. _____ with child caretaking (assistance or information)?
Yes___No___

Does he/she help 3. _____? Yes___No___

Does he/she help 4. _____? Yes___No___

Does he/she help 5. _____? Yes___No___

Next, we would like to find out a little about:

3. _____ (from the above list)

What is your relationship with him/her? (You can circle / choose more than one) He/ she is my:

Spouse/partner___ If checked, parent to the baby? ___

Parent_____

Child_____

Sibling_____

Other family member _____
Coworker _____
Neighbor _____
Friend _____
Professional/trained expert _____
Other: _____

What is his/her gender?

Male ___ Female ___

How old is he/she by your best guess? ___ years old. Or, don't know ___

How long have they been helping to take care of the child? _____ Months.

Does he/ she help with (check all that are true):

Cleaning the child (for example, bathing, teeth brushing, disposing waste) ___

Feeding the child ___

Playing with the child ___

Holding the child ___

Taking care of the child when the child was sick ___

Helping with taking care of the child when you were busy, such as when you were working or needed to leave the home, or when you were sick ___

Putting the child to sleep ___

Providing food for the child or for you, to help with breast-feeding ___

Watching the child with an understanding of when the child needs to be fed or cleaned, and when to return the child to you ___

Helping provide clothing, washing clothing, or helping to dress the child ___

Giving medical advice ___

Giving information about the child's nutrition, food or water intake/what they drink, or breast-feeding

What else did they help with, if there's anything else?

On average, about how many days in a month does he/she help with taking care of the child?
____ days (0 ~ 31 days)

Convert to a percentage over the last 6 months: _____

Overall, how happy are you with the way that he/she takes care of the child?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

Overall, how much do you trust him/her to take care of your child?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

On average, how much do you think the child likes him/her?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much
Or, Not Applicable

How emotionally close you feel to him/her (name of helper), such as, feeling supported, feeling understood, or that you can discuss problems or exchange advice with them?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much
Or, Not Applicable

Do you help him or her to take care of the baby (e.g., by providing instructions, information about the child or advice on how to take care of the child)? Yes ___no___

Does he/she help 1. _____ with child caretaking (assistance or information)?
Yes___No___

Does he/she help 2. _____? Yes___No___

Does he/she help 4. _____? Yes___No___

Does he/she help 5. _____? Yes___No___

Next, we would like to find out a little about:

4. _____ (from the above list)

What is your relationship with him/her? (You can circle / choose more than one) He/ she is my:

Spouse/partner ___ If checked, parent to the baby? ___

Parent _____

Child _____

Sibling _____

Other family member _____

Coworker _____

Neighbor _____

Friend _____

Professional/trained expert _____

Other: _____

What is his/her gender?

Male ___ Female ___

How old is he/she by your best guess? _____ years old. Or, don't know ___

How long have they been helping to take care of the child? _____ Months.

Does he/ she help with (check all that are true):

Cleaning the child (for example, bathing, teeth brushing, disposing waste) ___

Feeding the child ___

Playing with the child ___

Holding the child ___

Taking care of the child when the child was sick ___

Helping with taking care of the child when you were busy, such as when you were working or needed to leave the home, or when you were sick ___

Putting the child to sleep ___

Providing food for the child or for you, to help with breast-feeding ___

Watching the child with an understanding of when the child needs to be fed or cleaned, and when to return the child to you ___

Helping provide clothing, washing clothing, or helping to dress the child ___

Giving medical advice ___

Giving information about the child's nutrition, food or water intake/what they drink, or breast-feeding

What else did they help with, if there's anything else?

On average, about how many days in a month does he/she help with taking care of the child?
___ days (0 ~ 31 days)

Convert to a percentage over the last 6 months: _____

Overall, how happy are you with the way that he/she takes care of the child?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

Overall, how much do you trust him/her to take care of your child?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

On average, how much do you think the child likes him/her?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

Or, Not Applicable

How emotionally close you feel to him/her (name of helper), such as, feeling supported, feeling understood, or that you can discuss problems or exchange advice with them?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

Or, Not Applicable

Do you help him or her to take care of the baby (e.g., by providing instructions, information about the child or advice on how to take care of the child)? Yes ___no___

Does he/she help 1. _____ with child caretaking (assistance or information)?
Yes___No___

Does he/she help 2. _____? Yes___No___

Does he/she help 3. _____? Yes___No___

Does he/she help 5. _____? Yes___No___

Next, we would like to find out a little about:

5. _____ (from the above list)

What is your relationship with him/her? (You can circle / choose more than one) He/ she is my:

Spouse/partner___ If checked, parent to the baby? ___

Parent _____

Child _____

Sibling _____

Other family member _____

Coworker _____

Neighbor _____

Friend _____

Professional/trained expert _____

Other: _____

What is his/her gender?

Male ___ Female ___

How old is he/she by your best guess? ___ years old. Or, don't know ___

How long have they been helping to take care of the child? _____Months.

Does he/ she help with (check all that are true):

Cleaning the child (for example, bathing, teeth brushing, disposing waste) ___

Feeding the child ___

Playing with the child ___

Holding the child ___

Taking care of the child when the child was sick ____

Helping with taking care of the child when you were busy, such as when you were working or needed to leave the home, or when you were sick ____

Putting the child to sleep ____

Providing food for the child or for you, to help with breast-feeding ____

Watching the child with an understanding of when the child needs to be fed or cleaned, and when to return the child to you ____

Helping provide clothing, washing clothing, or helping to dress the child ____

Giving medical advice ____

Giving information about the child's nutrition, food or water intake/what they drink, or breast-feeding

What else did they help with, if there's anything else?

On average, about how many days in a month does he/she help with taking care of the child?
____ days (0 ~ 31 days)

Convert to a percentage over the last 6 months: ____

Overall, how happy are you with the way that he/she takes care of the child?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

Overall, how much do you trust him/her to take care of your child?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much

On average, how much do you think the child likes him/her?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much
Or, Not Applicable

How emotionally close you feel to him/her (name of helper), such as, feeling supported, feeling understood, or that you can discuss problems or exchange advice with them?



1- Not at all 2- Not really 3 – Neutral or undecided 4 – Somewhat 5 – Very much
Or, Not Applicable

Do you help him or her to take care of the baby (e.g., by providing instructions, information about the child or advice on how to take care of the child)? Yes ___no__

Does he/she help 1. _____ with child caretaking (assistance or information)?
Yes___No___

Does he/she help 2. _____? Yes___No___

Does he/she help 3. _____? Yes___No___

Does he/she help 4. _____? Yes___No___

Ideally, how would you like the people you often interact with to help with child care?
