Cultural Practices, Knowledge, and Beliefs of Newborn Care and Health-Seeking in Rural Zambia

by

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DEDICATION

This dissertation is dedicated to the women, health workers, and community members in rural Zambia who participated in the focus group, case series, and quasi-experimental studies. I appreciate your openness and willingness to share your experience and knowledge. For the mothers and newborns – wishing you bright futures. Thank you to my family, friends, and classmates for your unconditional support.

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ANC – antenatal care

AOR – Adjusted odds ratio

ARI – acute respiratory infection

BEmOC – Basic Emergency Obstetric Care

BEmONC – Basic Emergency Obstetric and Newborn Care

CEmOC – Comprehensive Emergency Obstetric Care

CEmONC – Comprehensive Emergency Obstetric and Newborn Care

CBR – Crude Birth Rate

CDR – Crude Death Rate

CHW – community health workers

CI – confidence interval

CIA – Central Intelligence Agency

CDC – Centers for Disease Control and Prevention

CPD – cephalopelvic disproportion

DHS – Demographic and Health Surveys

EmOC – emergency obstetric care

ENC – Essential Newborn Care

ERES – Excellence in Research Ethics and Science

FGD – Focus group discussions

GRZ – Government of the Republic of Zambia

HAZ – height-for-age *z*-score (HAZ)

HIV – human immunodeficiency virus

IDI – in-depth interview

IMNCI – Integrated Management of Newborn and Childhood Illness

IRB – institutional review board

LBW – low birth weight

LMIC – low- and middle-income country

LRT – likelihood-ratio test

MCDMCH – Ministry of Community Development Mother and Child Health

MCS – maternal care-seeking

MDG – Millennium Development Goal

MOH – Ministry of Health

MWH – maternity waiting home

NGO – non-government organization

OR – odds ratio

PCPNC – pregnancy, childbirth, postpartum and newborn care

PNC – postnatal care

PPCT model – process, person, context, and time model

RA – research assistant

SBA – skilled birth attendants

SDG – Sustainable Development Goal

SF – signal function

SMAG – Saving Mothers Action Group

SMGL – Saving Mothers, Giving Life

SSA – sub-Saharan Africa

STI – sexually transmitted infection

TB – tuberculosis

TBAs – traditional birth attendants

TM – traditional midwife (TM)

UM – University of Michigan

UN IGME – United Nations Inter-Agency Group for Child Mortality Estimation

WCBA – women of child bearing age

WHO – World Health Organization

WHZ – weight-for-height z-score

WLWH – women living with HIV

ABSTRACT

Purpose: Decreasing newborn morbidity and mortality remains a serious global health challenge. For this reason, interventions like maternity waiting homes (MWHs) and the Saving Mothers, Giving Life (SMGL) initiative may improve maternal-newborn newborn health and delivery outcomes. The overarching goal of this dissertation was to explore and describe the cultural practices, knowledge, and beliefs of essential newborn care and health-seeking in the context of MWHs and the SMGL initiative in rural Zambia. Guided by the *Ecological Systems Theory*, this goal was met through three studies with the following aims: (1) Describe knowledge and beliefs of newborn care and illness from the perspective of rural Zambian women, community members, and health workers, (2) Examine similarities and differences in knowledge and beliefs of newborn care and illness among rural Zambian women, community members, and health workers, (3) Explore the social and cultural factors that are associated with the ways women seek newborn care to identify traditional and professional newborn care practices in rural Zambia, (4) Compare maternal knowledge of newborn care in two groups of women in rural Zambia, and (5) Advance an understanding of maternal-newborn delivery outcomes for women referred from health facilities with and without MWHs to the district referral hospital.

Methods: Study 1 used focus groups (*n*=646), comprised of community members (*n*=208), health workers (*n*=225), and women with babies younger than 1-year-old (*n*=213) collected between June and August 2016 in two rural Zambian districts. A semi-structured guide was used to collect data on cultural beliefs and health-seeking practices in communities with MWH and non-MWH facilities. Study 2 employed a quasi-experimental two-group comparison (*n*=250) design using a face-to-face survey approach to determine whether MWH use impacted maternal knowledge of newborn care. For Study 3 (*n*=234), a retrospective record review of district-level data recorded by healthcare providers for the Zambian Ministry of Health was performed to compare maternal-newborn delivery outcomes for cases referred from five health facilities (*n*=142) with and five without MWHs (*n*=92) to a single rural Zambian district referral hospital for delivery.

Results: The following themes emerged independently from each of the focus groups in Study 1: from women with infants younger than 1-year-old, (1) traditional newborn protective rituals; from community members, (2) strong sense of family and community protecting the newborn, and from health workers, (3) preservation of dignity. A fourth theme, essential newborn care, was common among all groups. Study 2 found rural Zambians have an understanding of WHO guidelines whether or not they used an MWH. In Study 3, among all referrals across ten facilities in the case series, more came from facilities with a MWH than from those without MWHs (60.7% MWH vs. 39.3% non-MWH).

Conclusions: This dissertation uncovered a maternal duality faced by women caring for newborns between cultural and health system responsibilities. The finding that referrals were more likely to come from facilities with MWHs is significant as we enter the post-2015 era of sustainable development with a goal to reduce the inequities of preventable death by reaching all

women and newborns. The findings highlight the need for targeted health education by professional and community health workers towards younger and primigravida women. As maternal “Essential Newborn Care” knowledge improves through health education, potential long-term benefits exist for improved maternal-newborn health and delivery outcomes in rural Zambia.

CHAPTER 1

Introduction

Newborn morbidity and mortality remain serious global health challenges in low- and middle-income countries. In 2016, an estimated 2.6 million children died within 28 days of birth (UNICEF, 2018). Almost 1 million newborns die in the first day of life (UNICEF, 2018) in these low-resource countries. A child's risk of death in the first 4 weeks of life is nearly 15 times greater than any other time before his or her first birthday (WHO, 2017). The large majority of newborn deaths (80 percent) are due to complications related to preterm birth, intrapartum events such as birth asphyxia, or infections such as sepsis or pneumonia (WHO, 2018). Newborn deaths can be attributed to conditions and diseases associated with lack of quality or skilled care and treatment immediately after birth (WHO, 2018). Targeting the time around birth with proven high-impact interventions and quality care for small and sick newborns may prevent up to 80 percent of newborn deaths (UNICEF, 2018).

Maternity waiting homes (MWHs) offer a way to provide better perinatal obstetric care (Kelly et al., 2006; Lori, Wadsworth, Munro & Rominski, 2013), by targeting the high-risk period before birth. As defined by the WHO, MWHs are residential facilities, located near a qualified medical facility, where women defined as high risk can await their delivery and be transferred to a nearby medical facility shortly before delivery, or earlier should complications arise (WHO, 1996). Women in LMICs living in rural areas often face geographic and

transportation difficulties associated with accessing health care facilities, which jeopardizes the health of their babies. Maternity waiting homes help overcome distance and transportation barriers that prevent women from receiving timely skilled obstetric care (Lori et al., 2016). By addressing distance to health facility and transportation barriers, MWHs could increase the use of skilled birth attendants, thereby reducing newborn morbidity and mortality in rural, low-resource areas of Zambia (Lori et al., 2016).

Maternity waiting homes provide a setting where high-risk women can be accommodated during the final weeks of their pregnancy near a health facility with essential obstetric facilities (WHO, 1996). The expanded purpose of many MWHs is to not only decrease maternal morbidity and mortality, but to improve newborn outcomes and increase newborn health knowledge for the mothers utilizing them. Also, MWHs bring women closer to a health facility so they can deliver with a skilled attendant and have improved newborn outcomes. In these homes, additional emphasis is placed on education and counseling regarding pregnancy to improve newborn outcomes, and delivery and care of the newborn and family (WHO, 1996). Poor knowledge of newborn danger signs delays care-seeking (Sandberg et al., 2014). Health-seeking behavior of mothers for newborn care relies heavily on their knowledge, but studies are limited on how to assess maternal knowledge of newborn care and danger signs (Kibaru & Otara, 2016; Nigatu, Worku, & Dadi, 2015; Senarath et al., 2007).

Another intervention aimed at reducing maternal-newborn mortality in rural Zambia was the Saving Mothers, Giving Life (SMGL) initiative. To address maternal mortality and avoid delays in women seeking, reaching, and receiving timely, quality services, the SMGL initiative was launched in 2012 using a systems approach at the district level (Quam, Achrekar, & Clay, 2019). Working hand-in-hand with the Zambian government, the initiative set out to make high-

quality, safe childbirth services available and accessible to women and their newborns, focusing on the critical period of labor, delivery, and the first 48 hours postpartum (SMGL, 2019). From the onset, to promote ownership and sustainability, SMGL was designed to reinforce host country government structures, policies, guidelines, and priorities (Healey et al., 2019). Strategic, long-term capital investments were made to enable districts to achieve national standards, including essential infrastructural renovations of health facilities and MWHs, provision of required equipment and supplies, training of medical personnel in critical lifesaving skills and mentorship, and provision of ambulances (Healey et al., 2019).

Maternal health outcomes achieved after 5 years of implementation in the SMGL-designated pilot districts in Zambia included a 38% decrease in facility and a 41% decline in district wide maternal mortality rate while facility deliveries increased by 44% (from 62% to 90%) (Conlon et al., 2019). The average annual rate of reduction for maternal deaths in the SMGL-supported districts in Zambia exceeded that found countrywide by 10.5% versus 2.8% (Conlon et al., 2019). Meanwhile, the changes in stillbirth rates were significant (36% in Zambia) but those for pre-discharge neonatal mortality rates were not significant (Conlon et al., 2019).

Statement of the Problem

To catalyze action in lowering maternal mortality, the United Nations Member States launched the Sustainable Development Goals (SDGs) mobilizing efforts to end all forms of poverty, fight inequalities, and tackle climate change while ensuring that no one is left behind (United Nations, 2018). The third goal (SDG 3) is to ensure healthy lives and promote well-being for all, at all ages. One target to attain SDG 3 is to end preventable deaths of newborns and children younger than 5 years of age, with all countries aiming to reduce newborn mortality to at

least as low as 12 per 1,000 live births by 2030 (United Nations, 2018). Fortunately, nurses are in a unique position to accelerate the reduction of newborn mortality in low resource settings. The research presented here explored MWH use as part of an ecological systems approach to reduce newborn morbidity and mortality ratios to meet the Sustainable Development Goals.

Historically, the focus of research studies evaluating MWHs have been on maternal outcomes (Buser & Lori, 2016; Figa'-Talamanca, 1996; Kelly et al., 2006; Lori, Wadsworth, Munro & Rominski, 2013). Perinatal and newborn health are mentioned in a limited number of articles (Chandramohan, Cutts & Millard, 1995; Lori, Munro et al, 2013; Tumwine & Dungare, 1996; van Lonkhuijzen, Stegeman, Nyirongo, & van Roosmalen, 2003); however, the research remains unclear with a fragmentary understanding of newborn outcomes at MWHs (Buser & Lori, 2016). Given the aforementioned dearth of evidence, it is both relevant and critical that further research address the gap in knowledge about the impact of MWHs on newborn health.

Background of the Problem

In Zambia, the newborn mortality rate is 34 per 1,000 live births (UNICEF, 2017). Examination of newborn, infant, and under-5 mortality rates in Zambia over the past 15 years reveals newborn mortality has decreased at a slower pace than infant and child mortality (DHS, 2014). Newborn deaths are mainly due to birth asphyxia, newborn sepsis, or infection, and these are affected by poor health care at birth and a lack of access to skilled birth attendants at delivery (DHS, 2014).

Zambia

Zambia is a land-locked country in south-central Africa (CultureGrams, 2017). Figure 1.1 shows a map of Africa highlighting Zambia (World Atlas, 2016). Zambia is slightly larger than

the state of Texas in the United States (CultureGrams, 2017). The president is the chief of state and head of government (McIntyre, 2012). The cool, dry season is from May to August; the hot,

Figure 1.1 Map of Africa highlighting Zambia (World Atlas, 2016)

dry season runs from September to October, and the warm, rainy season is from November to April (CultureGrams, 2017).

Zambia has a population of 15,510,711 (CIA, 2017). Zambia's annual population growth rate is one of the highest in the world, with almost six children per woman (CIA, 2017). In Zambia, newborn health is affected by widespread and extreme rural poverty and high unemployment levels among families (CIA, 2017). Poor, uneducated women from rural areas are more likely to marry young, to give birth early, and to have more children, viewing children as a sign of prestige and recognizing not all of their children will live to adulthood (CIA, 2017).

Purpose

The overarching goal of this dissertation was to explore and describe the cultural practices, knowledge, and beliefs of essential newborn care and health-seeking in the context of MWHs and the SMGL initiative in rural Zambia. Guided by the *Ecological Systems Theory* (Bronfenbrenner, 1977, 1979, 1989, 1994), this goal was met through three distinct studies that: (1) Described knowledge and beliefs of newborn care and illness from the perspective of rural Zambian women, community members, and health workers, (2) Examined similarities and differences in knowledge and beliefs of newborn care and illness among rural Zambian women, community members, and health workers, (3) Explored the social and cultural factors that are associated with the ways women seek newborn care to identify traditional and professional newborn care practices in rural Zambia, (4) Compared maternal knowledge of newborn care in two groups of women in rural Zambia: one group used a MWH prior to delivery and the other group did not use a MWH, and (5) Advanced an understanding of maternal-newborn delivery outcomes for women referred from health facilities with and without MWHs to the district referral hospital.

This dissertation is divided into six chapters comprising three studies. All three studies were inter-connected with varying levels of emphasis on MWH use. Chapter 1 provides an overview of the research problem, specific aims, and theoretical framework guiding the proposed dissertation. Chapter 2 consists of a comprehensive literature review of newborn health in low- and middle-income countries along with MWH and SMGL interventions. Chapter 3 presents Study 1 describing Zambian women's knowledge and beliefs about newborn care and illness, and the perspectives of community members and health workers. In addition, the social and cultural factors that influence ways women seek newborn care were examined. Study 1 was conducted as a basis for understanding the rural Zambian context to inform design of subsequent case series and quasi-experimental studies. Chapter 4 describes Study 2, which assessed maternal knowledge of newborn care for MWH and non-MWH users referred to a district hospital for delivery. Chapter 5 reports Study 3, a case series examining newborn and maternal health outcomes for women with complications referred from rural Zambian health facilities to the district hospital for delivery. Finally, Chapter 6 summarizes the results from the three studies (Chapters 3-5) and discusses future implications for nursing practice and potential policy changes at the national level to increase the allocation of resources for building additional MWHs in low-resource settings.

Specific Aims, Research Questions, and Hypotheses

I. The specific aims for Study 1, *Beliefs and Health-Seeking Practices: Rural Zambians' Views on Maternal-Newborn Care*, were to:

Aim 1): *Describe knowledge and beliefs of newborn care and illness from the perspective of rural Zambian women, community members, and health workers.*

Aim 2): *Examine similarities and differences in knowledge and beliefs of newborn care and illness among rural Zambian women, community members, and health workers.*

Aim 3): *Explore the social and cultural factors that are associated with the ways women seek newborn care to identify traditional and professional newborn care practices in rural Zambia.*

Research was guided by the following a priori questions:

- "What are the cultural beliefs and practices of rural Zambian women with infants younger than 1-year-old, community members, and health workers that influence newborn care and health-seeking behavior?"
- "What are the similarities and differences in knowledge and beliefs of newborn care among rural Zambian women, community members, and health workers?"
- "What social and cultural factors influence newborn care and health-seeking practices for rural Zambians?"

Focus groups were used to collect data employing a semi-structured interview guide to understand cultural beliefs and health-seeking practices of rural Zambians related to newborn care and illness.

II. Study 2, *Maternal Knowledge of Essential Newborn Care in Rural Zambia,* addressed the following:

Aim 1): *Compare maternal knowledge of newborn care in two groups of women in rural Zambia: one group used a MWH prior to delivery and the other group did not use a MWH.*

Topics in this two-group comparison study assessing maternal "Essential Newborn Care" knowledge included: (1) umbilical cord care, (2) thermal and skin care, (3) nutrition, (4) prevention of diarrhea, and (5) newborn danger signs prompting care-seeking. Research for Study 2 was guided by the question: "What is the difference in maternal 'Essential Newborn Care' knowledge among women who did and did not use a MWH prior to delivery?" The research hypothesis was maternal "Essential Newborn Care" knowledge would be higher for women who used a MWH before delivery than for women who did not use a MWH before delivery. A quasi-experimental, two-group comparison design was employed using a face-to-face survey approach to determine whether MWH use has an impact on maternal knowledge of newborn care.

III. Study 3, *A Case Series of Maternal-Newborn Delivery Outcomes in Rural Zambia: Comparison of Referral to a District Hospital from Facilities with and Without a Maternity Waiting Home*, addressed the following:

Aim 1): *Advance an understanding of maternal-newborn delivery outcomes for women referred from health facilities with and without MWHs to the district referral hospital.*

The case series used medical record data from delivery registers located in one district referral hospital to examine a sample of all women from ten lower-level BEmONC facilities with complications who were referred to and arrived at the higher-level CEmONC district referral hospital. Within the larger group of cases, the characteristics of those referred from facilities with and without MWHs were examined. Newborn delivery outcomes included low birth weight [LBW <2,500 grams]; condition of baby [alive or dead]; low Appearance, Pulse, Grimace, Activity, and Respiration [APGAR] score, and breastfeeding within 1 hour. Maternal delivery

outcomes included assisted delivery (forceps, vacuum); prolonged/obstructed labor, and eclampsia. Research for the case series study was conducted through a retrospective hospital-based record review guided by the questions:

- "Do newborns born to mothers referred from facilities with MWHs have fewer poor delivery outcomes than cases referred from non-MWH health facilities?"
- "Do women referred from facilities with MWHs have fewer poor delivery outcomes than women referred from non-MWH health facilities?"

The research hypotheses were:

- Newborns born to mothers referred from facilities with MWHs will have fewer poor delivery outcomes than women referred from non-MWH health facilities, and
- Women referred from facilities with MWHs will have fewer poor delivery outcomes than women referred from non-MWH health facilities.

A retrospective record review of district level data recorded by health care providers for the Zambian Ministry of Health was performed for this case series to compare maternal-newborn delivery outcomes for cases referred from five BEmONC health facilities with and five without MWHs to a single rural Zambian CEmONC district referral hospital for delivery.

Significance

Maternity waiting homes provide an opportunity to improve newborn outcomes and increase access to perinatal obstetric care (Chandramohan et al., 1995; Lori et al., 2013; Millard, 1991; Tumwine & Dungare, 1996; van Lonkhuijzen et al., 2003). However, an exceptionally wide gap in knowledge about the outcomes of newborns born at MWHs exists (Buser & Lori, 2016). More research is needed to understand the effectiveness of MWHs on newborn morbidity and mortality. Innovative research into newborn outcomes at MWHs has the potential to positively contribute to the attainment of the SDG to ensure healthy lives for all through the

reduction of newborn mortality (Buser & Lori, 2016). Research on the impact of MWHs and the SMGL initiative on newborn outcomes has the potential to inform future research, practice, and policy. An increased focus on the study of MWHs and the SMGL initiative for improving newborn outcomes in low-resource settings merits immediate attention.

The proposed dissertation is timely and significant as we are well into the post-2015 era of sustainable development. It will provide vital, new knowledge on the impact MWHs have on improving newborn health outcomes. The goal of this innovate research complements global efforts to ensure healthy lives and promote well-being for all because it includes three studies that focus on the cultural practices, knowledge, and beliefs of essential newborn care and health-seeking in the context of MWHs and the SMGL initiative in rural Zambia.

Theoretical Framework

Ecological Systems Theory

The purpose of nursing science is to develop knowledge using paradigms and theories that guide both research and practice (Walker & Avant, 2011). Bronfenbrenner's Ecological Systems Theory (Bronfenbrenner, 1977, 1979, 1989, 1994) was operationalized to guide this dissertation. Bronfenbrenner's Ecological Systems Theory stems from the social ecology approach to health promotion (Bronfenbrenner, 1977, 1979, 1989, 1994). A core theme of ecological research is that human health is influenced not only by environmental circumstances but also by a variety of personal attributes, including genetic heritage, psychological dispositions, and behavioral patterns (Stokols, 1996).

Within the Ecological Systems Theory, an individual is conceived as a functional whole, an integrated system in its own right in which various psychological processes—cognitive, affective, emotional, motivational, and social—operate not in isolation but in coordinated

interaction with one another (Bronfenbrenner, 1997). The environment extends beyond the behavior of individuals to encompass functional systems both within and between settings, systems that can also be modified and expanded (Bronfenbrenner, 1979). The inclusivity of the Ecological Systems Theory to view an individual maternal-newborn dyad within the context of nested hierarchical systems makes an adaption of Bronfenbrenner's work ideal for global community health research. Guided by the Ecological Systems Theory, there is a definite need for development of nursing studies to affirm the potential benefits of MWHs and the SMGL initiative in rural Zambia to improve maternal-newborn health outcomes.

Ecological theory is rooted in core principles concerning the interrelations among environmental conditions and human behavior and well-being (Stokols, 1996). The term ecology is derived from biological science and refers to the interrelationships between organisms and their environments. Ecological models have been central to health promotion practice for several decades (Sallis, Owen, & Fisher, 2015). The environmental and policy levels of influence distinguish ecological models from behavioral theories that emphasize individual characteristics skills and proximal social influences, such as family and friends, but do not explicitly consider the broader community, organizational, and policy influences on health behaviors (Sallis, Owen, & Fisher, 2015). A key strength of ecological models is their focus on multiple levels of influence, in which policy and environmental changes are expected to affect entire populations, while a weakness of many ecological models is their lack of specificity about the most important hypothesized influences (Sallis, Owen, & Fisher, 2015).

First introduced in the 1970s, Bronfenbrenner's ecological paradigm represented a reaction to the restricted scope of most research then being conducted by developmental psychologists (Bronfenbrenner, 1994). The *Ecological Systems Theory* focuses on a scientific

approach emphasizing the interrelationship of different processes and their contextual variation (Darling, 2007). As with most theories, the *Ecological Systems Theory* evolved over time: from an ecological approach to human development during the initial phase (1973–1979), followed by a stronger emphasis on the role of the individual and developmental processes during 1980–1993 (Eriksson, Ghazinour, & Hammarström, 2018; Rosa and Tudge 2013). Finally, in the last phase (1993–2006), Bronfenbrenner proposed methods for evaluating developmental outcomes that emerge as a result of the active participation of the four major concepts: process, person, context, and time (PPCT model) (Eriksson, Ghazinour, & Hammarström, 2018; Rosa and Tudge 2013; Tudge et al., 2013). A review by Tudge and colleagues (2013) found that while recent publications included citations to the mature (mid-1990s) version of Bronfenbrenner's theory, few appropriately describe, test, and evaluate all four major concepts.

The research in this dissertation was guided by the two earliest phases of Bronfenbrenner's theory. Earlier versions of Bronfenbrenner's theory were used in this dissertation because they focus on interventions in the wider social environment (Eriksson, Ghazinour & Hammarström, 2018). Research presented here views MWHs as an intervention to improve maternal-newborn health in communities. Later versions, incorporating the PPCT model, focus mainly on the close/proximal context rather than on broad public interventions (Eriksson, Ghazinour & Hammarström, 2018). The *Ecological Systems Theory* is well established in nursing and other disciplines and is used in various methodologies (Coetzee, Kagee, & Bland, 2015; Grzywacz & Marks, 2000; Olsen, Baisch, & Monsen, 2017; Rothery, 2001). Onwuegbuzie and colleagues (2013) conceptualized how Bronfenbrenner's (1979) ecological systems model could be mapped onto the research process representing qualitative, quantitative, and mixed research, and it is applicable across the social, behavioral, and health

fields. Table 1.1 highlights the use of *Ecological Systems Theory* in maternal-child health research including an overview of study design, findings, and limitations.

Early on, Bronfenbrenner developed two propositions specifying the defining properties of the general ecological model. Proposition 1 states that human development takes place through processes of progressively more complex reciprocal interaction between an active, evolving biopsychological individual and the people, objects, and symbols in its immediate environment (Bronfenbrenner, 1994). To be effective, the interaction must occur on a regular basis over extended periods of time (Bronfenbrenner, 1994). Proposition 2 states that the form, power, content, and direction of enduring interaction in the immediate environment affecting development vary systematically as a joint function of the characteristics of the developing person: of the environment—both immediate and more remote—in which the processes are taking place, and the nature of the developmental outcomes under consideration (Bronfenbrenner, 1994). Propositions 1 and 2 are theoretically interdependent and subject to empirical testing (Bronfenbrenner, 1994).

Researchers must be concerned with the validity of their designs. Another important proposition for Bronfenbrenner is that the properties of the environmental contexts in which an investigation is conducted or from which the experimental subjects come can influence the process that take place within the research setting, and thereby affect the interpretation and generalizability of the findings (Bronfenbrenner, 1979). Therefore, Bronfenbrenner formulated a definition of ecological validity that takes both these principles into account. For Bronfenbrenner (1979), ecological validity is defined as the extent to which the environment experienced by the subjects in a scientific investigation has the properties it is supposed or assumed to have by the investigator.

Table 1.1 Studies using Ecological Systems Theory in maternal-child health research

First Author, Title (year)	Setting	Research Design	Aims	Sample Size	Results	Implications	Study limitations
Ashaba, Understanding coping strategies during pregnancy and the postpartum period: a qualitative study of women living with HIV in rural Uganda (2017)	Uganda	Qualitative: semi-structured interviews	Explore women's perceptions of how they cope with the challenges of pregnancy and the postpartum period as HIV-infected women.	n=20 postpartum women living with HIV (WLWH) accessing ART who had a pregnancy within 2 years prior to recruitment	Summarized five coping strategies within a socio-ecological framework according to Bronfenbrenner's Ecological Model. Coping strategies on individual level included acceptance of self and HIV status, and self-reliance. On interpersonal level, coping through support from partners, family, and friends. On organizational level, coping through HIV-related healthcare delivery and system supports. At community level, coping through support from church and spirituality.	Intervention programs for WLWH must emphasize psychosocial care and incorporate strategies addressing psychosocial challenges in the HIV care package to optimize well-being. Programs that support WLWH for economic empowerment and improved livelihoods should be strengthened across all regions in the country.	Small study sample that may limit generalizability of findings to all HIV positive women during pregnancy and the postpartum period.
Chomat, Maternal Stressors Impact Maternal Wellbeing and Cortisol, and Infant Growth in Rural Guatemala: Insights from Qualitative and Quantitative Approaches (2016)	Guatemala	Mixed-methods: observational grounded in participatory action research and Bronfenbrenner framework	Characterize women's exposure to nutrition, infection and psychosocial stressors vs. resilience factors, evaluate maternal cortisol as a mediator in transmission of stress	n=155 women, seen during pregnancy and two cross-sectional cohorts (60 early, 56 later)	Diet diversity was low and only 38% of women were food secure. Participants reported low maternal autonomy, high paternal support, small social support networks and common domestic violence. Infants of mothers with greater paternal support, autonomy and emotional distress were more likely to be stunted.	Research highlighted importance of integrating psychosocial interventions into research and intervention programs targeting early infant growth, and sheds light on strategies to increase resilience and empower women and communities to break the intergenerational cycle of poor growth.	The homogeneity of study population limited ability to test effects of ethnicity, altitude, and socioeconomic status on infant growth.

Reeves, Infant-feeding practices among African American women: Social-ecological analysis and implications for practice (2015)	United States	Literature review	(a) use social-ecological model to explore personal, socio-economic, psychosocial, and cultural factors affecting infant feeding decision-making processes	22 articles Relevant information from each article was categorized by theme based on Bronfenbrenner's (1994) social-ecological spheres of influence	Social-Ecological Theory's spheres of influence help show how a woman's work environment, neighborhood and community must also be taken into account in analyzing the factors that affect African American women's infant-feeding choices.	African American infant-feeding decisions result of complex interplay between demographic, socioeconomic, psychosocial, and cultural factors. Improving health of historically disadvantaged is critical to fostering a culture of social justice.	
Viken, Maternal health coping strategies of migrant women in Norway (2015)	Norway	Qualitative: semi-structured interviews	Explore the maternal health coping strategies of migrant women in Norway.	n=17 semi-structured interviews with women from South America, Europe, the Middle East, Asia, and Africa.	Results interpreted in the light of Bronfenbrenner's ecological model. One overall theme is as follows: keeping original traditions while at the same time being willing to integrate into Norwegian society, and four themes: balancing their sense of belongingness; seeking information and support from healthcare professionals; being open to new opportunities and focusing on feeling safe in new country.	To provide quality care, healthcare professionals should focus on the development of migrant women's capabilities. Adaptation of maternal health services for culturally diverse migrant women requires a culturally sensitive approach on the part of healthcare professionals.	Interviewers were both public health nurses. This could have affected the participants' answers in that they might have wanted to be positive and not criticize the Norwegian health services.

Bronfenbrenner defined the ecological environment as conceived topologically as a nested arrangement of structures, each contained within the next (Bronfenbrenner, 1997). Moving from the innermost level to the outside, as shown in Figure 1.2, are the microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Bronfenbrenner, 1989). These components of the *Ecological Systems Theory* are defined in Table 1.2.

The operationalized *Ecological Systems Theory* guiding this dissertation is shown in Figure 1.3. When the *Ecological Systems Theory* is modified for maternal-newborn health and MWH use, the maternal-newborn dyad represents the microsystem. Factors affecting knowledge and beliefs of newborn care and illness and MWH use within the microsystem include demographics as well as newborn and maternal health outcomes. The mesosystem includes the family and community surrounding the maternal-newborn dyad. Interpersonal factors within the mesosystem include family members (i.e. husband, mother-in-law) and community members. The exosystem incorporates the health care system in rural Zambia. Health care organization factors affecting knowledge and beliefs of newborn care and illness along with MWH use within the exosystem include: (a) professional and community health worker support, (b) quality and availability of staff, (c) referral capability, and (d) health care facility accessibility and distance. The macrosystem encompasses culture. The social and cultural factors affecting the macrosystem include cultural beliefs, financial resources, and laws (i.e. fines for home births). Finally, the chronosystem is represented by health policy in the adapted *Ecological Systems Theory*. Public health policy factors include national and local government agency support and promotion of maternal-newborn health and MWH use.

Figure 1.2 Illustrated model of Bronfenbrenner's Ecological Systems Theory (Adapted from Berger, 2007 by Stranger, 2011)

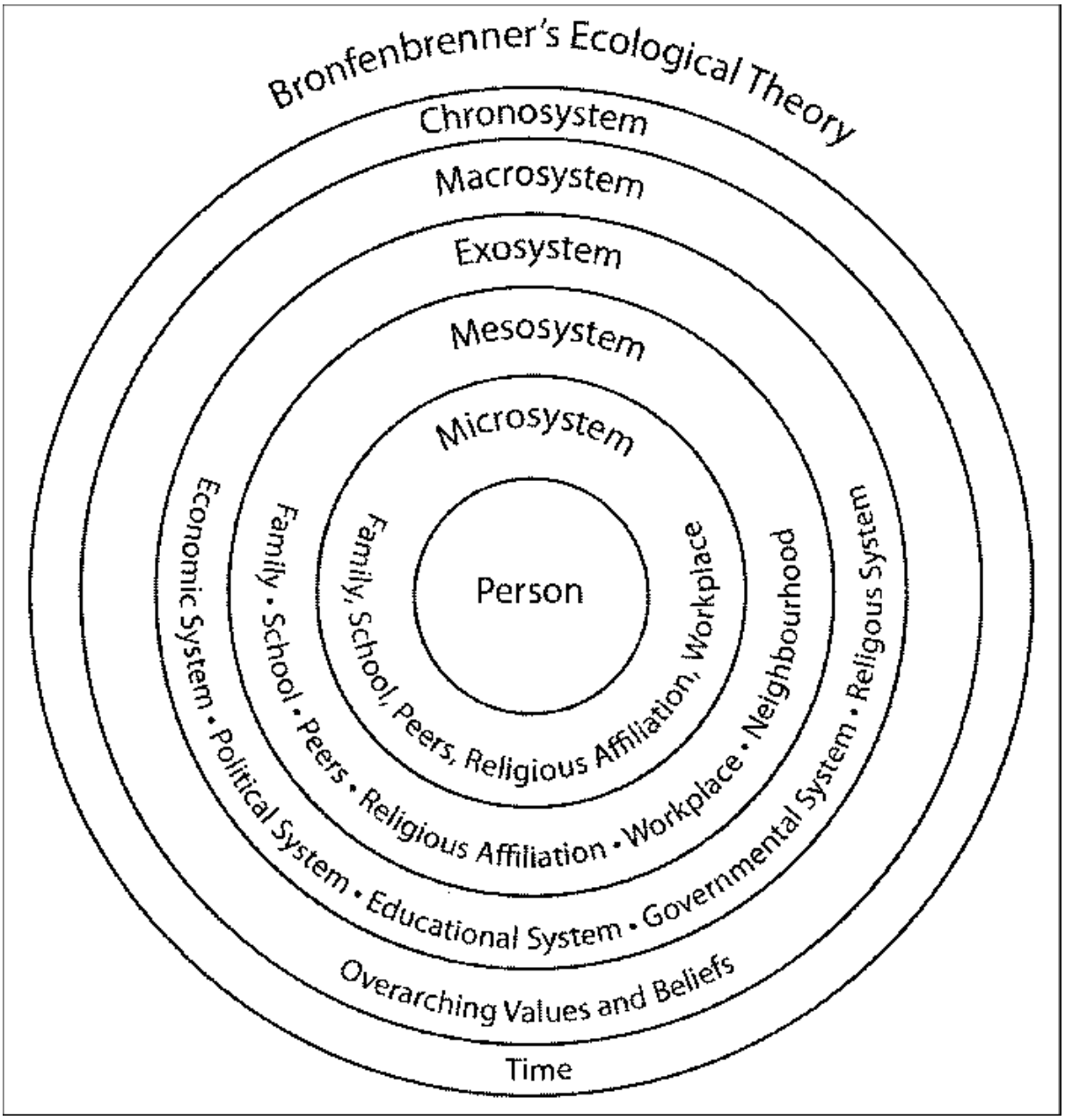
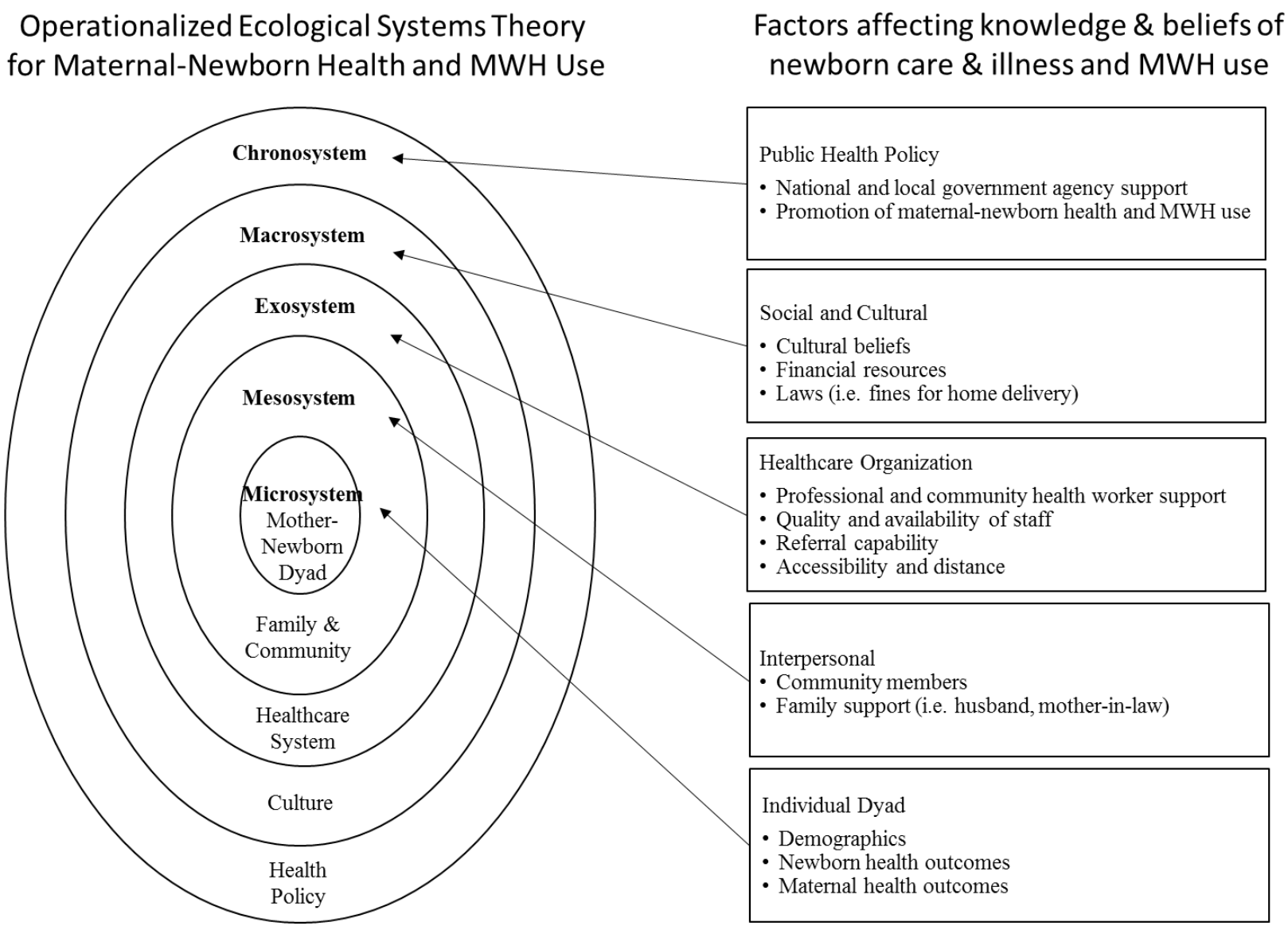


Table 1.2 Ecological Systems Theory Definitions and Operationalization for Dissertation

Ecological Systems Theory Component	**Definition** (Bronfenbrenner, 1977, 1979, 1989)	**Operationalized Ecological Systems Theory for Maternal-Newborn Health and MWH Use**
Microsystem	Pattern of activities, social roles, and interpersonal relations experienced in a given face-to-face setting with particular physical, social, and symbolic features.	**Mother-Newborn Dyad**
Mesosystem	Comprises the linkages and processes taking place between two or more settings.	**Family (husband, grandmothers) & Community Members**
Exosystem	An extension of the mesosystem embracing other specific social structures, both formal and informal, that do not contain the individual but impinge upon or encompass the immediate settings in which that person is found, and thereby influence, delimit, or determine what goes on there.	**Healthcare System**
Macrosystem	Consists of the overarching pattern of micro-, meso-, and exosystems characteristic of a given culture or subculture, with particular reference to the belief systems, bodies of knowledge, material resources, customs, life-styles, opportunity structures, hazards, and life course options that are embedded in each of these broader systems.	**Social & Culture**
Chronosystem	Encompasses change or consistency over time not only in the characteristics of the individual but also of the environment in which that person lives.	**Health Policy**

Figure 1.3 Operationalization of Ecological Systems Theory for dissertation (adapted from Berger, 2007; Stranger, 2011)



A weakness of many ecological models of health behavior is their lack of specificity about the most important hypothesized influences putting a greater burden on health promotion professionals to identify critical factors for each behavior application (Sallis, Owen, & Fisher, 2015). Critics of the ecological perspective have noted that it has a number of inherent problems and has not provided a clear set of procedures for: (1) assessment, (2) intervention techniques, and (3) strategies and rationales for their use (Conte & Halpin, 1983; Pardeck, 1998). A major challenge for those working with ecological models is to develop more sophisticated models that lead to testable hypotheses and useful guidance for interventions (Sallis, Owen, & Fisher, 2015).

To compensate for these weaknesses, Bronfenbrenner's Theory was used in this dissertation to explore interactions among systems in the *Ecological Systems Theory for Maternal-Newborn Health and MWH Use* and factors affecting knowledge and beliefs of newborn care and illness. The three studies reported here addressed social, cultural, and community processes involved in maternal-newborn health and MWH use in rural Zambia. After all, a more fully operationalized ecological approach may be key to developing a more thorough and nuanced understanding of complex health problems and means of addressing them to promote the public's health (Richard, Gauvin, & Raine, 2011).

Summary

The overarching goal of this three-study dissertation was to explore and describe the cultural practices, knowledge, and beliefs of essential newborn care and health-seeking in the context of MWHs and the SMGL initiative in rural Zambia. Three distinct studies -- using focus groups, a quasi-experimental approach, and a case series -- with specific aims contributed to this overall goal. The *Ecological Systems Theory* is flexible and allows for conducting parallel studies using different methods. Research for all studies was guided by Bronfenbrenner's theory

using quantitative methods in sequence with different participants to complement and add depth to the initial qualitative findings. An overview of all three papers for the dissertation is presented in Table 1.3. The research described in this dissertation adds to the literature on newborn care and health-seeking practices in rural Zambia. Findings also contribute to nursing knowledge about rural Zambian culture in relation to maternal-newborn health in the context of MWHs and the SMGL initiative.

Table 1.3 Overview of three papers for dissertation, *Culture, Knowledge, and Beliefs of Newborn Care and Health-Seeking Practices in Rural Zambia*

Title	**Study 1:** Beliefs and Health-Seeking Practices: Rural Zambian's Views on Maternal-Newborn Care	**Study 2:** Maternal Knowledge of Essential Newborn Care in Rural Zambia	**Study 3:** A Case Series of Maternal-Newborn Delivery Outcomes in Rural Zambia: Comparison of Referral to a District Hospital from Facilities with and Without a Maternity Waiting Home
Aim	Aim 1): Describe knowledge and beliefs of newborn care and illness from the perspective of rural Zambian women, community members, and health workers. Aim 2): Examine similarities and differences in knowledge and beliefs of newborn care and illness between rural Zambian women, community members, and health workers. Aim 3): Explore the social and cultural factors that are associated with the ways women seek newborn care to identify traditional and professional newborn care practices in rural Zambia.	Aim 1): Compare maternal knowledge of newborn care in two groups of women in rural Zambia: one group used a MWH prior to delivery and the other group did not use a MWH.	Aim 1): Advance an understanding of maternal-newborn delivery outcomes for women referred from health facilities with and without MWHs to the district referral hospital.
Method	Qualitative	Quantitative	Quantitative
Design	Focus Groups	Quasi-experimental	Case Series
Sample	Zambian women with babies <1 year, community members, and health workers	Pregnant and postnatal women referred from facilities with MWH and non-MWH facilities for delivery or postpartum care	Medical record data from a delivery register at one district referral hospital to examine a sample of all cases from ten lower-level BEmONC facilities with complications who were referred and arrived at the higher-level CEmONC district referral hospital

Setting	MWH and non-MWH facilities in Lundazi & Mansa Districts in rural Zambia	Lundazi District Referral Hospital and Lundazi District Hospital MWH in rural Zambia	Lundazi District Referral Hospital in rural Zambia
Instruments	Semi-structured focus group guide	Maternal Knowledge Questionnaire	Ministry of Health Delivery Register
Analysis	Thematic latent content analysis organized using ATLAS.ti software	Statistical comparison using SPSS to perform descriptive, inferential, and logistic regression comparing knowledge for women referred from facilities with and without MWHs and assess associations between independent variables.	Statistical comparison using SPSS to perform crosstabulation, tests of independence, and logistic regressions.

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CHAPTER 2

Literature Review

Maternal, Child and Newborn Health in Low- and Middle-Income Countries

The role the maternal-newborn dyad plays in the long-term health of each member is undeniable. What impacts the mother's health also impacts the newborn's health and vice versa. Complications from pregnancy and childbirth are the leading causes of death and disability for women of childbearing age in low- and middle-income countries (LMICs) (World Health Organization [WHO], 2017a). Every day, more than 800 women die from preventable causes related to pregnancy and childbirth (WHO, 2016b) and almost all maternal deaths (99 percent) occur in developing countries (WHO, 2016b). The major direct causes of maternal morbidity and mortality include hemorrhage, infection, high blood pressure, unsafe abortion, and obstructed labor (WHO, 2017b). Between 2016 and 2030, as part of the Sustainable Development Goals (SDGs), the target is to reduce the global maternal mortality ratio to less than 70 per 100,000 live births (WHO, 2016b).

Morbidity and mortality among newborns in LMICs remains a challenge. Of the estimated 5.9 million children younger than age 5 who died in 2015, 45 percent were newborns, with a newborn mortality rate of 19 per 1,000 live births (WHO, 2016c). An estimated 2.7 million newborn babies die globally in the first 28 days of life (UNICEF, 2016). Almost 1

million newborn deaths occur on the day of birth, and close to 2 million die in the first week of life (UNICEF, 2015). The major causes of newborn mortality are prematurity, birth-related complications (birth asphyxia), and newborn sepsis (WHO, 2016c).

Great strides were made in reducing child mortality in the past two decades as part of an international effort to attain the Millennium Development Goals (MDGs) proposed by world leaders at the United Nations at the beginning of the new millennium. However, newborn mortality declined less steeply than the global under-5 and infant mortality rates, dropping 47 percent compared to 54 percent for under-5s (UNICEF, 2016). If the present newborn rate of decline continues, it will be more than a century before an African newborn has the same survival probability as one born in Europe or North America in 2013 (Lawn et al., 2014).

The United Nations Member States launched the SDGs to end preventable deaths of newborns and to reduce newborn and maternal mortality by 2030 (United Nations, 2018). An acceleration of the pace of progress is urgently required to achieve the SDG target on child survival, particularly in high mortality countries in sub-Saharan Africa (UNICEF, 2015). To reach SDG targets, newborns and their mothers need access to good health care and important life-saving interventions.

Newborn Health in Sub-Saharan Africa

Sub-Saharan Africa (SSA) includes 46 countries with substantial variation between and within countries (Friberg et al., 2010) and accounts for 11% of the world's population yet half of the world's burden of maternal, newborn, and child deaths with 4.7 million deaths per year (Kinney et al, 2010). The sub-Saharan African region has the highest rates of newborn mortality in the world (Lawn & Kerber, 2006) and it is much higher for the poorest of the poor (Lawn et al, 2009). The rural poor have the greatest geographic and financial challenges in accessing care,

particularly emergency obstetric care (EmOC). More than 13,000 mothers, newborns, and children die every day in SSA -- almost nine deaths every minute (Kinney et al, 2010). Most newborn deaths could be prevented with available, simple, cost-effective solutions (Blencowe & Cousens, 2013).

The underlying social determinants that contribute to the causes of newborn deaths in Africa are poverty, low levels of maternal education, and inequities in access to quality health care (Mason, 2007). High priority needs to be given to identifying approaches in SSA that overcome existing physical, economic, and cultural barriers to care-seeking and provision of timely childbirth and newborn care to reduce morbidity and mortality (Blencowe & Cousens, 2013). Local factors must be considered in health planning and prioritization in SSA, such as epidemiology, coverage and utilization of services at all levels of the health system, and health system performance potential platforms for scaling up interventions as well as funding opportunities and constraints (Friberg et al., 2010). Inequity in child health is high in Africa, but few studies have assessed it with respect to newborn care (Waiswa et al., 2010).

Two-thirds of newborn deaths could be prevented if all mothers and newborns had access to a small number of interventions that are well known, feasible and deliverable without complex technology (Mason, 2007). Many newborn deaths could be prevented with facility-based interventions such as neonatal resuscitation, hygienic practices, and thermal care around the time of birth for all neonates, as well as antenatal steroids and Kangaroo Mother Care for preterm babies (Friberg et al., 2010). Depending on many factors, such as the quality of adjacent facility, training of personnel, availability of supplies and more, MWH use by pregnant women has the potential to improve access to lifesaving facility-based interventions.

Newborn Care Practices in Sub-Saharan Africa

Early detection of newborn illness is an important step toward improving newborn survival (Sandberg et al., 2014). Poor knowledge of newborn danger signs delays care seeking (Sandberg et al., 2014). Several studies assessed maternal knowledge of newborn danger signs in South Asia (Senarath et al, 2007; Shrestha et al., 2015; Syed et al., 2008), and found that mothers demonstrated a satisfactory knowledge in recognizing danger signs of the newborn with maternal education and socioeconomic status having a significant, positive association with newborn-care knowledge. However, there is a paucity of data on newborn health from SSA and few studies have assessed inequity in uptake of newborn care practices (Waiswa et al., 2010). South Asia and SSA have different labor/delivery and care-seeking practices, cord care practices, population densities, mortality rates, and cultural practices (Hamer et al., 2015). A majority of newborn deaths in SSA occur at home, indicating that few families recognize signs of newborn illness, and/or a majority of the newborns are not taken to health facilities when they are sick (Lawn et al., 2010).

The Young Infants Clinical Signs Study Group (2008) developed an algorithm based on the Integrated Management of Newborn and Childhood Illness (IMNCI) Handbook (2006). The handbook includes seven signs or symptoms — history of difficulty feeding, movement only when stimulated, temperature below 35·5°C or greater than or equal to 37·5°C, respiratory rate over 60 breaths per minute, severe chest retractions, and history of convulsions — to predict the need for hospitalization in newborns presenting to health facilities, particularly in the first week of life, to ensure prompt treatment. Researchers in rural Uganda used the algorithm and showed poor understanding of danger signs in the studied area (Sandberg et al., 2014). This indicates a need to enhance educational efforts aimed at all pregnant and delivered women in the community

(Sandberg et al., 2014). Researchers also recommended the promotion of birth preparedness in the community as it has been shown to alert women to newborn danger signs (Sandberg et al., 2014).

Providing mother's breast milk to infants within 1 hour of birth is referred to as "early initiation of breastfeeding" and ensures that the infant receives the colostrum, or "first milk," which is rich in protective factors (WHO, 2017c) such as immune, growth and tissue repair factors (Uruakpa, 2002). Jones and colleagues (2013) identified *Demographic and Health Survey* data from several sub-Saharan African countries to determine cross-country patterns of associations of the WHO breastfeeding indicators including child stunting, wasting, height-for-age *z*-score (HAZ), and weight-for-height *z*-score (WHZ). In the Ethiopia and Zambia analyses, only HAZ and WHZ were assessed (Jones et al., 2013). In all countries, approximately one-quarter or more of children younger than 24 months old were stunted, with nearly half of all children stunted in Ethiopia and Zambia (47% and 45%, respectively) (Jones et al., 2013). Researchers found that 56% of mothers reported early breastfeeding initiation in Zambia, yet the WHO indicators showed mixed associations with child anthropometric indicators across countries (Jones et al., 2013). Exclusive breastfeeding of children younger than 6 months of age was associated with greater WHZ in Zambia ($p<0.05$) (Jones et al., 2013). Breastfeeding protects against diarrhea and common childhood illnesses such as pneumonia, and may have longer-term health benefits for the mother and child, such as reducing the risk of overweight and obesity in childhood and adolescence (WHO, 2017c). Breastfeeding has also been associated with higher intelligence quotient (IQ) in children (WHO, 2017c).

In an assessment of socioeconomic differences in use of newborn care practices to inform policy and programming in Uganda, Waiswa and colleagues (2010) found newborn care

practices in this setting were low and did not differ much by socioeconomic group. All mothers with infants ages 1-4 months (*n*=414) in a Demographic Surveillance Site were interviewed face-to-face (Waiswa et al., 2010). Despite a study design relying upon maternal recall alone, researchers concluded that despite established policy, most neonatal interventions in Uganda were not reaching newborns, suggesting a "policy-to-practice gap" (Waiswa et al., 2010).

In a study aimed at collecting data on thermal care practices in rural Ghana to inform the design of a community newborn intervention, narrative and in-depth interviews (IDIs) about thermal care practices and barriers and facilitators to behavior change were obtained from recently delivered/pregnant women, birth attendants/grandmothers, and husbands through birth narratives, IDIs and focus group discussion (FGD) (Hill et al, 2010). All 635 women who delivered in six districts in Ghana in the first 2 weeks of December 2006 were interviewed about immediate newborn care (Hill et al, 2010). With the exception of wrapping/dressing the baby in the first weeks of life, thermal care practices were not optimally practiced by families in the study area (Hill et al, 2010). Despite short recall periods, respondents may not have observed what happened to the baby after delivery or they had difficulty estimating the time between birth and the behaviors (Hill et al, 2010). Researchers concluded the design of interventions should be based on an understanding of current behaviors and beliefs (Hill et al, 2010).

In rural southern Tanzania, researchers developed a sustainable and scalable home-based counseling intervention for delivery by community volunteers to improve newborn care practices and survival (Penfold et al., 2014). All 132 wards in the six-district study area were randomized to intervention or comparison groups. Starting in 2010 in intervention areas, trained volunteers made home visits during pregnancy and after childbirth to promote recommended newborn care practices including hygiene, breastfeeding, identification and extra care for low birth weight

babies. In 2011, in a representative sample of 5,240 households, researchers asked women who had given birth in the previous year about counseling visits and their childbirth and newborn care practices. Four newborn care practices were more commonly reported in intervention than comparison areas: delaying the baby's first bath by at least 6 hours, exclusive breastfeeding in the 3 days after birth, putting nothing on the cord, and, for home births, tying the cord with a clean thread (Penfold et al., 2014). A limitation of the study is that fewer than half of the women in intervention areas received a postnatal visit and a fifth of the women reporting any counseling were visited within 2 days of childbirth (Penfold et al., 2014). Researchers concluded a home-based counseling strategy to promote recommended newborn care implemented by volunteers and designed for scale within the health system can improve newborn care in rural communities in southern Tanzania (Penfold et al., 2014).

In a peri-urban area in Kampala, Uganda, using focus group discussions, researchers explored the perceptions among 30 post-delivery mothers who were purposively sampled from 249 mothers in the postnatal ward of skin-to-skin contact (Kangaroo Care) and newborn baby care (Byaruhanga et al., 2008). Two main themes emerged from the focus group discussions: "acceptability of health practices are influenced by knowledge and sensitization" and "pregnant women's choices are dependent on social, cultural and economic factors" (Byaruhanga et al., 2008). Mothers expressed varying opinions about the usefulness of skin-to-skin contact: Some knew about its use to reduce the risk of hypothermia, others were unaware, and some believed skin-to-skin contact was an intervention used to distract them from the pain in the post-delivery period (Byaruhanga et al., 2008). The vernix caseosa and the mixture of amniotic fluid with blood in the post-delivery period were perceived as dirty and infectious (Byaruhanga et al., 2008). A potential limitation is that two of the focus group leaders were male, and two were

health care providers in the hospital. These characteristics could have affected the mothers' responses, especially when discussing negative practices they perceived in the hospital such as a lack of privacy (Byaruhanga et al., 2008). Researchers concluded the gap between the knowledge and practice of skin-to-skin contact in hospital needs to be bridged (Byaruhanga et al., 2008). Health care providers need to be encouraged to continuously advocate for, educate, and implement regular skin-to-skin contact (Byaruhanga et al., 2008).

Health care practitioners must be aware of the beliefs held and behaviors practiced by pregnant women in the community and what can be done to address these in a way that enhances both cooperation and the well-being of the mother and baby (M'soka, Mabuza, & Pretorius, 2015). Recognizing the importance of being aware of cultural beliefs in Zambia, M'soka and colleagues (2015) conducted a descriptive, cross-sectional survey of women attending antenatal care (n=294) in Lusaka who were selected by systematic sampling. A researcher-administered questionnaire was used for data collection to determine dietary beliefs, behaviors, and use of medicinal herbs during pregnancy. Regarding health beliefs and diet intake in pregnancy, 33% believed that eating eggs can cause a baby to be born without hair, 33% believed that ingesting okra during pregnancy caused excessive salivation of the child, and nearly 75% of respondents agreed with the belief that salt should be avoided during pregnancy (M'soka, Mabuza, & Pretorius, 2015). Regarding behaviors, 25% of the women believed that using condoms was harmful and could lead to a weak child (M'soka, Mabuza, & Pretorius, 2015). Regarding use of medicinal herbs during pregnancy and childbirth, 66% agreed that herbs could assist in a difficult delivery and 75% believed herbs should be used for cleansing after a miscarriage (M'soka, Mabuza, & Pretorius, 2015). Limitations of the study include that the questionnaire did not establish any explanation for the beliefs held by the pregnant women and the questionnaires were

only available in two dominant local languages in the region, excluding participants who spoke neither, which potentially deprived the study of other important views (M'soka, Mabuza, & Pretorius, 2015). Researchers concluded that women attending antenatal care hold a number of beliefs regarding pregnancy and childbirth. Those beliefs that are of benefit to the patients should be encouraged with scientific explanations, whilst those posing a health risk should be discouraged respectfully (M'soka, Mabuza, & Pretorius, 2015).

Newborn Care Practices in Zambia

Cultural childbirth practices and beliefs in Zambia lack documentation in the scientific literature (Maimbolwa et al., 2003). Therefore, researchers in Zambia conducted a study to explore cultural childbirth practices and beliefs in Zambia as related by 36 women accompanying laboring women to maternity units using a thematic semi-structured interview guide (Maimbolwa et al., 2003). Half of the women who accompanied birthing women to maternity units in Zambia considered themselves a *mbusa* (traditional birth attendant) and assisted women during childbirth (Maimbolwa et al., 2003). Apart from certain food taboos, the women encouraged mothers to eat locally defined nourishing foods, such as cooked vegetables with pounded groundnuts and *nshima*, which is the staple food of plain maize flour (Maimbolwa et al., 2003). *Munkoyo* (a drink brewed from maize flour) was also believed to be good for pregnant women (Maimbolwa et al., 2003). Eight of the *mbusas* said they administered local traditional medicines to pregnant women to prepare and widen the birth canal (Maimbolwa et al., 2003). A possible limitation of the study was that the sample was comprised only of women who accompanied laboring women to maternity units and excluded women who did not accompany mothers to the selected health facilities who might have other beliefs and experiences of cultural childbirth practices in Zambia (Maimbolwa et al., 2003).

Ten of the *mbusas* discussed the general belief that any sexual relationship outside marriage was harmful, and that it could damage the unborn child and cause problems during labor, such as prolonged or obstructed labor and/or the death of the mother and baby (Maimbolwa et al., 2003). Pregnant women were advised to avoid having sex from the eighth month of pregnancy onward to avoid the baby being born with "white stuff'" (vernix caseosa), which was considered "dirt" (Maimbolwa et al., 2003). The majority (*n*=28) of the women reported that the birth of the baby should take place in seclusion, preferably in a hut (Maimbolwa et al., 2003). Several of the *mbusas* talked about methods to accelerate labor such as fundal pressure by tying a *chitenge* (a fabric Zambian women use to tie around the waist) over the uterus and giving traditional medicine to precipitate the delivery (Maimbolwa et al., 2003).

The umbilical cord was cut using various devices such as a razor blade or sugar cane peel then tied with a string (Maimbolwa et al., 2003). The women mentioned different mixtures used to dress the umbilical cord, such as ash, seashell mixed with oil, scrapings from a pounding stick (used to pound food), or breast milk (Maimbolwa et al., 2003). Several said that a new mother should not be allowed to cook until the baby's umbilical cord dropped off, or else the woman would get a mysterious disease (Maimbolwa et al., 2003). They also reported that a newly delivered mother and baby should be bathed soon after birth and thereafter twice a day (Maimbolwa et al., 2003). There was a general belief that a pregnant woman should not make it known in the neighborhood that labor had begun for fear of attracting evil spirits and witches believed to have magical powers, which could cause complications during labor and delivery (Maimbolwa et al., 2003).

Conducting research in areas with diverse cultures requires attention to community sensitization and involvement (Hamer et al., 2015). For a large community-based, cluster-

randomized, controlled trial comparing daily 4% chlorhexidine umbilical cord wash to dry cord care for neonatal mortality prevention in Southern Province, Zambia, researchers described the process of community engagement (Hamer et al., 2015). Study preparations required baseline formative ethnographic research, substantial community sensitization, and engagement with three levels of stakeholders, each necessitating different strategies. Researchers acknowledge that conducting a large cluster-randomized, controlled trial at the community level in an African country with poor road infrastructure, human resource shortages, and widely dispersed rural populations presents significant logistical barriers that must be addressed in study design and implementation (Hamer et al., 2015). Cluster-specific birth notification systems developed with traditional leadership and community members using community-selected data collectors resulted in a postnatal home visit within 48 hours of birth in 96% of births. Of 39,679 pregnant women enrolled (93% of the target of 42,570), only 3.7% were lost to follow-up or withdrew antenatally and 0.2% live-born neonates were lost by day 28 of follow-up (Hamer et al., 2015). Working closely with traditional authorities to limit the social disruption and suspicion that might result when people from outside the community conduct research is critically important to the success of community-based research (Hamer et al., 2015). Focus groups and individual interviews were conducted in Zambia with a variety of stakeholders to inform the trial design (Hamer et al., 2015). Using community input on birth notification systems, they were able to successfully enroll and follow large numbers of pregnant women and newborns in the community, despite major structural and cultural barriers (Hamer et al., 2015).

In Choma District, rural Zambia, researchers conducted 36 in-depth interviews, five focus groups and eight observational sessions with recently delivered women, traditional birth attendants, and clinic and hospital staff from three sites, focusing on skin, thermal, and cord care

practices for newborns in the home (Sacks et al., 2015). In this region of southern Zambia, thermal care practices for newborns were revealed to be largely beneficial, with some significant exceptions (Sacks et al., 2015). One is the common ritual first bath in cold water after the umbilical cord separates and the other the practice of bathing the newborn in cold water at night, both of which increase the risk of hypothermia and could be harmful. (Sacks et al., 2015). Newborns were generally kept warm with hats and layers of clothing, and extra thermal protection was provided for preterm and small newborns (Sacks et al., 2015). The vernix was considered important for the preterm newborn but dangerous for HIV-exposed infants (Sacks et al., 2015). Applying harmful substances to the skin and umbilical cord, a commonly reported practice, may amplify exposure to invasive pathogens (Sacks et al., 2015). Mothers applied various substances to the skin and umbilical cord, most commonly powders made of burnt roots or ash, with special practices for preterm infants (Sacks et al., 2015). There were several researcher-acknowledged limitations inherent in the study design including that much of the data were descriptive and relied on reported information and limited generalizability (Sacks et al., 2015). Researchers concluded locally appropriate behavior change interventions should aim to promote chlorhexidine in place of commonly reported application of harmful substances to the skin and umbilical cord, reduce bathing of newborns at night, and address the immediate bathing of HIV-infected newborns (Sacks et al., 2015).

Development of further focus group discussions are needed to obtain personal and group feelings, perceptions and opinions about the newborn health-seeking practices of rural Zambians. Additional quantitative surveys and secondary data analyses are also needed to better understand newborn care-seeking behavior in rural Zambia. Use of the *Ecological Systems Theory* in the

exploration of newborn care practices in rural Zambia will promote the preservation of maternal-child health and well-being of the cultural groups being served.

Maternity Waiting Homes

Nurses have a responsibility to advocate for culturally congruent care and the reduction of newborn mortality in low-resource settings. One potential mechanism is the use of maternity waiting homes (MWHs). Maternity waiting homes are residential facilities, located near a qualified medical facility, where women defined as high risk can await their delivery and be transferred to a nearby medical facility shortly before delivery, or earlier should complications arise (WHO, 1996). Maternity waiting homes are an important component of a strategy to "bridge the geographical gap" in obstetric care between rural areas, with poor access to equipped facilities, and urban areas where services are more available (WHO, 1996). When staying in a MWH, women often have access to antenatal care (van Lonkhuijzen, Stekelenburg, & van Roosmalen, 2012). As one component of a comprehensive package of essential services, MWHs may offer a low-cost way to bring women closer to needed obstetric care (WHO, 1996). Often, the time women spend in the MWH is also used to give health education about pregnancy, giving birth, and neonatal care (van Lonkhuijzen, Stekelenburg, & van Roosmalen, 2012).

The idea of homes for pregnant women with obstetric and social problems is not new (WHO, 1996). For many centuries, voluntary organizations in Europe have provided shelters for single mothers in an effort to reduce abortion and infanticide (WHO, 1996). Since the beginning of the 20th century, waiting homes have existed in Northern Europe, Canada, and the United States to serve women in geographically remote areas with few obstetric facilities (WHO, 1996).

There is considerable variation in the organizational structures of maternity homes (WHO, 1996), although one consistent characteristic is that deliveries do not occur in the waiting

homes. Maternity waiting homes are a link in a larger chain of comprehensive maternity care, all the components of which must be available and of sufficient quality to be effective and must be linked with the home (WHO, 1996). Success in safeguarding pregnant women's health depends largely on what happens outside the maternity waiting home. A MWH is not a stand-alone intervention, but rather serves to link communities with the health system in a continuum of care (WHO, 1996). The level of success in reducing maternal and infant mortality depends on the following factors: 1) definition of risk factors and selection of women, 2) viable community-level health service necessary for referral to occur and women's compliance with the referral, 3) skilled obstetric services (including capacity to handle obstetric emergencies), and 4) community and cultural support (WHO, 1996).

The way women are cared for in MWHs differs from country to country (van Lonkhuijzen, Stekelenburg, & van Roosmalen, 2012). Some facilities are completely self-catering and women provide their own food, water, and firewood. In other facilities, the economic status of the women determines whether she is provided with food or not (van Lonkhuijzen, Stekelenburg, & van Roosmalen, 2012). The costs of a MWH are also covered in different ways. Communities have been involved in building huts while ministries of health or nongovernmental organizations contribute to building costs (van Lonkhuijzen, Stekelenburg, & van Roosmalen, 2012).

Recognizing that study findings from other countries on MWHs differ from one geographical, sociocultural, and economic context to another, Sialubanje and colleagues (2015) explored women’s experiences and beliefs concerning the use of MWHs in rural Zambia. Researchers conducted 32 in-depth interviews with women of reproductive age (15–45 years) from nine health center catchment areas (Sialubanje et al., 2015). A total of 22 in-depth

interviews were conducted at a health care facility with a MWH and 10 were conducted at a health care facility without MWHs (Sialubanje et al., 2015). Their findings showed that most women appreciate the important role MWHs play in improving access to skilled birth attendance and improving maternal health outcomes (Sialubanje et al., 2015). However, several individual, family, and health system-related factors prevent utilization of these services (Sialubanje et al., 2015). Women's perceptions of the availability and quality of the basic social and health care services provided in the MWHs influenced their decision whether to use the service (Sialubanje et al., 2015). These findings suggest that MWHs could be a useful intervention in improving access to, and utilization of, facility-based skilled birth attendance services (Sialubanje et al., 2015). Limitations include that findings are only based on the experiences of the few women who agreed to participate in the in-depth interviews and researchers did not have information on the differences between the women who agreed to participate in the interviews and those who did not (Sialubanje et al., 2015).

Access to MWHs and health care is not only affected by geography and distance or access to affordable and efficient transport links (van Lonkhuijzen, Stekelenburg, & van Roosmalen, 2012). Women may have many factors to take into account when deciding where they spend the last weeks of their pregnancy and, indeed, where they give birth (van Lonkhuijzen, Stekelenburg, & van Roosmalen, 2012). In-depth interviews by Sialubanje and colleagues (2016) explored husbands' experiences and perceptions regarding the use of MWHs in Zambia with the husbands/partners of women attending the under-5 clinic at a health center with a MWH (Sialubanje et al., 2016). Men ages 18–50 years whose partner/wife was of reproductive age and who had lived in the area for more than 6 months were eligible for inclusion (Sialubanje et al., 2016). Overall, findings showed that husbands had a positive attitude

toward MWHs and perceived benefits from using this service, including mitigating long-distance travel and improving access to facility-based delivery services (Sialubanje et al., 2016).

A study exploring the factors influencing women's use of MWHs was performed by Kyokan and colleagues (2016) in Sierra Leone. Researchers used in-depth interviews, key informant interviews, focus group discussions, document review, and observations. Of the participants, eight interviews were conducted with women who had delivered in the past year and used MWHs; eight key informant interviews were with a project manager, MWH hosts, and community members; and 13 were with women who delivered in the past year without using MWHs (four interviews and two FGDs) (Kyokan et al., 2016). A limitation of the study noted it was difficult to recruit women who had not used the MWHs, therefore researchers had to rely on women who lived closer to the MWHs (Kyokan et al., 2016). Researchers found that past experiences of childbirth, promotion of the MWHs by traditional birth attendants, family commitments, and distance and costs of transport to the homes influenced their use (Kyokan et al., 2016). Family views of the importance of the MWH, childcare, costs of food during the women's stay, and education about reasons to use the MWH also influenced their use (Kyokan et al., 2016). Key recommendations for MWHs included good links with the health system and strengthening of community participation in monitoring and managing the MWHs for their long-term success and sustainability (Kyokan et al., 2016).

Before formulating the MWH model used in the rural communities included in this study, researchers performed a qualitative study to explore Zambian stakeholders' beliefs regarding the acceptability, feasibility, and sustainability of MWHs. Lori and colleagues (2016) conducted individual interviews with community leaders (*n*=46). Focus groups were held with Safe Motherhood Action Groups, husbands, and women of childbearing age in two rural districts in

Zambia (*n*=500) (Lori et al., 2016). Researchers discovered that Zambian stakeholders were overwhelmingly in support of MWHs as a way to improve access to facility-based childbirth and address the barrier of distance (Lori et al., 2016). Participants agreed that a committee to oversee the MWHs was important, and recommended that the committee oversee all aspects of the MWH, including building and maintenance of the MWHs (Lori et al., 2016). Although food security was a pervasive problem in rural Zambia, the community stated a willingness to contribute toward providing food at a MWH (Lori et al., 2016). The majority of participants agreed that female relatives, traditional birth attendants, and female community health workers should be allowed to stay at the MWHs with the pregnant women (Lori et al., 2016).

Gaps in the Literature on Newborn Outcomes and Maternity Waiting Homes

Historically, the focus of research at MWHs has been on maternal outcomes (Figa'-Talamanca, 1996; Kelly et al., 2006; Lori, Wadsworth, Munro & Rominski, 2013). Perinatal and newborn health are mentioned in a limited number of articles (Chandramohan, Cutts & Millard, 1995; Lori, Munro et al, 2013; Tumwine & Dungare, 1996; van Lonkhuijzen, Stegeman, Nyirongo, & van Roosmalen, 2003); however, the research remains unclear with a fragmentary understanding of newborn outcomes at MWHs (Buser & Lori, 2016).

A wide gap in knowledge examining the outcomes of newborns at MWHs was identified through a scoping review of the scientific literature (Buser & Lori, 2016). Figure 2.1 provides a flow diagram summarizing the search process. The scoping review illustrates the need for more research to understand the effectiveness of MWHs on newborn morbidity and mortality (Buser & Lori, 2016). Research to date has focused on describing the impact of MWHs on newborn health in LMICs in nonspecific ways (Buser & Lori, 2016).

There is little evidence to support the effectiveness of MWHs on improving newborn outcomes in low-resource settings over the standard of care (Buser & Lori, 2016). Data from the scoping review of scientific literature on newborn outcomes and MWHs were analyzed to identify gaps in research and appropriate next steps (Buser & Lori, 2016). Table 2.1 identifies the study design and aims, sample size, results, and implication for future research as well as study limitations of articles included in the scoping review. More research is needed to investigate the impact of MWHs on newborn outcomes and develop a better understanding of factors affecting newborn outcomes at MWHs.

The same search strategy outlined in the PRISMA flow diagram (Figure 2.1) was repeated for the time frame from 2016 to 2018 and found no additional studies meeting inclusion criteria for the original scoping review examining at the impact of MWHs on newborn health in low- and middle-income countries. To provide a broad overview of recent literature on MWHs loosely connected to newborn outcomes, a literature review used the following search strategy Ovid MEDLINE (R) and Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations for publications between 2016-2018: (exp Infant, Newborn/ OR infant* OR newborn* OR neonat* OR small for gestational age OR "low birth weight" OR premature) AND (("maternity waiting home" OR "maternity waiting homes" OR "maternity waiting house" OR "maternity waiting houses" OR "maternal home" OR "maternal homes" OR "maternal house" OR "maternal houses") OR ((maternity OR maternal OR birth OR childbirth) adj3 (waiting OR shelter OR shelters OR hut OR huts))). Table 2.2 identifies the study design and aims, sample size, results, and implication for future research as well as study limitations of articles included in the review of recent literature.

Figure 2.1 PRISMA Newborn Outcomes and Maternity Waiting Homes Flow Diagram

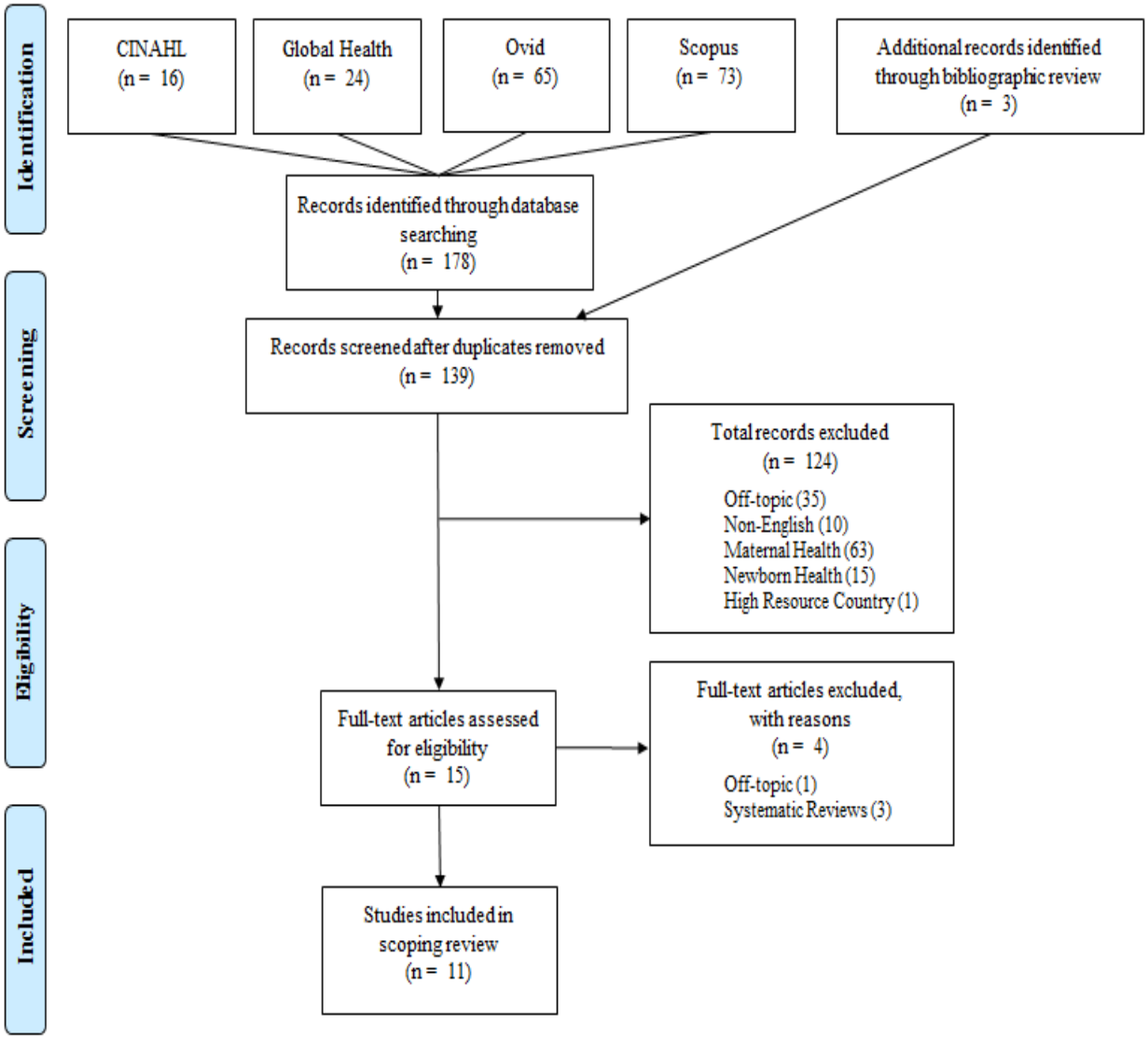

Table 2.1 Summary of characteristics of articles reviewed for maternity waiting homes (MWHs) and newborn outcomes in low resource settings (Buser & Lori, 2016)

First Author, Title (year)	Setting	Research Design	Aims	Sample Size	Results	Implications	Study limitations
Andemichael, Maternity waiting homes: A panacea for maternal/ neonatal conundrums in Eritrea (2009)	Eritrea Africa	Quantitative: Delivery records reviewed, self-administered questionnaires to health workers, TBAs, mothers	Assess pregnancy outcomes verified through maternal mortality and perinatal mortality rates at MWHs in hard to reach areas	Heads of 11 health facilities, community leaders, TBAs and mothers at MWHs interviewed (exact number not given), 862 deliveries reviewed	Deliveries in 11 MWHs increased by 56% with no maternal deaths between Sept 2007-Apr 2009 7 neonatal deaths and 7 still births, making perinatal death rate 1.6%	Study recommends up scaling strategy due to cost effectiveness and community support.	Limited discussion and recommendations regarding peri-natal deaths except to state that deaths were common among young, unmarried mothers who came after long hours of labor and failed to deliver the child at home.
Chandramohan The effect of stay in a maternal waiting home on perinatal mortality in rural Zimbabwe (1995)	Zimbabwe Africa	Quantitative: Hospital-based cohort study conducted at district hospital. Data on antenatal risk, use of antenatal care, access to hospital and stage of labor collected for every delivery at hospital from 1989-1991	Evaluate effect of MWH on perinatal mortality.	n=4488 mothers and neonates, 1573 mothers in MWH and 2915 non-MWH	Women who stayed in the MWH had a lower risk of perinatal death compared to women who came directly from home to the hospital during labor. Women from the obstetric risk group who stayed at the MWH reduced their risk of perinatal death by nearly 50% compared to those who did not on multivariate analysis.	The use of MWHs has the potential to reduce perinatal mortality in rural areas with low geographic access to hospitals and merits further investigation.	Data for study entered in a log book by six midwives and are subject to limitations of routine health information systems. Study groups not selected randomly and had several differences in risk characteristics.
Eckermann, Maternity waiting homes in Southern	Lao Asia	Quantitative: demographic, reproductive	Establish whether the MWH concept	Exact number of interviews not given,	Major barriers to minority ethnic groups using existing maternal health services (reflected in very low usage	Unless MWH are adapted to overcome potential barriers, they will not succeed.	Large discrepancies between official statics on

Lao PDR: The unique 'silk home' (2008)		health and transport data Qualitative: 26 questions in semi-structured interviews and focus group discussions with villagers, chiefs, TBAs, health care providers, and community health workers	would be affordable, accessible, and acceptable as a strategy to improve maternal outcomes in remote areas	the sample consisted of 18 of the 54 villages (33%) in Thateng District, total population surveyed n=7876, total babies born =326	of trained birth attendants, hospitals, and clinics) in Thateng exist. The silk home project which combines maternal and infant health services with opportunities for micro credit and income generating activities and allowing non –harmful traditional practices to co-exist alongside modern medical protocols is unique and innovative.		maternal and infant health outcomes and research data. Sample size of MWH usage too low to report statistical analysis.
Garcia Prado, Maternity waiting homes and institutional birth in Nicaragua: policy options and strategic implications (2012)	Nicaragua Central America	Quantitative: econometric analysis of data extracted from surveys conducted in 2006 on a sample of women and traditional birth attendants Qualitative: interviews with key informants	Analyze and examine factors associated with the use of MWH and institutional birth	660 women, 66 TBAs, 18 MWHs	Operation of MWH is usually satisfactory, room for improvement: (i) disseminating information about the homes to both women and men; (ii) strengthening the postpartum care; (iii) ensuring financial sustainability (iv) strengthening the local management and involvement of the regional government.	Useful for health policy makers in Nicaragua and in other developing countries considering MWH strategy.	No solid qualitative or empirical measures of impact on neonatal outcomes.
Gaym, Maternity waiting homes in Ethiopia-three decades experience (2012)	Ethiopia Africa	Quantitative: facility assessment tool, facility checklist, logbook Qualitative: focus group	Describe the current status of maternity waiting home services in Ethiopia.	Total number not provided, 9 MWHs, maximum monthly MWH admission averaged at 25	Indirect evidence that MWHs improved maternal health outcomes while caesarean sections were much higher among clients' admitted to MWHs compared to non-users. Provided MWH service is standardized and institutionalized, it can be	Need to standardize indications for admission to MWHs and formalize the semi-institutionalized care provided.	Limited observational evidence presented regarding reduction in neonatal mortality.

		discussions, interviews			one approach to improving access to comprehensive emergency obstetric care for rural mothers in Ethiopia who are challenged by distance to access services.		Lack of standardization in type and frequency of data collected and analyzed.
Lori, Maternity waiting homes and traditional midwives in rural Liberia (2013)	Liberia Africa	Quantitative: freq of MWH use, # referrals, presence of skilled birth attendants (SBA) at delivery, proportion of team births, perinatal and maternal outcomes collected from logbooks completed by certified midwives Qualitative: in-depth focus group discussions with traditional midwives (TMs)	Determine whether MWHs increase the use of SBAs as a team and to describe the perceptions of TMs as they engage with SBAs; and to determine whether MWHs decrease maternal and child morbidity and mortality.	n =500 pregnant women, n=46 TMs, 5 MWHs (intervention group), 5 non-MWH communities (control group)	Communities with MWHs experienced a significant increase in team births from baseline to post-intervention with greater TMs on their integration into health teams. Lower rates of maternal and perinatal death were reported from communities with MWH.	Reduction in morbidity and mortality indicates the establishment of MWHs is an effective strategy to increase the use of SBAs, improve the collaboration between SBAs and TMs, and improve maternal and neonatal health.	MWHs opened at different points in time, non-MWH communities started with a larger proportion of team births at baseline, lack of randomization in assigning communities to receive an MWH. Limited discussion and recommendations regarding peri-natal deaths except to state results did not reach statistical significance between the 2 groups.
Millard, Antenatal village stay and pregnancy outcome in rural Zimbabwe (1991)	Zimbabwe Africa	Quantitative: data recorded on woman's age, parity, antenatal risk factors, antenatal clinic attendance, and	Compare pregnancy outcome for women using antenatal village and those admitted	n =486 women using a MWH, 336 non-MWH mothers	Women who stayed in MWH experienced better pregnancy outcome than non-MWH. Birth weight was greater, perinatal mortality lower, and obstetrical intervention less	Establishment of MWHs should be evaluated in a broader context, addressing issues such as cost and psychological and family issues arise from separating	Lack of randomization, differences between the two groups in antenatal risk factors, and lack of information

		outcome measures.	directly from community.		often required in the MWH group.	women from their families.	relating to socio-economic status.
Poovan, A maternity waiting home reduces obstetric catastrophes (1990)	Ethiopia Africa	No discussion of design or methods. Assumed retrospective analysis of MWH and hospital records in rural area.	Aims not clearly defined. Presentation of MWH, primary health care, and lives saved.	n =151 pregnant women admitted to MWH in 1987, 635 non-MWH admissions	In a rural district of Ethiopia, a MWH for pregnant women at high risk led to a significant decline in maternal and perinatal mortality. The stillbirth rate among non-MWH admissions was ten times higher than among MWH.	A MWH close to a rural hospital is vital where women have to travel long distances, transport is poor, and obstetric disasters are frequent.	Limited information about live births and neonatal outcomes. Poor description of study design, methodology and aims.
Ruiz, Barriers to the use of maternity waiting homes in indigenous regions of Guatemala: a study of users' and community members' perceptions (2013)	Guatemala Central America	Qualitative: interviews with MWH users, family members, community leaders, MWH staff, TBAs, hospital and health facility staff	Identify barriers before, during and after women's stay in MWH.	n =48 people interviewed	MWH users' lack of knowledge about the existence of the homes, limited provision of culturally appropriate care and a lack of sustainable funding were most important problems identified.	While the strategy of MWHs had the potential to contribute to the prevention of maternal (as well as newborn) deaths in rural Guatemala, they can only function effectively if they are planned and implemented with community involvement and support, through a participatory approach	No solid qualitative description of impact on neonatal outcomes
Tumwine, Maternity waiting shelters and pregnancy outcome: experience from a rural area in Zimbabwe (1996)	Zimbabwe Africa	Quantitative: All deliveries of MWH and non-MWH deliveries during 2-year period were studied. Statistical analysis with chi-squared test.	Evaluate pregnancy outcome of women using a MWH in a remote rural district.	n =280 women using a MWH, 773 non-MWH mothers	MWHs can contribute to preventing low birthweight, and to a lesser extent, improve perinatal outcome.	Need to strengthen health care referral systems and to increase efforts to improve other determinants of perinatal and maternal morbidity and mortality.	Non-statistically significant perinatal mortality rate comparison between groups presented and insufficiently explained.
van Lonkhuijzen,	Zambia Africa	Quantitative: questionnaire	Assess the results from	n =218 women	Although the differences in risk status were statistically	When dependent on a proper functioning	Difficult to draw conclusions on

Use of maternity waiting home in rural Zambia (2003)		filled out by midwives about SES and maternal risk factors from history and the current pregnancy. Chi-square and unpaired t-test used.	the use of a MWH in rural Zambia.	using a MWH, 292 non-MWH mothers	significant, no differences were found in birth weight and maternal and perinatal mortality.	referral system, MWHs can reduce perinatal mortality.	effectiveness of MWH by comparing two groups delivering in hospital. Unknown bias may account differences between groups.

Table 2.2 Summary of characteristics of articles reviewed for maternity waiting homes (MWHs) and newborn outcomes in low resource settings published between 2016-2018

First Author, Title (year)	Setting	Research Design	Aims	Sample Size	Results	Implications	Study limitations
Fogliati, A new use for an old tool: maternity waiting homes to improve equity in rural childbirth care. Results from a cross-sectional hospital and community survey in Tanzania (2017)	Tanzania	Quantitative: Secondary analysis of a cross-sectional hospital survey	Determine whether Maternity Waiting Homes (MWHs) may be a tool to improve access of lower socio-economic women to emergency obstetric care facilities.	n=1072, 31.3% had accessed the MWH.	In multivariable analysis, age, education, marital status and obstetric factors were not significantly associated with MWH stay. Adjusted odds ratios for MWH stay increased progressively with distance from the hospital. In adjusted analysis, poorer women were more likely to access the MWH before hospital delivery compared with the wealthiest quintile.	Promoting MWHs near hospitals is a mitigation strategy that can reduce inequity, by improving poorer women's access to facilities able to provide advanced management of childbirth complications.	Two populations were not time-matched, with hospital data collected 24–31 months after the community survey. Facility study therefore population examined was not representative of the general population.
Henry, The influence of quality maternity waiting homes on utilization of facilities for delivery in rural Zambia (2017)	Zambia, Southern Province	Quantitative: Facility survey and photographs of structures	Assess the relationship between MWH quality and the likelihood of facility delivery in Kalomo and Choma Districts	Data sources from two separate studies included survey data from 17,200 pregnant women, and both health facility and MWH assessments.	Women whose catchment area health facilities had an MWH or a designed waiting space had higher rates of facility delivery. The higher the quality of the MWH, the more likely a woman was to deliver at a facility, regardless of the facility's capacity to address obstetric emergencies.	MWH are a potential solution to the distance problem and should be considered as one possible intervention to improve access to facility delivery in Zambia.	Unclear if MWH scored higher due to increased facility deliveries, or if volume changed due to launch of or improved quality MWH. Deterrents to utilization not captured include increased delivery costs, lack of privacy, and lack of respect from health staff.

Penn-Kekana, Understanding the implementation of maternity waiting homes in low- and middle-income countries: a qualitative thematic synthesis (2017)	Worldwide	Qualitative: Thematic analysis countries.	Share with policy makers and implementers who are thinking about implementing MWHs key learnings from other implementation experiences, so that they can apply lessons to their own contexts.	29 studies across 17 countries.	Poor utilization was due to lack of knowledge and acceptance of the MWH among women and communities, long distances to reach the MWH, and culturally inappropriate care. Facilitators included reduced or removal of costs associated with using a MWH, community involvement in the design and upkeep of the MWHs, activities to raise awareness and acceptance among family and community members, and integrating culturally-appropriate practices into the provision of maternal and newborn care at the MWHs and the health facilities to which they are linked.	MWHs should not be designed using a health systems perspective, taking account of women and community perspectives, the quality of the MWH structure and the care provided at the health facility. Improved and harmonized documentation of implementation experiences would provide a better understanding of the factors that impact on successful implementation.	Wide variations in the organization, functioning and operationalization of MWHs, and how women were screened for MWH residence means studies are difficult to compare. A number of factors that may play a key role on implementation of these programs were not reported Most papers didn't specifically document the contextual factors or assess barriers and facilitators.
Scott, Listening to the community: Using formative research to strengthen maternity waiting homes in Zambia (2018)	Zambia, Southern Province	Concurrent triangulation study design and mixed methods, primarily qualitative	Design a MWH intervention that could 1) overcome barriers to facility delivery; 2) acceptable to community; 3) be both financially and operationally sustainable.	n=167 women, men with a child under the age of two (n = 53), and community elders (n = 55), 17 FGDs (n = 135), 38 semi-structured interviews	Distance, roads, transport, and the quality of MWHs and health facilities were major problems facing pregnant women along with inadequate advanced planning for delivery and the lack of access to delivery supplies and baby clothes as other problems. The annual fixed recurrent cost per 10-bed MWH was estimated as $543, food and charcoal added $3,000.	Development of an intervention model for renovating existing MWH or constructing new MWH. Basic strategies of the new MWH model include improving community acceptability, and building upon existing efforts to foster financial and operational sustainability.	Results cannot speak to changes over time nor are they generalizable to all of rural Zambia.

Vian, Willingness to Pay for a Maternity Waiting Home Stay in Zambia (2017)	Zambia, Southern Province	Mixed-methods: survey and FGDs	Examine willingness to pay for a night of stay in a MWH	n=167 women, men, and community elders surveyed. 16 FGDs	In rural Zambia, most women, men, and elders surveyed were willing to contribute at least a small sum to stay in a shelter, suggesting they would gain utility and satisfaction from this service.	Contributions, either individual donations or annual community contribution, have potential to support long-term financial sustainability of shelters.	Women's preferences for birth-related care, including maternity home stay, may change over the course of the pregnancy, and the optimum time to measure willingness to pay in this population isn't known

The scoping review on newborn outcomes and MWHs highlighted a definite need for further research to affirm the potential benefits of MWH use to improve newborn outcomes (Buser & Lori, 2016). Improvements in the newborn morbidity and mortality rates necessitate the evaluation of the broader cultural context for use of MWHs (Buser & Lori, 2016). As we continue our efforts to accelerate the worldwide average annual reduction rate in newborn mortality, an increased focus on the study of MWHs for improving newborn outcomes in low-resource settings merits immediate attention (Buser & Lori, 2016).

Saving Mothers, Giving Life (SMGL) and Safe Motherhood Action Groups (SMAGs) in Zambia

Lundazi, Mansa, and Chembe Districts were part of Phase 1 of the Saving Mothers, Giving Life (SMGL) initiative. The SMGL public-private partnership aimed to significantly reduce maternal and newborn mortality in sub-Saharan African countries (SMGL, 2018a). The global partnership sought to leverage strengths, experience, methodologies, and resources of each partner in pursuit of the SMGL goal (Quam, Achrekar, & Clay, 2019). The SMGL initiative set out to make high-quality, safe childbirth services available and accessible to women and their newborns, focusing on the critical period of labor, delivery, and the first 48 hours postpartum (SMGL, 2019). The SMGL initiative significantly reduced maternal and perinatal mortality in Zambia by using a district health systems strengthening approach to address the key delays women and newborns face in receiving quality, timely, and appropriate medical care (Healy et al., 2019).

To increase the utilization of maternal healthcare services, in 2003 the Zambian Ministry of Health (MOH) established Safe Motherhood Action Groups (SMAGs) as part of a national safe motherhood program (Ensor et al., 2013; Sialubanje, Massar, Horstkotte, Hamer, & Ruiter,

2017). The SMGL initiative ensured that all SMGL-supported facilities had trained SMAGs (Serbanescu et al., 2019). The SMGL significantly increased the number and expanded the functions of SMAGs in all SMGL-supported districts (Serbanescu et al., 2019). The SMAGs teach pregnant women about the importance of delivering in a facility, having a birth plan and practicing healthy behaviors during pregnancy and early childhood (SMGL, 2018b). SMAGs conduct home visits with women throughout their pregnancy to offer guidance and instructions and inform them about MWHs (SMGL, 2018b). In rural Zambia, SMAGs were also trained to perform follow-up postnatal home visits for mothers and newborns, identify mothers and newborns with danger signs, and conduct referrals to health facilities when danger signs were identified (Serbanescu et al., 2019).

Health in Zambia

One objective of this dissertation was to determine the social and cultural factors that impact newborn care, illness, and community support in rural Zambia. The dissertation research conducted on MWHs and the SMGL initiative falls within the Zambian Ministry of Health framework for facilitating broad-based community ownership and participation in the governance and delivery of health services. In the Zambian health sector context, community ownership and participation in the governance and delivery of health services is considered an important pillar of the health system (WHO, 2014).

Zambian Health System

The government of Zambia abolished user fees on outpatient primary health care services, first in 2006 in rural areas, extending to urban areas in 2012 (Masiye & Kaonga, 2016). Public health care in Zambia is funded from three major sources: general tax revenue, out-of-pocket payments by patients, and donor funding (Masiye, Chitah & McIntyre, 2010). People

living in rural and remote areas still face significant financial and other barriers to accessing public primary health care even though the services are free (Masiye, Chitah & McIntyre, 2010). Out-of-pocket payment in the form of travel costs, medical expenses for drugs or investigations not available at public facilities represent remaining challenges for reducing financial barriers to access (Masiye, Chitah & McIntyre, 2010).

The public health system is structured as a pyramid with health posts at the bottom as the first point of contact (Masiye & Kaonga, 2016). Health posts are designed to offer basic primary health services such as health promotion and basic curative care at the community level (Masiye & Kaonga, 2016). Health posts are usually managed by a public health officer (called an environmental health technologist) (Masiye & Kaonga, 2016). The staffing profile of health centers typically includes a clinical officer, a laboratory technician, a pharmacist, nursing staff, midwives, and an environmental health technologist (Masiye & Kaonga, 2016). Most health centers only serve as outpatient facilities (Masiye & Kaonga, 2016). District hospitals provide slightly more advanced curative care and basic surgical services, although they are still considered to be part of primary health care (Masiye & Kaonga, 2016).

Maternal, Infant, and Child Health in Zambia

In Zambia, increased vulnerability to disease and ill health threaten the lives, well-being, and livelihood of many Zambians, especially children and women (UNICEF Zambia, 2009). Human immunodeficiency virus (HIV) and AIDS, tuberculosis (TB), malaria, childhood diseases, pneumonia, acute respiratory infection (ARI) and sexually transmitted infections (STIs) persist and create a significant constraint to social and economic development (UNICEF Zambia, 2009). In Zambia, 45 percent of children younger than 5 years of age are stunted (chronically malnourished) while 28 percent of children younger than 5 are underweight (UNICEF, 2017).

There is a general and critical deficiency of micro-nutrients (iodine, iron, and Vitamin A) among both children and expecting mothers in Zambia (UNICEF, 2017). With children and women especially vulnerable at the household and community levels, the deficits and demands of ill health undermine the fabric of Zambian family life, culture, and society (UNICEF Zambia, 2009).

In Zambia, only 47 percent of births are attended by a skilled health worker at health institutions leaving 53 percent practicing home delivery (UNICEF, 2017). Communities in rural areas, such as Lundazi and Mansa Districts, have limited access to health care. Currently, estimates suggest that in urban areas, such as Lusaka, approximately 99 percent of households are within 5 kilometers of a health facility, compared to 50 percent in rural areas (UNICEF, 2017). Sociocultural factors compound families' health care seeking behavior such that many children are taken late to health facilities and pregnancy is not given special care (UNICEF, 2017). Knowledge about postnatal care and practice on infant and young child feeding practices are low in Zambia (UNICEF, 2017).

As in other LMICs, pregnancy and childbirth represent a leading cause of death and disability for women in Zambia of childbearing age. In Zambia, 224 maternal deaths occur per 100,000 live births (UNICEF, 2017). The lifetime risk of maternal death in Zambia -- the probability a 15-year-old girl will eventually die from a complication related to childbirth -- is 1 in 59 (Demographic and Health Surveys [DHS], 2014). Zambia currently ranks 26th out of 184 countries for maternal deaths (Central Intelligence Agency [CIA], 2017).

Under-5 morbidity and mortality also remains a great concern in Zambia. Zambia ranks 17th for infant mortality in the world (CIA, 2017). Infant and under-5 mortality rates from 2008 to 2013 were 45 and 75 deaths per 1,000 live births, respectively, in Zambia (DHS, 2014). At

these mortality levels, 1 in every 22 Zambian children dies before reaching age 1 (DHS, 2014). One in every 13 children in Zambia does not survive to their fifth birthday (DHS, 2014).

In Zambia, infant and child mortality is higher in rural areas than in urban areas (DHS, 2014). Infant mortality in rural areas is 49 deaths per 1,000 live births, compared with 46 deaths per 1,000 live births in urban areas (DHS, 2014). Rural-urban differences are more notable in the case of child mortality and under-5 mortality rates (DHS, 2014). Infant mortality ranges from 39 deaths per 1,000 live births in North Western Province to 68 deaths per 1,000 live births in Eastern Province (DHS, 2014) where Lundazi District is situated. Under-5 mortality is highest in Eastern and lowest in Copperbelt Province (115 and 63 deaths per 1,000 live births, respectively) (DHS, 2014).

Newborn care is essential to reduce newborn problems and death. To identify, manage, and prevent complications, the government of Zambia recommends at least three postnatal checkups for newborns, the first within 6 hours of delivery, the second 6 days after delivery, and the third 6 weeks after delivery (DHS, 2014). In Zambia between 2008 and 2013, 16 percent of newborns were taken for their first postnatal checkup within the critical first 2 days after birth while 5 percent had a postnatal checkup less than 1 hour after birth (DHS, 2014). Newborns delivered outside of a health facility were less likely to receive a postnatal checkup within the first week after birth (85 percent) than newborns delivered in a health facility (72 percent) (DHS, 2014).

Conclusion

The framing of this dissertation using an operationalization of the *Ecological Systems Theory* provides a solid theoretical basis for the proposed and novel exploration and description of the cultural practices, knowledge, and beliefs of essential newborn care and health-seeking in

the context of MWHs and the SMGL initiative in rural Zambia. The significant gap in knowledge about MWHs and newborn outcomes demonstrates the need for timely and innovative research. The literature reviewed here highlights maternal, child, and newborn health in Zambia and other low- and middle-income countries. The overview of MWHs and the SMGL initiative provides background information on interventions to improve newborn outcomes and perinatal obstetric care. The literature provides a glimpse of the uniqueness of Zambian culture and the special health challenges facing Zambians in rural areas. The priority research question to emerge from this review is: “Do MWH and SMGL interventions impact knowledge of essential newborn care and maternal-newborn health and delivery outcomes in rural Zambia?”

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CHAPTER 3

Beliefs and Health-Seeking Practices: Rural Zambians' Views on Maternal-Newborn Care

Introduction

Newborn morbidity and mortality remain a serious global health challenge in low- and middle-income countries (LMICs). Almost 1 million newborns die in the first day of life (UNICEF, 2016) in LMICs. Globally, a child's risk of death in the first 4 weeks of life is nearly 15 times greater than any other time before his or her first birthday (WHO, 2017). In Zambia, the newborn mortality rate is 34 per 1,000 live births (UNICEF, 2017) and the infant mortality rate is 44 per 1,000 live births (UNICEF, 2018). To promote improved newborn health outcomes in rural Zambia, new knowledge is needed to enhance our understanding of newborn care and cultural factors that influence the ways women seek newborn care.

Research in Zambia and other LMICs has focused on specific aspects of newborn care and health-seeking practices such as cultural care practices, umbilical cord care, skin care, thermal care, antenatal care (ANC) seeking, and postnatal care (PNC) (Table 3.1). As outlined in Table 3.1, several studies show that cultural beliefs strongly influence behavior during pregnancy, childbirth, and care-seeking (Lang-Baldé & Amerson, 2018; Lori & Boyle, 2011; Maimbolwa, Yamba, Diwan, & Ransjö-Arvidson, 2003; Raman, Nicholls, Ritchie, Razee, &

Table 3.1 Overview of studies exploring specific aspects of newborn care in Zambia and LMICs

First Author, Title (year)	Setting	Research Design	Aims	Sample Size	Results	Implications	Study limitations
Cultural childbirth practices							
Gupta, Grandmothers as gatekeepers? The role of grandmothers in influencing health-seeking for mothers and newborns in rural northern Ghana (2015)	Ghana	Qualitative: Focus group discussions (FGDs) with household heads, compound leaders and grandmothers & in-depth interviews (IDIs) with mothers of newborns, traditional birth attendants (TBAs), local healers, community leaders, & healthcare practitioners.	Explore the role grandmothers (typically a woman's mother-in-law) play in influencing maternal and newborn healthcare decisions.	n=253 total participants, 35 IDIs with mothers of newborns, 8 TBAs and local healers, 16 community leaders, 13 healthcare practitioner, 18 FGDs (n-181)	Grandmothers play an integral and multi-faceted role in maternal & infant health in rural northern Ghana. They may act as primary support providers to pregnant mothers, care for newborns following delivery, preserve cultural traditions & serve as repositories of knowledge on local medicine. Grandmothers may also serve as gatekeepers for health-seeking behavior, especially with regard to their daughters and daughters-in-law.	Research sheds light on the potential gap between health education campaigns that target mothers as autonomous decision makers, & the reality of a more collectivist community structure in which mothers rarely make such decisions without the support of other community members.	Study not explicitly to explore the decision-making role of grandmothers. Researchers may have had different insights had they explicitly sought to explore the role of grandmothers a priori. Interviews conducted in local languages of and later transcribed into English for analysis. Nuances may have been lost in that process.
Lang-Baldé, Culture and Birth Outcomes in Sub-Saharan Africa: A Review of Literature (2018)	sub-Saharan Africa	Literature review: Using PRISMA guidelines, review focused on articles that defined, directly or indirectly, associations of cultural values, beliefs, & lifeways to pregnancy &	Provide evidence of relevant cultural beliefs and the impact on birth outcomes for women in sub-Saharan Africa (SSA).	n=25 studies included in final review	Three categories emerged from the literature: birth outcomes, maternal care-seeking (MCS), and maternal culture care. The ability to conform to local birth culture validates a woman's individual birth outcomes for herself and her child only if she relies on culturally accepted, sometimes high-risk options. Cultural beliefs and	Throughout sub-Saharan Africa, motherhood is viewed as an essential role, a cultural imperative, for all women of childbearing age. Women's voices & an understanding of cultural constructs of care are required to encourage the use of biomedical health	Review limited by the vast geographic territory of SSA (49 countries). Research only available from roughly 13 countries highlighting large literature gap.

		birth from the perspective of women of childbearing age			practices are a key factor influencing MCS, place of birth, & understanding progression of birth. Many women are not aware of these negative impacts on pregnancy outcomes, as all are culturally prescribed as beneficial & passed down from one generation to another.	system along with the use of indigenous practices.	
Lori, Cultural Childbirth Practices, Beliefs, and Traditions in Postconflict Liberia (2011)	Liberia	Qualitative: semi-structured IDIs of postpartum women who experienced a maternal complication, community & family members of women who died from a pregnancy or childbirth complication	Describe the sociocultural & contextual factors including practices, beliefs, & traditions that influence maternal health, illness, & death in postconflict Liberia, West Africa.	n=54 total participants, 10 post-partum women, 18 family members, 26 community members	Three major themes from the data: (a) secrecy surrounding pregnancy & childbirth; (b) power and authority; & (c) distrust of the health care system. These themes, linked together, create the overarching cultural theme & interpretive theory, Behind the House, used to describe the complexity of maternal illness & death in Liberia.	Behind the House defines complexities & challenges women face in reproductive health such as lack of decision-making authority & low social status of young women within communities. When a human rights perspective focusing on the interests & concerns of women is embraced, more relevant, sensitive, & culturally congruent public health programs & policies can be developed.	Limited generalizability as it focused on one regional area in one sub-Saharan African country
Maimbolwa, Cultural childbirth practices and beliefs in Zambia (2003)	Zambia	Qualitative: semi-structured interview of women accompanying laboring women to urban and rural maternity units	Explore cultural childbirth practices and beliefs in Zambia as related by women accompanying laboring women	n=36	Cultural childbirth practices & beliefs of women interviewed focused on prevention of childbirth complications. If a problem occurred, it was explained by something the laboring woman or her husband had or had not done. Major	Midwifery curricula should be revised & must address cultural dimensions of childbirth. Culturally-specific knowledge from this study should be used to guide policy-makers &	Sample comprised only of women who accompanied laboring women to maternity units. Excludes women who did not accompany mothers to health

			to maternity units.		concern was expressed about sexual relationships, infidelity and fertility issues. TBAs believed by accompanying laboring women to maternity units, they could learn from trained midwives what to do at home during childbirth.	health planners in the future development of safe motherhood initiatives in developing countries.	facilities & who might have had other beliefs and experiences of cultural childbirth practices in Zambia.
Raman, How natural is the supernatural? Synthesis of the qualitative literature from low and middle income countries on cultural practices and traditional beliefs influencing the perinatal period (2016)	LMICs	Literature review: Systematic literature search of electronic databases from 1990 to 2014, including Medline, Embase, CINAHL and PsycINFO, using search terms such as traditional beliefs, practices, pregnancy, childbirth.	Review qualitative research studies in low resource settings around the perinatal continuum over the past two decades, with focus on the cultural realm; to identify common themes in the research-base, to provide policy direction for culturally appropriate perinatal interventions.	n=71 included in final review	Religious & spiritual beliefs strongly influenced behavior over the perinatal period. Beliefs in supernatural influences, particularly malevolent forces were widespread, such that pregnancy was concealed in many parts of Africa and Asia. In most low resource settings, pregnancy & childbirth were seen as normal phenomena. Rituals played an important part for women & their infants, reinforced by inter-generational support. Cross-cutting themes were: (1) the role of women as mothers, demonstrating their 'goodness' by bearing pain and suffering; (2) the idea of the 'natural' incorporating the supernatural; and (3) negotiating change across generations.	Diverse cultural practices influence perinatal well-being across low resource settings. Health practitioners & policy-makers need to acknowledge the primacy of women's reproductive roles, cultural constructions of motherhood; that supernatural forces are believed to exert powerful influences on the health of mother & infant; that inter-generational tensions result in resisting or embracing change. Need to take culture seriously & recognize that it shapes behaviors & choices throughout perinatal continuum & deliver contextually specific, culturally responsive care.	Review broad in scope & offered generalizations with respect to cultural practices that could be odious. Limited to English language papers. Many papers included presented a Eurocentric view that sees traditional practices & beliefs around childbirth as being overly restrictive, disempowering and risky.
Umbilical cord care							

Coffey, Umbilical cord-care practices in low- and middle-income countries: a systematic review (2017)	LMICs	Literature review: searched domestic & international databases for articles published in English from Jan 2000-Aug 2016. Primary inclusion criteria was description of substances applied to umbilical cord stump.	Review cord care practices to assist development of behavior-change strategies to support introduction of novel cord-care regimens, particularly 7.1% chlorhexidine digluconate for umbilical cord care.	n=46 included in final review	Documentation of cord-care practices not consistent across LMICs, yet existing literature depicts a firm tradition of umbilical cord care in every culture. Cord-care practices vary by country & by regions or cultural groups within a country & employ a wide range of substances. Desire to promote healing & hasten cord separation are the underlying beliefs related to application of substances to the umbilical cord. Frequency of application of substance, source, & cost of products used is not well-characterized.	Desire to actively care for the umbilical cord of a newborn—as noted in the variety of cord care practices and beliefs identified—points toward the need to contextualize any behavior change approach to align with the local culture.	Reporting not global as review limited to English. Doubtful that data from one country in a region also pertains to other surrounding countries and/or nearby ethnic groups. Few in-depth, qualitative assessments of umbilical cord care practices.
Herlihy, Local Perceptions, Cultural Beliefs and Practices That Shape Umbilical Cord Care: A Qualitative Study in Southern Province, Zambia (2013)	Zambia	Qualitative: FGDs with breastfeeding mothers, grandmothers & TBAs, IDIs with key community informants using semi-structured field guides at urban and rural sites.	Determine local perceptions of cord health & illness and the cultural belief system that shapes umbilical cord care knowledge, attitudes, & practices.	n=36 FGDs, n=42 IDIs	Wide variation in knowledge, beliefs, & practices surrounding cord care was discovered. For home deliveries, cords cut with non-sterile razor blades or local grass. Cord applications included drying agents, lubricating agents & medicinal/protective agents. Concerns regarding the length of time until cord detachment were universally expressed. Blood clots in the umbilical cord perceived to foreshadow neonatal illness. Management of blood clots or infected umbilical cords included multiple traditional	Umbilical cord care practices and beliefs were diverse. Dry cord care, as recommended by the WHO at time of the study, not widely practiced in Southern Province, Zambia. Vast diversity of knowledge, disease constructs and practices regarding cord function, tying, cutting, applications, care, and disposal. Integration of traditional practices with a Western biomedical model of	Many respondents shared practices or beliefs that they "had heard" others practiced. Unclear is how many of primary respondents personally hold these beliefs or followed these practices. Because it was not a random sample, authors cannot comment on frequency of cord application or commonality of beliefs expressed.

					remedies & treatment at government health centers.	care common in Southern Province.	
Sacks, Skin, thermal and umbilical cord care practices for neonates in southern, rural Zambia: a qualitative study (2015)	Zambia	Qualitative: IDIs, FGDs & observational sessions with recently-delivered women, TBAs, clinic & hospital staff from three sites, focusing on skin, thermal and cord care practices for newborns in the home.	Present findings on neonatal skin, thermal and umbilical cord practices in an HIV-endemic region of rural southern Zambia	36 IDIs, 5 FGDs, 8 observation sessions	Newborns generally kept warm by application of hats and layers of clothing. Thermal protection provided for preterm and small newborns yet practice of nighttime bathing with cold water common. Vernix considered important for preterm newborn but dangerous for HIV-exposed infants. Mothers applied various substances to skin & umbilical cord, with special practices for preterm infants. Applied substances included petroleum jelly, commercial baby lotion, cooking oil & breastmilk. Most common substances applied to the umbilical cord were powders made of roots, burnt gourds or ash.	Thermal care for newborns commonly practiced but co-exists with harmful practices. Locally appropriate behavior change interventions should aim to promote chlorhexidine in place of commonly-reported application of harmful substances to the skin & umbilical cord, reduce bathing of newborns at night, & address the immediate bathing of HIV-infected newborns.	Data were descriptive and relied on reported information. Limited generalizability. Observations were not conducted directly at birth but rather within the first week, hence conclusions regarding certain behaviors practiced in first hours after birth (such as wrapping & drying the infant) depend solely on interviewee reports.
Skin & thermal care							
Amare, Current Neonatal Skin Care Practices in Four African Sites (2015)	Nigeria, Ethiopia, Tanzania	Qualitative: IDIs, FGDs & observations. Respondents were mothers, grandmothers, fathers, health workers, birth attendants and people selling skin-care products.	Report on perceptions and practices related to on skin care practices & emollient use in four African sites.	~66 IDIs, ~14 FGDs, 8 observations ~20 newborn care narratives with mothers	Emollient use was a normative practice in all sites, with frequent application from an early age in most sites. There were variations in the type of emollients used, but reasons for use were similar and included improving the skin, keeping the baby warm, softening or strengthening joints/bones, shaping the baby, ensuring flexibility and encouraging	Study provides the first in-depth and comparative data on emollient use in Africa. Given widespread use of emollients, repeated exposure of newborns in the first month of life & potential impact of emollients on mortality, trials are needed in a range of African settings.	Potential for reporting bias. Data were collected from small geographic areas, and the findings may not apply to other areas, with results from Nigerian sites highlighting emollient use can vary within a country and

					growth and weight gain. Factors influencing emollient choice varied & included social pressure, cost, availability & deep-rooted traditional norms.		between ethnic groups. Exact number of participants not mentioned.
Bee, Neonatal care practices in sub-Saharan Africa: a systematic review of quantitative and qualitative data (2016)	sub-Saharan Africa	Literature review: published between January 2001 and May 2014 on thermal care (immediate drying and wrapping, skin-to-skin contact after delivery, delayed bathing), hygienic cord care & early initiation of breastfeeding.	Systematically review published and unpublished literature from sub-Saharan Africa on key immediate newborn care practices.	n=42 included in final review, DHS data was included from 33 countries on early breastfeeding practices.	The importance of keeping newborn babies warm was well recognized, although thermal care practices were sub-optimal. Similar factors influenced practices across countries, including delayed drying and wrapping because the birth attendant focused on the mother; bathing newborns soon after delivery to remove the dirt and blood; negative beliefs about the vernix; applying substances to the cord to make it drop off quickly; and delayed breastfeeding because of a perception of a lack of milk or because the baby needs to sleep after delivery or not showing signs of hunger.	The majority of studies came from five countries (Ethiopia, Ghana, Malawi, Tanzania and Uganda). There is a need for more research from a wider geographic area, more research on newborn care practices at health facilities & standardization in measuring newborn care practices. The findings of this study could inform behavior change interventions to improve the uptake of immediate newborn care practices.	Unclear rationale for incorporating DHS data - only available for early breastfeeding practices from 33 countries – was included in the systematic review.
Lunze, Prevention and Management of Neonatal Hypothermia in Rural Zambia (2014)	Zambia	Qualitative: FGDs with mothers, grandmothers & IDIs with community leaders & health officers	Characterize relevant practices, attitudes, and beliefs in rural Zambia about practices related to newborn hypothermia in rural Africa.	n=171 total participants, 14 FGDs, 31 IDIs	Community members were aware of the danger of neonatal hypothermia. Caregivers' & health workers' knowledge of thermoprotective practices included birthplace warming, drying & wrapping of the newborn, delayed bathing, & immediate and exclusive breastfeeding. Warm chain	Understanding & addressing community-based practices on hypothermia prevention & management might help improve newborn survival in resource-limited settings. Possible interventions include skin-to-skin	Study based on respondents' narratives, limiting researchers' ability to quantify any practice.

					was not consistently maintained in first hours postpartum when newborns at greatest risk. Skin-to-skin care not practiced in the study area. Having to assume household & agricultural labor responsibilities in immediate postnatal period was a challenge for mothers to provide continuous thermal care to newborns.	care in rural areas & use of appropriate, low-cost newborn warmers to prevent hypothermia & support families in their provision of newborn thermal protection. Training family members could facilitate practices.	
Antenatal care seeking							
Lori, Examining Antenatal Health Literacy in Ghana (2014)	Ghana	Qualitative:	Explore Ghanaian pregnant women's understanding & recognition of danger signs in pregnancy, birth preparedness & complication readiness, & understanding of newborn care.	n=68 total participants, 6 FGDs	Women identified danger signs of pregnancy & in the newborn, but had difficulty interpreting & operationalizing information received during ANC visits, indicating health education did not translate to appropriate health behaviors. Cultural beliefs in alternative medicine, lack of understanding, & prior negative encounters with healthcare professionals may have led to underutilization of professional midwives for delivery & health services.	With limited health literacy, pregnant women cannot fully comprehend the scope of services that a health system can provide for them & families. Since ANC is widely available to pregnant women in Ghana, it is vital to reexamine how antenatal education is delivered. Pregnant women must receive health information that is accurate & easy to understand to make informed health choices that will improve maternal & child health.	Limited generalizability. FGDs led by a healthcare provider, albeit not a midwife from the antenatal clinic, which could potentially bias the responses from participants.
Moyer,''It's up to the Woman's People'': How	Ghana	Qualitative: FGDs & IDIs among women with newborns,	Explore the impact of social factors on place	72 IDIs, 18 FGDs	Several ''meta themes'' permeate the data: (1) This region of Ghana is undergoing a pronounced	Social factors influence women's delivery experiences in rural northern	Nuances in meaning may have been lost due to data collected

Social Factors Influence Facility-Based Delivery in Rural Northern Ghana (2014)		grandmothers, household heads, compound heads, community leaders, TBAs, traditional healers, and formally trained healthcare providers.	of delivery in northern Ghana.		transition from traditional to contemporary birth-related practices; (2) Power hierarchies within the community are extremely important factors in women's delivery experiences; and (3) This community shares a widespread sense of responsibility for healthy birth outcomes for both mothers and their babies.	Ghana. Future research & programmatic efforts need to include community members such as husbands, mother-in-laws, compound heads, soothsayers, & traditional healers if they are to be maximally effective in improving women's birth outcomes.	in one language & translated it into English for analysis. Differences across socioeconomic status not assessed.
Moyer,'They treat you like you are not a human being': Maltreatment during labour and delivery in rural northern Ghana (2014)	Ghana	Qualitative: FGDs mothers with newborn infants, grandmothers, household heads, compound heads, traditional healers, TBAs, & community leaders. IDIs with formally trained healthcare providers.	Explore community & health-care provider attitudes towards maltreatment during delivery in rural northern Ghana, & findings against The White Ribbon Alliance's seven fundamental rights of childbearing women.	n=128 total participants, 7 FGDs, 43 IDIs	Meta theme one: potential impact of socio-economic status on women's delivery experiences. Second meta theme is power differentials within the healthcare setting appear to have a profound effect on women's delivery experiences. Despite the majority of respondents reporting positive experiences, Unprompted, maltreatment was brought up in community focus groups, community interviews, & interviews with healthcare providers. Respondents reported physical abuse, verbal abuse, neglect, & discrimination/denial of traditional practices.	Maltreatment was spontaneously described by all types of interview respondents in this community, suggesting the problem is not uncommon and may dissuade some women from seeking facility delivery. Provider outreach in rural northern Ghana is necessary to address & correct the problem, ensuring that all women who arrive at a facility receive timely, professional, non-judgmental, high-quality delivery care.	Interviewers did not explicitly ask about maltreatment & additional types of maltreatment may have been identified had the topic been asked about directly. Lack of individual sociodemographic identifiers collected precludes ability to situate discrepant experiences within social & demographic groups.
Roberts, The Role of Cultural Beliefs in	Malawi	Qualitative: face-face, audio-recorded interviews, and	Identify the cultural beliefs that influence womens ANC	20 pregnant mothers and 8 health workers at	Identified maternal cultural beliefs included: seeking advice from village elders,	Cultural beliefs play an integral role in the decision-making process of ANC. The	Limited generalizability as it focused on one regional area

Accessing Antenatal care in Malawi: A Qualitative Study (2016)		a demographic survey	or pregnancy-related health care decisions.	two urban tertiary care hospitals	spousal fidelity, and disclosing pregnancy. Health workers mentioned providers often held the same cultural beliefs and turned women away if they tried to go against cultural norms.	belief and practice of when to disclose pregnancy prohibits women from seeking ANC in the first trimester	(urban) in one sub-Saharan African country
Taylor, Associations of Household Wealth and Individual Literacy with Prenatal Care in Ten West African Countries (2016)	West Africa: Benin, Burkina Faso, Ghana, Guinea, Liberia, Mali, Nigeria, Niger, Senegal and Sierra Leone	Quantitative: Data on women with recent births obtained from 2006 to 2010 Demo-graphic and Health Surveys	Examine associations of household wealth and individual literacy with prenatal care in West Africa.	n=58,512	78% of women had any PNC; 23% had adequate care. Women who were not literate had lower odds of having any PNC & lower odds of ANC. Women in the poorest wealth quintile were substantially less likely to have any PNC than women in the wealthiest quintile & less likely to have ANC.	A substantial percentage of women in West Africa have no PNC. Few have adequate care. Illiteracy & poverty are important risk factors for having little or no PNC. Increasing education for girls, promoting culturally appropriate messages about PNC, & building trust in providers may increase PNC.	Applicability to other developing countries may be limited. The survey data were crosssectional, which do not provide a basis to infer causality. There is potential for recall bias regarding PNC content.
Waiswa, Effect of the Uganda Newborn Study on careseeking and care practices: a cluster-randomised controlled trial (2015)	Uganda	two-arm cluster-randomised controlled trial: In intervention villages community health workers (CHWs) were trained to identify pregnant women & make 5 home visits (2 during pregnancy & 3	Assess effect of a home visit strategy combined with health facility strengthening on uptake of newborn care-seeking, practices, services, & to link the results to national policy & scale-up. Primary outcomes were	Intervention: 31 villages, n=194 baseline household survey of women with live birth in 4 months, n=894 endline household survey of women with live birth in 12 months.	Care-seeking for ANC, routine & extra care services increased in both the control and intervention arms, the intervention significantly improved essential newborn care practices, although many interventions saw major increases in both arms over the study period.	Volunteer CHWs can be effective in changing long-standing practices around newborn care. The home visit strategy may provide greater benefit to poorer families. However, CHW strategies require strong linkages & concurrent improvement of quality through health system strengthening,	Differing recall periods of the baseline and endline surveys for services that occurred before & around time of birth. Surveys only captured women who had live births in both the baseline and endline surveys.

		in the first week after birth) to offer preventive care	improved coverage of services for PNC, ANC, birth preparedness, skilled birth attendance, breastfeeding, thermal care, & hygiene.	Control: 32 villages, n=201 baseline survey, n=893 endline survey.		especially in settings with high & increasing demand for facility-based services.	
Postnatal care seeking							
Sacks, Postnatal Care Experiences and Barriers to Care Utilization for Home- and Facility-Delivered Newborns in Uganda and Zambia (2016)	Uganda, Zambia	Qualitative: FGDs with recently-delivered women with previous home and facility deliveries as part of a larger evaluation of an initiative to promote facility deliveries in 8 rural districts	Examine experiences with, and barriers to, accessing postnatal care services, in the context of a maternal health initiative.	48 FGDs (6 per district), n= 393 total participants	Women who accessed care largely reported positive experiences, with Zambian women generally reporting more positive interactions than Ugandan women. The main reasons given for low PNC utilization were low awareness about the need, fear of mistreatment by clinic staff, cost and distance. In half of FGDs, women described personal experience or knowledge of denial or threatened denial of PNC due to the birth location. Although outright denial of care was not common, women frequently described various types of actual or presumed discrimination because of having a home birth.	While many women reported positive experiences with postnatal care utilization, cases of delay or denial of postnatal care exist. As programs incentivize facility deliveries, lack of focus on postnatal support may place home-delivered newborns in "double jeopardy" due to poor quality intra-partum care & reduced access to PNC.	Relies on women's reports & not broadly generalizable.
Sivalogan, Influence of newborn health messages on care-seeking	Zambia	Qualitative: FGDs & IDIs with mothers & health workers from ten health	Understand the impact of newborn care health messages on care-seeking	5 FGDs with 6–10 mothers, 26 IDIs	Community perceptions and local realities were identified as fundamental to care-seeking decisions and influenced individual	The acceptability of health initiatives, such as chlorhexidine cord application, in community settings, is	Demographic data were missing for 5 FGDs. Many of the FGD & IDI participants

practices and community health behaviors among participants in the Zambia Chlorhexidine Application Trial (2018)		centers (5 rural and 5 peri-urban/urban).	behavior for neonates and the acceptability, knowledge, and attitudes towards chlorhexidine cord care among community members and health workers.		participation in particular health-seeking behaviors.	dependent on community education, understanding, & engagement. Community-based approaches, such as using community-based cadres of health workers to strengthen referrals, are an acceptable & potentially effective strategy to improve care-seeking behaviors and practices.	discussed traditional perceptions or practices that they perceived to exist or had heard that individuals in the community practiced, however, the quantification of individuals who actually shared the discussed understanding remains unclear.
Tesfahun, Knowledge, Perception and Utilization of Postnatal Care of Mothers in Gondar Zuria District, Ethiopia: A Cross-Sectional Study (2014)	Ethiopia	Community based, cross-sectional study supported by a qualitative study conducted among 15–49 years mothers who gave birth during the last year using structured questionnaires & FGDs	Assess mothers' knowledge, perception & utilization of PNC.	n=836 total sample size distributed proportion-ally to each strata: 131 urban and 705 rural households sampled selected by systematic random sampling technique	Majority of the women were aware and considered PNC necessary; however, only 66.83% of women obtained PNC. Most frequent reasons for not obtaining PNC were lack of time, long distance to a provider, lack of guardians for children care, & lack of service. Place of residence, distance from a health institution, ANC visit & having decision-making authority for utilization were factors significantly associated with PNC utilization.	Mothers had a high level of awareness and perception about the necessity of PNC. Urban women & those who displayed higher levels of autonomy were more likely to use postnatal health services.	Limited generalizability as it focused on one regional area in one sub-Saharan African country.

Shafiee, 2016). Grandmothers and other family members play important roles in maternal-newborn health (Gupta et al., 2015; Moyer et al., 2014). While Maimbolwa and colleagues (2003) explored cultural childbirth practices and beliefs in Zambia, there remains scant research documenting recent, broader knowledge and beliefs about newborn care in the country. Health care providers need to clearly understand the beliefs and health-seeking practices of rural Zambians from a cultural perspective to provide care and interventions to improve maternal-child health.

Statement of the Problem

Recognizing the limited research investigating cultural beliefs and health-seeking practices, the goal of this focus group study was to determine the factors associated with newborn care in rural Zambia. The specific aims were to:

Aim 1): *Describe the knowledge and beliefs about newborn care and illness from the perspective of rural Zambian women, community members, and health workers.*

Aim 2): *Examine the similarities and differences in the knowledge and beliefs about newborn care and illness among rural Zambian women, community members, and health workers.*

Aim 3): *Explore the social and cultural factors associated with the ways women seek newborn care to identify traditional and professional newborn care practices in rural Zambia.*

Research was guided by the following a priori questions:

- "What are the cultural beliefs and practices of rural Zambian women with infants younger than 1-year-old, community members, and health workers that influence newborn care and health-seeking behavior?"

- "What are the similarities and differences in knowledge and beliefs of newborn care among rural Zambian women, community members, and health workers?"
- "What social and cultural factors influence newborn care and health-seeking practices for rural Zambians?"

Theoretical Framework

Bronfenbrenner's *Ecological Systems Theory* was operationalized to frame this qualitative study utilizing focus group discussions for data collection. Acknowledging that multiple factors affect decision making regarding newborn health, the *Ecological Systems Theory* incorporates exogenous ecological environment factors conceived topologically as a nested arrangement of systems, each contained within the next, including the microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Bronfenbrenner, 1977, 1979, 1989, 1994). When the *Ecological Systems Theory* focuses on maternal-newborn health, the maternal-newborn dyad represents the microsystem. The mesosystem includes the family and community surrounding the maternal-newborn dyad. The exosystem incorporates the health care system in rural Zambia. The macrosystem encompasses culture. Finally, the chronosystem is represented by health policy in the operationalized *Ecological Systems Theory* for maternal-newborn health.

Methods

Employing a semi-structured interview guide to orient discussions, focus groups were used to collect data and gain an understanding of cultural beliefs and health-seeking practices of rural Zambians related to newborn care and illness. Focus groups were conducted between June and August 2016 in 20 communities located in Zambia's rural Lundazi (Eastern province), Mansa, and Chembe (Luapula province) Districts. Zambian research assistants served as interpreters. Focus groups in Lundazi District were conducted in the Tumbuka language. In

Mansa and Chembe Districts, focus groups were conducted in the Bemba language. Illiteracy in rural Zambia is substantial with few people able to read or write English. Tumbuka and Bemba are oral, not written, languages.

Ethical Approval

Institutional Review Board (IRB) approval was sought before beginning the study from the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board (HUM00110404), the Zambian IRB equivalent, Excellence in Research Ethics and Science, and the Zambian National Health Research Authority. Informed, verbal, and written consent were obtained from focus group participants before discussions (Appendix A).

Setting

The study sites were chosen because they were included in the parent study's collaborative research endeavor between 2015-2018 to determine the impact of maternity waiting homes (MWHs) on facility delivery among women living at least 10 km from health facilities in rural Zambia (Scott, Kaiser et al., 2018). The purpose of MWHs is to provide a setting where women can be accommodated during the final weeks of their pregnancy near a hospital with essential obstetric facilities (WHO, 1996).

Lundazi and Mansa/Chembe Districts.

Research for this focus group study was conducted in the Lundazi District of Eastern Province along with the Mansa and Chembe Districts of Luapula Province. Table 3.2 displays the demographic information for Eastern and Luapula Province (Chief Statistics Office, 2015). The infant mortality rates of 94.9 and 95.6 per 1,000 live births in Eastern and Luapula Provinces, respectively, are much higher than the overall Zambian national infant rate of 44 per 1,000 live births (Chief Statistics Office, 2015). Figure 3.1 shows a detailed map of Eastern

Province in Zambia (Chalo Chatu.org, 2016). The population in the 2010 Census was 308,420 (Chief Statistics Office, 2012). The Tumbuka language is widely spoken in Lundazi District. In nearly all communities in the district, Tumbuka is the predominant ethnic group (Williams et al., 1999).

Data were collected in the Mansa and Chembe Districts. Bemba is the language most widely spoken in Mansa/Chembe Districts; Mansa is the provincial capital of the Luapula Province of Zambia (Provincial Administration Luapula Province, 2014). Figure 3.2 shows a map of Luapula Province including Mansa and Chembe Districts (Chalo Chatu.org, 2016). Chembe is one of the newly created districts in the Luapula Province of Zambia (Provincial Administration Luapula Province, 2014). Given the newness of Chembe District, limited district-level health data are available.

Sample

Inclusion criteria.

A purposive sample with three different demographic groups in Lundazi and Mansa/Chembe Districts in Zambia was used including: 1) Zambian women with infants younger than 1-year-old; 2) male and female community members older than 18 years, and 3) male and female professional and community health workers. These three groups were selected because they were believed to represent different perspectives and beliefs pertaining to health-seeking practices about maternal-newborn care. Health workers and community members were included in the focus group study recognizing that their input undoubtedly influences maternal knowledge of newborn care and support for care-seeking behavior of women with infants younger than 1-year-old. Women with infants younger than 1-year-old were invited to participate in the study even if they were younger than 18 years old. All literacy levels were eligible to

participate. Only self-identified permanent residents of the study site villages were included. All other community members were excluded.

Table 3.2 Demographics of Eastern and Luapula Province in 2015 (Chief Statistics Office, 2015).

Demographic	**Eastern Province**	**Luapula Province**
Population	1,813,445	1,127,453
Crude Birth Rate (CBR)	45.3 births per 1,000 population	47.2 births per 1,000 population
Crude Death Rate (CDR)	15.6 deaths per 1,000 population	16.9 deaths per 1,000 population
Infant Mortality Rate	94.9 per 1,000 live births	95.6 per 1,000 live births
Total Fertility Rate	6.2 births per woman	6.8 births per woman

Figure 3.1 Map of Eastern Province including Lundazi District (Chalo Chatu.org, 2016)

Figure 3.2 Map of Luapula Province including Mansa and Chembe Districts (Chalo Chatu.org, 2016)

Recruitment

Recruitment for the study was conducted orally by word of mouth through the nurse in charge at the health facilities and village chiefs. Village chiefs from ten communities in each district were informed in advance of when the nurse researcher would be coming to their area. The nurse in charge and village chief announced to community members that the nurse researcher would arrive on a particular day and stay all day to conduct focus groups (Appendix B). Focus groups were conducted by the nurse researcher and a Zambian research assistant (RA) to determine the factors that impact newborn care, illness, and community support in rural Zambia. The Zambian RA served as an interpreter and was fluent in both English and the local language (Tumbuka in Lundazi or Bemba in Mansa/Chembe). Participants were provided a small snack and drink for their time in the focus group.

Data Collection

Data were collected over a period of 3 months between June and August 2016. The study included (n=646) rural Zambians, comprised of groups of community members (n=208), health workers (n=225), and women with infants younger than 1-year-old (n=213). The groups of community members and health workers were heterogeneous with varying ages, compositions of males and females, number of living children, educational level, and length of time in the community. The group of women with infants younger than 1-year-old had more homogeneous demographic characteristics than the other groups.

Sixty focus groups were conducted. Each group contained a minimum of 8 and maximum of 12 participants. The interviews lasted approximately 60 minutes. The focus groups used a semi-structured interview guide to explore how rural Zambians understand and describe newborn care and health-seeking (Appendix C). Before beginning the focus groups, verbal and written

informed consent was obtained and each participant completed a demographic questionnaire. The interpreters asked questions in the local language. The interviews were digitally audiotaped, transcribed verbatim (and appear that way in the quotations), and 20% were back-translated before analysis. No names were used in the focus groups or on the audiotapes. The interpreters and group members were asked to avoid discussing group content outside of the group.

Data Analysis

An inductive iterative process was employed to analyze the focus group data in light of the operationalized *Ecological Systems Theory*. Data were analyzed using four main stages identified by Bengtsson (2016): decontextualization, recontextualization, categorization, and compilation. To begin, the researcher used a process of decontextualization to familiarize herself with the transcribed text to obtain the sense of the whole before breaking it down into smaller coding units (Bengtsson, 2016). The ATLAS.ti (2018) qualitative data analysis software was used to help organize data from the focus groups. Findings in transcriptions were coded and evaluated for significance. Coding was deductive, using a codebook (Appendix D), and inductive, allowing for themes to emerge from the data.

Next, the original text was then reread alongside the final list of meaning units through a process of recontextualization (Bengtsson, 2016). To ensure focus group context was covered in relation to the aims, the researcher reread the transcripts and highlighted each quote with a different color according to identified codes. Few non-highlighted quotes remained. Text that was not highlighted and did not answer the research questions was excluded from analysis. Categorization with latent content analysis was used to identify themes and categories. The researcher sorted and classified by similar thematic content and separated into smaller categories based on the aims of the focus group study. When saturation was reached, categorization was

stopped. Next, the researcher immersed herself in the data to identify meanings in the text and chose meaningful units to present as quotations (Bengtsson, 2016). Finally, the researcher added information by performing quantification in which responses within themes and categories were counted then compared to examine similarities and differences across groups.

Rigor for the focus group study was established using Lincoln and Guba's (1985) model for addressing components of trustworthiness that are relevant to this study: (a) truth–value (credibility), (b) applicability (transferability), (c) consistency (dependability), and (d) neutrality (confirmability). Credibility, similar to internal validity when using quantitative methods, is the element that allows others to recognize the experiences contained within the study through the interpretation of participants' experiences (Thomas & Magilvy, 2011). Transferability refers to the ability to transfer research findings or methods from one group to another, equivalent to external validity in qualitative research (Lincoln & Guba, 1985). Dependability, related to reliability in quantitative terms, occurs when another researcher can follow the decision trail used by the researcher (Thomas & Magilvy, 2011). Confirmability, similar to objectivity in quantitative terms, occurs when credibility, transferability, and dependability have been established (Thomas & Magilvy, 2011).

To preserve trustworthiness, an audit trail was maintained. Audit trails are comprised of a variety of researcher-generated data that must be consistently recorded and organized throughout the research process (Rodgers & Cowles, 1993). Lincoln and Guba (1985) discuss six categories of information that need to be collected to inform the audit process: 1) raw data, 2) data reduction and analysis notes, 3) data reconstruction and synthesis products, 4) process notes, 5) materials related to intentions and dispositions, and 6) preliminary development information. A

comprehensive audit trail generally has four basic types of documentation including contextual, methodological, analytic, and personal response (Rodgers & Cowles, 1993).

Detailed field notes were taken through observation, active listening, participation, reflection, and reconfirmation of findings in the environment with Zambian women, community members, and health workers to understand and describe newborn care and illness. Critical reflection entails a deeper level of reflection whereby researchers examine the assumptions (i.e. beliefs, values, ideas) that guide their actions (Fook & Gardner, 2007). Using Fook and Gardner's (2007) model, Maharaj (2016) prepared a list of questions that I kept in mind when reflecting upon field notes:

- What do these notes suggest regarding my beliefs and values about myself, my relationships with others, and my assumptions about knowledge, power, and privilege?
- How do I understand my role in this setting (observer/participant, insider/outsider)?
- How well does my account align with my beliefs and values?
- What kinds of words (emotions) and language (formal/informal) did I use?
- What did I leave out of my notes and why?
- How did the fact that I was taking notes impact my understanding of the situation?
- How did my presence as an observer influence others around me?

When taking field notes, I was mindful to avoid using my own beliefs and values in judging what focus group participants deemed normal and appropriate maternal-newborn care and health-seeking in rural Zambia. I made a conscious effort to be broad-minded and use nonjudgmental words in my notes. I also strived to maintain open body language during my observation of focus groups.

Findings

Demographic characteristics of the focus group study participants are shown in Table 3.3. In the overall sample, most participants were married (86.8%) and female (71.6%). The average age was 37 years, while the average time living in the community was 25 years. Among the 646 total participants, focus groups were made up of a similar number of participants among community members (*n*=213), health workers (*n*=208), and women with infants younger than 1-year-old (*n*=225). In terms of educational level, 6.2% had no formal education, 12.5% had a lower primary level (Grades 1-4), and 32.7% had an upper primary level (Grades 5-7) of education.

Women with infants younger than 1-year-old (*n*=213) were, on average, 26 years old. The vast majority were married (*n*=183) with 1-5 living children (*n*=179). Almost half (*n*=105) had a primary education (Grades 1-7) while 7 percent had no education (*n*=15). Women with infants younger than 1-year-old had lived an average of 16.8 years in the community.

Community members (*n*=208) were, on average, 39 years old. A substantial majority were married (*n*=190) and 58.2% had 1-5 living children (*n*=121). Fifty percent (*n*=103) had a secondary education (Grades 8-12) while nearly 5 percent had no education (*n*=10). Community members had lived an average of 26.9 years in the community.

Health workers (*n*=225) were, on average, 45 years old. Most were married (*n*=182) and nearly half had 1-5 living children (*n*=105). More than half (*n*=131) had a secondary education (Grades 8-12) while 4 percent had a tertiary education (*n*=9). Health workers had spent an average of 31.6 years in the community.

Table 3.3 Focus group participant characteristics

Demographic Characteristic	**Total (n=646)**	**Women w/ Infants <1yr 33.0% (n=213)**	**Community Members 32.2% (n=208)**	**Health Workers 34.8% (n=225)**
District	**% (n)**	**% (n)**	**% (n)**	**% (n)**
Lundazi	49.2% (318)	49.3% (105)	51.4% (107)	47.1% (106)
Mansa/Chembe	50.8% (328)	50.7% (108)	48.5% (101)	65.1% (119)
Age (years)				
Range	15-88	15-65	18-77	18-88
Mean (SD)	37 (13.3)	26 (8)	39.3 (11.9)	45 (11.5)
Missing	0.5% (3)	0.5% (1)	0.5% (1)	0.4% (1)
Sex				
Male	28.4% (183)	None	38.0% (79)	44.0% (99)
Female	71.5% (462)	100% (213)	62.0% (129)	55.6% (125)
Missing	0.2% (1)	None	none	0.4% (1)
Marital status				
Married	85.9% (555)	89.2% (190)	88.0% (183)	80.9% (182)
Single	4.6% (30)	1.9% (4)	4.3% (9)	7.6% (17)
Widowed	2.6% (17)	1.4% (3)	2.9% (6)	3.6% (8)
Separated/Divorced	5.9% (38)	6.6% (14)	4.3% (9)	6.7% (15)
Missing	0.9% (6)	0.9% (2)	0.5% (1)	1.3% (3)
Number of living children				
0	2.2% (14)	0.5% (1)	4.3% (9)	1.8% (4)
1-5	62.7% (405)	84.0% (179)	58.2% (121)	46.7% (105)
6 and above	34.5% (222)	15.0% (32)	36.5% (76)	50.7% (114)
Range	0-16	0-9	0-16	0-14
Mean (SD)	4.5 (2.7)	3.2 (2.0)	4.7 (2.7)	5.5 (2.7)
Missing	0.8% (5)	0.5% (1)	1.0% (2)	0.9% (2)
Education level				
None	4.8% (31)	7.0% (15)	4.8% (10)	2.7% (6)
Lower (1-4) &	42.4% (274)	49.3% (105)	43.8% (91)	34.7% (78)

Upper Primary (5-7)				
Junior (8-9) & Senior Secondary (10-12)	49.2% (318)	39.4% (84)	49.5% (103)	58.2% (131)
Tertiary	2.2% (14)	0.9% (2)	1.4% (3)	4.0% (9)
Missing	1.4% (9)	3.3% (7)	0.5% (1)	0.4% (1)
Time in community (years)				
Range	1-88	1-65	1-68	1-88
Mean (SD)	25.2 (16.1)	16.8 (11.3)	26.9 (15)	31.6 (17.5)
Missing	0.5% (3)	0.5% (1)	0.9% (2)	none

Themes

The following themes emerged from each of the groups independently: from women with infants younger than 1-year-old, (1) traditional newborn protective rituals; from community members, (2) a strong sense of family and community to protect the newborn, and from health workers, (3) an avoidance of shame. A fourth theme, essential newborn care, was common among all groups. Table 3.4 summarizes themes and categories from the focus groups. A description of each theme follows in this section along with supporting quotations.

Women with Infants Younger Than 1-Year-Old

Traditional newborn protective rituals.

When conducting focus groups with women with infants younger than 1-year-old, participants most often mentioned using traditional newborn protective rituals when caring for newborns. Categories of protective rituals included prevention of cough and pneumonia, care of the umbilical cord, and early introduction of porridge to the newborn.

Prevention of cough and pneumonia.

Women with infants younger than 1-year-old described the ritual use of fire and sperm to prevent cough and pneumonia. The belief, as explained by interpreters in both districts, is the sperm of the man will make the baby strong and prevent cough. The words used to label traditional practices were different based on whether participants spoke Bemba or Tumbuka, but the essence of the health belief was similar in both districts. As one woman with an infant younger than 1-year-old in Lundazi District explained:

> When the baby is a month old we prepare fire in the house where we live. Then we will have sex that night [and] after having sex we will spread the sperms to the joints of the baby. After this [is] done, we pass the baby back and forth over the fire to make the baby strong and keep from unnecessary coughs.

Table 3.4 Summary of themes and categories emerging from focus groups

Group	Theme	Category
Women with infants under one year	Traditional newborn protective rituals	Prevention of cough and pneumonia
		Care of the umbilical cord
		Early introduction of porridge
Community members	Strong sense of family & community to protect the newborn	Husbands and maternal-newborn health
		Grandmothers and maternal-newborn health
		Community members and maternal-newborn health
Health workers	Preservation of dignity	Cultural concerns related to maintaining privacy
		Social concerns about partner's fear of HIV/STI testing.
Women with infants under one year, community members, & health workers	Essential newborn care	Pregnancy and postpartum care
		Breastfeeding
		Newborn danger signs
		Immunizations

In both districts, this ritual of preparing a special fire and protective use of sperm is usually performed when the baby is about 1 month old. Traditional herbs are placed in the fire with the expectation that the smoke will clear the lungs and avert cough. As a woman with a baby younger than 1-year-old in Mansa District described:

> When a child has a cough it means the father to the child was having sex with other women and when he returned home he touched the child. They would be advised by elders to have sex then [the] husband must release his sperms on his hand to spread [over] the sick baby.

Women with infants younger than 1-year-old in the focus group study acknowledged that they usually do not talk about traditional newborn protective rituals involving the prevention of cough and pneumonia at the rural clinics because they've been told by health workers not to engage in cultural newborn care.

Care of the umbilical cord.

Many women with infants younger than 1-year-old mentioned the use of herbs and powders on the umbilical cord to make it heal and fall off faster so they can carry the baby on their back. One mother mentioned, "We get traditional herbs and put it round the baby's cord so that it falls off faster." Several women mentioned their grandmothers and mothers-in-law, in particular, promote the practice of applying traditional herbs to the umbilical cord. They made a point of mentioning in focus groups that they avoid bringing herbs to the clinic because "they would be confiscated by nurses."

There was a commonly expressed belief that the umbilical cord should not fall between the baby's legs or else the baby would be at risk for infertility. The baby is not placed on their back to sleep or carried by the mother on her back until the cord falls off so that the cord will not fall between the legs.

Women often cited traditional rituals involving the disposal of the umbilical cord after the stump falls off. A woman with a baby younger than 1-year-old from Lundazi explained:

> When the cord falls off we dig a hole in the bush under the tree. The part where the umbilical cord touched the skin should face up and were the doctor tied should face down when burying it for fear that the mother may not have another child in future.

The special tree chosen by the family is a sacred place blessed by ancestors and the umbilical cord stump, along with other offerings throughout the year, will bring good harvests. It is believed that to view the cord stump will lead to future infertility.

Early introduction of traditional porridge.

Another frequently mentioned traditional newborn protective ritual in both districts is the early introduction of traditional herbs mixed as a porridge when the child is about 1 month old to "make the baby strong and healthy." There is a belief that parents should abstain from intercourse during the newborn period and that they can resume sexual relations when the baby is a month old as long as they give the baby a protective porridge made of traditional medicine. According to a woman in Mansa District, "We give herbs mixed with porridge at 1 month to keep them from getting diseases." However, women in the study with infants younger than 1-year-old mentioned that they do not discuss the use of herbs at the clinic because they would be "scolded by midwives."

Community Members

Strong sense of family and community to protect the newborn.

Among focus groups with community members, the main theme was a *strong sense of family and community to protect the newborn*. In rural Zambia, family and community support are important influences on newborn care and health-seeking. Husbands and maternal-newborn health, grandmothers and maternal-newborn health, and community members and maternal-

newborn health composed categories within this theme. Focus groups in both geographical areas with community members expressed a strong desire to protect newborns and play important roles in maternal-newborn health.

Husbands and maternal-newborn health.

In rural Zambia, men typically occupy the roles of head of households and key decision makers in whether a woman adheres to traditional newborn cultural care practices or accesses the professional health system. Husbands propagate and persuade women to maintain traditional newborn protection rituals in a variety of ways. In an attempt to encourage monogamy, as described by a female community member in Lundazi District, it is believed:

> When a woman is pregnant [she] is not supposed to have sex with any other man but the husband only for fear that the woman may die while delivering and the man is not to have sex or have a girlfriend for fear of the same reason.

One female community member in Mansa District noted:

> When your husband is seeing someone and it happens that you meet that person you can collapse and maybe die. Sometimes you can die if your husband is sleeping around while you are pregnant and no one knows about the pregnancy.

In the same vein, in both Lundazi and Mansa/Chembe Districts of Zambia, it is believed that vernix caseosa is sperm and makes the baby and woman unsanitary. A male community member in Mansa mentioned that when the woman is in the eighth month of pregnancy, "she should not sleep with her husband to avoid the baby coming out with sperms on their head." Community members in the study talked about the importance of "following the wishes" of the husband when deciding how to protect the newborn and when to go to the clinic.

Grandmothers and maternal-newborn health.

Grandmothers also possess a strong sense of responsibility to protect the newborn and greatly influence a woman's decision to follow cultural or health system newborn care practices

in rural Zambia. Several community members in both districts describe the role of grandmothers and the use of traditional medicine in maternal-newborn health. A female community member in Lundazi stated:

> When we have prolonged labor in the village, our grandmothers prepare medicine to ease the pain and deliver faster. This is known and it's not allowed in the hospital because they say it may destroy both the life of the child and mother.

Traditional herbs are often used in cultural maternal-newborn care practices in rural Zambia, but women are reluctant to divulge their use because health workers do not allow them to be used in facilities. In the health system, nurses and midwives spread health education messages about the potentially harmful effects of traditional medicine used in maternal-newborn care. As described by a male community member in Mansa, grandmothers assist women who are interested in speeding labor to avoid pain:

> Some women like to deliver from home because their grandmothers or other relatives give them traditional herbs to deliver without much pain and faster. Where at the hospital is not allowed it may destroy both the life of the child and mother.

In focus groups, community members expressed the need to follow the advice of the "elder women" because "they know what is best for mothers."

Community members and maternal-newborn health.

Along with family, community members in rural Zambia have a strong sense of responsibility to protect newborns. In focus groups with community members, there was an often-cited belief that no single or unmarried people in the community should touch the newborn baby or the baby risks death or infertility. According to a female community member in Mansa District:

> Immediately [after] a baby is born only selected people are to touch the baby like the grandmothers and other elderly people but not and strictly not the singles or divorces for fear that the child may die in case they are just from having sex which is considered to be dirty to touch the baby.

A female community member in Lundazi commented, “Immediately after a baby is born, anyone who is unmarried should not touch it for fear that the baby may have or develop a cough.” Community members in the study spoke about how neighbors and friends of mothers have a “duty to protect” everyone in the village “no matter what their age.”

Health Workers

Preservation of dignity.

The theme to arise from focus groups with health workers was the cultural and social *preservation of dignity*. In both districts, when health workers were asked to discuss reasons for women not seeking ANC, participants mentioned the following categories: lack of privacy at the clinic and partner’s fear of HIV/STI (sexually transmitted infections) testing.

Cultural concerns related to maintaining privacy.

Health workers frequently said that a cultural desire by women not to be seen naked by male nurses in the maternity ward led to hesitancy to deliver at the facility. According to a female health worker in Lundazi, “Women don’t attend ANC because they feel shy and fear exposure to opposite sex health personnel at the clinic.” Along this line was the frequent discussion of a lack of privacy in the tight quarters of a delivery room. A female health worker in Mansa explained:

> There’s no privacy at the facility because they are using a [converted] office as an examination place. [This] makes the woman uncomfortable to deliver at the facility because there is no maternity ward. If the midwife wants to talk in a labor ward everyone outside hears.

There is a widely held belief in rural Zambia that no man outside of the home should see a woman without clothes on. Furthermore, pregnant women believe it is embarrassing if others hear them groan or cry during labor.

Social concerns about HIV/STI testing.

During the first ANC visit, per Zambian Ministry of Health officials, guidelines stress the importance of partner testing for HIV and various STIs. A female health worker in Mansa explained, "Men don't like to be tested with women for HIV/STIs." A male health worker in Mansa said, "Three-quarters of our men do not come for tests like HIV, syphilis and other diseases [because] they say it is for women only. Hence, they end up delivering from home." In Lundazi, a health worker stated:

> The first antenatal visit is a challenge to most of the pregnant mothers because husbands refuse to go with their wives for fear of being tested for HIV/AIDS and syphilis. Husbands say once they know their status is positive he will kill himself to avoid being known by family members, friends, and community that he is sick.

Health workers in the study said that the most common reason men do not participate in antenatal pregnancy care is their desire to avoid STI testing.

Common to All Focus Groups

Essential newborn care.

The theme that was common across all types of focus groups was an understanding of *essential newborn care*. Responses were placed in the theme of *essential newborn care* if focus group participants mentioned newborn care and care-seeking according to pregnancy, childbirth, postpartum, and newborn care (PCPNC) guidelines published by the WHO and UNICEF (2015). The PCPNC includes recommendations from approved WHO guidelines relevant to maternal and perinatal health including: preeclampsia and eclampsia, postpartum hemorrhage, postnatal care for the mother and baby, newborn resuscitation, prevention of mother-to-child transmission of HIV, HIV and infant feeding, malaria in pregnancy, interventions to improve preterm birth outcomes, tobacco use and secondhand exposure in pregnancy, postpartum depression, postpartum family planning, and post-abortion care (WHO & UNICEF, 2015). The categories

supporting this theme include *pregnancy and postpartum care, breastfeeding, newborn danger signs, and immunizations.*

Pregnancy and postpartum care.

Many participants in all groups were able to state the importance of *pregnancy and postpartum care* including attending ANC, facility delivery, and PNC, and correctly identified maternal-newborn danger signs during delivery and the postpartum period as outlined in the PCPNC. As one woman with a baby younger than 1-year-old in Mansa mentioned:

> Family and friends advise us to go early for antenatal visits because ladies don't hide any secrets. They also tell us to go for medications in case the baby is not in a good position to help your friend from dying. Sometimes if a person is pregnant she is in danger and should go to the clinic.

In Lundazi, a female community member commented that after birth in the clinic, "They discharge mothers and tell her to come at 6 days for postnatal checkups for both the baby and the mother and also third postnatal at 6 weeks to check for the baby."

Breastfeeding.

Numerous participants in all groups in both districts were able to identify the importance of *breastfeeding*. A woman with a baby younger than 1-year-old commented, "At the clinic they emphasize the mother to start breastfeeding the baby immediately after the baby is born and they discharge the woman only after first seeing that the baby has start breastfeeding." A male health worker in Mansa mentioned, "The mother should breastfeed the child the first milk because it is the most nutritious milk ever. The mother should be clean always and the baby too."

Newborn danger signs.

All focus group participants in both districts correctly cited *newborn danger signs* as reasons for taking newborns to the clinic, such as convulsions, difficulty breathing, and fever. A female community member in Lundazi District noted, "These days we take the baby to the clinic

either coughs, fever or fitting [seizures].” A male community member in Mansa said that the community health workers, “Emphasize to us to bring the baby to clinic to see if the baby is gaining or losing because some gain more weight abnormally because some do reach that line when they have feeding difficulties.”

Immunizations.

In all groups in both districts, most participants expressed understanding of the importance of returning to the clinic for *immunizations* as the newborn grows. A woman with a baby younger than 1-year-old in Lundazi stated, “When the baby is born the nurse will tell us to be bringing the baby for under five visits to receive some prevention injections like BCG [Bacillus Calmette-Guerin vaccine for tuberculosis].” As stated by a female community member in Mansa, “We need to observe hygiene and the food which the baby may eat should be soft and also the vaccines like polio, BCGs and all the 4 injections rota (rotavirus) and pcv [pneumococcal conjugate vaccine] are necessary.”

Similarities and Differences Among Focus Groups

Similarities among types of focus groups.

Women with infants younger than 1-year-old, community members, and health workers in both districts mentioned the same theme pertaining to *essential newborn care.* Themes brought up among communities with and without a MWH were similar. The similarity in themes brought up independently by focus groups across geographic areas was surprising. We expected there would be distinct differences in responses between districts where focus groups were conducted. We anticipated finding more differences given the likely range between cultures, education, stages of development, population diversity, and access to health care between

districts. Findings point to wide-ranging pervasive cultural and health system influences on newborn care in rural Zambia.

Differences among types of focus groups.

There were some differences among groups in the frequency in which themes were mentioned and in how many times categories were mentioned among groups and districts. Also, there were a few notable differences in expressive style among focus groups. Community members were least likely to mention the *essential newborn care* theme compared to women with infants younger than 1-year-old and health workers in both districts. While it is commendable that community members mentioned an understanding of newborn care in focus groups, their discussion of this theme being less frequent than that of other groups focuses our attention on the importance of targeting community members for maternal-newborn health education.

On the whole, health workers were more expressive, giving a greater number of total responses with longer replies to questions than women with infants younger than 1-year-old and community members. Regarding the understanding of *essential newborn care*, it is predictable that health workers mentioned the theme a greater number of times than other groups. This could be explained by higher levels of education and literacy leading to a greater knowledge of maternal-newborn health care among health workers.

Geographic differences.

Although few geographic differences existed, focus group participants in Lundazi more often mentioned *traditional newborn protective rituals* than participants in Mansa/Chembe Districts. The greater number of responses in this theme likely demonstrates the continued adherence to traditional health beliefs in Lundazi District. Moving forward, it is of utmost

importance to be mindful of the traditional maternal-newborn health beliefs and newborn care practices in rural regions. The high number of responses in the *traditional newborn protective rituals* theme in Lundazi highlights the importance of understanding the local context and existing beliefs and health-seeking practices before proposing any policy changes. Conversely, participants in Lundazi focus groups were less likely to mention e*ssential newborn care* than those in Mansa/Chembe. Perhaps this finding signifies that less exposure to health education at facilities impacts their continued adherence to traditional cultural beliefs.

Participants in Mansa/Chembe were more verbally expressive than in Lundazi in all focus groups, giving a higher number of responses than in Lundazi even though the numbers of participants were well matched. Mansa District is in the Luapula provincial capital with a better road network than in Lundazi District. Focus group participants in Mansa/Chembe more often mentioned *essential newborn care* than those in Lundazi. Given the potentially easier access to health facilities in Mansa due to the better road network, participants could over time have more exposure to care and health education at health facilities thereby explaining their increased likelihood of mentioning and understanding *essential newborn care*.

Discussion

This focus group study described newborn care beliefs and health-seeking practices while examining the cultural and health system factors associated with the ways women seek care from the point of view of rural Zambian women with infants younger than 1-year-old, community members, and health workers. Themes at the levels of culture (macrosystem) and health care system (exosystem) were uncovered that support the identification of traditional and professional newborn care practices in rural Zambia. Keeping these themes in mind, along with Bronfenbrenner's (1994) proposition that human development takes place through processes of progressively more complex reciprocal interaction between an active, evolving biopsychological

individual and the people, objects, and symbols in its immediate environment, nurses and midwives can engage in health promotion practices aimed at improving newborn care and reducing illness. This study adds to the literature about cultural beliefs and practices of rural Zambians related to newborn care and health-seeking practices that influence maternal-newborn health. Findings from this first study informed the design of the 2nd and 3rd studies by providing a basis for understanding the rural Zambian context.

Substantiation of themes

Findings from focus groups relating to *traditional newborn protective rituals* (macrosystem) are consistent with various other studies in Zambia. Participants relayed culturally specific prevention of cough, care of the umbilical cord, early introduction of traditional porridge, familial roles, and community support. The use of traditional herbs and powders when caring for the umbilical cord corroborates findings from other studies in Zambia (Hamer et al., 2015; Herlihy et al., 2013; Maimbolwa et al., 2003; Sacks et al., 2015; Siwila, 2015).

Encouragingly, in all focus groups, participants were knowledgeable about *essential newborn care*. Overall, knowledge among participants verbalized understanding about the importance of exclusive breastfeeding while results related to the early initiation of complementary foods as protective factors is similar to findings reported by Gewa & Chepkemboi (2016) and Katepa-Bwalya et al. (2015). The importance of familial roles and involvement of family members in mother-newborn care seeking in Zambia has been documented previously (Gabrysch, McMahon, Siling, Kenward, & Campbell, 2016; Sialubanje, Massar, Hamer, & Ruiter, 2015; Sialubanje et al., 2016) as has the use of traditional medicine during labor (Dika, Dismas, Iddi, & Rumanyika, 2017; M'soka, Mabuza, & Pretorius, 2015).

Preservation of dignity (exosystem), reasons for not seeking antenatal care, and motives for home delivery were also identified by other studies in Zambia (Lori, Munro-Kramer, Mdluli, Musonda, & Boyd, 2016; Phiri, Fylkesnes, Ruano, & Moland, 2014; Sacks et al., 2017; Sinyange, Sitali, Jacobs, Musonda, & Michelo, 2016). The desire to preserve dignity and avoid being shamed by lack of privacy at the clinic and fear of receiving partner testing for STIs are important findings for health care providers to keep in mind when caring for pregnant women. To preserve dignity, changes are needed in rural Zambia to ensure the environment and facilities are mother and baby friendly, including:

1. Care is provided in a comfortable, clean, safe setting that promotes the well-being of women, newborns, families, and facility staff.
2. Women's needs, preferences, and privacy are respected.
3. The physical environment supports normal birth outcomes for the woman and baby (International Confederation of Midwives, White Ribbon Alliance, International Pediatric Association, & World Health Organization, 2015).

Maternal Duality

Linked together, the themes emerging from focus groups point toward a maternal duality for women in rural Zambia. Women with infants younger than 1-year-old in rural Zambia likely experience a dualistic sense of responsibility to satisfy both cultural and health system expectations when caring for their newborns (Figure 3.3). Women are pulled to engage in traditional protective newborn care rituals while at the same time being pushed to attend ANC and deliver at the health facility. Contributing to this dueling push-pull felt by mothers, in several communities in both Lundazi and Mansa/Chembe Districts, women face fines by chiefs and community leaders for failing to attend ANC or deliver at the health facility. In Zambia, Greeson

Figure 3.3 Maternal Duality between culture and health system in rural Zambia

and colleagues (2016) researched the frequency and perception of penalties for home delivery and found that while communities largely supported the use of penalties to promote facility delivery, the penalties introduced a new tax on poor rural women and may have deterred their utilization of postnatal and child health care services. Researchers viewed the imposition of penalties as a punitive adaptation that can impose new financial burdens on vulnerable women and contribute to widening health, economic, and gender inequities in communities (Greeson et al., 2016). These penalties add an additional layer of complexity and probable pressure on women to meet health system responsibilities.

The emergence of the *strong sense of family and community to protect the newborn* theme in focus groups with community members adds strength to the argument that women are pulled to meet cultural responsibilities placed on them by those outside the maternal-newborn dyad. Women likely feel pressured by husbands, grandmothers, and community members to maintain rural Zambian cultural beliefs about newborn care. In the health workers' focus groups, the uncovering of the preservation of dignity theme sheds light on the dichotomy women feel when considering access to the rural Zambian health system. According to health workers, women face barriers to meeting health system responsibilities because of a lack of privacy in facilities and a reluctance by their husbands to undergo partner testing for STIs. Again, even in the minds of health workers, women are being pulled in two different directions. They might recognize the need to meet health system responsibilities, but they feel compelled to satisfy responsibility to culture and family.

The maternal dualism felt by women to fulfill both cultural and health system responsibilities when caring for their newborns undoubtedly causes undue stress and anxiety for new mothers. Future studies should explore this maternal duality to better understand how nurses

and midwives can meet the psychosocial needs of this population. In rural Zambia, individual interviews with women rather than focus groups could be considered for a follow-up study allowing for confidentiality to be fostered as participants might be reluctant to express maternal duality in the open forum of a focus group.

Implications for Practice

Numerous implications for nursing practice emerged from this ecological systems investigation of cultural beliefs and health-seeking practices of rural Zambians related to newborn care. Traditional cultural practices reflect values and beliefs held by members of a community for periods often spanning generations (OHCHR, 1995). Every social grouping in the world has specific traditional cultural practices and beliefs, some of which are beneficial to all members, while others are harmful to a specific group, such as women and newborns (OHCHR, 1995). Nurses and midwives can promote the maintenance of cultural beliefs that benefit or at the very least do no harm to the mother-newborn dyad (microsystem) while encouraging the reframing of potentially detrimental practices.

Within the *traditional newborn protective rituals* (macrosystem) and *strong sense of family & community to protect the newborn* (mesosystem) themes, there were findings about the culture-specific prevention of cough, care of the umbilical cord, and early introduction of traditional porridge that carry implications for nursing practice. Cultural practices that are not harmful to the maternal-newborn dyad should be encouraged. For example, the traditional protective rituals to prevent cough and pneumonia involving fire and sperm have long-standing cultural roots and could be maintained – provided the newborn is not exposed to smoke for extended periods of time and the risk of burns is mitigated. On the other hand, the application of potentially harmful herbs and powders on the umbilical cord should be discouraged. Instead, an

alternative would be for nurses and midwives to advocate the use of daily chlorhexidine (4%) application to the umbilical cord stump during the first week of life to replace application of a harmful traditional substance to the cord stump (WHO, 2014).

To address the reluctance of rural Zambians to place newborns on their back to sleep until the cord falls off, nurses and midwifes can deliver culturally appropriate messages about safe sleep. Health professionals should educate mothers that when the newborn is not placed in a supine position to sleep it may contribute to aspiration or choking (NICHD, 2018) or place the child at risk for Sudden Infant Death Syndrome (AAP, 2016). Meanwhile, the introduction of traditional herbs mixed as a porridge at 1 month of age should be discouraged. The WHO (2018b) recommends that infants start receiving complementary foods at 6 months of age in addition to breast milk.

Regarding familial roles in the macrosystem, nurses and midwives have a duty to foster those that promote the health of the mother-newborn dyad. Beliefs inspiring monogamy by partners during pregnancy should not be discouraged--especially in light of the dangers of mother-to-child transmission of HIV/AIDS. The belief that no single or unmarried person in the community should touch the newborn baby is a protective ritual practiced by community members that reduces exposure to infection and controls the spread of disease. The often-mentioned recommendation by grandmothers to use traditional medicines to speed labor should be approached with sensitivity by health care professionals. Many countries have their own traditional or indigenous forms of healing that are firmly rooted in their culture and history (WHO, 2013). Nurses, midwives, and community health workers can incorporate the potential for harmful effects to the mother and newborn into health education messages.

Concerning the *preservation of dignity* (exosystem) theme, there is an obvious need for nurses and midwives to promote privacy and modify clinic spaces to allow women to feel more comfortable seeking care. Furthermore, it is important for nurses and midwives to reinforce the importance of partner testing for STIs during routine ANC even though there is a desire to preserve dignity. Achieving higher rates of partner HIV testing and couples testing among pregnant and postpartum women in sub-Saharan Africa is essential for the success of combination HIV prevention, including the prevention of mother-to-child transmission (Masters et al., 2016).

Limitations

Several limitations in this focus group study are worth mentioning. This was a purposive sample in two rural districts in Zambia and results cannot be generalized nor do they reflect changes over time. Findings expose the experience of focus group participants recruited at rural primary care health centers. The viewpoints of those not accessing the Ministry of Health facilities were not obtained, therefore, findings might not be applicable to those not seeking care in the clinics.

Furthermore, as with all research based on focus group methodology, an inherent power differential existed between participants and researcher. Another power differential occurred because recruitment was conducted by the nurse in charge and village chief, who are leaders in the community, and potential existed for participant selection biases. To address these limitations, the principal investigator situated herself within the local context, was mindful of power dynamics, and cultivated cultural humility through a process of reflection and by challenging her own cultural biases. I valued the insights offered by interpreters as I attempted to create a dialogue of understanding between me as an observer/outsider and focus group participants/insiders. I discussed the interpreters' description of the cultural meaning of the

mother-newborn care phenomenon with Zambian Ministry of Health staff and nongovernmental organization staff not participating in the focus groups to review what I observed and share reflections on conversations. I nurtured a strong relationship with partners from within the Ministry of Health at the district level. I wanted to make sure that I was not misrepresenting or discounting the culture of the groups included in the study. I also engaged in discussions with Zambian colleagues to gain a better understanding of the similarities and differences among focus group participants, potentially in ways that reflect privilege and power in their communities.

Use of local languages by participants within the communities and the lack of elaboration on a topic due to low literacy level could influence the researcher's ability to understand fine distinctions in meaning. Interpreters mitigated this potential limitation by being fluent in both local languages and English. They provided assistance in deciphering the cultural meaning of the mother-newborn care phenomenon while interpreting audio recordings and verbatim transcriptions of focus groups. Even with back-transcription of 20% of the focus groups, there is the potential for loss of meaning within the translations. Another limitation could be the inclusion of only the predominant local language as eligibility to participate in the focus groups.

Conclusion

These findings shed light on the beliefs and practices of rural Zambian women, community members, and health workers related to newborn care and health-seeking practices. Traditional newborn protective rituals and professional newborn care practices were identified. Findings also revealed a strong sense of family and community to protect the newborn using traditional belief systems. Positively, in general, rural Zambians have an understanding of essential newborn care according to WHO guidelines. The study uncovered a maternal duality between cultural and health system responsibilities faced by women caring for newborns.

While this focus group study provides important information, development of further research is vital to understand the maternal duality experienced by women with infants younger than 1-year-old as they strive to balance responsibilities associated with traditional protective newborn care rituals and essential newborn care practices. This focus group study lays the groundwork for developing future research to explore the push-pull felt by mothers navigating cultural practices and health system regulations to inform future interventions aimed at improving newborn care in rural Zambia where far too many newborns still face serious morbidity or death. It would be helpful to develop, validate, and collect data using an instrument to measure understanding of essential newborn care. Then, a mixed-message approach could be used to conduct individual interviews with women about cultural responsibilities and to collect data using an instrument measuring understanding of essential newborn care to further explore the concept of maternal duality in rural Zambia.

Moreover, a targeted exploration of the family's sense to protect the newborn is warranted to understand whether it is necessary to recommend policies in Zambian to increase involvement by husbands and grandmothers in routine professional maternal-newborn health care. Additional research should investigate the roles of husbands, grandmothers, and community members and explore their understanding of the benefits of their involvement in pregnancy and postpartum maternal-newborn care.

In conclusion, this focus group study described knowledge and beliefs about newborn care while examining the social and cultural factors associated with the ways women seek care from the perspective of rural Zambian women, community members, and health workers. Similarities and differences in knowledge and beliefs of newborn care were explored to identify traditional and professional newborn care practices in rural Zambia. Attention should be given to

the maternal duality experienced by women pulled between fulfilling cultural and health system responsibilities. Findings can be used to inform future interventions aimed at improving maternal-newborn care.

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CHAPTER 4

Maternal Knowledge of Essential Newborn Care in Rural Zambia

Introduction

Newborn care-seeking behavior of mothers relies heavily on their knowledge of newborn care. Although studies are limited on how to assess maternal knowledge of newborn care and danger signs (Kibaru & Otara, 2016; Nigatu, Worku, & Dadi, 2015; Senarath et al., 2007), it has been shown that poor knowledge of newborn danger signs delays care seeking (Sandberg et al., 2014). The expanded purpose of many maternity waiting homes (MWHs) is to increase newborn health knowledge (World Health Organization [WHO], 1996). MWHs are accommodations located near a health facility where women can stay toward the end of pregnancy and/or after birth to enable timely access to essential childbirth care or care for complications (Penn-Kekana et al., 2017). The availability of a MWH allows decision making to take place as part of birth preparedness (Vermeiden & Stekelenburg, 2017). One way to advocate for the health of the maternal-newborn dyad is by encouraging pregnant women to utilize MWHs (Buser & Lori, 2016).

Maternity waiting homes can be located near facilities that provide Basic Emergency Obstetric and Newborn Care (BEmONC) or Comprehensive Emergency Obstetric and Newborn Care (CEmONC). The functions that a BEmONC facility can provide include: (1) administering

parenteral antibiotics, (2) administering uterotonic drugs, (3) administering parenteral anticonvulsants, (4) manually removing the placenta, (5) removing retained products, (6) performing assisted vaginal delivery, and (7) performing basic neonatal resuscitation (WHO, 2009). A CEmONC facility can carry out 1-7 above, plus (8) perform surgery and (9) provide blood transfusion (WHO, 2009). It is recommended that pregnant women having risk factors with predictive value for the need of CEmONC, such as multiple pregnancy, previous postpartum hemorrhage, previous preterm birth, previous caesarian section, severe preeclampsia, or severe anemia, be admitted to a MWH near a CEmONC facility (Vermeiden & Stekelenburg, 2017).

Relevant to this study, the WHO (2017) released guidelines with recommendations related to newborn health. The guidelines for newborn health are meant to respond to these questions: (1) What health interventions should the newborn and young infant less than 2 months of age receive and when should s/he receive it? and (2) What health behaviors should a mother/caregiver practice (or not practice)? (WHO, 2017). The *WHO Recommendations on Newborn Health* (2017) are divided into sections on the promotion of newborn and young infant health and prevention of illnesses, along with a section on management of newborn and young infant illnesses. The WHO recommendations serve as a guideline for assessing maternal "Essential Newborn Care" knowledge in this quasi-experimental study. Topics assessed in this study assessing maternal "Essential Newborn Care" knowledge included: (1) umbilical cord care, (2) thermal and skin care, (3) nutrition, (4) prevention of diarrhea, and (5) newborn danger signs prompting care-seeking.

Umbilical cord care

Postpartum infections remain a leading cause of neonatal morbidity and mortality worldwide (Stewart & Benitz, 2016). A high percentage of these infections may stem from bacterial colonization of the umbilicus, because cord care practices vary in reflection of cultural traditions within communities and disparities in health care practices globally (Stewart & Benitz, 2016). Clean, dry cord care is recommended for newborns born in health facilities (WHO, 2017). Although dry cord care was widely promoted by the WHO as the standard of practice, researchers in the southern region of Zambia found many who practiced alternative approaches to cord care, which included a vast diversity of knowledge, disease constructs, and practices regarding cord function, tying, cutting, applications, care, and disposal (Herlihy et al., 2013).

Thermal and skin care

The WHO (2017) recommendations on newborn health also include initiation of kangaroo care, or skin-to-skin care, with mothers during the first hour after birth to prevent hypothermia and promote breastfeeding. The key features of kangaroo care are early, continuous, and prolonged skin-to-skin contact between the newborn and mother, exclusive breastfeeding, early discharge from the health facility, and close follow-up at home (Boundy et al., 2016; WHO, 2003). The Zambian Ministry of Community Development Mother and Child Health (MCDMCH) adopted kangaroo care in 2013 as part of the national Essential Newborn Care (ENC) Package and established a kangaroo mother care training center at the University Teaching Hospital in 2015 (Zambian Ministry of Health, 2015).

Nutrition

According to WHO guidelines (2017), all babies should be exclusively breastfed from birth until 6 months of age, at which time complementary foods should be initiated. The WHO

(2017) also recommends that all newborns, including low-birth-weight babies who are able to breastfeed, should be put to the breast as soon as possible after birth when they are clinically stable and the mother and baby are ready. The Zambian Ministry of Health recommends breastfeeding within an hour of birth and adopted exclusive breast feeding as a method of infant feeding from birth to six months (Tembo, Ngoma, Maimbolwa, & Akakandelwa, 2015).

Prevention of diarrhea

To prevent diarrhea, the WHO and UNICEF integrated Global Action Plan for Pneumonia and Diarrhea (2013) recommends increased use of improved sources of drinking water and sanitation facilities, universal immunization, HIV prevention, and healthy environments, including improved maternal hygiene through hand washing with soap. Dehydration can be prevented through the early administration of increased amounts of appropriate fluids available in the home, and promotion of exclusive breastfeeding (WHO, 2013).

Newborn danger signs prompting care-seeking

Regarding newborn health problems and recognition of danger signs, the WHO (2017) recommends assessment during each postnatal care (PNC) visit of the following signs: (1) stopped feeding well, (2) history of convulsions, (3) fast breathing, (4) severe chest in-drawing, (5) no spontaneous movement, (6) temperature >37.5°C, (7) temperature <35.5°C, and (8) any jaundice in first 24 hours of life or yellow palms and soles at any age. The newborn should be referred for further evaluation if any of these signs are present (WHO, 2017). Moreover, the family should be encouraged to seek health care early if they identify any of the above danger signs between PNC visits (WHO, 2017).

Lundazi District was part of the Saving Mothers, Giving Life (SMGL) public-private partnership to dramatically reduce maternal and newborn mortality in sub-Saharan African countries (SMGL, 2018a). To encourage women to seek care, SMGL trained respected community members as community health workers known as Safe Motherhood Action Groups (SMAGs), who teach pregnant women about the importance of delivering in a facility, having a birth plan, and practicing healthy behaviors during pregnancy and early childhood (SMGL, 2018b). SMAGs conduct home visits with women throughout their pregnancy to offer guidance and instructions and inform them about MWHs (SMGL, 2018b). SMAGs also conduct maternal-newborn health talks at health facilities and MWHs. Table 4.1 provides a summary of maternal-newborn health education classes offered to women staying at the MWHs and family or friends accompanying them by SMAGs and professional health workers. SMAGs were trained in focused ANC to identify danger signs, encourage women to start ANC early, attend ANC at least four times, and deliver with a skilled attendant (Jacobs, Michelo, & Moshabela, 2018). SMAGs were also trained in essential newborn care, including the provision of effective cord care, early initiation of exclusive breastfeeding, and reporting maternal-newborn deaths in the community (Jacobs, Michelo, & Moshabela, 2018).

Table 4.1 Summary of maternal-child health education classes taught at MWH sites

Maternal-Newborn Health Education Class Schedule
Danger signs for mother, labor, recognition and early signs and postpartum care
Nutrition and exercise during pregnancy
Good sanitation and hygiene to prevent diarrheal diseases
Post-partum family planning
Malaria in pregnancy
Danger signs for neonatal and well-baby care
Early initiation and exclusive breastfeeding
Post-partum family planning
Infant and young child feeding practices
Immunizations
STDs, HIV and AIDS

Statement of the Problem

Understanding maternal knowledge of "Essential Newborn Care" is fundamental when implementing interventions to reduce newborn mortality. According to the WHO (2017), basic care for all newborns should include promoting and supporting early and exclusive breastfeeding, keeping the baby warm, increasing hand washing, providing hygienic umbilical cord and skin care, identifying conditions requiring additional care, and counselling on when to take a newborn to a health facility. Recognizing that newborn health-seeking relies heavily on maternal knowledge of newborn care, it is important to assess awareness of "Essential Newborn Care" to inform clinical and policy recommendations.

The aim of this quasi-experimental study was to compare maternal knowledge of newborn care in two groups of women in rural Zambia: one group used a MWH prior to delivery and the other group did not use a MWH. The primary outcome was maternal "Essential Newborn Care" knowledge. The research question was: "What is the difference in maternal "Essential Newborn Care" knowledge among women who did and did not use a MWH prior to delivery?"

The research hypothesis was that maternal "Essential Newborn Care" knowledge would be higher for women who used a MWH prior to delivery.

Theoretical Framework

The *Ecological Systems Theory*, operationalized for maternal-newborn health and MWH use, was used to guide this quasi-experimental study (Bronfenbrenner, 1977, 1979, 1989, 1994). Bronfenbrenner's theory is ideal because it takes a broader view of multi-level factors that influence health behaviors and is useful for guiding complex interventions (Kaiser et al., 2019). In this study, maternal-newborn outcome variables could be affected if independent maternal-newborn health indicators are influenced by factors present in the *Ecological Systems Theory for Maternal-Newborn Health and MWH Use*, such as individual maternal-newborn dyad (microsystem), interpersonal (mesosystem), healthcare organization (exosystem), social and cultural (macrosystem), and public health policy (chronosystem).

Methods

A quasi-experimental, two-group comparison design was employed using a face-to-face survey approach to determine whether MWH use has an impact on maternal knowledge of newborn care. The study protocol and tool received institutional review board (IRB) approval from the University of Michigan and Zambian Ethics Reviews Converge IRB, and the National Health Research Authority in Zambia was informed.

Because illiteracy in rural Zambia is substantial, with few people able to read or write in English, and Tumbuka, the native language in Lundazi District, is a non-written oral language, recruitment for the evaluation was conducted orally after identifying eligible women from the delivery register (Appendix G). Zambian research assistants (RAs) (conversant in Tumbuka language) served as interpreters. They were trained on data collection protocols, identified

women who met the inclusion criteria, and explained the study (Appendix H). Research assistants were trained to ask all questions and wait for response without prompting. They were also trained to record all responses given to questions posed in face-to-face interview.

Sample and Setting

The quasi-experimental study was performed in the Eastern Province of rural Zambia at Lundazi District Hospital and the CEmONC MWH on the grounds of the hospital. Lundazi District Hospital is the Zambian governmental Ministry of Health (MOH) CEmONC referral facility for the area. The last national census in Zambia, conducted in 2010 (Chief Statistics Office, 2018), lists the total population of Lundazi District as 323,870 (Chief Statistics Office, 2015).

This study built from a larger parent study that evaluated MWHs in rural Zambia using a controlled before-and-after, quasi-experimental design. A collaborative team of researchers developed this study to measure the impact of the MWH model on facility delivery among women living farthest (≥10 km) from their designated health facility, which would inform decision-making policy in Zambia and globally (Scott et al., 2018). The study began in March 2016 and was completed in December 2018 (Scott et al., 2018). Women coming from study sites in Lundazi district included in the parent study were also included in this study about maternal "Essential Newborn Care" knowledge.

The sample consisted of women aged 15 years and above from an area in Lundazi district with MWHs recently built as part of the parent study. The specific age cut-off was established because, in Zambia, married, pregnant, or parent-children are considered "emancipated minors" if aged ≥15. Participants included both those who used a MWH and those who did not use a MWH prior to delivery. MWHs were located at five BEmONC facilities and one CEmONC

facility in the region. A purposeful sample of participants including postpartum women referred from five BEmONC facilities associated with MWHs and five BEmONC comparison facilities without MWHs admitted in the Lundazi District referral hospital and pregnant women from the same communities awaiting delivery at the CEmONC MWH were invited to participate in the study. Participants were identified by directly approaching women in the delivery ward and the CEmONC MWH and asking whether they live in and were referred from the ten communities included in the study. All other pregnant and postpartum women were excluded from participating in the study.

Measurement

Given the absence of a validated tool in the literature, a questionnaire was developed for this study to assess maternal knowledge of essential newborn care in rural Zambia. The structured *Maternal Knowledge of Newborn Care Questionnaire* (Appendix I) was administered verbally by face-to-face interview to assess maternal knowledge of essential newborn care in rural Zambia (n=250). Maternal knowledge was defined as participants mentioning at least one item included in the WHO (2017) guidelines for newborn health or the WHO and UNICEF integrated Global Action Plan for Pneumonia and Diarrhea (2013) in response to a question.

The *Maternal Knowledge of Newborn Care Questionnaire* was pre-tested for contextual appropriateness and meaning-in-context by asking nurses, midwives, local residents, and RAs familiar with the language and culture to explain their understanding of terms and concepts posed in the questionnaire. Conceptual and cultural meanings where taken into consideration and the questionnaire was modified and tested again by asking others familiar with the local culture to review the modifications and propose any additional adaptations. Interviews were conducted in a private room at the CEmONC MWH or at the CEmONC facility.

Study Variables

The main independent variable in this study was MWH use before delivery. Independent sociodemographic and previous obstetric history variables assessed on the *Maternal Knowledge of Newborn Care Questionnaire* included age, education level, marital status, gravida (number of times pregnant), parity (number of live births), and number of stillbirths and living children (Table 4.2). Other independent predictor variables that were assessed included referral village, attendance and topic of health talks at MWHs. Dependent outcome variables assessed included maternal knowledge of umbilical cord care, thermal and skin care, nutrition, prevention of diarrhea, and newborn danger signs.

Data Collection

Two team members, the primary investigator and an RA, conducted face-to-face interviews from September 1, 2017 through January 31, 2018 using the structured *Maternal Knowledge of Newborn Care Questionnaire* as a guide. Prior to the verbal interviews, participants were privately consented. The Teach Back Method (2019) was used to confirm understanding by asking potential participants to describe their understanding of the study's purpose, procedure, risks, and benefits using open-ended prompts and repeating the material until understanding was achieved. If they agreed, a time was decided upon for the one-time interview to take place. Participants were not paid to be in the study. Snacks and a juice drink were provided after the discussion as incentives to thank participants for their time. Per Zambian government regulations, the cost of snacks and juice drink did not exceed $6.

No certified translation services are available for Tumbuka in rural Zambia; however, the RA was fluent in verbal Tumbuka dialect and culture as well as in English. The RA simultaneously translated the responses and filled out the *Maternal Knowledge of Newborn Care*

Table 4.2 Operational definition of variables in maternal knowledge of newborn care questionnaire

Independent Variables		**Definition**
Use of MWH before delivery	MWH used	Yes or no to used a MWH
	Name of MWH used	MWH mother used before delivery
Sociodemographic	Age of mother	Age in completed years as at last birthday
	Education	Number of years of school completed
	Marital status	Single, married, living together, separated, divorced, or widowed
Previous Obstetric History	Gravida	Number of pregnancies the woman has had including the current pregnancy
	Parity	Number of previous live births prior to this pregnancy
	Stillbirths	Number of previous stillbirths
	Living children	Number of living children
Referral Village	Name of mother's referral village	Mother referred from facility with or without a MWH
Health talks at MWHs	Attendance of health talk at MWH	Yes or no to attend a health talk at MWH
	Topic of health talk at MWH	Any topic of health talk attended at MWH
	Person who gave health talk at MWH	Any person who gave health talk at MWH
Dependent Variables: "Essential Newborn Care"		
Umbilical cord care	Knowledge of umbilical cord care	Any method/item mentioned to care for newborn's umbilical cord care at home
Thermal and skin care	Knowledge of kangaroo care	Any thermal care method/item mentioned to keep newborn warm
	Knowledge of newborn skin care	Any newborn skin care method/item mentioned
Nutrition	Knowledge of exclusive breastfeeding	Any exclusive breastfeeding method/item mentioned
	Length of breastfeeding	Number of months mother plans to breastfeed
	Timing for introduction of complementary foods	Age when plans to introduce complementary foods (months)
Prevention of diarrhea	Knowledge of how to prevent diarrheal diseases	Any method/item mentioned about good sanitation and hygiene to prevent diarrheal diseases
Recognition of newborn danger signs	Newborn danger signs	Any newborn danger sign mentioned warranting newborn care-seeking

Questionnaire. Upon completion of the interview, survey response data were entered into an electronic database by the RA. All questionnaires were double-checked by the primary investigator to verify the consistency of the data entered.

At the end of the face-to-face interview, if a woman provided a response to any open-ended question that was potentially harmful (i.e. use of traditional herbs on umbilical cord), the RA and primary investigator provided health education on topics included in the WHO (2017) newborn health guidelines. Also, if a woman answered "Don't know" in response to a question, the RAs and primary investigator provided health education about the topic.

The primary "Essential Newborn Care" outcomes (1) umbilical cord care, (2) thermal and skin care, (3) nutrition, (4) prevention of diarrhea, and (5) newborn danger signs were measured by dichotomizing women's unprompted responses on the *Maternal Knowledge of Newborn Care Questionnaire*. If women answered "Don't know" to a question, or provided a response to any open-ended question that was potentially harmful, the response was coded as = 1. If participants mentioned at least one item included in the WHO (2017) guidelines for newborn health or the WHO and UNICEF integrated Global Action Plan for Pneumonia and Diarrhea (2013) in response to a question, the response was coded as = 0.

Data Analysis

Descriptive statistics were obtained by performing crosstabulation. Pearson chi-square tests were performed to evaluate associations among sociodemographics, previous obstetric history, and MWH use. Frequency distributions, percentages, means, and standard deviations were calculated. To analyze responses on the *Maternal Knowledge of Newborn Care Questionnaire*, bivariate analysis was performed to examine the relationship between pairs of variables and to assess the likelihood of variables having affected maternal knowledge outcomes.

The correlation coefficient provided information about the strength of the relationship and whether the relationship was positive or negative. Odds ratios with 95% confidence interval (CI) were computed to assess the strength and significance level of the association between variables in the newborn care questionnaire. Independent t-tests were used to compare knowledge for women who did and did not use a MWH. The chi-square test was used to control for confounding variables. In cases where the sample size was too small to use a chi-squared test, a Fisher's exact test was used.

Logistic regression with a dichotomized MWH variable (non-MWH = 0, MWH = 1) was performed. Regression models were also conducted to examine the independent contribution of variables of interest (such as age and whether women answered "Don't Know") to maternal "Essential Newborn Care". Regressions were performed controlling for categorized variables such as age, education, gravida (number of pregnancies), parity (number of live births), which could interact with maternal knowledge as the outcome variable. *P*-values < .05 were considered statistically significant. All statistical analysis was performed using SPSS version 25.

Results

Demographics

Maternal sociodemographic characteristics were comparable for those included in the study who used a MWH (*n* = 135) and those who did not use a MWH (*n* = 115). Seven women out of 257 approached declined participation in the study. There were no significant differences between demographic characteristics relating to age, education, and marital status among the groups of MWH and non-MWH users (Table 4.3). Among women who used a MWH, 28% (*n* =37) stayed at the CEmONC MWH located at Lundazi District Hospital while 72% (*n* = 96) stayed at BEmONC MWH facilities. Most participants (63.2%) were between 15-24 years of age (*n* = 158), 71.6% (*n* = 179) had less than an eighth grade

Table 4.3 Sociodemographic characteristics

		MWH Use		Statistical Tests	
Maternal-Newborn Health Indicator	**Total (n=250)**	**Stayed at MWH (n =135)**	**Did not stay at MWH (n = 115)**	**Pearson Chi-Square**	**P value**
	% (n)	**% (n)**	**% (n)**		**(2-sided)**
Age group (years)					
15 to 19	29.6% (74)	33.3% (45)	25.2% (29)	1.734	.785
20 to 24	33.6% (84)	33.3% (45)	33.9% (39)		
25 to 29	12% (30)	11.9% (16)	12.2% (14)		
30 to 34	9.2% (23)	8.9% (12)	9.6% (11)		
35 and older	12.4% (31)	11.1% (15)	13.9% (16)		
Mean (SD)	24.2 (6.8)				
Missing	3.2% (8)	1.5% (2)	5.2% (6)		
Education level					
None	8.8% (22)	8.9% (12)	8.7% (10)	1.451	.694
Lower (1-4) & Upper Primary (5-7)	62.8% (157)	60.7% (82)	65.2% (75)		
Junior (8-9) & Senior Secondary (10-12)	25.6% (64)	26.7% (36)	24.3% (28)		
Tertiary	0.4% (1)	none	0.9% (1)		
Missing	2.4% (6)	3.7% (5)	0.9% (1)		
Marital status					
Single	5.2% (13)	5.9% (8)	4.3% (5)	0.345	.557
Married	94.0% (235)	92.6% (125)	95.7% (110)		
Missing	0.8% (2)	1.5% (2)	None		

education, and the vast majority of participants (94%) were married. The previous obstetric history characteristics of MWH and non-MWH users were not significantly different (Table 4.4). When a participant attended a health talk at a MWH, community health workers (SMAGs) gave 45% of education sessions and 22% were given by a nurse. There were no significant differences among MWH and non-MWH users relating to planned length of breastfeeding and introduction of complementary foods (Table 4.5).

Table 4.4 Previous obstetric history characteristics

		MWH Use		**Statistical Tests**	
Maternal Health Indicator	**Total (n=250)**	**Stayed at MWH (n =135)**	**Did not stay at MWH (n = 115)**	**Pearson Chi-Square**	**P value**
	% (n)	**% (n)**	**% (n)**		**(2-sided)**
Gravida					
1	38.4% (96)	42.2% (57)	33.9% (39)	3.821	.281
2-5	51.6% (129)	47.4% (64)	56.5% (65)		
6 and above	8.8% (22)	8.9% (12)	8.7% (10)		
Mean (SD)	2.7 (1.9)				
Missing	1.2% (3)	1.5% (2)	0.9% (1)		
Parity					
0	19.2% (48)	19.3% (26)	19.1% (22)	0.070	.966
1-5	74.0% (185)	71.9% (97)	76.5% (88)		
6 and above	3.2% (8)	3.0% (4)	3.5% (4)		
Mean (SD)	1.9 (1.7)				
Missing	3.6% (9)	5.9% (8)	0.9% (1)		
Stillbirths					
0	70.4% (176)	65.9% (89)	75.7% (87)	0.226	.634
1-5	24.4% (61)	24.4% (33)	24.3% (28)		
Mean (SD)	0.35 (0.67)				
Missing	5.2% (13)	9.6% (13)	none		
Living children					
0	20.8% (52)	22.2% (30)	19.1% (22)	0.491	.491
1-5	74% (185)	71.9% (97)	76.5% (88)		
6 and above	3.2% (8)	3.0% (4)	3.5% (4)		
Mean (SD)	1.8 (1.7)				
Missing	2% (5)	3.0% (4)	0.9% (1)		

Table 4.5 Planned length of breastfeeding and introduction of complementary foods

		MWH Use		Statistical Tests	
Maternal "'Knowledge of Newborn Care" Survey Question	**Total (n=250)**	**Stayed at MWH (n =135)**	**Did not stay at MWH (n = 115)**	**Pearson Chi-Square**	**P value**
	% (n)	**% (n)**	**% (n)**		**(2-sided)**
How long do you plan to breastfeed? (months)					
1-18	16.8% (42)	18.5% (25)	14.8% (17)	1.894	.595
19-24	62.0% (155)	57.8% (78)	67.0% (77)		
25 and above	10.0% (25)	11.1% (15)	8.7% (10)		
Don't know	5.2% (13)	4.4% (6)	6.1% (7)		
Mean (SD)	22.7 (6.8)				
Missing	6.0% (15)	8.1% (11)	3.5% (4)		
When do you plan to give your baby complementary foods? (months)					
1-6	38.8% (97)	43.7% (59)	33.0% (38)	3.900	.272
7-12	41.2% (103)	39.2% (53)	43.5% (50)		
13-24	1.6% (4)	0.7% (1)	2.6% (3)		
Don't know	17.2% (43)	15.6% (21)	19.1% (22)		
Mean (SD)	8.1 (3.4)				
Missing	1.2% (3)	0.7% (1)	1.7% (2)		

"Essential Newborn Care" knowledge

Table 4.6 presents the most common responses (≥ 5%) to questions posed to both MWH and non-MWH users about maternal knowledge of "Essential Newborn Care". The research study hypothesis that maternal knowledge of "Essential Newborn Care" would be higher for women who used a MWH prior to delivery was not supported. When controlling for age, education, gravida, and parity, there were no significant differences among MWH and non-MWH users on the *Maternal Knowledge of Newborn Care Questionnaire* assessing (1) umbilical cord care, 2) thermal and skin care, (3) nutrition, (4) prevention of diarrhea, and (5) newborn danger signs prompting care-seeking (Table 4.7).

Table 4.6 Most common responses to maternal "Essential Newborn Care" questions

Maternal "Essential Newborn Care" Knowledge Survey Question		MWH Use		Statistical Tests	
	Total (n=250) %[1] (n)	Stayed at MWH (n =135)	Did not stay at MWH (n = 115)	Pearson Chi-Square	P value (2-sided)
What health problems in your newborn would make you want to take your baby to the clinic?					
Fever	66.7% (157)	72.4% (96)	60.0% (61)	89.448	.556
Excessive crying	37.8% (94)	38.8% (52)	36.5% (42)		
Weak suckling or feeding	20.1% (50)	15.7% (21)	25.2% (29)		
Shivering	16.5% (41)	15.7% (21)	15.7% (20)		
Breathing difficulties or rapid breathing	15.7% (39)	12.7% (17)	19.1% (22)		
Don't know	10.4% (26)	8.2% (11)	13.0% (15)		
How you will care for your baby's umbilical cord when you get home?					
Plain Water	40.2% (100)	39.6% (53)	40.9% (47)	22.412	.264
Don't know	36.0% (90)	33.3% (45)	39.1% (45)		
Soap (Lifebuoy)	8.8% (22)	10.4% (14)	7.0% (8)		
Breastmilk	5.6% (14)	9.0% (12)	1.7% (2)		
Traditional Herbs	5.2% (13)	4.5% (6)	6.1% (7)		
Have you ever heard the term "Kangaroo Care", or skin-to-skin care, for the baby to keep them warm?					
Yes	21.6% (54)	19.3% (26)	24.3% (28)	2.201	.333
No	78% (195)	80.7% (109)	74.8% (86)		
Tell me what you know about "Kangaroo Care", or skin-to-skin care, for the baby to keep them warm					
Baby naked against your skin	6.8% (17)	8.2% (11)	5.2% (6)	14.841	.190
Promotes bonding and/or attachment	5.2% (13)	5.2% (7)	5.2% (6)		
How will you care for your baby's skin when you get home?					
Petroleum Jelly	35.7% (89)	40.3% (54)	30.4% (35)	20.532	.550
Glycerin	30.5% (76)	27.6% (37)	33.9% (39)		
Cooking Oil	18.1% (45)	17.2% (23)	19.1% (22)		
Don't know	8.4% (21)	6.0% (8)	11.3% (13)		
Tell me what you know about exclusive breastfeeding					
Only give breastmilk for 6 months	85.9% (214)	85.1% (114)	87.0% (100)	14.391	.347
Don't know	9.6% (24)	9.7% (13)	9.6% (11)		
Tell me what you know about good sanitation and hygiene to prevent diarrheal diseases					
Maintain hygienic environment	43.8% (109)	46.3% (62)	40.9% (47)	27.840	.315
Take baby to clinic	27.3% (68)	29.9% (40)	24.3% (28)		
Don't know	17.7% (44)	13.4% (18)	22.6% (26)		
Wash hands before and after using toilet	13.7% (34)	14.9% (20)	12.2% (14)		
Wash hands before and after eating	13.3% (33)	14.2% (19)	12.2% (14)		
Exclusively breastfeed	11.9% (16)	3.5% (4)	8% (20)		

[1]All items mentioned were recorded, total percentage of responses to each question will not equal 100%

Table 4.7 Logistic regression for MWH use and maternal "Essential Newborn Care" knowledge

Maternal-Newborn Health Indicator	Adjusted OR[a] Exp (B)	95% CI for Exp (B)	
		Lower	Upper
Umbilical cord care	1.027	.135	7.787
Skin care	.776	.205	2.940
Thermal care	1.571	.626	3.939
Exclusive breastfeeding	.196	.023	1.659
Prevention of diarrhea	.525	.233	1.182
Newborn danger signs prompting care-seeking	.651	.188	2.258

[a]controlling for age, education, gravida, and parity

Overall Sample Characteristics and Maternal Knowledge of "Essential Newborn Care"

While there were no significant differences in maternal knowledge of "Essential Newborn Care" among MWH and non-MWH users, some significant differences were found between predictor variables such as sociodemographic, previous obstetric history, and maternal "Essential Newborn Care" knowledge. Table 4.8 summarizes differences in independent variables and maternal "Essential Newborn Care" knowledge among MWH and non-MWH users. A description of differences in maternal "Essential Newborn Care" knowledge when both MWH and non-MWH users are combined and examined as an overall sample follows in this next section.

Table 4.8 Summary of differences in overall sample characteristics and maternal knowledge of "Essential Newborn Care"

		MWH Use		Statistical Tests	
Maternal-Newborn Health Indicator	**Total (n=250)**	**Stayed at MWH (n =135)**	**Did not stay at MWH (n = 115)**	**Pearson Chi-Square**	**P value**
	% (n)	**% (n)**	**% (n)**		**(2-sided)**
Thermal and skin care					
Older women who used a MWH more likely to know how to care for newborn's skin					
15 to 24 years, "Don't know" responses	5.2% (13)	1.2% (3)	4.0% (10)	-2.033	.042*
25 and older, "Don't know" responses	2.8% (7)	1.2% (3)	1.6% (4)		
Prevention of diarrhea					
Women with all levels of primary and secondary education who used a MWH more likely to know about good sanitation and hygiene to prevent diarrheal diseases					
Lower & Upper Primary, "Don't know" responses	11.3% (28)	4.4% (11)	6.9% (17)	-2.158	.031*
Junior & Senior Secondary, "Don't know" responses	4.4% (11)	1.2% (3)	3.2% (8)		
Women with fewer pregnancies who used a MWH were more likely to know how to prevent diarrhea					
Gravida 1, "Don't know" responses	7.6% (19)	3.2% (8)	4.4% (11)	-2.065	.034*
Gravida 2-5, "Don't know" responses	8.8% (22)	3.2% (8)	5.6% (14)		
Gravida ≥ 6, "Don't know" responses	1.6% (4)	0.8% (2)	0.8% (2)		

Age

In the overall sample, among both groups, younger women answered "Don't know" more often than older women (≥ 25 years) to every question on the *Maternal Knowledge of Newborn Care Questionnaire* (*n* = 158) (Table 4.9). However, in both groups, there was insufficient evidence to conclude a significant relationship between younger age (< 25 years) and answering "Don't know" when asked about umbilical cord ($p < .001$, 95% CI [0.455, 1.292]), skin care (*p*

= .027, 95% CI [0.186, 1.144]), exclusive breastfeeding (p = .011, 95% CI [0.443, 2.402]), and newborn danger signs (p = .013, 95% CI [0.258, 1.338]).

Table 4.9 Younger age (n = 158) and "Don't know" responses

Maternal Essential Newborn Care Question	**Fisher's Exact Test**
Tell me about how you will care for your baby's umbilical cord when you get home.	< .001
How will you care for your baby's skin when you get home?	.027
Tell me what you know about "Kangaroo Care", or skin-to-skin care, for the baby to keep them warm	.532
Tell me what you know about exclusive breastfeeding	.011
Tell me what you know about good sanitation and hygiene to prevent diarrheal diseases.	.358
What health problems would make you take your newborn baby to the clinic?	.013

Education

In both groups of the overall sample, women with lower (1-4) and upper primary (5-7) (n = 157) education answered "Don't know" more often than those with any amount of secondary education (n = 64) to all questions specific to "Essential Newborn Care".

Previous obstetric history

In the overall sample, women with six or more pregnancies (n = 22) were less likely to answer "Don't know" to "Essential Newborn Care" questions. In both groups, more primigravida women (n = 96) responded "Don't know" to all questions on the *Maternal Knowledge of Newborn Care Questionnaire* than those with more than one pregnancy.

Discussion

In general, women in this study demonstrated "Essential Newborn Care" knowledge in accordance with the WHO (2017) guidelines for newborn health. The overall knowledge of pregnant and postpartum women included in the study may reflect the success of the SMGL program and health education of SMAGs at MWHs and in all communities included in the study. The lack of significant differences in demographic characteristics relating to age, education, and marital status among groups of MWH users and non-users suggests that the communities were well matched, with homogenous populations. Younger women need more education by nurses, midwives, and community health workers about newborn health problems and danger signs, exclusive breastfeeding, umbilical cord care, and newborn skin care. Additionally, health education efforts to reinforce the avoidance of traditional herb use for umbilical cord care (reported by 5.2% of women in this study) are necessary.

Almost all the individual health facility comparisons were not significant; the only significant difference among MWH users and non-users was in the MWH users' ability to identify good hygiene and sanitation to prevent diarrhea. Given that sepsis is a main cause of newborn deaths in Zambia (UN IGME, 2018), it is encouraging that women in all communities are aware of newborn danger signs related to infection. However, findings demonstrate that health talks at MWHs in this study are falling short of their intended benefits and highlight the importance of placing additional emphasis on providing health talks at MWHs. Since 45% of health talks at MWHs were given by SMAGs, it might be worthwhile to reinforce the importance of educating mothers about newborn care and care-seeking while they are using the MWH. Furthermore, recognizing that nearly 20% of women report learning about newborn care from family members, it might be worthwhile expanding the SMAG program to include education

sessions for family members and/or inviting family members to participate in newborn health education sessions led by nurses and midwives at the MWH or health facility.

While there were no statistically significant differences in answering "Don't know" for any questions among women who used the CEmONC MWH located at Lundazi District Hospital and those who used BEmONC MWHs in this study, further research is needed to understand whether there are differences in maternal knowledge of newborn care and care-seeding for women using MWHs at other CEmONC facilities compared to those using MWHs near, rather than at, BEmONC facilities.

In this quasi-experimental study, outcomes were likely influenced by factors present in the operationalized *Ecological Systems Theory for Maternal-Newborn Health and MWH Use* including individual maternal-newborn dyad (microsystem) and public health policy (chronosystem). Factors at the individual maternal-newborn dyad (microsystem) level that may influence "Essential Newborn Care" knowledge included age, education, marital status, education, gravida, parity, stillbirths, living children, plan for delivery, referral for delivery, MWH use, and health talks. Other factors at the microsystem level that likely influenced responses on the *Maternal Knowledge of Newborn Care Questionnaire* included maternal knowledge of the following: newborn health problems and danger signs, umbilical cord care, skin and thermal care, nutrition (exclusive breastfeeding, introduction of complementary foods), sanitation and hygiene to prevent diarrheal disease, and timing of first post-natal visit.

When the *Ecological Systems Theory* was operationalized to focus on maternal-newborn health and MWH use, factors at the public health policy (chronosystem) level encompasses change or consistency over time in the characteristics of the individual maternal-newborn dyad and also of the environment where they live. At the public health policy level, factors influencing

outcomes in the study included national and local government agency support for maternal-newborn health including district-wide participation in the SMGL program. Zambian Ministry of Health promotion of and funding for maternal-newborn health and MWH use in Lundazi district also influence study outcomes at the chronosystem level. Based on our operationalization of the grand *Ecological Systems Theory* for maternal-newborn health and MWH use, we conclude that it can be applied globally, which further validates it, especially since, to our knowledge, this study was the first to apply this theory to healthcare in rural Zambia.

Limitations

Results of this quasi-experimental study examining maternal "Essential Newborn Care" knowledge may not be generalizable to other districts in Zambia or the broader population in Zambia or other countries in sub-Saharan Africa due to likely cultural and socioeconomic differences. Group differences in numerous factors that could not be controlled for, such as differences in access to and quality of education and/or healthcare in rural study sites, may play a role in maternal "Essential Newborn Care" knowledge.

Causality cannot be clearly determined in this study. Also, an inherent power differential existed between participants and researcher, which could potentially have biased the responses from participants. Another potential limitation is that the sample straddles the actual delivery period by including pregnant woman at the CEmONC MWH and postpartum women at the district hospital.

The MWHs at the parent study sites opened at varying times, from one month to nearly a year, before this assessment of maternal "Essential Newborn Care" was conducted. The varying lengths of time MWHs were functioning in villages included in this study could have impacted the amount of exposure to health education received prior to referral for CEmONC care and

could partially explain why there were no significant differences in maternal "Essential Newborn Care" knowledge among MWH users and non-users.

Conclusion

To our knowledge, this study is the first to assess and compare maternal "Essential Newborn Care" knowledge among women who used and did not use a MWH in rural Zambia. Generally, both MWH users and non-users in the rural district were knowledgeable about: (1) umbilical cord care, (2) thermal and skin care, (3) nutrition, (4) prevention of diarrhea, and (5) newborn danger signs prompting care-seeking, and no significant differences were found among groups. Nevertheless, younger age and primigravida showed significant relationships with lower maternal "Essential Newborn Care" knowledge among both MWH users and non-users.

The structured *Maternal Knowledge of Newborn Care Questionnaire* was developed for use in this study because of the absence of a validated tool in the literature to assess maternal "Essential Newborn Care" knowledge. Future directions for research include developing a more rigorous rating of responses on the questionnaire, with a scale to assess each maternal "Essential Newborn Care" outcome. The *Maternal Knowledge of Newborn Care Questionnaire* should be validated in future research by demonstrating adequate reliability and validity.

Currently, most MWHs are located in rural areas. Recent health policy changes recommend a shift away from rural delivery facilities toward larger urban facilities for better maternal-newborn outcomes (Kruk et al., 2018; Montagu et al., 2017). There is an exceptionally wide gap in knowledge about the interest in and viability of MWH use in urban environments. Future studies should evaluate MWH use in an urban setting and incorporate a pre- and post-assessment of maternal "Essential Newborn Care" knowledge into the study design to identify any trends associated with MWH use.

The findings of this quasi-experimental study highlight the need for targeted health education by professional and community health workers towards younger and primigravida women. Improvement of maternal "Essential Newborn Care" knowledge through health education received from health talks at MWHs may potentiate long-term benefits for improved maternal-newborn health and delivery outcomes in rural Zambia.

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CHAPTER 5

A Case Series of Maternal-Newborn Delivery Outcomes in Rural Zambia: Comparison of Referral to a District Hospital from Facilities with and Without a Maternity Waiting Home

Introduction

In the southern African country of Zambia, 224 maternal deaths occur per 100,000 live births (UNICEF, 2017) and there are approximately 14,000 newborn deaths each year (38 babies each day) (WHO, 2018). The newborn mortality rate in rural areas in Zambia is 34 per 1,000 live births (UNICEF, 2017). In Zambia, the main causes of newborn deaths are birth asphyxia, prematurity, and sepsis (United Nations Inter-Agency Group for Child Mortality Estimation [UN IGME], 2018).

One of the biggest challenges in achieving access to skilled care in countries with large rural populations such as Zambia is connecting women with obstetric emergencies to necessary care (Henry et al., 2018). Universal access to Emergency Obstetric and Newborn Care (EmONC) is considered essential to reduce maternal mortality and requires that all pregnant women and newborns with complications have rapid access to well-functioning facilities that include a broad range of service delivery types and settings (Otolorin, Gomez, Currie, Thapa, & Dao, 2015; Campbell, Graham, & Lancet Maternal Survival Series steering group, 2006). Emergency

Obstetric and Newborn Care facilities are divided into those meeting tiered standards of care for providing either Basic Emergency Obstetric and Newborn Care (BEmONC) or Comprehensive Emergency Obstetric and Newborn Care (CEmONC). Signal functions for EmONC are the major interventions for averting maternal and newborn mortalities (Roy, Biswas, & Chowdhury, 2017) and help differentiate between levels of care provided at a facility. Table 5.1 provides an overview of signal functions.

Table 5.1: Signal functions used to identify basic and comprehensive emergency obstetric care services (WHO, 2009)

BEmONC services	**CEmONC services**
1. Administer parenteral antibiotics	8. Perform signal functions 1–7, plus: Perform surgery (e.g. caesarean section)
2. Administer uterotonic drugs (i.e. parenteral oxytocin)	9. Perform blood transfusion
3. Administer parenteral anticonvulsants for preeclampsia and eclampsia (i.e. magnesium sulfate)	
4. Manually remove the placenta	
5. Remove retained products (e.g. manual vacuum extraction, dilation and curettage)	
6. Perform assisted vaginal delivery (e.g. vacuum extraction, forceps delivery)	
7. Perform basic neonatal resuscitation (e.g. with bag and mask)	
A basic emergency obstetric care facility is one in which all functions 1–7 can be performed. A comprehensive emergency obstetric care facility is one in which all functions 1–9 can be performed.	

In Zambia, pregnant women are referred from rural primary health facilities, where BEmONC services are provided, to the district hospital where CEmONC can be provided when a potential complication is recognized by a skilled birth attendant. Women are often referred to a CEmONC facility for prolonged labor (1st or 2nd stage), obstructed labor, poor progress, and cephalopelvic disproportion (CPD). Prolonged labor is defined as labor lasting longer than 24 hours after the onset of regular, rhythmical painful contractions accompanied by cervical dilation (WHO, 2008a). Meanwhile, obstructed labor implies that, in spite of strong uterine contractions, the fetus cannot descend through the pelvis because an insurmountable barrier prevents its descent (WHO, 2008a). Cephalopelvic disproportion occurs when there is a misfit between the fetal head and the pelvis, making it difficult or impossible for the fetus to pass safely through the pelvis (WHO, 2008a). In low- and middle-income countries (LMICs), CPD is often due to stunted growth of the maternal pelvic bones from malnutrition, early childbearing, or abnormalities of the shape of the pelvis due to rickets or osteomalacia (WHO, 2008a).

The use of maternity waiting homes (MWHs) may offer a possible referral source from BEmONC to CEmONC in rural Zambia, ultimately serving as an intervention to improve maternal-newborn delivery outcomes. Maternity waiting homes provide a setting where women can be accommodated during the final weeks of their pregnancy near a hospital with essential obstetric facilities (WHO, 1996). In LMICs, MWHs can help overcome distance and transportation barriers that prevent women from receiving timely skilled obstetric care (Lori et al., 2016). By addressing distance to a health facility and transportation barriers, MWHs could increase the use of skilled birth attendants, thereby reducing newborn morbidity and mortality in rural, low resource areas of Zambia (Lori et al., 2016).

This case series was conducted at Lundazi District Hospital, one of the CEmONC facilities included in a collaborative research endeavor (parent study) between 2015-2018 to determine the impact of MWHs on facility delivery among women living at least 10km from health facilities in rural Zambia. Using formative research, a team of researchers developed a MWH intervention model with three components: infrastructure, management, and linkage to services (Scott, Kaiser et al., 2018). The larger study evaluated the impact of core model MWHs employing a controlled before-and-after, quasi-experimental design and using mixed methods (Scott, Kaiser et al., 2018) to examine outcomes. The parent study was conducted by the Maternity Homes Alliance, a partnership between the Government of Zambia, Boston University, and Right to Care Zambia (formerly the Zambian Center for Applied Health Research and Development), Africare, and the University of Michigan, and was funded by Merck Sharp and Dohme for Mothers, the Bill & Melinda Gates Foundation, and The ELMA Foundation (Scott, Kaiser et al., 2018). The Maternity Homes Alliance hypothesized that MWHs can remove the distance barrier and increase access to facility-based delivery (Scott, Kaiser et al., 2018).

Lundazi District is part of the Saving Mothers, Giving Life (SMGL) program. The SMGL public-private partnership aims to significantly reduce maternal and newborn mortality in select sub-Saharan African countries (SMGL, 2018a). In Zambia, SMGL put in place key interventions to improve maternal and newborn health across 16 districts (SMGL, 2018a). Working hand-in-hand with the Zambian government between 2013-2018, the initiative set out to make high-quality, safe childbirth services available and accessible to women and their newborns, focusing on the critical period of labor, delivery, and the first 48 hours postpartum (SMGL, 2018a). The SMGL initiative advocates replicating their endeavors to approach the

sustainable development goals (SDGs) through engaging a diverse group of partners and adopting a comprehensive systems approach (SMGL, 2018a).

Lundazi District was included in phase 1 of the SMGL program in Zambia. During SMGL phase 1, the maternal deaths occurring in health facilities for the four SMGL districts (Mansa, Lundazi, Nyimba, Kalomo) from direct obstetric causes declined by 36% from 260 per 100,000 live births to 167 per 100,000 (Centers for Disease Control and Prevention [CDC], 2014). The largest reductions were for obstructed labor (-78%) (CDC, 2014). In the mid-initiative report released by SMGL, nearly 90% of women in target districts in Zambia gave birth in a facility, compared to just 63% at the start of the initiative; the institutional stillbirth rate was down by nearly 40%, as compared to the start of the initiative (SMGL, 2015).

Statement of the Problem

This study aimed to advance an understanding of maternal-newborn delivery outcomes for women referred from health facilities with and without MWHs to the district referral hospital. The case series study used medical record data from delivery registers located in one district referral hospital to examine a sample of all women with complications who were referred from ten lower-level BEmONC facilities and arrived at the higher-level CEmONC district referral hospital. Of these cases, the characteristics of those referred from facilities with and without MWHs were examined. Newborn delivery outcomes included low birth weight [LBW < 2500 grams]; condition of baby [alive or dead]; low Appearance, Pulse, Grimace, Activity, and Respiration [APGAR] score; and breastfeeding within one hour. Maternal delivery outcomes included assisted delivery [forceps, vacuum], prolonged/obstructed labor, and eclampsia. Research for the case series study was conducted through a retrospective hospital-based record review guided by the questions: (1) “Do newborns born to mothers referred from facilities with

MWHs have fewer poor delivery outcomes than cases referred from non-MWH health facilities?" and (2) "Do women referred from facilities with MWHs have fewer poor delivery outcomes than cases referred from non-MWH health facilities?" The research hypotheses are: (1) Newborns born to women referred from facilities with MWHs will have fewer poor delivery outcomes than women referred from non-MWH health facilities; and (2) Women referred from facilities with MWHs will have fewer poor delivery outcomes than women referred from non-MWH health facilities.

Theoretical Framework

Bronfenbrenner's *Ecological Systems Theory* was operationalized for use in this case series. Maternal-newborn outcome variables could be affected if independent maternal-newborn health indicators are influenced by factors present in the *Ecological Systems Theory* such as individual maternal-newborn dyad (microsystem), interpersonal (mesosystem), healthcare organization (exosystem), social and cultural (macrosystem), and public health policy (chronosystem). This study focuses on the healthcare organization (exosystem) and its relationship to the maternal-newborn dyad.

Methods

A retrospective record review of district-level data recorded by healthcare providers for the Zambian Ministry of Health was performed to compare maternal-newborn delivery outcomes for cases referred from five BEmONC health facilities with and five without MWHs to a single rural Zambian CEmONC district referral hospital for delivery. Data from the delivery register (date/time of admission, demographics [name, address, age], delivery outcomes, birth outcomes) were recorded by the attending nurse or midwife on the labor ward (Appendix E). The delivery

register, an institutionally based document that does not leave the labor ward, is a permanent record that provides information on delivery process and outcome as well as laboratory tests.

Prior to beginning the study, Institutional Review Board (IRB) approval was obtained from the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board (HUM00110404) and from the Zambian IRB equivalent, Excellence in Research Ethics and Science. The Zambian National Health Research Authority was informed of the case series study. Verbal permission for data collection was obtained from the Hospital Administrator and District Health Officer directly responsible for oversight of the facility in Zambia.

Setting and Sample

Lundazi District Hospital is a centrally located referral hospital where women with obstetric complications from all corners of the district deliver (Moyo, Makasa, Mumbi & Musonda, 2018). The total population of Lundazi District is 323,870 (Chief Statistics Office, 2015). In Zambia, the fertility rate is 4.98 births per woman (World Bank, 2019). In Eastern Province, the fertility rate is higher at 5.8 births per woman (DHS Program, 2014). Table 5.2 shows the population (Chief Statistics Office, 2015) and delivery characteristics of cases referred for delivery to the district hospital from the ten facilities included in the study.

Study sites were chosen based on their inclusion in the larger parent study. Researchers and implementing partners in the parent study worked with the Zambian Ministry of Health to identify five intervention sites (Scott et al., 2018). Sites were eligible for inclusion in the parent study if the BEmONC health facility was located ≤2 hours driving time to a CEmONC capable referral facility, performed a minimum of 150 deliveries per year and met at least one of two sets of conditions below (Scott et al., 2018):

Eligibility condition set 1:

i. Facility is able to provide at least five of seven BEmONC signal functions based on 2015 data.

Eligibility condition set 2:

i. Facility has at least one skilled birth attendant on staff.

ii. Facility routinely provides active management of third stage of labour.

iii. Facility has had no stock-outs of oxytocin in the last 12 months.

iv. Facility has had no stock-outs of magnesium sulfate in the last 12 months.

Five comparison sites were matched to intervention sites on annual delivery volume and distance to the referral hospital (Scott et al., 2018). Sites with an existing infrastructure that functioned as an MWH were not considered as an option for comparison sites (Scott et al., 2018). A two population proportions z-score test, performed to compare the populations of paired MWH and non-MWH referral facilities, showed they were similar and well matched (Table 5.2). Women of childbearing age made up 27.1% of the total population.

The case series comparing maternal-newborn delivery outcomes was performed in rural Zambia at Lundazi District Hospital (Eastern Province). The maternity ward delivery registers for five full calendar months from September 1, 2017 through January 31, 2018 were reviewed. The beginning timeframe was used due to publication of a new delivery register by the MOH. The ending date was chosen due to constraints by the primary investigator to meet scholastic program responsibilities in her home department. Inclusion criteria included all cases aged 15 years and above (n = 234) who were referred and arrived at the district hospital with a complication from the ten catchment areas. In Zambia, married, pregnant, or parent-children are

Table 5.2 Population and delivery demographics with two proportion z-score test

MWH Site	Total Population (n)	WCBA[a] (n)	BEmONC facility deliveries (n)	CEmONC district hospital deliveries (n)	non-MWH Site	Total population (n)	WCBA (n)	BEmONC facility deliveries (n)	CEmONC district hospital deliveries (n)	Z Score	P value
Mwase Lundazi	19,578	4,767	349	78	Kapichila	10,287	2,729	147	37	.082	.936
Nkhanga	11,193	3,461	165	20	Kamsaro	5,701	1,254	135	6	.029	.976
Lusuntha	6,407	1,840	93	8	Phikamalaza	4,463	982	95	34	-.270	.787
Zumwanda	10,323	2,570	81	34	Chikomeni	6,051	2,303	41	2	.170	.865
Nyangwe	6,670	2,065	116	2	Lukwizizi	7,475	2,278	45	13	-.148	.881
Total	54,171	14,703	804	142	Total	33,977	9,546	463	92	.008	.992

WCBA=women of childbearing age, [a]Figures provided by the Zambian Ministry of Community Development Mother & Child Health

considered “emancipated minors” if aged 15 years and older. From the sample, 60.7% of cases (*n* = 142) were referred from five rural facilities with a MWH and 39.3% of cases (*n* = 92) were referred from five rural non-MWH facilities. It is important to note that information about whether a case actually used a MWH was not recorded in the delivery register.

Data Collection

After identifying all cases referred from MWH and non-MWH facilities documented in the Zambian Ministry of Health (MOH) delivery register in the maternity ward at Lundazi District Hospital, data were extracted by two local research assistants (RA) trained by the principal investigator (Appendix F). Both had previous experience performing chart reviews, conducting household surveys, and facilitating focus groups. One RA read directly from the delivery register while the other transcribed the data. The principal investigator double-checked each variable and entered data into an Excel spreadsheet. The key maternal-newborn health indicators used in this analysis are listed in Table 5.3. Data for conditions requiring special attention and labor complications were sorted into four sub-categories: prolonged labor (prolonged 1st or 2nd stage, obstructed or prolonged labor, poor progress, CPD), caesarian section (C-section) (previous or current C-section), hypertensive disorders (preeclampsia, eclampsia, epilepsy), and malpresentation (breech, transverse lie, face presentation, hand prolapse, cord prolapse).

Table 5.3 Key maternal-newborn health indicators from delivery register at district hospital

Independent Maternal-Newborn Health Indicator Variables	**Definition/Rationale** (Zambian Ministry of Health, 2017)
Name of mother's village	Mother referred from facilities with a MWH or without a MWH
Origin code	Location of residence in relation to the district referral hospital
Age of mother	Age in completed years as at last birthday
Gravida	Number of pregnancies the woman has had including the current pregnancy
Parity	Number of previous live births prior to this pregnancy
Dependent Maternal-Newborn Health Indicator Variables	
Mode of delivery	Birth form (Normal delivery, caesarean section, breech, assisted [i.e.: forceps, vacuum])
Conditions requiring special attention	Conditions requiring special attention (i.e.: hypertension, anemia)
Labor complications	Any complication that occurred during labor and delivery (i.e.: prolonged labor[a], uterine rupture)
Condition of baby	Alive or dead
Apgar score at 5 minutes	Reading of Apgar score at 5 minutes
Birth weight (grams)	Weight of the baby in grams
Breastfed within 1 hour	Yes or no to breastfed within 1 hour

[a]Nurses and midwives in Lundazi district, use varying terminology for dystocia of labor, therefore, for the purposes of analysis in this case series, prolonged labor is used to describe: prolonged first or second stage labor; prolonged labor; obstructed labor; poor progress, and; cephalopelvic disproportion.

Statistical Analysis

Descriptive statistics were computed for all maternal-newborn variables of interest by performing crosstabulation. Predictor variables for the maternal-newborn dyad included referral from a referral facility with or without a MWH, distance of facility from district referral hospital, age of mother, gravida, and parity. Newborn outcome variables included condition of baby, Apgar score, birth weight, and breastfeeding within one hour. For Apgar score, per the local definition, a dummy variable was created by coding, as the reference group, all cases with an Apgar score less than or equal to 6 as low Apgar score. An Apgar score at 5 minutes of 7 to 10 is considered normal (Costa et al., 2016; Pediatrics, T. A. A., Newborn, C., & Gynecologists, A., 2006), while a 5-minute Apgar score of < 7 generally indicates a risk of poor birth outcome (Cnattingius et al., 2017; Tiemeier & McCormick, 2019). For low birth weight, a dummy variable was created by coding all cases with a birth weight less than 2500 grams as LBW, in accordance with the WHO (2014) definition. Maternal outcome variables included mode of delivery, labor complications, and conditions requiring special attention.

A Pearson chi-square test of independence was performed for relevant variables to examine whether there was a difference in referral from a facility with a MWH compared to those referred from a facility without a MWH. In addition, certain numerical variables, such as age, gravida (number of pregnancies), parity (number of live births), and village community, were categorized to determine their associations when comparing referrals from a facility with a MWH to referrals from a facility without a MWH. In cases where the sample size was too small to use a chi-squared test, a Fisher's exact test was performed. Frequencies were established to examine documented labor complications and conditions requiring special attention. Pairwise

referral-facility comparisons were conducted as were grouped (MWH vs. non-MWH) comparisons.

The hypotheses were tested with independent and pairwise referral-facility comparison t-tests. Given that multiple significance tests were performed, Bonferroni corrections were performed. Logistic regression with a dichotomized MWH variable (non-MWH = 0, MWH = 1) was performed. Adjusted logistic regression was performed controlling for categorized variables such as age, gravida (number of pregnancies), parity (number of live births), and village referral facility that could interact with the maternal-newborn delivery outcomes. *P*-values < 0.05 were considered statistically significant. Statistical analysis was performed using SPSS version 25.

Results

Among all cases referred to a district hospital from facilities with and without MWHs, referrals were more likely to come from facilities with MWHs (60.7% MWH vs. 39.3% non-MWH). We had 142 cases referred from facilities associated with a MWH and 92 cases referred from facilities not associated with a MWH. Most cases (64.1%) were referred from facilities more than 12km from the district referral hospital. Twenty percent of newborns weighed less than 2500 grams. The mean age of mothers was 22.9 years with mean gravida of 2.6 and parity of 1.5. Most cases had a normal spontaneous vaginal delivery (55.6%) while 20.5% had a C-section with the remainder having an assisted (12.4%) or vaginal breech delivery (11.5%) (Table 5.4). Select demographic and delivery outcome data are shown in Table 5.4. Apart from low Apgar score, there were no other statistically significant differences in distance, age, gravida, or parity between women referred from MWH and non-MWH facilities.

Table 5.4 Demographic characteristics of women referred for delivery to district hospital

		Referring Facility		Statistical Tests	
Maternal-Newborn Health Indicator	**Total (n = 234)**	**MWH (n =142)**	**non-MWH (n = 92)**	**Pearson Chi-Square**	**Adjusted P value**
Distance	**% (n)**	**% (n)**	**% (n)**		**(2-sided)**
≤ 12 km	35.5% (83)	34.5% (49)	37.0% (34)	0.118	0.731
> 12 km	64.1% (150)	64.8% (92)	63.0% (58)		
Missing	0.4% (1)	0.7% (1)	none		
Age group					
15 to 19	39.7% (93)	43.0% (61)	34.8% (32)	6.240	0.182
20 to 24	29.1% (68)	30.3% (43)	27.2% (25)		
25 to 29	12.0% (28)	10.6% (15)	14.1% (13)		
30 to 34	8.1% (19)	4.9% (7)	13.0% (12)		
35 and older	9.8% (23)	9.9% (14)	9.8% (9)		
Mean (SD)	22.9 (6.9)	22.4 (6.6)	23.8 (7.2)		
Missing	1.3% (3)	1.4% (2)	1.1% (1)		
Gravida					
1	46.6% (109)	52.1% (74)	38.0% (35)	4.475	0.107
2-5	41.9% (98)	38.7% (55)	46.7% (43)		
6 and above	11.1% (26)	9.2% (13)	14.1% (13)		
Mean (SD)	2.6 (2.1)	2.3 (1.7)	3.1 (2.3)		
Missing	0.4% (1)	none	1.1% (1)		
Parity					
0	47.0% (110)	51.4% (73)	40.2% (37)	3.130	0.209
1-5	48.3% (113)	43.7% (62)	55.4% (51)		
6 and above	4.7% (11)	4.9% (7)	4.3% (4)		
Mean (SD)	1.5 (1.9)	1.3 (1.8)	1.9 (2.1)		
Missing	none				
Mode of delivery					
Normal delivery	55.6% (130)	54.9% (78)	56.5% (52)	1.506	0.681
Caesarean section	20.5% (48)	19.0% (27)	22.8% (21)		
Vaginal Breech	11.5% (27)	13.4% (19)	8.7% (8)		
Assisted (forceps or vacuum)	12.4% (29)	12.7% (18)	12.0% (11)		
Missing	none				
Condition of baby					
Alive	94.4% (221)	94.4% (134)	94.6% (87)	.004	0.948
Dead	5.6% (13)	5.6% (8)	5.4% (5)		
Missing	none				

Apgar score at 5 mins					
0-6	15.4% (36)	19.7% (28)	8.7% (8)	7.460	0.024*
7-10	84.6% (198)	80.3% (114)	91.3% (84)		
Mean (SD)	7.8 (2.4)	7.6 (2.3)	8.3 (2.1)		
Missing	none				
Birth Weight (grams)					
< 2500	20.9% (49)	21.2% (30)	20.7% (19)	0.008	0.931
≥ 2500	79.1% (185)	78.9% (112)	79.3% (73)		
Mean (SD)	2961 (549)	2943 (594)	2988 (473)		
Missing	none				
Breastfed within 1 hour					
Yes	81.2% (190)	78.2% (111)	85.9% (79)	2.168	0.141
No	18.8% (44)	21.8% (31)	14.1% (13)		
Missing	none				

Newborn delivery outcomes

After record review, the hypothesis "Newborns born to women referred from facilities with MWHs will have fewer poor delivery outcomes (LBW, condition of baby, low Apgar score, breastfeeding within one hour) than women referred from non-MWH health facilities" was not supported. Eighteen newborn deaths were reported (7.7%). Fetal distress was noted for 23 cases (9.8%). Cases with LBW were no more likely to be referred from MWH compared to non-MWH facilities ($X^2 = 0.008$, $p = 0.931$) (Table 5.4). Regarding condition of baby (alive or dead), there was no statistically significant difference for cases referred from MWH compared to non-MWH ($X^2 = .004$, $p = 0.948$). Cases from MWH and non-MWH had similar rates of breastfeeding within one hour of birth that were not statistically different ($X^2 = 2.168$, $p = 0.141$) (Table 5.4).

The majority (84.6%) of all newborns in both groups had Apgar scores of 7 or above. When compared to cases referred from facilities without a MWH, those referred from facilities with a MWH were more likely to have newborns with an Apgar score from 0-6 ($X^2 = 7.460$, $p = 0.024$) (Table 5.4). However, a regression model demonstrated no significant difference among groups referred from MWH and non-MWH facilities for Apgar score when controlling for variables that could interact with the maternal-newborn delivery outcomes, including subcategories within distance, age, gravida (number of pregnancies), and parity (number of live births).

Maternal delivery outcomes

No maternal deaths were recorded in the case series. Seventy-five cases with either labor complications or those requiring special attention had prolonged labor (Prolonged 1st or 2nd stage, obstructed labor, poor progress, CPD) (32.1%), while 71 were primiparous (first birth)

(30.3%). The second hypothesis was "Cases referred from facilities with MWHs will have fewer poor delivery outcomes (assisted delivery, prolonged/obstructed labor, eclampsia) than cases referred from non-MWH health facilities; this was only partially supported. Cases referred from facilities with MWHs had similar modes of delivery compared to cases referred from non-MWH health facilities (X^2 = 1.506, p = 0.681) (Table 5.5). Frequency distributions for labor complications and conditions requiring special attention are presented in Table 5.5. Cases with prolonged labor were more often referred from facilities associated with MWHs (X^2 = .032, p = .033) (Table 5.5). Among all women presenting with complications at the district hospital, cases with high parity (6 or more live births) were more likely to come from non-MWH facilities than facilities with MWHs (X^2 =.007, p = .012). Similarly, cases experiencing malpresentation as a labor complication were more likely to come from a non-MWH facility than a facility with a MWH (X^2 =.026, p = .041) (Table 5.5). Pairwise referral facility and grouped (five MWH vs. five non-MWH) comparisons did not show any significant differences among groups in the sample.

Table 5.5 Labor complications and conditions requiring special attention

		Referring Facility			
Labor complications & conditions	**Total (n = 234)**	**MWH (n =142)**	**non-MWH (n = 92)**	**Pearson Chi-Square**	**Fisher's Exact Test**
Figure 1.1	**% (n)**	**% (n)**	**% (n)**		**(2-sided)**
Prolonged labor[a]	32.1% (75)	37.3% (53)	23.9% (22)	.032	.033*
Primipara	30.3% (71)	32.4% (46)	27.2% (25)	.396	.467
No complications	20.1% (47)	16.9% (24)	25.0% (23)	.131	.137
High parity (>6)	9.8% (23)	5.6% (8)	16.3% (15)	.007	.012*
Fetal distress	9.8% (23)	7.7% (11)	13.0% (12)	.184	.260
Malpresentation[d]	9.8% (23)	6.3% (9)	15.2% (14)	.026	.041*
Neonatal death	7.7% (18)	8.5% (12)	6.5% (6)	.589	.802
C-section[b]	6.8% (16)	7.0% (10)	6.5% (6)	.878	1.000
Hypertensive disorders[c]	6.8% (16)	9.2% (13)	3.3% (3)	.081	.111
Twins	5.1% (12)	3.5% (5)	7.6% (7)	.166	.225

[a]Prolonged 1st or 2nd stage, obstructed or prolonged labor, poor progress, cephalopelvic disproportion

[b]Previous or current c-section

[c]Preeclampsia, eclampsia, epilepsy

[d]Breech, transverse lie, face presentation, hand prolapse, cord prolapse

Discussion

Among all cases referred to a district hospital from facilities with and without MWHs, we found that referrals were more likely to come from facilities with MWHs (60.9% vs. 39.3%). More cases of women with prolonged labor were referred from facilities associated with a MWH than without a MWH (37.3% vs. 23.9%). In this case series, no maternal deaths were recorded. Because information about MWH use per se was not recorded in the delivery register, and is therefore unknown, this study could not directly test differences in maternal-newborn outcomes among cases that used a MWH and those that did not. However, findings demonstrate the potential positive influence of referral from facilities associated with MWHs, especially for those with prolonged labor as a complication.

In this case series, access to a MWH may have brought women closer to a BEmONC facility where prolonged labor was recognized and emergency referral to CEmONC at the district hospital was made for obstetric management. Untreated prolonged, or obstructed labor can be dangerous and is a major cause of both maternal and newborn morbidity and mortality (Dolea & AbouZahr, 2003). Especially for poor, remote, and rural populations where access to health services may be limited, emergency referral is critical to improving outcomes for time-sensitive conditions, such as prolonged labor, that underlie many unpredictable problems during pregnancy, delivery, and the postnatal period. (Bailey et al., 2019). In the newborn, neglected obstructed labor may cause asphyxia leading to stillbirth, brain damage, or neonatal death (Dolea & AbouZahr, 2003). Maternal complications include intrauterine infections following prolonged rupture of membranes, trauma to the bladder and/or rectum due to pressure from the fetal head or damage during delivery, and ruptured uterus with consequent hemorrhage, shock, or even death (Dolea & AbouZahr, 2003).

The finding that 20% of newborns weighed less than 2500 grams is concerning and demonstrates a higher prevalence of LBW than the national rate of 9% (DHS Program, 2014). In a retrospective cohort analysis to identify predictors and outcomes of LBW in Lusaka, Zambia using data from the public Maternal, Newborn, and Child Health system recorded from 2006-2012, nearly 11% of newborns met the criteria for LBW (Chibwesha et al., 2016). The high prevalence of LBW in the rural district is concerning because being undernourished in the womb increases the risk of death in the early months and years of a child's life (UNICEF, 2014). Newborns who survive tend to have impaired immune function and increased risk of disease; they are likely to remain undernourished, with reduced muscle strength, cognitive abilities and IQ throughout their lives (UNICEF, 2014). Affordable, accessible and appropriate health care is critical for preventing and treating LBW along with culturally appropriate care and gender-sensitive interventions to reach women who face greater barriers in access to health care (WHO, 2014).

To attain Sustainable Development Goal targets, newborns and their mothers need access to quality health care. The finding that there were few significant differences in maternal-newborn delivery outcomes, and no cases of maternal deaths, for cases referred from MWH and non-MWH facilities could be explained by overall improvements in maternal-newborn health made in Lundazi District over the past five years. The presence of the SMGL program (chronosystem) for two years prior to starting the MWH intervention study may confound the results of this case series, since positive trends in improved maternal-newborn mortality were already associated with the SMGL program when the first MWHs were introduced in Lundazi District in late 2016. The SMGL initiative, a package of multiple interventions focused on

reducing maternal and perinatal mortality during labor, delivery, and postpartum (Conlon et al., 2019), likely had a positive influence on maternal-newborn dyad (microsystem) health.

In conjunction with stimulus from the SMGL initiative, several explanations are plausible for why the hypotheses in this case series were not supported. It is plausible the insignificant differences in maternal-newborn delivery outcomes in the sample reflect quality care provided at rural BEmONC facilities in the district. It is encouraging that nurses and midwives may be identifying maternal-newborn health problems early and referring appropriately. The SMGL initiative implemented several interventions to improve quality of care in rural Zambia (Morof et al., 2019). Interventions employed by SMGL in Zambia to build capacity and ensure sufficient trained health care providers at facilities included: (1) recruitment of new nurses and midwives, (2) training of health professionals in emergency obstetric care and surgeries, and (3) provision of mentoring and supportive supervision to newly hired and existing personnel (Morof et al., 2019).

Furthermore, despite potential geographic barriers, such as distance and transportation difficulties, our findings suggest that a good system is in place in the district for referring cases to CEmONC when complications arise. Another explanation for insignificant differences in the sample could be that MWHs had not been open for a sufficiently long period of time to influence maternal-newborn outcomes. MWHs were opened from between one month to one year prior to the case series data collection timeframe.

In this study, it was difficult to interpret the findings given the ongoing improvements in maternal and newborn delivery outcomes from the SMGL interventions. The SMGL initiative used an integrated systems approach focusing on the following interventions: (1) skilled attendance at birth; (2) safe facilities and hospitals for delivery; (3) supplies and provision of

basic and emergency obstetric services; (4) systems for communication, referral, and transportation available 24 hours a day, 7 days a week; and (5) quality data, surveillance, and response (Quam, Achrekar, & Clay, 2019). In a baseline cross-sectional household survey among SMGL-supported districts in Zambia prior to the opening of MWHs in Lundazi District, Lori and colleagues (2018) demonstrated that SMGL districts had higher rates of facility delivery than the general population of Zambia and concluded that MWHs bridge the distance barrier for women who live greater than 9.5 km from a health facility. As part of a baseline observation of impact evaluation of MWHs, researchers assessed the determinants of home delivery among remote women in seven districts targeted by the SMGL initiative; they found that those living in districts not yet exposed to the SMGL program had significantly increases odds of home delivery (Scott, Henry et al., 2018). Serbanescu and colleagues (2017) compared baseline maternal outcomes to those during Year 1 in SMGL pilot districts by reviewing health facility assessments pregnancy outcome monitoring, enhanced maternal mortality detection in facilities, and population-based investigation of community maternal deaths. After one year, researchers found that access to care, infrastructure, and delivery care improved in SMGL districts with the institutional delivery rate increased by 35% in Zambia (Serbanescu et al., 2017). While it is challenging to tease out specific maternal-newborn delivery outcomes from the various SMGL interventions, SMGL provides a framework for how to approach the SDGs through engaging and collaborating with a diverse group of partners (SMGL, 2018b).

Given that this case series is the first of its kind to explore the delivery outcomes of women and their newborns referred from health facilities with and without MWHs, no direct comparisons can be made to other studies. However, findings related to labor complications from women in this case series can be assessed in light of findings from other studies investigating

maternal-newborn health outcomes. In a retrospective observational study involving MWHs in rural Ethiopia, Braat and colleagues (2018) examined the impact of a MWH by comparing pregnancy outcomes among users and non-users at hospitals with and without MWHs. The researchers found that high-risk women who used a MWH had less favorable sociodemographic characteristics, but better birth outcomes than both women who gave birth at the same hospital but did not use the MWH and women who gave birth at a hospital without a MWH (Braat et al, 2018). In the cohort study in Ethiopia, MWHs contributed to reducing maternal deaths, stillbirths, and uterine ruptures by providing an important service to women living in rural areas who have difficulty accessing facilities providing EmONC (Braat et al, 2018). While in this case series the sociodemographic characteristics were similar across all cases, referral from facilities associated with a MWH likely allowed for early and rapid recognition of prolonged labor at a BEmONC facility. Subsequent timely referral to CEmONC at the district hospital for management of prolonged labor in this case series lends support to the effectiveness of facilities associated with MWHs as a potentially lifesaving intervention to improve maternal-newborn delivery outcomes.

In this case series, maternal-newborn delivery outcomes were likely influenced by environmental factors consistent with the operationalized *Ecological Systems Theory*, including the individual maternal-newborn dyad (microsystem), healthcare organization (exosystem), and public health policy (chronosystem). As presented in the *Ecological Systems Theory*, microsystem factors that play important roles in delivery outcomes for the maternal-newborn dyad include self-care during pregnancy, and family and social roles. Health-seeking during pregnancy and ability to follow up on recommendations for referral to a CEmONC facility often depend on complex relationships between the maternal-newborn dyad and decisions influenced

by husbands, grandmothers, and community members. The relationships experienced by women when accessing antenatal care also influence maternal-newborn delivery outcomes in the microsystem.

Healthcare organization (exosystem) factors could influence individual maternal-newborn dyad delivery outcomes. Since no clear guidelines exist, wide variation in classification of labor complications, conditions requiring special attention, and subjective remarks regarding stability of maternal-newborn dyad by nurses and midwives at the district referral hospital may occur. For example, because of potential differences in how nurses and midwives are educated and trained to recognize maternal and newborn complications and in willingness to report more than one complication, midwives may register Apgar scores, fetal distress, or prolonged labor differently. These exosystem factors could influence reporting of maternal-newborn health indicators.

In this study, maternal-newborn delivery outcome variables could have been affected by chronosystem factors such as the implementation of the SMGL program in Lundazi District. In Zambia, the proportion of women with childbirth complications delivering in EmONC facilities rose by 23% after one year of SMGL (Serbanescu et al., 2017). In the past three years, SMGL communities saw the maternal mortality ratio decline by 55% and the stillborn and neonatal deaths decline by 44% in target facilities in Zambia, with an accompanying increase of 38% in women giving birth in a facility in the target districts (SMGL, 2018a). Furthermore, as part of the SMGL program, community health workers were active in all study sites and likely influenced the health-seeking behavior of pregnant women.

Limitations

As a case series using data from the delivery register at one district referral hospital in rural Zambia, the study has several limitations. Results may not be generalizable to other districts in Zambia, nor to the broader population. The study was also limited by the variables in the delivery registers; moreover, the data were retrospective and any assumptions about maternal-newborn outcomes are inferred. The data collected in the delivery register represents only a snapshot of the time around birth, and are not updated by staff to reflect complications that occurred after delivery. It was not possible to explore other aspects of antenatal care or sociodemographic information that could be associated with maternal-newborn delivery outcomes such as intrauterine infections, maternal smoking or alcohol use, poor fetal growth, mother's weight, etc. Exclusion of this information could bias the observed results. Furthermore, only data for those referred to the one district hospital from BEmONC study sites were available. We have no data from referrals from study facilities to other hospitals.

Researchers must be concerned with the internal validity of their designs. Historical bias is a potential threat to the internal validity of this case series. Inconsistencies between the MWH and non-MWH groups could have occurred within the parent study through a selection threat to internal validity due to a lack of randomization. Furthermore, a compensatory intervention threat to internal validity could have occurred if the non-MWH group lost motivation or became resentfully demoralized after baseline assessment. Further prospective studies are needed to evaluate maternal-newborn delivery outcomes for cases referred from health facilities with and without a MWH for CEmONC.

Regarding newborn delivery outcomes, while there were slight statistically significant differences in Apgar score among MWH and non-MWH users, they were not present when

controlling for distance, age, gravida, and parity. Moreover, there is likely significant inter-observer variability in the 5 minute Apgar score documented in the maternity delivery register. It is important to recognize the limitations of the Apgar score, which includes subjective components, as an expression of the newborn's physiologic condition at one point in time (Committee on Obstetric Practice American Academy of Pediatrics - Committee on Fetus and Newborn, 2015). The Apgar score provides a convenient method for reporting the status of the newborn infant immediately after birth, and quantifies clinical signs of neonatal distress, such as cyanosis or pallor, bradycardia, depressed reflex response to stimulation, hypotonia, and apnea or gasping respirations (Watterberg et al., 2015); however, researchers have found large variations in the distribution of Apgar scores, likely due to national scoring practices, making the Apgar score an unsuitable indicator for benchmarking newborn health across countries (Siddiqui, 2017). It would be helpful to have reference materials with standard definitions and guidelines for calculating the Apgar score and identifying maternal-newborn delivery outcomes at the district CEmONC facility.

Furthermore, no clear guidelines or protocols were in place at the hospital for diagnosing or documenting most maternal-newborn delivery outcomes. The quality of documentation in the delivery register likely varied by the person entering the data. Students training in the district hospital were often the ones entering information into the delivery register. While there were few cases with incomplete documentation, under-reporting of delivery outcomes in the delivery register is a potential limitation. Lack of electricity, understaffing, operating at over-capacity, and competing demands for the attention of nurses and midwives make data entry difficult or under-prioritized and, therefore, may have caused gaps in the register. Every provider was responsible for identifying complications, thus creating potential for not recognizing or recording

complications or conditions requiring special attention. Finally, because data about actual use of MWHs by case and referrals that occurred to other CEmONC facilities were unavailable, no inferences about causality or correlation between maternal-newborn delivery outcomes and a woman's use of MWH could be made.

Conclusion

By examining maternal-newborn delivery outcomes for cases referred from five facilities with MWHs and five without MWHs to a single district hospital, this study found that, among all referrals across the ten facilities, more came from facilities with a MWH than from those without MWHs. Although there was no significant difference in maternal or newborn outcomes, and lack of pertinent data precluded an assessment of MWH utilization, the use of MWHs likely allowed for early access and rapid recognition of prolonged labor at a BEmONC facility, offering a probable referral source to CEmONC in rural Zambia. Recognition of prolonged labor at a BEmONC facility with a MWH likely led to crucial referrals to CEmONC at the district hospital for management, which in turn could argue for the effectiveness of MWHs as a potentially lifesaving intervention to improve maternal-newborn delivery outcomes in rural Zambia.

This study is the first case series that we are aware of to focus on the impact of referrals from facilities with MWHs on maternal-newborn delivery outcomes in a low-resource setting. It is innovative, timely, and important because it provides vital new knowledge on the association of referral from facilities with MWHs and maternal-newborn delivery outcomes. Among all women referred to a district hospital from facilities with and without MWHs, we found that referrals were more likely to come from facilities with MWHs. This finding is significant as we enter the post-2015 era of sustainable development with a goal to reduce the inequities of preventable death by reaching all women and newborns.

More research is needed to compare the long-term impact of MWHs on newborn delivery outcomes and health in communities. Additional investigation of maternal-newborn outcomes comparing documented MWH use and referral to CEmONC facilities in urban settings is justified to understand the potential wide-ranging impact of MWH use. Meanwhile, the potentially lifesaving effects of findings from the case series on maternal-newborn delivery outcomes at a district referral hospital could ultimately be used to influence public health policies regarding the access and use of MWHs in Zambia and other low-resource countries.

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CHAPTER 6

Summary

Newborn morbidity and mortality remain a serious global health challenge in low- and middle-income countries (LMICs). Targeting the time around birth with proven high-impact interventions and quality care for small and sick newborns may prevent up to 80 percent of newborn deaths (UNICEF, 2018). Maternity waiting homes (MWHs) offer a way to provide better perinatal obstetric care (Kelly et al., 2006; Lori, Wadsworth, Munro & Rominski, 2013) by targeting the high-risk period before birth. By addressing distance to the health facility and transportation barriers, MWHs could increase the use of skilled birth attendants, thereby reducing newborn morbidity and mortality in rural, low resource areas of Zambia (Lori et al., 2016). In addition, the expanded purpose of many MWHs is to increase newborn health knowledge for mothers utilizing them. Also, by bringing women closer to a health facility so they can deliver with a skilled attendant, MWHs may improve maternal-newborn outcomes.

To catalyze action in lowering maternal and newborn mortality, the United Nations Member States launched the Sustainable Development Goals (SDGs), mobilizing efforts to end all forms of poverty, fight inequalities, and tackle climate change while ensuring that no one is left behind (United Nations, 2018). The third SDG is to ensure healthy lives and promote well-being for all, at all ages. To reach SDG targets, newborns and their mothers need access to good

health care through programs such as Saving Mothers, Giving Life (SMGL) and important life-saving interventions such as maternity waiting homes (MWHs). Fortunately, nurses are in a unique position to accelerate the reduction of newborn mortality in low resource settings. The research summarized here explored MWH use as part of an ecological systems approach to reduce newborn morbidity and mortality ratio targets set by the United Nations to meet the SDGs goals.

Historically, the focus of research studies evaluating MWHs has been on maternal outcomes (Buser & Lori, 2016; Figa'-Talamanca, 1996; Kelly et al., 2006; Lori, Wadsworth, Munro & Rominski, 2013). Although perinatal and newborn health is mentioned in a limited number of articles (Chandramohan, Cutts & Millard, 1995; Lori, Munro et al, 2013; Tumwine & Dungare, 1996; van Lonkhuijzen, Stegeman, Nyirongo, & van Roosmalen, 2003), results are unclear, with only fragmentary understanding of newborn outcomes at MWHs (Buser & Lori, 2016).

Given the dearth of evidence, the relevant and critical overarching goal of this dissertation was to explore and describe the cultural practices, knowledge, and beliefs of essential newborn care and health-seeking in the context of MWHs and the SMGL initiative in rural Zambia. Guided by the *Ecological Systems Theory* (Bronfenbrenner, 1977, 1979, 1989, 1994), this goal was met through three distinct studies. Study 1 addressed the gap in knowledge by using focus groups to describe the knowledge and beliefs of newborn care and illness from the perspective of rural Zambian women, community members, and health workers. Also, in order to identify traditional and professional newborn care practices in rural Zambia, the first study examined the social and cultural factors that influence ways women seek newborn care. Study 2 explored the association between MWH use and maternal-newborn health and delivery

outcomes, using a quasi-experimental approach to assess maternal knowledge of newborn care and care-seeking for users and non-users of MWHs referred to a district hospital for delivery. Study 3 examined the characteristics of those referred from facilities with and without MWHs, using a sample of all women with complications who were referred from ten lower-level BEmONC facilities and arrived at the higher-level CEmONC district referral hospital. Medical record data for the analysis was extracted from delivery registers located in the one district referral hospital.

Broadly, findings from the three studies highlight and support the maternal-newborn dyad duality faced by women as they navigate the complex interplay between cultural newborn care practices and evidence-based "Essential newborn care" (ENC) of the health system (Figure 6.1). As seen in the three studies, rural Zambians understand the importance of seeking pregnancy care at the health facility for delivery and know about ENC according to World Health Organization (WHO) (2017) guidelines. However, women don't always act on what they know about the benefits of ENC and maternal-newborn health-seeking. Multiple factors influence adherence to traditional newborn protective rituals and avoidance of maternal-newborn health-seeking at an established facility, including the influence of husbands and grandmothers over health decision making, desire to preserve dignity at health facilities, financial constraints, and geographic barriers.

Figure 6.1 The maternal-newborn dyad duality

Implications for Practice

Numerous implications for nursing practice emerged from this ecological systems approach, which explored the impact of MWH use on maternal-newborn health and delivery outcomes in rural Zambia. Professional and community health workers should be supported to continue work in promoting maternal-child health in rural Zambia. Nurses and midwives can promote the maintenance of cultural beliefs that benefit or at the very least do no harm to the mother-newborn dyad (microsystem) while encouraging the reframing of potentially detrimental practices. Professional and community health workers can incorporate the potential for harmful effects from traditional protective rituals, such as the use of herbal medicine to speed labor or apply to the umbilical cord, into the mother-newborn health education messages. Regarding familial roles in the health decision making-process, nurses and midwives have a duty to foster those that promote the health of the mother-newborn dyad. Concerning the *preservation of dignity* (exosystem) theme, there is an obvious need for nurses and midwives to promote privacy and modify clinic spaces to allow women to feel more comfortable with seeking care. Furthermore, it is important for nurses and midwives to reinforce the importance of partner testing for sexually transmitted infections (STIs) during routine antenatal care (ANC) despite the issue of shame.

It is encouraging that nurses and midwives are identifying maternal-newborn health problems early and referring appropriately. However, findings from Study 3 raised questions about the potential for wide variation in classification of labor complications, conditions requiring special attention, and subjective remarks regarding stability of maternal-newborn dyad by nurses and midwives at the district referral hospital. Results highlight the urgency of targeting younger, primigravida women for education by nurses and midwives in rural health facilities to improve maternal "Essential Newborn Care" knowledge in Zambia. Younger women need more education by nurses, midwives, and community health workers about timing of PNC visits, newborn health problems and danger signs, exclusive breastfeeding, umbilical cord care, and newborn skin care.

Theoretical Framework

The relevance of the operationalized *Ecological Systems Theory* to the three studies in this dissertation is shown in Figure 6.2. Based on our operationalization of the grand *Ecological Systems Theory* for maternal-newborn health and MWH use in three studies in this dissertation, we conclude that it can be applied globally. This further validates the theory, especially since our studies were the first that we know of to apply it to healthcare in rural Eastern and Luapula provinces of Zambia. The *Ecological Systems Theory* was modified for maternal-newborn health and MWH use with the maternal-newborn dyad representing the microsystem, family and community members the mesosystem, healthcare organization the exosystem, culture the macrosystem, and health policy the chronosystem.

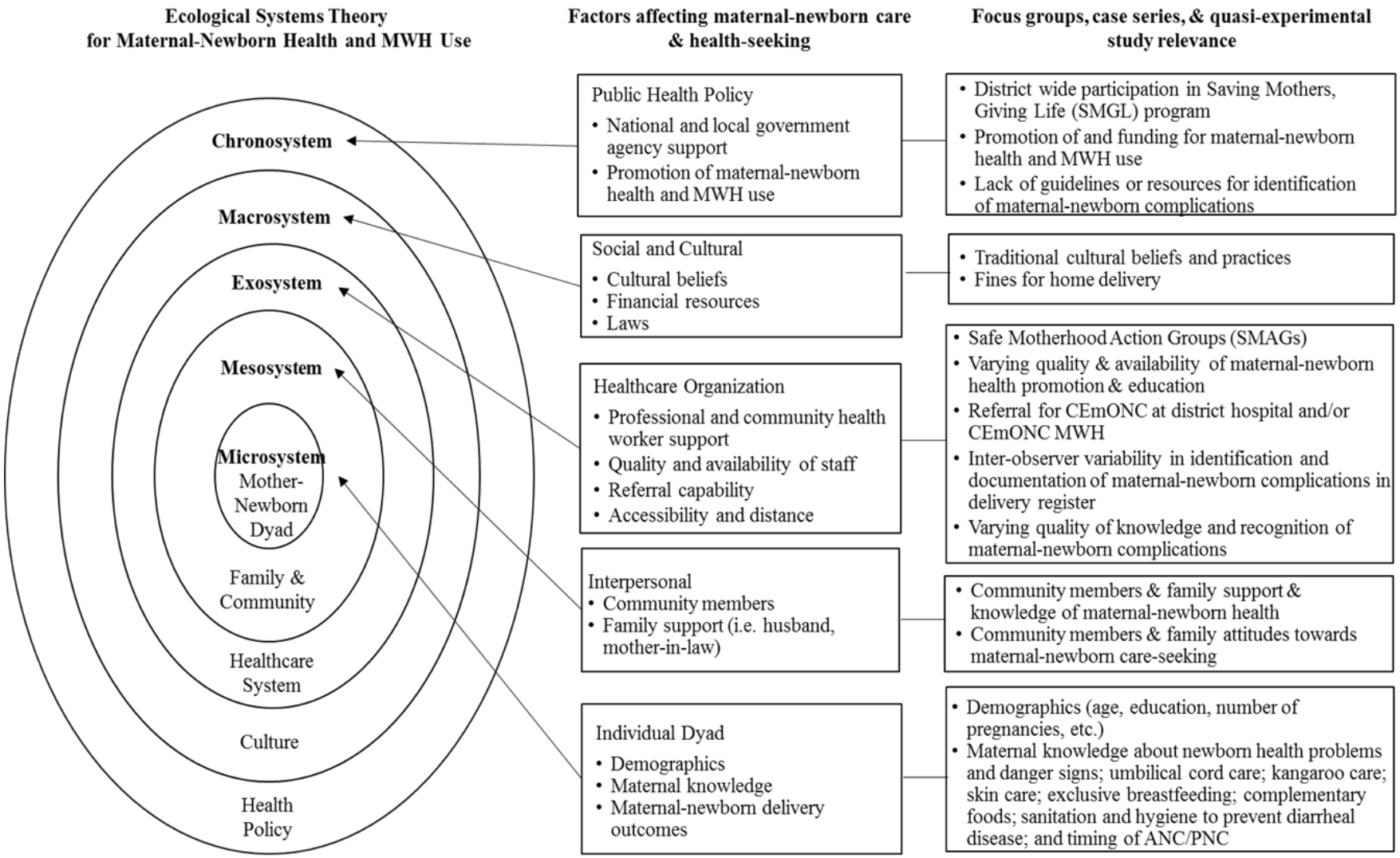
In Study 1, individual maternal-newborn dyad factors associated with newborn care in rural Zambia in the microsystem included demographic characteristics and maternal understanding of essential newborn care. In the mesosystem, a strong sense of family &

community to protect the newborn was evident. Themes at the level of culture (macrosystem) and healthcare system (exosystem) were uncovered supporting the identification of traditional and professional newborn care practices in rural Zambia.

When the *Ecological Systems Theory* was operationalized in Study 2, factors at the individual maternal-newborn dyad (microsystem) level that influenced maternal "Essential Newborn Care" knowledge included age and gravida. At the public health policy (chronosystem) level, factors influencing outcomes in the study included national and local government agency support for maternal-newborn health, including district-wide participation in the SMGL program. Zambian Ministry of Health promotion of and funding for maternal-newborn health and MWH use in Lundazi district also influenced study outcomes at the chronosystem level.

In Study 3, the case series, maternal-newborn delivery outcomes were likely influenced by environmental factors consistent with the operationalized *Ecological Systems Theory*, including the individual maternal-newborn dyad (microsystem), healthcare organization (exosystem), and public health policy (chronosystem). Microsystem factors playing an important role in delivery outcomes for the maternal-newborn dyad included self-care during pregnancy, family, and social roles. Healthcare organization (exosystem) factors that could influence the individual maternal-newborn dyad delivery outcomes included potential differences in how nurses and midwives are educated and trained to recognize maternal and newborn complications. Maternal-newborn delivery outcome variables could have been affected by public health policy chronosystem factors, such as the implementation of the SMGL program and active health education of community health workers (SMAGs) in all study sites and likely influenced the health-seeking behavior for pregnant women.

Figure 6.2 Relevance of operationalized Ecological Systems Theory to three studies in dissertation (adapted from Berger, 2007; Stranger, 2011)



Strengths

Although development of further research is needed, findings presented here shed light on newborn care practices and health-seeking behavior, maternal knowledge of newborn care, and maternal-newborn delivery outcomes in rural Zambia. The inclusivity of the operationalized *Ecological Systems Theory* that views an individual maternal-newborn dyad within the context of nested hierarchical systems makes the operationalization of Bronfenbrenner's work ideal for global community health research. This dissertation is innovative because it is the first to focus on the association between maternal-newborn health and delivery outcomes and MWH use in a low-resource setting, and has the potential to inform future research, practice, and policy.

The research presented here partially fills the gap in knowledge about the outcomes of newborns born to mothers with access to MWHs. The use of different types of methods in data collection across the three studies and the inclusion of diverse focus group participants strengthens the validity of the findings of the dissertation. An essential strength of Study 1 is that it adds to the literature about cultural values, beliefs, and practices of rural Zambians related to newborn care and illness that influence maternal-newborn health. Study 2 is the first to assess maternal knowledge of newborn care and care-seeking in relation to MWH and SMGL interventions in rural Zambia. Study 3 is timely and important because it provides vital, new knowledge on the impact of referral from facilities with and without MWHs on maternal-newborn delivery outcomes.

Limitations

Several limitations in this dissertation are worth mentioning. Since all studies were conducted in rural districts in Zambia, results cannot be generalized to other districts in Zambia or to the broader population. Also, findings of the three studies do not reflect changes over time.

Furthermore, an inherent power differential existed between participants and researcher, as well as potential for bias by cultural brokers/interpreters/researcher. To address these limitations, the principal investigator situated herself within the local context, was mindful of power dynamics, and cultivated cultural humility through a process of reflection to challenge her own cultural biases.

The researcher's ability to understand fine distinctions in meaning may be limited by the use of local languages by the participants and by the lack of elaboration on a topic in the focus groups and maternal knowledge surveys due to low literacy levels. Cultural brokers, fluent in both local languages and English, mitigated this potential limitation, and provided assistance in deciphering the cultural meaning of mother-newborn care phenomena while interpreting audio-recordings, responses on the *Maternal Knowledge of Newborn Care Questionnaire*, and verbatim transcriptions of focus groups.

Because the data were collected retrospectively, Study 3 was limited by the existing variables in the maternal delivery database. Without data about MWH use by participants or referrals that occurred outside the district hospital, no inferences about causality or correlation between maternal-newborn delivery outcomes and MWH use could be made. Healthcare organization (exosystem) factors present in the operationalized *Ecological Systems Theory* could have influenced the individual maternal-newborn dyad (microsystem) delivery outcomes. Since no clear guidelines were available, documentation may have varied widely in classification of labor complications, conditions requiring special attention, and subjective remarks regarding stability of maternal-newborn dyad by nurses and midwives at the district referral hospital.

Future Directions

In combination, the three studies highlight that rural Zambian women, community members, and health workers have an understanding of newborn care according to WHO guidelines (2017). As shown in Studies 1 and 2 in this dissertation, rural Zambians understand the importance of ANC, delivering at the health facility, and dangers signs prompting health-seeking for newborns. Clearly, on-going community health sensitization programs such as SMGL and the presence of community health workers from the SMAGs are reaching far corners of rural districts to increase knowledge at the grass roots level. These programs should be continued and expanded to reach regions not yet covered.

Given the understanding of essential newborn care expressed by rural Zambians, we can conclude that lack of knowledge about maternal-newborn health in rural communities is not the biggest barrier to decreasing high rates of newborn morbidity and mortality. In rural Zambia, knowledge of newborn and pregnancy care does not directly translate into maternal-newborn health seeking. Other factors, such as adherence to traditional newborn care practices, transportation, distance, and financial barriers influence whether a woman makes timely decisions to seek maternal-newborn health services. Also, women often rely on their husbands for financial support and, without money, face difficulty in covering the cost of travel to the facility or of supplies for newborns after delivery, such as baby blankets and clothing. Study 1 revealed the maternal-newborn dyad duality experienced by women as they are pushed and pulled between fulfilling competing cultural and health system responsibilities. More research is needed to explore this maternal duality to better understand how nurses and midwives can meet the psychosocial needs of this population.

Research exploring the push-pull felt by mothers navigating cultural practices and health system regulations has the potential to inform future interventions aimed at improving newborn care. To foster confidentiality, individual interviews with women could be considered for a follow-up study, since participants might be reluctant to express maternal duality in the open forum of a focus group. To further explore the concept of maternal duality in rural Zambia, a mixed-methods approach could be used in these interviews to explore perceived cultural responsibilities and to collect data using a validated instrument measuring understanding of ENC. A more rigorous rating of responses on the questionnaire with a scale to assess each maternal "Essential Newborn Care" outcome on the *Maternal Knowledge of Newborn Care* Questionnaire is needed. The tool should be further tested in future research to demonstrate adequate reliability and validity.

Husbands, grandmothers/mothers-in-law, and community members all influence a woman's decision-making about maternal-newborn health seeking. Longstanding gender norms and stereotypes persist in the patriarchal social systems and attitudes of rural Zambians, which contributes to unequal power relationships for women in their families and communities. This power differential often leads to imbalanced influence over maternal health-seeking decisions by opinion-leading husbands and grandmothers/mothers-in-law. Community health policies aimed at increasing use of maternal-newborn health services, such as MWHs, need to consider the expanded network of people who influence a woman's decisions, including her family and the broader community. A targeted exploration of the family's sense to protect the newborn is warranted to understand whether it would be helpful to recommend policies in Zambia that would increase involvement by husbands and grandmothers in routine professional maternal-newborn health care. Additional research should investigate the roles of husbands, grandmothers,

and community members, and to explore their understanding of the benefits of their involvement in pregnancy and postpartum maternal-newborn care.

Unfortunately, discrimination against women continues to take place in male-dominated rural Zambian agricultural households. Further contributing to unequal power over maternal-newborn health decision-making for women are the high rates of early marriage and child bearing in rural Zambia demonstrated in the sociodemographic characteristics in all three studies included in this dissertation. Moreover, gender-based violence is prevalent in Zambia. According to the Zambian Demographic and Health Survey (DHS) (2014), 43% of all women aged 15-49 years of age experience intimate partner physical and/or sexual violence at least once in their lifetime, with 27% of women experiencing violence in the last 12 months. Research programs aimed at increasing the participation of husbands in routine maternal-newborn health and ANC that incorporates principles to prevent gender-based violence would be useful for exploring how to mitigate power imbalances and help husbands understand the benefits for women and the entire family when they access care during pregnancy and after delivery.

Future studies are needed to compare the long-term impact of MWHs on newborn delivery outcomes and health in communities. Additional case series investigation of maternal-newborn delivery outcomes comparing CEmONC facilities associated with and without MWHs in urban settings is justified to understand the potential wide-ranging impact of MWH use. Evaluation of MWH use in urban settings should incorporate a pre- and post- assessment of maternal "Essential Newborn Care" knowledge into the study design to identify any trends associated with MWH use.

Finally, moving forward, it will be important to study the long-term sustainability of MWHs. The financial and logistical support of the international non-governmental organization

(NGO) partner in constructing the MWHs in these studies ended in late 2018. While measures were put in place to ensure community ownership and responsibility for operating the MWHs, the sustainability of the intervention after resources from an NGO are no longer available needs to be evaluated. Follow-up studies should evaluate the impact and functioning of MWHs operating under community ownership to further understanding of the long-term sustainability and cost-effectiveness of MWHs as an intervention to improve maternal-newborn health and delivery outcomes.

Career goals and plans

My eventual goal as a PhD-prepared nurse scientist is to contribute positively to the discipline of global child health by performing innovative and impactful scientific research and teaching in a robust academic setting. I am also interested in teaching and mentoring the next generation of scholars. I envision myself working as an independent research scientist, conducting studies that evaluate community-based models of care for improved newborn and child health across the globe.

I am passionate about contributing to a reduction of newborn morbidity and mortality in low- and middle-income countries. I intend to use the research from this dissertation as a platform to generate new knowledge and explore innovative ways of promoting newborn and child health worldwide. My immediate next research steps will be to study as a Fogarty Global Health Fellow. As a postdoctoral fellow, I plan to conduct a qualitative needs assessment via individual interviews and focus groups to explore interest in and viability of MWHs as an intervention to reduce maternal-newborn mortality in an urban low-resource setting. Most MWHs are located in rural areas such as the ones included in this dissertation. Recent health policy changes recommend a shift away from rural delivery facilities towards larger urban

facilities for better maternal-newborn outcomes (Kruk et al., 2018; Montagu et al., 2017). However, there is an exceptionally wide gap in knowledge about the interest in and viability of MWH use in an urban environment. The research will be innovative and timely as we enter the post-2015 era of sustainable development with a goal to reduce the inequities of preventable deaths by reaching all women and newborns. Results of the research will aid in understanding whether resources could be mobilized to establish MWHs in urban Kumasi, Ghana. This exploratory project could be adapted and implemented in other urban settings throughout sub-Saharan Africa, such as Lusaka, the capital of Zambia. The proposed project will reduce the gap in knowledge about interest and support for urban MWHs as health policy shifts toward encouraging women to deliver in larger-volume facilities.

The results of the individual interviews and focus groups have the potential to provide pilot data for future grant submissions after the postdoctoral fellowship. If themes elicited from individual interviews indicate that community stakeholders and key decision makers are interested in mobilizing resources to establish MWHs, and themes from focus groups indicate that women of childbearing age and family members deem MWHs a viable intervention to reduce maternal-newborn mortality, I will use results of this initial needs assessment as a platform from which to build future grant applications.

Conclusions

This three-study dissertation explored the cultural practices, knowledge, and beliefs of newborn care and health-seeking in rural Zambia. Taken together, results of the three studies support the notion that MWH and SMGL interventions can benefit the maternal-newborn dyad. The recommendations presented here can be used to develop interventions to increase use of MWHs and continue SMGL maternal-newborn health services to improve pregnancy and

newborn outcomes in rural Zambia. The operationalized *Ecological System Theory* exhibited its usefulness as a guide for the research included in this dissertation.

To summarize, Study 1 highlighted the need to pay attention to the maternal duality experienced by women pulled between fulfilling cultural and health system responsibilities. Study 2 demonstrated that both MWH users and non-users in the rural district were knowledgeable about ENC; however, younger age and primigravida were significantly associated with lower maternal "Essential Newborn Care" knowledge. Findings can be used to inform future interventions aimed at improving maternal-newborn care and evaluating the long-term sustainability of MWHs. In Study 3, more referrals came from facilities with a MWH than from those without MWHs. Referral from facilities with MWHs and recognition of prolonged labor at a BEmONC facility likely led to crucial referral for labor management to CEmONC at the district hospital, in turn bolstering support for the effectiveness of MWHs and SMGL programs as potentially lifesaving interventions to improve maternal-newborn delivery outcomes in rural Zambia.

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Appendix A

Consent for Focus Group Study

General Information about Research

The University of Michigan in the United States and Africare-Zambia are leading a research study. We want to find out about experiences, beliefs, and customs about seeking care for mothers and babies. You are being asked to be in this study because you are a valued member of the community and speak English and/or Bemba or Tumbuka.

Background and Purpose for this study

In 2013– 014, the University of Michigan and Africare/Zambia completed an evaluation on the need for and support of maternity waiting homes located next to rural health facilities in Zambia. We learned that existing maternity homes, were often small, poorly constructed, lacked basic amenities and, thus, often were not used. Based on the knowledge gained from that evaluation, we designed a model for a high-quality maternity home we call the Zambian Maternity Homes. One part of that model is to engage the community in behaviors that may increase health-seeking behaviors around childbirth and newborn care.

The reason for this study is to learn more about experiences, beliefs, and customs that may influence seeking care for mothers and babies.

Study Procedures

You can choose to be in this study or not. Your decision is voluntary and does not affect your role in the community in any way. If you decide to participate, you will meet with a group of other community members. We will ask for your opinion about how you and your community get information and make decisions about seeking healthcare. There will be one group meeting with 8-12 other community members and that will last for approximately 60-90 minutes. We will ask for your ideas about how the community might do things differently. We will make voice tapes of the group meeting to make sure that we have a record of everyone's ideas. We will not use names on the tapes or when we type them out. If you do not want to be recorded you cannot participate in the research.

We will also ask you some questions before the group meets; it will take about 5 to 10 minutes for those questions. We will not write your name on any interview forms.
Snacks will be provided during the session.

Possible Risks and Discomforts

Participating in the interview and being in the group is not likely to cause you any harm. Whatever you say will be private and confidential. We will ask everyone in the group not to talk outside of the group about anything that we discuss in the group. This way whatever you say in group will also be private. We don't think anything we talk about will upset you, but if it does you can leave at any time with no problem to you. If this does happen, we will give you names of people you can talk at the Health Center who can help you get over being upset. Participation is up to you.

Possible Benefits

You will not get special treatment or rewards for being in the group, but we do hope that being in the group and sharing your ideas might help us understand more about how health care is managed in your community. Sometimes people tell us they feel good about helping make things better for others.

Alternatives to Participation

You do not have to participate in the group if you don't want to. If you do not want to be in the group, it will not affect your role in the community in any way.

Confidentiality

We will keep what you say private as best we can. We will ask everyone in the group not to talk outside of the group about anything that we discuss in the group. This way whatever you say will be private. We will not talk about you being in the group outside the research team. We will keep all information on a computer that is password protected. No one will be able to see it except the research team. You will not be named in any reports. Our records may be reviewed to make sure we are doing the research correctly (ERES Converge Institutional Review Board in Zambia and/or the University of Michigan Institutional Review Board in the United States).

Compensation

You will not be paid to be in the study. Snacks will be served during the discussion to thank you for your time.

Additional Cost

It will not cost you anything to be in the study, except for your time.

Voluntary Participation and Right to Leave the Research

You can choose to be in the study or not be in the study, it is up to you. If you choose not to be in the study, there will be no problem for you now or in the future. You can leave the study at any time without any problem to you now or in the future. Being in the study or not being in the study does not affect your role in the community in any way.

Termination of Participation by the Researcher

We will not ask you to leave the study unless you are too upset to continue.

Contacts for Additional Information

If you have questions or concerns about the research, please contact the Co-Investigator / Project Director, Gertrude Musonda at:
Africare-Zambia
Flat A, Plot 2407, Off MBX Twin Palm Road
Ibex Hill, Box 33921
Lusaka, Zambia
Tel: =260 977476766 or Email: gmusonda@africare.org

Your Rights as a Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions or discuss any concerns about this study with someone other than the researcher(s), please contact the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board, 540 E. Liberty St. Ste. 202, Ann Arbor, MI 48104-2210. For international calls from Zambia to the US, 00+1+734-936-0933 or email: irbhsbs@umich.edu. Please note the time in Michigan is 6 hours earlier than in Zambia.

This research has been reviewed and approved by the ERES Converge, 33 Joseph Mwilwa Road, Rhodes Park, Lusaka, Zambia. If you have any questions about your rights as a research participant you can contact the ERES CONVERGE IRB, between the hours of 8am -5pm through the landline +260 0955 155633/4 or email: eresconverge@yahoo.co.uk

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the project title **The Evaluation of Zambian Maternity Homes (ZaMs) Project in Mansa and Lundazi Districts** has been read and explained to me. I have been given an opportunity to have any questions about the evaluation research answered to my satisfaction. I agree to participate as a volunteer.

_____ _____

Date Name and signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the evaluation research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this evaluation research have been explained to the above individual.

_____ _____

Date Name and Signature of Person Who Obtained

Appendix B

Oral Script for Nurse In-Charge/Village Chief Announcement to Village

Zambian researchers from Africare working with the University of Michigan in the US are coming to the village on _____; they will be here for part of the day (time will be included). They are interested in learning more about your experiences, beliefs, and behaviors that influence health decisions and actions. They want to talk to woman who have babies that are less than 1-year-old. They also want to speak to adults 18 years or older who are community members, community health workers/TBAs, or healthcare staff.

They will talk to people for 90-minutes in groups and for 10 –minutes in individual interviews. You do not have to talk to them and you will not have a problem if you don't. They will make a voice recording of the discussions and interviews. Everything will be confidential. They will not use names on the recordings. If you do not want to be recorded you may choose to not be in the study. There will be snacks given during the discussions."

They will be here on _____. You are invited to come if you are interested and eligible.

Appendix C

Focus Group Interview Guide

Date: _____

Facilitator: _____

Note taker: _____

District: _____

Community/Health Center: _____

Number in attendance (not including Africare staff):_____

Type of Group (check one):

- Women with infants under one year
- Community members
- Health workers

Now we are ready to get started with the focus group. I will be the moderator today. This is _____ and s/he will be taking notes and keeping us "on time". We will be meeting for about 90 minutes. We are going to use a tape recorder so we do not forget the important things you tell us. Is that OK?

You have been invited to join a focus group with community members. This focus group is an interview, conducted by a trained moderator from Africare. The interview is conducted in a natural way, much like a discussion. In the focus group, people are free to give their views and opinions to the questions that the moderator asks.

Two organizations – Africare and the University of Michigan—have joined together to learn more about our community; they want to better understand our experiences, beliefs, and traditions about seeking care. I am here to ask you questions about health issues, especially for pregnancy, delivery, and newborns. Before we begin, I thought we should introduce ourselves. Let me begin. My name is _____ and I work for Africare.

I want to remind you that your comments are the research team only to learn more about the community and nothing you say will not be shared with others.

START THE TAPE RECORDER HERE!

AFTER YOU TURN ON THE TAPE RECORDERS, BE SURE TO STATE: THE DATE, YOUR NAME, THE DISTRICT, THE COMMUNITY/HEALTH CENTER AND THE TYPE OF GROUP (e.g. Women with infants, Community members, or Health workers).

YOU ARE READY TO ASK THE QUESTIONS.

First, I'd like to learn a little about your customs, traditions and community.

1) What do you think are the major health problems in your community?
   Probe:
   - Do you know any women that have died while giving birth or in the few days after?
   - How many women have died while giving birth in your community?
     i. Tell me what people in the community did when the mother died.
     ii. Tell me what you saw.
     iii. Tell me what happened.
     iv. Tell me what helped.
     v. What caused the mother to die?

2) Tell me about the information health workers provide about pregnancy or childbirth.
   - What do you think about the information health workers provide about caring for newborns?

3) Tell me about the information your family or friends provided about pregnancy and childbirth?
   - What do you think about the information your family or friends provided about caring for newborns?

4) Now, I'd like to ask about the customs and traditions in your community for pregnant women, women giving birth, newborns and the few days after delivery.
   Probe:
   - Who is usually present during labor? What does this person do for the mother while she is in labor?
   - Who is usually present at the delivery? What does this person do for the mother during the delivery?
   - Is there a different person to tend to the newborn than the person tending to the mother? Who is that person?
   - What are the common things you do for the mother and the baby immediately after birth? In the following week?
   - What are the common things you do for the baby immediately after birth?
   - How long does the woman stay at (identified facility) after having a baby?

5) Who do you go to for answers, guidance, and advice if you have a problem or question about pregnancy, childbirth or newborns?
   Probe:
   - How do they influence the decisions you make about your health and the health of your baby?
   - How do you (women in your community) get the resources you need to change things that involve your health?

- How do you (women in your community) get the resources you need to change things that involve the health of your baby?
- What health information do you want (need)?

6) Have you heard about some women delivering at home?
   Probes:
   - Why would a woman choose to deliver at home?
   - Who decides where she will deliver?
   - What might make it easier for a woman to use a facility for birth?

7) In the past 6 months, have you participated in a meeting or gathering around pregnancy, childbirth, or newborn care?
   Probes:
   - Tell me more about that.
   - Have you ever been involved in organizing a meeting or gathering to provide information to your community?
   - What types of groups or meetings would you like to see in your community?
   - What would help you to take care of your newborn?

8) Next I'd like to ask you a few things about caring for a newborn baby. Tell me some things you or the midwife does right after a baby is born—in the first day.
   Probes:
   - Do new mothers or midwives do anything special to keep a baby warm right after it is born?
   - In your communities, when does a newborn baby get the first bath? How often do you bathe a newborn?

9) Tell me about caring for the newborn cord.
   Probes:
   - Do you have the resources to care for the cord in the way you were taught?
   - If you don't have the resources, what can you do?

10) Now I'd like to talk to you about breastfeeding. Tell me how long a mother usually breastfeeds after her baby is born in your community.
    Probes:
    - How are mothers supported to breastfeed?
    - When does breastfeeding start?
    - Do mothers give colostrum to the baby?
    - Do some mothers have problems with breastfeeding?
    - If a woman has difficulty with breastfeeding, what can she do?
    - When are other foods besides breast milk usually introduced?

11) Tell me about taking babies to the clinic for "routine" care.
    Probes:
    - Do mothers have their baby immunized? Why or why not?

- Does the newborn currently receive health care? If so, where do they receive health care?

12) Tell me about taking babies to the clinic for "sick' care.

Probes:

- Tell me what you do if the baby has a cough.
- Tell me what causes the baby to have a cough.
- What do you know about pneumonia?
- Tell me what you do if the baby has a fever.
- Tell me what causes the baby to have a fever.
- Tell me what you do if the baby has diarrhea.
- Tell me what causes the baby to have a diarrhea.

13) Have you ever heard about or seen a very sick baby or a baby that died?

Probes:

- Tell me what people did.
- Tell me what you saw.
- Tell me what happened.
- Tell me what helped.
- Did the baby get better?
- What caused the baby to be sick (or die)?

14) Tell me some things mothers can do to keep their baby healthy.

Probes:

- Do you have the resources to do these things?
- Is there any problem to do these things?

15) Are any of the problems or issues we just talked about new to anyone?

Appendix D

Codebook for focus groups

Theme 1: Essential newborn care

- newborn care and care-seeking according to Pregnancy, Childbirth, Postpartum and Newborn Care/Essential Newborn Care guidelines
    - state importance of attending ANC, facility deliver, PNC
    - able to identify maternal-newborn danger signs during delivery and postpartum
        - eclampsia & eclampsia
            - described by participants as "fitting/pressure/being swollen"
        - postpartum hemorrhage
            - described by participants as "too much blood"
        - management of anemia
            - described by participants as "not enough blood/lack of blood"
        - PMTCT, HIV exclusive breastfeeding for 6 months
            - discuss/obtain prophylaxis medication during ANC/PNC visits
        - early initiation and exclusive breastfeeding
            - initiate within one hour of birth
            - frequent feedings
            - breastfeed exclusively for months
        - newborn & infant feeding
            - avoid complementary foods in newborn
            - initiate complementary foods at 6 months
        - malaria in pregnancy
            - use mosquito net
            - take malaria prophylaxis medication
        - interventions to improve preterm birth
            - manage stress
            - avoid heavy lifting
            - limit hours worked in field
        - post-partum family planning
            - discuss/obtain during ANC/PNC visits
        - umbilical cord care
            - only clean water, no bandage
        - kangaroo care
            - maximize skin-to-skin contact
        - skin/thermal care
            - use blankets/hats to keep baby warm
            - prompt drying and covering
            - only clean water with gentle soap, no need for herbs/Vaseline/etc.
        - delaying of first bath
            - ideally wait for 24 hours after birth
        - hygiene practices
            - safe food handling to prevent diarrhea

- clean home environment
- wash hands after using toilet
- wash hands before breastfeeding

Theme 2: Traditional newborn protective rituals

- cultural care of the umbilical cord
    - use of traditional herbs/rat feces
    - belief that newborn will be barren if cord falls between legs
    - belief that cord must be buried under special tree or harm will come to family
- cultural prevention of cough and pneumonia
    - spread sperm on newborns to prevent cough
    - newborn breathing of smoke will prevent
- early introduction of traditional porridge
    - dietary belief that early introduction of porridge with traditional herbs at 1-2 months will protect newborn from disease

Theme 3: Strong sense of family & community to protect the newborn

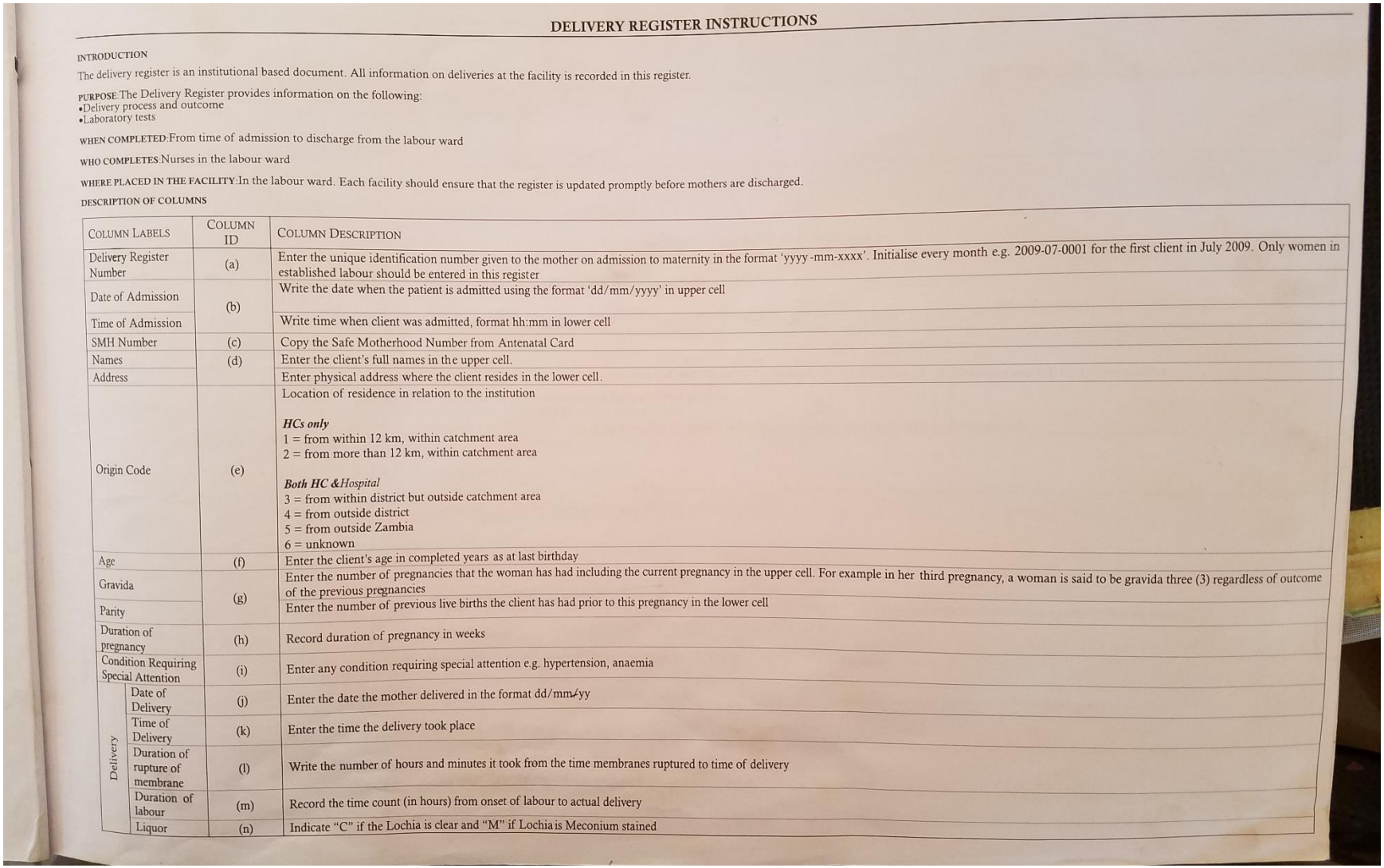
- husband
    - belief that intercourse with anyone except wife will cause death to newborn
    - belief that sperm is harmful to fetus/newborn
- mother-in-law/mother/grandmother
    - belief that use of traditional medicine will speed up delivery
- community members
    - belief that if single people touch or see newborn the baby will die or be infertile

Theme 4: Preservation of dignity

- lack of privacy
    - shame of being seen naked by male providers
    - small clinic & delivery wards
        - embarrassed to make noise during delivery
- Partner's fear of HIV/STI testing
    - desire by men not to be tested for STIs

Appendix E

Delivery Register Instructions, Zambian Ministry of Health



DELIVERY REGISTER INSTRUCTIONS

INTRODUCTION

The delivery register is an institutional based document. All information on deliveries at the facility is recorded in this register.

PURPOSE:The Delivery Register provides information on the following:
- Delivery process and outcome
- Laboratory tests

WHEN COMPLETED:From time of admission to discharge from the labour ward

WHO COMPLETES:Nurses in the labour ward

WHERE PLACED IN THE FACILITY:In the labour ward. Each facility should ensure that the register is updated promptly before mothers are discharged.

DESCRIPTION OF COLUMNS

COLUMN LABELS		COLUMN ID	COLUMN DESCRIPTION
Delivery Register Number		(a)	Enter the unique identification number given to the mother on admission to maternity in the format 'yyyy -mm-xxxx'. Initialise every month e.g. 2009-07-0001 for the first client in July 2009. Only women in established labour should be entered in this register
Date of Admission		(b)	Write the date when the patient is admitted using the format 'dd/mm/yyyy' in upper cell
Time of Admission			Write time when client was admitted, format hh:mm in lower cell
SMH Number		(c)	Copy the Safe Motherhood Number from Antenatal Card
Names		(d)	Enter the client's full names in the upper cell.
Address			Enter physical address where the client resides in the lower cell.
Origin Code		(e)	Location of residence in relation to the institution ***HCs only*** 1 = from within 12 km, within catchment area 2 = from more than 12 km, within catchment area ***Both HC &****Hospital* 3 = from within district but outside catchment area 4 = from outside district 5 = from outside Zambia 6 = unknown
Age		(f)	Enter the client's age in completed years as at last birthday
Gravida		(g)	Enter the number of pregnancies that the woman has had including the current pregnancy in the upper cell. For example in her third pregnancy, a woman is said to be gravida three (3) regardless of outcome of the previous pregnancies
Parity			Enter the number of previous live births the client has had prior to this pregnancy in the lower cell
Duration of pregnancy		(h)	Record duration of pregnancy in weeks
Condition Requiring Special Attention		(i)	Enter any condition requiring special attention e.g. hypertension, anaemia
Delivery	Date of Delivery	(j)	Enter the date the mother delivered in the format dd/mm/yy
	Time of Delivery	(k)	Enter the time the delivery took place
	Duration of rupture of membrane	(l)	Write the number of hours and minutes it took from the time membranes ruptured to time of delivery
	Duration of labour	(m)	Record the time count (in hours) from onset of labour to actual delivery
	Liquor	(n)	Indicate "C" if the Lochia is clear and "M" if Lochia is Meconium stained

	Mode of delivery	(o)	Indicate the birth form, e.g. spontaneous vaginal delivery or caesarean section 1= Normal delivery 2= CS 3= Breach 4= Assisted
	Active Management of 3rd stage	(p)	If active management enter "Y" if not enter "N'
	Placenta Complete	(q)	Write YES if placenta is complete and NO if not complete
	Uterus contracted	(r)	Write 'Y' if uterus contracted. or 'N' if not contracted
	Blood loss *(in mls))*	(s)	Indicate the amount of blood loss during delivery in millilitres (mls)
	Perineum Intact	(t)	Write 'Y' if Perineum is intact and 'N' if it is not intact. If 'N', describe degree of tear e.g. 1st, 2nd or 3rd degrees
	Labour complications	(u)	Write any complication that occurred during labour and delivery in RED
Partogram Opened		(v)	Write 'Y' if Partogram is opened. or 'N' if not opened
Episiotomy Performed		(w)	Write 'Y' if episiotomy done, OR 'N' if NOT done
HIV Status	ANC	(x)	Record HIV status during the last ANC visit This can be copied from the card. Enter 'P' for Positive, 'N' for Negative 'U' for Unknown and KP for known positive.
	Maternity	(y)	Enter 'P' for Positive, 'N' for Negative 'U' for Unknown and KP for known positive. **Note 1:** Only results for tests done in the maternity should be recorded here. **Note 2:** If column (aa) result is negative but column (ab) is positive, this is a repeat test for a woman who was tested early in the pregnancy.
ARV Prophylaxis	ANC	(z)	Use the following codes 1 = NVP only 2 = AZT + NVP 3 = HAART
	Labour and Delivery	(aa)	Use the following codes 1 = NVP only 2 = AZT + NVP 3 = HAART
	To Baby	(ab)	Use the following codes 1 = NVP 2 = ART + 3TC (7 / 28 days)
Cotrimoxazole to the mother		(ac)	Write 'Y' if Cotrimoxazole has been given or 'N' if not given. In summarising for number of mothers on CTX, count those given in maternity and those already taking CTX.
Birth	Condition of baby	(ad)	Write 'A' if baby is alive and' D' if baby is dead
	Apgar Score	(ae)	Enter the reading of the Apgar score (enter at 1, 5 & 10 minutes separated by commas)
	Weight	(af)	Enter the weight of the baby in grams
	Length	(ag)	Enter baby's length in centimetres
	Sex	(ah)	Enter M for 'Male' or F for 'Female'
	BF within 1 hour	(ai)	Write 'Y' if breast fed within 1 hour, or 'N' if NOT
Delivered by	Name / Title	(aj)	Record the name of person who conducted delivery in upper cell and his/her title in lower cell
	Signature	(ak)	Write own signature of person who conducted the delivery
	Remarks	(al)	Write any other comments that will be beneficial to the client and service

Appendix F

Delivery Register Data Collection Tool

Data Source: Delivery register at Lundazi District Hospital
Data Collector: PhD Student and/or Zambian Research Assistant
Frequency: Daily
Population: All post-partum women at Lundazi District Hospital from Lundazi District

Data Collector: _____ Today's Date: _____

1. Location of delivery:

ZaMS SITES	□ LUSUNTHA □ MWASELUNDAZI □ NKHANGA □ NYANGWE □ ZUMWANDA
NON-MWH COMPARISON SITES	□ CHIKOMENI □ KAMSANO □ KAPICHILA □ LUKWIZIZI □ PHIKAMALAZA
CEmONC	□ LUNDAZI DISTRICT HOSPITAL □ OTHER (SPECIFY)_____

2. Date of admission (*column b*): _____
3. Name of Mother's village (*column e):* _____
4. Origin Code (*column e*): **Circle one response**

   1= within 12km, within catchment area

   2= more than 12 km, within catchment area

   3= within district but outside catchment area

   4= from outside district

Maternal History

5. Age of Mother *(column g)*: _____
6. Number of pregnancies (gravida) *(column h)*: _____

7. Number of births (parity) (*column i)*: _____

8. Conditions Requiring Special Attention *(column k)*

_____

_____

9. Date of Delivery *(column s)*: _____ (DD/MM/YYYY)

10. Mode of delivery (MOD) (*column u)*: **Circle one response**

1= Spontaneous Vaginal Delivery (SVD)

2= Caesarean Section (CS)

3= Breech (BRE)

4= Assisted

Mother Delivery Outcome

14. Labor Complications *(column ab):*

_____

_____

Newborn Outcome (If multiple birth, please answer the following for each newborn)

15. Condition of Baby 1 *(column ad):* **Circle one response**

A (alive)	NO =0	YES=1
D (dead)	NO =0	YES=1

16. APGAR score (*column ae*): (@ 5 minutes) _____

17. Birth weight (*column af*): (in gm) _____

19. Breastfeeding within 1 hour? NO =0 YES=1

2nd newborn

15b. Condition of Baby *(column ac):* **Circle one response**

A (alive)	NO =0	YES=1
D (dead)	NO =0	YES=1

16b. APGAR score (*column ad*): (@ 5 minutes) _____

17b. Birth weight (*column ae*): (in gm) _____

19b. Breastfeeding within 1 hour? NO =0 YES=1

3rd Newborn

15c. Condition of Baby *(column ac):* **Circle one response**

A (alive)	NO =0	YES=1
D (dead)	NO =0	YES=1

16c. APGAR score (*column ad*): (@ 5 minutes) _____

17c. Birth weight (*column ae*): (in gm) _____

19c. Breastfeeding within 1 hour? NO =0 YES=1

20. Remarks (*column am*): (write an intervention or relevant information with regard to labor and delivery

_____
_____
_____
_____
_____

APPENDIX G

Oral Script for Nurse or Research Assistant Announcement to Women at Lundazi District Hospital and CEmONC MWH

The following is the script to be read to potential participants who are interested in participating in the study and are requesting additional information. The PI and research assistant/translator will use this script.

"Because you are pregnant or have recently delivered a baby, you are being invited to participate in a study. This study is done by myself, Julie Buser, a doctoral student at the University of Michigan. I am interested in understanding newborn health and knowledge of newborn care."

"If you agree to participate in this study, you will be asked to have 1 interview with myself and a Zambian research assistant who is acting as a translator for me in this study. These interviews will be conducted at a time and location of your choice and will be in your choice of Tumbuka or English language. The interviews will be conducted in a private place in the maternity waiting home (Mother's Shelter) in Tumbuka or English."

"If you agree to participate in this study, your name and identity will not be revealed or associated with anything you say or do in this study. You are in no way obligated to participate in this study and you may withdraw your participation at any time. Your name will not appear on these notes. Participation in this study has no effect on the services or care you receive from the clinic or hospital."

APPENDIX H

Information Sheet, Address of Ethical Issues & Informed Consent for Quasi-Experimental Study

Title: Maternity Waiting Home Use and Newborn Outcomes in Lundazi, Zambia

Researcher: Julie M. Buser, MS, CPNP-PC, RN, PhD Student

General Information about Research

The University of Michigan in the United States is conducting a research study. We want to help women in Zambia have safer births and healthier babies. We want to find out about newborn care and the maternity waiting homes (MWHs) in your district. You are being asked to be in this study because you are a valued member of the district and are pregnant or recently delivered a baby. If you agree, you will participate in an individual interview and survey with a researcher. We will ask about demographic information and ask for your opinion about newborn health and knowledge of newborn care. The interview is expected to last about 45 minutes. Snacks and a juice drink will be provided after the discussion.

Possible Risks and Discomforts

Participating in the study is not likely to cause you any harm. We will ask everyone participating in the study not to talk about anything that we discuss. This way whatever you say will be private. We don't think anything we talk about will upset you, but if it does you can leave at any time with no problem to you. If this does happen, we will refer you to the health center if you are distressed. Participating in the study or not participating in the study is up to you. If you do not want to participate in the study, it will not affect your role in the community or at the hospital in any way.

Possible Benefits

You will not get special treatment and there will be no direct benefits to you for participating in the study.

Confidentiality

We will keep what you say private as best we can. Researchers will not discuss what happens in our discussion outside the research team. We will keep all information on a computer that is password protected. No one will be able to see it except the research team. The survey form will not ask for individually identifiable information. You will not be named in any reports. Our records may be reviewed to make sure we are doing the research correctly (ERES Converge Institutional Review Board in Zambia and/or the University of Michigan Institutional Review Board in the United States).

Compensation

You will not be paid to be in the study. Snacks a juice drink will be provided after the discussion to thank you for your time.

Additional Cost
It will not cost you anything to be in the study, except for your time.
Voluntary Participation and Right to Leave the Research

You can choose to be in the study or not be in the study, it is up to you. If you choose not to be in the study, there will be no problem for you now or in the future. You can leave the study at any time without any problem to you now or in the future. Being in the study or not being in the study does not affect your role in the district or at the hospital in any way.

Termination of Participation by the Researcher

We will not ask you to leave the study unless you are too upset to continue.

Contacts for Additional Information

If you have questions or concerns about the research, please contact the researcher, Julie Buser at + 260 972612613

Your Rights as a Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions or discuss any concerns about this study with someone other than the researcher(s), please contact the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board, 540 E. Liberty St. Ste. 202, Ann Arbor, MI 48104-2210. For international calls from Zambia to the US, 00+1+734-936-0933] or email: irbhsbs@umich.edu. Please note the time in Michigan is 6 hours earlier than in Zambia.

This research has been reviewed and approved by the ERES Converge Institutional Review Board in Lusaka, Zambia. If you have any questions about your rights as a research participant, you can contact ERES CONVERGE IRB, 33 Joseph Mwilwa Road Rhodes Park LUSAKA. Tel: 0955 155633/4. Email: eresconverge@yahoo.co.uk

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the project title **Maternity Waiting Home Use and Newborn Outcomes in Lundazi, Zambia** has been read and explained to me. I have been given an opportunity to have any questions about the evaluation research answered to my satisfaction. I agree to participate as a volunteer.

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the evaluation research.

_____ _____

Date Name and signature of witness

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this evaluation research have been explained to the above individual.

_____ _____

Date Name and Signature of Person Who Obtained Oral Consent

APPENDIX I

Maternal Knowledge of Newborn Care Questionnaire

Data Source: Maternal interview
Data Collector: PhD Student and/or Zambian Research Assistant
Frequency: Daily
Population: All women staying at Lundazi District Hospital Mothers Shelter and all post-partum women referred to Lundazi District Hospital from MWH intervention and non-MWH control sites.

Data Collector: _____ Today's Date: _____

1. How old were you at your last birthday?	Age in years |___|___|
2. How many years of school have you completed?	☐ None ☐ Lower Primary (1-4) ☐ Upper Primary (5-7) ☐ Junior Secondary (8-9) ☐ Senior Secondary (10-12) ☐ Tertiary
3. Are you now single, married, living together, separated, divorced, or widowed?	☐ Single ☐ Married ☐ Living Together ☐ Separated or Divorced ☐ Widowed
4. How many times have you been pregnant?	☐ _____
5. How many live births have you had?	☐ _____
6. How many stillbirths have you had?	☐ _____
7. How many living children do you have?	☐ _____

8. Did you plan to deliver at Lundazi District Hospital?

☐ YES ☐ NO

9. Were you referred to Lundazi District Hospital?

☐ YES ☐ NO

10. **IF YES,** where were you referred from?

MWH Sites	□ Lusuntha □ Mwaselundazi □ Nkhanga □ Nyangwe □ Zumwanda
Non-MWH Sites	□ Chikomeni □ Kamsano □ Kapichila □ Lukwizizi □ Phikamalaza
CEmONC MWH	□ Lundazi District Hospital

11. **IF YES,** why were you referred?
RECORD ALL REASONS MENTIONED

□ The doctor/nurse told me I had to □ I was bleeding □ The baby was stuck □ I was in labor pain for a long time □ The baby was not in the right position □ I have HIV, syphilis, or other sexually transmitted infections □ Distance □ High blood pressure	□ I needed a caesarian section (C-section) □ I had a fever □ My womb was leaking fluid □ There were problems with the baby □ Wait to deliver □ No midwife available at clinic □ Don't know □ Other (Specify)_____

12. Did you stay at a Mothers Shelter before delivery?

□ YES □ NO

13. **IF YES,** which one?

MWH Sites	□ Lusuntha □ Mwaselundazi □ Nkhanga □ Nyangwe □ Zumwanda
Non-MWH Sites	□ Chikomeni □ Kamsano □ Kapichila □ Lukwizizi □ Phikamalaza
CEmONC MWH	□ Lundazi District Hospital □ Other (Specify)_____

14. Did someone tell you to stay at the Mothers Shelter?

□ YES □ NO

15. **IF YES,** who told you to stay at the Mothers Shelter?

□ Nurse □ Midwife □ TBA □ SMAG	□ Traditional Healer □ Family Member □ Don't Know □ Other (Specify)_____

16. **IF YES,** what was the reason you were told to stay at the Mothers Shelter?

RECORD ALL REASONS MENTIONED

□ The doctor/nurse told me I had to □ I was bleeding □ The baby was stuck □ I was in labor pain for a long time □ The baby was not in the right position □ I have HIV, syphilis, or other sexually transmitted infection □ Distance	□ I needed a caesarian section (C-section) □ I had a fever □ My womb was leaking fluid □ There were problems with the baby □ Wait to deliver □ No midwife available at clinic □ Don't know □ Other (Specify)_____

17. Did you attend any health talks at the Mothers Shelter?

□ YES □ NO

18. **IF YES,** what were the health talks about?

RECORD ALL HEALTH TALKS MENTIONED

□ Danger signs for mother, labor, recognition and early signs and postpartum care □ Nutrition and exercise during pregnancy □ Good sanitation and hygiene to prevent diarrheal diseases □ Post-partum family planning □ Malaria in pregnancy □ Danger signs for neonatal and well-baby care □ Early initiation and exclusive breastfeeding □ Post-partum family planning □ Infant and young child feeding practices □ Immunizations □ STDs, HIV and AIDS □ Gender Based Violence □ Don't know □ Other (Specify)_____

19. **IF YES,** who gave the health talks?

□ Nurse □ Midwife □ TBA □ SMAG	□ Traditional Healer □ Family Member □ Don't Know □ Other (Specify)_____

20. Did you attend antenatal care (ANC)?

□ YES □ NO

21. **IF YES,** how many ANC visits did you attend?

□ 1 □ 2 □ 3	□ 4 □ Don't know □ Other (Specify)_____

22. During antenatal care, did a healthcare provider talk with you about newborn problems you should watch for?

□ YES □ NO □ DON'T KNOW

23. Tell me what health problems in your newborn would make you want to take your baby to the clinic. **(ASK QUESTION AND WAIT FOR RESPONSE WITHOUT PROMPTING) RECORD ALL PROBLEMS MENTIONED**

□ Seizures □ No movements or weak cry □ Weak suckling or feeding □ Breathing difficulties or rapid breathing □ Fever □ Shivering □ Diarrhea	□ Excessive crying □ Redness/Discharge around the umbilical cord □ Eyes swollen and red with pus □ No urination/stool □ Cough □ Other (Specify)_____ □ None/Don't Know

24. Apart from ANC visits, did you receive newborn information from anyone else during your pregnancy?

□ YES □ NO

25. **IF YES,** who gave you the information?

□ Nurse □ Midwife □ TBA □ SMAG	□ Traditional Healer □ Family Member □ Don't Know □ Other (Specify)_____

26. When did you learn about health problems in your newborn that would make you want to take your baby to the clinic?

□ During my stay at the mothers shelter □ From midwife during ANC □ In community from a SMAG	□ At home from a family member □ Don't Know □ Other (Specify)_____

27. Tell me about how you will care for your baby's umbilical cord when you get home.

RECORD ALL APPLICATIONS MENTIONED

□ Breastmilk □ Plain Water □ Soap (Lifebuoy)	□ Traditional Herbs □ Don't Know □ Other (Specify)_____ _____

28. Have you ever heard the term "Kangaroo Care", or skin-to-skin care, for the baby to keep them warm?

□ YES □ NO

29. **IF YES,** tell me what you know about "Kangaroo Care", or skin-to-skin care, for the baby to keep them warm.

RECORD ALL ITEMS MENTIONED

□ Baby naked against your skin □ Baby wears a hat □ Promotes bonding and/or Attachment	□ Helps promote increased milk production and/or Breastfeeding success □ Don't Know □ Other (Specify) _____

30. How will you care for your baby's skin when you get home?

RECORD ALL APPLICATIONS MENTIONED

□ Petroleum Jelly	□ Traditional Herbs
□ Commercial Baby Lotion	□ Glycerin
□ Cooking Oil	□ Don't Know
□ Breastmilk	□ Other (Specify) _____

31. Tell me what you know about exclusive breastfeeding.

RECORD ALL ITEMS MENTIONED

□ Only give breastmilk for 6 months	□ Promotes optimal growth
□ No other liquids or solids are given	□ Protects baby from diarrhea and/or infection
□ Good nutrition	□ Don't Know
□ Breastmilk	□ Other (Specify) _____

32. How long do you plan to breastfeed?

□ _____

33. When do you plan to give your baby complementary foods?

□ _____

34. Sometimes newborns get diarrheal diseases. Tell me what you know about good sanitation and hygiene to prevent diarrheal diseases. **RECORD ALL ITEMS MENTIONED**

□ Exclusively breastfeed	□ Maintain hygienic environment
□ Wash hands before and after eating	□ Don't Know
□ Wash hands before and after using toilet	□ Other (Specify) _____

35. Who told you about good sanitation and hygiene to prevent diarrheal diseases?

□ Nurse	□ Traditional Healer
□ Midwife	□ Family Member
□ TBA	□ Don't Know
□ SMAG	□ Other (Specify)_____

36. When will you take your baby for the first check-up?

□ _____