OBSTETRIC AND PERINATAL OUTCOMES OF A PROFESSIONAL MIDWIFERY SERVICE IN GUATEMALA: A RETROSPECTIVE COHORT STUDY MEASURING OPTIMALITY

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Abstract

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In a 1999 Joint Statement on Reduction of Maternal Mortality, the World Health Organization and several partner agencies strongly endorsed national policies favoring professional midwifery care for all normal births. However, professional midwives remain absent from the maternity care system in Guatemala, where perinatal outcomes are among the poorest in the Western Hemisphere. The majority of childbearing women in Guatemala are cared for by traditional midwives who lack access to adequate training, supplies and equipment and are poorly integrated into the formal health care system. Concurrently, hospital services yield a high rate of obstetric intervention with no associated reduction in the incidence of poor outcomes. A retrospective cohort study was designed to compare the obstetric and perinatal processes and outcomes of professional midwifery services in a free-standing birth center in Antigua Guatemala (n=99) and a home birth service in inner-city Chicago (n=157). Study sites were chosen because of similarities in patient demographic and perinatal backgrounds, delivery sites, midwife qualifications, and practice guidelines. Processes of care and perinatal outcomes were measured using an adapted optimality tool as described by Murphy and Fullerton (2001). No statistically significant differences were observed in composite index scores across the two settings. These results suggest that professional midwifery may optimize the maternity care provided to low-risk women in Guatemala by maximizing outcomes while minimizing interventions. The applicability of the optimality concept to low-resource settings and implications for policy are discussed.

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Chapter I

BACKGROUND

Introduction

The Safe Motherhood Initiative (SMI), launched in 1987, has emphasized the importance of a skilled attendant present at every birth as a means to reduce maternal mortality in areas of the world where rates remain high. A skilled attendant is defined as a "person with midwifery skills [that include] the capacity to initiate the management of complications and obstetric emergencies including life saving measures where needed"(WHO, UNFPA, UNICEF, & World Bank, 1999, pg. 31).

While SMI considers doctors, midwives and nurses all to be suitable personnel to serve as skilled attendants, special emphasis has been given to strengthening professional midwifery through training, regulation and political action. The Initiative has sponsored the development of "Country Action Plans" to meet this objective in selected areas of the developing world (ICM, WHO, & UNICEF, 1997). These efforts emerge from historical analyses of maternal mortality trends demonstrating that improved maternal outcomes have correlated most strongly with one factor: national policies favoring professional midwifery care for all normal births. In their 1999 Joint Statement on Reduction of Maternal Mortality, the World Health Organization (WHO), the United Nations Population Fund (UNFPA), the United Nations Children's Fund (UNICEF), and the World Bank provide specific examples that illustrate this trend. Sweden experienced dramatic declines in maternal mortality after adopting such policies and establishing standards for professional midwifery care in the late 1800's. Denmark, the Netherlands and Japan followed with similar strategies and comparable results in the early twentieth

century. In England and Wales, delays in introducing professional midwifery resulted in corresponding delays in improved outcomes. Recently, significant improvements in maternal outcomes have been seen in Sri Lanka, China, Cuba and Malaysia, developing countries with high rates of births attended by trained personnel, strong community-based maternal health care systems and effective linkages between levels of care in the case of obstetric complications. This suggests that the organization of a nation's health care system, perhaps more than socioeconomic factors, affects maternal mortality rates (WHO et al., 1999).

An ecological analysis of maternal mortality ratios conducted using 1999 data supports these historical observations. The authors studied the individual and group effects of six "promising interventions" on maternal mortality and found that maternal mortality ratio was most strongly inversely associated with the proportion of deliveries with a skilled attendant, with high levels of maternal mortality observed where skilled attendance at delivery was less frequent (Sloan, Winikoff, & Fikree, 2001). While these results do not necessarily indicate a causal relationship, the authors conclude that strategies aimed at increasing the proportion of deliveries with skilled attendants are likely to be beneficial and should be tested further.

Recognizing the need for the establishment of professional midwifery globally, the International Confederation of Midwives (ICM), a member of SMI, has recently completed a comprehensive, two-phase global effort to delineate the essential competencies for midwives (Fullerton, Severino, Brogan, & Thompson, 2003). The resulting document puts forth the "basic knowledge, skills and behaviors required of the midwife for safe practice in any setting" and is in keeping with the International

Definition of the Midwife. These competencies are "ideally practiced within a community-based health care system that may include traditional birth attendants, traditional healers, other community-based health workers, doctors, nurses and specialists in referral centers" (ICM, 2003).

This concept is reflected in an emerging model of maternity care systems where midwives are essential both in the direct provision of primary obstetric care and in their role as linkage between community-based providers and the formal health care system. Increasingly, global experts are working at the country level to promote pyramid-like systems that shift basic maternity care to "the most peripheral level at which it is feasible and safe" (World Health Organization Department of Reproductive Health and Research, 1999, pg. 31) and involve communities, small health centers and hospitals in an integrated system that employs midwives at all levels. (See Figure 1.)

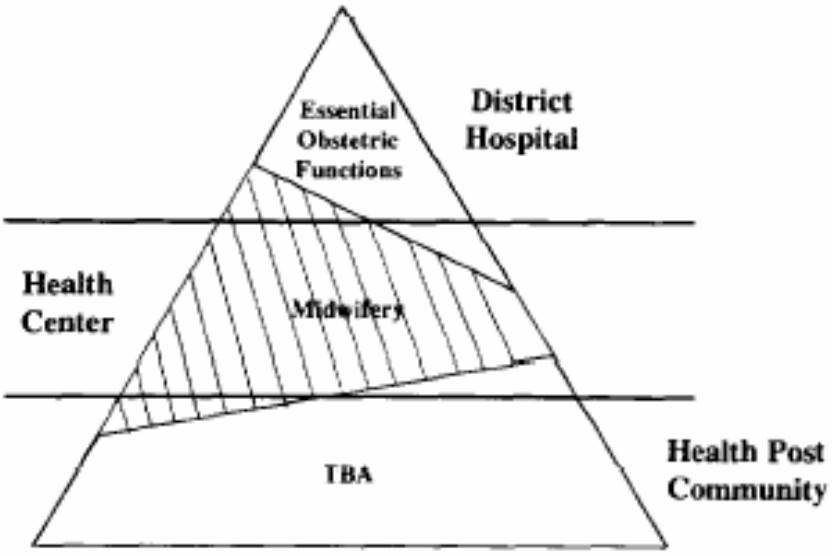

Fig. 1. The district health system and safe motherhood. Source: WHO Document. 'Human Resource Development for Maternal Health and Safe Motherhood.' Report of a task force meeting, Geneva, April 1990. MCH/HRD/90.1

Maternity Care in Guatemala

The quality of information about the incidence and causes of maternal morbidity and mortality in individual countries is poor. Nevertheless, the World Health Organization (WHO) has estimated that the causes of maternal deaths are essentially the same in all developing countries. These include, in order of incidence, hemorrhage, sepsis, hypertensive disorders, obstructed labor and complications of unsafe abortion (WHO et al., 1999). A study conducted in urban and peri-urban areas of Guatemala in 2000 found that the two leading causes of maternal mortality in the study area were infection and hemorrhage, suggesting that Guatemala is consistent with other developing countries with respect to pregnancy-related mortality (Kestler & Ramirez, 2000).

A study published in 2000 describes the results of a comparative assessment of maternal and neonatal health services in 49 developing countries, among them Guatemala. Country experts responded to an 81-item questionnaire that rated the maternal and neonatal health programs of in their respective countries. The questionnaire included items in 13 areas: capacities of health centers, capacities of district hospitals, percentage of population with access, care at antenatal visits, care at delivery, care for newborns, family planning at health centers, family planning at district hospitals, policies toward safe pregnancy, resources for maternity care, information/education, training arrangements, and monitoring/evaluation. This study provides a more useful comparative measure than individual statistics such as maternal mortality rate (MMR), the method for calculating which may vary significantly among nations and regions. Guatemala scored below the mean in 12 of 13 areas measured (all but “resources for maternity care”), with

scores in the bottom three of 13 Latin American and Caribbean nations surveyed in nine of the areas (Bulatao & Ross). While this study measured health care resource and access indicators as opposed to outcomes, its results are consistent with the conventional wisdom that pregnant women and their babies in Guatemala can expect care and outcomes that are among the poorest in the Western Hemisphere.

The root of this problem lies at least in part in the way maternity care is delivered in Guatemala. The ideal "pyramid-like" maternity care structure described above stands in stark contrast to the "hourglass-like" structure observed in Guatemala. Here the middle tier of the pyramid, which is characterized by broad use of skilled attendants with midwifery skills, has eroded. Guatemala eliminated professional midwifery schools in the 1970s and now restricts many aspects of traditional midwifery practice, with an apparent aim to phase out all forms of midwifery in favor of medical care and hospital deliveries (Kwast, 1995). As a result, Guatemala has a pluralistic health care system characterized by the coexistence and concurrent use of traditional and biomedical sectors. Maternity care is provided by community-based traditional midwives (also referred to as traditional birth attendants, or TBAs) and by biomedical practitioners (i.e., doctors and nurses) based in centralized hospitals and health posts (Acevedo & Hurtado, 1997; Cosminsky & Schrimshaw, 1980). These systems are poorly integrated, contributing to inadequate access to essential obstetric functions[a] (EOF) and various other inefficiencies (Acevedo & Hurtado, 1997; Pebley, Goldman, & Rodriguez, 1996). Poor quality of care and perinatal outcomes are observed in both the care provided by traditional midwives

[a] The World Health Organization (WHO) defines EOF as: surgical obstetrics, anesthesia, medical treatment, blood replacement, manual procedures and monitoring of labor, management of women at high risk, family planning support and neonatal special care (World Health Organization, 1991)

(TMs) and by the existing biomedical infrastructure (Goldman & Glei, 2003; Kestler & Ramirez, 2000).

Hospital services in Guatemala yield a high rate of obstetric intervention, as evidenced by a 23.8 percent cesarean section rate in public hospitals, and a rate of 63.9 percent in private hospitals, with no associated reduction in the incidence of poor outcomes (Barillas & Valladeres). A study of maternal mortality in the area of Guatemala City, where hospital birth is common, found that one-third of fatal maternal infections – the most common cause of maternal death in the population studied – resulted from cesarean deliveries (Kestler & Ramirez, 2000). This study further found that "vaginal deliveries where there was medical assistance had the highest rate of delivery-related death from general infection" (p. 43). Despite these statistics, there continue to be efforts to move more births into the hospital setting. However, it is estimated that Guatemalan hospitals are only capable of safely serving 20 percent of the country's birthing women (Schieber & Delgado, 1993).

The persistence of traditional midwifery in Guatemala is related to the shortcomings of the current medical model, as well as cultural, demographic and economic factors. Approximately half of the population is indigenous and maintains a separate cultural identity from the "ladino" population (i.e., those of mixed indigenous and European descent, characterized by more "Western" dress and Spanish as the predominant language). The indigenous population is heavily concentrated in rural areas where access to formal health services is very limited. They are also disproportionately poor, with 91 percent living in poverty (Pan American Health Organization, 1998). A 1995 survey conducted in 60 rural communities in Guatemala found that, while all of the communities

surveyed had access to a traditional midwife, only 25 percent had a public hospital within one hour of travel time and almost half were more than an hour's distance from any doctor that serves pregnant women. Furthermore, the average cost of maternity care by a TM was a small fraction of that charged by private doctors, and traditional midwives were much more likely to accept payment in-kind. As a result, nearly all indigenous women in Guatemala rely primarily or exclusively on TMs for maternity care. Even among ladinos, approximately 75 percent of women depend on TMs for prenatal care, while half are attended by TMs during childbirth. Postpartum care is exclusively provided by TMs in both populations (Acevedo & Hurtado, 1997).

Training for TMs is provided by the Guatemalan Ministry of Health (MOH) and several non-governmental agencies. With few exceptions, these training programs are widely considered inadequate and ineffective. The 15-day training course offered by the MOH is taught by nurses who lack experience in obstetrical management, rely on didactic teaching methods without opportunities for practice or interactive learning, and conduct educational sessions in Spanish, even though many traditional midwives are conversant only in their indigenous Mayan languages (Lang & Elkin, 1997). As a result, TMs often lack the skills necessary to correctly diagnose and manage obstetric complications or respond to emergencies. Even when a complication is correctly and promptly recognized, the patient must navigate a poorly integrated system and travel great distances without the assistance of emergency transport vehicles or personnel to obtain emergency care. Many untrained or empirically trained midwives also provide care despite laws requiring government-approved training (Goldman & Glei, 2003).

Traditional midwife training programs and regulatory efforts in Guatemala largely emphasize the identification of risk factors and transfer of patients into the hospital system. This model fails to address the cultural, logistical and economic barriers that may interfere with transfers should a hospital birth become necessary, as well as the fact that birth can safely take place outside of the hospital setting with adequate personnel and infrastructure.

Measuring the Impact of the Midwifery Model of Care on Perinatal Outcomes

Despite international support for strengthening midwifery services to improve maternal and perinatal outcomes, only recently have experts successfully begun to describe the unique characteristics of the "midwifery model of care." Among the key findings in her landmark study of "exemplary midwives," Kennedy found that exemplary midwifery is characterized not by low rates of interventions such as labor induction or cesarean delivery or by good outcomes such as high Apgar scores, but by "optimal health of the woman and/or infant in the given situation." "Support for normalcy of birth" and "vigilance and attention to detail" help ensure this result (Kennedy, 2000, pg. 8).

For many years, emphasis has been given to measuring the outcomes of different maternity care strategies and models. These efforts have relied on benchmarking of best practices or maternal and perinatal morbidity and mortality measurements. However, the appropriateness and utility of these methods in measuring outcomes of midwifery care provided to low-risk women has been called into question (Murphy & Fullerton, 2001; Wiegers, Keirse, Berghs, & van der Zee, 1996). Benchmarking of best practices in order to compare rates of obstetric interventions fails to take into consideration the context in

which interventions take place. Maternal mortality tends to be rare in low-risk populations, and the usefulness of perinatal morbidity and mortality indicators is complicated by differences in definitions, reporting procedures and calculation methods across settings. The limitations of measuring only these health indicators highlight the need for an alternative approach, where evaluation of the processes of midwifery care is incorporated into outcome analyses. There has been a growing recognition of the need for such midwifery evaluation instruments as a means to ensure quality maternity care (The Pew Health Professions Commission, 1999; Thompson, 2002; Wells, Nelson, Kotch, Weiss, & Gaudino, 2001).

In 1996, Wiegers and colleagues developed a tool to measure "maximum outcome with minimal intervention"(Wiegers, Keirse, Berghs et al., 1996) based on a previously defined "optimality concept"(Prechtl, 1980). The tool measures the frequency of the best possible, i.e., "optimal," outcomes for various items pertaining to the course of labor, postpartum and the newborn period, then calculates a composite index score to reflect overall optimality. Additionally, the optimality concept considers both the outcome itself and the means by which it was achieved by incorporating a measurement of the frequency of common obstetric interventions, with less reliance on interventions indicating a more optimal condition. By reflecting midwives' commitment to supporting the normalcy of birth and to using technology judiciously, the tool then succeeds in quantifying "optimal health of the woman and infant in the given situation" as described by Kennedy (2000), and thus provides an important tool for measuring exemplary midwifery processes and outcomes. This method of tracking best possible outcomes in relationship to different models of care also avoids judgments of "normal" versus

"abnormal" and maintains an emphasis on positive outcomes as opposed to adverse (and generally rare) events. Finally, such a tool allows for the study of midwifery care to comparable populations across countries and birth sites.

Purpose of the Study

The current study employs an adapted optimality tool to determine whether it is possible to provide professional midwifery care to a diverse Guatemalan population using North American standards of midwifery care and achieve outcomes similar to those feasible in an exemplary midwifery practice serving an urban Latina population in the United States.

Chapter II

METHODS

Research Design

This was a retrospective cohort study comparing the obstetric and perinatal processes and outcomes of professional midwifery services in a free-standing birth center in Antigua Guatemala and a home birth practice in inner-city Chicago. Data were retrieved through a comprehensive chart review and processes and outcomes of care were measured using an adapted optimality tool as described by Murphy and Fullerton (2001). It is hypothesized that the midwifery care and outcomes achieved in the Guatemalan practice are more similar to those of an exemplary midwifery practice in the U.S. than to those achieved by the Guatemalan standard of care. The home birth service in Chicago was selected because the style of practice and population served are similar to those of

the Guatemalan birth center, and because of its reputation and status as an "exemplary" midwifery service.

The Settings

Ixmucané Centro de Parto y Salud de la Mujer (also simply known as "Ixmucané") is a free-standing women's health and birth center located in Antigua Guatemala. Its mission is to provide respectful, empowering, full-scope women's health care by professional midwives to all women. Care at Ixmucané is directed by United States-educated nurse-midwives in accordance with standards of practice established by the American College of Nurse-Midwives. Ixmucané also serves as a clinical education site for professional midwives from the U.S. and other countries and for traditional midwives in Guatemala.

In conjunction with the U.S.-based not-for-profit organization Midwives for Midwives & Women's Health International (MFM), Ixmucané serves as a pilot project intended to model the provision of professional midwifery care within a system that links community-based maternity care with the formal medical sector. Women who want to give birth at the birth center may register for care during the prenatal period. Additionally, a woman may transfer to the birth center during the course of her pregnancy, labor or in the postpartum period if she has begun her care with a traditional midwife with the intention of giving birth in her own community (typically in her own home or in the home of the traditional midwife). This arrangement is an extension of the TM training program offered by MFM. Traditional midwives who have completed MFM's program may bring patients to the birth center for jointly managed care when there is an actual or potential complication or when a second opinion is warranted. In

turn, the professional midwives at Ixmucané have established consulting relationships with local physicians and are able to consult, collaborate, or refer care as indicated by the health status of the patient. When necessary, transfer to the hospital is accomplished using a project vehicle owned by MFM or using patient-arranged transportation when available.

Ixmucané's patients include women from Antigua Guatemala and the surrounding villages and towns. This region has relatively good access to medical services, transportation, and basic utilities like electricity and clean water compared with other areas of Guatemala. However, extreme poverty still exists nearby, and Ixmucané's sliding fee scale ensures access to a wide range of women of both indigenous and ladina descent. Because it is the only professional midwifery practice in the area, a portion of Ixmucané's clientele is comprised of women from developed countries who live in Guatemala and have sought out good quality maternity care.

Comparison data were obtained from a midwifery practice in inner-city Chicago that serves a primarily immigrant Latina population and offers professional midwifery care including home births for low-risk women. The service is widely considered an exemplary midwifery practice, having won the Safe Motherhood Initiative-USA Model Award in 1999 and 2000 (Anonymous, 2002). The home birth service is a part of a midwifery practice offering both home and hospital birth that functions within a large bilingual inner-city community health center. The mission of the not-for-profit community health center is to "provide access to quality cost-effective health care to the Latino community, the uninsured and underinsured, and not to the exclusion of other cultures and races. This mission is expressed through the provision of services, advocacy,

education and research and evaluation provided in an environment of caring and respect" (Board of Directors).

All women registering for prenatal care at the community health center are screened for risk factors, and those who meet predetermined criteria are offered the home birth option. Those women who enroll in the home birth service attend a preparation class and receive a home visit near the time of delivery. Established practice relationships with physicians provide the opportunity for consultation or collaboration as needed. If, at any time, the woman or her fetus/infant ceases to meet screening criteria for delivery at home, care is transferred to the hospital setting. The majority of patients are undocumented immigrants from Mexico or, less frequently, Central or South America. Ninety percent of the clientele of the community health center are monolingual in Spanish, and most live in poverty (Board of Directors). However, like Ixmucané, the service's reputation attracts some patients who specifically seek midwifery care and whose demographic characteristics differ from the primary beneficiaries of this inner-city midwifery service.

As a free-standing birth center, Ixmucané provides a model of midwifery care similar to that of out-of-hospital practices, including home birth practices, in the United States. The Chicago midwifery practice was chosen as a comparison site because it serves a primarily Latina population with socioeconomic conditions similar to those of women living in Guatemala. Additionally, Ixmucané has access to personnel and equipment as the Chicago-based practice provides in the home and similar protocols for identifying women who require more specialized care in a hospital setting. Notable exceptions include protocols that allow for pharmacologic induction or augmentation of labor using intravenous oxytocin and vacuum-assisted delivery at Ixmucané. Additionally, unlike the

Chicago midwifery practice, Ixmucané provides out-of-hospital care to women planning a vaginal birth after a previous cesarean section.

The Sample

The researcher used a modified power analysis to establish the necessary number of study participants to show equivalence between the two cohorts. Using Illinois State Health Department maternal and child health data (separated by ethnicity) and a large cohort study of Guatemalan women and infants, the researcher determined that the incidence of low birth weight (LBW), a marker for poor obstetric outcome, is considerably different between the two populations (15 percent in Guatemala and 7.1 percent among Hispanic infants in Chicago) (IPLAN Data System, 2001; United Nations Children's Fund, 1999). Using LBW data from the Guatemalan cohort as a proxy of the LBW rates at Ixmucané (i.e., the worst case scenario being Ixmucané's outcomes are equal to those in the rest of Guatemala,) for an *n* of 250 births, the researcher would have 80 percent power to detect an odds ratio of 2.345. By then comparing Ixmucané with the Chicago midwifery service, where outcomes are assumed to be similar if not better than among the overall Hispanic population in Chicago, the researcher would then have the power to detect poorer outcomes (i.e. those more similar to Guatemala than Chicago) and reject the null hypothesis.

Complete perinatal process and outcomes data were available for those planned birth center births that took place at Ixmucané between October 1997 and June 2002 (n=99). This method excludes intrapartum transfers to Ixmucané of women planning to give birth with traditional midwives because complete prenatal records and medical histories were not recorded for these women (n=13; four transfers for malpresentation, four transfers

for failure to progress, one transfer for moderate meconium, one transfer for prolonged rupture of membranes, three transfers for unknown indications.) It also excludes patients who required antepartum or intrapartum transfer to hospital-based care because outcomes data were not reliably recorded for these patients and their newborns. (See Table 1.) Additionally, one patient delivered a previable infant at the birth center after electing not to accept hospital-based care. Another patient who planned to deliver at the birth center had an unattended precipitous delivery at her home. Both of these births were excluded from the final data set.

Table 1. Indications for antepartum and intrapartum transfers to hospital-based care in Guatemala cohort

Indication	**N**
Antepartum (*n*=7)	
Preeclampsia	2
Preterm rupture of membranes	2
History of classical C/S	1
Malpresentation at term	1
Preterm labor	1
Intrapartum* (*N*=13)	
Failure to progress	5
Malpresentation	4
Fetal distress	3
Placental abruption	1

* All intrapartum transfers resulted in cesarean deliveries.

Comparison group data were retrieved from 156 planned home births that took place at home with the Chicago-based midwifery service between 1997 and 2002, randomly selected from a total of all 174 home births that took place during the study period. Again, this method excludes data from those patients who planned home births but required antepartum or intrapartum transfer to the hospital setting because complete

process and outcomes data were not available for these births. Additionally, two births were excluded from the data set because the women precipitously delivered before midwives reached the home, yielding a final *n* of 154 for the Chicago cohort. Data pertaining to the rate and indications for hospital transfer were not available for this cohort.

Data Collection Instruments

The optimality tool developed by Wiegers et al. was modified by Murphy and Fullerton (2001) to reflect contemporary nurse-midwifery as practiced in the United States. The resulting "Optimality Index-US" (OI-US) was further adapted for use in this study. Amendments were made based on the models of care provided at the sites studied and limitations of available clinical data. Additionally, some changes to the tool that were made by Johnson and Vedam in 2003 to reflect the most current clinical evidence are applied again in this study (Johnson & Vedam, 2003).

The resulting tool uses an 11-item Perinatal Background Index to assign a composite background score to each participant based on the frequency of optimal background characteristics. (See Table 2.) This index, which includes items pertaining to social and medical background and obstetric past history, produces a composite index score that can be used to assess comparability between groups and individuals. The score is constructed by summing the results of a dichotomous system where each variable is assigned a value based on whether it meets (value = 1) or does not meet (value = 0) criteria for "lowest risk." Pregnancy, maternal and newborn outcomes are then measured using a 33-item Perinatal Outcome Index. (See Table 3.) Again, optimality is defined using a dichotomous system where each item either meets or does not meet optimality criteria.

By summing the results for each variable for each participant, a composite index score is then calculated.

The Perinatal Outcome Index was designed to be self-weighting (Murphy & Fullerton, 2001; Prechtl, 1980; Wiegers, Keirse, Berghs et al., 1996), in that nonoptimal findings on "important" perinatal outcomes (such as perinatal mortality or serious morbidity) tend to be accompanied by simultaneous nonoptimal findings in other items within the index. On the other hand, those nonoptimal findings that occur in isolation tend not to be associated with nonoptimal outcomes in the overall course of the pregnancy and birth.

Tables 2 and 3 present the items included in the Perinatal Background Index and Perinatal Outcome Index, respectively, for the purposes of this study, as well as necessary clarification of any changes to the indexes from previous versions of the instruments. Additionally, rationale is given for the exclusion of any variables from the OI-US for the purposes of this study.

Table 2. The Perinatal Background Index.

Variable	Criteria for "lowest risk"	Comments
Involved partner	Yes	Adapted from marital status/"as if married" because presence of supportive partner more reliably noted in charts than marital status.
Cigarette smoking	None	
Alcohol use	None	
Drug use	None	
Preexisting major chronic disease	No	Includes chronic hypertension, chronic renal disease, non-gestational diabetes, heart disease class II-IV, HIV antibody positive, major psychosocial history (treated with drugs or inpatient therapy), hematological disorder, asthma, liver disease, neurological disorder, and thyroid disorder. "Prior pregnancy complications" was excluded from this item and added to "history of other serious obstetric complications," below.
Interval between viable pregnancies	> 18 months	
Previous preterm delivery	No	< 37 weeks gestation
Previous intrauterine fetal demise	No	
Previous cesarean section	No	
Previous low birth weight for gestational age infant	No	
History of other serious obstetric complications	No	Adapted from "history of other serious antepartum complications" to include intrapartum and postpartum complications previously included among chronic disease category above. Item includes gestational diabetes, placenta previa, placenta abruption, severe pregnancy-induced hypertension (preeclampsia), eclampsia, pyelonephritis, Rh sensitization, recurrent abortion/fetal loss, and intrauterine growth restriction. Additionally, hyperemesis gravidarum, gestational trophoblastic disease, postpartum hemorrhage, retained placenta, and shoulder dystocia were included.
Items Excluded from OI-US for the purpose of this study		**Rationale**
Ethnic minority		Not reliably noted in patient charts in either setting.
Prepregnancy body mass index (BMI)		Height not reliably noted in patient charts in either setting, making calculation of BMI impossible.
Age		Database error resulted in this information not being collected.

Table 3. The Perinatal Outcome Index

Variable	Criteria for "optimality"	Comments
Vaginal bleeding in second or third trimesters	None	
Weight gain in pregnancy	16-40 pounds	
Preeclampsia	No	Defined as diagnosis of preeclampsia or hypertension (blood pressure ≥ 140/90) with 2+ proteinuria.
Anemia	No	Defined as hemoglobin < 10mg/dl in any trimester
Other serious antepartum complications	No	Include gestational diabetes, intrauterine fetal demise, preterm labor, placenta previa, placenta abruption, pyelonephritis, and Rh sensitization. Additionally, current domestic violence, acute exacerbations of chronic disease, polyhydramnios/ oligohydramnios, pneumonia, and TORCH infections were included.
Adequate prenatal care	Yes	Defined as initiation prior to 14 weeks gestation and at least nine visits.
Nonstress test, contraction stress test or biophysical profile	No	Excluding use of these procedures for post-dates testing.
Prescription drugs prescribed or taken during pregnancy	No	Excluding iron and vitamins.
Preterm birth	No	Defined as delivery prior to 37 weeks gestation.
Time between rupture of membranes and delivery	≤ 24 hours	
Amniotic fluid	Clear	
Pharmacologic induction or augmentation of labor	No	
Oral or parenteral (IM or IV) medication during first or second stage of labor	No	Excluding induction/augmentation agents.
Intermittent monitoring during labor	Yes	Rather than continuous electronic fetal monitoring.
Fetal heart rate abnormalities	No	Includes prolonged bradycardia, late decelerations, loss of beat-to-beat variability. Prolonged tachycardia was added.
Presence of a support person during labor	Yes	Other than care provider.
Need for collaborative management	No	Includes medical co-management during intrapartum, postpartum and/or newborn periods.
Presentation at birth	Cephalic	
Instrumental (vaginal) delivery	No	
Episiotomy	No	

Variable	Criteria for "optimality"	Comments
Laceration of perineum or perineal tissue	No	Including episiotomy or third or fourth degree laceration despite the fact that these are measured separately. This approach accounts for an appreciation of the continuum of perineal trauma within the OI-US.
Third or fourth degree laceration	No	
Suturing of episiotomy or laceration	No	
Retained placenta	No	
Postpartum hemorrhage (PPH)	No	Defined as estimated blood loss ≥ 500ml or diagnosis of PPH by the provider.
Blood transfusion	No	
Other serious intrapartum problems	No	Includes abruption, cord prolapse, severe PIH, PIH with eclampsia, and shoulder dystocia (as defined by practitioner).
Estimate of gestational age	37 – 42 weeks	This information was not reliably documented in newborn charting. Therefore, EGA was assumed to be consistent with pregnancy dating unless otherwise noted.
Birth weight	2500 – 4500 grams	
Apgar score at five minutes	8, 9, or 10	
Breast fed by one hour after birth	Yes	
Transfer to high risk neonatal care setting	No	
Birth trauma or other serious medical problem	No	Includes bacterial infections other than sepsis, bronchopulmonary dysplasia, cardiac failure, hypovolemia, hypotension, shock, intraventricular hemorrhage, necrotizing enterocolitis, pneumonia, persistent pulmonary hypertension, renal failure, respiratory distress syndrome, Rh disease, seizures, and sepsis.
Perinatal death	No	
Items excluded from the OI-US for the purposes of this study		**Rationale**
Amniocentesis		This procedure is not accessible to many women in Guatemala.
Delivery occurred in the place originally intended at the onset of labor		The data set includes only those women whose births took place in the originally intended setting.
Epidural		This intervention was never performed in either setting.
Cesarean section		Same as above.
Fever or provider diagnosis of infectious process while mother remains in the birth setting		Detailed information about the condition of the mother after the immediate postpartum period were not available for births taking place at Ixmucané
Prescription medication for newly identified conditions in mother		Same as above

Data Collection and Analysis

The study was approved by the Yale University School of Nursing Human Subjects Research Review Committee and a HIPAA Waiver of Authorization was obtained. Data for patients of Ixmucané were retrieved from the history and physical summary, prenatal flow sheet, and labor and birth summary. Full chart reviews were conducted separately to obtain information on those variables that were not reliably documented in these summaries. Comparison group data from the Chicago midwifery service were retrieved through full chart reviews. All data were entered into a password-protected Microsoft Access® Database with all Protected Health Information omitted. Data were later exported to an Excel® spreadsheet and each variable was coded such that the "lowest risk" or "optimal" characteristic was given a value of "1" and the "non-optimal" characteristics were given a value of "0". Raw Perinatal Background Index and Perinatal Outcome Index scores were calculated by adding the sum of all variables in each index for each participant. These raw scores were then divided by the total number of items documented for each participant in order to correct for missing data. In other words, if a participant was missing a score for one of the 11 Perinatal Background Index variables, the denominator would be ten. The final composite score for both indexes is therefore expressed as a percentage, with a higher score in each index representing a more optimal outcome.

Data were analyzed using the SAS® statistical program. Because of anticipated differences between nulliparas and multiparas, all analyses were performed separately on each group. Differences in individual background and outcome variables were measured using the X^2 test. Differences in the composite Perinatal Background Index scores were

assessed using the Mann-Whitney U test in order to adjust for the natural skewed distribution of this index among low-risk women (i.e., a tendency toward more optimal Perinatal Background Index scores). Perinatal Outcome Index scores were compared using a two-sample *t*-test.

Because of the expected skewed distribution of Perinatal Background Index scores in a low-risk population, this variable was collapsed in a dichotomous manner such that women at or above the median composite score were considered to have a relatively favorable background and those with scores below the median were considered to have a relatively unfavorable background. Differences in Perinatal Outcome Index scores were measured and reported separately by relative favorability of the Perinatal Background Index.

Because of differences between the practice guidelines across settings, subsequent analysis of Perinatal Outcome Index scores was conducted using a subset of the original data. Need for pharmacologic induction or augmentation and/or instrumental vaginal delivery are indications for transfer to the hospital setting in the Chicago midwifery practice. In Guatemala, on the other hand, these interventions are performed by trained nurse-midwives at the birth center according to written practice guidelines. Therefore, differences in the rates of induction and augmentation and of instrumental delivery represent different practice standards in the two settings and do not necessarily reflect different outcomes. To adjust for these differences between the two study sites, a subset analysis was performed where all augmented or induced labors and instrumental deliveries were excluded.

Chapter III

RESULTS

Tables 4 and 5 show the frequency and percentage of optimal (i.e., "lowest risk") background characteristics among nulliparas and multiparas, respectively, in each study setting. There were few differences between the two sites with respect to background characteristics. Nulliparas were less likely to have an involved partner in the Chicago group than among nulliparous women in Guatemala ($p = .0484$). There were no women in the Chicago group with previous cesarean deliveries, reflecting a client selection policy in that practice that restricts vaginal birth after cesarean section (VBAC) to the hospital setting. Ixmucané's practice guidelines allow for VBAC in the birth center. Therefore, the two cohorts also differed with respect to history of previous cesarean section among multiparas ($p < .0001$). As seen in Table 4, there were no statistically significant differences in the composite Perinatal Background Index Scores between the two settings in either nulliparas or multiparas, indicating that the two populations studied are comparable.

Table 4. Percentage of optimal characteristics in the perinatal background index among nulliparas giving birth in two professional midwifery services

Item	**Guatemala (*n*=54)**		**Chicago (*n*=48)**		***p* value**
	number	**percent**	**number**	**percent**	
Involved partner	46	86.8%	34	70.8%	0.0484
Cigarette smoking	54	100.0%	47	97.9%	0.4706
Alcohol use	54	100.0%	47	97.9%	0.4706
Drug use	54	100.0%	47	97.9%	0.4706
Preexisting major chronic disease	54	100.0%	47	97.9%	0.4706
Interval between viable pregnancies	n/a	n/a	n/a	n/a	n/a
Previous preterm delivery < 37 weeks	n/a	n/a	n/a	n/a	n/a
Previous intrauterine fetal demise	n/a	n/a	n/a	n/a	n/a
Previous cesarean section	n/a	n/a	n/a	n/a	n/a
Previous low birth weight for gestational age infant	n/a	n/a	n/a	n/a	n/a
History of other serious obstetric complications	n/a	n/a	n/a	n/a	n/a

Table 5. Percentage of optimal characteristics in the perinatal background index among multiparas giving birth in two professional midwifery services

Item	**Guatemala (*n*=45)**		**Chicago (*n*=107)**		***p* value**
	number	**percent**	**number**	**percent**	
Involved partner	41	93.2%	92	86.0%	0.2147
Cigarette smoking	45	100.0%	107	100.0%	1.0000
Alcohol use	45	100.0%	106	99.1%	1.0000
Drug use	45	100.0%	107	100.0%	1.0000
Preexisting major chronic disease	45	100.0%	103	96.3%	0.3194
Interval between viable pregnancies	42	93.3%	94	87.9%	0.3146
Previous preterm delivery < 37 weeks	41	91.1%	95	88.8%	0.7790
Previous intrauterine fetal demise	44	97.8%	106	99.1%	0.5058
Previous cesarean section	37	82.2%	107	100.0%	<.0001
Previous low birth weight for gestational age infant	44	97.8%	105	98.1%	1.0000
History of other serious obstetric complications	40	88.9%	92	86.0%	0.6283

Table 6. Comparison of Perinatal Background Index scores in Guatemala and Chicago by parity

Cohort	Nulliparas			Multiparas		
	Mean Perinatal Background Index Score		*p* value	Mean Perinatal Background Index Score		*p* value
Guatemala	98.7%	}	.0686	94.9%	}	.6880
Chicago	96.6%			94.6%		

Tables 7 and 8 show the frequency and percentage of optimal outcomes among nulliparas and multiparas, respectively. Most individual outcomes were similar between the two settings. Nulliparous women in Guatemala were less likely to be prescribed medication during pregnancy ($p = .0299$), and more likely to have clear amniotic fluid ($p = .0240$), have their labors pharmacologically induced or augmented ($p < .0001$), and have an episiotomy at delivery than nulliparas in Chicago. Multiparous women in the Guatemalan cohort were more likely than multiparas in Chicago to have pharmacologic induction or augmentation of labor ($p = .0019$) and a laceration or episiotomy that required suturing ($p = .0006$). There was a trend toward higher incidence of postpartum

hemorrhage among multiparas in the Guatemalan cohort, although this association failed to reach statistical significance ($p = .0514$).

There was no overall difference observed between the composite Perinatal Outcome Index Scores in the two groups, as seen in Table 9.

Table 7. Percentage of optimal characteristics in the perinatal outcome index among nulliparas giving birth in two professional midwifery services

Item	Guatemala (*n*=54)		Chicago (*n*=48)		*p* value
	number	percent	number	percent	
Vaginal bleeding in second or third trimesters	51	94.4%	45	93.8%	1.0000
Weight gain in pregnancy	39	73.6%	39	83.0%	0.2577
Preeclampsia	53	98.1%	48	100.0%	1.0000
Anemia	48	96.0%	44	91.7%	0.4312
Other serious antepartum complications	52	96.3%	47	97.9%	1.0000
Adequate prenatal care	18	40.0%	16	34.0%	0.5540
Nonstress test, contraction stress test or biophysical profile	52	96.3%	45	93.8%	0.6641
Prescription drugs prescribed or taken during pregnancy	33	61.1%	19	39.6%	0.0299
Preterm birth	54	100.0%	48	100.0%	1.0000
Period of time between rupture of membranes and delivery	48	90.6%	43	91.5%	1.0000
Amniotic fluid	42	89.4%	34	70.8%	0.0240
Pharmacologic induction or augmentation of labor	38	70.4%	48	100.0%	<.0001
Oral or parenteral (IM or IV) medication during first or second stage of labor	51	94.4%	43	89.6%	0.4700
Intermittent monitoring during labor	52	96.3%	48	100.0%	0.4968
Fetal heart rate abnormalities	54	100.0%	48	100.0%	1.0000
Presence of a support person during labor	54	100.0%	48	100.0%	1.0000
Need for collaborative management	50	92.6%	46	95.8%	0.6814
Presentation at birth	53	100.0%	48	100.0%	1.0000
Instrumental (vaginal) delivery	51	96.2%	48	100.0%	0.4962
Episiotomy	47	87.0%	48	100.0%	0.0136
Laceration of perineum or perineal tissue	15	28.3%	8	16.7%	0.1638
Third or fourth degree laceration	53	98.1%	48	100.0%	1.0000
Suturing of episiotomy or laceration	26	50.0%	27	56.3%	0.5316
Placental retention	53	98.1%	48	100.0%	1.0000
Postpartum hemorrhage	44	81.5%	38	79.2%	0.7688
Blood transfusion	54	100.0%	48	100.0%	1.0000
Other serious intrapartum problems	53	98.1%	46	95.8%	0.6000
Estimate of gestational age	53	100.0%	48	100.0%	1.0000
Birth weight	51	98.1%	48	100.0%	1.0000
Apgar score at five minutes	52	96.3%	44	91.7%	0.4165
Breast fed by one hour after birth	36	78.3%	38	80.9%	0.7568
Transfer to high risk neonatal care setting	53	98.1%	43	89.6%	0.0970
Birth trauma or other serious medical problem	53	98.1%	47	97.9%	1.0000
Perinatal death	53	98.1%	48	100.0%	1.0000

Table 8. Percentage of optimal characteristics in the perinatal outcome index among multiparas giving birth in two professional midwifery services

Item	Guatemala (*n*=45)		Chicago (*n*=107)		*p* value
	number	percent	number	percent	
Vaginal bleeding in second or third trimesters	44	97.8%	103	96.3%	1.0000
Weight gain in pregnancy	34	81.0%	79	75.2%	0.4579
Preeclampsia	45	100.0%	106	99.1%	1.0000
Anemia	39	92.9%	90	84.1%	0.1589
Other serious antepartum complications	43	95.6%	97	91.5%	0.5073
Adequate prenatal care	15	42.9%	39	37.1%	0.5475
Nonstress test, contraction stress test or biophysical profile	42	93.3%	98	91.6%	1.0000
Prescription drugs prescribed or taken during pregnancy	28	62.2%	62	57.9%	0.6242
Preterm birth	43	97.7%	106	99.1%	0.4992
Period of time between rupture of membranes and delivery	41	95.3%	104	98.1%	0.5793
Amniotic fluid	34	85.0%	85	80.2%	0.5042
Pharmacologic induction or augmentation of labor	40	88.9%	107	100.0%	0.0019
Oral or parenteral (IM or IV) medication during first or second stage of labor	43	95.6%	95	89.6%	0.3460
Intermittent monitoring during labor	44	97.8%	107	100.0%	0.2961
Fetal heart rate abnormalities	45	100.0%	105	99.1%	1.0000
Presence of a support person during labor	45	100.0%	107	100.0%	1.0000
Need for collaborative management	44	97.8%	105	98.1%	1.0000
Presentation at birth	45	100.0%	107	100.0%	1.0000
Instrumental (vaginal) delivery	44	97.8%	107	100.0%	0.2961
Episiotomy	45	100.0%	107	100.0%	1.0000
Laceration of perineum or perineal tissue	18	41.9%	50	46.7%	0.5881
Third or fourth degree laceration	45	100.0%	106	99.1%	1.0000
Suturing of episiotomy or laceration	28	65.1%	95	88.8%	0.0006
Placental retention	44	97.8%	106	99.1%	0.5058
Postpartum hemorrhage	35	77.8%	96	89.7%	0.0514
Blood transfusion	45	100.0%	106	99.1%	1.0000
Other serious intrapartum problems	45	100.0%	103	96.3%	0.3194
Estimate of gestational age	44	97.8%	106	99.1%	0.5058
Birth weight	43	100.0%	102	96.2%	0.3245
Apgar score at five minutes	43	95.6%	106	99.1%	0.2093
Breast fed by one hour after birth	33	84.6%	95	89.6%	0.3963
Transfer to high risk neonatal care setting	45	100.0%	104	98.1%	0.4914
Birth trauma or other serious medical problem	45	100.0%	107	100.0%	1.0000
Perinatal death	45	100.0%	107	100.0%	1.0000

Table 9. Comparison of Perinatal Outcome Index scores in Guatemala and Chicago by parity

Cohort	Nulliparas		Multiparas	
	Mean Perinatal Outcome Index Score	*p* value	Mean Perinatal Outcome Index Score	*p* value
Relatively favorable background				
Guatemala	88.3%	.9577	92.2%	.8691
Chicago	88.2%		92.0%	
Relatively unfavorable background				
Guatemala	88.8%	.5268	90.0%	.9805
Chicago	87.4%		90.0%	

For the subset analysis, mean scores for individual index items were recalculated and compared, excluding those study participants who received pharmacologic induction or augmentation and/or had an instrumental vaginal delivery. All differences in individual index items that were significant in the original analysis remained significant in the subset analysis with the exception of the difference in proportion of nulliparas with an involved partner, which was no longer significant ($p = .2774$). There were no previously insignificant differences that became significant in the subset analysis. There was no overall difference observed between the composite Perinatal Outcome Index Scores in the two groups, as seen in Table 10.

Table 10. Comparison of Perinatal Outcome Index Scores in Guatemala and Chicago by parity, excluding participants whose labors were induced or augmented and/or who had instrumental vaginal deliveries

Cohort	Nulliparas		Multiparas	
	Mean Perinatal Outcome Index Score	*p* value	Mean Perinatal Outcome Index Score	*p* value
Relatively favorable background				
Guatemala	90.7%	.0908	92.2%	.8691
Chicago	88.2%		92.0%	
Relatively unfavorable background				
Guatemala	89.3%	.4213	91.1%	.4169
Chicago	87.4%		90.0%	

Chapter IV

DISCUSSION

Study Findings

This study compared the obstetric and perinatal processes and outcomes of professional midwifery care in a free-standing birth center in Antigua Guatemala with that provided by an exemplary midwifery practice offering a similar model of care to a similar population in Chicago. The study considered nulliparous and multiparous women separately and controlled for the effects of social and medical background (as measured by the Perinatal Background Index) and for differences in the practice guidelines between the two birth settings. The study findings confirm the researcher's hypothesis that there are no detectable differences in the processes and outcomes of professional midwifery care in the two populations when measured using an adapted optimality tool. Therefore, this study supports the assertion that the provision of professional midwifery care to a low-risk population in Guatemala can yield outcomes similar to those of an exemplary midwifery practice in the United States.

Limitations of the Study

Outcomes of midwifery care among women who planned and achieved childbirth outside of the hospital setting were measured in this study. Both of the midwifery practices studied have written practice guidelines that recommend transfer of care to the hospital in the case of complications or when the mother or her fetus/newborn ceases to meet criteria for low-risk. When conducting research on place of birth, it is imperative to group women by *planned* birth site and to analyze results based on this

planned site, regardless of where the birth ultimately takes place. Failing to do so potentially creates bias or otherwise improperly measures the effect of planned site of birth on birth outcomes (Vedam, 2003).

Unfortunately, data were not available for those women who transferred to the hospital in the antepartum or intrapartum period for either study cohort. Including these women in the study sample may have influenced the study findings. However, the interpretation of such findings would be problematic because significant differences exist between the two settings in the quality and capacity of the hospitals to which patients are transferred. Availability of necessary hospital equipment and personnel may be poorer in Guatemala than in a large North American urban center like Chicago. Furthermore, while nurse-midwives who conduct home births in Illinois are permitted to maintain hospital privileges, allowing for continuity of provider in the case of some transfers, the same is not true in Guatemala.

This methodological dilemma highlights a broader and potentially more significant limitation of the current study: while every effort was made to find a similar practice to which outcomes of Ixmucané could be compared, no setting in the United States can approximate the myriad social, economic, medical, cultural, and geographic factors that affect maternal and perinatal outcomes in Guatemala. Ideally, outcomes of professional midwifery care in Guatemala would be measured against the outcomes of other forms of care in Guatemala, with careful attention given to matching study participants. Because documentation of maternity care is very infrequent among traditional midwives (Goldman & Glei, 2003; Lang & Elkin, 1997) and may be incomplete in Guatemalan

hospitals (Barillas & Valladeres), this method of comparison was not feasible for the purpose of this study.

Another important limitation of the current study relates to the application of the Optimality Index itself. For the purposes of this study, some changes were made to the Optimality Index–US, including revisions in the variables measured and in the criteria for optimality of some of the individual index items. While the researchers who developed the original Optimality Index emphasized that it is a dynamic tool meant to continually reflect improvements in knowledge related to maternity care practices, validity and reliability studies should be repeated whenever adaptations are made (Wiegers, Keirse, Berghs et al., 1996). These studies were not undertaken for the purposes of the current research, although care was taken to avoid making substantive changes that may have a high likelihood of influencing the instrument's utility.

Among the adaptations made to the tool for the purposes of the current study, patient age data were omitted from the index due to database errors. This omission may theoretically alter the reliability of the Perinatal Background Index. However, while mean ages for the two cohorts are not documented, it is known from provider reports that few women in each setting fell outside of the optimal age range. Therefore, it is unlikely that the inclusion of patient age data would produce significant differences in mean Perinatal Background Index scores.

Data collection also revealed that items pertaining to the condition of the mother after the immediate postpartum period, such as the presence of signs of infection, were not reliably recorded for women in the Guatemalan cohort, and were therefore omitted from the Perinatal Outcome Index. Wiegers et al. found that these variables approached

100 percent optimality among a sample of women in the Netherlands with low-risk pregnancies receiving midwifery care (Wiegers, Keirse, Berghs et al., 1996). This suggests that inclusion of this information may not significantly affect composite Perinatal Outcome Index Scores in the current study. However, effort should be made to include these indicators in any future optimality studies undertaken in developing countries because maternal infection represents a significant contribution to overall maternal morbidity and mortality rates in the developing world.

In addition to limitations in study design and methods, there are important limitations to the usefulness and applicability of the results of the current study to maternity care strategies in Guatemala. Ixmucané is staffed by North American midwives educated in the United States. It is located in an area with relatively good access to medical services, transportation, and basic utilities like electricity and clean water compared with other areas of Guatemala. Furthermore, the birth center relies heavily on grant funding, donated supplies, and volunteer services to continue to provide midwifery care to the population it serves. Considering the much poorer access to such resources in more remote areas of Guatemala, the replicability and sustainability of a free-standing birth center like Ixmucané remains unclear.

Instrument Utility

The Optimality Index provides a useful tool for evaluating midwifery care because it considers both the outcomes of the care provided and the means by which they were achieved. One key distinction between midwifery care and the medical model of maternity care is that midwives rely less on routine use of obstetric interventions, even when controlling for client selection bias (Rooks, 1999). High rates of obstetric

intervention have not been correlated with improved maternal or perinatal outcomes and often introduce added risk for complications such as infection or excessive bleeding and/or increase the need for further intervention (Enkin et al., 2000; Notzon, 1990). Therefore, ensuring "maximum outcome with minimal intervention" (Wiegers, Keirse, Berghs et al., 1996 pg 319), i.e., optimality, represents a desirable goal in the provision of maternity care.

Prior to this study, the Optimality Index had only been applied to maternity care settings in the developed world. However, given the constraints on health care resources in developing nations such as Guatemala, the optimality concept may have even greater utility in guiding policies and priorities in the delivery of maternity care in these settings. Maternity care structures that emphasize hospital-based care within a medical model for all normal births are likely to sacrifice optimal outcomes by introducing unnecessary intervention. Conversely, policies intended to maximize optimality are likely to result in a greater proportion of births managed by professional midwives at or near the community level. While this study did not consider cost efficiency of different care models, it is highly likely that increased optimality would also result in more efficient use of scarce economic and human resources. Studies of out-of-hospital birth in developed countries have found both increased optimality (Johnson & Vedam, 2003; Wiegers, Keirse, van der Zee, & Berghs, 1996) and improved cost-effectiveness (Anderson & Anderson, 1999).

After 17 years, the global Safe Motherhood Initiative has resulted in few, if any, improvements in rates of maternal mortality or serious morbidity, despite widespread implementation of interventions designed to reduce these poor outcomes. This has led

some experts to point out that few such public health interventions are supported by good quality research, while established evidence-based obstetric practices have not been widely implemented (Miller, Sloan, Winikoff, Langer, & Fikree, 2003; Villar, Carroli, & Gülmezoglu, 2001). For example, those who promote the importance of skilled attendance at childbirth rely on historical and observational data, while no randomized controlled trials (RCTs) or other properly controlled experiments exist to support this approach (Miller et al., 2003). Assessing the effect of the presence of a skilled attendant at birth may be impossible in a context of an RCT because of ethical and logistical considerations. Even interventions intended to reduce maternal mortality that lend themselves to RCTs often require prohibitively large sample sizes, especially in areas where maternal mortality baseline rates are low and/or when the size of the effect of the intervention is modest (Miller et al., 2003).

The Optimality Index, on the other hand, offers a means to measure real differences in outcomes without requiring large and complex experimental studies. The index itself is constructed to measure only those aspects of the model of maternity care that are supported by credible evidence. It also measures outcomes that are more frequently and easily observed than maternal mortality. By considering both the process and content of care and incorporating these into an overall index score, it may be a more meaningful and clinically significant means to compare maternity care practices than tools that look at individual outcomes. However, by measuring a broad range of individual outcomes that contribute to optimality, the tool also has potential to improve efforts to more effectively quantify maternal and perinatal morbidity. The use of the Optimality Index might therefore provide the opportunity to measure both the overall beneficial effects (i.e.,

optimality) of different maternity care structures as well as the impact on outcomes of specific interest such as cesarean section rates, postpartum hemorrhage, or low birth weight.

Such an instrument, therefore, has a potentially important role in evaluating and comparing the care provided by different types of birth attendants, including professional midwives. Additionally, as it has been used in the past in Europe and the United States, the tool will likely continue to be useful in measuring the effects of different birth settings on perinatal outcomes in resource-poor settings. This is important because access to hospital-based care continues to be inadequate in many areas of the developing world. Moreover, even where hospitals are accessible, some childbearing women prefer to give birth in their own homes or communities (Cunningham, 1993; Davies, Hey, Reid, & Young, 1996; Glei & Goldman, 2000; Hildingsson, Waldenstrom, & Radestad, 2003; Soderstrom, Stewart, Kaitell, & Chamberlain, 1990).

Implications for Policy

In Guatemala, virtually every skilled birth attendant is employed in the hospital setting. Simultaneously, more than half of women, and much higher proportions in rural areas, give birth outside of the hospital with traditional midwives who do not meet the WHO definition of skilled attendants. There are few linkages between the traditional and biomedical sectors, and, as a result, many logistical, cultural and economic barriers are encountered when the need to obtain emergency obstetric care arises.

When birth takes place outside of a system that provides timely access to emergency care, poor outcomes inevitably result. Conversely, when emergency obstetric interventions are employed routinely, the potential benefit that may have been realized

through judicious use of these interventions is offset by unnecessary risk and expense due to overuse. Skilled attendants who are educated in the philosophy and essential competencies of midwifery are able to provide safe care to birthing women without undue reliance on risky and expensive technological interventions. In some settings, they may also serve as a key linkage between traditional/community-based care and biomedical/centralized care by providing supportive supervision to traditional midwives and facilitating access to emergency obstetric services when necessary.

The results of this study suggest that professional midwifery care may optimize the maternity care provided to a screened population of low-risk women in Guatemala by maximizing outcomes while minimizing interventions. However, currently, the only professional midwives practicing in Guatemala are foreign-trained. By rebuilding professional midwifery education programs and reintroducing professional midwives into the maternity care infrastructure, Guatemala may begin to realize improvements in maternal and perinatal outcomes that have thus far remained elusive.

However, simply educating more professional midwives is not enough to ensure the beneficial results we have come to associate with skilled attendance at childbirth. A broad commitment on the part of individuals, communities, and governmental and nongovernmental agencies is required in order to enable effective professional midwives. A useful framework for determining what enables effective skilled attendants is "The Three E's," described by Maclean (2003). These include the *education* of the skilled attendant, the *environment* in which s/he must practice, and the *effectiveness* of the skilled attendant.

Educational systems must not only teach core competencies such as those put forth by the International Confederation of Midwives (ICM, 2003), but also provide for continuing education and skills maintenance. These systems must overcome the common obstacles that make up the "wall of resistance to skill acquisition," such as clinically unskilled instructors, insufficient opportunities for clinical practice, and teaching approaches that overemphasize theory and factual recall and deemphasize critical thinking (Maclean, 2003).

An enabling environment exists when there are "supportive regulatory frameworks, supportive policies, functional infrastructure, efficient and effective systems of communication and referral/transport, adequate equipment, and adequate supplies" (Maclean, 2003). Isolation of midwives in remote communities, lack of continuing education, and lack of supervision may contribute to a disabling environment.

Finally and most importantly, the effectiveness of the skilled attendant is mediated by cultural, political and professional factors. Midwives will be effective when they are organized in professional associations with defined standards of practice, when there is broad political will and commitment to reducing maternal mortality and morbidity, when maternity care systems are effective, affordable and accessible, and when the public understands and values the role of the midwife (Maclean, 2003).

Nothing less than an overhaul of the current maternity care system in Guatemala is necessary in order for there to be significant improvements in maternal and perinatal outcomes. A commitment to the optimality concept can help guide the nation as it maps its priorities for the next decade and beyond. A thoughtful and systematic reintroduction

of professional midwives is a first step in achieving optimal care and outcomes for pregnant women and their families in Guatemala.

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