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MATERNAL OUTCOMES OF WOMEN WHO PREFER TO COMMUNICATE IN ENGLISH COMPARED TO WOMEN WHO PREFER TO COMMUNICATE IN A LANGUAGE OTHER THAN ENGLISH IN NEW ENGLAND

Katharine Green
University of Massachusetts Amherst

MATERNAL OUTCOMES OF WOMEN WHO PREFER TO COMMUNICATE IN

ENGLISH COMPARED TO WOMEN WHO PREFER TO COMMUNICATE IN A

LANGUAGE OTHER THAN ENGLISH IN NEW ENGLAND

A Dissertation Presented

by

KATHARINE A. GREEN

Submitted to the Graduate School of the
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DEDICATION

To Jesse and Elizabeth Green

and

Jordan and Abigail Helzer

for their unwavering love and support

ABSTRACT

MATERNAL OUTCOMES OF WOMEN WHO PREFER TO COMMUNICATE IN

ENGLISH COMPARED TO WOMEN WHO PREFER TO COMMUNICATE IN A

LANGUAGE OTHER THAN ENGLISH IN NEW ENGLAND

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Introduction:

Language acquisition is the primary marker of acculturation to the dominant

society in a receiving geographic area, and effective communication in English is a

marker of acculturation in the United States. There is good evidence that women who

receive midwifery care have improved maternal outcomes, and that women who are not

well acculturated to the dominant culture in the United States have improved neonatal

outcomes. However, the maternal outcomes of women who do not communicate in

English are not well studied, nor is it known whether care during parturition by

physicians when compared to nurse midwives makes a difference in such women.

The purpose of this study was to determine whether there was a difference in

maternal outcomes, defined as labor interventions and delivery methods, in childbearing

women who were or were not able to communicate in English, or in childbearing women

who used midwifery versus physician care. The moderating influence of the care provider type on language use and maternal outcomes were also studied.

Methods:

This quantitative, retrospective study was conducted using analysis of labor, delivery, language, and care provider data extracted from electronic health records of women during their labor and delivery. Electronic health records of parturient patients admitted for delivery between 23 and 42 weeks' gestation were analyzed from 2013-2016 (N=11,656) from a tertiary care center in New England. Data were analyzed using descriptive statistics and Chi squared (χ^2) using SPSS.

Findings: Women had improved delivery outcomes if they were unable to communicate in English when compared to English speaking women or women who stated they could communicate in English, but later needed an interpreter. Women who utilized midwifery services had equal or improved maternal outcomes when compared to women who utilized physician services.

Conclusions: Healthy Migrant Theory was substantiated or not refuted in most variables, and women who did not speak English and who used midwives for care were more likely to achieve vaginal deliveries, vaginal birth after cesarean, and significantly less likely to have cesarean deliveries. All women, no matter what language used, should receive equivalent care during labor and delivery.

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CHAPTER I

INTRODUCTION

Problem statement

The Healthy People 2020 report includes goals to improve the health of women, particularly during childbearing. Reduction in maternal morbidity, mortality and complications from childbearing are stated objectives in the report. Maternal outcomes, the health outcomes for parturient women during labor and delivery, are one measure of this goal (U.S. Department of Health and Human Services Office of Disease Prevention and Health Promotion, 2015).

The need for interpreters in health care facilities has been long established in the United States when patients do not speak English Jacobs, Shepard, Suaya, Stone,(2004). However, it has been unclear whether the care of pregnant women varies between women who are unable or limited in their ability to speak English when compared to native speakers when communicating with their care providers during parturition.

Approximately 20% of the population in the United States does not speak English at home, and 8.6% of the total U.S. population has difficulty communicating in English, according to the 2013 Census data (Zeigler & Camarota, 2014; U.S. Department of Commerce: Census Bureau, 2014). The U.S. Census Bureau estimated that there were approximately 76.5 million women considered to be of childbearing age, or ages 15-50, in the United States in 2015. Of those women, 5.4%, or approximately 3.98 million women, delivered babies in 2015. (U.S. Department of Commerce: Economics and Statistics Administration, 2014; Hamilton, Martin, Osterman, Driscoll, Mathews, 2017). Close to 21% of the deliveries in the United States were to women not born in this

country, a percentage similar to the percentage of immigrants in the United States (U.S. Department of Commerce: Census Bureau, 2014; U.S. Department of Commerce: Economics and Statistics Administration, 2014). Thus, it can be assumed that the population of pregnant women mirrors the total U.S. population, and that 8% to 9% of pregnant women are unable to communicate well in English. It is important to understand the effect of language on the maternal health care outcomes of women.

Background

The principle language spoken in the United States is English. Although there is good evidence of the relative health of newborns of recent immigrants when compared to native born U.S. mothers (Afable-Munsuz et al., 2013; Guendelman & English, 1995; Madan et al., 2006; Rumbaut & Weeks, 1996; Thomson & Hoffman-Goetz, 2012), there is little information on whether maternal outcomes for childbearing women whose preferred language is English differ from maternal outcomes of immigrant or native born women whose preferred language is not English in the United States.

Countries of nativity for women living in the United States who do not speak English vary considerably. Childbearing women may be recent immigrants, or may have been raised in the United States in a household where English is not used at home. However, limited proficiency in the dominant language of a country has been shown to be a barrier in health care situations whether a woman was native born or an immigrant (Wilson, Chen, Grumbach. Wang and Fernandez, 2005). Patients who do not speak English at home are less likely to receive the amount or level of health care recommended for their medical condition or health status (Cheng, Chen, & Cunningham, 2007). Known barriers to care as a result of limited English language proficiency in the

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United States and Canada include decreased continuity of care or less overall quantity of care, decreased ability to get advice or information, and long wait times for visits (Pippins, Alegría, & Haas, 2007). Whether or not access to care is limited for those without dominant language proficiency, misunderstanding of medication instructions, lower levels of patient satisfaction, lower rates of preventative health screening, and diminished ability of patients to ask questions are more prevalent in those with low language proficiency (Timmons, 2008).

Language acquisition is considered to be the most important proxy measure for acculturation to the dominant culture in a country, and can be defined as a complex process by which children or adults learn to communicate, usually through speech (Deyo, Diehl, Hazuda, & Stern, 1985; Mahoney, 2015). Approximately one third of immigrants report that they do not speak English at all or do not speak English well on arrival to the United States (Center for Immigration Studies, 2015). More than half of native-born Hispanic women speak English well, whereas less than one third of those not born in the United States speak English well (Gonzalez, 2008).

Maternal outcomes during parturition include both normal physiologic labor with vaginal delivery and interventions that facilitate delivery when normal physiologic labor and delivery do not occur. Interventions during labor may include such actions as induction or augmentation of labor, anesthesia such as epidural or spinal anesthesia, administration of antibiotics for pyrexia, narcotic administration, and artificial rupture of membranes. Method of delivery specifically denotes how a woman achieved delivery, and may include spontaneous vaginal delivery, use of forceps, use of a vacuum extractor,

or cesarean delivery. Other interventions at delivery may include laceration repair, episiotomy, and postpartum hemorrhage treatment.

A study done before the U.S. health care reform system began in 2010 (Patient Protection and Affordable Care Act, 2010), and the before recent rise in immigration to the United States suggested that immigrant women around the turn of the current century had slightly higher rates of diabetes, fetal macrosomia, and episiotomies with subsequent 4th degree lacerations (Forna et al., 2003). However, there have been marked changes in both obstetrical practices and immigration in the last two decades. Changes in the practice of obstetrical care include increased rates of cesarean section, sharp decreases in episiotomy rates, and changes in labor induction practices (Hartmann, 2005; Laughon, Branch, Beaver, & Zhang, 2012). Additionally, the numbers of women who are not fluent in English, including childbearing women, have increased sharply (Laughon et al., 2012; U.S. Department of Commerce: Census Bureau, 2014). Thus, it is no longer clear whether pregnant women who are not well acculturated in the United States continue to have poorer maternal outcomes considering the changes in obstetrical practice and the rapidly changing composition of the total population.

In the United States, nearly 99% of deliveries are in hospital settings (Martin et al., 2015). Several types of providers provide maternal care during labor and delivery, most commonly physicians, nurse midwives and osteopaths (Martin, et al., 2015). The majority of labor and delivery care in the United States is done by obstetrician gynecologists, who perform 85.6% of hospital deliveries (Martin et al., 2015). Obstetrician gynecologists are defined as physicians who specialize in women's medical care, including pregnancy and reproductive care (American Board of Obstetrics and

Gynecology, 2015). Nurse midwives, who have graduate degrees, are certified and licensed providers of health care and are educated in both midwifery and nursing, perform 7.8% of hospital deliveries in the United States (King, 2006; Martin et al., 2015). Doctors of osteopathy provide the majority of the remainder of in-hospital labor and delivery care (Martin et al., 2015). While practices may be independent, it is also common to have some overlap in provision of care, and childbearing women may see several types of providers during their parturition. However, in that instance, one category of health care provider generally assumes principle responsibility for the overall care of any given patient during the patient's hospital admission, and patients usually plan to be delivered by the type of care provider they have chosen for the majority of their care (American College of Nurse Midwives (ACNM), 2011; American College of Nurse Midwives (ACNM) 2011a).

Enhancing communication with non-English speaking patients is thought to be beneficial in health care (Taira, 1999). However, it is unclear if communication between women who are not fluent in English and their nurse midwives or physicians would alter maternal labor and delivery outcomes.

Theoretical framework: Healthy Migrant Theory

Acculturations was defined and codified in 1936 by Redfield, Linton & Herskovitz in their "Memorandum for the study of acculturation". The authors defined acculturation as including "those phenomena which result when groups of individuals having different cultures come into continuous first-hand contact, with subsequent changes in the original cultural patterns of either or both groups" (p.149). The authors discussed factors that impact integration into a new culture. These factors included length

of time in the receiving culture, conflict in accepting new cultural traits incongruous with previous traits, and adjustment, which incorporated the replacement of prior traits with traits from the dominant receiving culture (Redfield et al., 1936).

Other theories related to the health status of immigrants include Selective Migration, Negative Health Theory, Acculturation theory, Transnational theory, and Healthy Migrant Theory (Im & Yang, 2006; Kimberlin, 2009; Redfield et. al, 1936). Im & Yang (2006) reviewed various works related to health based on prior work on acculturation, including Selective Migration. This theory that posits that immigrants are mostly the healthiest and most resilient of the population from the originating country, and, thus, can both take more risks and sustain the rigors of immigration to a new country well. Im and Yang (2006) also discussed Negative Health Theory, which posits that the rigors of immigration and stressors of the receiving society may put immigrants at increased risk for health impairment. Acculturation theory considers the incorporation of immigrants into the receiving population, and Transnational theory has gained popularity in recent years and posits that immigrants acculturate into the receiving country, but retain ties to their country of origin as well (Kimberlin, 2009; Im & Yang, 2006).

Healthy Migrant Theory incorporates many aspects of the theories reviewed by Im and Yang (2006) and has been used as a theoretical framework in multitudes of articles. Healthy Migrant Theory hypothesizes that immigrants are among the healthiest of the population in their country of origin, and that immigrants may be healthier than the receiving country's population with protective cultural and social factors from their country of origin until acculturation occurs, lowering the migrant's risks for disease in their first years following immigration. This effect appears to lessen over time as

acculturation to the receiving country occurs (David & Collins, 2007; Guendelman & English, 1995; Guendelman et al., 1999; Gushulak & MacPherson, 2006; Harding, 2004; Im & Yang, 2006; Janevic, Savitz & Janivic, 2011; Kimberlin, 2009; Singh & Miller, 2004; Tarnutzer, Bopp & the SNC study group, 2012).

The effect of Healthy Migrant Theory is not thought to be genetic; rather, it is considered to be based on socioeconomic status prior to immigration (David & Collin, 2007). Selective immigration of healthier people with a higher socioeconomic status and better initial physical and mental health, as well as optimistic outlook for the future may be protective for immigrating populations (David & Collin, 2007; Guendelman et al, 1999; Kennedy et al., 2006; Kimberlin, 2009; Tarutzer et al, 2012). The effect of Healthy Migrant Theory appears to be stronger when immigrants leave developing countries, although a positive outlook on life in and of itself may be protective for all immigrants. (Kennedy et al., 2006).

Obviously, the immigrant population in the United States is quite diverse, and variations in countries of origin, cultural background, and socioeconomic status on departure and arrival are the basis for very different experiences. Acculturation to a receiving country is multifaceted, and factors such as socioeconomic status, diet, language acquisition, and cultural assimilation all play a role in adaptation. There is evidence that those who chose to migrate, whether to different countries or within a country's borders, may have some difference in personalities from the general population, as they are willing to leave the institutional and social ties they already have in order to obtain a perceived improvement in economic or social situations (Hull, 1979).

Some earlier tests of the Healthy Migrant Theory suggested that either national quarantine and screening policies at recipient country borders may have prevented immigrants with preexisting health conditions from arriving in receiving countries, or that social support and cultural issues from countries of origin were protective for immigrants (Kennedy et al., 2006). However, it is currently thought that the premise of the Healthy Migrant Theory, i.e. that healthier people choose to emigrate from the country of departure, is more likely (Gushulak & MacPherson, 2006; Kennedy et al., 2006; Kimberlin, 2009; Tarutzer et al, 2012). Of interest, the Healthy Migrant Theory appears to have a stronger effect for immigrants who leave developing countries, although as a whole, immigrants appear to have optimistic personality traits that are protective on arrival in a new country (Kennedy et al., 2006).

Women of low socioeconomic status usually have poorer neonatal outcomes than those who are of higher socioeconomic status (Aizer & Currie, 2014). However, there is good evidence that newborns of pregnant women who immigrated to the United States within the last five years generally fair considerably better than those whose mothers are more acculturated, even if their country of origin is a developing nation, although there is some variation by region of origin and socioeconomic status before immigration (Afable-Munsuz et al., 2013; Guendelman & English, 1995; Madan et al., 2006; Rumbaut & Weeks, 1996; Thomson & Hoffman-Goetz, 2012). Despite higher maternal parity (number of deliveries), less prenatal care and lower levels of maternal education, rates of neonatal morbidity and mortality, preterm delivery, and low birth weights in babies born to most recent immigrant women are generally significantly lower than among the offspring of women who have lived 5 years or more in the United States, although Asian

born Indian women may have a higher rate of low birth weight newborns. (Afable-Munsuz et al., 2013; David & Collins, 2007; Guendelman & English, 1995; Lindsay, Gibney, & McAuliffe, 2012; Madan et al, 2006; Rumbaut & Weeks, 1996; Salmasi & Pieroni, 2015; Thomson & Hoffman-Goetz, 2012).

While the theories and processes of acculturation and its relationship to new immigrant health status remain under some debate in more recent literature, it seems clear that the effect of the Healthy Migrant Theory appears to diminish with increased amounts of time in the receiving country. Risks of conditions such as cardiovascular disease, preterm delivery, and other health issues in the immigrant populations appear to equal or exceed those of the population of the receiving country within approximately five years (Harding, 2004, David & Collins, 2007; Kimberlin, 2009; Tarutzer et al, 2012; Urquia, Campo, & Heaman, 2012). Indeed, there is consistent evidence that morbidity and chronic disease increase as time spent in the United States following immigration lengthens (Singh and Miller, 2004). It is suspected that socio-economic status before and after immigration, behavioral traits, and social support, play a part in initial and subsequent immigrant health in the United States (See Figure 1).

The process of acculturation may in itself worsen the health risks for immigrant populations. Thomson & Hoffman-Goetz (2009) state that initial acculturation changes are marked by changes in food preferences and media use, while language use marks intermediate acculturation changes. The authors hypothesize that later acculturation changes include those of values and attitudes, which are more difficult to evaluate. Thus, increasing English language use in the United States has been used as a proxy marker for intermediate acculturation. Progressive increases in language acquisition may be used as

a proxy measure for acculturation and may be a marker for increased risk of detrimental changes in health practices and beliefs in immigrant populations (Afable-Munsuz, Gregorich, Markides, & Pérez-Stable, 2013; Deyo, et al., 1985; Tarutzer et al., 2012; Thomson & Hoffman, 2009).
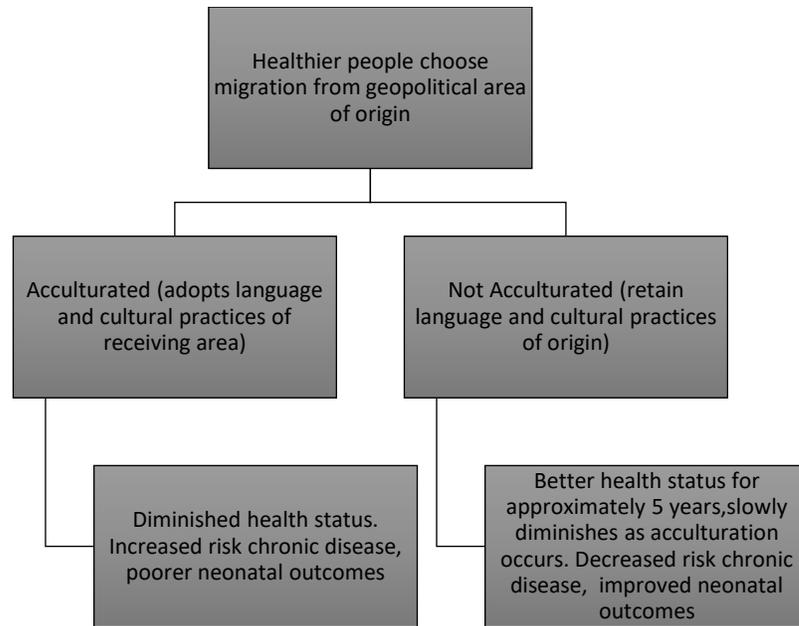
Figure 1: Healthy Migrant Theory

Healthy Migrant Theory was used to guide this work. Under the assumption that language acquisition was an intermediate marker for acculturation, maternal language preference was used as a proxy measure for acculturation in both international and native-born immigrant populations (Borjas, Bronars & Trejo, 1991; Deyo, et al., 1985; Hull, 1979). In this study, maternal outcomes of women who preferred to communicate in English, whether immigrant or native born in the United States, were compared with women who did not prefer to communicate in English. Using Healthy Migrant Theory, it was expected that there would be improved maternal outcomes, indicated by less

interventions in labor and more spontaneous vaginal deliveries, among women who preferred not to communicate in English as the proxy measure for decreased acculturation. Further, if Healthy Migrant Theory was applicable, all women who were less acculturated should have improved maternal outcomes, despite the primary type of obstetrical care provider (Urquia et al, 2012).

Research question and purpose

The study answers the following research questions:

1. Do maternal outcomes during parturition, defined as labor interventions and delivery methods, vary between women whose preferred language is English and women whose preferred language is not English?

2. Does the principle type of health care provider, certified nurse midwife (CNM) or physician (medical doctor or doctor of osteopathy, i.e., MD or DO), influence maternal outcomes in those who prefer to communicate in English compared to those who prefer to communicate in a language other than English?

3. Does the principle type of care provider modify any relationship between language use and maternal outcomes in those who prefer to communicate in English compared to those who prefer to communicate in a language other than English?

Maternal outcomes variables during parturition included labor interventions: induction, augmentation, epidural use, intravenous antibiotic use, and artificial rupture of membranes (AROM). Delivery method variables were spontaneous vaginal, cesarean, forceps or vacuum deliveries. Principle types of care providers examined in this study included CNMs or physicians, the latter defined as both MDs and DOs. Communication

via a preferred non-English language was used as a proxy measure for women who were less acculturated to the receiving geographic area.

Using the lens of Healthy Migrant Theory, the purpose of this investigation was to understand if the sample of women in this study showed improved maternal outcomes if women were less acculturated, or if there was no difference between groups regardless of English proficiency or type of health care provider during parturition.

Study Aims

Specific aims of this study are as follows:

Aim 1: To examine the relationship between language preference and maternal outcomes.

H1: There will be a relationship between language preference and frequency of induction or augmentation of labor.

H2: There will be a relationship between language preference and use of epidural or other anesthesia during parturition.

H3: There will be a relationship between language preference and artificial rupture of amniotic membranes (AROM) during parturition.

H4: There will be a relationship between language preference and frequency of cesarean section delivery.

H5: There will be a relationship between language preference and frequency of vaginal or operative vaginal (forceps and vacuum) deliveries.

H6: There will be a relationship between language preference and frequency of episiotomy use during parturition.

H7: There will be a relationship between language preference and between language preference and frequency of postpartum hemorrhage.

H8: There will be a relationship between language preference and frequency of antibiotic administration during parturition.

Aim 2: To examine the relationship between health care provider type and maternal outcomes.

H1: Women who utilize nurse midwives for care during parturition will have a lower frequency of induction or augmentation of labor

H2: Women who utilize nurse midwives for care during parturition will have a lower frequency of use of epidural or other anesthesia during parturition

H3: Women who utilize nurse midwives for care during parturition will have a lower frequency of artificial rupture of amniotic membranes (AROM) during parturition

H4: Women who utilize nurse midwives for care during parturition will have a lower frequency of cesarean section delivery.

H5: Women who utilize nurse midwives for care during parturition will have a lower frequency operative vaginal (forceps and vacuum) deliveries.

H6: There will be a relationship between type of provider and frequency of episiotomy use during parturition

H7: There will be a relationship between type of provider and frequency of postpartum hemorrhage

H8: There will be a relationship between type of provider and frequency of antibiotic administration during parturition

Aim 3: To examine the impact of provider type on the relationship between language preference and maternal outcomes.

H1: Provider type will moderate the relationship between language preference and lower frequency of induction or augmentation of labor

H2: Provider type will moderate the relationship between language preference and the frequency of use of epidural or other anesthesia during parturition

H3: Provider type will moderate the relationship between language preference and frequency of artificial rupture of amniotic membranes (AROM) during parturition

H4: Provider type will moderate the relationship between language preference and frequency of cesarean section deliveries.

H5: Provider type will moderate the relationship between language preference and frequency of vaginal or operative vaginal deliveries (vacuum and forceps).

H6: Provider type will moderate the relationship between language preference and frequency of frequency of episiotomy use during parturition.

H7: Provider type will moderate the relationship between language preference and frequency of postpartum hemorrhage

H8: Provider type will moderate the relationship between language preference and frequency of antibiotic administration during parturition

Summary

In the United States, communication in English is difficult for approximately 8.6% childbearing aged women (Zeigler & Camarota, 2014; U.S. Department of Commerce: Census Bureau, 2014; U.S. Department of Commerce: Economics and Statistics Administration, 2014). Since language acquisition is the primary marker of

acculturation to the dominant society in a receiving geographic area, women in the United States, whether immigrants from another country or from different geographic areas within the U.S., can be considered to be more acculturated when their choice of language use is English (Deyo, et al., 1985).

This research was conducted using analysis of data extracted from electronic health records on file in a large, tertiary medical center in New England. Data were analyzed to compare maternal outcomes of women whose preferred language was English to those who preferred to communicate in a language other than English. Healthy Migrant Theory guided this quantitative, retrospective research study. The study was focused on determining whether there was a difference in maternal outcomes during labor and delivery in childbearing women whose preferred language is English when compared to childbearing women whose preferred language was not English. Maternal outcomes were delivery methods and obstetrical interventions. The second question determined whether maternal outcomes differed by principle type of care provider in the population of women who did or did not prefer to speak English during parturition.

CHAPTER II

REVIEW OF LITERATURE

Introduction

The ability to communicate health needs and treatment options between patients and health care providers is paramount in optimizing care. Fluency or lack of the dominant language may significantly affect the care of patients unable to communicate in the dominant language of any given area. Equally important, particularly when communication barriers are present, is the choice of care provider who can provide the safest and most efficacious care for patients.

Approximately 15% of the total U.S. population is foreign born (U.S. Census Bureau, 2015). Census data shows that approximately 20% of the population speaks another language at home, and that nearly 9% is unable to communicate easily in English. U.S. Department of Commerce: Census Bureau, 2014).

It has been unclear what effects a lack of language proficiency has on maternal outcomes during parturition. Childbearing women who do not prefer to communicate in English may vary in terms of maternal outcomes, such as labor interventions and delivery methods, from women whose preferred language is English. While there is some evidence that midwifery care may improve maternal outcomes, substantiation is needed. Furthermore, it has been unclear whether maternal outcomes vary in women whose preferred language is English when compared to outcomes in women whose preferred language is not English when moderated by type of care provider during parturition.

The work presented here compares maternal outcomes in childbearing women whose preferred language was English to childbearing women whose preferred language

was not English. This work also addresses whether maternal outcomes vary by type of care provider when in the context of preferred language of women during labor and delivery.

In this chapter, relevant literature was reviewed and synthesized to form a picture of the current state of birthing in the United States, issues of acculturation including those faced by childbearing women whose preferred language was not English, provision of care during parturition in the U.S. by physicians and nurse midwives, and maternal outcomes during labor and delivery.

In this review of literature, maternal outcomes in labor and delivery were defined as labor interventions and delivery outcomes. Labor interventions included: induction and augmentation of labor, use of pain medications and artificial rupture of amniotic membranes. Delivery outcomes included vaginal delivery, operative deliveries by vacuum or forceps, cesarean deliveries and soft tissue trauma. Other maternal outcomes included the use of antibiotics and incidence of postpartum hemorrhage.

Background

Childbearing women in the United States have exhibited clear trends in the last few years. Reproductive age is defined as ages 15-49, and the mean maternal age for first birth was 26.4 years in 2015 (Kassebaum et al., 2014; Martin, et al, 2013; Martin, et al, 2017). Other demographic factors included a decrease in the adolescent (15-19 years) delivery rate to 2.2% of teens, and approximately 60% of the women delivering in the U.S. were married at the time of delivery (Martin et al., 2017; U.S. Census Bureau 2015).

Although birth rates in both native born and immigrant women decreased precipitously around the start of the U.S. economic recession in 2007, approximately four

million babies were born in the United States in 2013. This was a slight increase in the annual number of births over the previous few years in the United States (Hamilton, Martin, Osterman, Curtin, 2013; Livingston & Cohn, 2012). However, in 2015, the number of overall births in the U.S. decreased by 1% from the previous year, and preliminary data from 2016 shows that the number of births registered decreased another 1% to 3,941,109. (Hamilton, Martin, Osterman, Driscoll & Rossen, 2017; Martin et al, 2017). Although the percentage of foreign-born people living in the United States stood at approximately 13% of the total population, 23% of births, or approximately 930,000 babies, were born to immigrant women, making the care of these women during parturition an important aspect of maternal newborn care in the United States (Hye-Kyung, 2014; Korinek & Smith, 2011; Livingston & Cohn, 2012; U.S. Department of Commerce: Census Bureau, 2014; U.S. Department of Commerce: Economics and Statistics Administration, 2014).

Recent changes in childbearing practices

Although the basic physiologic processes of pregnancy, labor and vaginal delivery remain unchanged, some aspects of care during childbearing have altered markedly in the last two decades in the United States. Of the babies delivered in the United States, approximately 68% of babies are delivered vaginally. However, it is clear that the cesarean section rate in the United States increased dramatically through the 1990's until 2009, when it began dropping slowly to its current level of just under one third of all deliveries (APHA, 2011; Grivell & Dodd, 2011; Hamilton, et al., 2013; Martin, et al., 2013; Hamilton et al., 2017). The cesarean section rate is noteworthy, as WHO guidelines suggest a cesarean rate of between 10 and 15%, and the U.S. ranks

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globally behind only 14 other countries in highest percentages of cesarean deliveries (Gibbons et al., 2010).

The percent of adults in the United States categorized as overweight to obese has risen dramatically since the 1990s, when less than 20% of the adult population was classified as obese, to the current rates of approximately two thirds of the adult population (Ogden, Carroll, Kit & Flegal, 2014). Currently, over half of pregnant women are obese, which is a known risk factor in pregnancy for gestational diabetes, cesarean delivery, hypertension, and preeclampsia (ACOG 2013b). Non-Hispanic black and Hispanic adult populations are typically more obese than non-Hispanic white populations (CDC, 2014). Newborns have also had slightly higher weights and higher APGAR scores (Laughon, et al., 2012).

Labor and delivery is a slower process than in the past. Length of the first stage of labor has increased by more than two and a half hours- an increase attributed to current obstetrical interventions such as use of epidurals and maternal factors during childbearing, including the increased average BMI exhibited by current pregnant women, older average maternal age at delivery, larger babies, and a more racially diverse population (Laughon, Branch, Beaver, & Zhang, 2012; Zhang, Landy, Branch, Burkman, Haberman, Gregory... & Reddy, 2010). Other changes include attempts to decrease early labor induction (at less than 39 weeks of gestation), causing a reduction in early induction rates (Fisch, English, Pedaline, Brooks, & Simham, 2009). Medications and mechanical devices for cervical ripening are now commonly used, particularly low dose misoprostol, as well as dinoprostone, oxytocin, and other prostaglandins, and catheter balloons

(Wallstrom, Jarnbert-Pettersson, Stenson, Akerud, Darj, Gemzell-Danielsson, & Wiberg-Itzel, 2017).

However, the majority of the increased labor time is directly related to changes in obstetrical practice. These changes include increased percentages of childbearing women who receive induction or augmentation of labor, which is known to increase the length of labor, particularly if women are nulliparous or not full term and the increased use of epidural anesthesia, suspected of prolonging the first stage labor.

Other changes in practice in the last 30 years include decreased numbers of operative vaginal deliveries (Andrews, Leeman & Yonke, 2016; Getahun, 2014; Hamilton et al., 2017; Hodnett, 2002; World Health Organization, 2012). There have been decreased 3rd and 4th degree perineal lacerations following a decrease in the use of episiotomy when a systematic review in 2005 that suggested that episiotomies were over-used, detrimental to women's perineal integrity, and increased the likelihood of deep lacerations (Hartmann, et al., 2005; Laughon et al., 2012).

Issues of maternal morbidity and mortality

Many of the changes in practice are being driven by the rising maternal morbidity and mortality rates in the United States. By some estimates, maternal morbidity rates have increased to as much as 27%, and it is estimated that there are 50 cases of severe maternal morbidity for each case of maternal mortality (APHA, 2011; Cabacungan, Ngui & McGinley, 2012; Zhang, Cardarelli, Shim, Ye, Booker, & Rust, 2013). Maternal morbidity, with its subsequent increased risk of maternal mortality, tends to be from causes such as postpartum hemorrhage, infection, hypertensive disorders, abortion, or clotting disorders, although there are many other causes (Khan, Wojdyla, Say,

Gülmezoglu, & Van Look, 2006; Small, James, Kershaw, Thames, Gunatilake & Brown, 2012). Although there is limited evidence, it is possible that over-medicalization of birth may be a significant contributor to rising rates of maternal morbidity and mortality in the United States (Renfrew et al., 2014).

Issues suspected of increasing morbidity and mortality include increasing rates of cesarean sections, particularly among wealthier populations, and excessive use of anesthetic agents, medications for induction and augmentation, and antibiotic use in laboring women (Stones & Arulkumaran, 2014; Van Lerberghe, et al., 2014; Renfrew, et al., 2014). Other factors when considering increases in maternal morbidity and mortality may include delivery decisions based on newborn rather than maternal well-being, poor team communication, economic barriers to care, or limited access to care (Homer, et al., 2014; Stones & Arulkumaran, 2014). It is possible that there has been some increase in maternal morbidity attributable to the high number of weekly hours worked by labor and delivery staff, although there have been some restrictions in numbers of hours worked by obstetrical residents and interns to reduce fatigue driven medical errors and improve quality of care since 2003 (D'Alton et al, 2013).

According to the World Health Organization (WHO), the definition of a maternal death is "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes" (2014, p 14). While causes of maternal mortality can vary, most maternal deaths occur during labor and delivery or during the first few hours and days postpartum and are most commonly caused by hemorrhage, sepsis, hypertensive

disorders, obstructed labor, unsafe abortion, direct and indirect maternal disorders, pulmonary embolism, and HIV during the childbearing cycle (D'Alton et al., 2013; Kassebaum et al., 2014). Globally, the rates of abortion, maternal hemorrhage and sepsis, although still accounting for approximately half of maternal mortality, are those that have decreased most significantly in the last decade (Kassebaum et al., 2014).

For the most part, rates of maternal mortality in less developed countries such as India and countries and central Africa, are considerably higher than those in developed countries (WHO, 2014; WHO 2015). In high-income, developed countries, the maternal mortality ratio was approximately 10 per 100,000 during the time of this study. In the United States, however, the maternal mortality rate has risen in the recent years (APHA, 2011; Kassebaum, et al., 2014; WHO, 2012a; WHO, 2014). While estimates vary, in part complicated by a change in the reporting system, in 2013, the United States was ranked 60th in the globe in terms of maternal mortality and the U.S. maternal mortality rate was approximately 17.8 per 100,000 according to the Centers for Disease Control and Prevention, a higher rate than most European countries (CDC, 2017; Kassebaum et al, 2014; World Bank, 2017).

It is thought that the primary causes of the increase in maternal death rates in the U.S. are both indirect, including kidney disease, obesity, hypertension, and diabetes, and direct, including obesity exacerbated sepsis as well as high-risk pregnancies related to chronic diseases including obesity and its constellation of metabolic syndrome disorders, embolism, and anesthesia complications. (Kassebaum et al., 2013).

Disparities in maternal morbidity and mortality

Historically, there have been some significant disparities in maternal mortality and neonatal outcomes by racial or ethnic divisions. Adverse disparities have been particularly marked among African American women in the United States (Miranda, Maxson & Edwards, 2009). African American women are more likely to have higher rates of maternal morbidity and mortality and poorer neonatal outcomes than other groups (Dominguez, Strong, Krieger, Gillman & Rich-Edwards, 2009), while White and Hispanic women have tended to be similar in terms of maternal morbidity and mortality. Asian and Pacific Islander fare better, as do their newborns (Walker & Chesnut, 2010; Ventura, Curtin, Abma & Henshaw, 2012).

With underlying socioeconomic status tied to maternal morbidity rates, higher percentages of infection and postpartum hemorrhage are found in African American, Hispanic, Asian/Pacific Islander and Native American women when compared to White women during labor and delivery. African American women have higher rates of preterm labor, premature rupture of amniotic membranes, and hypertension than other groups, and Hispanic, Asian/Pacific Islander and Native American women have increased percentages of gestational diabetes (Cabacungan et al., 2012; Whitehead, Callaghan, Johnson & Williams, 2009; Liu, Gallagher, Carta, Torres, Moran, & Wilcox, 2014). In a study of Medicaid recipients during childbearing in the southern U.S., 25.6% of African American women were found to have complications during labor and delivery, while 23.3% of White women and 19.9% of Hispanic women had complications (Zhang, et al., 2013). Interestingly, Hispanic women with normal weight gain are less likely to develop gestational hypertensive disorders than are White women (Liu et al., 2014).

There is some evidence that women who are of East Asian descent are at lower risk and that women of African American and Caribbean Hispanic descent are of higher risk for cesarean deliveries compared to other ethnic groups. Nearly 36% of African American women deliver by cesarean section, and these women are at higher risk for maternal mortality (Walker & Chesnut, 2010, Hamilton, 2017). Hispanic women have a higher frequency of repeat cesarean section, at nearly 90% and immigrant Hispanic women appear to be at higher risk of cesarean delivery than native born Hispanic women. (Gonzales-Mendez, Gonzalez-Maddux, Hall, Maddux-Gonzalez, Handley, 2012; Hamilton et al., 2017; Janevic, Loftfield, Savitz, Bradley, Illuzzi, Lipkind, 2014).

Immigration in the United States

Immigration can be defined as the "movement of non-native people into a country in order to settle there" (dictionary.com, 2017). For hundreds of years in the United States, immigration has been a presiding pattern in populating the country, with significantly increased numbers of immigrants arriving in waves, at times, over the centuries (Kimberlin, 2009). Globally, approximately half of immigrants have been women in recent years (Livingston & Cohn, 2012; Hye-Kyung, 2014; Martin, 2013).

While political views of immigration have fluctuated over time, immigration to the United States has increased markedly since the late 1980s due to factors such as immigration policy, human rights concerns, easier transportation, global economics, and the rapid communication of information about opportunities in receiving countries via electronic media (Guendelman & English, 1995; Im & Yang, 2006; Madan, Palaniappan, Urizar, Wang, Fortmann, & Gould, 2006; Martin, 2013; U.S. Department of Homeland Security, 2013). Admission quotas are set by the United States government on the

numbers of legal international immigrants to the country. While political trends and their

influence on immigration policies are in flux at this writing, restrictions on numbers of

immigrants to the United States have loosened in the last half century, and there has been

a sharp increase in legal and illegal immigration, particularly from Latin America and

Asia (Forna et al., 2003; Kimberlin, 2009; Martin, 2013; United States Department of

Homeland Security, 2013).

The last few decades of U.S. immigration policy have underpinned the increased

proportion in the total U.S. population of foreign-born people, defined by the U.S. Census

Bureau as "not a U.S. citizen at birth". Currently, the United States receives

approximately 20% of the world's international immigrants, and approximately 13% of

the total population is estimated to be foreign born (Martin, 2013; U.S. Census Bureau,

2012; U.S. Census Bureau, 2014). Although immigrants to the United States arrive from

many countries, the majority originate from China, India, and Mexico (United States

Census Bureau, 2014; United States Department of Homeland Security, 2013).

There is another type of migration within any given country which can be defined

as crossing a border (whether administrative or geographic) to settle elsewhere, including

within a country or state's own boundaries (Borjas, Bronars & Trejo, 1991; Hull, 1979).

Those who migrate within a country or state may move for economic opportunities, their

own marketable skills, or social reasons, and may come from areas where English is the

spoken language or where other languages are spoken in the home (Borjas et al., 1991;

Hull, 1979).

Immigration from country to country or from one location to another within

countries occurs for many reasons, including economic inequality, political pressures,

and family attachments in the receiving country (Brojas et al., 1991; Hull, 1979; Kimberlin, 2009). Population demographics also play a significant role, as the majority of population growth from births is in economically disadvantaged countries or areas, which may encourage childbearing families to immigrate (Hull, 1979; Martin, 2013). Whether people are migrants to the United States, or have moved within geographic borders, how well migrants adapt to their new surroundings largely determines their health (Hull, 1979).

Immigration and adjustment

Immigration inevitably involves stress and changes in the immigrants' culture, economics, social structures, and physical surroundings, all of which subsequently underpin adaptation to the host country (Gupta & Sullivan, 2013). Negotiating adjustment to a receiving country's background may include changes in a family's structure and roles, changes in occupation, and adjustment to new government and institutional expectations (Sinacore, Titus, & Hofman, 2013). Women who immigrate are not from a single, uniform background, and cannot be expected to have the same experiences on arrival in the receiving country (Korinek & Smith, 2011; Migration Policy Institute, 2015). While some women migrate willingly, and have prepared for their immigrant status, others move under less propitious circumstances, and have a history of stressful situations pre-migration and a much more difficult time adjusting to the destination country (Degna et al., 2014; O'Mahony, Donnelly, Raffin Bouchal, & Este, 2013).

Culture and health effects for immigrant childbearing women

Notable differences have been found between newer migrants and those who had been in an area for a more extended time. Women with longer durations of residence in the United States, who are presumably more acculturated, are more likely to have higher incomes, work more (particularly in poorly paid jobs that entailed "strenuous" work), have better health care access, and have attained more education (Guendelman & English, 1995; Salmasi and Pieroni, 2015). Women with longer durations of residence also had higher incidences of hypertension, diabetes, bleeding during pregnancy, surgeries, and kidney disease, reported more substance use, had more children, and more unplanned pregnancies. (Guendelman & English, 1995). Individualism, highly prized in the United States, may not be a typical attribute from countries of origin, and the necessary rebuilding of lives and identities may be challenging (Gupta & Sullivan, 2013).

Specific difficult issues for immigrant women may include lowered socioeconomic status, language barriers, becoming a part of a minority population in the receiving country, changes in dietary patterns, and fewer social supports following immigration (Benza and Liamputtong, 2014; Lindsay, Gibney, & McAuliffe, 2012; O'Mahony, et al., 2013).

Childbearing and immigrant women

It is clear that the childbearing experiences of immigrant women vary and are dependent on their country and culture of origin, their legal status or lack thereof, and their immigration experiences (Korinek & Smith, 2011). Typically, immigrant women of childbearing age have some health advantages if they move to the United States. Although there are many variations based on country of origin and individual characteristics, immigrant women in the childbearing years tend to be slightly older at the

time of delivery than native-born U.S. women. Further, they may have a lower parity

rate, lower rate of hepatitis B, less illicit substance use, a lower rate of HIV and other

sexually transmitted infections, and are more likely to be married than the native-born

U.S. population (Forna et al., 2003). Such women are also likely to have lower rates of

pregnancy related hypertension, particularly if their country of origin is in South America

(Forna et al., 2003). The preferences many immigrant women show for spontaneous

vaginal deliveries may speed recovery times in such populations (Benza and

Liamputtong, 2014).

There are significant issues faced by immigrant women during reproductive years

related to acculturation. Lack of knowledge about the receiving culture may prevent

immigrants from utilizing resources and accessing easier ways of managing their lives

(Im & Yang, 2006). Transportation issues, a different sense of time and scheduling, and

lack of child care may negatively impact immigrant women's ability to access prenatal,

intrapartum and postpartum care (Benza & Liamputtong, 2014; Gupta & Sullivan, 2013).

Dietary changes may raise issues of obesity, hypertension and diabetes, which may later

lead to subsequent abnormal labor patterns, while traditional diets could be more

protective of health (Guendelman & English, 1995; Guendelman, Ritterman-Weintraub,

Fernald, & Kaufer-Horwitz, 2013; Gupta & Sullivan, 2013; Lindsay et al., 2012).

Many immigrant women come from countries and cultures where a strong social network

of support is provided by close proximity to families, friends, and places of worship, a

situation that is no longer evident following immigration to the United States (Gupta &

Sullivan, 2013). Religious affiliation is one factor in social support. Approximately

76.5% of the overall population in the United States report a religious affiliation (Pew

Research Center, 2015), considered to be a support network for women during

childbearing. In the Northeast region of the country, the percentage of the population who

report a religious affiliation was reported at approximately 75%. In Boston, the largest

city in New England, approximately 67% reported a religious affiliation (Pew Research

Center, 2015).

Immigrant expectations: childbearing and prenatal care

There is much variability between countries and regions in the care available to

women during pregnancy, labor and delivery, and postpartum. Cultural frameworks from

women's countries of origin set expectations of childbearing processes and traditions, and

changes from those expectations can cause anxiety and distrust of the health care systems

in receiving countries, complicating adaptation to receiving countries for many

childbearing women (Benza & Liamputtong, 2014).

Immigrant women may not utilize formalized prenatal care extensively in

comparison to other pregnant populations, although individuals vary widely. The

relationship between immigrant women and the amount of formal prenatal care leading to

potentially poorer maternal outcomes is not clear (Hartmann et al., 2005; Gadson,

Akpova & Mehta, 2017). Rituals and informal care from family members and friends,

familiar to pregnant women in their country of origin may be diminished or absent in

receiving countries, or may still occur via relatives, community members, and various

types of community workers (Benza and Liamputtong, 2014; Korinek & Smith, 2011).

Although some immigrant women find the focused attention of the health care system in

large, industrialized countries disconcerting when they access prenatal care, others find it

reassuring to have westernized care and treatment (Benza and Liamputtong, 2014).

Barriers to antenatal and intrapartal care may include differences in expectations in immigrant women, communication barriers, difficulty negotiating the finances of care, lower socioeconomic status, not knowing care providers, or not grasping the receiving country's care expectations, all of which may lead to late and irregular prenatal care (Benza & Liamputtong, 2014; Guendelman et al., 1999; Lindsay et al., 2012). Many immigrants take lower status and lower paying jobs that may not provide health insurance on arrival in the United States as one of the costs of immigration (Im & Yang, 2006). These issues may be compounded in immigrant women, who may need to adjust to a new occupational role on immigration as part of both economic necessity and assimilation into the new culture (Gupta & Sullivan, 2013). Adding to these pressures in the receiving area, some immigrant women feel marginalized, limiting access to prenatal care, and that they are not treated in a caring manner or with personalized concern due to stigmatization by care providers (Degna et al, 2014; Korinek & Smith, 2011).

Practices related to labor and delivery

There are both advantages and deterrents to immigration from developing countries during the childbearing period for some women. Women may well be pleased with the attendance of their husbands and the relative ease of remaining nourished and safe during parturition. However, immigrant women frequently preferred to deliver vaginally, with minimal interventions, including interventions in pain management, and some felt confusion and a sense of misunderstanding communicating their wishes in western countries (Benza and Liamputtong, 2014; Degna et al, 2014). Some women delayed arriving at a hospital in an effort to prevent cesarean section delivery, and many preferred silence and stoicism as methods of coping with labor, based on their

backgrounds. Changes of position and the use of gravity have been seen as beneficial to labor progress across the globe. Common positions in western countries, including the U.S., include side-lying, supine, or lithotomy maternal positions for delivery, were seen as positions of weakness for some women, when compared to squatting or sitting positions which were more commonly used in less industrialized countries (Benza and Liamputtong, 2014).

Many women found the intrusive nature of labor and delivery difficult in the receiving country and expressed a tendency to refrain from asking questions of care providers in the receiving country who appeared rushed (Benza and Liamputtong, 2014). Immigrant women in Australia found caregiver attitudes, patient information, continuation of care, and their own participation in decision making less than satisfactory (Hye-Kyung, 2014). If immigrant women came from countries where female providers or female circumcision were the norm, adjusting to receiving countries' practices of mixed gender providers and lack of experience in managing deliveries in women who had been circumcised was concerning and a cause of anxiety (Benza and Liamputtong, 2014). However, some women have reported the reassuring nature of westernized medicine with its technology and safety standards when their country of origin was particularly difficult due to war, social disruption, or poverty (Degni et al., 2013).

Background related to language, care provision and maternal outcomes
<u>**Use of English and foreign languages in U.S.**</u>

The most common language spoken in the United States is English. (U.S. Department of Commerce: Census Bureau, 2014) The U.S. Census Bureau published data showing markedly increased numbers of foreign language speakers in the United States

in recent years. (U.S. Department of Commerce: Census Bureau, 2014). The 2013 U.S. Census data indicated that 8.6% of the population is unable to communicate easily in English (Lopez & Gonzalez-Barrera, 2014; Zeigler & Camarota, 2014; U.S. Department of Commerce: Census Bureau, 2014). Approximately 61.8 million people, or approximately 20% of the U.S. population in 2013, spoke a spoke a language other than English at home, a number that has increased over prior surveys (Zeigler & Camarota, 2014; U.S. Department of Commerce: Census Bureau, 2014). Forty-four percent of the foreign language speakers reported in the last Census were native born (Zeigler & Camarota, 2014; U.S. Department of Commerce: Census Bureau, 2014). The majority of those who spoke a foreign language spoke Spanish (Lopez & Gonzalez-Barrera, 2014).

<u>Acculturation and tie to language</u>

It has long been thought that acculturation takes place both on a social group level and on an individual psychological level (Berry, 1997). In the United States, English language use is considered to be a relatively direct measure of acculturation of foreign language populations into the dominant culture, which includes accessing practices of the dominant culture (Olmedo, & Padilla, 1978; Salinas & Sheffield, 2009). Approximately 44% of the immigrant population over age five is relatively fluent in English on arrival to the United States, while approximately 13% of the immigrant population speaks no English at all (U.S. Census Bureau, 2014). Although it varies somewhat by state, 84.6% of immigrants do not speak English at home. (U.S. Census Bureau, 2014).

Lack of fluency in the English language in and of itself does not necessarily mean that the speaker is foreign born. It is clear that the various populations- native-born foreign language speakers and immigrants from other countries are different groups (Korinek &

Smith, 2011). However, it has been reported that language use is a strong marker for ethnic identity, and thus can be used as a marker of acculturation, whether foreign language speakers are immigrants or natives of a country (Afable-Munsuz et al., 2013). Further, acculturation of immigrants (voluntary or otherwise) and "national minorities" appears to be a similar process (Berry, 1997). Just under half of Latina acculturation studies used language acquisition as the proxy marker for acculturation in the United States, despite the limitations of language use as a marker for such acculturation. (Tarutzer et al., 2012; Thomson & Hoffman, 2009).

Prenatal and obstetric care may well be impacted by language use. Low English language acculturation has been shown to decrease levels of physical activity, particularly in populations of childbearing female immigrants with low educational levels and low socioeconomic status (Gaskins, Baskin, & Person, 2012; Heaman, Bayrampour, Kingston, Blondel, Gissler, Roth, & ... Gagnon, 2013). Indeed, in the United Kingdom, a primary recommendation to decrease maternal morbidity and mortality is to provide professional interpretation services for all women who do not speak English, as women were unable to communicate adequately with their health care providers by other means (CMACE, 2011).

Proficiency in language and health care

Interpreters must be used liberally in federally funded hospital settings in the United States to assist with clear communication during admissions for patients who seek health care and who do not speak English (Patient Protection and Affordable Care Act, 2010). Language acquisition in receiving countries may make a material difference in health outcomes, particularly when the ability to access care and follow health care

instructions is considered. Differences in both language and culture prevent clear communication between patient and provider, and as a result, immigrants may use less health care services, terminate care earlier, or receive lower quality care (Degna et al, 2014).

Lack of fluency in the language in which care is being given has been shown to negatively affect health and health care. Salinas and Sheffield (2009) noted that English language use, regardless of place of birth, was predictive of mortality and health risk factors such as smoking. Barriers to language use are considered to have deleterious effects between patient and clinician interactions (Deyo et al., 1985). In a study of foreign-born people and access to the Canadian and U.S. health systems, people with limited English were less likely to have access to a health care provider and less satisfactory health care experiences (Lebrun, 2012). Health care providers found language barriers to be among the most problematic parts of caring for women who were not proficient in English, and worried about whether language interpretation was being performed adequately (Degni, Suominen, Essén, El Ansari, & Vehviläinen-Julkunen, 2012).

Language barriers may also limit access to care for immigrant women, who may experience anxiety and fear, isolation, insulting comments from care providers, disinterested treatment, and bias during their childbearing experiences in the new country (Benza and Liamputtong, 2014; Degna et al., 2014). Although some immigrant women find care providers in receiving countries welcoming and helpful, many immigrant women believe misunderstanding between providers of care and the women themselves is fostered by poor communication (Degna et al., 2014).

Typically, immigrant women, who often have the role of primary caregiver for children and older adults, take longer to acquire proficiency in the language of the receiving country (Gupta & Sullivan, 2013). Language proficiency, however, allows for increased cultural integration for immigrants (Gupta & Sullivan, 2013). Additionally, language acquisition may improve socioeconomic status, which could improve health outcomes. Access to health care services, improved communication with providers of health care, and increased exposure to the non-immigrant population can all be assets of language acquisition (Heaman et al., 2013; Thomson & Hoffman-Goetz, 2009). It is of note that in health care, although increasing language skills are related to health care system utilization, they may also be an indicator of changes in health beliefs and practices (Tarutzer et al., 2012; Thomson & Hoffman, 2009).

Health care provider type

Although it is clear that trained birth attendants lower maternal morbidity and mortality across the globe, it remains under discussion whether any one specific care model can improve maternal morbidity and mortality (Hatem et al., 2009; Kassebaum et al., 2013; Renfrew et al., 2014). Midwifery models of care focus on the childbearing woman in her environment and are practiced under the assumption that most women can proceed through their pregnancies, labors, and deliveries in as in normal physiologic occurrences in female life (Hatem et al, 2009). Physician-led care is a model where medical doctors or doctors of osteopathy, usually obstetricians, supervise labor care and are present at delivery, although most of the labor and postpartum care is typically provided by nurses (Hatem et al., 2009).

There has been some speculation that the mode of provision of care may be a factor in maternal outcomes (Renfrew, et al., 2014). Many countries have models of maternity care provision that focus on teams led by physicians or midwives or rely primarily on various forms of midwives as the primary providers of obstetrical care (Hatem, Sandall, Devane, Soltani, Gates, 2009). Finland provides maternal care primarily through the use of midwives, who work under the supervision of obstetrician/gynecologists in maternity clinics (Degni, Suominen, El Ansari, Vehviläinen-Julkunen, & Essen, 2014). Countries such as the United Kingdom, Ireland, Australia, and the Netherlands utilize combinations of physician-led, midwife-led, and shared-care team models (Hatem et al., 2009).

In the United Kingdom, policies of the National Health Service support the routine use of midwives for antenatal, intrapartum, and postpartum care when no complications or risks are identified (CMACE, 2011). Indeed, some studies showed that women who received midwifery care in England had lower rates of amniotomy, episiotomies, use of opioid analgesics, use of oxytocin in labor, epidural or spinal anesthesia, or vacuum or forceps deliveries, with a higher rate of spontaneous vaginal delivery, and improved maternal perceptions of control (Devane, et al., 2010; Sandall, Soltani, Gates, Shennan, & Devane, 2013). A Cochrane meta-analysis 2009 showed that women who utilized midwifery care were less likely to be hospitalized in the antepartum period, receive regional anesthesia, receive an episiotomy, have a vacuum or forceps (instrumental) delivery, or suffer a fetal demise at less than 24 weeks of gestation (Hatem et al., 2009). Further, such women were more likely to have a spontaneous vaginal delivery, no analgesia or anesthesia at all, a midwife they knew attending their deliveries,

to initiate breastfeeding with their infants, and to feel more in control of their labors (Hatem et al., 2009). One systematic review of literature found that midwives were less likely to use technology during parturition, but that perineal lacerations were diminished and newborn outcomes were improved during midwifery deliveries (Johantgen, Fountain, Zangaro, Newhouse, Stanik-Hutt, & White, 2012).

Some labor and delivery procedures appear not to vary by type of care provider. Interestingly, some analyses showed no significant difference in cesarean section delivery, amniotomy, length of or induction of labor, perineal lacerations, use of opioid analgesia, preterm labor, or postpartum hemorrhage by type of care provider (Hatem et al., 2009; Grivell & Dodd, 2011).

U.S. models of care

In the United States, most babies are born in hospitals and physicians are the most common primary providers of care. Obstetricians are physicians who specialize in obstetrics and childbearing. Most also specialize in women's reproductive health. Several other types of providers also provide care during parturition, particularly nurse midwives, who deliver approximately 8% of babies in the country (American College of Nurse Midwives, 2014; Martin, Hamilton, Osterman, Curtin and Mathews, 2013). A small percentage of childbearing women in the United States choose to deliver in birth centers, at home or in other locations; doctors of medicine and osteopathy, nurse midwives, and other types of midwives deliver women in all of these sites (Martin et al., 2013).

Midwifery care in the United States

Midwives are the providers of choice in many parts of the globe for women who are at low risk. The definition of "midwife" can, however, vary across the globe. Many

countries including the United States utilize trained birth attendants who are licensed or unlicensed and apply the word "midwife" to such care providers. However, for the purposes of this work, the term midwife only applies to licensed certified nurse midwives. "Certified nurse midwives" (CNMs) refers to nurses who have also become midwives and who have achieved certification from the American College of Nurse Midwives. Certified Nurse Midwives are independent, licensed providers of women's health care (ACNM, 2014). Increasingly, there is evidence that the use of licensed midwives as providers of routine antenatal care decreases maternal mortality rates (Hatem et al., 2009; Homer, et al., 2014).

Certified nurse midwives utilize a philosophy of promoting normal physiological birth. A joint statement by the American College of Nurse Midwives, Midwives Alliance of North America (MANA), and National Association of Certified Professional Midwives in 2012 defined normal physiologic birth as "one that is powered by the innate human capacity of the woman and fetus. This birth is more likely to be safe and healthy because there is no unnecessary intervention that disrupts normal physiologic processes" (p.2).

Certified Nurse Midwives delivered 7.9% of the babies in the United States in 2012, including 11.9% of vaginal deliveries, 8.1% of babies from white mothers, 7.3% of black women, 16.5% of American Indian or Alaskan native women, and 6.5% of Asian or Pacific Islander women, the categories listed under the national health statistics categories (Martin et al, 2013).

The relationship between midwives and pregnant women is usually perceived to be personal and equal with patients (Normand, 2009). It is important to note that when

communication is not clear in such professional-patient relationships, patients may be limited in their ability to understand and decide on care options and may accede to midwives' promotion of institutional policies and procedures rather than advocating for their own preferences (O'Malley, 2015; Normand, 2009).

Physician care in the United States

Obstetricians arrived relatively late in the world of childbearing, as births were attended by female relatives or friends or by female midwives for centuries. The word obstetrics comes from the Latin word "obstetrix", or midwife (one who "stood before") (Drife, 2002). Formal antenatal care was not practiced for many years, and women preferred female midwives for uncomplicated deliveries for the majority of human history. However, early obstetricians were beginning to practice by the 16th century, and started becoming more accepted in parts of Europe by the 18th century, where they were called male midwives or "accoucheurs" (Drife, 2002). Throughout the 1800s, remarkable advances were made by obstetricians, including the introduction of clean technique, obstetrical forceps, and the introduction of chloroform for labor discomfort, and midwifery began to be a required course in medical schools (Drive, 2002).

Obstetrician-gynecologists are defined as physicians who have completed "an accredited program of graduate medical education, possess special knowledge, skills and professional capability in the medical and surgical care of women related to pregnancy and disorders of the female reproductive system". (ABOG, 2015a). Obstetrician-gynecologists complete medical school and residencies, then are board certified and practice in a variety of settings related to women's health including preconception, antenatal, intrapartum, and postpartum care, genetics, and gynecology including

reproductive organs, sexual function and breast care (ABOG, 2015b). Doctors of osteopathy follow a slightly different educational path and focus, but practice obstetrics very similarly to medical doctors (American Osteopathic Association, 2017).

For the last decade, there have been more female than male obstetrician gynecologists entering practice (Gerber & Lo Sasso, 2006). The majority of women, particularly immigrant women, prefer a female obstetrician-gynecologist, or at least a "female pattern" of communication from male obstetricians, with more empathy and understanding. Most women also prefer a patient-centered style of communication (Degni, et al., 2012; Janssen & Lagro-Janssen , 2012). Whatever the gender, there is some evidence that communication between physicians and patients may be complicated by physician preferences and paternalism, even when there is no language barrier (Goldberg & Shorten, 2014).

Maternal outcomes background

Many of the practices and interventions in modern obstetrical care are based on attempts to prevent the causes of maternal morbidity and mortality, while other practices are based on defensive medical practice to protect care providers from liability (Hermer & Brody, 2010). In either event, such practices have been the reality of maternal care during parturition in the United States during the time of this study.

<u>Labor interventions introduction</u>

Cervical ripening, induction of labor and augmentation of labor are all interventions used during labor to facilitate uterine contractions and the expulsion of the uterine contents, and specific pharmacologic or mechanical methods may be used for each or all of the stages of labor. Frequently, multiple methods are used for induction.

Cervical ripening improves the chances of vaginal delivery during induction of labor, and induction of labor is the use of interventions to start uterine contractions and the expulsion of the products of conception (Weeks et al., 2007; Wallstrom et al., 2017). Augmentation of labor is the stimulation of uterine contractions with artificial rupture of membranes or pharmacologic methods once labor has started (ACOG, 2014). Specific methods to stimulate contractions similar to those of induction may be used to increase uterine contraction strength or frequency in the effort to expel the products of conception vaginally (ACOG, 2014; Wallstrom et al., 2017).

Cervical ripening

Frequently the response to oxytocin for induction of labor is more effective following cervical ripening, which is the softening, thinning, and sometimes dilation of the cervix before labor. Typical agents used for cervical ripening include oral, vaginal or rectal misoprostol, vaginal dinoprostone, or Foley catheter bulbs for manual dilation (ACOG, 2009; Getahun, 2014). Alternative methods, not well studied, include acupressure or acupuncture, nipple stimulation, and herbal remedies such as blue cohosh, or evening primrose oil, which may be used by some women for cervical ripening (Getahun, 2014; Smeriglio, 2014; Wallstrom, 2017).

Induction and augmentation of labor

Induction of labor can be defined as artificially starting labor before spontaneous onset of labor to deliver the products of conception, with a goal of vaginal delivery (ACOG, 2009; Getahun, 2012; Wallstrom et al., 2017). Induction of labor can be performed for multiple medical, obstetrical, and psychosocial reasons, but there is evidence that it has also been performed electively for reasons such as convenience, risk

of litigation, or the discomfort of late pregnancy (ACOG, 2009; Getahun, 2012). The percentage of women receiving labor inductions, particularly those receiving elective inductions without medical indication, rose steadily throughout the 1990s and the beginning of this century (Getahun, 2012). While the U.S. rate of labor induction was approximately 9.5% in 1991, in 2012, 22.8% of women received induction of labor in the United States (Martin et al., 2013). There were some racial disparities in who received induction of labor, as 23.6% of women classified as white received induction of their labors, while 21.7% of black women, 21.6% of American Indian or Alaskan Native, and 17% of Asian or Pacific Islander women received inductions (Martin et al, 2013). Typical methods of induction of labor include medications such as prostaglandins, particularly misoprostol, and oxytocin. Mechanical methods to induce labor include placement of a balloon catheter in the cervix (but outside the amniotic membranes), amniotomy, and less commonly, placement of laminaria (Weeks, Alfirevic, Faúndes, Hofmeyr, & Wing, 2007; Wallstrom et al, 2017). Grivell & Dodd (2011) report a 67% increase in cesarean delivery when induction of labor is utilized without obstetric or medical indications, regardless of the number of prior pregnancies.

While induction rates had climbed for the last two decades, there have been relatively recent changes in obstetrical practice that have caused induction rates to decrease somewhat. Current guidelines for labor inductions now discourage elective induction of labor (ACOG, 2009). Further, induction of labor is now discouraged at less than 39 weeks of gestation, based on a recent committee opinion from the American College of Obstetricians and Gynecologists that redefined term pregnancy as 39-42 weeks' gestation (ACOG, 2013a; Getahun, 2012).

Oxytocin and prostaglandin use

Both oxytocin and the various prostaglandin formulations are used in both laboring and postpartum women. Oxytocin, used as the first line medication, and misoprostol, as well as several other prostaglandins, may be used for cervical ripening, labor, or postpartum to control hemorrhage, as the overall function of all is to cause contraction of the uterus.

For labor induction or augmentation, intravenous oxytocin is the most common pharmaceutical agent utilized to stimulate contractions (ACOG, 2009). It is usually rapid in its effect on the uterus, although effectiveness increases with gestational age (ACOG, 2009). Misoprostol orally, vaginally, or rectally may also be used for labor induction (Wallstrom et al., 2017). Non-pharmacologic methods may include nipple stimulation to cause release of endogenous oxytocin, acupuncture or acupressure, or herbal teas including cohosh or raspberry leaf, although these methods are less well studied (Getahun, 2014; Smeriglio, Tomaino, & Trombetta, 2014).

Side effects of oxytocin or prostaglandin induction depend on medication or method, the individual woman's gestational age and response, and fetal tolerance of induction. The most common problems associated with the induction of labor are hyperstimulation of the uterus, ineffective progression of labor, and possible uterine rupture, and, as a consequence of these issues, possible fetal hypoxia and increased risk of cesarean delivery (Weeks, et al., 2007). Interestingly, women who have a normal progression in labor without induction or augmentation typically also have a more rapid descent of the fetal head through the maternal pelvis during parturition (Graseck, Tuuli, Roehl, Odibo, Macones, & Cahill, 2014).

Artificial rupture of membranes

One commonly used intervention in labor is artificial rupture of membranes (AROM), the intentional rupturing of the amniotic membranes, also called amniotomy. Artificial rupture of membranes has been utilized in several ways since it was introduced as a possible procedure for use during labor over 50 years ago, including induction of labor, augmentation of labor, visualization of the amniotic fluid, and for the application of internal monitoring during labor (Cohain, 2013; Smyth, Markham & Dowswell, 2013). Typically, the procedure is performed utilizing an "amnihook" to puncture the amniotic membranes when labor is well established (Cohain, 2013).

Despite the inexpensiveness and frequency of use of the method, there has been considerable controversy about the use of amniotomy over time (Cohain, 2013; Macones, Cahill, Stamilio, & Odibo, 2012; Smyth et al., 2013). The Active Management of Labor theory propounded in Dublin in the 1990s suggested amniotomy as a method to speed labor progress and was readily incorporated into practice by many providers (Smyth et al., 2013). However, there has not been strong evidence that amniotomy speeds labor, and there are potential risks to the procedure including prolapsed umbilical cord, chorioamnionitis, and prolonged rather than shortened labors (Cohain, 2013; Macones et al., 2012). A Cochrane review in 2013 recommended against the use of routine amniotomy, although the use of amniotomy in prolonged labor may shorten second stage (Smyth et al., 2013). The topic is still under debate in the literature (Cohain, 2013; Macones et al., 2012; Smyth et al., 2013).

Labor pain management

Use of anesthesia

Epidural use for pain management is a common and increasingly popular current practice in the United States (Osterman and Martin, 2011). Epidural anesthesia became widely accepted for use during labor in the 1980s and has become a wildly popular method of pain control during labor (Humenick, 2000). An epidural is a regional anesthesia, administered by an anesthesiologist or nurse anesthetist, that delivers medication to the epidural space to block pain. Most women report satisfaction and good pain relief with the method (Cheng, Shaffer, Nicholson, & Caughey, 2014; Leighton & Halpern, 2002). Further, the first stage of labor is only minimally prolonged, there is no significant increased risk in cesarean, and neonatal outcomes are thought to be slightly better (Leighton & Halpern, 2002).

However, the use of epidurals during labor have some less positive aspects that must be considered. It is well known that epidurals prolong labor, and there is some evidence that use of epidural anesthesia appears to prolong the first stage of labor by over two hours (Leighton & Halpern, 2002; Cheng et al., 2014). Rates of augmentation utilizing oxytocin are considerably higher when an epidural is placed, and maternal pyrexia and hypotension with possible associated fetal bradycardia are notable side effects of epidural use (Cheng, Bautista, Leo, & Sia, 2013; Leighton & Halpern, 2002). There has been some evidence that use of epidurals in labor is correlated with chorioamnionitis, although the relationship is not necessarily causal (Abramovici, Szychowski, Biggio, Sakawi, Andrews & Tita, 2014).

Parenteral narcotics

Narcotics have been widely used for pain control in the past during labor, and can be administered intramuscularly or intravenously during labor. Parenteral narcotics do

not provide complete pain relief during labor, but may be an option women choose for pain control when epidurals are unavailable or undesired (Ullman, Smith, Burns, Mori, & Dowswell, 2011). Specific narcotic types change frequently in institutions based on availability, and a Cochrane review noted that there was not sufficient evidence to evaluate and document beneficial or detrimental effects of specific narcotics on fetuses as a result (Ullman et al., 2011). With these changes in mind, parenteral narcotics were not reviewed for this work, although they are used during labor and delivery.

Inhaled nitrous oxide was not in wide use at the time of this study for pain relief, and therefore will not be discussed. However, at this writing, inhaled, maternal-controlled nitrous oxide is becoming more popular for pain control in labor.

Electronic fetal monitoring

There are various methods utilized for fetal monitoring including manually auscultating the fetal heart with a fetoscope, external electronic fetal monitoring, and internal electronic fetal monitoring. Electronic fetal monitoring (EFM) is very commonly used during labor and delivery to provide evaluation of the fetal status (Sprong, Berghella, Wenstrom, Mercer, & Saade, 2012). As long ago as 2002, EFM was used in 85% of all labors, and nearly all women in the United States currently have at least some external continuous or intermittent external EFM during their admission for labor and delivery, despite questions about the efficacy and safety of such a method in normal populations (Martin, Hamilton, Sutton, Ventura, Menacker, & Munson, 2003; Paterno, McElroy, & Regan, 2016).

No benefit has been found for continuous fetal monitoring in low risk women, and the incidence of cerebral palsy rates have not diminished (Sprong et al, 2012). However,

fetal monitoring is indicated for labors that are not normal, and internal fetal and uterine

monitoring are labor interventions used when the status of the fetus or uterine

environment is unclear, when progress is poor, or when the maternal or fetal status is

abnormal (Sprong et al, 2012). Internal fetal monitoring, an invasive procedure that

requires rupture of the amniotic sac, may be used when external monitoring is not

efficacious. Internal uterine monitoring may also be used via an internal uterine pressure

catheter (IUPC).

Delivery methods

One measure of maternal outcomes during parturition is the method by which

women deliver their baby. Normal physiologic birth is achieved by spontaneous vaginal

delivery and is considered to be the safest method of delivery for most women, but other

methods more commonly equated with complications during labor include use of forceps

or a vacuum extractor or cesarean section deliveries. Primary cesarean section is usually

done for obstetrical or medical reasons. Repeat cesarean sections may be for obstetrical

or medical reasons, or may be electively chosen by the woman and her provider for social

reasons. Whatever the reason for the decision, more than 90% of women who have a

primary cesarean will have subsequent cesarean deliveries (Sprong, et al., 2012).

Normal spontaneous vaginal delivery

Just over two thirds of women successfully achieved vaginal deliveries between

2012 and 2016 (Martin et al., 2013, Hamilton et al, 2017). A normal spontaneous vaginal

delivery (NSVD) is the spontaneous expulsion of the fetus and placenta vaginally,

without the use of operative techniques or complications at delivery (ACNM, MANA, &

NACPM, 2013). However, women who achieve spontaneous vaginal deliveries may well

have interventions during labor, including labor induction, labor augmentation, narcotic administration for pain control, or epidural anesthesia (Tam, Conte, Schuler, Malang, & Roque, 2013).

A newer- or older- goal for women is to achieve normal physiologic birth during labor and delivery (ACNM et al, 2013). Normal physiologic birth is a spontaneous vaginal delivery achieved without disruption of normal physiologic processes with unnecessary interventions. Practices that support normal physiologic birth are more likely to be included in midwifery care in large care centers (ACNM et al, 2013).

Cesarean section delivery

The term cesarean delivery describes a method of delivering a baby, while cesarean section describes an operative procedure. In practice, these terms are used nearly interchangeably to describe the delivery a baby by the cesarean section operative procedure where the baby and placenta are surgically removed from the abdomen and uterus (Gibbons, Belizán, Lauer, Betrán, Merialdi, & Althabe, 2010; Martin et al., 2017).

Cesarean delivery rates have increased considerably in the last 20 years both in the United States and in other industrialized countries. In the U.S., the cesarean delivery rate in 1996 stood at 20.7%, but rose to 31.1% of all deliveries by 2010 and was at 32.8% in 2012 (Grivell & Dodd, 2011, Martin et al., 2015). Other industrialized countries are facing similar rates of cesarean delivery, as Australia had a rate of 30.9% in 2007 (a 9% increase in 9 years), and other European countries have reported rates from 15% in Norway to 37.8% in Italy (Grivell & Dodd, 2011). A World Health Organization survey in Asia in 2010 found an average rate of 27.3% cesarean across 9 countries (Lumbiganon, et al., 2010).

In the United States, the rate of cesarean delivery for non-Hispanic white women has dropped slightly in recent years, and the cesarean rate has dropped from the 32.8% noted in 2012 to 31.9% in 2016, still nearly one third of all deliveries, but decreasing (Hamilton, et al., 2013; Martin, et al., 2013; Martin et al, 2017). However, the rate of cesarean delivery for Hispanic women in 2013 was steady at 32.2, and the rate of cesarean for non-Hispanic black women rose to 35.9%. (Hamilton, et al., 2013; Martin, et al., 2013). In 2012, the cesarean section rate was slightly lower for white and American Indian or Alaska Native women at 32.3 and 28.6%, respectively. For Black women, the rate of cesarean delivery in 2012 was 35.6%, and rose to 35.9% in 2016 (Hamilton et al, 2017; Martin et al., 2013) and for Asian or Pacific Islander women, 33.2%. (Martin et al., 2013).

There is some evidence that women who are not native-born in the United States may have higher rates of cesarean section deliveries than those born in the U.S., even when comparing ethnically similar cohorts. The exception to this finding was in non-Hispanic White women (Janevic et al., 2014). However, in Massachusetts, between 1996 and 2006, Puerto Rican, Dominican, Salvadoran, Mexican and "Other Central American" women all had lower percentages (15.5-21.3%) of cesarean deliveries than those women who identified as "American" (23.3%) (Edmonds, Hawkins & Cohen, 2014).

Repeat cesarean section is reported as the most common cause for cesarean delivery (Grivell & Dodd, 2011). However, there are other causes as well. Vaginal breech delivery is much less common globally than it was two decades ago, largely as the result of research on the risks of vaginal breech birth and the subsequent increase in perceived risk of vaginal breech delivery (Hannah, Hannah, Hewson, Hodnett, Saigal, Willan,

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2000). As the perceived risk increased, providers had less opportunity to learn the skill to deliver vaginal breeches, and the loss of expertise in providers has become a further factor in the decreasing rates of vaginal breech deliveries (van Roosmakn & Meguid, 2014). Other causes of the increased rates of cesarean delivery may include factors such as increased maternal age, multifetal gestation, increased BMI, low neonatal birth weight, women's preferences, and practices of maternal-newborn care providers (Grivell & Dodd, 2011). The use of electronic fetal monitoring, concern for fetal well-being, societal expectations of good maternal and fetal outcomes, various methods of induction of labor and decreasing interest in vaginal birth after cesarean (VBAC) may also increase the risk of cesarean delivery (Grivell & Dodd, 2011).

There are increased risks for approximately 10.1% of the women who deliver by this surgical method (Grivell & Dodd, 2011; Martin et al., 2018). Women who receive cesarean section deliveries are known to be at increased risk for lower levels of satisfaction with their deliveries, less positive interaction and breastfeeding with their newborns, hemorrhage, infection, and abdominal and pelvic organ injury in the short term, and ectopic pregnancy, abnormal placentation, repeat cesarean delivery, uterine rupture, and possible hysterectomy in subsequent pregnancies (Grivell & Dodd, 2011; van Roosmakn & Meguid, 2014). Other serious complications of cesarean delivery may include deep vein thrombosis, infection, possible infertility, pulmonary emboli, paralytic ileus, and maternal admission to ICUs or maternal demise (Grivell & Dodd, 2011).

Immigrant women may view cesarean section poorly as a result of cultural and religious beliefs from their country of origin, particularly if they are from developing countries. While some women fear the actual surgery or have misconceptions about

cesarean deliveries, others fear the costs and potential complications, of cesarean sections, or have religious strictures against such surgery. (Degna et al., 2014) However, some women may view cesarean deliveries more positively, particularly if their countries of origin have increased cesarean rates. Mean cesarean rates by global region in recent years have been stated at 38.2% in Central America, and 27.5% in the Caribbean, and 42.9% in Latin America (Betrán, Ye, Moller, Zhang, Gülmezoglu, A., & Torloni, M., 2016)

Operative vaginal deliveries: vacuum extraction and forceps

Operative vaginal deliveries may be used as a delivery method of choice to avoid cesarean section under specific circumstances (Sprong et al, 2012). Vacuum extractions utilize a vacuum cup that is applied to the baby's head to assist maternal expulsive efforts. Vacuum extractions have diminished in popularity as a method of delivery and were 2.8% of all deliveries in the United States in 2012, a drop from the 3.9% in 1990 (Martin et al., 2013). Forceps deliveries employ a single obstetrical forcep or pair of obstetrical forceps, which are applied to the baby's head to provide traction during maternal expulsive efforts. In 1990, forceps were used fairly commonly as a method of delivery and accounted for 5.1% of all deliveries. However, forceps deliveries have been decreasing steadily in the United States since 1990, and in 2012 were 0.6% of all deliveries (Martin et al., 2013).

Operative vaginal deliveries have been found to reduce rates of cesarean deliveries. However, the diminishing number of operative vaginal deliveries are of concern due to the increasingly limited numbers of providers who can train new

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practitioners in the methods and limited experience available in the methods (Sprong et al., 2012).

<center>**Other maternal outcomes: background**</center>

Postpartum hemorrhage

While there are other kinds of hemorrhage during pregnancy and parturition, postpartum hemorrhage from maternal uterine atony is by far the most common cause of maternal blood loss during childbearing. Blood loss of 500 ml. or greater within the twenty-four hours following vaginal delivery or 1000 ml. or greater following cesarean section is the usual definition of postpartum hemorrhage (Miller, Cohn, Akdagli, Carvalho, Blumenfeld & Butwick, 2017; WHO, 2012b). Manual compression of the uterus is the first step of management for postpartum hemorrhage around the globe, followed by the administration of a uterotonic, typically oxytocin, during the third stage of labor (after the expulsion of the fetus, but before the expulsion of the placenta (WHO, 2012b). Other typical actions include emptying the maternal bladder, administration of second-line uterotonics including misoprostol or other prostaglandins, and intravenous fluids. More extensive methods of controlling a postpartum hemorrhage may include use of an inflatable balloon device, bi-manual compression, aortic compression and uterine artery embolism or hysterectomy (ACOG, 2006; Evansen, Anderson & Fontaine, 2017; Miller et al., 2017; WHO, 2012b).

Infection and antibiotic use

Maternal infection affects nearly 4.1% of all deliveries in the United States, most commonly puerperal fever, maternal pyrexia, or surgical site infections (Goffs, Pekow, Avrunin, Lagu, Markenson, Lindenauer, 2013). Maternal pyrexia, an indicator of

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infection, is noted as any maternal temperature above 100.4 degrees Fahrenheit. It is important to note that increased maternal temperatures may be related to chorioamnionitis, or may be related to epidural or prostaglandin use, dehydration, excess ambient heat during labor, or postpartum infection. The most common related factor when maternal infection occurs is cesarean section, however, maternal infection also occurs more frequently in adolescent pregnant women, when amniotic membranes were ruptured more than 24 hours before delivery, with anemia from blood loss, and with a fetal head not engaged in the maternal pelvis, whether delivered vaginally or by cesarean section, particularly in large teaching hospitals (Goffs et al., 2013; Smiall & Gyte, 2010).

Intravenous, and occasionally parenteral or oral, antibiotics are used both for treatment of infections and for prophylaxis against maternal infections during admissions for labor and delivery. Typically, intravenous antibiotics are given prophylactically during repeat cesarean section, as they reduce both postpartum endometritis and wound infections (Smiall & Gyte, 2010).

Current standards also require prophylactically treating the approximately 20% of women who have positive Group B Streptococcus cultures from the genitourinary tract with antibiotics during labor and delivery as protection for the neonate. Group B streptococcus is a common vaginal infection in women. Since 1996, CDC guidelines have been to screen pregnant women at 35-37 weeks' gestation for Group B streptococcus, which is often an asymptomatic infection (Oster, Edelsberg, Hennegan, Lewin, Narasimhan, Slobod,.. & Baker, 2014).   Although there is some debate about the cost effectiveness of treating all Group B Strep positive women in light of the baseline low rate of actual neonatal infections, current guidelines are to treat all positive

women prophylactically with intravenous penicillin during labor to prevent early newborn pneumonia, sepsis and meningitis. Rates of neonatal infection have dropped sharply since these guidelines were put in place (CDC, 2016; Oster et al., 2014).

However, when a parturient woman receives antibiotics other than for known or suspected Group B streptococcus infection or during surgical delivery, the antibiotic is usually administered for current infection. Endometritis, infection of the endometrium, chorioamnionitis, or infection of the chorionic and amniotic membranes and fluid, and surgical wounds are all causes of these infections and subsequent antibiotic treatment.

Summary

Currently, slightly less than 13% of the U.S. population was born in another country (Martin, 2013; U.S. Census Bureau, 2012; U.S. Census Bureau, 2014). Twenty one percent of childbearing women in the United States are not native born, and many prefer to communicate in a language other than English, the predominant language in the U.S. (U.S. Department of Commerce: Census Bureau, 2014; U.S. Department of Commerce: Economics and Statistics Administration, 2014). Language acquisition is considered to be the primary proxy measure of acculturation, therefore the preferred use of English during childbearing can be used as the proxy measure of acculturation to the dominant society in the United States (Tarutzer et al., 2012; Thomson & Hoffman, 2009).

There has been a marked increase in labor interventions in the United States in recent years. Many more women are receiving induction or augmentation of labor, fetal monitoring is used extensively, and epidural use has become widespread (Getahun, 2014; Hodnett, 2002). Length of labor has increased by approximately two hours, most likely because of these interventions (Laughon et al., 2012, Zhang, Landy, Branch, Burkman,

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Haberman, Gregory,... & Reddy, 2010). It should be noted, however, there have also

been recent decreases in the use of episiotomies and in non-indicated induction before 39

weeks of gestation (Hartmann, et al., 2005; Laughon et al., 2012).

Delivery outcomes in the United States have also changed in recent years.

Although vaginal deliveries are achieved in approximately two thirds of childbearing

women, there has been a substantial rise to nearly one third of pregnancies being

delivered by cesarean section, and a drop in operative vaginal deliveries via forceps or

vacuum extraction (Martin et al., 2013). In the United States, most babies are delivered

in hospitals, and by physicians or nurse midwives, who have somewhat different models

of care that may influence maternal outcomes (ACNM, MANA & NACPM, 2012;

Goldberg & Shorten, 2014; Renfrew et al., 2014).

It is unclear if women whose preferred language is English vary on admission for

their parturition in maternal outcomes, defined for this work as labor interventions and

delivery methods, from women whose preferred language is not English. Health Migrant

Theory would indicate that women who are unable to communicate in English may have

improved outcomes in terms of less labor interventions and more vaginal deliveries than

women whose preferred language is English. This research will focus on this question, as

well as whether maternal outcomes vary among both groups of women by principle type

of care provider.

CHAPTER III

METHODS

The purpose of this investigation was to determine whether maternal outcomes (including labor interventions and delivery outcomes) were different in women who prefer to communicate in English compared to women who prefer to communicate in a language other than English, and furthermore, whether maternal outcomes in English-speaking versus non-English-speaking women vary by principle type of health care provider (nurse midwife or physician). Maternal outcomes during parturition were labor interventions measured by: induction, augmentation, epidural use, antibiotic use, and artificial rupture of membranes. Delivery methods were measured by: spontaneous vaginal, cesarean, forceps or vacuum deliveries. Other dependent variables included postpartum hemorrhage and administration of antibiotics. For this study, the principle type of health care provider was defined by the recorded admission practitioner's practice type and was indicated as either a certified nurse midwife (CNM) or a physician, including medical doctor or doctor of osteopathy (MD).

Study design

This retrospective study was designed to measure whether there were differences in maternal outcomes during labor and delivery for women who did or did not prefer to speak English (Burns and Grove, 2009). The quantitative study was done via retrospective analysis of electronic health records (EHRs) in a large urban hospital in Massachusetts. Maternal outcomes, which included labor interventions and delivery methods, of women whose preferred language was English and maternal outcomes of women who preferred to communicate in another language were compared by the

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language preference and by principle provider type, indicated on the admission record as

CNM or MD. A schematic representation of independent variables, dependent variables,

and moderating factors can be found in Figure 2, below.
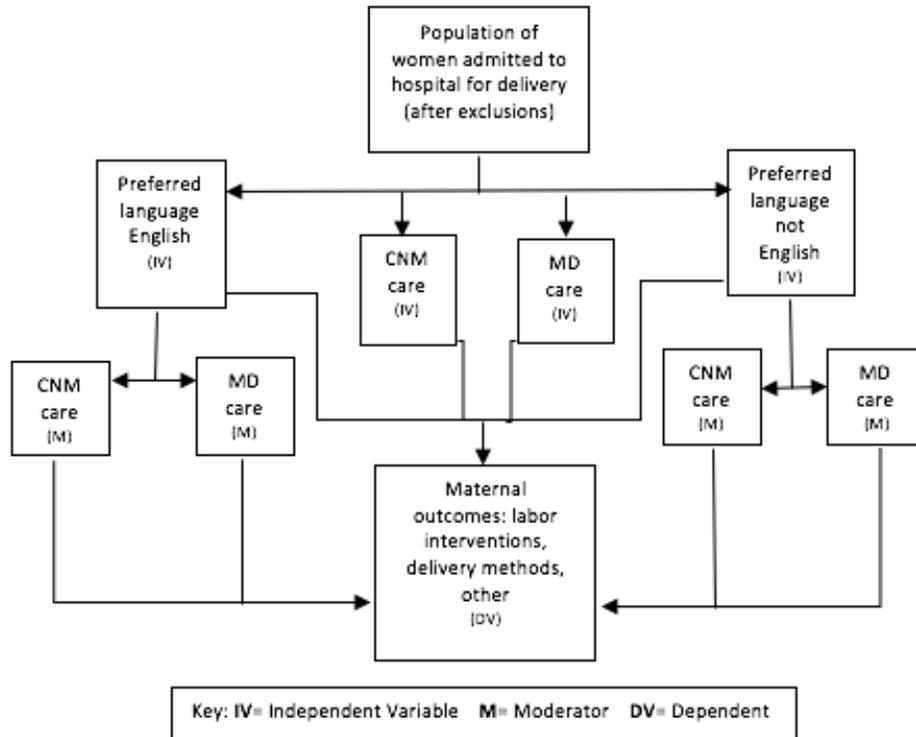
Figure 2: Independent and dependent variables and moderators

Analysis of data collected for other purposes is a well-established method for

generation of new knowledge (Finlayson, Egan & Black, 1999; Magee, Lee, Giuliano &

Monro, 2006; Smith, et al., 2011). The method is well established, and the National

Institutes of Health have been promoting the use of this method as a cost efficient, timely

method of doing research, particularly with the now ubiquitous presence of computerized

medical records, data storage and the ready availability of calculation software for

researcher computers (Magee, Lee, Giuliano & Monro, 2006; NIH, 2003; Smith, et al., 2011).

At the time of this work, while the percentage of foreign-born people in the United States was just under 13% of the population, the percentage of foreign-born people in Massachusetts, the site of this study, was approximately 15% (U.S. Census, 2014b). Of the group of foreign-born people in Massachusetts approximately half have become naturalized citizens, and half remained non-naturalized. Massachusetts immigrants' original countries mirrored U.S. immigration patterns, as the majority of immigrants originated in Latin America or Asia (U.S. Census, 2014b). During the years in which data was collected, approximately 21% of the population in Massachusetts did not speak English at home. About 13% of the total Massachusetts population spoke English well outside of their homes, although they did not at home, implying that about 8% had difficulty communicating in English (U.S. Census, 2014b). English language use was considered to be the proxy measure for acculturation in this work.

Sample and setting

The site for this work was chosen both because of its situation in an urban center that includes a population of foreign language speakers, and for its care provider model, as the hospital utilized both large cohorts of physicians and of nurse midwives as the primary providers of care (DeJoy, Burkman, Graves, Grow, Sankey, Delk, ... & Hallisey, 2011). The model of care utilized at the tertiary care center chosen was known for its unique model of both collaborative and independent physician and midwifery practice. Patients self-selected during their pregnancies for a primary type of antepartum and intrapartum care provider, and usually had their care managed by the type of provider

they chose (DeJoy et al., 2011). It should be noted that almost all labor patients admitted to this tertiary care center were seen at least once by a midwife even if they were principally cared for by physicians, and many patients who were principally managed by midwives were seen by a physician if needed. However, the type of provider selected by patients was noted on their admission records, and the preponderance of care during labor, delivery, and postpartum was given by the type of provider individual patients chose.

The population of interest for this study was all women who delivered babies over three years at a large tertiary care center in New England that did more than 4,000 deliveries annually (Baystate Health, 2015). In 2014, the hospital had a cesarean rate of 30%, slightly below the 32.8% national rate. Of the babies delivered in 2014 at the tertiary care center, 19% were delivered by certified nurse midwives (Baystate Health, 2015). The latest annual statistics available also showed an institutional labor induction rate of 22%, an augmentation rate of 14%, a 2% overall episiotomy rate, a 58% epidural rate, and less than 1% of deliveries performed via vacuum extraction or forceps (Baystate Health, 2015).

Three years was chosen as the span of time because of relatively recent changes in obstetrical practice in the last decade in the United States. Changes included lower rates of labor induction at less than 39 weeks of gestation, a significant drop in the rate of episiotomy usage following a 2005 study showing an increased incidence of 3rd and 4th degree lacerations with episiotomy (Hartmann, 2005), and a slowing of labor and delivery times related to epidural usage (ACOG, 2013a; Getahun, 2012; Laughon, et al., 2012). More women in the U.S. received inductions of labor, cesarean section deliveries,

and epidural anesthesia, while fewer forceps and vacuum deliveries were being performed in the second decade of this century (Laughon et al., 2012).   Finally, there was a pattern of slower labor and delivery times over the last few decades related to the increased averages of BMI and older ages of women, an increasingly diverse population, larger babies, and increasing use of regional anesthesia (Hye-Kyung, 2014; Laughon, et al., 2012; Livingston & Cohn, 2012).

In 2008, it was estimated that approximately 20% of the population in the urban area surrounding the tertiary care center did not speak English at home, and 44% of those people were not proficient in English (Commonwealth of Massachusetts, DPH, 2008). This approximated the levels of language use in the state as a whole. Approximately 14% of the population was foreign born at that time (Commonwealth of Massachusetts, DPH, 2008). In this urban area, 13% of students enrolled in the public schools were not proficient in English, and the languages used were primarily Spanish (one fifth of school children), then Vietnamese, Somali and Russian, in descending order of language preference (Tung, 2010). This implied a relatively high percentage of households in the city with limited English proficiency. Interpreter services were required in treatment or emergency care settings in Massachusetts for those who were not proficient in English (Commonwealth of Massachusetts, DPH, 2008). Patients were questioned as to their "preferred language" on admission to the tertiary care center as an indicator of English language proficiency. If a patient preferred to communicate in a language other than English, it was assumed that they were not comfortable or proficient using English, and thus were not acculturated.

Three distinct language groups were constructed for sub-analysis: 1) women who were able to communicate in English fluently, 2) women who wished to communicate in English but needed professional interpreter services for assistance in communication at some point during their hospitalization, and 3) women who were unable to communicate in English and used professional interpreter services to communicate.

Power Analysis

A power analysis is the ability of a study to find differences or relationships in a correlational study that truly exist in the population of interest (Burns and Grove, 2009). Power was estimated using the following criteria: $a = 0.05$ (Type I error rate), $\text{ß} = 0.20$ (Type II error rate), power $(1-\text{ß}) = 0.80$, and $f = 0.10$ (a small effect size). Given the large anticipated sample, a conservative estimate of the effect size was used. The power analysis was performed using G*Power (v.3.1.9.2) and identified a required sample size of 787 subjects. The final total sample size of 11,656 subjects was more than adequate to answer the study aims and hypotheses.

Exclusions

Exclusions were entered by the medical center, which has just over 4,000 deliveries yearly, before data was extracted. Although there are case studies and some evidence indicate that a few neonates survive between 22 and 23 weeks of gestation if delivered, 23 weeks is usually the gestational age considered for viability and a cut-off point for exclusion (Seri & Evans, 2008). Therefore, all women who delivered before 23 weeks of gestation were excluded from the analyzed sample. Other exclusions included those with significant conditions that would require specialized, individualized treatment during labor and delivery such as terminal multivehicle accidents, maternal cardiac

disease, maternal structural anomalies, fetal structural anomalies, multifetal gestation

pregnancies, and intrauterine fetal demises. These were considered exclusions as

treatment for such cases is not typical. The final exclusion was patients who received care

from maternal fetal medicine physicians as they also represent a sample of patients with

non-typical complications that require specific and focused treatment. (Note:

Occasionally maternal fetal medicine physicians cover the general labor and delivery

unit, but patients who received care entirely from the maternal fetal medicine service

were excluded.) Following exclusions, a total sample of 11,656 medical records of

laboring women were obtained for analysis. The list of exclusions can be seen in Table 1.

Table 1. Exclusions from sample before analysis

Gestational age less than 23 weeks	Fetal structural anomalies
Terminal multivehicle accidents	Multifetal gestation pregnancies
Maternal cardiac disease	Intrauterine fetal demises
Maternal structural anomalies	Maternal fetal medicine patients

Aims and Hypotheses

Using Healthy Migrant Theory, the central hypothesis was that there would be

less labor interventions and operative vaginal delivery and cesarean delivery methods

among women whose preferred language was not English than among women whose

preferred language was English during parturition. A second central hypothesis was that

there would be less labor interventions and operative vaginal or cesarean delivery

methods in women receiving care principally provided by midwives when compared to

those whose care was principally provided by physicians, despite the women's ability to

communicate in English.

The specific study aims and hypothesis are below.

Aim 1: To examine the relationship between language preference and maternal outcomes.

H1: There will be a relationship between language preference and frequency of induction or augmentation of labor.

H2: There will be a relationship between language preference and use of epidural or other anesthesia during parturition.

H3: There will be a relationship between language preference and artificial rupture of amniotic membranes (AROM) during parturition.

H4: There will be a relationship between language preference and frequency of cesarean section delivery.

H5: There will be a relationship between language preference and frequency of vaginal or operative vaginal (forceps and vacuum) deliveries.

H6: There will be a relationship between language preference and frequency of episiotomy use during parturition.

H7: There will be a relationship between language preference and between language preference and frequency of postpartum hemorrhage.

H8: There will be a relationship between language preference and frequency of antibiotic administration during parturition.

Aim 2: To examine the relationship between health care provider type and maternal outcomes.

H1: Women who utilize nurse midwives for care during parturition will have a lower frequency of induction or augmentation of labor

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H2: Women who utilize nurse midwives for care during parturition will have a lower frequency of use of epidural or other anesthesia during parturition

H3: Women who utilize nurse midwives for care during parturition will have a lower frequency of artificial rupture of amniotic membranes (AROM) during parturition

H4: Women who utilize nurse midwives for care during parturition will have a lower frequency of cesarean section delivery.

H5: Women who utilize nurse midwives for care during parturition will have a lower frequency of operative vaginal (forceps and vacuum) deliveries.

H6: There will be a relationship between type of provider and frequency of episiotomy use during parturition

H7: There will be a relationship between type of provider and frequency of postpartum hemorrhage

H8: There will be a relationship between type of provider and frequency of antibiotic administration during parturition

Aim 3: To examine the impact of provider type on the relationship between language preference and maternal outcomes.

H1: Provider type will moderate the relationship between language preference and lower frequency of induction or augmentation of labor

H2: Provider type will moderate the relationship between language preference and the frequency of use of epidural or other anesthesia during parturition

H3: Provider type will moderate the relationship between language preference and frequency of artificial rupture of amniotic membranes (AROM) during parturition

H4: Provider type will moderate the relationship between language preference and frequency of cesarean section deliveries.

H5: Provider type will moderate the relationship between language preference and frequency of vaginal or operative vaginal deliveries (vacuum and forceps).

H6: Provider type will moderate the relationship between language preference and frequency of frequency of episiotomy use during parturition.

H7: Provider type will moderate the relationship between language preference and frequency of postpartum hemorrhage

H8: Provider type will moderate the relationship between language preference and frequency of antibiotic administration during parturition

Data Collection, Management and Analysis

Data collection was done following IRB approval at both institutions. Data from women admitted for labor and delivery from 2013 – 2016 were extracted from the hospital electronic health records (EHRs). Data from the EHRs were de-identified before released to the investigator. Data were stripped of personal health information (PHI) to conform with HIPAA regulations (HHS: OCR, 2013). To protect anonymity and provide confidentiality, names and medical record numbers as well as other identifying information were stripped from files and relabeled with randomized subject numbers, thus minimizing risk to subjects. There was a high level of reliability in the data obtained as there was no transcription of data.

During the extraction process, several CSV (Comma Separated Value) files were produced. All CSV files were cleaned and any text data were converted into numerical values. Data cleaning was accomplished by checking distributions to make sure data was

within the expected range. Data checks were done to evaluate data quality or when there were questions about meaning. Since data were collected via computerized transfer of a large quantity of data, a high degree of accuracy in data transfer occurred. A small subset of subject data (20 cases) were checked for accuracy across files. After data cleaning, all CSV files were imported into SPSS (v24) and merged for analysis.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) system, version 24 software. Sample demographic data and all predictor, outcome and additional variables were initially examined via descriptive statistics. Chi-square, also called "goodness of fit" was used to evaluate the independence of categorical data. The test evaluated how well the data obtained fits the expected model if variables were independent (Burns and Grove, 2009). Specifically, in this study, the chi-square analysis was used to examine differences in maternal outcome variable proportions between English vs. non-English speaking women and between women who received care from a nurse midwife vs. physician during pregnancy, labor and delivery (AIMS 1 and 2).

Following bi-variate analysis of AIMS 1 and 2, AIM 3 was examined via chi-square analyses adding in a third level. In other words, all of AIM 1 analyses, which examined the relationship between language preference and maternal outcomes, were performed a second time adding the level of provider. This analysis allowed us to examine if the relationship between language and maternal outcome was different across the different levels of the provider. If the relationship between language preference and maternal outcomes was different across the two provider levels (midwife/MD) this would provide evidence of moderation. For all analyses $\alpha < 0.05$ was used to determine statistical significance.

Variables

Preferred maternal language during parturition, an established proxy measure for acculturation, was assigned as the independent variables of interest (Olmedo, & Padilla, 1978; Salinas & Sheffield, 2009; Tarutzer et al., 2012; Thomson & Hoffman, 2009). The preferred maternal language categories were "preferred language English" and "preferred language other than English", with a subdivision of the former when moderating variables were included of "preferred language English; interpreter requested later". Of note, interpreters were assumed to be needed for all women whose preferred language was not English.

Type of provider was evaluated both as a dependent variable and as a moderator between language and the other dependent variables. Moderator variables are variables that may affect how strong a relationship is between independent and dependent variables. Moderators of independent variables in this study were principle type of care provider, as indicated on the admission record of patients, and included nurse midwives or physicians. Dependent maternal outcome variables for this study included labor interventions (including cervical ripening, induction of labor, and augmentation of labor), artificial rupture of membranes, use of regional or local anesthesia during labor for pain management, and internal monitoring. Delivery outcomes included spontaneous vaginal delivery, operative (vacuum extraction or forceps) vaginal deliveries, or cesarean section. Other outcomes included postpartum hemorrhage, blood transfusion and antibiotic use for maternal infection. Additional demographic information collected included socioeconomic status, type of insurance, patient age, maternal education, and social support and type of insurance (see Table 2).

Table 2: Variables and composite variables

Domain	Variable name	Variable type
Language	Preferred language	IV
	Need for interpreter if spoke English	M
Provider	Provider type	IV/M
Labor interventions	Induction	DV
	Augmentation	DV
	Anesthesia	DV
	Artificial rupture of membranes	DV
Delivery Outcome	Spontaneous vaginal delivery	DV
	Operative vaginal delivery	DV
	Cesarean section delivery	DV
	Vaginal birth after cesarean	DV
Other Outcomes	Antibiotic administration	DV
	Postpartum hemorrhage	DV
	Episiotomy	
Key: IV= Independent variable DV= Dependent variable M= Moderator		

Independent variable operational definitions

The independent variables were preferred maternal language and provider type. Operational definitions of major independent variables included:

1.   Preferred language:

a. For the purposes of this study, preferred language use was divided into proficient English users and those who spoke a foreign language and were not proficient in English. The English-speaking sample was subdivided for some analyses by those who spoke English, and those who stated they spoke English but later were determined to need an interpreter.

2.   Type of provider principally providing care:

a. Physician: Although there are many other physician specialties, for this work "physician" was defined as obstetrician gynecologists. Doctors of osteopathy were also included under this definition. Although other specialties of physicians may assist in the care of pregnant women at the tertiary care center, they are always under the supervision of an obstetrician gynecologist.

b. Certified Nurse Midwife (CNM) was defined as an independent practitioner in the state of Massachusetts, who was educated in both nursing and midwifery, had a graduate degree, and had passed a certification exam by the American Board of Midwifery Certification (ACNM, 2011). Massachusetts law does not permit other types of midwives to practice in hospital settings, so unless otherwise specified, "midwives" referred to certified nurse midwives.

<u>Dependent variable operational definitions</u>

The dependent variables were methods of delivery and labor interventions. Operational definitions of major dependent variables included:

1. Common labor interventions:

   a. Induction of labor is defined in William's Obstetrics as the "stimulation of contractions before the spontaneous onset of labor, with or without ruptured membranes" (Cunningham, et. al., 2014). This may be effectuated by administration of oxytocin, prostaglandins, artificial rupture of membranes, laminaria, Foley catheter balloon, or other methods (ACOG, 2014).

   b. Cervical ripening: This procedure is utilized prior to induction of labor when the cervix is not effaced or dilated to soften and open the cervix. Prostaglandins are frequently used for this procedure, although other methods may include low dose Pitocin, laminaria, or Foley catheter balloon dilation. (Cunningham et. al., 2014)

c. Augmentation of labor: increasing contractions that are thought to be inadequate related to lack of progression in dilation of the cervix and lack of fetal descent. (Cunningham et al., 2014).

2. Postpartum Hemorrhage (PPH): Although definitions of postpartum hemorrhage vary markedly and criteria are inexact, postpartum hemorrhage was defined for the purpose of this work by the WHO definition of greater than 500 ml. blood loss within the first 24 hours following vaginal delivery (WHO, 2012). Following cesarean delivery, the ACOG definition of greater than 1000 ml. blood loss in the 24 hours was used (ACOG, 2014).

3. Antibiotic administration related to maternal infection: There are many causes for maternal infection during pregnancy and parturition (Kourtis, Read, & Jamieson, 2014). Most commonly, antibiotics are administered for the following during parturition:

   a. Group B Strep (GBS): Current guidelines suggest routine late third trimester screening for GBS and maternal antibiotic treatment during labor to prevent serious early neonatal infection (Fairlie, Zell, & Schrag, 2013).

   b. Chorioamnionitis: inflammation of the chorion and amnion, diagnosed presumptively during labor by a maternal temperature of 38 degrees centigrade (100.4 degrees Fahrenheit) or higher without other known cause. Confirmation of chorioamnionitis is typically done via placental culture, but the condition is treated presumptively related to the risks of adverse outcomes to mother and neonate (Archabald, Lopes & Anderson, 2015).

c. Postpartum endometritis: Commonly treated with antibiotics, early postpartum endometritis is defined as maternal pyrexia of 38 degrees centigrade (100.4 degrees Fahrenheit) or more in any two of the first 10 postpartum days or 38.7 degrees centigrade (101.66 degrees Fahrenheit) in the first postpartum day when no other cause of maternal fever is known (Chapman, Reveiz, Illanes, & Bonfill Cosp, 2014).

4. Prophylaxis: Antibiotics are commonly given prophylactically to prevent endometritis in the postpartum period (Chapman, Reveiz, Illanes, & Bonfill Cosp, 2014).

5. Delivery method: Delivery is defined as "the act of giving birth: the expulsion or extraction of a fetus and its membranes", or as "the procedure of assisting birth of the fetus and expulsion of the placenta by manual, instrumental, or surgical means". (Mirriam Medical Webster Dictionary 2015b) Hence, the delivery method can be defined as by what mechanism delivery has occurred, i.e. via:

   a. Spontaneous vaginal delivery: spontaneous maternal expulsion of the fetus and other products of conception

   b. Vacuum extraction: the use of a vacuum extractor applied to the fetal head by the practitioner to assist in the delivery of the fetus (ACOG, 2014).

   c. Forceps: the use of obstetrical forceps applied to the fetal head by the practitioner to assist in the delivery of the fetus, indicated in medical records whether or not delivery is successful by this method (ACOG, 2014).

d. Cesarean section: the use of "a surgical incision of the walls of the abdomen and uterus for delivery of offspring" (Mirriam Webster Medical Dictionary, 2015a)

e. Vaginal birth after cesarean: a vaginal delivery achieved after a prior cesarean section delivery

Protection of human subjects

The University of Massachusetts Amherst has a reciprocal agreement with Baystate Medical Center for the institutional review board (IRB) process. IRB approval was obtained from Baystate Medical Center, protocol approval #BH-16-130, and was registered under a memorandum of understanding arrangement with the University of Massachusetts Amherst Human Research Protection Office. The investigator completed CITI training for both institutions prior to application for IRB approval.

No human tissue or body fluids were utilized in this work, and there were no outside researchers from other institutions involved. There were no known potential conflicts of interest for this study as evidenced by the investigator having no managerial position, consulting arrangements, or equity holdings in the tertiary care center or its vendors. A conflict of interest form was submitted to the Human Research Protection Office (HRPO) at the University of Massachusetts Amherst Conflict of Interest Committee, as the investigator was a per diem employee of the tertiary care center, and as such, received income from the tertiary care center. The investigator had no other conflicts of interest.

In light of the retrospective nature of the sample, individual subject consent was not obtained, as the study consisted of previously existing data maintained in an

electronic health record system. Data were obtained under an exemption for individual

consents due to the large number of subjects used in the sample, which prohibited

obtaining individual consents of the de-identified subjects.

<div align="center">**Threats to internal validity**</div>

Threats to internal validity in this work included missing data or duplicate records

on women. If data were missing in the independent variables, the subject was not

included in the analysis. No duplicate medical records were transferred for analysis.

Other threats to internal validity included confounding by other variables such as

socioeconomic status during labor and delivery, maternal history prior to labor and

delivery, and cross mixing of care providers. Socioeconomic status was controlled for by

describing type of insurance women had during their admission. Of note, in

Massachusetts, all pregnant women were eligible for insurance, including Mass Health

(Medicaid) for those who have limited incomes, and could elect to be cared for by

midwives or physicians. Subjects were removed from the analysis if their medical history

was complicated by such issues as cardiac disease or uncommon diseases in pregnancy,

which would require specialized and specific care in labor and delivery. Cross mixing of

types of care providers was possible due to the joint model of care between midwives and

physicians in this labor and delivery unit. However, the majority of care for any

individual patient was given by the type of care provider the patient chose to see during

their pregnancy, listed on the admission record of all patients.

Threats to external validity are limited due to the retrospective nature of this

proposed work. However, there were several threats to external validity that should be

noted. During retrospective secondary analysis, it is not possible to confirm or refute

chart data with individual patients, or to prospectively examine or manipulate variables related to patient outcomes. Situational effects may have limited the generalizability due to the dual midwifery and physician care model provided at the intended tertiary care center. However, the diversity at the tertiary care center study setting and the large sample size of subjects may have improved external validity.

Summary

This retrospective descriptive study was designed to explore any relationships between language use, a proxy measure of acculturation, and labor interventions and delivery outcomes, particularly when modified by type of care provider used by parturient women.

Data from 11,656 women after exclusions over three years were obtained from EHRs of women admitted to a tertiary care center for labor and delivery after de-identification. Data were extracted, after exclusions were determined and applied, for analysis using SPSS (version 24) software. Care provider types were nurse midwives or physicians, and dependent variables included induction and augmentation of labor, epidurals, artificial rupture of membranes, vaginal delivery, operative vaginal delivery, or cesarean section delivery, postpartum hemorrhage, and social protective scores.

CHAPTER IV

RESULTS

This research focused on determining whether there was a difference in maternal outcomes in terms of obstetrical interventions or methods of delivery among childbearing women whose preferred language was English compared to childbearing women whose preferred language was not English. English was used as a proxy marker for acculturation (Deyo et al., 1985). Additionally, the research determined if the principle type of health care provider for women during their parturition changed outcomes in the context of preferred maternal language.

In this section results of the study are reported. Overall, when the sample was divided by preferred maternal language in two categories, "preferred English" and "preferred a language other than English", the results were negligible. However, when the sample was subdivided by need for interpreter services, it became clear that non-English speaking women who used interpreters from the onset of their hospitalization had significantly improved maternal outcomes, and women who said they preferred to communicate in English but later needed an interpreter had significantly poorer maternal outcomes than women who preferred English for communication. Women cared for by nurse midwives had improved maternal outcomes except in terms of soft tissue lacerations when compared to those who were cared for by physicians. Women who preferred a language other than English and received care from nurse midwives had markedly improved delivery outcomes, while those who said they preferred English but later needed an interpreter and sought care from physicians had markedly poorer delivery outcomes.

Results include demographic information and sample characteristics, and then are organized by study aims: language preference and maternal outcomes (AIM 1), health care provider type and maternal outcomes (AIM 2), and impact of provider type on the relationship between language and maternal outcomes (AIM 3).

Study Sample Demographics

The population of interest was all childbearing women admitted for labor and delivery at a tertiary care center in New England. After exclusion criteria were applied, 11,656 labor and delivery electronic health records for three years, from 2013-2016, remained for subsequent data extraction and analysis. Descriptive statistics related to age, marital status, insurance coverage, preferred religion, ethnicity, and country of origin are provided.

Women in this sample ranged in age from 13 to 51 years old, (mean of 28.4 years, (SD=6.0). Adolescents 13 - 17 years old accounted for 1.9% of the sample (n=225), while 12.3% of the women (n=1,433) were older than 35 years old. Despite the urban setting of the tertiary care center, women admitted to the hospital lived both in urban areas (37.2%) and rural areas (62.7%) according to their zip codes. The percentage of single or unmarried couples in this sample was higher than the 2015 national average of 40.2% (Hamilton et al., 2017), which was reported near the middle of the study time period (See Table 3).

Table 3: Marital status at time of admission for labor

Single or unwed couples	51.3%
Married	47.2%
Divorced	1.2%
Widowed	0.1%
Missing information	0.2%

Racial background of the sample compared to the city and state in which the study was conducted is summarized in Table 4. Of interest is the large percentage of women in the sample who did not know or declined to state a racial background.

Table 4: Racial background of sample compared to city and state.

Race	Sample	City*	State*
White including Hispanic	62.4%	76.9 %	81.8%
Black	10.5%	13.3%	8.6%
Asian	2.4%	5.7%	6.7%
Pacific Islander	0.2%	0.2%	0.1%
Native American	0.1%	1.3%	0.5%
Unknown or declined	24.3%	--	--

*City and state comparison numbers from U.S. Census Bureau, 2016

Almost all women (99.8%) had adequate insurance coverage for their admission, including commercial insurances (45.7%), Medicaid or Medicare (52.6%), or other insurance types (1.4%). Prenatal care was received by 99.1% of all women in this sample. Maternal records showed an essentially healthy sample, as 88.1% of the women had no notable past medical history, and 96.1% were considered to be low risk. An increased Body Mass Index (BMI) may increase the risks during pregnancy of complications, prolonged labor, and cephalopelvic disproportion (CPD) in labor. The average BMI in the United States for non-pregnant women aged 20-49 ranges from 25.6 to 28.1 (Fryar, Gu, Ogden, & Flegal, 2016). In this sample, the pre-pregnancy mean BMI was 27.04 and the recorded admission BMI mean was 32.34.

The majority of women (54%) in this sample stated that they had no religious practice, followed by 23% who stated they were Catholic, then "Christian" (4.6%), Protestant (3.1%) and Pentecostal (2.4%) faiths. Multiple other religions were noted, as found in Table 5.

Table 5: Religious preferences:

Religion stated	n	%	Religion stated	n	%
none	6,289	54.0	Seventh Day Adventist	39	0.3
Roman Catholic	2,751	23.6	Greek Orthodox	25	0.2
Christian	541	4.6	Hindu	18	0.2
Protestant	364	3.1	Evangelical	17	0.1
Pentecostal	282	2.4	Unitarian	9	0.1
Baptist	186	1.6	Buddhism	8	0.1
Muslim	69	0.6	Assemblies of God	11	0.1
Jehovah's witness	67	0.6	Mormon	1	0.0
Other	60	0.5	Affiliation missing	892	7.7

Limited information was available on smoking or opioid use in this sample. Opioid use status was recorded on admission, and 91.6% of women had no use recorded, while 5.1% reported a history of past use that was resolved, and 3.3% of the study sample had either suspected or documented current use of opioids.

Language and provider study demographics

The predominant language in New England is English. Language use mirrored the U.S. national trends in language use published in the U.S. Census Bureau information for the city (US Census Bureau, 2008). Of interest is the 16.6% of the sample of women whose primary language was not English. Of that group, approximately half (8.3%) were unable to communicate in English, although another 7% preferred to communicate in English, but later were identified as needing an interpreter. However, only 2.7% of the total sample had a documented request for interpreter services, whether women initially stated they spoke English or not. (see Table 6).

Despite the language preferences patients indicated on admission, data from health care providers for 1,781 of these women (15.3%) indicated that women had a language barrier to communication in spoken English. Out of the more than thirty non-English languages used for communication when English was not preferred in this

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sample, the majority used Spanish (n=648); Nepalese (n=60), Russian (n=58), Arabic (n=55), and Somali (n=32).

Table 6: Preferred languages in sample

(N=11656)	% of sample	n
Preferred language English	91.7%	10656
Spoke English	83.4%	9840
Preferred language English. Later needed interpreter	7.0%	746
Preferred language not English	16.6%	1931
Language barrier identified on admission	15.3%	1781
Unable to communicate in English	8.3%	967
Interpreter requested in total sample	2.7%	317
No language preference listed	0.3%	35

Patients self-selected whether to be cared for by nurse midwives or by physicians during their pregnancy, and usually delivered with the same type of care provider used during the pregnancy. Percentages of patients seeking care from specific provider types are found in Table 7. A higher percentage of younger women (< 35 years) utilized nurse midwives for their care during labor, while a higher percentage of women over 35 years of age utilized physicians for care (χ_2=51.4, p < .001). Of interest, significantly more Black, Asian American, and Native American women chose to seek care from nurse midwives (χ_2 = 64.8, p < .001).

Table 7: Type of care provider utilized by women for labor and delivery

Type of provider	% of women
Physicians (includes medical doctors and doctors of osteopathy)	80.7%
Nurse midwives	19.3%
Care during pregnancy by physicians; delivered by nurse midwife	0.1%

A higher percentage of patients (24.5%) chose to use midwifery services if they did *not* speak English (χ^2 = 45.0, p <.001), while 18.2% of English speaking patients chose midwives for their care. A higher percentage of women chose to use physicians if they spoke English (81.8%, p < .001), while 75.5% chose physician care if they did *not*

speak English. These differences were particularly notable in certain language groups, as 29.9% of Spanish speaking women, 53% of Nepalese women, 47.3% of Arabic speaking women and 59.4% of Somali-speaking women chose to use midwives ($\chi^2 = 658.7$, p <.001), and 86.2% of Russian speaking women sought care from physicians ($\chi^2 = 658.7$, p <.001).

Nationally, midwifery services are frequently located in poor and underserved population areas, which matches the practice locations for some of the nurse midwives' practices in this sample. A higher proportion (23.6%) of midwifery patients lived in a city ($\chi^2 = 80.7$, p < .001) compared to those who sought care from physicians. Women who had midwifery care were less likely to have commercial insurance or Medicare but were more likely to have Medicaid or other insurance ($\chi^2 = 35.3$, p <.001). Women who sought midwifery care were more likely to seek prenatal care than the general sample, no matter what their language ($\chi^2 = 7.0$, p = .013).

Labor and delivery characteristics of total study sample

The majority of women (76.3 %, n= 8,897) presented with no previous risk factors in pregnancy, which in this study included preeclampsia, HELLP (hemolysis, elevated liver enzymes, and low platelets) syndrome, chronic hypertension, premature prolonged rupture of membranes (PPROM), gestational diabetes, intrauterine growth restriction, oligohydramnios, or immune or blood disorders during their pregnancy. One risk factor was noted in 14.3% (n=1,666) of this sample, and 9.4% (n=1,093) presented with two or more risk factors.

The majority of women (60.7%) in this sample were multiparas and delivered their second or subsequent babies during their admissions. The remaining women had

either had no prior pregnancies or had not achieved 20 weeks' gestation in a prior pregnancy. Nearly two thirds of women (62%) arrived at the hospital with active uterine contractions, thus required no interventions to start labor. Fetal breech and other non-vertex positions were noted on admission (n=126), but no vaginal breech deliveries occurred at this care center during the 3-year study period.

Induction of labor was primarily achieved through oxytocin administration (5.5%), followed by misoprostol (2.1%), dinoprostone (1.3%), artificial rupture of membranes (AROM, 1.3%) and/or intracervical placement of an intracervical Foley catheter bulb (1.0%). Nearly all women in this sample received at least some external fetal monitoring. Internal fetal monitoring was performed in 9.5% of the total sample and intrauterine pressure catheter (IUPC) use was documented in 9.3% of women. While other types of anesthesia were given and some women received more than one kind of anesthesia, 68.7% of women received epidurals for pain control. Further details on sample characteristics can be found in Table 8.

Table 8: Selected sample characteristics

Sample Characteristic	%		Sample Characteristic	%
Multiparas	60.7		Received epidural anesthesia	68.7
Active uterine contractions	62.0		Received "walking epidural"	0.7
Fetus vertex on admission	97.9		Received spinal anesthesia	21.2
Vaginal Group B Strep	16.7		Received Spinal/ epidural	1.2
Induction of labor	21.2		Received local anesthesia	6.1
AROM	43.2		Received pudendal block	0.3
Internal fetal monitoring	9.5		Received general anesthesia	2.9
Internal uterine monitoring	9.3			

Mirroring national trends during the study years, approximately two thirds (67.7%, n=7,896) of the sample achieved a vaginal delivery, with 65% achieving a spontaneous vaginal delivery. Operative vaginal deliveries also resembled national

trends, and were performed in 2.7% of the sample, with 2.4% via vacuum extraction and 0.3% via forceps delivery.

The total number of cesarean deliveries for this three-year sample was 3,516 (32%), closely matching the national average during the study period. Of the 2,971 women with a listed reason for cesarean delivery, 18% were primary cesarean sections and 14% of the total sample were repeat cesarean sections. Approximately 15.5% of cesareans were performed for protracted/ arrested dilation or fetal cephalopelvic disproportion (CPD).

Women may have had more than one type of maternal soft tissue trauma during delivery, including various types of lacerations and/or episiotomy. Only 2.1% (n=247) of this total sample received episiotomies during their vaginal deliveries. Between 53% and 79% of all women delivering vaginally will have a soft tissue laceration (ACOG, 2016). Table 9 shows the types and percentages of soft tissue trauma from this sample.

Table 9: Percentages of episiotomy and lacerations during delivery

Soft tissue trauma type during delivery	% of sample
Episiotomy	2.1
Perineal lacerations	28.4
1st degree perineal lacerations	9.9
2nd degree perineal lacerations	17.4
3rd degree perineal lacerations	1.2
4th degree perineal lacerations	0.2
Labial lacerations	10.8
Vaginal lacerations	7.2
Cervical lacerations	0.1

Other maternal factors

Postpartum hemorrhage was defined at the time of this study as > 500 ml in a vaginal delivery, and > 1000 ml in a cesarean delivery. In this sample, 65.4% of women had an estimated blood loss of < 500 ml, while 32% had an estimated blood loss between 500 ml and 999 ml, and 2.6% had an estimated blood loss > 1000 ml. Of those records

that noted a postpartum hemorrhage, 61.5% followed vaginal deliveries. Only 0.1% of the *total* sample had postpartum hemorrhages following cesarean.

Maternal pyrexia, a possible indicator for antibiotic administration, was noted as maternal temperature >100.4 degrees Fahrenheit in 7% (n=816) of this sample during their admission. In this sample, 43.7% of women received no antibiotics at all. Of the 56.3% who did receive antibiotics, approximately three quarters (76.3%) were administered 6 doses or less of antibiotics. While a variety of antibiotics were administered to the remainder of the study sample, 36.2% of the total sample received penicillin, which is the antibiotic recommended for prophylaxis for women infected with Group B Streptococcus.

Women who communicated in English were more likely to have a support person present during labor and delivery. There were no significant differences in supportive situation at home, access to prenatal care, referrals to social services or history of domestic violence between language groups (See Table 10).

Table 10: Social characteristics and language use

	N	English language		χ^2
		yes	no	
Supportive situation	6552	100.0%	100.0%	0.0
Violence risk	7713	1.3%	1.2%	0.0
Support person	11656	91.0%	86.9%	30.7***
Prenatal care	10303	99.1%	99.2%	0.1

   ***p<.001

Insurance coverage can be a protective factor during pregnancy. Types of insurance coverage or payment for pregnancy and delivery care varied significantly among preferred language groups. English speaking women and women who reported speaking English but later needed assistance with translation were more likely to have commercial insurance or Medicare, and less likely to have "other" insurance than the

overall sample. Women who did not speak English were much less likely to have

commercial insurance and somewhat less likely to have Medicare, but were more likely

to have Medicaid and "other" insurance than the overall sample. See Table 11 for details.

Table 11 Types of insurance by use of language

	English	Preferred English, needed interpreter later	Did not speak English
Commercial insurance	49.9%	44.9%	6.3%
Medicare insurance	2.3%	2.6%	1.9%
Medicaid insurance	46.5%	50.8%	89.9%
Other insurance	1.3%	1.8%	1.9%

Study aim results

This section addresses analysis of Aims 1 through 3. Specifically, the analyses

below examine the relationship between language preference (AIM 1) and provider type

(AIM 2) on maternal outcomes. In addition, analyses were performed to evaluate the

impact of provider type on the relationship between language preference and maternal

outcome (AIM 3).

Aim 1: Relationship between language preference and maternal outcomes

H1, H2, and H3: Language preference and relationship to labor interventions

Among the maternal labor interventions examined, there were significant

differences identified among the recipients of an epidural, general, and pudendal

intervention by preferred maternal language. Non-English-speaking women received a

higher percentage of general anesthesia (3.7% vs. 2.9%, $p<0.05$) or pudendal blocks

during parturition in this study, but were less likely to receive epidural anesthesia for pain

control (See Table 10).

No significant differences were noted between women who spoke English and women

who preferred to speak a language other than English in terms of the labor interventions

of induction or augmentation of labor, methods of induction of labor, external electronic

fetal or uterine monitoring, internal electronic fetal or uterine monitoring, or artificial

rupture of amniotic membranes (see Table 12).

Table 12: Language preference and labor interventions

N=11656	No		Yes		χ^2
	% English	% non-English	% English	% non-English	
Induction of labor	78.8%	78.9%	21.2%	21.1%	0.0
Internal scalp electrode	90.5%	90.6%	9.5%	9.4%	0.0
Internal uterine monitor	90.7%	90.5%	9.3%	9.5%	0.1
Artificial rupture of membranes (AROM)	98.7%	98.7%	1.3%	1.3%	0.0
Epidural anesthesia	30.2%	36.5%	69.8%	63.5%	29.6***
Spinal anesthesia	79.0%	77.2%	21.0%	22.8%	3.2†
Local anesthesia	93.8%	94.3%	6.2%	5.7%	5.5
General anesthesia	97.3%	96.3%	2.7%	3.7%	5.6*
Pudendal anesthesia	99.7%	99.3%	0.3%	0.7%	6.8*

†$p<.10$. *$p<.05$. **$p<.01$. ***$p<.001$

H4, H5, & H6: Language preference and relationship to delivery methods

VBACs were attempted by 3.4% of the total study sample, and 91% of those who

attempted VBAC were successful in achieving a vaginal delivery. Women who did not

speak English were more likely to both attempt a VBAC and to succeed in achieving a

VBAC as seen in Table 13.

Analysis showed no significant relationship between methods of delivery when

evaluated solely by language preference. There were no significant differences between

language groups in rates of vaginal delivery, operative vaginal deliveries using forceps or

vacuum, or primary or repeat cesarean section by language. Additionally, there were no

significant relationships in rates of cesarean for protracted or arrested dilation,

cephalopelvic disproportion, or failed induction of labor by language groups.

Table 13: Language preference and delivery outcomes

N=11656	No		Yes		χ^2
	% English	% non-English	% English	% non-English	
Cesarean section delivery	68%	66.9%	32.0%	33.1%	0.4
Primary	82.1%	81.7%	17.9%	18.3%	0.1
Repeat	86%	85.1%	14.0%	14.9%	0.4
Protracted/Arrested dilation	96.9%	96.8%	3.1%	3.2%	0.0
Cephalopelvic disproportion	99.2%	99.0%	0.8%	1.0%	0.4
Failed induction	99.4%	99.3%	0.6%	0.7%	0.4
Vaginal delivery	32.1%	33.2%	67.9%	66.8%	0.9
Normal spontaneous vaginal delivery	34.8%	35.9%	65.2%	64.1%	1.0
Operative vaginal del.	97.3%	97.3%	2.7%	2.7%	0.0
Vacuum	97.7%	97.6%	2.3%	2.4%	0.0
Forceps	99.7%	99.6%	0.3%	0.4%	0.0
VBAC attempted (n=398)	96.8%	95.4%	3.2%	4.6%	10.0**
VBAC successful	97.2%	95.6%	2.8%	4.4%	12.5***
Episiotomy	97.3%	98.0%	2.7%	2.0%	1.9
Perineal lacerations	71.9%	70.5%	28.1%	29.5%	1.5
1st degree	90.4%	88.8%	9.6%	11.2%	10.3*
2nd degree	82.4%	83.4%	17.6%	16.6%	10.3*
3rd degree	98.9%	98.4%	1.1%	1.6%	10.3*
4th degree	99.8%	99.7%	0.2%	0.3%	10.3*
Labial lacerations	89.1%	89.7%	10.9%	10.3%	0.6
Periurethral lacerations	92.5%	94.9%	7.5%	5.1%	13.3***
Other lacerations	98.8%	99.1%	1.2%	0.9%	1.4
Cervical lacerations	99.9%	100%	0.1%	0.0%	2.2
Vaginal laceration	93.9%	92.5%	7.1%	7.5%	0.3

*p<.05 **p<.01 ***p<.001   VBAC= Vaginal birth after cesarean

A significantly higher percentage of non-English speaking women had first, third and fourth degree perineal lacerations and significantly less periurethral and second-degree lacerations. There were no significant differences in the percentages of episiotomies or total perineal lacerations between English and non-English speaking groups. Labial, vaginal, cervical, and "other" lacerations showed no significant differences in percentages between English and non-English speaking groups of women.

H7 & H8: Language preference and relationship to other maternal outcomes

When data were analyzed using the three groupings of women who spoke English, those who preferred to communicate in English then needed an interpreter, and those who did not speak English, there were no significant differences in postpartum hemorrhage frequencies among groups. There was no significant difference in the percentages of women who spoke English and those who did not in terms of administration of antibiotics or maternal pyrexia, an indication for possible antibiotic administration (See Table 14).

Table 14: Language preference and other maternal outcomes

N=11656	No		Yes		χ^2
	% English	% Non-English	% English	% Non-English	
PPH after vaginal delivery	98.5%	97.9%	1.5%	2.1%	3.9*
PPH after C/S	99.9%	100.0%	0.1%	0.0%	1.4
T > 100.4F	93.2%	92.1%	6.8%	7.9%	3.0†
Antibiotic use	76.9%	77.7%	23.1%	22.4%	0.2

†p<.10. *p<.05. **p<.01. ***p<.001

Aim 2: Relationship between health care provider type and maternal outcomes

H1, H2, and H3: Provider type and relationship to labor interventions

Women who chose to see a midwife were significantly less likely to receive an induction of labor than those who had care from a physician. However, women were significantly more likely to receive augmentation of labor if they chose a nurse midwife for care. Midwifery patients had a higher frequency of intracervical Foley bulbs for induction of labor than those who saw physicians for care. Additionally, women were less likely to have AROM if they were cared for by a nurse midwife. When the total sample was evaluated solely by provider type, pain management during labor and delivery showed some significant differences. Women seeing nurse midwives were significantly less likely to receive an epidural for pain management, more likely to

receive local anesthesia, and more likely to receive a pudendal block. General anesthesia results should be considered with caution, as it is only used when other anesthesia types are not appropriate (see Table 15).

There were no significant differences in use of misoprostol, dinoprostone, or oxytocin between provider types. There were no significant differences in the use of external and internal fetal or uterine monitoring by provider type.

Table 15: Provider type and labor interventions

N=11655	No		Yes		χ^2
	MD	CNM	MD	CNM	
Induction	77.8%	83.3%	22.2%	16.7%	33.3***
Augmentation	77.2%	69.3%	22.8%	30.7%	61.1***
Misoprostol	97.9%	98.4%	2.1%	1.6%	2.3
Dinoprostone	98.7%	98.6%	1.3%	1.4%	2.1
Oxytocin	94.4%	95.2%	5.6%	4.8%	2.4
Foley bulb	99.1%	98.6%	0.9%	1.4%	5.1*
AROM	95.6%	93.2%	1.2%	1.6%	13.8***
Internal uterine monitor	90.7%	90.7%	9.3%	9.3%	0.0
Internal fetal monitor	90.6%	90%	9.4%	10.0%	0.8
Epidural (%yes)	28.5%	42.7%	71.5%	57.3%	170.3***
Spinal (%yes)	74.8%	95.2%	25.2%	4.8%	449.6***
Local	94.2%	92.5%	5.8%	7.5%	10.0**
Pudendal	96.6%	99.2%	0.2%	1.0%	31.1***
General	99.8%	99.0%	3.4%	0.8%	45.6***
Walking epidural	99.4%	99.3%	0.6%	0.7%	0.0

†p<.10. *p<.05. **p<.01. ***p<.001

H4, H5, and H6: Provider type and relationship to delivery methods

Women were significantly more likely to achieve a vaginal delivery if they were cared for by a nurse midwife. The cesarean rate in this sample, when analyzed solely by provider type, showed lower frequencies of overall, primary, and repeat cesareans if women sought care from nurse midwives. Significantly lower frequencies of cesarean deliveries for prolonged labor and for cephalopelvic disproportion were noted if patients

were cared for by nurse midwives. Significantly more women seeking care from nurse

midwives attempted and achieved a vaginal birth after cesarean (see Table 16).

There were no significant differences by provider type in overall operative

vaginal deliveries, in successful vacuum deliveries, or in vaginal forceps deliveries by

provider type.

Table 16: Provider type and delivery methods

N=11656	No		Yes		χ^2
	MD	CNM	MD	CNM	
Vaginal delivery	38.2%	7.6%	61.8%	92.4%	777.2***
NSVD	40.8%	10.6%	59.2%	89.4%	730.1***
Operative vaginal delivery	97.4%	97%	2.6%	3.0%	0.8
Cesarean delivery	61.9%	92.4%	38.1%	7.6%	772.9***
Vacuum	97.8%	97.2%	2.2%	2.8%	2.9 †
Forceps	99.6%	99.4%	0.4%	0.1%	3.6†
Primary cesarean	79%	94.3%	21.0%	5.7%	286.9***
Repeat cesarean	82.9%	98.1%	14.0%	1.1%	345.2***
Cesarean reason: prolonged labor	96.5%	98.7%	3.5%	1.3%	30.2***
Cesarean reason: CPD	99%	99.7%	1.0%	0.3%	11.7**
Cesarean reason: elective	98.8%	99.9%	1.2%	0.1%	22.3***
Attempted VBAC	96.8%	95.6%	3.2%	4.4%	8.9**
VBAC	97.1%	96%	2.9%	4.0%	8.6**
Episiotomy	98.6%	96.7%	2.4%	3.3%	7.0**
Vaginal laceration	93.1%	91.6%	6.9%	8.4%	6.2*
Perineal laceration	74.2%	60.8%	25.8%	39.2%	160.5***
1st degree laceration	--	--	8.6%	15.2%	183.9***
2nd degree laceration	--	--	16.4%	21.7%	183.9***
3rd degree laceration	--	--	0.9%	2.3%	183.9***
4th degree laceration	--	--	0.2%	0.1%	183.9***
Labial lacerations	89.9%	86.5%	10.1%	13.5%	21.4***
Periurethral lacerations	93.8%	89.1%	6.2%	10.9%	61.7***
Cervical laceration	99.9%	99.8%	0.1%	0.2%	2.1
Other lacerations	98.9%	98.7%	1.1%	1.3%	0.9

†p<.10. *p<.05. **p<.01. ***p<.001   NSVD= Normal spontaneous vaginal delivery
CPD=Cephalopelvic disproportion   VBAC= Vaginal birth after cesarean

Women seeking care from midwives during the study time period had a higher

percentage of episiotomies, vaginal lacerations, as well as first, second and third degree

perineal lacerations. Patients choosing nurse midwives for care also had a higher

percentage of periurethral and labial lacerations than those choosing care from physicians. Women who chose care from a physician were more likely to have a fourth-degree perineal laceration. There were very few cervical lacerations reported during this study, and there was no statistical significance by care provider groups (see Table 16).

H7, and H8: Provider type and relationship other maternal outcomes

Although women who sought midwifery care were more likely to have a postpartum hemorrhage noted in their medical record, the percentage of women who had *less* than 500 ml. of blood loss was significantly more likely to receive care from nurse midwives. A significantly lower percentage of midwifery patients received antibiotics during their admission, although this needs to be interpreted with caution as midwives do not perform cesarean deliveries at this institution. Patients with maternal pyrexia had no significant difference between those cared for by nurse midwives and those cared for by physicians (see Table 17).

Table 17: Provider type and other maternal outcomes

N=11655	No		Yes		χ^2
	MD	CNM	MD	CNM	
PPH vaginal delivery	98.5%	97.9%	1.5%	2.1%	4.9*
EBL < 500 ml	40.1%	11.7%	59.9%	88.3%	648.0***
EBL 500-999ml	62.8%	89.6%	37.2%	10.4%	648.0***
Temperature ≥100.4º F	93.1%	92.6%	6.9%	7.4%	0.6
Antibiotics	51.8%	74.8%	48.2%	25.2%	389.0***

†p<.10. *p<.05. **p<.01. ***p<.001   PPH=Postpartum hemorrhage   EBL=Estimated blood loss

Provider type and additional study variables

Although not specifically examined as study aims, several additional demographic variables were collected and compared across provider type. Significantly fewer women who used midwifery care were referred to social services during their hospitalizations when compared to those who had care during parturition from physicians. There were no significant differences between provider types in percentages of women living in shelters

or incarcerated women, although the latter are frequently seen by nurse midwives in the jail clinics (see Table 18).

Table 18: Provider type and additional demographic variables

N=11656	No		Yes		χ^2
	MD	CNM	MD	CNM	
Interpreter	99.2%	98.1%	0.8%	1.9%	45.1***
Prenatal care	1.0%	0.4%	99.0%	99.6%	7.0**
Lives in city	64.7%	54.5%	35.3%	45.5%	80.7***
Social work referral	97.8%	98.7%	2.2%	1.3%	6.3*
DCF involvement	99.1%	99.3%	0.9%	0.7%	1.2
Incarcerated patient	89.3%	60%	10.7%	40.0%	2.8†

†p<.10. *p<.05. **p<.01. ***p<.001   DCF= Department of Children and Families

Aim 3: Impact of health care provider type on the relationship between language preference and maternal outcomes

As mentioned previously, AIM 3 was examined using chi-square analyses and adding in a third level. In this method, all AIM 1 analyses, which examined the relationship between language preference and maternal outcomes, were performed a second time adding the level of provider. This analysis allowed us to examine if the relationship between language and maternal outcome was different across the different levels of the provider. If the relationship between language preference and maternal outcomes was different across the two provider levels (midwife/MD) this would provide evidence of moderation.

H1, H2, and H3: Provider type moderating effect on preferred language and labor interventions

Women who preferred to communicate in a language other than English were much more likely to have labor induced if they chose midwifery care, while women were more likely to be induced by physicians if they spoke English. Interestingly, use of misoprostol and Foley bulbs for induction were increased in the non-English speaking

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group by physicians. Artificial rupture of membranes was used less frequently by midwives for non-English speaking patients. Epidural use was analyzed with language preference and maternal choice of provider. A significantly higher percentage of non-English speaking women cared for by midwives received epidurals when compared to the epidural rate in English speaking-women cared for by midwives. Non-English-speaking women were more likely to receive local anesthesia than their English-speaking counterparts when cared for primarily by physicians.

There were no significant differences in administration of oxytocin, dinoprostone, external or internal fetal or uterine monitoring between English and non-English speaking women when type of provider was added to the analysis as a moderator (See Table 19)

Table 19: Provider type moderating effect on language and labor interventions

| | All (N=11655) | | Language | | | | χ^2 | | |
| | | | English | | Non-English | | Total | | |
	No	Yes	MD	CNM	MD	CNM	English	Non-English	Total
Induction	9189	2466	22.1%	17.1%	23.1%	15.0%	21.0***	14.2***	33.3***
Miso-prostol	11416	239	2.0%	1.5%	3.0%	2.1%	1.8	1.0	2.3
Dino-prostone	11506	149	1.3%	1.7%	1.2%	0.2%	1.9	3.6†	.21
Oxytocin	11018	637	5.6%	5.0%	6.0%	4.0%	.82	2.8†	2.4†
Foley bulb	11543	112	0.8%	1.6%	1.1%	0.6%	8.9**	.84	5.1*
AROM	11508	147	1.1%	1.7%	1.4%	0.8%	4.3*	1.1	1.9
FSE	10549	1106	9.4%	10.2%	9.4%	9.4%	1.0	0	.82
IUPC	10567	1088	9.2%	9.7%	10.0%	7.9%	.4	1.8	0.0
Epidural	3644	8011	84.3%	15.7%	69.1%	46.3%	93.6***	80.8***	170.4***
Spinal	2478	9177	24.9%	3.4%	26.9%	10.2%	404.2***	57.1***	449.6***
Local	10942	713	5.8%	8.1%	5.9%	5.4%	13.9***	0.1	10.0**

†p<.10. *p<.05. **p<.01. ***p<.001 FSE= Internal fetal monitor (fetal scalp electrode)
AROM= Artificial Rupture of Membranes IUPC= Internal uterine monitor

H4, H5, and H6: Provider type moderating effect on preferred language and delivery methods

In this section, the impact of health care provider type on the relationship between language preference and delivery methods is explored. Specifically, the impact of the provider type on the relationship between preferred maternal language and frequency of cesarean deliveries, spontaneous and operative vaginal deliveries, is explored, testing Aim 3, hypotheses 4, 5, and 6 via use of Chi Square with a p value < .05. Results are summarized in Table 16.

Evaluation of vaginal deliveries showed a higher frequency in non-English speaking women cared for by midwives, while non-English speaking women cared for by physicians had a significantly lower frequency of vaginal deliveries. English speaking women were more likely to achieve a normal spontaneous vaginal delivery with a physician than those who did not speak English. When VBACs were analyzed using type of provider and language choice, significantly increased percentages of attempted VBAC were noted with non-English speaking midwifery patients. These women also were more likely to succeed in vaginal births after cesarean.

When analyzed with type of provider and language use, differences in soft tissue trauma were noted in frequencies of episiotomy and vaginal lacerations. When women were cared for by physicians, a significant increase in the percentage of episiotomies and perineal lacerations were found for English speaking women, although a higher incidence of vaginal lacerations were found among women who did *not* speak English. An increased percentage of perineal lacerations was noted in non-English speaking women who sought care from midwives.

When analyzed by language and provider type, operative deliveries as a group, and forceps and vacuum vaginal deliveries individually showed no significant differences between provider type and patient language (See Table 20).

Table 20: Impact of care provider type on language and delivery method

| | All (N=11655) | | Language | | | | χ^2 | | |
| | | | English | | Non-English | | Total | | |
	No	Yes	MD	CNM	MD	CNM	English	Non-English	Total
Vaginal del.	3760	7895	62.2%	93.4%	59.6%	88.7%	646.0***	138.0***	777.2***
NSVD	4074	7581	59.7%	90.3%	56.7%	86.2%	600.4***	135.9***	730.1***
Operative vaginal deliveries	11341	314	2.6%	3.1%	2.8%	2.5%	1.5	0.1	0.8
Vacuum	11381	274	2.2%	2.9%	2.3%	2.5%	3.3†	0.0	2.9†
Forceps	11615	40	0.4%	0.2%	0.5%	0.0%	1.9	2.3	3.6†
Primary cesarean	9557	2098	20.8%	5.0%	21.6%	8.1%	246.0***	43.8***	286.9***
Repeat cesarean	10003	1652	16.8%	1.6%	18.7%	3.1%	278.9***	69.3***	345.2***
Cesarean for prolonged labor	11295	360	3.5%	1.2%	3.7%	1.5%	24.5***	6.0*	30.2***
Cesarean for CPD	11554	101	1.0%	0.3%	1.2%	0.2%	8.2**	3.9†	11.7**
Attempted VBAC	11257	398	3.0%	3.8%	3.9%	6.7%	3.0†	6.2*	8.9**
VBAC	11296	359	2.7%	3.4%	3.7%	6.5%	2.4	6.9 **	8.6**
Failed VBAC	11616	39	0.3%	0.5%	0.3%	0.2%	0.6	0.1	0.4
Episiotomy	11353	302	2.5%	3.7%	2.0%	2.1%	7.6**	.02	6.0*
Vaginal laceration	10819	836	6.7%	8.9%	7.7%	6.7%	9.9**	.56	6.2*
Perineal laceration	8350	3305	25.6%	39.7%	26.9%	37.4%	142.2***	18.9**	160.5***
1st degree laceration	8317	1151	8.4%	14.8%	9.4%	16.7%	161.1***	25.1***	183.9***
2nd degree laceration	8317	2029	16.4%	22.7%	16.2%	18.0%	161.1***	25.1***	183.9***
3rd degree laceration	8317	136	0.8%	2.3%	1.3%	2.3%	161.1***	25.1***	183.9***

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| 4th degree laceration | 8317 | 22 | 0.2% | 0.1% | 0.3% | 0.2% | 161.1*** | 25.1*** | 183.9*** |

†p<.10. *p<.05. **p<.01. ***p<.001   CPD= Cephalopelvic disproportion

Women who preferred to communicate in English as a whole group were more likely to receive a cesarean delivery than those who did not speak English if they sought care from a physician, while women who spoke a language other than English were at slightly more risk to receive both primary and repeat cesarean section deliveries if they were cared for by a midwife (see Table 21). However, when the sample was subdivided into three groups (women who spoke English, women who said they spoke English but later were determined to need an interpreter, and women who did not speak English), differences in the cesarean rate were marked and significant. The overall cesarean rate was 32.2%. Patients who saw midwives had significantly lower rates of cesarean deliveries, and patients who spoke no English and saw physicians had lower rates of cesarean section than other patients who saw physicians. However, patients who preferred to communicate in English but later needed an interpreter had a cesarean rate of 44.7%, higher than all other groups.

Table 21: Cesarean section by language, interpreter and provider type

Variable	N	Cesarean no	Cesarean yes	χ^2
MD care provider				
Spoke English	11620	62.4%	37.6%	17.4***
Said spoke English, later needed interpreter	11620	55.3%	44.7%	17.4***
Did not speak English	11620	64.7%	35.3%	17.4***
CNM care provider				
Spoke English	11620	93.3%	6.7%	11.6**
Said spoke English, later needed interpreter	11620	89.5%	10.5%	11.6**
Did not speak English	11620	88.3%	11.7%	11.6**

**p<.01. ***p<.001.

H7 and H8: Provider type moderating effect on preferred language and other maternal outcomes

When maternal postpartum bleeding was analyzed by language and provider type, a significant increase in the percentage of women who did not speak English who had increased postpartum blood loss was found, as well as a significant relationship between increased blood loss in English speaking women cared for by physicians at both amounts of 500 ml and 1000 ml. (See Table 22). There was no relationship between provider type, maternal language preference, and postpartum maternal pyrexia in this study sample.

Table 22: Other maternal outcomes by preferred language and provider type

	All (N=11655)		Language				χ^2		
			English		Non-English		Total		
	No	Yes	MD	CNM	MD	CNM	English	Non-English	Total
PPH vaginal	11468	187	1.4%	2.0%	2.0%	2.5%	4.1†	0.5	4.9*
EBL >/= 500	7622	4033	39.5%	10.7%	43.4%	15.4%	532.7***	121.4***	645.7***
EBL >/= 1000	11350	305	2.9%	1.2%	3.2%	1.7%	15.3***	3.2†	18.1***

†p<.10. *p<.05. **p<.01. ***p<.001.

Summary: relationship of effects of language and provider type on maternal outcomes

In summary, analysis of retrospective maternal labor and delivery records from 2013-2016 at a large tertiary care center investigated the differences of maternal language use and care provider type on maternal outcomes during parturition using Healthy Migrant Theory as a lens of inquiry.

Several findings emerged. Over the three years of the study, spontaneous and operative vaginal deliveries accounted for 67.7% of all deliveries, and the cesarean section rate was 32% in this relatively healthy sample, mirroring national trends. The VBAC rate was

surprisingly low at 3.1%, well under the national average, although 91% of those who attempted VBAC were successful. Epidurals were administered to 68.7% of the entire sample.

English, the proxy for acculturation, was not spoken at home by 16.6% of this sample, contiguous with the surrounding area. Of that group, 8.3% preferred to communicate in English, but needed help with translation. Language barriers were related to increased risk for receiving general anesthesia and lowered percentages of epidural anesthesia. A higher percentage of non-English speakers attempted and achieved VBAC deliveries and had lower percentages of episiotomies, although the group had higher percentages of first degree and periurethral lacerations than in the total sample.

A higher percentage of women who did not speak English and urban women saw nurse midwives for care. Women who had care from nurse midwives had lower percentages of induction and augmentation of labor, artificial rupture of membranes, and use of epidurals for pain management during labor, although they had a higher percentage of use of local and pudendal anesthesia. If they received an induction of labor, a higher percentage of women who saw midwives were induced using intracervical Foley bulbs. Women who had midwifery care were more likely to have a spontaneous vaginal delivery and were less likely to receive a primary cesarean section delivery. These women were, however, at higher risk of receiving an episiotomy or having first, second or third degree perineal lacerations. Interestingly, women who saw physicians had a higher percentage of 4th degree lacerations.

The effect of type of care provider on the relationship between language preference and maternal outcomes showed interesting results. Physicians cared for a

higher percentage of English speaking women, although a lower percentage of those women obtained prenatal care. English speaking women also had a higher percentage of induction or augmentation of labor if they saw physicians. Women who did *not* speak English were significantly less likely to achieve a vaginal delivery if they were cared for by physicians.

Women who indicated that they did not speak English were more likely to have access to an interpreter if they saw a midwife. They also were more likely to receive induction or augmentation of labor, to receive an epidural for pain control, and to attempt and achieve a VBAC, and *less* likely to have AROM if they were cared for by nurse midwives. However, the non-English speaking group who were cared for by nurse midwives were also much more likely to achieve a vaginal delivery than those who were cared for by physicians.

The cesarean section rate was increased for non-English speaking women in the total sample. However, further division by language groups showed that the women with the lowest percentage of cesarean deliveries spoke English, and were cared for by midwives at 6.7%, followed by those cared for by midwives who said they spoke English but needed an interpreter (10.5%) and those who did not speak English (11.7%). Those cared for by physicians who spoke English had a 32.2% cesarean rate, close to the average for the hospital, but those who did not speak English had a 35.3% cesarean rate, and those who said they spoke English but needed an interpreter had a 44.7% cesarean rate, well above the national average.

CHAPTER V

DISCUSSION

Overview

This study was a retrospective analysis of maternal medical records during labor and delivery admissions from 2013 to 2016 at a large tertiary care center in New England. The study compared maternal outcomes in women who spoke English, a proxy measure of acculturation to the dominant culture, to women who did not speak English and were therefore assumed to be less acculturated. This study also explored the relationship between provider type (midwife or physician) and maternal labor outcomes. Further analysis was done to evaluate if maternal outcomes changed based on the moderating effect of the type of provider (midwife or physician) who primarily cared for the patient during the women's admission for labor and delivery given the women's preferred use of English or another language.

Independent variables analyzed in this study included preferred language. Provider type was considered both as an independent variable and mediator. Dependent variables of maternal outcomes related to labor included cervical ripening, induction and augmentation of labor, use anesthesia for pain relief, fetal and uterine monitoring, and artificial rupture of membranes. Dependent variables related to delivery methods included vaginal, operative vaginal or cesarean section delivery. Other dependent variables included postpartum hemorrhage, antibiotic use, and maternal pyrexia.

Approximately 8.1% of the total U.S. population is unable to communicate well in English, the predominant language in the United States (U.S. Department of Commerce, U.S. Census Bureau, 2017). This sample approximated the proportion of people in the U.S., as 16.6% of women admitted for labor and delivery during the three years of the study reported that their primary language was not English, although about

half of that group stated they preferred to communicate in English. This left 8.3% of the sample who preferred not to communicate in a language other than English, closely approximating the national trend.

Labor interventions evaluated included induction of labor, augmentation of labor, use of epidurals, artificial rupture of membranes, and antibiotic use. Cervical ripening, induction of labor and augmentation of labor are on a continuum during the labor process. The same medications and procedures are used for each, and more than one medication or procedure may be used in the same woman.

Key findings of this study included a higher percentage of VBACs among those who did not speak English and those who saw nurse midwives. There were fewer labor interventions and a higher percentage of vaginal deliveries when women saw nurse midwives for care than if they saw physicians. Non-English speaking women were more likely to have a higher rate of general anesthesia, and were more likely to receive cesarean deliveries if they used physicians for care.

Key findings on language use and maternal outcomes

Healthy Migrant Theory is based on the belief that those immigrating are the healthiest people in their country or area of origin, and therefore will be healthier on arrival, with diminishing effects for several years after they enter the receiving culture until they become acculturated (Im & Yang, 2006; Kimberlin, 2009; Janevic, Savitz & Janivic, 2011; Tarnutzer, Bopp & the SNC study group, 2012; Urquia, Campo, & Heaman, 2012). Acquisition of the dominant language in the receiving culture is considered to be a proxy measure for acculturation (Borjas, Bronars & Trejo, 1991; Deyo, et al., 1985; Hull, 1979).

Hence, the first hypothesis for this work was that parturient women who did not speak English would be less likely to have interventions during labor and delivery than women who spoke English. Women who did not speak English, were more likely to attempt and succeed at vaginal births after cesarean section (VBAC), which may or may not be a cultural expectation from their countries of origin. Interestingly, there were higher percentages of lacerations and soft tissue trauma in those who did not speak English, although these factors might be attributable to increased numbers of vaginal deliveries in non-English speaking women, particularly when delivered by CNMs.

There were many areas where non-English and English-speaking women had no significant differences. Healthy Migrant Theory was neither refuted or substantiated in these areas, and non-English speaking women were no less or more at risk than their English-speaking counterparts. Examples of such factors include demographic factors such as supportive social situations, medical past histories, and preterm labor. During labor, there were no significant differences in terms of percentages of women receiving oxytocin, misoprostol, or dinoprostone for induction or augmentation of labor, use of internal or external electronic fetal monitoring, artificial rupture of membranes, local anesthesia or antibiotic use.   There were also no significant differences in percentages of vaginal operative deliveries, episiotomy rates, all perineal laceration types except first degree lacerations, or in postpartum hemorrhage, transfusion, or maternal pyrexia or antibiotic administration when analyzed by preferred maternal language.

Women may have more than one type of anesthesia during parturition, although regional anesthesia or local anesthesia is generally preferred to lower the risks to the fetus. In the United States, 61-89% of women currently receive epidurals during labor for

pain management (Attanasio, Kozhimannil, Jou, McPherson, Camann, 2015). In this study, a total of 68.7% of women received epidurals for pain management, well within the national range. However, women who did not speak English were significantly less likely to receive epidurals during labor. This may have been due to maternal preference, but also could be related to decreased communication.

Spinal anesthesia is given almost solely for surgical procedures during parturition, hence is usually administered only in patients receiving care from physicians. However, non-English speaking women were significantly less likely to receive spinal anesthesia from their physicians than their English-speaking counterparts. General anesthesia is not given as the anesthesia of choice in childbearing unless other options are not possible due to increased risks to both the mother and her neonate and is usually reserved for instances when other types of anesthesia cannot be effectively used, or for postpartum procedures where regional or local anesthesia are not practicable. General anesthesia use was more significantly more common in non-English speaking women. It is unclear why these variances in anesthesia administration occurred, and further study is indicated to explore the circumstances surrounding the choice of anesthesia.

There is evidence that social support in pregnancy, labor and delivery improves maternal outcomes (Rubavathy, Stellagracy & Kumar, 2015). A factor known to increase risks for laboring women is lack of support during parturition. In the United States, most women have a support person present during labor and delivery; frequently this is the father of the baby. Non-English-speaking women were significantly less likely to have a support person present during labor and delivery in this sample. Following immigration, there may be no other support person available to women other than their partners. Male

partners may not be permitted to be present during parturition in their countries of origin, or may need to care for older children, making them unavailable for support during labor (O'Mahony, et al., 2013; Benza and Liamputtong, 2014). Non-English speaking women may have had alterations in their outcomes with their communication barriers, lack of support and possible lack of advocacy.

Key findings on provider type and maternal outcomes

There is evidence that the type of obstetrical care given is a factor in maternal outcomes (Renfrew et al, 2014; Vedam, Stoll, MacDorman, Declercq, Cramer, Cheyney, M., …Kennedy, 2018). Indeed, there is evidence that women who receive midwifery care in westernized countries have lower rates of interventions such as use of amniotomy, opioid analgesics, oxytocin, epidural anesthesia, or spinal anesthesia in labor, and fewer operative vaginal or cesarean deliveries (Altman, Murphy, Fitzgerald, Anderson, Daratha, 2017; Devane, et al., 2010; Sandall et al., 2013). In this study, maternal outcomes were analyzed in terms of the type of provider during labor and delivery.

Findings from this work were consistent with other recent studies on protective status of midwifery care in an essentially normal sample and supported the nurse midwifery model of normal physiologic birth. Key findings for women using midwifery care included fewer labor interventions including induction of labor, artificial rupture of membranes (AROM), epidural and general anesthesia. More women using midwives for care had Foley bulb inductions, augmentation of labor, and local anesthesia, as well as attempted and achieved VBACs, and vaginal deliveries. There were less 1st or 4th degree lacerations in women using midwifery care, as well as less antibiotic use and postpartum

hemorrhage. However, there was more soft tissue trauma overall, possibly related to increased vaginal deliveries

Some variables showed no significant difference between those who had midwifery care and those who had care from physicians and did not support or show evidence against the use of either type of care provider during parturition. There were no significant differences among women who saw physicians or nurse midwives in use of misoprostol, dinoprostone or oxytocin for induction or augmentation of labor, in external or internal monitoring, operative vaginal deliveries (vacuum or forceps) or in the percentages of cervical lacerations. There were no significant differences between women cared for by physicians and those cared for by nurse midwives in terms of maternal pyrexia, transfusions, and postpartum hemorrhages.

Certified nurse midwives practice using a philosophy of normal physiologic birth, defined as birth that is focused on safely utilizing the human capacity of the woman and fetus and that does not rely on unnecessary interventions that disrupt normal physiologic processes (ACNM, MANA, & NACPM, 2012). Certified nurse midwives and certified midwives, both groups certified by the American Midwifery Certification Board, delivered 7.9% of babies in 2012 and 8.3% of all babies in 2014 in the United States, which was 12.1% of all vaginal births. This sample showed a higher percentage than the national average of patients choosing nurse midwifery care during pregnancy and labor, at just over 19%, despite all cesarean section patients being transferred to physicians in the care center where the study was conducted. This indicates that women who entered care with a midwife were, for the most part, delivered vaginally by a nurse midwife and had a lower chance of receiving a cesarean delivery.

Substantiating other work, while the rate of cesarean approximated the national average in this sample at 32.3% over the three years of the study, those who achieved a vaginal delivery were significantly more likely to have obtained prenatal, labor and delivery from a nurse midwife. Cesarean section rates were lower if women received midwifery care for all women in this sample. This should be interpreted with caution since scheduled cesarean sections are always scheduled with physicians' practices, as physicians are accountable for surgery. However, women who had care from nurse midwives were also less likely to receive cesarean deliveries for cephalopelvic disproportion or prolonged labor. This correlates with the model of care given by nurse midwives, which promotes normal physiologic birth, and typically allows more time for labor and delivery processes.

After the American Congress of Obstetricians and Gynecologists recommended against routine episiotomy use during vaginal deliveries in 2006, use of episiotomies has fallen steadily (ACOG, 2016). In 2012, the reported rate of episiotomy was approximately 12% (ACOG, 2016). Episiotomy rates have fallen sharply in the United States in the past decade following a report correlating the procedure's use with third and fourth degree perineal lacerations. Mixed results were noted in laceration and episiotomy rates in this sample when analyzed by provider type. In this sample, women who received care from midwives had higher incidences of episiotomies, perineal, periurethral, vaginal, and labial lacerations, except for fourth degree lacerations which were distributed non-significantly across provider groups and language types. This may be attributable to the higher percentage of vaginal deliveries performed by nurse midwives as increased percentages of vaginal deliveries puts women at higher risk for more genital tract

lacerations. While many factors affect soft tissue trauma during delivery, continuing to guard against unnecessary episiotomies and controlling delivery of the fetal head can continue to decrease unnecessary soft tissue trauma during delivery.

Overall antibiotic use was similar to national trends, however, significantly more antibiotics were given to patients who had care from a physician than those who had care from a midwife. This is unsurprising when considering that all cesarean deliveries are performed by physicians. While nationally Group B Streptococcus (GBS) infections account for approximately one quarter of the childbearing population (CDC, 2016), GBS was found in 14.5% of this sample, and routinely treated prophylactically with penicillin by both physicians and midwives, as per national standards (CDC, 2016).

Key findings on the moderating effect of provider type on the relationship between language use and maternal outcomes

Provider type modified the relationship of language and labor interventions, as well as language and delivery methods in some interesting ways. This work showed that the relationship of language to labor interventions (induction of labor and the methods used for induction of labor, use of AROM, and epidural anesthesia) all had effects moderated by provider type. Women who used midwifery care and spoke English were less likely to have an epidural or delivery by cesarean section, possibly related to the socioeconomic status of women attracted to care from midwives. However, women who did not speak English and who used midwifery care were more likely to have labor interventions including induction and administration of oxytocin, and to receive cesarean deliveries.

The national rate of VBACs (Vaginal Birth After Cesarean) in the United States was reported at 12.4% in 2016 (Martin et al, 2018). If women spoke a language other than English and were cared for primarily by nurse midwives, they were much more likely to both attempt and be successful at achieving a vaginal birth after cesarean (VBAC) than English-speaking counterparts, or than women who were cared for by physicians. It is unclear whether women's expectations of a VBAC and their subsequent success came from cultural norms in places of origin for such women, or if they were encouraged to pursue vaginal delivery by the nurse midwives who cared for them. In either event, the success of VBAC attempts can be positively related to the health of the women who were not acculturated, and to the support given for normal physiologic birth, substantiating both Healthy Migrant Theory and the nurse midwifery model of care.

Midwifery patients had concerning variations in cesarean rates between language groups, with non-English speaking women have a significantly higher rate of cesarean section than English speaking women, although all language groups were within the World Health Organization recommendation of a 5 to 15% cesarean rate.

Artificial rupture of membranes (AROM) may be used at any time during labor to just after delivery in the belief that it will encourage active labor, to check the color of amniotic fluid in case of need of neonatal resuscitation, or to promote patent airway in the newborn if the baby is born in the caul (with amniotic membranes intact). Procedures that cause rupture of amniotic membranes increase the woman's risk of chorioamnionitis as length of time increases, and standard practice is to *not* rupture membranes artificially until active labor is established due to the risk of developing chorioamnionitis. Interestingly, when nurse midwives cared for women who did not speak English, use of

AROM was more prevalent than in other groups, possibly related to a shortened estimated time from AROM until delivery.

Women who used physicians for care were more likely to receive induction of labor and a vaginal delivery and less likely to attempt a VBAC if they spoke English. Women who used physicians for care and said they spoke English but later needed an interpreter had highest percentage of cesareans, followed by women who spoke English. If did not speak English had third highest risk of cesarean. The most common reasons listed for cesarean section in the women cared for by physicians were cephalopelvic disproportion and failure to progress. Analysis of underlying risk factors related to the primary cesarean section rate might by language use might further illuminate this finding in the future, but the rates of primary and repeat cesareans for women who have difficulty communicating in English are concerning.

Intracervical Foley bulb placement was used more frequently for induction of labor by physicians in non-English speaking women than in English speaking women. This may reflect changes in practice in the residency teaching service at the hospital, as Foley bulbs became more frequently used during the study time period

Women who did not communicate in English were more likely to receive local anesthesia from physicians, although the risk of lacerations potentially needing repair was somewhat increased in those who saw nurse midwives. With all types of anesthesia use, it is unclear as to whether the differences in care received by English and non-English speaking women were related to women's own cultural factors, misunderstanding of language and culture, hence language disparities, or possible cultural bias on the part of providers.

Practices of managing the immediate postpartum period have changed in recent years, as WHO initiated a program to decrease maternal hemorrhage. In the past, midwives have tended to not intervene with Pitocin or other uterotonics during the postpartum period if there was no evidence of increased postpartum blood loss. However, newer guidelines recommend a uterotonic immediately following the delivery of the baby, and global maternal mortality rates from hemorrhage have plummeted as a result.

In this sample, there was a significantly decreased overall risk of a postpartum hemorrhage if the woman was cared for by a nurse midwife. On further analysis, if women did not speak English and were delivered by nurse midwives, or spoke English and were delivered by physicians, there were significantly higher rates of postpartum hemorrhage than in the other groups. With the recent practice change of increased administration of uterotonics immediately after delivery, these differences in postpartum hemorrhage percentages may become completely nonsignificant in the next few years.

Incidental findings

Prenatal care is well known to prevent unnecessary maternal morbidity and mortality (Office on Women's Health, 2017), and the majority of women in this sample obtained prenatal care. In many countries, outside of the United States, women receive their pregnancy and labor care from a midwife or birth attendant. Women who did not speak English, particularly women who spoke Spanish, Nepalese, Arabic, and Somali, were more likely to attain their prenatal care from nurse midwives, and it is possible that these women may have felt more at home receiving care at midwifery practices. This may account for the increased percentage of women who did not speak English accessing and maintaining prenatal care- behavior known to reduce maternal and newborn risks- if

they saw midwives. Of interest, and supporting the hypothesis that women were more likely to choose a more familiar care model, Russian speaking women in this sample were more likely to obtain care from physicians, long considered the primary providers of care during parturition in Russia (Chalmers, 2005). Further, women were significantly more likely to receive prenatal care from physicians if they spoke English than if they did not.

Of the 16.6% of women did not speak English at home, more women needed an interpreter than actually had one, particularly the approximately 8% who initially stated they preferred to communicate in English and later needed an interpreter. Only 2.7% of records of women admitted for labor and delivery in this sample showed a request for interpreter services during their hospitalization. Some of the discrepancy can be accounted for by nurses, midwives and physicians who speak a second language, or from omissions in charting on individual records, but the lack of recorded professional interpreter services assistance for the remainder non-English speaking women is concerning.

Limitations

Certain information was grossly underreported in the medical records in this sample, making analysis impossible. Maternal education levels were unfortunately unable to be analyzed, as education levels were rarely entered into the medical records during the years of the study. Some medications and techniques are used for cervical ripening, induction of labor, and augmentation of labor. Women receiving these intervention earlier in the labor process may have had further interventions by these methods later in

her labor and delivery, and stage of labor when interventions occurred were not clearly delineated in the available medical records.

Immigration status was not available in this sample's labor and delivery records. It is possible that women may have had a selection bias when choosing the type of care provider they wished to see related to their country of origin that might have contributed to the differences found. Country of origin also may have influenced women's expectations around labor and delivery, including their expectations and plans for type of delivery.

There is a mixed model of care at the tertiary care center studied. Generally, care is supervised and administered by the type of provider that a patient has self-selected to see for pregnancy and parturition. However, if a patient is normal and admitted to the residency service, a nurse midwife supervises the care that is given in conjunction with the supervising attending. If a patient was admitted to nurse-midwifery care and complications ensue, she will receive care in conjunction with a physician, and the physician may entirely assume the patient's care. Occasionally the admitting provider is a midwife, but if complications require intervention from a physician, such as a cesarean section, care may be assumed entirely by the medical staff. This occurred in 37 cases in the total sample, or .0037 of the cases evaluated. Further confusing the situation is a cross coverage plan at this tertiary care center that has most normal patients admitted by a nurse midwife in the triage area, no matter what type of provider will give labor care, and the tracking of midwifery patients by the residency service. Although intervening in another provider type's plan of care is rare, it is possible, and any such cases were not documented in the available data.

Prescribed opioid dosages and routes during labor and delivery varied considerably by individual provider, and complete analysis was difficult due to the multiple order entries. This limited the findings on opioids, although it would be of interest in further work.

Threats to validity

Threats to internal validity in this work included missing data or contradictory records on women. If data was missing in the independent variables, the subject was not included in the analysis. No duplicate medical records were transferred for analysis. Other threats to internal validity included confounding by other variables such as socioeconomic status during labor and delivery, maternal history prior to labor and delivery, and cross mixing of care providers. Socioeconomic status was controlled for by describing type of insurance women had during their admission. Of note, in the state in which the tertiary care center is located, all pregnant women were eligible for insurance, including Medicaid for those who have limited incomes, and could elect to be cared for by midwives or physicians. Subjects were removed from the analysis if their medical history was complicated by such issues as cardiac disease or uncommon diseases in pregnancy, which would require specialized and specific care in labor and delivery. Cross mixing of types of care providers was possible due to the joint model of care between midwives and physicians in this labor and delivery unit. However, the majority of care for any individual patient was given by the type of care provider the patient chose to see during their pregnancy, listed on the admission record of all patients.

Threats to external validity are limited due to the retrospective nature of this proposed work. However, there were several threats to external validity that should be

noted. During retrospective secondary analysis, it is not possible to confirm or refute chart data with individual patients, or to prospectively examine or manipulate variables related to patient outcomes. Situational effects may have limited the generalizability due to the dual midwifery and physician care model provided at the intended tertiary care center. However, the diversity at the tertiary care center study setting and the large sample size of subjects may have improved external validity.

Of note, there were certain factors in recording data that appeared to be inaccurate in the data set. According to the National Center of Vital Statistics (2016), total precipitous labors (those of less than 3 hours length) should be approximately 3% or less of all deliveries by the national average in the United States. This sample showed approximately 1% of labors completed in less than 1 hour. Records were reviewed at length across charting areas, and were found to be consistent, however, approximately 40% of charts were missing times for onset of labor or first stage, and there were instances where the admission time was before the onset of labor time. There were some instances where hours in the total labor were negative numbers, and where it was unclear if the admission time was erroneously entered for time of onset of labor. It seems likely that the times for onset of labor may be inaccurate more times than a researcher would wish, and that length of labor may be incorrectly analyzed.

Generally, placentas deliver spontaneously following a vaginal delivery, and that was the case in this study. Retained placentas, and the care needed for them (including manual placenta removal), are not common. The percentage of manual placentas during a vaginal delivery is very low, at .1-3% according to national data. On the other hand, nearly all placentas delivered during a cesarean section are manual deliveries or manual

lysis. There were 10 cases in which there were errors in recording the delivery of placentas that included two separate methods, including spontaneous and manual lysis, which are conflicting information. In most cases manual lysis seemed even less likely due to the recorded normal short time between delivery time and placental delivery time and normal recorded blood loss of < 500 ml., although one patient had a document postpartum hemorrhage with significant blood loss. Improving recording in the medical record and understanding of definitions could help with these discrepancies.

Implications for practice

If improved maternal outcomes can be defined as labor interventions, vaginal delivery, limited or no tissue trauma, labor interventions showed minimal variations in maternal outcomes between English/ non-English speakers in the total sample. However, when non-English speakers were evaluated separately, women requesting interpreters had significantly better maternal outcomes than either English speakers and considerably better maternal outcomes than those who spoke a language other than English but did not have an interpreter. Further, women in all groups have significantly improved maternal outcomes if cared for primarily by a nurse midwife over those cared for by a physician.

The starting variations in this sample of cesarean rates and attempted and successful VBACs across provider types and preferred language groups is of importance for practice. Considering the national percentages of VBACs, it is clear that VBACs should be offered to many more women following a primary cesarean. It is also clear that the midwifery model of care for normal physiologic birth should be promoted for most healthy parturient women attempting VBAC.

Discrepancies in care between English language and non-English language may have some basis in cultural background, but standards of care should not vary by language use. With clearly improved care by nurse midwives, and statistically significant and markedly improved outcomes noted in women who received interpreter services if their primary language was not English, care for the majority of pregnant and parturient women should be done by certified nurse midwives, with consistent use of professional interpreter services for all women whose primary language is not English. Political and regulatory changes may be needed to achieve these outcomes.

Healthy Migrant Theory was, overall, substantiated in this study. Women who do not speak English can be assumed to be less acculturated than women whose primary language is English in the United States. Translation is necessary to promote optimal health care in these women, but their own practices for diet and exercise, as a general rule, should be continued and encouraged, as such women appear to have better maternal, as well as the improved previously studied neonatal, outcomes than acculturated women.

Future research

Immediate work is planned to explore more fully which women received interpreters, and whether their outcomes differed in other ways, as well as an analysis exclusively focusing on women at 35 weeks' gestation or more. Regression analysis is planned on social characteristics to evaluate their effect on maternal outcome. Other planned work is focused on underlying health status of women who had a postpartum hemorrhage by language.

Several future research studies are suggested by this work. The Pew Research Center reported that in 2015 in the United States, 22.8% of the population in the United

States was religiously unaffiliated, and regionally, in New England, approximately 25% of the population in the northeast reported "none" when questioned on their religion (Pew Research Center, 2015). In this sample, there were marked differences from the national percentages, as 54% of women reported no religious affiliation, a percentage quite different from the average in the northeast. It is unclear what effect this lack of a social support has on labor and delivery, or what the postpartum effects might be of this lowered social support, and further research is needed in this area.

Ethnic background affects several aspects of childbearing beyond genetics and genomics. Women's beliefs and practices around childbirth are tied to their ethnic and family background and may influence their childbearing outcomes. While this work intimated at the many ethnic backgrounds that women claim, it did not pursue the beliefs and practices that pertain to childbearing. A future prospective study might be better able to follow women's perceived ethnic backgrounds, countries of origin, and maternal outcomes. It would also be interesting to examine the maternal outcomes of the most common non-English languages from this sample by individual language.

Approximately one fifth of women were documented as receiving induction of labor. More women who did not speak English were likely to be induced by nurse midwives, while a higher percentage of English speaking women were induced by physicians. It is unclear as to whether this is related to communication issues, uncertain dating, or other factors. Further study is needed with consistent translation to those not speaking English on reasons for induction of labor in both populations. Other research pertaining to labor, beyond the scope of this study, includes the timing of AROM to delivery. More English-speaking women had AROM performed when delivering with

nurse midwives, and the reasons are unclear, since it may well have been rupture of membranes during delivery to facilitate neonatal respiration, checking the color of amniotic fluid in order to obtain pediatric care in a timely fashion, the necessity of applying internal uterine or fetal monitoring, or the belief that AROM might facilitate labor.

Rates of general anesthesia were increased in the non-English speaking portion of this sample, as were epidural rates if these patients chose care from a nurse midwife. Future work should include examination of use of pain relief during parturition to determine the underlying cause of these differences between language groups. Antibiotic use in this population was fairly high, at 43.7%. In light of the use of prophylactic antibiotics for genital Group B Streptococcus and cesarean section, this may not be a surprising rate, but warrants further investigation when considered with the increasing overuse of antibiotics globally.

While not in the scope of this work, a future study could be done evaluating the birth weights of neonates with the laceration and other soft tissue trauma mothers sustained during delivery, as well as APGAR scores and methods of delivery by provider type.

This was a retrospective, correlational study. If this work were repeated prospectively, it would be interesting to generate an overall health score, and to obtain better information on length of labor in relation to language preference and provider type. It would also be interesting to see if the results changed if consistent professional interpreter services were used by all women who had a primary language other than English for communication during labor and delivery. It would also be interesting to have

weighed measurements of postpartum blood loss, rather than the estimates currently

made visually by care providers.

Articles expected from this work include 1.) a review of literature related to

language and health care of women, 2.) substantiation of midwifery care as a preferred

model of care to improve maternal delivery outcomes, and 3.) reporting the importance of

interpreter services in maternal care during parturition.

Conclusions

This retrospective analysis of data examined maternal outcomes in women who

spoke English and those who did not speak English at a large tertiary care center in New

England. Maternal outcomes under consideration included labor interventions such as

induction of labor, artificial rupture of membranes, pain management and antibiotic use.

Other outcomes included delivery type, tissue trauma, and postpartum hemorrhage.

Several socioeconomic factors were also considered related to their protective or

detrimental effects on maternal outcomes.

Healthy Migrant Theory was supported when women were divided into groups by

English usage. When non-English speaking women were evaluated separately, women

requesting interpreters had improved maternal outcomes over English speakers and

markedly improved maternal outcomes over those who spoke a language other than

English but did not have a professional interpreter on admission.

Improved outcomes were shown with midwifery care, in terms of increased rates

of vaginal deliveries, attempted and successful VBACs, and decreased cesarean sections.

Practice recommendations support moving to a model supporting nurse midwifery

care for most pregnant and parturient women, the consistent use of professional

interpretation and support for women maintaining their cultural practices if they do not

speak English.

REFERENCES

Abalos, E., Duley, L., & Steyn, D. W. (2014). Antihypertensive drug therapy for mild to moderate hypertension during pregnancy. *The Cochrane Library*.

Abramovici, A., Szychowski, J., Biggio, J., Sakawi, Y., Andrews, W., & Tita, A. (2014). Epidural use and clinical chorioamnionitis among women who delivered vaginally. *American Journal of Perinatology*, *31*(11), 1009-1014.

Abrams, R. M. (2015). Hypertension in Pregnancy: A Review of Current Guidelines. *Current Women's Health Reviews*, *11*(2), 109-119.

ACNM, MANA, and NACPM (2013). Supporting healthy and normal physiologic childbirth: A consensus statement by ACNM, MANA, and NACPM. *The Journal of Perinatal Education*, *22*(1), 14–18. http://doi.org/10.1891/1058-1243.22.1.14

Afable-Munsuz, A., Gregorich, S., Markides, K., & Pérez-Stable, E. (2013). Diabetes risk in older Mexican Americans: Effects of language acculturation, generation and Socioeconomic Status. *Journal Of Cross-Cultural Gerontology*, *28*(3), 359-373. doi:10.1007/s10823-013-9200-y

Aizer, A., & Currie, J. (2014). The intergenerational transmission of inequality: Maternal disadvantage and health at birth. *Science, 23* (344), Issue 6186, 856-861. DOI:10.1126/science.1251872

Altman, M., Murphy, S., Fitzgerald, C., Anderson, F., Daratha, K. (2017). The Cost of Nurse Midwifery Care: Use of Interventions, Resources, and Associated Costs in the Hospital Setting. *Women's Health Issues, 27*(4), 434-440. https://doi.org/10.1016/j.whi.2017.01.002

American Board of Obstetrics and Gynecology (ABOG) (2015a). Definition of an obstetrician and gynecologist and American Board of Obstetrics and Gynecology Certification. http://www.abog.org/policies.asp?pol_type=definition. Retrieved May, 2015.

American Board of Obstetrics and Gynecology (ABOG) (2015b). Frequently asked questions: Questions and answers for the public and medical organizations. http://www.abog.org/faq.asp Retrieved April 8, 2015.

American College of Nurse Midwives (ACNM) (2011). Definition of midwifery and scope of practice of certified nurse-midwives and certified midwives. http://www.midwife.org/ACNM/files/ACNMLibraryData/UPLOADFILENAME/000000000266/DefinitionofMidwiferyandScopeofPracticeofCNMsandCMsDec2011.pdf

American College of Nurse Midwives (ACNM) (2011a). Standards for the practice of
    midwifery. American College of Nurse Midwives, Silver Spring, MD.

American College of Nurse Midwives (ACNM) (2014). Fact sheet: Essential facts
    about midwives. American College of Nurse Midwives, Silver Spring, MD.
    http://www.midwife.org/ACNM/files/ccLibraryFiles/FILENAME/000000003276
    /EssentialFactsAboutMidwives-0314.pdf

American College of Nurse Midwives (ACNM) (2017). Our philosophy of care.
    American College of Nurse Midwives, Silver Spring, MD.
    http://midwife.org/Our-Philosophy-of-Care

American College of Nurse Midwives (ACNM), Midwives Alliance of North America
    (MANA), and National Association of Certified Professional Midwives
    (NACPM) (2012). Supporting normal physiologic birth: A consensus statement
    by ACNM, MANA, and NACPM. Silver Spring, MD.
    http://www.midwife.org/ACNM/files/ccLibraryFiles/Filename/000000002179/Ph
    ysioloigical%20Birth%20Consensus%20Statement-
    %20FINAL%20May%2018%202012%20FINAL.pdf

American College of Obstetricians and Gynecologists (ACOG) (2006). ACOG practice
    bulletin: Clinical management guidelines for obstetrician-gynecologists Number
    76, October 2006: Postpartum hemorrhage. *Obstetrics and Gynecology*, *108*(4),
    1039.

American College of Obstetricians and Gynecologists (ACOG) (2009). ACOG practice
    bulletin: Clinical management guidelines for obstetrician-gynecologists Number
    107, August 2009: Induction of labor. *Obstetrics & Gynecology, 114*:386–97.

American College of Obstetricians and Gynecologists (ACOG) (2013). ACOG
    Committee opinion no. 549: obesity in pregnancy. *Obstetrics and Gynecology*,
    121(1), 213.

American College of Obstetricians and Gynecologists (ACOG) (2013a). Definition of
    term pregnancy. Committee Opinion No. 579. *Obstetrics & Gynecology,
    122*:1139–40.

American College of Obstetricians and Gynecologists (ACOG) (2014). ReVITALize
    obstetric data definitions. http://www.acog.org/-/media/Departments/Patient-
    Safety-and-Quality-Improvement/2014reVITALizeObstetricDataDefinitions
    V10.pdf. Retrieved May, 2015.

American College of Obstetricians and Gynecologists (ACOG) (2016). Practice Bulletin
    No. 165: Prevention and management of obstetric lacerations at vaginal delivery.
    Obstetrics & Gynecology, 128(1) July 2016, p e1–e15.
    doi:10.1097/AOG.0000000000001523

American Congress of Obstetricians and Gynecologists (ACOG) Committee on Obstetric Practice (2013b). Committee opinion: Obesity in pregnancy. ACOG Committee Opinion Number 549, January 2013. http://www.acog.org/Resources-And-Publications/Committee-Opinions/Committee-on-Obstetric-Practice/Obesity-in-Pregnancy

American Osteopathic Association (2017). About DOs. http://www.osteopathic.org/osteopathic-health/about-dos/Pages/default.aspx Retrieved 7/10/17.

American Public Health Association (APHA) (2011). Reducing US maternal mortality as a human right. apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2014/07/11/15/59/reducing-us-maternal-mortality-as-a-human-right. Retrieved February 11, 2015.

Andrews, S., Leeman, L., & Yonke, N. (2017). Finding the breech: Influence of breech presentation on mode of delivery based on timing of diagnosis, attempt at external cephalic version, and provider success with version. *Birth: Issues in Perinatal Care*, *44*(3), 222-229. doi:10.1111/birt.12290

Archabald, K., Lopes, V., & Anderson, B. (2015). Impact of Antepartum Anemia on the development of chorioamnionitis at term. *American Journal of Perinatology*, *32*(3), 283-287. doi:10.1055/s-0034-1384638.

Attanasio, L., Kozhimannil, K., Jou, J., McPherson, M., Camann, W. (2015). Women's experiences with neuraxial labor analgesia in the Listening to Mothers II Survey: A content analysis of open-ended responses. *Anesthesia & Analgesia*, *121(4),* 974-980. doi: 10.1213/ANE.0000000000000546

Baystate Health (2015). Obstetrics and gynecology: BMC maternity statistics. Baystate Health Systems, Springfield, MA. https://baystatehealth.org/services/ob-gyn/labor-and-delivery/wesson-women-and-infants/maternity-statistics. Retrieved May, 2015.

Benza, S., & Liamputtong, P. (2014). Pregnancy, childbirth and motherhood: A metasynthesis of the lived experiences of immigrant women. *Midwifery*, *30*(6), 575-584. doi:10.1016/j.midw.2014.03.005

Berry, J. (1997). Immigration, acculturation and adaptation. *Applied Psychology (46)*1; 5-34.

Betrán, A. P., Ye, J., Moller, A., Zhang, J., Gülmezoglu, A. M., & Torloni, M. R. (2016). The increasing trend in caesarean section rates: Global, regional and national estimates: 1990-2014. *Plos ONE*, *11*(2), 1-12. doi:10.1371/journal.pone.0148343

Borjas, G., Bronars, S., & Trejo, S. (1991). Self-selection and internal migration in the

United States. *Journal of Urban Economics, 32,* 159-185.

Bouvier-Colle, M-H., Mohangoo, A., Gissler, M., Novak-Antolic, Z., Vutuc, C., Szamotulska, K., Zeitlin, J. and for The Euro-Peristat Scientific Committee (2012), What about the mothers? An analysis of maternal mortality and morbidity in perinatal health surveillance systems in Europe. *BJOG: An International Journal of Obstetrics & Gynaecology, 119*: 880–890. doi: 10.1111/j.1471-0528.2012.03330.x

Brunton, P. (2013). Effects of maternal exposure to social stress during pregnancy: consequences for mother and offspring. *Reproduction, 146*(5),175-89. doi: 10.1530/REP-13-0258.

Burns, N. & Grove, S. (2009). The practice of nursing research: Appraisal, synthesis, and generation of evidence (6th ed.). Saunders Elsevier, St. Louis, MO.

Cabacungan, E., Ngui, E., & McGinley, E. (2012). Racial/Ethnic disparities in maternal morbidities: A statewide study of labor and delivery hospitalizations in Wisconsin. *Maternal & Child Health Journal*, *16*(7), 1455-1467. doi:10.1007/s10995-011-0914-6

Callaghan W., Creanga A., Kuklina E. (2012). Severe maternal morbidity among delivery and postpartum hospitalizations in the United States. *Obstetrics & Gynecology 120*: 1029–36.

Callaghan, W., Mackay, A., Berg, C. (2008). Identification of severe maternal morbidity during delivery hospitalizations, United States, 1991-2003. *Am J Obstet Gynecol. Aug: 199*(2): 133e1-8

Center for Immigration Studies (2015). Immigrants in the United States: A profile of America's foreign-born population. http://cis.org/node/3876. Retrieved February 7, 2015.

Centre for Maternal and Child Enquiries (CMACE) (2011). Saving mothers' lives: reviewing maternal deaths to make motherhood safer: 2006–08. The Eighth Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. *BJOG;118* (Suppl. 1):1–203.

Centers for Disease Control (CDC) (2014). Obesity prevalence maps. *Division of Nutrition, Physical Activity and Obesity, National Center for Chronic Disease Prevention and Health Promotion,* updated September 9, 2014. http://www.cdc.gov/obesity/data/prevalence-maps.html

Centers for Disease Control (CDC) (2016). Group B Strep. *National Center for Immunization and Respiratory Diseases, Division of Bacterial Diseases.*

https://www.cdc.gov/groupbstrep/clinicians/obstetric-providers.html. Retrieved 7/24/17.

Centers for Disease Control (CDC) (2017). Pregnancy mortality surveillance system. Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion. https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pmss.html Retrieved 7/10/17.

Centers for Disease Control and Prevention (CDC) (2017a). 2016 Sexually transmitted diseases surveillance: Other sexually transmitted diseases. U.S. Department of Health and Human Services, Division of STD Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD and TB Prevention. https://www.cdc.gov/std/stats16/other.htm#herpes . Retrieved 1/18/18.

Chalmers, B. (2005). Maternity care in the former Soviet Union. *BJOG: an International Journal of Obstetrics and Gynaecology (112)* 495-499. doi: 10.1111/j.1471-0528.2005.00626.x

Chapman, E., Reveiz, L., Illanes, E., & Bonfill Cosp, X. (2014). Antibiotic regimens for management of intra-amniotic infection. *Cochrane Database Of Systematic Reviews*, (12).

Chen, A. H., Youdelman, M. K., & Brooks, J. (2007). The legal framework for language access in healthcare settings: Title VI and beyond. *Journal of General Internal Medicine*, *22* (Suppl 2), 362–367. doi:10.1007/s11606-007-0366-2

Cheng, E. M., Chen, A., & Cunningham, W. (2007). Primary language and receipt of recommended health care among Hispanics in the United States. *Journal of general internal medicine*, *22*(2), 283-288.

Cheng, S., Bautista, D., Leo, S., & Sia, T. (2013). Factors affecting fetal bradycardia following combined spinal epidural for labor analgesia: a matched case–control study. *Journal of anesthesia*, *27*(2), 169-174.

Cheng, Y., Shaffer, B., Nicholson, J., & Caughey, A. (2014). Second stage of labor and epidural use: a larger effect than previously suggested. *Obstetrics & Gynecology*, *123*(3), 527-535.

Cohain, J. S. (2013). The less studied effects of amniotomy. *The Journal of Maternal Fetal & Neonatal Medicine*, *26*(17), 1687-1690.

Cohen, J. (1992). A power primer. *Psychological bulletin*, *112*(1), 155.

Commonwealth of Massachusetts, Department of Public Health (DPH) (2008). Interpreter services in Massachusetts acute care hospitals. Office of Health Equity, Department of Public Health, Massachusetts. http://www.mass.gov/eohhs/docs/dph/health-equity/acute-care-hospitals.pdf

Cunningham, F., Leveno, K., Bloom, S., Spong, C., Dashe, J., Hoffman, B., Casey, B., Sheffield, J. (2014). Ch. 26, Induction of Labor. *William's Obstetrics, 24th ed..* McGraw-Hill Education.

D'Alton, M., Bonanno, C., Berkowitz, R., Brown, H., Copel, J., Cunningham, F., …Spong, C. (2013). Putting the "M" back in maternal-fetal medicine. *American Journal of Obstetrics and Gynecology, 208*(6):442-8. doi:10.1016/j.ajog.2012.11.041.

David, R., & Collins, J. (2007). Disparities in infant mortality: what's genetics got to do with it?. *American Journal of Public Health*, *97*(7), 1191-1197. doi:10.2105/AJPH.2005.068387

de Castro A, Gee G, Takeuchi D (2010). Examining alternative measures of social disadvantage among Asian Americans: the relevance of economic opportunity, subjective social status, and financial strain for health. *J Immigr Minor Health Oct; 12*(5), 659-71.

Degni, F., Suominen, S. B., El Ansari, W., Vehviläinen-Julkunen, K., & Essen, B. (2014). Reproductive and maternity health care services in Finland: perceptions and experiences of Somali-born immigrant women. *Ethnicity & Health*, *19*(3), 348-366. doi:10.1080/13557858.2013.797567

Degni, F., Suominen, S., Essén, B., El Ansari, W., & Vehviläinen-Julkunen, K. (2012). Communication and cultural issues in providing reproductive health care to immigrant women: health care providers' experiences in meeting Somali women living in Finland. *Journal of Immigrant and Minority Health*, *14*(2), 330-343.

DeJoy, S., Burkman, R. , Graves, B. , Grow, D., Sankey, H., Delk, C., ... & Hallisey, A. (2011). Making it work: successful collaborative practice. *Obstetrics & Gynecology*, *118*(3), 683-686.

Dennedy, M. C., Avalos, G., O'Reilly, M. W., O'Sullivan, E. P., Gaffney, G., & Dunne, F. (2012). ATLANTIC-DIP: raised maternal body mass index (BMI) adversely affects maternal and fetal outcomes in glucose-tolerant women according to International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria. *The Journal of Clinical Endocrinology & Metabolism*, *97*(4), E608-E612.

Devane D, Brennan M, Begley C, Clarke M, Walsh D, Sandall J, Ryan P, Revill P, Normand C. (2010) A systematic review, meta-analysis, meta-synthesis and economic analysis of midwife-led models of care. Royal College of Midwives: London

Deyo, R. A., Diehl, A. K., Hazuda, H., & Stern, M. P. (1985). A simple language-based acculturation scale for Mexican Americans: validation and application to health care research. *American Journal of Public Health*, *75*(1), 51-55.

Dominguez, T., Strong, E., Krieger, N., Gillman, M. Rich-Edwards, J. (2009). Differences in the self-reported racism experiences of US-born and foreign-born Black pregnant women. *Social Science & Medicine (69)*, 258–265.

Drife, J. (2002). The start of life: a history of obstetrics. *Postgraduate Medical Journal, (78),* 311-315 doi:10.1136/pmj.78.919.311

Edmonds, J., Hawkins, S., Cohen, B. (2014). The influence of detailed maternal ethnicity on cesarean delivery: Findings from the U.S. birth certificate in the state of Massachusetts. *Birth: Issues in perinatal care, 41*(3), 290-298. https://doi.org/101111/birt.12108

Evensen, A., Anderson, J. M., & Fontaine, P. (2017). Postpartum Hemorrhage: Prevention and Treatment. *American Family Physician*, *95*(7), 442-449.

Fairlie, T., Zell, E. R., & Schrag, S. (2013). Effectiveness of intrapartum antibiotic prophylaxis for prevention of early-onset group B streptococcal disease. *Obstetrics & Gynecology*, *121*(3), 570-577.

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior research methods*, *39*(2), 175-191.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior research methods*, *41*(4), 1149-1160.

Finlayson, M., Egan, M., & Black, C. (1999). Secondary analysis of survey data: a research method with potential for occupational therapists. *Canadian Journal of Occupational Therapy*, *66*(2), 83-91.

Fisch, J. M., English, D., Pedaline, S., Brooks, K., & Simhan, H. N. (2009). Labor induction process improvement: a patient quality of-care initiative. *Obstetrics & Gynecology*, *113*(4), 797-803.

Forna, F., Jamieson, D., Sanders, D., Lindsay. M. (2003). Pregnancy outcomes in foreign-born and US-born women. *International Journal of Gynecology and Obstetrics, 83,* 257–265.

Fryar, C., Gu, Q., Ogden, C., Flegal, K. (2016). Anthropometric reference data for children and adults: United States, 2011–2014. National Center for Health Statistics. *Vital Health Stat 3*(39). 2016.

Gadson, A., Akpovi, E., & Mehta, P. K. (2017). Exploring the social determinants of racial/ethnic disparities in prenatal care utilization and maternal outcome. *Seminars in Perinatology*, *41*(5), 308-317. doi:10.1053/j.semperi.2017.04.008

Gambino, C., Acosta, Y., & Grieco, E. (2012). English-speaking ability of the foreign born population in the United States: 2012 American Community Survey reports. U.S. Department of Commerce Economics and Statistics Administration, U.S. Census Bureau. ACS-26. http://www.census.gov/content/dam/Census/library/publications/2014/acs/acs-26.pdf

Gaskins, R. B., Baskin, M. L., & Person, S. D. (2012). Language, duration of United States residency, and leisure time physical activity among women from the Third National Health and Nutrition Examination Survey (NHANES III). *Journal of Women's Health (15409996)*, *21*(11), 1170-1179. doi:10.1089/jwh.2012.3477

GBD 2015 Maternal Mortality Collaborators (2016). Global, regional, and national levels of maternal mortality, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *The Lancet, 388*(10053), 1775-1812.

Gerber, S. & Lo Sasso, A. (2006). The evolving gender gap in general obstetrics and gynecology. *American Journal of Obstetrics and Gynecology, 195*, 1427–1430.

Getahun, D. (2014). Epidemiologic considerations: Scope of problem and disparity concerns. *Clinical Obstetrics and Gynecology*, *57*(2), 326-330.

Gibbons, L., Belizán, J. M., Lauer, J. A., Betrán, A. P., Merialdi, M., & Althabe, F. (2010). The global numbers and costs of additionally needed and unnecessary caesarean sections performed per year: overuse as a barrier to universal coverage. *World Health Report*, *30*, 1-31.

Goffs, S., Pekow, P., Avrunin, J., Lagu, T., Markenson, G., Lindenauer, P. (2013). Patterns of obstetric infection rates in a large sample of US hospitals**.** *American Journal of Obstetrics and Gynecology, 208* (6), 456.e1–456.e13

Goldberg, H., and Shorten, A. (2014). Patient and provider perceptions of decision making about use of epidural analgesia during childbirth: A thematic analysis. *Journal of Perinatal Education, 23*(3), 142–150. doi 10.1891/1058-1243.23.3.142

Gonzalez, Felisa (2008). Hispanic women in the United States, 2007 Fact Sheet. Pew Research Center, Hispanic trends. http://www.pewhispanic.org/2008/05/08/ Hispanic-women-in-the-united-states-2007/. Retrieved February 11, 2015.

Gonzales-Mendez, E., Gonzalez-Maddux, C., Hall, C., Maddux-Gonzalez, M., & Handley, M. (2012). An examination of cesarean and vaginal birth histories among Hispanic women entering prenatal care in two California counties with large immigrant populations... [corrected] *Journal of Immigrant & Minority Health*, *14*(2), 209-214. doi:10.1007/s10903-011-9450-0

Gould, J., Madan, A., Qin, C., Chavez, M. (2003). Perinatal outcomes in two dissimilar immigrant populations in the United States: A dual epidemiologic paradox. *Pediatrics (111),* e676

Graseck, A., Tuuli, M., Roehl, K., Odibo, A., Macones, G., & Cahill, A. (2014). Fetal descent in labor. *Obstetrics & Gynecology*, *123*(3), 521-526.

Grivell, R. M., & Dodd, J. M. (2011). Short-and long-term outcomes after cesarean section. *Expert Review of Obstetrics & Gynecology*, *6*(2), 205-215.

Guendelman, S., Buekens, P., Blondel, B., Kaminski, M., Notzon, F., Masuy-Stroobant, G. (1999). Birth outcomes of immigrant women in the United States, France, and Belgium. *Maternal and Child Health Journal (3)* 4.

Guendelman, S. and English, P. (1995). Effect of United States residence on birth outcomes among Mexican immigrants: An exploratory study. *Am. J. Epidemiol. 142 (Supplement 9): S30-S38 doi:10.1093/aje/142.Supplement_9.S30*

Guendelman, S. D., Ritterman-Weintraub, M. L., Fernald, L. H., & Kaufer-Horwitz, M. (2013). Weight status of Mexican immigrant women: A comparison with women in Mexico and with US-born Mexican American women. *American Journal Of Public Health*, *103*(9), 1634-1640. doi:10.2105/AJPH.2012.301171

Gupta, J., & Sullivan, C. (2013). The central role of occupation in the doing, being and belonging of immigrant women. *Journal of Occupational Science*, *20*(1), 23-35. doi:10.1080/14427591.2012.717499

Gushukak, B. & MacPherson, D. (2006). The basic principles of migration health: Population mobility and gaps in disease prevalence. *Emerg Themes Epidemiol. (3)*3. *Published online May 4, 2006.* doi:10.1186/1742-7622-3-3

Hamilton, B., Martin, J., Osteman, M., Curtin, S. (2013). Births: Preliminary data for 2013. *National Vital Statistics Reports 63* (2), pp. 1–20. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. http://www.cdc.gov/nchs/data/nvsr63/ nsvr63_02.pdf

Hamilton, B., Martin, J., Osterman, M., Driscoll, A., Rossen, L. (2017). Births: Provisional data for 2016. *National Vital Statistics Rapid Release 002.* U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

Hannah M., Hannah W., Hewson, Hodnett E, Saigal S, Willan A, for the Term Breech Trial Collaborative (2000). Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomized multicentre trial. *Lancet 2000 (356)* 1375–83.

Harding, S. (2004). Mortality of migrants from the Caribbean to England and Wales: effect of duration of residence. *Int. J. Epidemiol.33(2):* 382-386. doi: 10.1093/ije/dyh059

Hartmann K, Viswanathan M, Palmieri R, Gartlehner G, Thorp J, Lohr KN (2005). Outcomes of routine episiotomy: A systematic review. *JAMA*; *293*(17): 2141-2148. doi:10.1001/jama.293.17.2141.

Hatem, M., Sandall, J., Devane, D., Soltani, H., Gates, S. (2009). Midwife-led versus other models of care for childbearing women. The Cochrane Collaboration. doi: 10.1002/14651858.CD004667.pub2

Heaman, M., Bayrampour, H., Kingston, D., Blondel, B., Gissler, M., Roth, C., & ... Gagnon, A. (2013). Migrant Women's Utilization of Prenatal Care: A Systematic Review. *Maternal & Child Health Journal*, *17*(5), 816-836. doi:10.1007/s10995-012-1058-z

Hermer, L. D., & Brody, H. (2010). Defensive medicine, cost containment, and reform. *Journal of general internal medicine*, *25*(5), 470-473.

Hodnett, E. D. (2002). Pain and women's satisfaction with the experience of childbirth: a systematic review. *American Journal of Obstetrics and Gynecology*, *186*(5), S160-S172.

Hodnett, E. D., Gates, S., Hofmeyr, G. J., Sakala, C., & Weston, J. (2011). Continuous support for women during childbirth. *Cochrane Database Syst Rev*, *2*(2).

Homer, C., Friberg, I., Dias, M., ten Hoope-Bender, P., Sandall, J., Speciale, A., Bartlett, L. (2014). The projected effect of scaling up midwifery. *Lancet 384*(9948): 1146-1157. doi: 10.1016/S0140-6736(14)60790-X.

Hye-Kyung, K. (2014). Influence of culture and community perceptions on birth and perinatal care of immigrant women: Doulas' perspective. *Journal Of Perinatal Education*, *23*(1), 25-32. doi:10.1891/1058-1243.23.1.25

Hull, D. (1979). Migration, adaptation, and illness: a review. *Social Science & Medicine. Part A: Medical Psychology & Medical Sociology*, *13*, 25-36.

Humenick, S. (2000). Birth environments. *Journal of Perinatal Education, 9*(2): vi–vii. doi:10.1624/105812400X87572

Hutcheon, J. A., Lisonkova, S., & Joseph, K. S. (2011). Epidemiology of pre-eclampsia and the other hypertensive disorders of pregnancy. *Best Practice & Research Clinical Obstetrics & Gynaecology*, *25*(4), 391-403.

Im, E., & Yang, K. (2006). Theories on immigrant women's health. *Health Care for Women International*, *27*(8), 666-681

immigration. (n.d.). *Dictionary.com Unabridged*. Retrieved December 28, 2014, from Dictionary.com website: http://dictionary.reference.com/browse/immigration

International Federation of Health Plans (2013). 2013 Comparative price report: Medical and hospital fees by country. http://static1.squarespace.com/static/ 518a3cfee4b0a77d03a62c98/t/534fc9ebe4b05a88e5fbab70/1397737. Retrieved February 11, 2015.

Jackson, S., & Gregory, K. D. (2015). Management of the first stage of labor: Potential strategies to lower the cesarean delivery rate. *Clinical Obstetrics and Gynecology*.

Jacobs, E., Shepard, D., Suaya, J., Stone, E. (2004). Overcoming language barriers in health care: Costs and benefits of interpreter services. *American Journal of Public Health, 94*(5): 866–86.

Janevic, T., Loftfield, E., Savitz, D., Bradley, E., Illuzzi, J., & Lipkind, H. (2014). Disparities in cesarean delivery by ethnicity and nativity in New York City. *Maternal & Child Health Journal*, *18*(1), 250-257. doi:10.1007/s10995-013-1261-6

Janevic, T., Savitz, D. & Janevic, M. (2011). Maternal education and adverse birth outcomes among immigrant women to the United States from Eastern Europe: A test of the healthy migrant hypothesis. *Social Science & Medicine, 73*, 429-435

Janssen, S., & Lagro-Jannsen, A. (2012). Physician's gender, communication style, patient preferences and patient satisfaction in gynecology and obstetrics: A systematic review. *Patient Education and Counseling, 89*(2), 221-226. doi:10.1016/j.pec.2012.06.034

Johantgen, M., Fountain, L., Zangaro, G., Newhouse, R., Stanik-Hutt, J., & White, K. (2012). Comparison of labor and delivery care provided by certified nurse-midwives and physicians: A systematic review, 1990 to 2008. *Women's Health Issues*, *22*(1), e73-e81.

Khan, K., Wojdyla, D., Say, L., Gülmezoglu, A., & Van Look, P. (2006). WHO analysis

of causes of maternal death: a systematic review. *The Lancet*, *367*(9516), 1066-1074.

Kourtis, A., Read, J., & Jamieson, D. (2014). Pregnancy and infection. *New England Journal of Medicine*, *370*(23), 2211-2218.

Kassebaum, N., Bertozzi-Villa, A., Coggeshall, M., Shackelford, K., Steiner, C., Heuton, K., …Lozano, R. (2014). Global, regional, and national levels and causes of maternal mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet, Early Online Publication,* 2 May 2014. doi:10.1016/S0140-6736(14)60696

Kennedy, S., McDonald, J., & Biddle, N. (2006). The healthy immigrant effect and immigrant selection: evidence from four countries. http://carleton.ca/sppa/wp-content/uploads/chesg-mcdonald.pdf.

Kilpatrick, S., Berg, C., Bernstein, P., Bingham, D., Delgado, A., Callaghan, … Harper, M. (2014) Standardized severe maternal morbidity review: Rationale and process *Obstetrics and Gynecology*, *124* (2 Pt 1): 361-6. doi:10.1097/AOG.0000000000000397.

Kimberlin, S. (2009). Synthesizing social science theories of immigration. *Journal of Human Behavior in the Social Environment*, *(19),* 759–771. DOI: 10.1080/10911350902910922

King, T. L. (2006). What is a midwife? *Journal of Midwifery & Women's Health*, *51*(5), 385-386.

Kivisto, P. (2001). Theorizing transnational immigration: a critical review of current efforts. *Ethnic and Racial Studies (24)* 4, 549-577

Korinek, K., & Smith, K. R. (2011). Prenatal care among immigrant and racial-ethnic minority women in a new immigrant destination: Exploring the impact of immigrant legal status. *Social Science & Medicine*, *72*(10), 1695-1703.

Laughon SK, Branch DW, Beaver J, Zhang, J. (2012). Changes in labor patterns over 50 years. *American Journal Obstetrics and Gynecology 206*(419) e1-9.

Lebrun, L. A. (2012). Effects of length of stay and language proficiency on health care experiences among immigrants in Canada and the United States. *Social Science & Medicine*, *74*(7), 1062-1072.

Lee, S., Nguyen, H., Tsui, J. (2011). Interview language : A proxy measure for acculturation among Asian Americans in a population-based study. *Journal of Immigrant and Minority Health*, *13*(2), 244-252.

Lindsay, K., Gibney, E., & McAuliffe, F. (2012). Maternal nutrition among women from Sub-Saharan Africa, with a focus on Nigeria, and potential implications for pregnancy outcomes among immigrant populations in developed countries. *Journal Of Human Nutrition & Dietetics*, *25*(6), 534-546. doi:10.1111/j.1365-277X.2012.01253.x

Liu, J., Gallagher, A. E., Carta, C. M., Torres, M. E., Moran, R., & Wilcox, S. (2014). Racial differences in gestational weight gain and pregnancy-related hypertension. *Annals of Epidemiology*, *24*(6), 441-447. doi:10.1016/j.annepidem.2014.02.009

Livingston, G. & Cohn, D. (2012). U.S. birth rate falls to a record low; decline is greatest among immigrants. *Pew Research, Social & demographic trends.* Retrieved from www.pewsocialtrends.org/2012/11/29u-s-birth-rate-falls-to-a-record-low-decline-is-greatest-among-immigrants/#.

Lo, J., Mission, J. & Caughey, A. (2013). Hypertensive disease of pregnancy and maternal mortality. *Current Opinions in Obstetrics and Gynecology 25*(2):124-32. doi: 10.1097/GCO.0b013e32835e0ef5.

Lopez, M. & Gonzalez-Barrera, A. (2013). What is the future of Spanish in the United States? Pew Research Center. www.pewresearch.org/fact-tank/2013/09/05/what-is-the-future-of-spanish-in-the-united-states.

Lu, Y. (2008). Test of the 'healthy migrant hypothesis': a longitudinal analysis of health selectivity of internal migration in Indonesia. *Social science & medicine*, *67*(8), 1331-1339.

Lumbiganon, P., Laopaiboon, M., Gülmezoglu, A., Souza, I., Taneepanichskul, S., Ruyan, P., … Filatova, E. (2010). Method of delivery and pregnancy outcomes in Asia: the WHO global survey on maternal and perinatal health 2007–08. *Lancet, 375* (9713), 490–499. doi:10.1016/S0140-6736(09)61870-5

MacDonald-Wallis, C., Silverwood, R., Fraser, A., Nelson, S. Tilling, K. Lawlor, D., Stavola, B. (2015) Gestational-age-specific reference ranges for blood pressure in pregnancy: findings from a prospective cohort. *Journal of Hypertension 33*(1): 96-105. Published online 2014 Dec 4. doi: 10.1097/HJH.0000000000000368

Macones, G., Cahill, A., Stamilio, D., & Odibo, A. (2012). The efficacy of early amniotomy in nulliparous labor induction: a randomized controlled trial. *American Journal of Obstetrics and Gynecology*, *207*(5), 403-e1.

Magee, T., Lee, S., Giuliano, K., & Munro, B. (2006). Generating new knowledge from existing data: the use of large data sets for nursing research. *Nursing Research*, *55*(2S), S50-6.

Mahoney, N. (2015). Language and linguistics: A special report. Language learning. National Science Foundation, Arlington, VA. https://www.nsf.gov/news/special_reports/linguistics/learn.jsp. Retrieved 4/11/15.

Martin, J., Hamilton, B., Osterman, M., Curtin, S., Mathews, T. (2013). Births: Final data for 2012. *National Vital Statistics Report (62)* 9. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

Martin, J., Hamilton, B., Osterman, M., Driscoll, S., Drake, P. (2018). Births: Final data for 2016. *National Vital Statistics Report (67)*1. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

Martin, J., Hamilton, B., Osterman, M., Driscoll, S., Mathews, T. (2015). Births: Final data for 2013. *National Vital Statistics Report (64)*1. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

Martin, J., Hamilton, B., Osterman, M., Driscoll, S., Mathews, T. (2017). Births: Final data for 2015. *National Vital Statistics Report (66)*1. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

Martin J., Hamilton B., Sutton P., Ventura S., Menacker F., Munson M. (2003). Births: Final data for 2002. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Vital Statistics Reports, 52(10), 1–113

Martin, P. (2013). The global challenge of managing migration. *Population Bulletin (68)*2 .

Massachusetts Department of Public Health Office of HIV/AIDS (2016). Massachusetts HIV/AIDS data fact sheet: The Massachusetts HIV/AIDS epidemic at a glance. www.mass.gov/eohhs/docs/dph/aids/2016-profles/epidemic-glance.pdf. Retrieved 6/17.

McGlade, S., Saha, S., Dahlstrom, M (2004). The Latina paradox: an opportunity for restructuring prenatal care and delivery. *American Journal of Public Health, (94)*12, 2062–2065

Mehta, S., & Sokol, R. (2014). Shoulder dystocia: Risk factors, predictability, and preventability. *Seminars in Perinatology (38)4,* 189-193.

Migration Policy Institute (2015). State immigration data profiles. Washington, DC. http://www.migrationpolicy.org/programs/data-hub/state-immigration-data-profiles. Retrieved June, 2015.

Migration Policy Institute (2018). Frequently requested statistics on immigrants and immigration in the United States. https://www.migrationpolicy.org/article/frequently-requested- statistics-immigrants-and-immigration-united-states#Numbers. Retrieved February, 2018.

Miller, C., Cohn, S., Akdagli, S., Carvalho, B., Blumenfeld, Y., & Butwick, A. (2017). Postpartum hemorrhage following vaginal delivery: risk factors and maternal outcomes. *Journal of Perinatology*, *37*(3), 243-248. doi:10.1038/jp.2016.225

Miranda, M., Maxson, P., & Edwards, S. (2009). Environmental contributions to disparities in pregnancy outcomes. *Epidemiologic Reviews*, *31*67-83. doi:10.1093/epirev/mxp011

Mirriam Webster Medical Dictionary (2015a). Cesarean section. http://www.merriam-webster.com/dictionary/cesarean section. Retrieved 2015.

Mirriam Webster Medical Dictionary (2015b). Delivery. https://www.merriam-webster.com/ Retrieved 2015

Mirriam Webster Dictionary (2015). Foreign. https://www.merriam-webster.com/ Retrieved 2015.

National Center for Health Statistics (2014). Detailed technical notes: United States 2014: Natality. U.S. Department of Health and Human Services: Centers for Disease Control and Prevention, Hyattsville, Maryland: 2015 ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/DVS/natality/UserGuide2014.pdf

National Institutes for Health (2003). Final NIH statement on sharing research data. https://grants.nih.gov/grants/policy/data_sharing/. Retrieved 2013.

Ngo-Metzger, Q., Sorkin, D., Phillips, R., Greenfield, S., Massagli, M., Clarridge, B., & Kaplan, S. (2007). Providing high quality care for limited English proficient patients: the importance of language concordance and interpreter use. *Journal of General Internal Medicine*, *22*(2), 324-330.

Office on Women's Health (2017). Prenatal Care. U.S. Department of Health and Human Services. Washington, D.C. Retrieved 2/6/18. https://www.womenshealth.gov/a-z-topics/prenatal-care

Ogden CL, Carroll MD, Kit BK, Flegal KM. (2014). Prevalence of Childhood and Adult Obesity in the United States, 2011-2012. *JAMA*; *311*(8):806-814. doi:10.1001/jama.2014.732.

Olmedo, E. L., & Padilla, A. M. (1978). Empirical and construct validation of a measure of acculturation for Mexican Americans. *The Journal of Social Psychology*, *105*(2), 179-187.

O'Mahony, J., Donnelly, T., Raffin Bouchal, S., & Este, D. (2013). Cultural background and socioeconomic influence of immigrant and refugee women coping with postpartum depression. *Journal Of Immigrant & Minority Health*, *15*(2), 300-314. doi:10.1007/s10903-012-9663-x

O'Malley, Mary-Pat. "'So either you have a foetal monitor or you have your waters broken, basically is it?': Articulating Maternity Care Policy at a Midwives' Ante-Natal Clinic." *Language Policy* 9.1 (2010): 87-96. *ProQuest.* Web. 28 May 2015

Oster, G., Edelsberg, J., Hennegan, K., Lewin, C., Narasimhan, V., Slobod, K., ... & Baker, C. (2014). Prevention of group B streptococcal disease in the first 3 months of life: Would routine maternal immunization during pregnancy be cost-effective?. *Vaccine*, *32*(37), 4778-4785.

Osterman M, Martin J, Curtin S., Mathews, T., Wilson, E., Kirmeyer, S. (2013). Newly released data from the revised U.S. birth certificate, 2011. *National Vital Statistics Reports, 62* (4). Hyattsville, MD: National Center for Health Statistics.

Pauli, J., Zhu, J., Repke, J., & Kjerulff, K. (2013). 668: The impact of pre-pregnancy BMI on pregnancy complications in nulliparous women. *American Journal of Obstetrics & Gynecology*, *208*(1), S281-S282.

Panel on Treatment of HIV-Infected Pregnant Women and Prevention of Perinatal Transmission (2016). Recommendations for use of antiretroviral drugs in pregnant HIV-1-infected women for maternal health and interventions to reduce perinatal HIV Transmission in the United States. https://aidsinfo.nih.gov/guidelines . Accessed Oct. 10, 2016

Paterno, M., McElroy, K., Regan, M. (2016). Electronic fetal monitoring and cesarean birth: A scoping review. *Birth (43)*4, 277-284. DOI: 10.1111/birt.12247

Patient Protection and Affordable Care Act, Pub. L. No. 111-148, 124 Stat. 119 (2010).

Pew Research Center (2015). America's changing religious landscape. assets.pewresearch.org/wp-content/uploads/sites/11/2015/05/RLS-08-26-full-report.pdf Retrieved 7/20/17.

Pippins, J. R., Alegría, M., & Haas, J. S. (2007). Association between language proficiency and the quality of primary care among a national sample of insured Latinos. *Medical care*, *45*(11), 1020.

Price, S., Noseworthy, J., & Thornton, J. (2007). Women's experience with social presence during childbirth. *MCN: The American Journal Of Maternal Child Nursing*, *32*(3), 184-191.

Rath, W. (2011). Postpartum hemorrhage--update on problems of definitions and diagnosis. *Acta Obstetricia et Gynecologica Scandinavica*, *90*(5): 421-428. doi: 10.1111/j.1600-0412.2011.01107.x

Redfield, R., Linton, R., & Herskovitz, M. (1936). Memorandum for the study of acculturation. *American Anthropologist, 38*(1), 149-152.

Renfrew, M., McFadden, A., Bastos, M., Campbell, J., Channon, A., Cheung, N., …Declercq, E. (2014) Midwifery and quality care: findings from a new evidence-informed framework for maternal and newborn care. *Lancet, 384* (9948): 1129–1145. doi: 10.1016/S0140-6736(14)60789-3.

Rubavathy, P., J, J., Stellagracy, G., & Kumar, K. (2015). Effectiveness of Social Support during Labour on Behavioural Response among Primi Mothers. *International Journal Of Nursing Education*, *7*(4), 142-146. doi:10.5958/09749357.2015.00208.1

Rumbaut, R., & Weeks, J. (1996). Unraveling a public health enigma: Why do immigrants experience superior perinatal health outcomes? *Research in the Sociology of Health Care*. *13D*, 337·391. ISBN: 0-7623·0049·3

Salinas, J. J., & Sheffield, K. M. (2011). English language use, health and mortality in older Mexican Americans. *Journal of Immigrant and Minority Health*, *13*(2), 232-238.

Salmasi, L, & Pieroni, L. (2015). Immigration policy and birth weight: Positive externalities in Italian law. *Journal of Health Economics, 43,* 128-139.

Sancho′n-Macias, M., Prieto-Salceda, D., Bover-Bover, A., & Gastaldo, D. (2013). Relationship between subjective social status and perceived health among Latin American immigrant women. *Revista Latino-Americana De Enfermagem*, *21*(6), 1353-1359. doi:10.1590/0104-1169.2943.2374

Sandall, J., Soltani, H., Gates, S., Shennan, A., Devane, D. (2013). Midwife-led continuity models versus other models of care for childbearing women. *Cochrane Database Syst Rev, 8*, CD004667. doi: 10.1002/14651858.CD004667.pub3.

Seri, I., & Evans, J. (2008). Limits of viability: definition of the gray zone. *Journal of Perinatology*, *(28)* Suppl 1:S4-8. doi: 10.1038/jp.2008.42.

Sheridan, C., Yekinni, I., Oyeye, G., Ogunleye, K., Oluyede, G., O'Sullivan, K., Greene, R. & Higgins, J. (2011). Comparing birth plan preferences among Irish and Nigerian women. *Br. J. Midwif. (19)* 172–177.

Sinacore, A., Titus, J., & Hofman, S. (2013). The role of relationship in the cultural transitioning of immigrant women. *Women & Therapy*, *36*(3/4), 235-251. doi:10.1080/02703149.2013.797852

Singh, G., & Miller, B. (2004). Health, life expectancy, and mortality patterns among immigrant populations in the United States. *Can J Public Health (95):*I14-21.

Smaill, F., & Gyte, G. (2010). Antibiotic prophylaxis versus no prophylaxis for preventing infection after cesarean section. *The Cochrane Library*.

Small, M., James, A., Kershaw, T., Thames, B., Gunatilake, R., & Brown, H. (2012). Near-miss maternal mortality: cardiac dysfunction as the principal cause of obstetric intensive care unit admissions. *Obstetrics & Gynecology*, *119*(2 part 1), 250-255.

Smeriglio, A., Tomaino, A., & Trombetta, D. (2014). Herbal products in pregnancy: experimental studies and clinical reports. *Phytotherapy Research*, *28*(8), 1107-1116.

Smith A, Ayanian J, Covinsky K, Landon B, McCarthy E, Wee C, Steinman M. (2011). Conducting high-value secondary dataset analysis: an introductory guide and resources. *Journal of General Internal Medicine*. *26*(8): 920-9.

Smyth, R., Markham, C., & Dowswell, T. (2013). Amniotomy for shortening spontaneous labour. *The Cochrane Library*.

Spong, C. Y., Berghella, V., Wenstrom, K. D., Mercer, B. M., & Saade, G. R. (2012). Preventing the first cesarean delivery: summary of a joint Eunice Kennedy Shriver National Institute of Child Health and Human Development, Society for Maternal-Fetal Medicine, and American College of Obstetricians and Gynecologists Workshop. *Obstetrics and Gynecology*, *120*(5), 1181.

Stones, W. & Arulkumaran, S. (2014). Health-care professionals in midwifery care. *Lancet, 384*(9499), 1169–1170.

Taira, D. (1999). Improving the health and health care of non-English-speaking patients. *Gen Intern Med*. 14(5): 322–323. doi: 10.1046/j.1525-1497.1999.00345.x

Tam, T., Conte, M., Schuler, H., Malang, S., & Roque, M. (2013). Delivery outcomes in women undergoing elective labor induction at term. *Archives of Gynecology and Obstetrics*, *287*(3), 407-411.

Tarnutzer, S., Bopp, M., and the SNC study group (2012). Healthy migrants but unhealthy offspring? A retrospective cohort study among Italians in Switzerland. *BMC Public Health (12)* 1104 doi:10.1186/1471-2458-12-1104

Thomson, M, & Hoffman-Goetz, L (2009). Defining and measuring acculturation: a systematic review of public health studies with Hispanic populations in the United States. *Social Science & Medicine. 69*(7): 983-91

Timmins, C. L. (2002). The impact of language barriers on the health care of Latinos in the United States: a review of the literature and guidelines for practice. *Journal of Midwifery & Women's Health*, *47*(2), 80-96.

Tita, A. T. N., Lai, Y., Bloom, S. L., Spong, C. Y., Varner, M. W., Ramin, S. M., ... & Iams, J. D. (2012a). Timing of delivery and pregnancy outcomes among laboring nulliparous women. *American Journal of Obstetrics and Gynecology*, *206*(3), 239-e1.

Tita, A. T., Szychowski, J. M., Rouse, D. J., Bean, C. M., Chapman, V., Northern, A., ...& Hauth, J. C. (2012b). Higher-dose oxytocin and hemorrhage after vaginal delivery: a randomized controlled trial. *Obstetrics and Gynecology*, *119* (2 Pt 1), 293.

Tung, R. (2010). Springfield Public Schools English language learner status report. *Center for Collaborative Education.* http://www.sps.springfield.ma.us/webContent/ContinuousImprovement/EnglishLanguageLearnerStatusReport.pdf.

Ullman, R., Smith, L., Burns, E., Mori, R., & Dowswell, T. (2011). The use of opioid intramuscular and intravenous pain relieving drugs in labour. *Health*.

United Nations Inter-agency Group for Child Mortality Estimation (UN IGCME) (2017). Levels and trends in child mortality: Report 2017. *United Nations Childrens Fund.* http://www.childmortality.org/ Retrieved, 2017.

Urquia, M., Campo, P., & Heaman, M. (2012). Revisiting the immigrant paradox in reproductive health: The roles of duration of residence and ethnicity. *Social Science & Medicine 74*,1610-1621

U.S. Census Bureau (2015). 2015 American Community Survey 1-Year estimates. https://factfinder.census.gov/faces/tableservides/jsf/pages/productview.xhtml?pid=ACS_15_1YR_S0201&prodType=table . Retrieved May, 2017

U.S. Department of Commerce: Census Bureau (2012). The foreign-born population in the United States: 2010 American Community Survey Reports. http://www.census.gov/content/dam/Census/library/publications/2012/acs/acs19.pdf.

U.S. Department of Commerce: Census Bureau (2014). Selected social characteristics in the United States 2011-2013; American Community Survey 3-year estimates. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src= bkmk.

U.S. Department of Commerce: Census Bureau (2014). Selected social characteristics in the United States 2009-2013 American Community Survey 5-Year Estimates. http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src= bkmk.

U.S. Department of Commerce: Census Bureau (2016). American fact finder: Massachusetts. https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml?src= bkmk

U.S. Department of Commerce: Census Bureau (2017). Commuting times, median rents and language other than English use in the home on the rise. https://www.census.gov/newsroom/press-releases/2017/acs-5yr.html . Retrieved April, 2018

U.S. Department of Health and Human Services Office for Civil Rights (HHS: OCR) (2003). Health information privacy. http://www.hhs.gov/ocr/privacy/hipaa/understanding/coveredentities/research. html. Retrieved May, 2015.

U.S. Department of Health and Human Services Office of Disease Prevention and Health Promotion (2015). Healthy People 2020 topics and objectives: Maternal, infant and child health. http://www.healthypeople.gov/2020/topics-objectives/topic/maternal-infant-and-child-health/objectives. Retrieved July, 2015.

U.S. Department of Homeland Security (2013). Yearbook of Immigration Statistics:2012. U.S. Department of Homeland Security, Office of Immigration Statistics. *American Fact Finder,* U.S. Department of Commerce., Washington, D.C. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid =ACS_13_3YR_DP02&prodType=table

Van Lerberghe, W., Matthews, Z., Achadi, E., Ancona, C., Campbell, J., Channon, …Terkmani, S. (2014). Country experience with strengthening of health systems and deployment of midwives in countries with high maternal mortality. *Lancet, 384*(9949), 1215–1225.

van Roosmakn, J., & Meguid, T. (2014). The dilemma of vaginal breech delivery worldwide. *Lancet*, *383*(9932), 1863-1864.

Vedam, S., Stoll, K., MacDorman, M., Declercq, E., Cramer, R., Cheyney, M., …Kennedy, H. (2018). Mapping integration of midwives across the United States: Impact on access, equity, and outcomes. *PLoS ONE 13*(2): e0192523. https://doi.org/10.1371/journal.pone.0192523

Ventura, S., Curtin, S., Abma, J., Henshaw, S. (2012). Estimated pregnancy rates and rates of pregnancy outcomes for the United States, 1990-2008. *National Vital Statistics Reports, 60* (7). Hyattsville, MD: National Center for Health Statistics. http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_07.pdf. Retrieved June 2015.

Walker, L., & Chesnut, L. (2010). Identifying health disparities and social inequities affecting childbearing women and infants. *JOGNN: Journal Of Obstetric, Gynecologic & Neonatal Nursing*, *39*(3), 328-338. doi:10.1111/j.1552-6909.2010.01144.x

Wallstrom, T., Jarnbert-Pettersson, H., Stenson, D., Akerud, H., Darj, E., Gemzell-Danielsson, K., & Wiberg-Itzel, E. (2017). Labor induction with orally administrated misoprostol: A retrospective cohort study. *Biomed Research International*, 1-9. doi:10.1155/2017/6840592

Weeks, A., Alfirevic, Z., Faúndes, A., Hofmeyr, G., Safar, P., Wing, D. (2007). Misoprostol for induction of labor with a live fetus *International Jnl of Gynecology & Obstetrics, 99* (Supplement 2), Pages S194–S197.

Whitehead, N., Callaghan, W., Johnson, C., & Williams, L. (2009). Racial, ethnic, and economic disparities in the prevalence of pregnancy complications. *Maternal & Child Health Journal*, *13*(2), 198-205. doi:10.1007/s10995-008-0344-2.

Wingate, M., Alexander, G. (2006). The healthy migrant theory: variations in pregnancy outcomes among US-born migrants. *Social Science and Medicine, 62*(2): 491-8.

World Health Organization (2012a). World health statistics 2012. Geneva, Switzerland. http://www.who.int/gho/publications/world_health_statistics/EN_WHS2012_Full pdf. ISBN 978 92 4 156444 1. Retrieved February 11, 2015.

World Health Organization (2012b). WHO recommendations for the prevention and treatment of postpartum hemorrhage. ISBN 97892 4 154850 2

World Health Organization (2014). Trends in maternal mortality: 1990-2013. Estimates by WHO, UNICEF, UNFPA, The World Bank, and the United Nations Population Division. New York.

World Health Organization (2015). Maternal mortality ratio (modeled estimate, per 100,000 live births) World Bank, Geneva, Switzerland. http://data.worldbank.org/indicator/SH.STA.MMRT. Retrieved July 10, 2017.

Zeigler, K., & Camarota, S. (2014). One in five U.S. residents speaks foreign language at home, record 61.8 million. Center for Immigration Studies. cis.org/record-one-in-five-us-residents-speaks-language-other-than-english-at-home.

Zhang, S., Cardarelli, K., Shim, R., Ye, J., Booker, K., & Rust, G. (2013). Racial disparities in economic and clinical outcomes of pregnancy among Medicaid recipients. *Maternal & Child Health Journal*, *17*(8), 1518-1525. doi:10.1007/s10995-012-1162-0

Zhang, J., Landy, H., Branch, D., Burkman, R., Haberman, S., Gregory, K., ... & Reddy, U. (2010). Contemporary patterns of spontaneous labor with normal neonatal outcomes. *Obstetrics and gynecology*, *116*(6), 1281.