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THE MULTI-LEVEL COMPONENTS OF THE HISPANIC/LATINA BIRTH PARADOX: A SCOPING REVIEW

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ABSTRACT

The birth rate of Latinas has been driving population growth in the United States (U.S.) since the 1980s (Stepler & Lopez, 2016; Flores, 2017). Latina women generally have a high burden of risk factors compared to non-Hispanic white women, such as low levels of education and high poverty rates (Flores, López, & Radford, 2017), but these risks are purportedly not reflected in their birth outcomes (Franzini, Ribble, & Keddie, 2001; Hummer, Powers, Pullum, Gossman, & Frisbie, 2007; Palloni & Morenoff, 2001). The phenomenon of paradoxically low levels of preterm birth, low birth weight, and infant mortality relative to their non-Hispanic white counterparts has been labeled as the Latina birth paradox. However, the use of the term paradox to describe the association is controversial due to the large variation in the birth outcomes (low birth weight, infant mortality, preterm birth, maternal risk factors), control populations (non-Hispanic white mothers, non-Hispanic black mothers, low acculturation Latinas, foreign-born Latinas), and the lack of acknowledgement of the heterogeneity in culture and ancestry of the Latina population (Palloni & Morenoff, 2001).

This scoping review was conducted to better understand how multi-level components contribute to studies related to the paradox, as well as determine the breadth of research on this topic and determine the extent of the support for the Latina birth paradox. In total, 104 peer-reviewed studies were identified through the use of the CINAHL, Web of Science, and PubMed databases. Gray, or non-peer reviewed literature was included to further understand the policy climate surrounding the Latina birth paradox.

Out of the 104 studies in this scoping review, 40 studies (38.5%) did not differentiate between Latina subgroups at all. There were few prospective studies in this sample; most of the

studies were cross sectional or retrospective cohort. Different studies report support for the paradox in different ways. Only ten studies (9.6%) supported the paradox, while many examined possible contributing factors to the reported paradox rather than examined the existence of the paradox itself. The paradox was found to accurately describe some ethnic groups or outcomes, but not others by 21.2% of studies. Very few gray literature sources mentioned the paradox at all, but reported on the effects of family structure and immigration policy on birth outcomes in Latinas, which were topics also discussed in the peer-reviewed literature.

Determining the existence of the paradox based on the current available research is difficult, given the aforementioned lack of consensus in the white-literature, as well as the variation by study type and comparison groups utilized. Our findings bring into question the idea that the paradox applies to all Latinas. In fact, this over simplification may be a barrier to current public health understanding of this quickly growing, diverse U.S. population. A separate limitation is that past research testing the paradox often focused on individual level risk factors rather than larger, population level influences. Future research should test the presence of the paradox after accounting for both individual and population level factors, as well as their interactions.

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Chapter 1

Introduction

Infant mortality is a commonly used metric of population health and healthcare quality (Reidpath & Allotey, 2003; Infant Mortality, 2019). High infant mortality rates not only provide a marker for the economic health of a country (Erdoğan, Ener, & Arıca, 2013; Ensor, Cooper, Davidson, Fitzmaurice, & Graham, 2010), but also can aptly reflect racial and economic disparities in access and outcomes within (State Infant Mortality Collaborative, 2013; Maternal, Infant, and Child Health, 2019). The U.S. currently ranks 56th in infant mortality, after countries such as Bosnia and Herzegovina, Cuba, and Serbia (The World Factbook) with a rate of 579.3 deaths per 100,000 live births (Murphy, Xu, Kochanek, & Arias, 2017). One large predictor of infant mortality is low birth weight (Paneth, 1995), which was the second leading cause of infant mortality in the U.S. (Murphy, Xu, Kochanek, & Arias, 2017).

The World Health Organization defines low birth weight as being less than 2500 g, or 5.5 lbs ("Low birth weight policy brief", 2014) and preterm birth as birth before 37 weeks gestation ("Preterm birth", 2018). The 2017 National Vital Statistics Reports put the rate of preterm birth in the U.S. at 9.93% (Martin, Hamilton, Osterman, Driscoll, & Drake, 2018). For Latina mothers in the U.S., the average preterm birth rate is slightly lower at 9.62%, although this does not capture the range of risk seen across individuals with different countries of origin (Martin, Hamilton, Osterman, Driscoll, & Drake, 2018). Low birth weight rates are at 8.28% for the general population and 7.43% for Latina women in the U.S. (Martin, Hamilton, Osterman, Driscoll, & Drake, 2018). Not all low birth weight babies are premature, but about 70% fall into both categories (Jin, 2015).

The minimum estimate of the cost of preterm birth in the U.S. in 2005 was $26.2 billion (Institute of Medicine . . ., 2007). Preterm birth cuts into the third trimester, when cortical folding, ability of the

lungs to conduct gas exchange (Lemola, 2015), the myelination of neurons, and the synaptogenesis are all occurring (Bouyssi-Kobar et al., 2016). Not only are there biological differences between premature and full-term babies that have the potential to exert long term health effects, but parents may also create more restrictive and protective environments for their children due to the stressors associated with the early concern about the child's health (Lemola, 2015). Sleep, introversion, anxiety, inattention, and lower intelligence quotient (IQ) have all also been associated with preterm birth, and these risks increase as birth weight decreases (Raju, Pemberton, Saigal, Blaisdell, Moxey-Mims, & Buist, 2017). Preterm birth has been associated with developmental defects of tooth enamel (de Oliveira Cortines, Corrêa-Faria, Paulsson, Costa, & Costa, 2018). Very preterm infants, born before 32 weeks gestational age, have decreased brain growth compared to full-term infants (Bouyssi-Kobar et al., 2016). Only 39% of infants born before 29 weeks leave without a severe morbidity (Patel, 2016). Extremely preterm birth, between 22-29 weeks, is associated with increased mortality, respiratory distress syndrome, bronchopulmonary dysplasia, patent ductus arteriosus, infection, necrotizing enterocolitis, and adverse neurodevelopmental outcomes such as cognitive impairment (Patel, 2016). Birth weight of less than 1500 grams has been associated with increased diagnosis of autism spectrum disorder (Matheis, Matson, & Burns, 2018). Low birth weight also affects renal development, which contributes to increased prevalence of hypertension and diabetes in adulthood (Tulassay & Vásárhelyi, 2002).

There has been a relatively recent change in calculating gestational age, switching from using the last menses of the mother (LMP) to an obstetric estimate (OE) of gestation at delivery (Martin, Hamilton, Osterman, Driscoll, & Drake, 2018). The change was made in 2014 to provide increased validity and has resulted in a decreased amount of births being classified as preterm, but an increased preterm infant mortality rate compared to data calculated using the LMP (Martin, Osterman, Kirmeyer, & Gregory, 2015). This illustrates the importance of accurate measurement in surveillance and epidemiologic studies of birth outcomes; most knowledge about preterm outcomes comes from cohort studies conducted outside of the U.S., which points to the need for other designs to better understand these outcomes and their

ramifications within the context of the U.S. (Raju, Pemberton, Saigal, Blaisdell, Moxey-Mims, & Buist, 2017). In addition, there may be differences in average birth weight within Latina women based on their country of origin, and so a more specific threshold for determining healthy birth weight may yield more accurate results and change our understanding of which populations are at higher risk (Paneth, 1995). Differences in healthy birth weight threshold could be due to the diversity in Latin American genetics between countries due to the historical admixture of native populations, Europeans, and Africans in the region (Bryc et al., 2010; Ruiz-Linares et al., 2014).

The importance of Latinas in the changing demographics of the U.S. means understanding the specifics of birth outcomes within this population is vitally important to public health moving forward. The birth rates of Latinas have been a huge part of demographic growth in the U.S. (Flores, 2017), but the recent slowing of immigration means birth rates are the main driver of this growth (Stepler & Lopez, 2016). There were 898,764 reported births to Latina women in 2017, and both their birth and fertility rates are higher than those of non-Hispanic white women (Martin, Hamilton, Osterman, Driscoll, & Drake, 2018). In 2016, there were 58 million Latinos in the U.S. with a younger median age than non-Hispanic whites (28 and 43 years respectively), which points to the continuation of Latina births driving population growth in the U.S. (Flores, 2017).

However, our categorizations of race may not reflect those in the home countries of these individuals, and may result in incorrect data being utilized to study the Latinas and the paradox. Only 24% of Latino individuals even identify as "Hispanic" or "Latino," and there is a mixed response as to whether individuals prefer to be called Hispanic, Latino, or have no preference (Taylor, Lopez, Martínez, & Velasco, 2012). A large majority of Latinos do not see themselves as sharing a culture with other Latinos (Taylor, Lopez, Martínez, & Velasco, 2012). More often, people identify themselves as being a part of a specific country of origin (Taylor, Lopez, Martínez, & Velasco, 2012). In addition, American terms may not capture the differences within Latino races. For example, Latinos use the phrases "mestizo" for those with indigenous ancestry and "mulatto" for those with African ancestry, meaning that

42% of these mixed-race Latinos reported their race as white (Gonzalez-Barrera, 2015). Our ability to correctly assess the demographics of the Latina population may be further confounded by nativity status and the differing racial categorizations of an individual's country of origin, such as is seen in Puerto Rican individuals who differ in the likelihood of the race they identify based on whether they were born on the island of Puerto Rico or mainland U.S. (Landale & Oropesa, 2002).

However, our genetic understandings of the diversity of the Latino population have come fairly recently, and there is a long and complicated history of the use of the terms Hispanic and Latino in the U.S.. In 1930, all Latinos were included under the term Mexican on the census (Cohn, 2010). By 1976, the Census was required provided a list of options for ethnic origins for Latinos, but were followed by many missteps in terms of the accuracy of the questions, such as people from the south of the U.S. indicating they were South American (Cohn, 2010). This resulted in the 2010 census, which asks about Hispanic, Latino, or Spanish origin and then provides a list of more specific examples (Cohn, 2010). Currently, the U.S. government does not put a limit on who can identify as Latino or Hispanic based on country of birth; if someone self-identifies as Latino, then they are included as a part of the ethnic group (Passel & Taylor, 2009). However, differences remain in deciding which countries of origin should be included in the Hispanic or Latino ethnic category; some definitions are based on origins in a Spanish-speaking country, but others limit this and claim that only individuals with ancestry originating from the Iberian Peninsula are Hispanics (Jaimes, Londono, & Halpern, 2013). There is also variation based on whether or not Brazilians are included in this definition, as most Brazilians speak Portuguese (Jaimes, Londono, & Halpern, 2013).While acknowledging the complication of these labels, the Hispanic and Latina population will be referred to as Latina throughout this review for continuity.

The Latina population is also unique because of the role of immigration and documentation status. A 2011 Pew Research study found Mexican immigrants accounted for about 70% of births to unauthorized immigrant parents (The Mexican-American boom, 2011). A large scale surprise Immigration and Customs Enforcement (ICE) raid in Postville, Iowa in 2008 has also been used to

measure how immigration and deportation stress affect birth outcomes (Novak, Geronimus, & Martinez-Cardoso, 2017). Researchers found Latina women, whether or not they were even immigrants, had increased rates of low birth weight after the raid. (Novak, Geronimus, & Martinez-Cardoso, 2017).

Even without the stress of immigration, Latina women have similarly disadvantaged risk factor profiles for poor health outcomes compared to non-Hispanic black women. As of 2017, 20.1% of Latinos have less than a 9th grade education, and only 15% have a bachelor's degree or more, compared to 4.2% and 20.2% for non-Hispanic black residents of the U.S. (Flores, López, & Radford, 2017). Non-Hispanic black and Latino individuals have similar poverty rates, at around 20% (Flores, López, & Radford , 2017). Compared to non-Hispanic black individuals, Latinos have a higher proportion of people who are uninsured, 19.7% compared to 12%, but also have a higher proportion of people who are currently married, 45.8% compared to 30.2% (Flores, López, & Radford , 2017). In addition, a higher proportion of Latino and non-Hispanic black individuals experience regular racially based discrimination than non-Hispanic white individuals (Lee, Perez, Boykin, & Mendoza-Denton, 2019), which has been proven to increase stress and likelihood of negative physical and mental health outcomes (Pascoe & Richman, 2009). Among Latinos specifically, discrimination has been strongly associated with negative mental health outcomes (Lee & Ahn, 2011). All of these statistics put both groups at a disadvantage compared to the majority non-Hispanic white population who have the highest rates of marriage and the lowest rates of completing less than 9th grade education, living in poverty, and being uninsured (Flores, López, & Radford , 2017). With this apparent quality of negative risk factors, health outcomes would be expected to be similar in non-Hispanic black and Latina women.

However, an apparent paradox has been reported between the generally disadvantaged socioeconomic characteristics of Latinas and the positive health outcomes they exhibit, such as all-cause and infant mortality (Franzini, Ribble, & Keddie, 2001). In fact, despite socioeconomic disparities, Latinos have been reported to show better health outcomes than non-Hispanic white individuals overall, with a few exceptions such as obesity and diabetes (Dominguez et al., 2015). A 1974 study published by

Teller and Clyburn is generally credited with being the first documentation of this paradox in infant mortality in Latinas, (Hummer, Powers, Pullum, Gossman, & Frisbie, 2007; Palloni & Morenoff, 2001) but evidence for the paradox remains controversial. Part of the controversy stems from the changing dimensions of the health outcome being studied, the population believed to have the paradoxical protective effect, and the population used as the control standard (Palloni & Morenoff, 2001). For example, a study focusing on Mexican low birth weight advantage compared to non-Hispanic black mothers and a study focusing on Latina infant mortality rate compared to non-Hispanic white mothers could both technically support the paradox as it is currently defined (Palloni & Morenoff, 2001). These studies may be examining different facets of the paradox rather than finding support for the paradox for all Latina women.

One popular proposed explanation for the paradox is known as the healthy migrant hypothesis, and refers to the idea only the healthiest members of a population are physically able to successfully immigrate to the U.S.. Therefore, immigrants in the U.S. only include those selected for having the health advantages needed for the journey. Subsequent generations of offspring may not undergo the same migration processes, and therefore may be more representative of individuals with less advantageous health statuses. To date, there is weak to no evidence to support this hypothesis (Abraído-Lanza, Dohrenwend, Ng-Mak., & Turner, 1999; Rubalcava, Teruel, Thomas, & Goldman, 2008; Franzini, Ribble, & Keddie, 2001)

The increase of negative health behaviors with assimilation is another proposed hypothesis. The basis of this hypothesis is that Latinas have more favorable health profiles to begin with, such as less tobacco and alcohol consumption, better diet, and more extensive social support, that then disappear and are replaced by more unhealthy behaviors found predominantly in the U.S., as the receiving culture (Abraído-Lanza, Chao, & Flórez , 2005; Franzini, Ribble, & Keddie, 2001). The process of cultural adaptation post immigration is often referred to as acculturation. Acculturation is defined as “the dual process of cultural and psychological change that takes place as a result of contact between two or more

cultural groups and their individual members . . . at the individual level, it involves changes in a person's behavioral repertoire" (Berry, 2005). There are different strategies of acculturation, each resulting in changes that can be positive or negative (see Fig 1.) (Berry, 2005). Assimilation is a specific outcome from Berry's larger model involving disconnection from the heritage culture and from the receiving culture (Berry, 2005). The replacement of positive health behaviors with negative ones, as mentioned above, is an example of unhealthy assimilation (Berry, 2005). Without considering the secular circumstances under which a person immigrates, their cultural similarities to the host country, their age at immigration, the changed role of acculturation in second or higher generation individuals, and the area of residence that they settle in, the concept of acculturation fails to capture the way that these factors may also impact health (Schwartz, Unger, Zamboanga, & Szapocznik, 2010). Nativity, years spent in the U.S., and language use have been criticized as being part of a one-dimensional model unable to capture these subtleties (Schwartz, Unger, Zamboanga, & Szapocznik, 2010). A more accurate model would determine whether the immigrant population is losing their own cultural practices or gaining the receiving culture's practices without sacrificing their own (Schwartz, Unger, Zamboanga, & Szapocznik, 2010). Nonetheless, multiple studies have supported the idea of low acculturation being beneficial with respect to birth outcomes (Chaponniere, 2016; Hoggatt, Flores, Solorio, Wilhelm, & Ritz, 2012; Giuntella, 2016; Khodr, Lupo, Canfield, Chan, Cai, & Mitchell, 2013; Coonrod, Bay, & Balcazar, 2004).

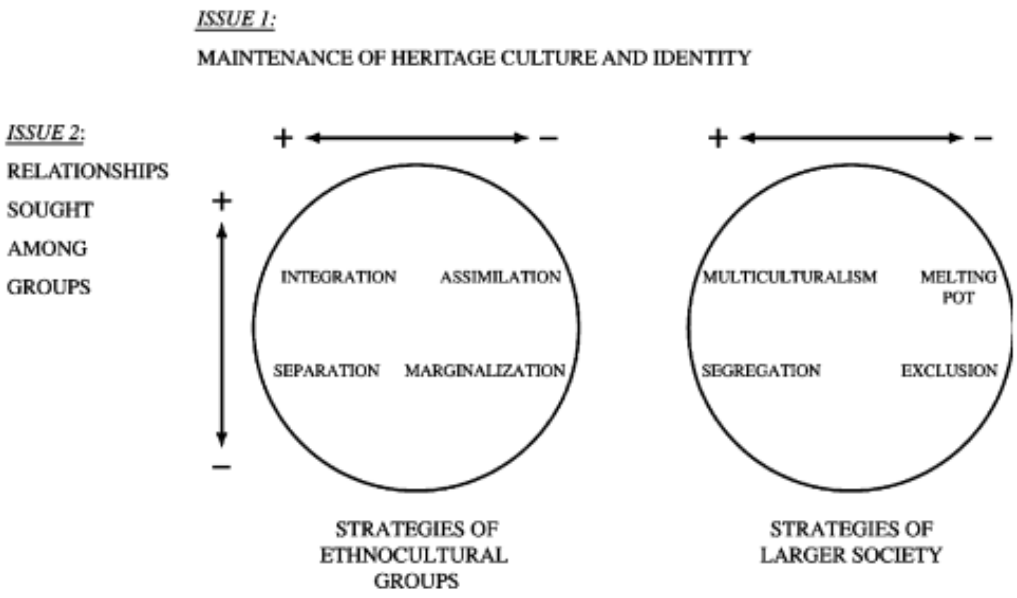

Figure 1: "Four acculturation strategies based upon two issues, in ethnocultural groups, and the larger society" (Berry, 2005)

Keeping in mind the role the proper definitions of outcomes and conceptualization of constructs can play in obtaining accurate results, another proposed explanation for the paradox is that it does not exist at all, or apply to all groups of Latinas. One major problem in the research of Latinas comes from a lack of recognition about the heterogeneity in cultural and ancestral origin of the population. A meta-analysis of 11 studies found six did not refer to the ethnic origin of the women they were studying other than to refer to them as Hispanic (Schaaf, Liem, Mol, Abu-Hanna, & Ravelli, 2013). In South America alone, the combination of native cultures, European colonization, and the African slave trade have resulted in genetic differences by country as well as within ethnic groups (Bryc et al., 2010; Homburger et al., 2015); even within Colombia there are significant differences in the amount of African ancestry (Bryc et al., 2010). The same could be said for many other Latin American countries (Moreno-Estrada et al., 2014). Therefore, by grouping these individuals together into one category, researchers may be missing out on important distinctions between groups.

This scoping review was conducted to better understand the multi-level components contributing to the reported paradox, as well as determine the breadth of research on this topic and determine the

extent of the support for the Latina birth paradox. Organizing the findings of research relevant to the Latina birth paradox to determine the boundaries of our knowledge will help to direct the focus of future research. To the researcher's knowledge, this scoping review is the first of its kind to specifically examine the Latina birth paradox.

Chapter 2

Methods

The aforementioned desire of the researcher to encompass the range of research currently available resulted in the choice of the researcher to use a scoping review (Arksey & O'Malley, 2005). Scoping reviews also promote helping to map current understanding and identify possible gaps in the literature (Arksey & O'Malley, 2005). This scoping review adhered to the five steps outlined by Arksey and O'Malley, which include "identifying the research question, identifying relevant studies, study selection, charting the data, and collating, summarizing, and reporting the results" (2005). The optional sixth step, consultation, was not utilized during this process (Arksey & O'Malley, 2005). Best practices were followed according to the PRISMA extension for scoping review checklist (Tricco, et al., 2018).

Relevant peer-reviewed literature was identified through the use of the CINAHL, Web of Science, and PubMed databases. Each database was searched using the Boolean phrases (Hispanic OR Latina AND birth paradox), (Hispanic OR Latina AND paradox AND birth outcomes), (Hispanic or Latina AND paradox AND perinatal) and (Hispanic OR Latina AND paradox AND maternal mortality rate OR low birth weight or preterm birth or cesarean or length of gestation). Studies were excluded if they were not written in English; were not a book, abstract, or comment; did not include information about women in the U.S.; and discussed the connection between the population and birth outcome directly. In addition, theses and dissertations were not included due to the assumption they would likely have gone on to be published and therefore cause overlap in information. There was no limitation based on publication year. The following information was extracted and organized in Excel: sample size, pregnancy status at time of study, ethnic background, citizenship, residence at time of study, first generation status, hypothesis, independent variable, dependent variable, covariates, level of influence addressed, results, and support of paradox.

Gray literature, which encompasses non-peer-reviewed documents, was included to add perspective on the policy sphere (Paez, 2017). Due to the lack of a centralized gray literature database, gray literature was pulled from the individual websites of the following organizations: the National Research Center on Hispanic Children & Families; California Latinas for Reproductive Justice; the American College of Obstetricians and Gynecologists; California Department of Public Health, Office of Equity; and the March of Dimes.

Chapter 3

Results

Key Findings: White Literature

The process of selecting studies for inclusion is outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart below (see Figure 2). Out of the 104 studies in this scoping review, 40 (38.5%) described their sample only as Hispanic or Latina, 27 described their sample as only Mexican (26%), and 27 compared multiple Latina subgroups (26%). In some cases, multiple Latina subgroups were described as "Puerto Rican and other Hispanic or Latinas" where the other subgroup was not specified. Often in these studies, studies included non-Hispanic white or non-Hispanic black women as comparison groups. For more information about study sample population, please see Appendix 1. About 60% of studies were cross sectional or retrospective. Very few studies used a prospective design. For more information about the breakdown of the study designs, see Table 1 below.

Table 1: Breakdown of Study Types

Study Type	Number of Studies	Percentage of Total Studies
Cross sectional	**39**	37.5%
Retrospective Cohort	**23**	22.1%
Prospective Cohort	**7**	6.7%
Qualitative	**8**	7.7%
Literature Review	**7**	6.7%
Case Control	**2**	1.9%
Systematic Review and Meta-Analysis	**3**	2.9%
Scoping Review	**1**	1%
Other	**14**	13.5%

In addition, 49 studies reported on the number of foreign born women in their study, 38 did not describe their sample by nativity, and for 17 studies reporting was not applicable. Different studies categorized supporting the paradox in different ways. Some examined 1) whether immigrant women had better birth outcomes than U.S. born women, 2) whether low acculturation women had better outcomes than high acculturation women, 3) whether specific subgroups had an advantage over others, 4) differences in health behaviors, and 5) others compared birth outcomes to non-Hispanic white women. Among the groups that compared birth outcomes to non-Hispanic white women, there was further variation based on whether birth outcomes had to be similar to or better than non-Hispanic white women

to constitute a paradox. Many studies (33.7%) did not even examine the paradox, but rather examined factors that could contribute to the purported paradox. The largest group of studies examining the paradox found evidence of the paradox for some ethnic groups and outcomes, but not for others (21.1%), and were labeled as partially supporting the paradox. There was almost an even split between the ten studies that supported the paradox and the nine that did not support the paradox when using non-Hispanic white women as a comparison group.

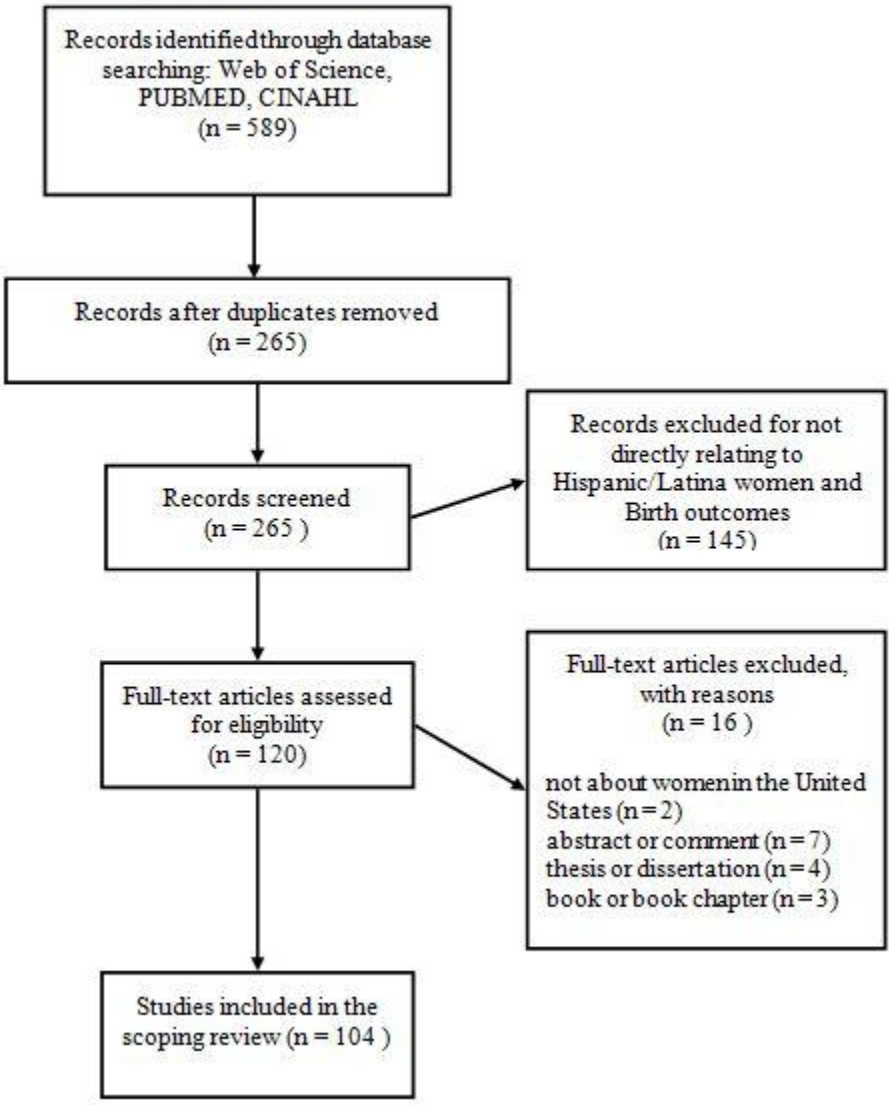

Figure 2: Screening Process Shown in Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flowchart

The majority of studies included in this scoping review were published between 2009-2018, with publications on the paradox becoming more common in 2012-2013 and decreasing in popularity after 2013 (see Fig. 3).

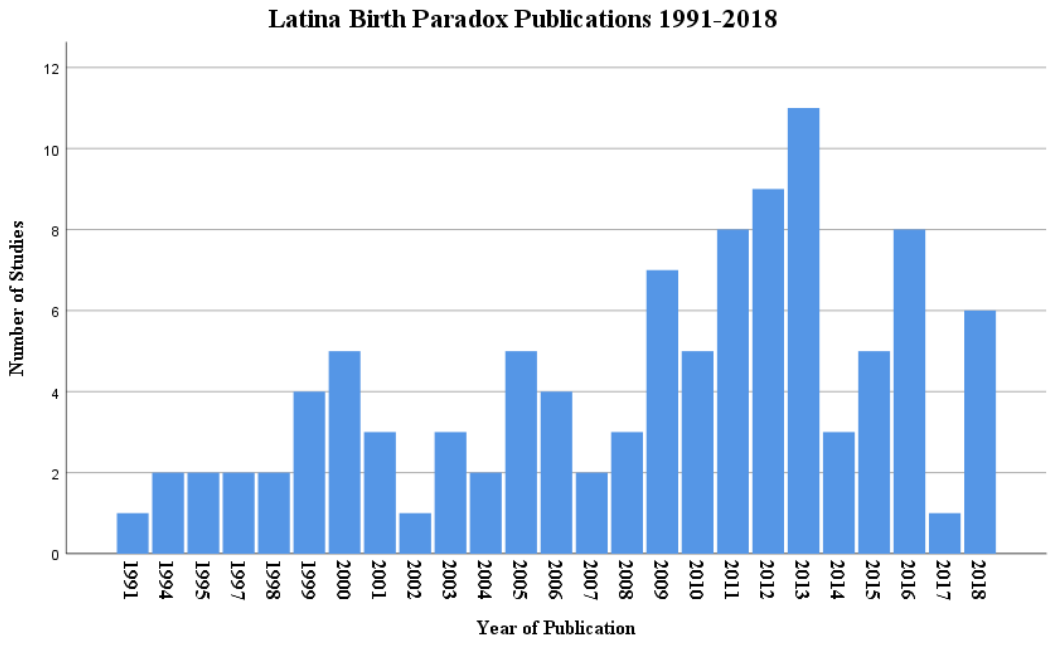

Figure 3: Years of Study Publication

The other benefit of utilizing a scoping review was incorporating the variation in study designs seen surrounding this topic. Being able to include studies with more than nine different designs allowed for a broader view of the research being conducted in this field.

Medicalized risk factors for adverse birth and infant outcomes and biologic mechanisms

Prenatal Care and Delivery

As a whole, Latina women generally receive less prenatal care and initiate care later during pregnancy compared to non-Hispanic white women, (McDonald, Suellentrop, Paulozzi, & Morrow, 2008;

Bromley, Nunes, & Phipps, 2012) a trend also seen when examining only Latina immigrant women (Gould, Madan, Qin, & Chavez, 2003; Frisbie & Song, 2003). There may be a cultural basis behind the decreased utilization of prenatal care, as shown by Callister and Vega, who state that the U.S. medicalizes pregnancy in a way not seen in Guatemala, where it is viewed as a normal physiological event (Callister & Vega, 1998). Women who believe pregnancy is a normal part of their life rather than a medical issue, may see less of a need for prenatal care visits (Callister & Vega, 1998). The underutilization of prenatal care could be due to a lack of available culturally competent care and failure to use intervention methods that appeal to recent immigrant women (Gaffney, 2000). One possibility for bridging this disparity may be integrating informal prenatal care networks into formal care, which could also function to preserve cultural knowledge and provide social support (McGlade, Saha, & Dahlstrom, 2004). However, in a sample that included non-Hispanic white, Asian, and Latina women, overall satisfaction with prenatal care was high (mean score of 3.50 out of 5) with higher average scores among women with low levels of acculturation, which implies that women who would be expected to have more cultural differences are generally satisfied with their prenatal care (Fuentes-Afflick, Odouli, Escobar, Stewart, & Hessol, 2014). Satisfaction with prenatal care in the aforementioned study involved measures including elimination of patient concerns and responsiveness, empowerment and self-care, explanations, patient-centered decision making, emotional support and reassurance, perceived discrimination, and respectfulness (Fuentes-Afflick, Odouli, Escobar, Stewart, & Hessol, 2014). As shown by the variety of these measures, the prenatal care experience is multifaceted, and satisfaction can be further influenced by the outcomes of the birth and the mother's expectations of what constitutes appropriate quality of care (Fuentes-Afflick, Odouli, Escobar, Stewart, & Hessol, 2014). For recent immigrant women, the informal interaction, quality of information, extent of the language barrier, and interest of healthcare workers may hold extra importance by serving as a proxy for the care they would have received from their families in their country of origin (Bender & Castro, 2000). Although prenatal care could play a role in determining birth

outcomes in Latina women, it is unlikely prenatal care would explain the paradox of why birth outcomes are better in Latinas, as they are using protective and preventative health care less.

Income plays a large role in determining prenatal care usage (Bromley, Nunes, & Phipps, 2012), with over half of Latina women relying on Medicaid to cover prenatal care and delivery costs (McDonald, Suellentrop, Paulozzi, & Morrow, 2008). Income, education, and insurance coverage can explain the disparity in initiation of prenatal care between Latina and non-Latina women, but not the rate of inadequate care (Bromley, Nunes, & Phipps, 2012). Inadequate prenatal care, such as receiving no care or only third-trimester care, may be a low birth weight risk factor (Gould, Madan, Qin, & Chavez, 2003). Immigrant farm workers are at a higher risk of not receiving adequate care, which may be due to access to information and care or transitory lifestyle (Maher, Lurie, Trafton, & Dozider, 2011). Adequate prenatal care must also remain cognizant of the individual risk factor profile of the mother (Schaaf, Liem, Mol, Abu-Hanna, & Ravelli, 2013).

Latina women may present with less risky prenatal health risk behaviors, such as smoking, (Gaffney, 2000; McDonald, Suellentrop, Paulozzi, & Morrow, 2008), but they also have a high burden of largely preventable conditions that could have been addressed with appropriate prenatal care (Guendelman, Thornton, Gould, & Hosang, 2006). For example, occurences of third and fourth degree lacerations, genitourinary infections, pre-eclampsia, and eclampsia are seen in about one in five deliveries to Mexican immigrant and Mexican American women (Guendelman, Thornton, Gould, & Hosang, 2006). Latina women also generally have a higher risk of nausea, gestational diabetes, kidney infection, bladder infection, incompetent cervix, and bleeding during delivery (McDonald, Suellentrop, Paulozzi, & Morrow, 2008). These high morbidity rates suggest Latina women are not exhibiting paradoxically good outcomes; the risk of not inadequate prenatal care is reflected in the outcomes.

A protective prenatal health behavior profile translates into a decreased risk of prematurity-related complications even after elective repeat cesarean sections (Vilchez, Chelliah, Bratley, Bahado-Singh, & Sokol, 2015). However, the most suitable timing of repeat cesarean sections is thought to be

different for Latinas and non-Hispanic whites, where the best cesarean outcomes happen at 39 weeks for non-Hispanic white women and 38 weeks for Latina women (Vilchez, Chelliah, Bratley, Bahado-Singh, & Sokol, 2015). The difference in appropriate timing may be due to a variation in the rate of fetal development and growth in Latinas (Vilchez, Chelliah, Bratley, Bahado-Singh, & Sokol, 2015). There seems to be a disparity in cesarean usage in the Latina population based on region of residence, where Latina women without private health insurance or a college degree living closer to the border were at a 276% increased risk of delivery by cesarean section, while women with the same risk factors living in non-border regions were only at a 43% increased risk (Morris, Gomez, Naiman-Sessions & Morton, 2018).

Latinas who conceive using in vitro fertilization have slightly increased rates of preterm birth compared to non-Hispanic white women, and there was no difference in number of fresh embryos transferred compared to non-Hispanic white women (Xiong, Pridjian, & Dickey, 2013).

Hypertension

The relationship between nativity, prevalence of hypertension, and ability of hypertension to predict birth weight in women with Mexican ancestry is inconclusive (Romero, Duke, Dabelea, Romero, & Ogden, 2012; Sanchez-Vaznaugh, Braveman, Egerter, Marchi, Heck, & Curtis, 2016; Gould, Madan, Qin, & Chavez, 2003). Latinas are less likely to be diagnosed with gestational hypertension than whites (Carr, Kershaw, Brown, Allen, & Small, 2013; Coonrod, Bay, & Balcazar, 2004; Salihu, Garces, Sharma, Kristensen, Ananth, & Kirby, 2005), although risk increases from singleton to twins (Salihu, Garces, Sharma, Kristensen, Ananth, & Kirby, 2005).

Gestational Diabetes

Gestational diabetes prevalence seems to be higher in Latinas than in their non-Hispanic white counterparts, (Sanchez-Vaznaugh, Braveman, Egerter, Marchi, Heck, & Curtis, 2016; McDonald,

Suellentrop, Paulozzi, & Morrow, 2008; Berggren, Boggess, Funk, & Stuebe, 2012), although this increase may not be significant after controlling for sociodemographic characteristics (McDonald, Suellentrop, Paulozzi, & Morrow, 2008). A similar increase in risk was also seen when looking specifically at the Latina immigrant population (Sanchez-Vaznaugh, Braveman, Egerter, Marchi, Heck, & Curtis, 2016) or the Mexican immigrant population (Romero, Duke, Dabelea, Romero, & Ogden, 2012; Braun, Huebschmann, Kim, Lezotte, Shupe, Dabelea, 2011). Yet, this increase may not be significant after controlling for sociodemographic characteristics (Braun, Huebschmann, Kim, Lezotte, Shupe, Dabelea, 2011). A study of individuals with gestational diabetes in Colorado reported a combined increase in gestational diabetes prevalence of about 6% per year between 1995-2004 in Mexican-born and US-born Latina women (Braun, Huebschmann, Kim, Lezotte, Shupe, Dabelea, 2011). Latinas are more likely than non-Hispanic white or non-Hispanic black women to be treated pharmacologically for gestational diabetes than by use of nutritional counseling and dietary management (Berggren, Boggess, Funk, & Stuebe, 2012). Physical activity during mid pregnancy was associated with a lower risk of having a small-for-gestational age infant in Puerto Rican women with gestational diabetes, which could also have ramifications for gestational diabetes management, (Gollenberg, Pekow, Bertone-Johnson, Freedson, Markenson, & Chasan-Taber, 2011) as gestational diabetes has been associated with a decreased risk of low birth weight (Gould, Madan, Qin, & Chavez, 2003). In adjusted analyses Latina women with gestational diabetes had less preterm births, low birth weight deliveries, and NICU admission than their non-Hispanic white counterparts, although they had increased prevalence of shoulder dystocia (Berggren, Boggess, Funk, & Stuebe, 2012). In a 2012 study comparing infants of Latina and non-Hispanic white women, infants of Latinas with glucose intolerance were more likely to exhibit neonatal hypoglycemia and hyperinsulinemia, infants of Latinas with untreated mild gestational diabetes had similar outcomes to non-Hispanic white infants, and infants of Latinas with mild treated gestational diabetes had elevated cord C-peptide (Berggren et al., 2012).

Biological Pathways

Multiple purely biological pathways have been proposed to explain the paradox, although few have been extensively tested or were mentioned in multiple studies. One such untested hypothesis introduces the idea that women from ancestries with high body fat percentages and low ability to synthesize Vitamin D have less of an inactive form of Vitamin D, 25-OH-D, which decreases their ability to carry a pregnancy to term (Ngueta, Ndjaboue, & Yepsi, 2018). Interleukin-10, which is a cytokine associated with regulating inflammation and preventing preterm birth, is another possible biological influencer (Wommack, Ruiz, Marti, Stowe, Brown, & Murphey, 2013). The researchers found low IL-10 levels predicted preterm birth in highly acculturated Latinas, leading them to conclude IL-10 may counterbalance higher levels of inflammation resulting from acculturation-related stress (Wommack, Ruiz, Marti, Stowe, Brown, & Murphey, 2013). Another biological pathway based on acculturation focuses on progesterone/estriol ratios and preterm birth (Ruiz et al., 2008). Progesterone and estriol hormones help to maintain a pregnancy full term, so women with low levels of progesterone and high levels of estriol are much more likely to deliver preterm, and women who are highly acculturated are more likely to present as such (Ruiz et al., 2008). Periodontal disease, which affects the mouth and gums and is caused by bacterial growth, has been proposed as another possible cause of the paradox due to the possibility it increases systemic inflammation that triggers a cascade of harmful reactions throughout the body that are reflected in birth outcomes (Xiong, Buekens, Vastardis, & Wu, 2006). One literature review suggested positive low birth weight profiles in Latinas mask how obesity and glucose intolerance can result in infants who are larger, but not necessarily healthier, and may be at a higher risk for diabetes, obesity, and other conditions later in life (Kieffer, 2000).

Genetics

Very few studies proposed a specific genetic explanation for the paradox. A proposed fetal programming framework has been used to argue that susceptibility in health is a combination of genetics

and environment, where the environment should be perceived as beginning during the fetal period (Fox, Entringer, Buss, DeHaene, & Wadhwa, 2015). A 2013 systematic review and meta-analysis added to this perspective of the paradox by stating their belief in the importance of epigenetics in explaining the paradox (Schaaf, Liem, Mol, Abu-Hanna, & Ravelli, 2013). A genetic variant making metabolizing folate more difficult in Mexican women was mentioned briefly but not discussed in other articles, which would be expected to be detrimental to birth outcomes (Bernosky de Flores, 2010).

Diet

Latinas describe a healthy diet as vital to ensuring positive birth outcomes, and categorize a healthy diet as containing a large amount of fresh fruit and vegetables (Bender & Castro, 2000; Hopkins, Yeoman, & Ritenbaugh, 2018; Bernosky de Flores, 2010). Nonetheless, maintenance of a healthy diet during pregnancy varies by a multitude of factors, such as nativity and country of origin. Women from Puerto Rico were more likely to have higher intake of fat, soft drinks, and sweet baked goods, as well as low vegetable, fiber, and dietary folate intake (Hromi-Fiedler, Bermúdez-Millán, Segura-Pérez,, & Pérez-Escamilla, 2012). Latinas who were not from Puerto Rico were more likely to have an overall healthy diet, even though they consumed high levels of carbohydrates, fruits, non-starchy vegetables, and sugar-sweetened products and had lower levels of vitamin B12 (Hromi-Fiedler, Bermúdez-Millán, Segura-Pérez,, & Pérez-Escamilla, 2012). The diets of women from Puerto Rico also varied with education, where college educated women were twice as likely to consume enough fruits and vegetables and less likely to smoke, which was independently associated with decreased likelihood of meeting fruit and vegetable guidelines (Gollenberg, Pekow, Merkenson, Tucker, & Chasan-Taber, 2008). A 2018 study examined the role of acculturation in the perception of what constitutes a healthy diet and found little difference between those who were interviewed in Spanish, a proxy measure of lower acculturation, and those who were interviewed in English (Hopkins, Yeoman, & Ritenbaugh, 2018). Both groups felt cooking at home and eating minimal amounts of processed food were important to a healthy diet during

pregnancy (Hopkins, Yeoman, & Ritenbaugh, 2018). The difference in ability to purchase local and organic foods, which are cheaper in Latin America, and processed foods, which are cheaper in the U.S., plays a role in dietary decisions (Hopkins, Yeoman, & Ritenbaugh, 2018). Using the special supplemental nutrition program for women, infants, and children (WIC) during pregnancy to increase access to healthy foods was associated with decreased odds of lower birth weight in U.S. born Mexican women (Sparks, 2009). Social support, family structure, knowledge, preferences, self-efficacy, maternal health status, and health outcome expectancies also affect fruit and vegetable intake (Hromi-Fiedler et al., 2016). Family support during pregnancy was important for increasing food related knowledge, helping with preparation, encouraging healthy eating, and providing financial assistance (Hromi-Fiedler et al., 2016). Diet also has an important postpartum role, as Mexican women eat special foods prepared by their families to recover (Bender & Castro, 2000), and Guatemalan women consume herbal teas for pain management and special foods such as chicken soup and bananas (Callister & Vega, 1998). Supplementation of diet with vitamins both pre- and postpartum generally only occurred if prescribed (Bender & Castro, 2000; Bernosky de Flores, 2010), which may be due to a lack of knowledge about why supplements such as folic acid are important during pregnancy (Bernosky de Flores, 2010).

Causes of Infant Mortality

From 1989-1991, the leading causes of infant death were similar between Mexican, Puerto Rican, Central and South American, or other Latina and non-Hispanic white women, and congenital abnormalities, SIDS, prematurity related conditions, and other infections remained in the top four causes of death (Forbes, Frisbie, Hummer, Pullum, & Echevarria, 2000). These causes of death were confirmed by another study, although they found respiratory distress syndrome to be among the four leading causes of death rather than infections (Pastore & MacDorman, 1995). Public health efforts and interventions have developed for some of these causes, including congenital abnormalities, respiratory distress syndrome and sudden infant death syndrome (Frisbie, Hummer, Powers, Song, & Pullum, 2010). One

study compared the rates before and after these public health interventions, and then compared the rates to outcomes without public health interventions, namely disorders relating to short gestation and unspecified low birth weight, and maternal complications (Frisbie, Hummer, Powers, Song, & Pullum, 2010). They found the outcomes with public health interventions showed decreased rates in non-Hispanic white infants, and this improvement was also reflected in decreases in U.S. born Mexican American rates (Frisbie, Hummer, Powers, Song, & Pullum, 2010). The outcomes without interventions remained the same or increased in rates in all ethnic groups studied (Frisbie, Hummer, Powers, Song, & Pullum, 2010). One example of congenital abnormalities are abdominal wall defects, of which the infants of U.S. born Mexican mothers are at a much higher risk compared to their immigrant counterparts (Hibbs, Bennett, Castro, Rankin, & Collins, 2016). Gastroschisis is one such abdominal wall defect, and has higher overall rates in Latinas (Khodr, Lupo, Canfield, Chan, Cai, & Mitchell, 2013). Despite the similarities in infant cause of death, infant risk of mortality based on intrauterine growth restriction, preterm status, and birth weight was dependent on ethnic origin (Forbes, Frisbie, Hummer, Pullum, & Echevarria, 2000). For example, the highest proportion of deaths in Mexican infants happened in the normal risk strata, while the highest proportion of deaths among Puerto Rican infants occurred in the highest risk group (Forbes, Frisbie, Hummer, Pullum, & Echevarria, 2000). The role of infectious diseases in infant mortality was also examined; in infants of normal birth weight, the odds of infectious disease playing a role in unexplained death is lower in Latinas, although this association was not significant in low birth weight infants (Taylor, Holman, Callinan, Zaki, & Blau, 2013).

Environmental risk factors for adverse birth and infant outcomes and community context

Community Context and Environment

In the five studies examining effect of the ethnic and racial makeup of communities on birth outcomes, education level was included in all studies and income was included in all but one study.

Interestingly, most of these studies focused on Mexican women exclusively. Studies that examined community context in terms of Hispanic population density found infant mortality decreased as density increased (Shaw & Pickett, 2013; Jenny, Schoendorf, & Parker, 2001) although the protective effect may be dependent on the nativity of the population. For example, living in an area with a high exposure to U.S. born Hispanics as well as high exposure to poverty is associated with higher levels of low birth weight, but this effect is only seen in U.S. born Hispanic mothers (Osypuk, Bates, & Acevedo-Garcia, 2010; Collins & Shay, 1994). Immigrant mothers seem to be immune to these risk factors which have an effect on their U.S. born counterparts (Osypuk, Bates, & Acevedo-Garcia, 2010; Collins & Shay, 1994). However, one study worth noting found contradicting results, where infant mortality increased as immigrant concentration increased, regardless of nativity (DeCamp, Choi, Fuentes-Afflick, & Sastry, 2015).

The role of community level environmental factors in birth outcomes were largely unexamined in this sample of studies. Air quality was only measured by one study. Nianogo and Okunade investigated regional differences in health as a cause for differing health outcomes, using county data to compare a number of environmental measures, including unhealthy air quality days in southern and northeastern states according to ozone and fine particulate matter. The relationship of these measures were not explicitly discussed as they related to birth outcomes (Nianogo & Okunade, 2015).

Residence Within the US/Mexico Border Region

One study examined the border region to determine whether out-migration of mothers after birth could be artificially decreasing the infant mortality rate and thus causing the appearance of a paradox, although this hypothesis was not supported (Hummer, Powers, Pullum, Gossman, & Frisbie, 2007). The change in cesarean section rates based on residence within the border region was mentioned in the *Prenatal Care and Delivery* section. A qualitative study on stress and pregnancy was conducted using a sample of women living only in the border regions, and is discussed in the *Psychological* section (Fleuriet

& Sunil, 2017). Latina women living in the border region are thought to be a unique subsection of the population due to the status of the region as a political battleground as well as the higher concentration of recent immigrants residing there (Morris, Gomez, Naiman-Sessions, & Morton, 2018; Fleuriet & Sunil, 2017).

Psychological risk factors for adverse birth and infant outcomes and stress levels

Cultural Meaning Behind Pregnancy

A woman's physiologic responses during pregnancy can vary greatly based on psychological factors. If Latina women associate pregnancy with positive emotions, their belief that pregnancy is a positive experience could decrease stress; the reduced stress levels could then contribute to better birth outcomes. For example, although Guatemalan women viewed their pregnancies as gifts from God, some of them reported being unhappy when they found out they were pregnant due to the financial and emotional strain of caring for another child (Callister & Vega, 1998). Nativity seems to play a role, as US-born Mexican women were similar to those who had immigrated 10+ years ago in that they were more likely to feel ambivalent, stressed out, and put little emphasis on the importance of support for the mother during pregnancy (Fleuriet & Sunil, 2017). Mexican immigrant women were more likely than US-born Mexican women to see pregnancy as socially valuable and as a means to receive privilege (Fleuriet & Sunil, 2017). A study of Mexican women living near the border in Texas found the implications of pregnancy changed based on length of time living in the U.S. (Fleuriet & Sunil, 2017). Recent immigrants viewed pregnancy as a blessing and a time of increased family support and bonding, but as time spent in the United States increased, stress and worry associated with pregnancy increased (Fleuriet & Sunil, 2017). Family support was also rated as less important during pregnancy as time spent in the United States increased (Fleuriet & Sunil, 2017). It has been hypothesized the meaning behind pregnancy and the role of stress within its confines affect birth weight (Fleuriet & Sunil, 2017). For example, Latina

culture puts an emphasis on avoiding as many stressful events as possible during pregnancy to protect the baby (Bernosky de Flores, 2010; Bender & Castro, 2000). Advice was also given to avoid eclipses during pregnancy, another interesting example of the role of cultural beliefs (Callister & Vega, 1998; Bender & Castro, 2000).

Subjective Social Status

Subjective social status describes how someone views their status compared to others in their community, and is thought to change uniquely with pregnancy and therefore affect birth outcomes (Fleuriet & Sunil, 2018). Fleuriet and Sunil hypothesized if pregnancy was viewed as a positive experience in women born in Mexico, becoming a parent would result in feelings of pride and increased subjective social status (Fleuriet & Sunil, 2018). When comparing Mexican women who were and were not pregnant, the researchers found pregnancy seemed to improve subjective social status, although the increase in subjective social status was larger for US- born women (Fleuriet & Sunil, 2018). Pregnant women also had lower levels of depressive symptoms regardless of nativity, although only among immigrant women was being a parent associated with an overall stronger psychosocial health profile (Fleuriet & Sunil, 2018). Only one study examined how subjective social status affected birth outcomes directly; they believed the interaction between anxiety, stress, and depression interacted with subjective social status to affect birth weights more than just subjective social status alone (Fleuriet & Sunil, 2015).

One other stressor that could be impacting birth outcomes in Latinas is discrimination (Bernosky de Flores, 2010; Nianogo & Okunade, 2015; Bender & Castro, 2000), higher levels of abuse (Velasco-Mondragon, Jimenez, Palladino-Davis, Davis, & Escamilla-Cejudo, 2016; McDonald, Suellentrop, Paulozzi, & Morrow, 2008) and cultural marginalization (Chaponniere, 2016).

Stress and Mental Illness

The role of mental illness in birth outcomes for Latina women was only briefly discussed in each of six studies, although anxiety, depression, post traumatic stress disorder, and schizophrenia were associated with higher risk of severe obstetric events, including preeclampsia, gestational diabetes, chorioamnionitis, pyelonephritis, placental abruption, and preterm labor (Brown, Small, Taylor, Chireau, & Howard, 2011).

The effectiveness of the measures being used for stress has been questioned by K. Gaffney, who saw a discrepancy between the low number of stressful life events in pregnant Central American women and the opinions of the public health nurses providing their care, who believed these women had higher stress levels than were being captured by surveys (Gaffney, 2000). Gaffney's sample included low income immigrant women who had been in the U.S. for about 3.5 years after arriving in the U.S. from Honduras, El Salvador, Guatemala, and Nicaragua (Gaffney, 2000). The low birth weight rate of the sample was also higher than would have been expected according to prenatal risk and stressful event scores, and was much closer to the rate seen in non-Hispanic black mothers (Gaffney, 2000). This led Gaffney to suggest the benefits of discovering how to evaluate stress specifically related to the experience and stress of immigration (Gaffney, 2000). In addition, looking at number of stressful life events may not be as effective as examining how pervasive the stressor is in everyday life (Gaffney, 2000).

Social risk factors for adverse birth and infant outcomes and social support

Social Support

Familisimo, a term that describes the importance and centrality of family in Latina culture, exemplifies the strong social support networks Latinas are believed to benefit from (Velasco-Mondragon, Jimenez, Palladino-Davis, Davis, & Escamilla-Cejudo, 2016; Franzini, Ribble, & Keddie, 2001). These strong social support networks in Latina women have been proposed as contributing to the paradoxically better birth outcomes. A low quantity of people in one’s social support network was associated with

increased low birth weight (Dyer, Hunter, & Murphy, 2011), although using only quantity as a measure of a network seems to leave out important measure of quality and context (Almeida, Mulready-Ward, Bettegowda, & Ahluwalia, 2014). Fathers were referred to as being a vital provider of social support (Hopkins, Yeoman, & Ritenbaugh, 2018; Bender & Castro, 2000; Dyer, Hunter, & Murphy, 2011; Ngui, Cortright, & Blair, 2009), especially for women who had a small network (Dyer, Hunter, & Murphy, 2011). This was further supported by the increase of low birth weight with the number of single parent households in the southern U.S (Nianogo & Okunade, 2015). Marital status was often used as a control in studies (see Appendix B); for Latina women, being unmarried without a child's father on the birth certificate was associated with the highest risk of low birth weight and preterm birth, followed by those who had court-established paternity (Ngui, Cortright, & Blair, 2009). The researchers suggest having to go to a court to establish paternity may reflect a lack of support from the child's father financially and emotionally (Ngui, Cortright, & Blair, 2009). Latina mothers are believed to be vital supports during their daughters' pregnancy, both by providing them with valuable pregnancy-related information and by taking care of them during the pregnancy and postpartum periods (Bender & Castro, 2000; Hopkins, Yeoman, & Ritenbaugh, 2018). Daughters who were first generation immigrants reported missing the social support of their own mothers during pregnancy (Bender & Castro, 2000; Hopkins, Yeoman, & Ritenbaugh, 2018). However, not all immigrant women felt this way; one qualitative study found the desired level of social support during pregnancy seemed to have less to do with pregnancy risk, number and kind of family nearby, support offered, or economic status and more to do with the what pregnancy meant to each individual and their previous life experiences (Fleuriet, 2009). For women who relied on the emotional support of their mothers but were geographically distant, engagement with doctors and clinic staff helped to bridge part of the gap of social support (Bender & Castro, 2000). Having an emotionally close relationship with one's mother was protective against low birth weight and infant mortality, however, having a mother who was physically but not emotionally close increased risk of these outcomes (Scelza, 2011).

The role of acculturation in dictating the availability and size of social support networks has also been examined as a possible explanation of why women with high levels of acculturation have worse outcomes than low acculturation women (Franzini, Ribble, & Keddie, 2001). The role of familismo, as mentioned above, could weaken or change with acculturation to American culture (Velasco-Mondragon, Jimenez, Palladino-Davis, Davis, & Escamilla-Cejudo, 2016; Franzini, Ribble, & Keddie, 2001). In holding with this idea, women who have low levels of acculturation report more social and tangible support (Chaponniere, 2016). The change in relationships across subsequent immigrant generations is not guaranteed to be negative (Viruell-Fuentes & Schulz, 2009). For example, first generation women often have to rely heavily on transnational relationships, and report relying on a small but sufficient network, although feelings of isolation were common and amplified by whether or not they were documented (Viruell-Fuentes & Schulz, 2009). Second generation women were able to access larger networks due to their familiarity with the language and culture while maintaining identity with the support of family and friends with the same background (Viruell-Fuentes & Schulz, 2009). Intermarriage, defined as a Hispanic woman marrying a non-Hispanic man, was used by Giuntella as an example of a change in available social networks and of acculturation (Giuntella, 2016). The second generation women in her study who intermarried often showed better socioeconomic characteristics, such as living in a better neighborhood or having higher levels of education, although both their children and grandchildren were at higher risk of being low birth weight (Giuntella, 2016).

Religion

Religion is another facet of the social support in Latino communities, both in terms of feeling support from God and in providing a community (Magaña & Clark, 1995). This emphasis was shown by a qualitative study where a recent immigrant described buying a framed picture of the Last Supper as soon as her family had saved enough money (Bender & Castro, 2000). Religious beliefs seem to be exceptionally influential during pregnancy and childbirth, as God is seen as not only giving the gift of

pregnancy, but also as able to dictate whether the pregnancy is healthy or not (Callister & Vega, 1998; Magaña & Clark, 1995). The Virgin of Guadalupe, a mother herself and patron saint of Mexico, is a very important central figure in Mexican culture as it relates to motherhood and pregnancy (Magaña & Clark, 1995). Religion is hypothesized to improve birth outcomes by encouraging positive health behaviors such as avoiding smoking; providing strength, comfort, and meaning to life; and creating a social network of women who share similar values and can provide trusted knowledge about childbirth (Magaña & Clark, 1995). The use of spirituality as a coping mechanism during pregnancy was associated with longer gestations and higher birth weight (Chaponniere, 2016).

Acculturation

Another dimension of the birth paradox is focused on comparing Latinas with low levels of acculturation to their counterparts with high levels of acculturation. Low acculturation is associated with better birth outcomes as marked by longer gestations and/or higher birth weights (Chaponniere, 2016; Ruiz, Saade, Brown, Nelson-Becker, Tan, Bishop, & Bukowski, 2008; Giuntella, 2016; Franzini, Ribble, & Keddie, 2001; Coonrod, Bay, Balcazar, 2004; Hoggatt, Flores, Solorio, Wilhelm, & Ritz, 2012). In addition, the risk of gastroschisis, a birth defect where the intestines of the baby are formed outside of the body (Centers for Disease Control and Prevention, 2017), was also lower in less acculturated Latinas who were older than 20 at the time of delivery (Khodr, Lupo, Canfield, Chan, Cai, & Mitchell, 2013). A study of obstetric outcomes and risk factor profiles also found lower rates of deliveries resulting in cesarean sections and less use of epidural anesthesia in women with lower levels of acculturation (Coonrod, Bay, & Balcazar, 2004).

A portion of the studies focused on acculturation looked at possible mediating factors for this trend, including the difference between risk factor profiles in high and low acculturation groups of women. As mentioned previously, the estriol-progesterone ratio has been proposed as one mediating link between acculturation and birth outcomes, where lower progesterone and higher estriol is associated with

increased risk of preterm birth (Ruiz, Saade, Brown, Nelson-Becker, Tan, Bishop, & Bukowski, 2008). Foreign-born status, low English proficiency, and residence in the U.S. for less than 10 years were associated with more favorable ratios, and women with more favorable ratios had a lower likelihood of preterm birth (Ruiz, Saade, Brown, Nelson-Becker, Tan, Bishop, & Bukowski, 2008). The variation in estrogen levels by ethnic groups and acculturation status has been posited as an explanation for gastroschisis risk (Khodr, Lupo, Canfield, Chan, Cai, & Mitchell, 2013) and a contributor to fetal programming (Fox, Entringer, Buss, DeHaene, & Wadhwa, 2015). Another biological predictor of preterm birth that shows variation with acculturation, Interleukin-10 (IL-10), is also thought to have a possible link to the estrogen progesterone ratio, as progesterone is able to regulate IL-10 production (Wommack, Ruiz, Marti, Stowe, Brown, & Murphey, 2013). IL-10 is an anti-inflammatory cytokine thought to help prevent preterm birth, and the interaction between IL-10, and both years spent in the U.S. and being born in the U.S. can be predictive of preterm birth, especially in highly acculturated women (Wommack, Ruiz, Marti, Stowe, Brown, & Murphey, 2013). Wommack et al. suggest IL-10 may be more important in preventing highly acculturated women from preterm birth, possibly due to inflammation stemming from acculturative stress (Wommack, Ruiz, Marti, Stowe, Brown, & Murphey, 2013).

Differences in health related behaviors related to acculturation have also been proposed as a mediating factor. Both in the U.S. and the United Kingdom, being foreign born is associated with more positive maternal health behaviors (Jackson, McLanahan, & Kiernan, 2012). Pregnant Latinas with low levels of acculturation often use less tobacco, alcohol, and illicit drugs than their highly acculturated counterparts (Fuller et al., 2009; de la Rosa, 2002; Kasirye et al., 2005; Gollenberg, Pekow, Merkenson, Tucker, & Chasan-Taber, 2008; Velasco-Mondragon, Jimenez, Palladino-Davis, Davis, & Escamilla-Cejudo, 2016). Positive dietary behaviors such as an emphasis on home-cooked meals (Hopkins, Yeoman, & Ritenbaugh, 2018) and the limitation of processed or fast foods (Hopkins, Yeoman, & Ritenbaugh, 2018; Kasirye, et al., 2005) may also fade with acculturation. Social support, including marriage (Giuntella, 2016), resilience (Giuntella, 2016; Bender & Castro, 2000), and close familial bonds

(de la Rosa, 2002; Franzini, Ribble, & Keddie, 2001) are also proposed explanations for behaviors that may change with acculturation. One study discussed the increased stress seen in marginalized women, who were described as feeling isolated from both Mexican and non-Hispanic white cultures, and linked this to being at higher risk for negative birth outcomes, an idea which was not discussed in other papers (Chaponniere, 2016). The country of origin of the mother may also have an effect on how acculturation alters birth outcomes; one study found that in the second generation, Mexican and Cuban women have better outcomes than non-Hispanic white women, while Puerto Rican women have worse birth outcomes than non-Hispanic white women, and only Mexican women retain a slight advantage in the third generation (Giuntella, 2016). However, acculturation and the pathways traditionally associated with it, such as diet, smoking, and stress, do not always fully explain differences in birth outcomes (Ceballos & Palloni, 2010).

Fox et al. stated a dissatisfaction with the current state of acculturation related research, claiming the current paradigm is not appropriate to compare the experiences of both first generation and second generation immigrants, as second generation natives are not necessarily adjusting to a new culture (Fox, Entringer, Buss, DeHaene, & Wadhwa, 2015). They argued the effects of acculturation through behavioral, psychosocial, and biophysical pathways in the first generation are passed on through fetal programming and exert a larger negative effect on subsequent generations (Fox, Entringer, Buss, DeHaene, & Wadhwa, 2015). Other authors also expressed dissatisfaction with the acculturation hypothesis to explain the entirety of the paradox, and suggest supplementary research on other possible channels (Ceballos, 2011; Franzini, Ribble, & Keddie, 2001). There was also a difference in the studies on how acculturation was measured, varying from nativity to language preference to years spent in the U.S.. For example, measuring only duration among the foreign born (Ceballos & Palloni, 2010) or nativity (Hoggatt, Flores, Solorio, Wilhelm, & Ritz, 2012) yields different results than an acculturation scale using measures including language and self-reported ethnic identity.

Education

Low levels of education in Latinas is not a factor that would explain the mechanisms behind the paradox, but rather an example of what is believed to make positive birth outcomes paradoxical. Latina mothers generally have lower educational achievement than their non-Hispanic white counterparts (Acevedo-Garcia, Soobader, & Berkman, 2007; Sanchez-Vaznaugh, Braveman, Egerter, Marchi, Heck, & Curtis, 2016; Frisbie & Song, 2003; McDonald, Suellentrop, Paulozzi, & Morrow, 2008). This trend in education is amplified when Latinas are categorized by their nativity status, which shows immigrant women have lower levels of education compared to U.S. born Latinas (Acevedo-Garcia, Soobader, & Berkman, 2007; Sanchez-Vaznaugh, Braveman, Egerter, Marchi, Heck, & Curtis, 2016). Part of the disparity in education among immigrant Latinas could come from the barriers to education for women in Latin American countries, such as in Mexico where educating girls is often not a priority (Bender & Castro, 2000). The way the educational disparity manifests in birth outcomes seems to be different in immigrant and U.S. born Latinas; for U.S. born Latinas, as education increases, low birth weight decreases (Acevedo-Garcia, Soobader, & Berkman, 2007; Acevedo-Garcia, Soobader, & Berkman, 2005). However, for immigrant women, low educational status does not increase the risk of low birth weight; there seems to be no association between education and low birth weight in this population (Acevedo-Garcia, Soobader, & Berkman, 2007; Acevedo-Garcia, Soobader, & Berkman, 2005). In fact, the protective benefit that seems to come from being an immigrant is more pronounced among women with low education (Acevedo-Garcia, Soobader, & Berkman, 2007; Acevedo-Garcia, Soobader, & Berkman, 2005). Researchers have hypothesized this unexpected effect could be due to a difference in educational stratification in these women's countries of origin (Acevedo-Garcia, Soobader, & Berkman, 2007; Acevedo-Garcia, Soobader, & Berkman, 2005). The belief in the ability of education to accurately predict socioeconomic status accurately in this population is under dispute (Nepomnyaschy, 2009; Sanchez-Vaznaugh, Braveman, Egerter, Marchi, Heck, & Curtis, 2016). The desire for better educational opportunities for one's children and the importance placed on learning English hint at the changes

between the first and second generations in educational access (Bernosky de Flores, 2010; Bender & Castro, 2000).

Income

Another common measure of socioeconomic status is income. Similar to education, the exposure to neighborhood poverty seems to have less of an effect on the low birth rates of foreign born women than on their U.S. born counterparts (Osypuk, Bates, & Acevedo-Garcia, 2010; Collins & Shay, 1994). A study on urban poverty found that although Latina mothers have high levels of poverty, the neighborhoods they lived in were often not the ones categorized as being poor based on percentage of families below the federal poverty level (Collins & Shay, 1994). This could support the paradox, as despite individual poverty, Latina women do not live in impoverished neighborhoods where residents would be less likely to have access to health-related resources (Collins & Shay, 1994). Individual poverty is often higher in Latinas, especially immigrant women (Sanchez-Vaznaugh, Braveman, Egerter, Marchi, Heck, & Curtis, 2016; Velasco-Mondragon, Jimenez, Palladino-Davis, Davis, & Escamilla-Cejudo, 2016; McDonald, Suellentrop, Paulozzi, & Morrow, 2008). They are also more likely to have lower value homes and less likely to have any financial investments (Nepomnyaschy, 2009). The relatively minimal role of individual financial status on Latina health outcomes is supported by the documented lack of effect of poverty on maternal mortality (Brown, Chireau, Jallah, & Howard, 2007) and low birth weight (Nianogo & Okunade, 2015), although not all studies have come to the same conclusion (Sanchez-Vaznaugh, Braveman, Egerter, Marchi, Heck, & Curtis, 2016; Nepomnyaschy, 2009).

Many studies looked at how income relates to factors that could contribute to the paradox. For example, comparatively higher salaries contribute to a feeling of being better able to afford food in the U.S. (Bender & Castro, 2000). Women viewed fruits and vegetables as expensive, and for low-income women, access largely depended on the Special Supplemental Nutrition Program (SNAP) for Women, Infants, and Children (WIC) (Hromi-Fiedler, Chapman, Segura-Pérez, Damio, Clark, Martinez, & Pérez-

Escamilla, 2016). Heightened reliance on family for social support to manage and reduce financial stress during pregnancy (Bernosky de Flores, 2010; Bender & Castro, 2000; Hopkins, Yeoman, & Ritenbaugh, 2018) may also change with acculturation. The role of financial on health outcomes may be subtle; Latina women who appeared to be healthy and had few pre-existing conditions but were financially disadvantaged had higher rates of severe maternal morbidities that almost resulted in death, such as cardiac or renal failure, stroke, and postpartum hemorrhage (Brown, Small, Taylor, Chireau, & Howard, 2011). Of this association between financial standing and near miss morbidity, Brown et al. said sociocultural factors may exert a large impact on the outcome after a complication arises (Brown, Small, Taylor, Chireau, & Howard, 2011). However, income alone is still likely not enough to explain the paradox in Latinas (Mendoza & Fuentes-Afflick, 1999).

Insurance

Latinas on a whole are less likely to have any insurance, especially private insurance (Sanchez-Vaznaugh, Braveman, Egerter, Marchi, Heck, & Curtis, 2016; Gould, Madan, Qin, & Chavez, 2003; Franzini, Ribble, & Keddie, 2001; Velasco-Mondragon, Jimenez, Palladino-Davis, Davis, & Escamilla-Cejudo, 2016; McDonald, Suellentrop, Paulozzi, & Morrow, 2008). One study found foreign-born Mexican mothers who paid for their delivery with Medi-Cal to be at a higher risk of low birth weight compared to those with private insurance (Gould, Madan, Qin, & Chavez, 2003). Insurance could affect prenatal care experience and reflect differences in expectations among more socially vulnerable, publicly insured women and their privately insured counterparts (Fuentes-Afflick, Odouli, Escobar, Stewart, & Hessol, 2014). The effects of the Affordable Care Act and enhanced Medicaid perinatal care on birth outcomes are yet to be determined (Velasco-Mondragon, Jimenez, Palladino-Davis, Davis, & Escamilla-Cejudo, 2016).

Immigration and Country of Origin

A number of studies focused almost exclusively on the difference in prevalence of birth outcomes between immigrant and non-immigrant mothers and among immigrant women from different countries of origin to determine whether which subgroups of women exhibited the paradox. Latina women have similar rates of very and moderately low birth weight to non-Hispanic white women (Fuentes-Afflick, Hessol, & Pérez-Stable, 1999; Fuentes-Afflick & Lurie, 1997; Sparks, 2009). Part of the birth weight advantage seen in Latinas may be due to differences in birth weight distribution; even at the same gestational age, non-Hispanic white women generally have the heaviest babies, followed by Latina women, while non-Hispanic black women have the lowest average birth weights (Chung, Boscardin, Garite, Lagrew, & Porto, 2003). Differences in the birth weight distribution as an explanation for low levels of low birth weight were dismissed by other studies who stated there was not a large enough difference in the birth weight distributions between Latinas and non-Hispanic whites for the explanation to be viable (Frisbie, 1994; Buekens, Notzon, Kotelchuck, & Wilcox, 2000). Yet, one study has reported that Latinas have higher preterm birth than non-Hispanic white women, although the infant mortality rate of preterm birth infants is similar to that of non-Hispanic white women (Pastore & MacDorman, 1995). Latinas have an especially low post-neonatal infant mortality rate, which suggests home environment plays a role in infant mortality after 28 days of life (Chen, Chauhan, Rankins, Ananth, Siddiqui, & Vintzileos, 2013).

A study in Utah utilized the live birth records of 13,208 undocumented and 18,719 documented Latinas, and found both groups had similar rates of low birth weight, preterm birth, and small for gestational age (Flores, Simonsen, Manuck, Dyer, & Turok, 2012). Documentation was determined by whether or not the mother had a social security number (Flores, Simonsen, Manuck, Dyer, & Turok, 2012).

Puerto Rican women do not seem to show the same protective factors against preterm birth (Cervantes, Keith, Wyshak, 1999; Frisbie, Forbes, & Hummer, 1998; Stein, Savitz, Janevic, Ananth, Kaufman, Herring, & Engel, 2009; DeSisto & McDonald, 2018) and low or moderately low birth weight (Cervantes, Keith, & Wyshak, 1999; Fuentes-Afflick, Hessol, & Pérez-Stable, 1999; Rosenberg, Raggio, & Chiasson, 2005; Becerra, Hogue, Atrash, & Pérez, 1991; Fuentes-Afflick & Lurie, 1997; Frisbie, Forbes, & Hummer, 1998; DeSisto & McDonald, 2018) as other Latina subgroups. They also exhibit higher rates of infant mortality (Becerra, Hogue, Atrash, & Pérez, 1991; Pastore & MacDorman, 1995; Frisbie, Forbes, & Hummer, 1998), even at normal birth weight (Pastore & MacDorman, 1995).

Cumulatively, immigrant Mexican women often have higher exposures to factors that normally contribute to negative birth outcomes, but their low birth weight (Fuentes-Afflick & Lurie, 1997; Cervantes, Keith, & Wyshak, 1999; Fishman, Morgan, & Hummer, 2018) and preterm birth rates (Cervantes, Keith, & Wyshak, 1999) remain better than or similar to those of U.S. born non-Hispanic white women, as do their infant mortality rates (Pastore & MacDorman, 1995). Being a standard deviation above the gestationally appropriate weight is a risk factor for infant mortality in Mexican women (Powers, Frisbie, Hummer, Pullum, & Solis, 2006). Mexican women also have postneonatal mortality rates similar to non-Hispanic white women (Becerra, Hogue, Atrash, & Pérez, 1991; Pastore & MacDorman, 1995; Powers, Frisbie, Hummer, Pullum, & Solis, 2006), although some suggest this should be attributed to underreporting due to a relatively high rate of Mexican women who deliver outside of hospitals (Becerra, Hogue, Atrash, & Pérez, 1991). The advantage seen in infant mortality also seems to disappear with increased maternal age (Powers, 2016), where foreign born Mexican mothers have disadvantaged outcomes compared to non-Hispanic white women starting at age 29, and U.S. born Mexican mothers disadvantage starts at age 24 (Powers, 2013). In addition, from 1989-2006, infant mortality among Mexican women seems to have increased relative to non-Hispanic white women, which brings the idea of an advantage into question (El-Sayed, Paczkowski, March, & Galea, 2014). Women who lived in Mexico during delivery had lower levels of preterm birth and low birth weight than those

who immigrated to the U.S., which the researchers believe suggests there are migration-related factors affecting birth outcomes (Hessol & Fuentes-Afflick, 2014).

In a study conducted in Miami, Florida, where the Latina sample consisted mainly of Caribbean, Central American, and South American origin women, Latinas retained a lower rate of preterm birth and low birth weight than non-Hispanic white women (González-Quintero, Tolaymat, Luke, González-García, Duthely, O'Sullivan, & Martin, 2006). Caribbean and Central American women have a higher rate of small for gestational age infants compared to non-Hispanic white women (Stein, Savitz, Janevic, Ananth, Kaufman, Herring, & Engel, 2009). Although, when Central and South American women are separated out from Latinas of other origins, they have been shown to alternately have higher levels of moderately low birth weight than non-Hispanic white women (Fuentes-Afflick, Hessol, & Pérez-Stable, 1999), or similar low birth weight rates to non-Hispanic white women (Pastore & MacDorman, 1995; Fuentes-Afflick & Lurie, 1997).

Ecuadorians have relatively low rates of low birth weight and preterm birth (Rosenberg, Raggio, & Chiasson, 2005; DeSisto & McDonald, 2018). Colombians have low rates of low birth weight (Rosenberg, Raggio, & Chiasson, 2005) and similar risk of small for gestational age infants as non-Hispanic white women (Stein, Savitz, Janevic, Ananth, Kaufman, Herring, & Engel, 2009). Cubans have low rates of low birth weight (Becerra, Hogue, Atrash, & Pérez, 1991; Fuentes-Afflick & Lurie, 1997; Frisbie, Forbes, & Hummer, 1998), preterm birth (DeSisto & McDonald, 2018), and infant mortality (Becerra, Hogue, Atrash, & Pérez, 1991; Pastore & MacDorman, 1995; Frisbie, Forbes & Hummer, 1998).

Changes in birth outcomes between Latinas from different countries have been suggested to be due to degree of African ancestry, which leads to darker skin, and is therefore accompanied by racism and discrimination that leads to differences in birth outcomes (Stein, Savitz, Janevic, Ananth, Kaufman, Herring, & Engel, 2009). This was not directly investigated in any of the studies in this scoping review.

Foreign born Latina women have better low birth weight (Flores, Simonsen, Manuck, Dyer, & Turok, 2012; Pastore & MacDorman, 1995; Urquia et al., 2010; DeSisto & McDonald, 2018), preterm birth (Flores, Simonsen, Manuck, Dyer, & Turok, 2012; Urquia et al., 2010; DeSisto & McDonald, 2018), and small for gestational age (Flores, Simonsen, Manuck, Dyer, & Turok, 2012; DeSisto & McDonald, 2018) outcomes than U.S. born Latinas. However, low birth weight advantage in foreign born Latinas may disappear after controlling for sociodemographic and medical risk factors (Rosenberg, Raggio, & Chiasson, 2005). Lower rates of smoking explained a significant portion of the decreased risk of low birth weight in Latina immigrants, although this varied by region of residence and did not fully explain the advantage (Fishman, Morgan, & Hummer, 2018). Interestingly, a systematic review suggests women from Latin America or the Caribbean had a higher likelihood of low birth weight if they settled in Europe than in the U.S., partly because of the baseline differences in birth weight between European and American women (Urquia et al., 2010).

Key Findings Gray Literature

Very few gray literature sources out of a ten article sample specifically mentioned the paradox. Some of the gray literature focused on the importance family structure of Latina women (Valladares & Franco, 2010; Wildsmith, Scott, Guzman, & Cook, 2014). Two-parent households are more common in low income households (Wildsmith, Scott, Guzman, & Cook, 2014), although adolescent Latino parents may not be receiving the resources they desire, such as parenting classes and child care (Valladares & Franco, 2010). However, the fertility rate is dropping among Latina women, and part of this could be due to the change in family dynamics, both in terms of the role of childbearing and relationships (Alvira-Hammond, 2019). The American College of Obstetricians and Gynecologists (ACOG) has released multiple committee opinions acknowledging the disparities in quality health care access based on residence in a rural location and racial bias from physicians (ACOG statement of policy on racial bias,

2017; Health disparities in rural women, 2014). ACOG has also declared their opposition to governmental immigration practices that put women, especially pregnant women, at higher risk for traumatic events and lack of appropriate health care (ACOG statement of policy on opposition to immigration practices . . ., 2018; Health care for unauthorized immigrants, 2015). An issue brief concerning the role federal policies play a role in health disparities in immigrant populations was published by the California Department of Public Health, Office of Health Equity, and lays out specific policies related to the subject (Issue brief: literature review of health implications . . ., 2018). March of Dimes also releases grey literature that references the Latina population, although one 2014 report focused entirely on maternal and infant health in Latinas in the U.S. (Maternal and infant health in US Hispanic populations . . ., 2014). Overall, references to the paradox do not seem to have extensively made their way into the gray literature, which is often concerned with population level policies and risk factors for poor birth outcomes.

Chapter 4

Discussion

Determining whether the Latina birth paradox exists is difficult based on the available research at the time of this scoping review. There were large differences in the defining of the paradox, where studies compared 1) Latina birth outcomes to non-Hispanic black birth outcomes 2) Latina birth outcomes to non-Hispanic white birth outcomes 3) high acculturation Latina birth outcomes to low acculturation Latina birth outcomes 4) immigrant Latina outcomes compared to U.S. born Latina outcomes and 5) differences in Latina outcomes based on region of residence. A total of 22 studies (21.2%) found partial support for the hypothesis, where only certain birth outcomes or women of specific ancestral backgrounds exhibited the paradoxically good outcomes. In contrast, 35 studies (33.7%) did not examine the existence of the paradox at all, but rather looked at specific factors they felt could explain the paradox, such as acculturation or social support. In addition, 40 studies (38.5%) referred to their population only as being Latina or Hispanic, with no further differentiation based on country of origin or ethnic ancestry.

The use of the word paradox in our search terms seems to have yielded articles that focus on individual level factors and health behaviors. Generally, removing the word paradox from the search terms used may have allowed for the inclusion of some environmental, intergenerational, immigration-related articles, which were not captured in our search results. However, our choice of search terms allowed us to take a broad approach to capture studies all types of studies that specifically discussed the Latina birth paradox. Perhaps this approach missed the larger structural, population level influences such as immigration policies, maternal leave policies, and environmental quality measures that could more fully shed light on the relevance of the paradox and account for why differences in individual level risk factor burden in Latinas do not always translate into worse birth outcomes.

The lack research on how population level determinants of health function within the discussion of the birth paradox constitutes one major knowledge gap in the literature. A 2013 review of population

health indicators suggested income inequality levels and governmental policy decisions regarding social spending and maternal care have a significant impact on infant mortality rates and other birth outcomes (Kim & Saada, 2013). For example, Cuba has established a home for women categorized as having high risk pregnancies, based on factors such as poverty, pre-eclampsia, or poor nutritional status, to receive full time care from nurses, psychologists, social workers, and other medical professionals (Bragg, Salke, Cotton, & Jones, 2012). Despite being categorized as resource poor, government interventions focused on maternal health contribute to Cuba having more favorable infant mortality rates than the U.S. (Bragg, Salke, Cotton, & Jones, 2012; "The World Factbook"). The implementation of home visits by nurses and focus on preventative care in low socioeconomic status women are both large scale focuses in Europe but not the United States, another case where population level policy can have an impact on birth outcomes (Chen, Oster, & Williams, 2016).

An example of government policy affecting health and birth outcomes is evident when looking at the disproportionate burden of poor housing, air pollution, lead, pesticide exposure, and unsafe drinking water in Latinos (Quintero-Somaini, Quirindongo, Arévalo, Lashof, Olson, & Solomon, 2004). The Natural Resources Defense Council believes current efforts by the federal government to better understand and resolve these environmental disparities are insufficient (Quintero-Somaini, Quirindongo, Arévalo, Lashof, Olson, & Solomon, 2004). However, this increased risk caused by environmental disparities would not necessarily explain the birth paradox unless the population level environmental exposures are worse in the U.S. than in countries of origin. Comparing environmental risk and other population level differences in Latina between the U.S. and Latin American countries as they pertain to birth outcomes could help to confirm whether immigration to the U.S. increases population level risk factors.

There are large differences by country of origin in whether the paradox is apparent and, if so, how protected the women are from negative birth outcomes. This variation could be due to cultural differences in health and risk, but could also reflect inadequacies in the measures being used by researchers. Working

to determine how individual concepts should be measured in each individual group is important, as not every concept means the same across cultures (Ramírez, Ford, Steward, & Teresi, 2005). The appropriateness of measurement scales after translation and the ability of the scale to accurately reflect how the construct functions across groups are very important for accurate cross cultural research (Ramírez, Ford, Steward, & Teresi, 2005). A study examining the accuracy of multiple measurement scales in Nicaragua, where the scales had not previously been verified, found that self-esteem and mental distress were conceptualized differently by Nicaraguans than by the populations the measures had been created for (Jani & Deforge, 2015). Because of their belief that uncontrollable forces, such as the government, were partially responsible for the distressing circumstances in their lives, Nicaraguans could report unexpectedly high self-esteem and high mental distress but low mental illness (Jani & Deforge, 2015). As mentioned previously in this paper, there is also a debate over the ability of the measures currently utilized for acculturation to accurately measure the experience of Latina women (Fox, Entringer, Buss, DeHaene, & Wadhwa, 2015). The use of 2500 grams as the threshold for low birth weight also may neglect the differences between racial groups, which may have different distributions of birth weights (Chung, Boscardin, Garite, Lagrew, & Porto, 2003; Yip, Li, Chong, 1991). The 2500 gram threshold was seemingly arbitrarily proposed in the early 1900s and widely adopted after 1935, although recently there has been a push to acknowledge that this cutoff is not suitable for women living in different countries or with different ancestral backgrounds (Hughes, Black, & Katz, 2017). If the low birth weight cutoff may not accurately reflect infant health in Latina populations, the paradoxically good outcomes seen in Latina women may be due to incorrect categorization of risk.

Another knowledge gap is the lack of genetic and epigenetic research directly concerning the birth paradox in Latinas. Genetics are believed to play a significant role in determining birth weight (Lunde, Melve, Gjessing, Skjaerven, & Irgens, 2007; Clausson, Lichtenstein, & Cnattingius, 2000), small for gestational age (Clausson, Lichtenstein, & Cnattingius, 2000), and preterm birth (Zhang, Srivastava, Bacelis, Juodakis, Jacobsson, & Muglia, 2018). The discrimination perceived by Latinas can also have

epigenetic effects (Santos et al., 2018). Various genetic loci believed to impact birth outcomes have been identified (Beaumont, et al., 2018; Freathy et al., 2010), but a better understanding of the environmental contexts in which Latina women have genetic variants that are protective against negative birth outcomes will help to provide a new understanding of the paradox.

Finally, a gap seems to exist between the numerous mentions of the paradox in peer-reviewed literature and its lack of use in policy documents. Social determinants of health are an inherently political topic, and systematic work to decrease these inequalities is often dependent on not only the evidence surrounding the topic but also the way these inequalities have become institutionalized and a part of the political and social culture (Baker, Friel, Kay, Baum, Strazdins, & Mackean, 2018). The reason for the small overall amount of gray literature referencing the birth paradox is unclear.

The results of this scoping review point towards the need for longitudinal studies in multiple countries capable of following women before and after migration to U.S. to determine how immigration and acculturation affect birth outcomes, although these studies would likely be very expensive to conduct. The relationship between immigration, acculturation, and birth outcomes seems to be important to explaining the paradox, and should be studied longitudinally. One way to structure such a study would involve utilizing a sample of women of reproductive age in a Latin American country and determining whether (1) those who immigrate have a significant health or social advantage compared to those who do not (2) birth outcomes are different before and after immigration because of some larger population-level factors (3) the risk of negative birth outcomes increases for Latina women the longer they remain in the U.S. (4) how the birth outcomes and acculturation processes may be different for women from different countries of origin. Utilizing a mixed methods design with both biological measures, such as measuring cortisol as a proxy for stress, and qualitative measures, such as interviews about the meaning of pregnancy, may also be helpful by providing a more well rounded view of birth in Latinas than would be provided by one method alone.

A limitation of this scoping review was that the quality of the studies included were not analyzed. However, the vast majority of the findings were extracted from peer-reviewed white literature. Another limitation is the possibility the review may have missed studies about the paradox that were located in databases other than Web of Science, PubMed, or CINAHL. Finally, the lack of a centralized database for gray literature made conducting a completely exhaustive search for all gray literature on the Latina birth paradox impossible.

The large variation in methodology, comparison groups, and birth outcomes examined in the peer-reviewed literature make it difficult to come to a final consensus about the ability of the paradox to accurately capture the experiences of all Latina women. This study is perhaps the first of its kind to look at the Latina birth paradox using a scoping review. The range of current research points to the Latina birth paradox only accurately describing the birth outcomes of certain subpopulations of Latina women. Public health interventions should be wary of assuming the risk factors and protective effects of the paradox are universal, as they risk neglecting the differing needs of Latina women from different countries and cultures.

Appendix A

Description of Sample Populations

Article #	Sample size	Pregnant at time of study	Ethnic background	Citizenship	Residence at time of study	Immigrant sample (Generation)
1	269	no	unknown	unknown	western New York	45.4% 1st
2	81	yes	Mexican	unknown	West Michigan	78.6% 1st
3	52033	NA	Puerto Rican, Mexican, white, black	unknown	Chicago	26% 1st
4	490332	NA	Mexican	unknown	168 Metropolitan statistical areas (areas with more than 100,000 people with more than 5000 Mexican-origin residents)	63.77% 1st
5	151422	NA	Mexican	unknown	Colorado	56% 1st
6	NA	NA	Mexican	NA	NA	NA
7	21227	no	whites, Mexican, other LH	unknown	California	39% 1st
8	NA	NA	LH	NA	NA	NA
9	634797	no	Mexican, Puerto Rican, Cuban, and Central/South American	unknown	USA	unknown
10	404	yes	Mexican	unknown	Chicago, Milwaukee	100% 1st
11	80702	no	LH, black, white	unknown	Miami	unknown
12	1057977	no	Asian Indian, Mexican, black, white	unknown	California	42.22% 1st
13	296	no	Central American, white, black	unknown	Virginia	42.91% 1st
14	28	yes	Mexican	unknown	southern Texas	100% 1st

Article #	Sample size	Pregnant at time of study	Ethnic background	Citizenship	Residence at time of study	Immigrant sample (Generation)
15	NA	NA	LH	NA	NA	NA
16	4443	no	white, black, Asian/Pacific Islander, Puerto Rican, other Latina	NA	New York City	56% 1st
17	4465	no	white, Mexican, other LH	unknown	Utah	9.7% 1st
18	631 (83 qualitative interviews)	yes	Mexican	unknown	two southernmost counties in Texas	44% 1st
19	395070	no	white, Central and South American, Cuban, Mexican, and Puerto Rican	unknown	California	unknown
20	196617	no	LH, white	13208 foreign born Latinas did not have social security numbers (61%)	Utah	11% 1st
21	468	yes	Mexican, Puerto Rican, South and Central American, other LH	unknown	Texas	70% 1st
22	8114	no	Mexican, other LH, black, Asian or Pacific Islander, white	unknown	national sample	unknown
23	3618589	no	white, black, LH	unknown	national sample	unknown
24	10755	no	black, white, and LH	unknown	North Carolina	unknown
25	1217	no	LH, whites	unknown	Los Angeles	50% 1st
26	NA	NA	LH	NA	NA	NA
27	2890898	no	Mexican, white	unknown	national sample	unknown

Article #	Sample size	Pregnant at time of study	Ethnic background	Citizenship	Residence at time of study	Immigrant sample (Generation)
28	78364	no	Colombians, Dominicans, Ecuadorians, Mexicans, Puerto Ricans, and other LH	unknown	New York City	67.4% 1st
29	unknown	no	Cuban, Mexican, Puerto Rican	unknown	California, Florida	2nd, 3rd only
30	47669	no	white, black, LH	unknown	unknown	unknown
31	21	no	Mexican	unknown	Orange County, North Carolina	100% 1st
32	30	no (early postpartum)	Guatemalan	NA	Sacatepequez District of Guatemala	NA
33	18	no	Argentinan, Columbian, Honduran, Mexican, Panamanian, Peruvian, other LH	unknown	near Tuscon, Arizona	100% 1st
34	7249 (753 cases)	no	LH, white	unknown	Arkansas, California, Georgia, Iowa, Massachusetts, New York, North Carolina, Texas, Utah, and New Jersey	unknown
35	3124	no	black, white, LH	unknown	unknown	unknown
36	7286735	no	Mexico, Puerto Rico, or Cuba, white, black, other	unknown	unknown	unknown

Article #	Sample size	Pregnant at time of study	Ethnic background	Citizenship	Residence at time of study	Immigrant sample (Generation)
37	6627611	no	Mexican, Puerto Rican, Cuban, and Central/South American, white, black	unknown	Arizona, Arkansas, California, Colorado, District of Columbia, Florida, Georgia, Hawaii, Illinois, Indiana, Kansas, Maine, Mississippi, Nebraska, New Jersey, New York, North Dakota, Ohio, Texas, Utah, and Wyoming	57% 1st
38	NA	NA	LH	NA	NA	NA
39	32 studies	no	Central/South American, Cuban, Mexican, Puerto Rican, black	unknown	varied based on study, many national studies	unknown
40	NA	NA	NA	NA	NA	NA
41	628281	no	Mexican	unknown	California	65% 1st
42	993	no	LH	unknown	national sample	unknown
43	61 studies and 34 articles	NA	NA	NA	NA	NA
44	3383	8% yes	Mexican, white, black	unkown	national sample	unknown
45	22892	no	Puerto Rican, Central-South American, Cuban, Mexican, other	unknown	Chicago	53% 1st
46	1818	no	Mexican, white	approximately 32% of Mexican born respondents	San Diego and Tijuana (Mexico)	40% 1st
47	NA	NA	Mexican	NA	NA	NA
48	1095462	no	Mexican	unknown	Arizona, California, New Mexico, Texas	59.4% 1st

Article #	Sample size	Pregnant at time of study	Ethnic background	Citizenship	Residence at time of study	Immigrant sample (Generation)
49	3036	no	LH, white, black	unknown	Maryland, Michigan, Florida, South Carolina, Texas, New York, Pennsylvania, Kansas	unknown
50	571	50% yes	Mexican	unknown	southern Texas	50% 1st
51	2763	no	Puerto Rican	unknown	Puerto Rico, or United States (Connecticut, Florida, Massachusetts, New Jersey, Pennsylvania, New York)	unknown
52	89 studies	NA	LH	NA	NA	NA
53	54764	unknown	Mexican, Puerto Rican, Central and South American, other LH	unknown	national except New Hampshire	unknown
54	1238150	no	Mexican	unknown	national sample	63.6% 1st
55	1062	yes	LH	unknown	San Joaquin County, California	73.9% 1st
56	151869	no	white, black, LH, other	unknown	Milwaukee, Wisconsin	unknown
57	45	yes	LH	unknown	Hartford, Connecticut	62% 1st

Article #	Sample size	Pregnant at time of study	Ethnic background	Citizenship	Residence at time of study	Immigrant sample (Generation)
58	unknown	no	LH, black	unknown	Texas, Oklahoma, Arkansas, Tennessee, North Carolina, South, Carolina, Louisiana, Mississippi, Alabama, Georgia, Florida, Connecticut, Maine, Maryland, Massachusetts, New Hampshire, Rhode Island, Vermont, New Jersey, New York, Pennsylvania	unknown
59	785430	no	white, LH	unknown	national sample	unknown
60	1231	yes	Puerto Rican	unknown	Western Massachusetts	88.9% 1st
61	154957	no	LH	unknown	Colorado	47% 1st
62	79933	no	white, Mexican	unknown	national sample	16.6% 1st
63	45 studies	NA	black, Asian, LH, other	NA	NA	NA
64	1172	no (early postpartum)	LH, white	unknown	Phoenix, Arizona	unknown
65	66	NA	LH	NA	NA	NA
66	9,000,000	no	white, Mexican, Puerto Rican, Cuban, Central and South American, other LH	unknown	national sample	unknown
67	9020142	no	white, Mexican, Puerto Rican, Cuban, Central and South American, other LH	unknown	national sample	17.4% 1st
68	11	unknown	Mexican	unknown	unknown but in Midwest	100% 1st
69	289464	unknown	Mexican	unknown	Los Angeles	63.5% 1st

Article #	Sample size	Pregnant at time of study	Ethnic background	Citizenship	Residence at time of study	Immigrant sample (Generation)
70	470	yes	LH	unknown	Texas	unknown
71	24 studies	NA	Asian, black, white, LH	NA	NA	NA
72	1243	postpartum	Asian, white, LH	unknown	San Francisco	60% 1st
73	949210	NA	white, black, North Africa, Sub-Saharan Africa, non-Hispanic Caribbean, Hispanic Caribbean, Mexico, Central America, South America, other Hispanic, East Asia, Southeast Asia and Pacific Islands, South Central Asia	unknown	New York City	unknown
74	19000	no	LH, non LH	unknown	United States or United Kingdom	35% 1st
75	12774	no	black, white, LH	unknown	Durham, North Carolina	unknown
76	233	yes	Puerto Rican, other LH	unknown	Hartford, Connecticut	63.5% 1st
77	7800	no	white, black, Mexican, other LH, Native American, Asian	unknown	national sample	unknown
78	150000	no	Mexican, white, black, Cuban, Puerto Rican, other LH	unknown	national sample	13% 1st
79	26578118	no	white, black, Mexican	unknown	national sample	10% 1st
80	NA	NA	NA	NA	NA	NA

Article #	Sample size	Pregnant at time of study	Ethnic background	Citizenship	Residence at time of study	Immigrant sample (Generation)
81	1535	yes	LH (Mexican, Central or South American, Caribbean), white,	unknown	unknown	unknown
82	1040	yes	Puerto Rican	unknown	Western Massachusetts	46.4% 1st
83	15627407	no	Mexican, white, black	unknown	national sample	unknown
84	32254627	no	Mexican, white, black	unknown	national sample	13% 1st
85	12615572	no	white, black, LH	unknown	national sample	unknown
86	138249	no	white, black, LH, Asian, Native	unknown	national sample	unknown
87	1018	no	white, black, LH	unknown	North Carolina (near Chapel Hill)	unknown
88	3638135	no	Cuban, Puerto Rican, Mexican, black, white	unknown	national sample	72.4% 1st
89	458521	no	non-LH, Central/South American, Mexican, Cuban, PR, other LH	unknown	Florida	unknown
90	27712	no	LH, white	unknown	Alabama, Alaska, Arkansas, Colorado, Florida, Hawaii, Illinois, Louisiana, Maryland, Maine, Michigan, Minnesota, Montana, North Carolina, North Dakota, Nebraska, New Jersey, New Mexico, New York, Ohio, Oklahoma, Rhode Island, South Carolina, Utah, Vermont, Washington, West Virginia	unknown

Article #	Sample size	Pregnant at time of study	Ethnic background	Citizenship	Residence at time of study	Immigrant sample (Generation)
91	6823979	no	white, Mexican, Central/South American	unknown	California, Oregon, Washington, Alabama, Arkansas, Florida, Kentucky, Louisiana, North Carolina, South Carolina, Tennessee, Iowa, Illinois, Indiana, Kansas, Mississippi, Minnesota, Missouri, Nebraska, Ohio, Washington, Arizona, Colorado, Idaho, New Mexico, Nevada, Oklahoma, Texas, Utah, Maryland, Massachusetts, New York, Pennsylvania	unknown
92	37489600	no	LH, black, white	unknown	national sample	unknown
93	36	yes	Mexican	unknown	south Texas	100% 1st
94	2436890	no	LH, black, white, Asian	unknown	national sample	24% 1st
95	1355896	no	white, black, LH, Cuban, Mexican, Puerto Rican	unknown	Florida, California	2nd, 3rd only
96	6414774	no	Mexican	unknown	national sample	64% 1st
97	40	unknown	Mexican	unknown	Detroit, Michigan	50% 1st
98	1854243	no	Mexican, white, other LH	unknown	Michigan	6% 1st
99	3570	no	LH, white, black, American Indian/Alaska Native, other	unknown	national sample	unknown

Article #	Sample size	Pregnant at time of study	Ethnic background	Citizenship	Residence at time of study	Immigrant sample (Generation)
100	725389	no	Argentinian, Bolivian, Chilean, Colombians, Costa Rican, Cuban, Dominican, Ecuadorian, El Salvadorian, Guatemalan, Honduran, Mexican, Nicaraguan, Panamanian, Peruvian, Spanish, Venezualen, other South American (Paraguay and Uruguay)	unknown	national sample (except Alabama, Arizona, Arkansas, Connecticut, Hawaii, Maine, Mississippi, New Jersey, Rhode Island, and West Virginia)	50% 1st
101	NA	NA	LH	NA	NA	NA
102	unknown	no	Mexican, white	unknown	San Antonio	unknown
103	9906	no	white, LH	unknown	Rhode Island	unknown
104	8650	no	white, black, LH, Asian/Pacific Islanders, and American Indian/Alaska Natives	unknown	national sample	unknown

Abbreviations: LBW = low birth weight, SGA = small for gestational age, PTB = preterm birth, IMR = infant mortality rate, NA = not applicable, LH = population described only as Latina or Hispanic

Appendix B

Study Findings

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
1	race/ethnicity; multipara and nullipara	optimal birth outcome	looked at perinatal background index, social and medical background,	medical risk factors, immigrant only, prenatal care	yes (compared to white)
2	stress (current state, perceived over the past month, and pregnancy-related stress), stress buffers (social support, coping, acculturation and optimism)	birth outcomes: length of gestation and birth weight	age, medical conditions, obstetrical history, body mass index prior to pregnancy, prenatal care, smoking and substance abuse history, income, education, stability of housing, and employment	social support, stress levels, acculturation, education, medical risk factors, prenatal care, religion, income	yes (low versus high acculturation)
3	race/ethnicity, within race ethnicity immigrant or native	LBW, PTB	maternal age, marital status, maternal education, prenatal care, parity, newborn gender, socioeconomic status (low, medium, high)	acculturation, nativity comparison, medical risk factors, income, prenatal care, education, ethnic origin, marriage, residential segregation/cities	partially (for some subgroups or outcomes)
4	exposure to immigrant enclaves, exposure to ethnic enclaves, exposure to poverty, exposure to Mexican origin residents; covariates of population size, median household	birth weight	women under 15 and over 45, parity, infant sex, maternal education, marital status, initiation of prenatal care	residential segregation/cities, income, nativity comparison, prenatal care, marriage, education, medical risk factors	yes (comparing immigrant to US born)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
5	nativity status (US born vs Mexico born)	LBW	maternal age, prenatal care, education, marital status, racial classification, alcohol and tobacco use during pregnancy, use of prenatal care; medical risk factors	medical risk factors, nativity comparison, healthy migrant, acculturation, prenatal care, education, marriage	yes (comparing immigrant to US born)
6	NA	LBW and IMR	NA	religion, social support, acculturation, illegal immigration, education, medical risk factors, stress levels, insurance, diet, ethnic origin, nativity comparison, income	NA
7	racial or ethnic group, nativity, length of residence in the US (less than 10 years or 10 years+); socioeconomic status, health insurance coverage	LBW, PTB	maternal and paternal age, parity, smoking, alcohol use, pregnancy intendedness, pre pregnancy health status, pre pregnancy body mass index, gestational diabetes, gestational hypertension, marital status, practical or emotional support, intimate partner violence, homelessness, poverty, or unemployment, stressful life 4events, food insecurity, prenatal care	social support, acculturation, ethnic origin, nativity comparison, immigration, income, medical risk factors, education, insurance, diet, prenatal care	no (compared to white)
8	NA	NA	NA	all covered	NA

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
9	foreign-born status, maternal education	LBW	maternal age, Hispanic/Latino subgroup, nativity, marital status, prenatal care, health behaviors, complications during pregnancy, smoking/drinking, child's gender, birth order, medical risk factors	ethnic origin, education, nativity comparison, medical risk factors, prenatal care, marriage	partially (for some subgroups or outcomes)
10	length of time lived in the USA, acculturation	intrauterine growth, birth weight, gestational age combined to make favorable or unfavorable birth outcome	diet, drug/alcohol use, social support, stress, prenatal care, mother's health, parity, maternal age, marital status, schooling, income, mother employed, location	immigrant only, acculturation, illegal immigration, diet, medical risk factors, social support, stress levels, prenatal care, marriage, education, income. cities	unclear
11	race/ethnicity	preterm premature rupture of membranes, preeclampsia, chronic hypertension, gestational diabetes, cesarean section rate, 5-minute Apgar score	substance abuse, STIs, hypertension, preeclampsia, substance abuse, smoking, prenatal care, previous preterm delivery	medical risk factors, prenatal care, marriage	unclear
12	maternal age, maternal and paternal education, initiation of prenatal care, payer for delivery (private insurance, medicaid, self-pay, other pay, or unknown)	LBW, VLBW, intrauterine growth retardation, PTB, fetal deaths, neonatal deaths and postneonatal death, complications of pregnancy	NA	education, medical risk factors, prenatal care, insurance, immigrant only	yes (compared to white)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
13	race/ethnicity	maternal age, education, living with partner, country of origin, time living in the US, prenatal health behavior status, birthweight, initiation of public health nursing services, current use of alcohol, illicit drugs, tobacco, HIV behavioral risk status, maternal stress during pregnancy	socioeconomic status (both groups were low income), gave birth to a single baby with no congenital abnormalities	immigrant only, stress levels, education, medical risk factors, prenatal care, social support, income	no (compared to white)
14	NA	interpretation of social support	low socioeconomic status (annual household income of $15,000 or less)	immigrant only, social support, prenatal care, diet, religion, income	NA
15	NA	NA	NA	biological mechanism	NA
16	maternal race/ethnicity and nativity status; social ties and perceived social support	LBW and PTB	maternal age, marital status, education level, insurance coverage before pregnancy, medical risks, weight gain during pregnancy, first birth, previous PTB, alcohol or tobacco use during pregnancy, experience of intimate partner violence during pregnancy, and prenatal care initiation	social support, stress levels, education, marriage, insurance, prenatal care, ethnic origin, nativity comparison, medical risk factors	partially (for some subgroups or outcomes)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
17	social network size	birth weight	excluded women having multiple births, "additional socioeconomic and medical factors were examined based on the review of literature"	social support, medical risk factors, education, marriage, income, nativity comparison	no (compared to white)
18	age, country of birth, years in the US, marital status, annual household income, education, primary language spoken, religious belief, number of pregnancies and deliveries, gestational age, initiation of prenatal care, reproductive histories, community standing, perceived social stress, self esteem, depression, pregnancy related anxiety scale, psychosocial stress	LBW	.	social support, stress levels, nativity comparison, religion, education, poverty, medical risk factors, marriage, income, prenatal care, mental illness	NA
19	maternal race and ethnicity and Latino subgroup	LBW	maternal age, education, marital status, birthplace, number of previous births, tobacco use, use of prenatal care, infant sex, gestational age	education, medical risk factors, marriage, prenatal care, ethnic origin, nativity comparison	yes (compared to white)
20	nativity and legal status	LBW, PTB, and small for gestational age	maternal medical risk factors, pregnancy complications, prepregnancy BMI, weight gain during pregnancy	illegal immigration, nativity comparison, medical risk factors, education, prenatal care, marriage	yes (comparing immigrant to US born) no (compared to white)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
21	acculturation, years residing in the US, progesterone and estriol levels	preterm birth	country of origin; body mass index, hormone measurements; marital status, age, education, prepregnancy BMI, history of previous preterm birth, and gravidity; controlled for medical factors before and during pregnancy	biological mechanism, acculturation, medical risk factors, marriage, education, income, prenatal care, ethnic origin, insurance, nativity comparison	yes (low vs high acculturation)
22	race/ethnicity as it relates to prenatal and nutritional practices	child health, physical growth, and cognitive outcomes	education, socioeconomic status, maternal age, marriage, number of children in household, poverty	acculturation, education, income, medical risk factors, marriage, prenatal care, diet, ethnic origin, social support	partially (for some subgroups or outcomes)
23	Hispanic density in mother's county of residence	LBW, preterm delivery, smoking during pregnancy, IMR	parity, maternal age, marital status, and socioeconomic status as indicated by maternal education, socioeconomic status of county (median household income and percentage of black residents in each county)	medical risk factors, marriage, education, income, residential segregation/cities	NA
24	race/ethnicity	preeclampsia, gestational diabetes mellitus, placental abruption, preterm birth, small for gestation age, fetal death/stillbirth, and maternal death	poverty, Medicaid insurance, maternal age, employment status, residence, medical comorbidity, substance abuse, psychological comorbidity, length of hospital stay, and total hospital charges	healthy migrant, income, medical risk factors, insurance, stress levels, mental illness	yes (compared to black women)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
25	race/ethnicity, acculturation	LBW	birthplace, age, parity, education, source of payment for prenatal care, pregnancy complications, and gestational age, household income, marriage status, alcohol use and smoking during pregnancy, living with a smoker in the home, prepregnancy BMI, pregnancy weight gain, fast food consumption during pregnancy, low partner support, chronic stress level	social support, stress levels, acculturation, nativity comparison, education, medical risk factors, marriage, insurance, prenatal care, diet, income	yes (comparing FB to US born) yes (comparing low acculturation to high acculturation) no (compared to white)
26	NA	NA	NA	social support, acculturation, healthy migrant, diet, prenatal care, residential segregation/cities, medical risk factors, nativity comparison, insurance	NA
27	race/ethnicity	LBW rates, heavy birth weight rates, mean birth weight	NA	nativity comparison, biological mechanism	unclear
28	demographic risk factors, medical risk factors, behavioral risk factors	birth weight	NA	ethnic origin, nativity comparison, medical risk factors, prenatal care, education, insurance, marriage	no (comparing immigrant to US born)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
29	assimilation	birth outcomes of third generation children	NA	acculturation, marriage, education, income, prenatal care, stress levels, ethnic origin, residential segregation/cities	yes (low vs high acculturation)
30	gestational age and race/ethnicity	LBW, taking into account gestational age at birth	maternal age, gestational age, diabetes mellitus, hypertensive disorders of pregnancy, parity, no prenatal care, male neonate, excessive weight gain or poor weight gain during pregnancy, medication use during the pregnancy	medical risk factors, prenatal care	yes (compared to black women) no (compared to white)
31	NA	NA	NA	marriage, education, medical risk factors, religion, acculturation, diet, insurance, stress levels, income, prenatal care, immigrant only, social support	NA
32	NA	NA	NA	education, prenatal care, income, religion, stress levels, diet, religion, medical risk factors, insurance (as a proxy for public health access)	NA

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
33	NA	NA	NA	maternal age, education, ethnic origin, diet, social support, nativity comparison, marriage, acculturation, income	NA
34	race/ethnicity, acculturation among Hispanics	gastroschsis risk	maternal education, income, prepregnancy BMI, smoking, and parity	education, medical risk factors, income, acculturation, nativity comparison	yes (low vs high acculturation) no(compared to white)
35	race/ethnicity	placental abruption, fetal growth restriction, LBW, hemorrhage, PTB, stroke, tissue and organ ischemia, acute tubular necrosis, maternal mortality, and intrauterine fetal demise, neonatal outcomes	maternal age, insurance status, ethnicity, marital status, employment, primary language, education level, entry into prenatal care, parity, tobacco abuse, illicit substance use, domestic violence, location of residence, BMI	education, insurance, marriage, education, prenatal care, medical risk factors, healthy migrant, stress levels (as a proxy for domestic violence)	yes (compared to black) yes (compared to white)
36	race/ethnicity	infant mortality risks	unknown	medical risk factors, ethnic origin, nativity comparison, healthy migrant	partially (for some subgroups or outcomes)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
37	race/ethnicity	infant mortality risks	age, marital status, education, prenatal care, place of birth, birth order, birth weight effect on mortality, period of gestation, multiple births, infant age at death, sex of infant, underlying cause of death	medical risk factors, marriage, ethnic origin, nativity comparison, education, prenatal care	partially (for some subgroups or outcomes)
38	NA	NA	NA	acculturation, education, immigration, healthy migrant, ethnic origin	no (compared to white)
39	race/ethnicity	LBW	maternal age, education, marital status, parity, gestational weight gain, prenatal care, birthplace	medical risk factors, education, marriage, prenatal care, ethnic origin, nativity comparison, acculturation, insurance	yes (compared to white)
40	NA	NA	NA	medical risk factors, prenatal care, biological mechanism	NA
41	place of birth for mother and country of Spanish origin for USB women	maternal morbidities during labor and delivery beyond what would be expected in a normal delivery	sociodemographic characteristics pre-existing health maternal health status, quality of obstetric care (used hospitals' expected death rate and observed death rate to determine quality of care)	maternal risk factors, nativity comparison, insurance, prenatal care, healthy migrant, education	partially (for some subgroups or outcomes)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
42	Latina compounded disadvantage	mode of delivery (cesarean or vaginal birth)	ethnicity, education, health insurance status, parity, maternal age, PTB, term birth, post term infants	education, insurance, medical risk factors, prenatal care (proxy for care during birth), residential segregation	no (based on region of residence)
43	NA	NA	NA	healthy migrant, social support, medical risk factors, acculturation, prenatal care, diet	NA
44	race and ethnicity and pregnancy status	periodontal disease	age at interview, marital status, participation in WIC, education, smoking status, insurance coverage, time elapsed since last dental visit, poverty income ratio	education, insurance, marriage, medical risk factors, income	NA
45	community of residence	LBW	maternal age, education, marital status, trimester of prenatal care initiation, parity, and nativity	marriage, education, medical risk factors, prenatal care, nativity comparison, ethnic origin, acculturation, residential segregation/cities, income	yes (comparing immigrant to US born)
46	history of fetal deaths, SES factors of education and prenatal care, age, number of children born, time in the region, and history of family problems, ethnicity and birthplace, history of smoking, alcohol, and drug use and a history of disease or complications during pregnancy	birth weight	.	education, prenatal care, medical risk factors, nativity comparison, social support, illegal immigration, healthy migrant	unclear

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
47	NA	NA	NA	immigrant only, acculturation, medical risk factors, healthy migrant	NA
48	concentration of Mexican residents in the neighborhood (low, medium, high)	LBW and infant mortality	maternal education, maternal place of birth, marital status, age, parity	education, marriage, medical risk factors, social support, nativity comparison, acculturation, residential segregation/cities	NA
49	race/ethnicity, pregravid weight	length of gestation, fetal growth, birth weight	maternal age, parity, Medicaid insurance, smoking, chronic hypertension, height, pregravid weight, BMI, infertility treatment, fetal reduction	medical risk factors, prenatal care, insurance	yes (compared to white)
50	nativity	subjective social status	depression, perceived social stress, parity, pregnancy intendeness, contraception use, age, marital status, birthplace, income, primary language, education, religious identification and attendance, parity	nativity comparison, religion, education, medical risk factors, marriage, poverty, social support, stress levels, acculturation, mental illness	NA
51	mother-adult daughter relationship proximity and closeness	LBW, infant mortality, instrumental support, emotional support during pregnancy, and emotional support after birth	baby's gender, birth order, age, income, education level , instrumental support, and emotional support after birth, number of siblings women had, employment status of the father, living in Puerto Rico or U.S.	social support, education, medical risk factors, income, marriage	NA

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
52	NA	NA	NA	income, insurance, education, acculturation, medical risk factors, social support, ethnic origin, nativity comparison, healthy migrant	partially (for some subgroups or outcomes)
53	Hispanic subgroup	fully compromised, light IUGR, light preterm, heavy preterm, heavy IUGR, normal	.	medical risk factors, ethnic origin	yes (compared to white) partially (for some subgroups or outcomes)
54	nativity	abdominal wall defects	maternal age, level of educational attainment, marital status, parity, prenatal care initiation and number of visits	medical risk factors, nativity comparison, education, marriage, prenatal care	yes (comparing immigrant to US born)
55	acculturation measured by the ARSMA-II-short version and characterized as low, moderate, or high	selected health risk behaviors (lifetime use of tobacco, alcohol, and illicit drugs; age at first sexual intercourse; lifetime number of sexual partners; intake of fruits, vegetables, and fast-food meals in the previous months)	occupation they had worked in the longest (farm work, not farm work, or never worked), age, nativity, age came to US, number of years, marital status, years of education	acculturation, nativity comparison, education, medical risk factors, marriage, diet	NA

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
56	race/ethnicity	PTB and LBW	education, maternal age, married/paternity, parity, tobacco use, hypertension, diabetes, prior PTB, adequacy of prenatal care	education, medical risk factors, marriage, prenatal care, social support (as a proxy for paternity status)	no (compared to white)
57	demographics, SES, food assistance participation, food security, FV purchasing and intake patterns, gestational weight gain, psychosocial constructs of FV intake	fruit and vegetable intake	NA	diet, medical risk factors, income, social support	NA
58	obesity rates, smoking rates, drinking and exercising habits, as well as the teen-birth rates	potential life-years loss, number of physically and mentally unhealthy days per month for adults, and LBW	access to care, quality of care, education, employment, income, family and social support, community safety, environmental air quality, built environment (food and liquor store density), less than 18, over 65, black or Hispanic, female, rural	education, income, medical risk factors, insurance, diet, social support, stress/mental illness, air quality, marriage	unclear
59	race/ethnicity	Apgar score, assisted ventilation, intensive care admission, surfactant/antibiotic use and seizures	maternal age, live birth order/parity, maternal race, sex of infant, year of birth	medical risk factors, prenatal care (as a proxy for care during delivery)	NA

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
60	fruit and vegetable consumption, physical activity participation, cigarette smoking and alcohol consumption	meeting guidelines	age, education level, employment, parity, pregnancy weight gain, prepregnancy BMI, personal history of gestational diabetes, history of adverse pregnancy outcome, family history of type 2 diabetes, acculturation, smoking, drinking, use of illicit drugs	medical risk factors, diet, acculturation, education, nativity comparison	NA
61	time, place of birth	GDM	age at delivery, parity, years of education, marital status, smoking during pregnancy, and receipt of prenatal care	medical risk factors, marriage, education, income, prenatal care, nativity status	no (comparing immigant to US born)
62	medical risk factors, labor complications, adequacy of prenatal care, previous pregnancy loss, plural birth, maternal smoking, being unmarried, low education, low parity, high parity, maternal age	infant mortality	.	medical risk factors, marriage, prenatal care, nativity comparison, education, acculturation	partially (for some subgroups or outcomes)
63	maternal ethnicity	PTB		medical risk factors, marriage, education, insurance, income, prenatal care, social support, healthy migrant, genetic	yes (compared to white)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
64	acculturation	obstetric outcomes	domestic violence, sexual abuse in the past year, sexual abuse during pregnancy, sexual abuse as a child, age, race, marital status, prior pregnancy history, gestational age, prenatal care and date initiated, and substance abuse during pregnancy (tobacco, alcohol and illicit substances)	medical risk factors, prenatal care, acculturation, marriage, stress levels (as a proxy for abuse)	yes (high vs low acculturation)
65	NA	NA	NA	all covered	NA
66	race/ethnicity	infant mortality, LBW, PTB	maternal age, marital status, nativity, parity, region of residence, prior pregnancy loss, plurality, sex of infant, type of attendant at birth, adequacy of prenatal care, maternal education, smoking, and weight gain	ethnic origin, prenatal care, medical risk factors, education, marriage, immigration	partially (for some subgroups or outcomes)
67	race/ethnicity	PTB, LBW, IMR	maternal age, marital status, place of residence, plurality, previous loss, prenatal care, education, parity, smoking, sex of infant, weight gain	ethnic origin, nativity comparison, medical risk factors, prenatal care, marriage, education	partially (for some subgroups or outcomes)
68	NA	NA	NA	medical risk factors, all immigrant, income, education, diet, stress levels	NA

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
69	neighborhood Latino immigrant concentration score	infant death	maternal age, maternal education, insurance, prenatal care, number of prior live births, previous adverse birth, tobacco use, diabetes, anemia, cardiac disease, chronic hypertension, renal disease, labor complication, infant birth weight, gestational age, infant sex	medical risk factors, insurance, education, residential segregation/cities, prenatal care, nativity comparison	yes (comparing immigrant to US born)
70	acculturation, cytokine analysis	preterm birth	collected family origin chart with country of birth, venous blood sample, height, weight, speculum examination, urine sample, BV diagnosis, maternal age, parity, marriage, history of PTB, insurance, English proficiency, born in the US	insurance, biological mechanism, acculturation, nativity comparison, medical risk factors, marriage	NA
71	migrant status	LBW and PTB	race/ethnicity, world region of origin and destination	nativity comparison,	partially (for some subgroups or outcomes)
72	maternal acculturation status and type of health insurance	interpersonal prenatal care ratings	maternal age, education, marriage, number of pregnancies, length of gestation, birth weight	insurance, acculturation, prenatal care, nativity comparison, education, medical risk factors, ethnic origin	NA

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
73	maternal ethnic ancestry	preterm birth by gestational age, preterm birth, SGA among term births, and birthweight among term births	maternal age, prepregnancy weights, nativity, parity, education, tobacco use during pregnancy	education, nativity comparison, medical risk factors	no (compared to white)
74	nativity and race/ethnicity	mothers' health behaviors (measured at birth and at age 5; smoking during pregnancy, early prenatal care)	sociodemographic characteristics (maternal education, family income, family structure aka marriage, mother's age at birth, child's gender)	education, income, nativity, prenatal care, medical risk factors, marriage, ethnic origin	NA
75	race/ethnicity	near miss maternal death morbidities, pregnancy (obstetrical) complications, non near miss morbidity events, and maternal death	maternal age, presence of medical or psychological comorbidities, high risk intervention procedures (c-section or vaginal delivery with complications, false labor, postpartum or post-abortion diagnoses)	insurance, medical risk factors, mental illness,	partially (for some subgroups or outcomes)
76	race/ethnicity	dietary intake assessment, nutrient and food group intake	acculturation, age, trimester at enrollment, parity, employment, education, marriage, supplemental nutrition program, monthly household income, maternal age, household size	acculturation, diet, income, nativity comparison, ethnic origin	NA

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
77	race/ethnicity	LBW	maternal age at time of birth, maternal education, poverty status, marriage, prenatal care, insurance, pregnancy weight gain, subjective health measures, mother's health risks during pregnancy, smoking during pregnancies	ethnic origin, nativity comparison, medical risk factors, insurance, income, education, marriage, mental illness	no (compared to white)
78	race/ethnicity	infant mortality	NA	nativity comparison, ethnic origin	yes (comparing immigrant to US born)
79	maternal age distribution, nativity, race/ethnicity	infant mortality	maternal morbidity, labor complications, adequacy of prenatal care, pregnancy loss, plural birth, maternal smoking, marriage, low maternal education, first birth, high parity	nativity comparison, medical risk factors, prenatal care, education, marriage	partially (for some subgroups or outcomes)
80	NA	NA	NA	acculturation	NA
81	treatment vs no treatment, where treatment was nutritional counseling and dietary therapy with insulin if required	adverse perinatal outcome, PTB, birth weight, large for gestational age, gestational hypertension or preeclampsia, and neonatal intensive care unit admission	separated into three groups by the results of their GDM screening test (glucose intolerant, mild untreated GDM, mild treated GDM)	medical risk factors, ethnic origin	no (compared to white)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
82	physical activity	gestational age at birth and birth weight	maternal age, birth place, language preference, education, income, employment, tobacco/alcohol/drug use, psychosocial stress, pregnancy diet, reproductive history, complications of the current pregnancy, prepregnancy BMI, parity	medical risk factors, diet, education, stress levels, nativity comparison, income	NA
83	race/ethnicity	age specific infant mortality rates		medical risk factors	yes (compared to black)
84	race/ethnicity, time	infant mortality (by cause)	maternal age, marital status, parity, plurality, sex, education, previous loss, medical risks, labor/delivery complications, smoking, weight gain, prenatal care, gestational age, birth weight	nativity comparison, medical risk factors, prenatal care, education, marriage	yes (compared to white)
85	race/ethnicity	infant mortality	maternal age, maternal education, marital status, tobacco use, infant gender, maternal race/ethnicity and infant mortality by gestational age and risk status	medical risk factors, marriage, education	partially (for some subgroups or outcomes)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
86	race/ethnicity	PTB	maternal age, gravidity, smoking, day of embryo transfer, number of embryos transferred, number of gestational sacs with heart rate, prepregnancy BMI, prior miscarriage, infertility diagnosis	medical risk factors	yes (compared to white)
87	race/ethnicity,	perinatal outcomes, birth weight in grams, gestational age at delivery, mode of delivery, 3rd or 4th degree perineal laceration, preeclampsia, gestational hypertension, shoulder dystocia, neonatal intensive care unit admission, NICU stay >24 hours	GDM management, maternal age at delivery, 1 hour oral glucose load screening test, 3 hour glucose load diagnostic test, any tobacco use during pregnancy, multiparity, chronic hypertension, multiple gestation, history of preeclampsia, history of gestational diabetes, placenta previa diagnosis, induction of labor, prior cesarean delivery, breech presentation, placental abruption, preterm premature rupture of membranes	medical risk factors	yes (compared to white)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
88	race/ethnicity (Cubans as reference for LH)	infant mortality due to respiratory distress syndrome, infant mortality due to other causes, infant survival	nativity, maternal age, marital status, infant sex, maternal education, parity, prenatal care, weight gain during pregnancy, smoking during pregnancy, medical risks, labor/delivery complications, previous loss, gestational age, birth weight	ethnic origin, medical risk factors, marriage, education, nativity comparison, prenatal care	NA
89	(1) old vs new death certificate (2) Hispanic ethnicity and maternal nativity (3) maternal and infant risk factors by the year	(1) Hispanic ethnicity agreement (2) change in Hispanic population (3) Hispanic infant death rate	maternal nativity, age, education, Hispanic origin, tobacco use during pregnancy, marital status, plurality, birth weight, adequacy of prenatal care utilization, Medicaid delivery payment, receipt of Supplemental Nutrition Assistance Program food	nativity comparison, ethnic origin, education, prenatal care, insurance, medical risk factors, marriage	NA

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
90	race/ethnicity	reproductive health, maternal age, parity, marital status, education, household density, income sources, Spanish language, insurance, Medicaid, Supplemental Nutritional Assistance Program, pregnancy intention, birth control, BMI, multi-vitamin use, prenatal care, smoking, drinking, stress factors, physical abuse, bedrest, labor and delivery complications, plurality, low birth weight infant death, ever breastfed, still breastfeeding, sleep position, infant check up	level of Hispanic birth increases	medical risk factor, marriage, education, stress levels, income, insurance, prenatal care,	partially (for some subgroups or outcomes)
91	race/ethnicity, smoking	LBW	stratified by state, maternal educational attainment, marital status at birth, maternal age, utilization of prenatal care, plurality, parity	nativity comparison, ethnic origin, prenatal care, education, marriage, medical risk factors	partially (for some subgroups or outcomes)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
92	fetal number	stillbirth, infant mortality	maternal education, age, marital status, adequacy of prenatal care, sex of the baby, medical risk factors	medical risk factors, prenatal care, education, marriage	partially (for some subgroups or outcomes)
93	NA	NA	NA	nativity comparison, stress levels, social support, acculturation, marriage, prenatal care, illegal immigration	NA
94	foreign born status, race/ethnicity	LBW	education, maternal age, marital status, prenatal care, tobacco and alcohol use, complications during pregnancy	nativity comparison, medical risk factors, education, marriage	yes (comparing immigrant to US born)
95	country of origin, generational status	birth weight	zip-code level income, female child, marital status, adequate prenatal care, parity, multiple birth, maternal age, paternal age, maternal education, paternal education	acculturation, ethnic origin, prenatal care, education, medical risk factors, income, marriage	partially (for some subgroups or outcomes)
96	maternal and state-level migration status	PTB, LBW	age, education, marital status, onset of prenatal care, number of previous live births, tobacco and alcohol use during pregnancy, sex of infant, gestational age	nativity comparison, medical risk factors, education, prenatal care, marriage	yes (comparing immigrant to US born)
97	NA	NA	NA	social support, marriage, education, poverty, medical risk factors, stress, illegal immigration	NA

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
98	race/ethnicity	infant mortality	maternal age, education, marital status, place of birth (USB vs FB), parity, prenatal care, payment source for labor and delivery	nativity comparison, education, medical risk factors, marriage, prenatal care, insurance, residential segregation/cities	no (compared to white)
99	maternal and infant characteristics (infant sex, live birth order, Apgar score, birth weight, gestational age, maternal race, Hispanic ethnicity, age, weight gain, method of delivery, marital status, and preexisting pregnancy conditions)	infant mortality with a UDPIC (unexplained death due to possible infectious cases)	.	medical risk factors, prenatal care, marriage	partially (for some subgroups or outcomes)
100	nativity, country of birth	PTB, LBW, SGA	education, maternal age, marital status, number of previous live births, adequacy of prenatal care, payment source for delivery, maternal smoking, chronic disease	nativity comparison, ethnic origin, medical risk factors, education, prenatal care, insurance	partially (for some subgroups or outcomes)
101	NA	NA	NA	acculturation, biological mechanism, genetic	NA
102	birth weight distribution	infant mortality rate	race/ethnicity	biological mechanism,	yes (compared to white)

Article #	Independent Variables	Dependent Variables	Covariates	Genetic, Biological, Psychological, Social Factor Addressed	Supported Paradox or Not?
103	race/ethnicity	prenatal and post-partum health care utilization	maternal age, education, total annual household income in the year before delivery, language of survey completion, insurance status before pregnancy, prenatal care payment, participation in WIC	prenatal care, education, medical risk factors, poverty, insurance	NA
104	SES (income, income adjusted by family size, wealth via value of family's home, maternal education, mother's marital status at birth, whether the mother lived with both biological parents until age 16, whether the family had a checking account, whether the family had any financial investments)	LBW, SGA	maternal age, first child or not, child's sex, number of children under 18 and number of adults in the family, region of residence, maternal smoking during pregnancy, adequacy of prenatal care, presence of any medical risk factors	income, education, medical risk factors, prenatal care, marriage	partially (for some subgroups or outcomes)

Abbreviations: LBW = low birth weight, SGA = small for gestational age, PTB = preterm birth, IMR = infant mortality rate, NA = not applicable, LH = population described only as Latina or Hispanic

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Education

The Pennsylvania State University, Schreyer Honors College
Bachelor of Science in Biobehavioral Health
Summer 2019

Research

Independent Research **November 2018 - July 2019**
Examined the environmental, social, psychological, and biological factors contributing to the reported Hispanic/Latina paradox. This research was conducted under the supervision of Dr. Lindsay Fernández-Rhodes.

Research Assistant **October 2017 - May 2018**
Assisted in data collection during lab visits, including interacting with the participant and parent, helping with transitions between activities, and assisting the researcher conducting the experiment when necessary. The Infant and Child Temperament Lab was run by Dr. Cynthia Stifter.

Awards and Honors

Schreyer Honors College Academic Excellence Scholarship
Weaver and Sutherland Scholarship
H & H Alumni Board Scholarship

Extracurricular Activities

Penn State University Bennett Family Center, University Park, PA
Wage Employee *May 2018 – August 2018*
Provide support to kindergarten and summer camp classroom teachers by planning activities and lessons, as well as facilitating day-to-day activities, such as meal time and field trips
Supervise safety of children and foster socioemotional development through emergent curriculum

Special Olympics
Indoor Track Volunteer *January– May 2017, January– May 2018, January - May 2019*
Provided moral support and companionship for athletes ranging from eight to 55
Created activities appropriate for the ability level and interests of each athlete

Life Link
Volunteer *October 2017– May 2017*
Worked with special needs students from the ages to 13-21 to promote skills such as appropriate peer interaction and reinforce basic educational concepts, such as adding and reading
Engaged with students by playing various board games and working with online educational modules