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Nativity and perinatal outcome disparities in the United States: Beyond the immigrant paradox

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Abstract

In the United States (US), epidemiologists have long documented paradoxically lower rates of adverse perinatal health outcomes among immigrant birthing people than what might be expected in light of socioeconomic and language barriers to healthcare, especially as compared to their US-born racial and ethnic counterparts. However, researchers have also documented significant variability in this immigrant birth paradox when examining within and across racial and ethnic subgroups. This review paper summarizes fifty years of research regarding differences in low, preterm birth, and infant mortality in the US, according to the nativity status of the birthing person. While there is ample evidence of the importance of nativity in delineating a pregnant person's risk of adverse infant outcomes, this review also highlights the relative paucity of research exploring the intersection of acculturation, ethnic enclaves, and structural segregation. We also provide recommendations for advancing the study of perinatal outcomes among immigrants.

Introduction

In the United States (US), disparities in perinatal and neonatal outcomes by race and ethnicity have been well documented. Disparities occur within single healthcare centers, within states, within national populations, and over time.^{1,2} In recent years, there is a growing recognition that these disparities reflect inequities because they arise as a result of unjust differential treatment, of individuals and entire communities, due to characteristics that reflect societally created groupings.²⁻⁴ However, there is also a rich body of literature that documents disparities in perinatal and neonatal outcomes by nativity, another variable important to an individual's identity and how they are situated within US society.

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A person's nativity indicates where they were born, and is defined by country of origin.⁵ However, researchers also use nativity to dichotomize people as native-born (i.e. born in the country being studied) or foreign-born (i.e. born outside the country under analysis).^{6,7} Thus, nativity can represent granular data regarding a specific country or as a global indicator of immigrant status. Similar to race and ethnicity, nativity is a variable that is not within an individual's control. While nativity can unite people and form the basis of community ties, it has also been used as a sociodemographic characteristic to aggregate individuals and regulate them through laws and policies.⁸ Currently, immigrants represent nearly 14% of the total US population. The fact that immigrants have a slightly higher fertility rate than US-born birthing people⁹ indicates the importance of studying birth outcomes within this population.

We review the relationship between a birthing person's nativity status and their risk for three adverse outcomes which are important for population health and we focus on the US experience. We evaluate the existing literature on low birthweight (LBW; birthweight < 2500 grams), preterm birth (PTB; gestational age < 37 weeks) and infant mortality (death in the first year of life). Although small-for-gestational age (SGA) (i.e. birthweight less than 10th percentile for gestational age) is a related outcome, we did not include it in this review given worldwide variability in how SGA is defined and ongoing conversations about whether some of these definitions are problematic and may obscure racial disparities in fetal growth (see Belfort et al. review in this issue).

We use the words "women" or "mother" when these terms were used by the original literature cited. However, this paper is meant to be inclusive of all people who birth infants, regardless of the birthing person's gender. Similarly, as the predominance of papers we reviewed used the word "Hispanic," we will also use this term. However, we recognize that some people prefer the use of terms such as Latinx, Latine, or Latino/a. Although the terms are not technically inter-changeable,¹⁰ this paper is meant to be inclusive of all who identify with any of these terms. Finally, because current immigration policies are deeply rooted in the 1965 Hart-Celler Act, which abolished national origin quotas and simultaneously capped the number of resident visas which could be issued,¹¹ we focused exclusively on research published after 1970. Our aims were to summarize epidemiologic findings, identify overarching themes, and provide clear recommendations for researchers who are committed to elimination of health disparities.

Foundational history and concepts

Striking disparities in health outcomes have been documented between non-Hispanic White and Black people in every age group for most of the 20th century.¹² However, in the 1980s researchers began reporting that Mexican-born women who lived in California had lower rates of LBW and other adverse health outcomes than non-Hispanic US-born White women.^{13,14} These early observations formed the basis of the "Hispanic" or "Latino" epidemiological birth outcomes paradox. The surprisingly favorable outcomes were considered paradoxical because Hispanic people generally experienced a profile of risk factors associated with adverse outcomes.¹⁵ Over subsequent years, our understanding of the Hispanic paradox has evolved and fits within the general framework of the immigrant

paradox,¹⁵ which describes a global epidemiologic trend in which immigrant people have similar or better health and educational outcomes as compared to native-born individuals, despite many risk factors for adverse health, such as decreased access to health insurance or socioeconomic challenges.¹⁶ Although the immigrant paradox has been documented in Europe,^{17,18} it has been most extensively studied in the US, especially in the maternal-infant sphere of health.¹⁵

The “paradoxical” nature of perinatal outcomes among immigrant birthing people and their infants is an important aspect of overall immigrant health. It is now well-recognized that birthplace, the reason for and process of migration, and immigration and documentation status within the receiving country are all important social determinants of health.⁵ There is an extensive body of literature on the impact of acculturation on immigrant health outcomes.^{19,20} Acculturation is defined as the changes related to behavior, attitudes and beliefs which may occur as a result of immigrants coming into contact with a new society.¹⁵ Acculturation is viewed as a multidimensional process whereby immigrant people vary with respect to how much they retain or relinquish their culture of origin and how much they accept or adopt the new, receiving culture.^{20,21} The way in which acculturation has been conceptualized and measured varies widely. Some studies use nativity itself as a measure of acculturation. Used in this way, a US-born Colombian-origin person would be considered more acculturated to US culture than a person born in Colombia. Since nativity may be a crude measure, others have utilized a short series of questions related to language preference and years in country,²² while some research groups employ validated acculturation surveys that have been psychometrically tested.²³

Acculturation, and the extent to which people undergo this process, has historically been considered the conceptual underpinning for the nativity health advantage. Typically, higher levels of acculturation have been associated with a negative impact on behavioral, psychological, and physical health outcomes, while retention of culture of origin has been protective of adverse health outcomes.¹⁹ For example, during pregnancy, researchers believed that acculturation explained immigrant birthing people’s lower rates of risky health behaviors, such as smoking or alcohol use, and higher rates of marriage, which may indicate greater social support.¹⁵

Acculturation is related to but separate from another phenomenon that is considered protective for immigrant health, ethnic enclaves. Ethnic enclaves are areas in which the majority of residents are from the same ethnic group. Residence within ethnic enclaves has been associated with a variety of positive health outcomes^{23,24} and is hypothesized to contribute to health through the creation and maintenance of strong social support ties. Such ties are hypothesized to mitigate the barriers to high-quality healthcare either directly, through informal health provision, or indirectly, by encouraging healthy behaviors or providing immigrants with language-concordant community-based knowledge and resources.^{25,26}

However, immigration status can influence individual and systemic barriers to health and healthcare. For example, immigrants may experience cultural and linguistic barriers to health and healthcare through limited English proficiency, lack of resource awareness, and

discrimination.²⁷ In the US, documentation status also determines legal and logistical access to health and healthcare through policies that control access to drivers' licenses, insurance, legal employment, social service programs, and other structural drivers of health.²⁸ Even now, contemporary immigration policies in the US are influenced by structural racism and xenophobia. Since the founding of the country, definitions and re-definitions of who qualifies for admission to and citizenship in the US have reflected racism, colorism and nativism, with evidence dating as far back as 1790, when the first Naturalization Act provided citizenship solely for "free white persons," to recent executive orders such as the Muslim Ban and the Zero Tolerance Policy, which disproportionately excluded immigrants of color.⁸ These government-sanctioned policies have created structural disadvantages for specific groups of immigrants that can affect health outcomes.

Nativity and risk of low birthweight (LBW)

The studies which reported an association between maternal nativity and LBW analyzed data beginning in 1989 (Table 1).^{29,30} The majority of studies analyzed state-wide registries such as state-provided birth certificates or state-based surveys. We also included five studies which analyzed local city-based data³¹⁻³⁵ and five analyses that aimed to be nationally representative (Table 1).³⁶⁻³⁹ Notably, except for one study,³⁹ all the nationally representative analyses which analyzed the relationship between nativity and LBW relied on data that are more than two decades old and thus may not represent current epidemiologic trends.

Although some studies considered the impact of nativity across racial/ethnic groups, many studies focused on Hispanic women, either by comparing Hispanic women to non-Hispanic women,^{29,38,40,41} or by exclusively studying women who identified as Hispanic.^{32,37,39,42-45} Within this body of literature, the majority of studies further focused on Mexican-origin women and compared either US vs. foreign-born Mexican-origin women or compared women of Mexican descent to non-Hispanic women or Hispanic women from other countries. In general, researchers reported that foreign-born Hispanic women had lower rates or risk of LBW compared to US-born Hispanic women, which is consistent with the immigrant paradox.^{33,39,41,44,46} However, there were some studies that reported contrary findings. For instance, Reichman and Kenney reported that Puerto Rican White women in New Jersey had a higher risk of LBW compared to non-Hispanic women and other Hispanic white women.²⁹ A study of women in California reported no significant differences in LBW when comparing a variety of different Hispanic subgroups to non-Hispanic White women.⁴⁰

Several studies of maternal nativity focused on non-Hispanic Black women to study the relationship between maternal nativity and LBW. In 1997, David & Collins published seminal work in the *New England Journal of Medicine* using Illinois vital records from 1980 to 1995 to show that Sub-Saharan African-born women had higher mean birth weights and lower rates of LBW and very LBW (i.e. birth weight < 1500 grams) than US-born Black women.⁴⁷ Using the same Illinois-based data, this group later reported a similar nativity advantage when comparing Caribbean-born and US-born Black women.⁴⁸ Critically, this team later documented that foreign-born Black women's daughters and granddaughters birthed infants with a decreased mean birth weight than each previous

generation, thus documenting a transgenerational erosion of the foreign-born advantage within Black families.⁴⁹

The original African and Caribbean nativity advantage however continued to exist for decades. Ten years after David & Collins' initial observations in Illinois, Vang and Elo used New Jersey data to report that infants born to US-born Black mothers had significantly lower birth weights than infants born to Black immigrant mothers from Sub-Saharan Africa or the non-Spanish-speaking parts of the Caribbean, with the highest birth weights documented among the African immigrant mothers.⁵⁰ Similar findings among African vs. Caribbean Black mothers were reported by two other groups.^{34,35} However, Howard et al. further documented that South and Central American-born Black women had the lowest risk of LBW compared to US-born Black women.³⁵

A few studies analyzed outcomes among Asian women.^{36,51} Hayes and colleagues reported differences in the association between maternal nativity and risk of LBW when comparing Chinese-origin mothers and Asian Indian-origin women. Women of Asian Indian origin had higher rates of both moderate and very low birthweight infants than Chinese-origin mothers. This variation within the broad Asian category was more pronounced when comparing foreign-born Asian Indian mothers and US-born Asian Indian mothers.³⁶ Differential manifestations of the immigrant paradox within Asian subgroups were also documented by Qin's group, which reported different rates of LBW when comparing US vs. foreign-born Chinese, Filipino, Vietnamese and Cambodian/Laotian mothers, but not when comparing US and foreign-born Korean and Japanese mothers.⁵¹

In our review, there were only a few studies which explored the interplay of race, ethnicity, and nativity on risk of LBW. For instance, Rechiman and Kenney analyzed maternal ethnicity and country of origin within Hispanic women and among women who self-identified as White or Black.²⁹ They compared the risk of LBW for all women of Mexican descent who lived in New Jersey, as well as the risk for women specifically born in Mexico. This led them to discover that Mexican-born women had a decreased risk of LBW compared to US-born women, while women of Mexican descent in general had a higher risk of LBW compared to other women of Hispanic descent and non-Hispanic women, but neither of these comparisons were statistically significant.²⁹ Given that they looked at differences between Hispanic and non-Hispanic women, and within Hispanic women by race, they also documented that disparities within Hispanic women were more often statistically significant among Black women, despite smaller sample sizes.²⁹ Similarly, in looking at the immigrant paradox among Black women, Howard's group documented that despite the lower risk of LBW experienced by foreign-born Black women in their cohort, their risk of LBW was still higher than that of US-born non-Hispanic White women.³⁵

Nativity and risk of preterm birth (PTB)

Most studies identified for this review analyzed the relationship between maternal nativity and risk of PTB. In contrast to the LBW literature, a larger proportion of the PTB studies analyzed city-level data rather than state or national datasets (Table 2). The data we reviewed

include births occurring between 1995 and 2017. As with the LBW literature, California-based data is over-represented.^{30,40,51-56}

As compared to the literature on LBW, the literature on PTB included a wider array of ethnic groups.^{30,31,33,35,56-60} All studies which included Black birthing people except for one reported an advantage for foreign-born individuals.^{30,33,35,46,56-59,61} Among Black mothers in Philadelphia, Pennsylvania who delivered from 2003 to 2005, Bloch et al. reported no significant difference in PTB rates by nativity status.⁶⁰ In contrast, in a study with lower PTB rates among immigrant Black women, Egbe et al. found evidence of an immigrant advantage among non-Hispanic Black women, with a PTB rate of 7.4% among their foreign-born non-Hispanic Black women compared to 10.7% among US-born non-Hispanic Black women.⁶¹ Notably, Egbe's group found US-born non-Hispanic Black women and US-born Hispanic Black women had higher risk of extreme, moderate and late PTB than both foreign-born non-Hispanic White women and foreign-born Hispanic White women.⁶¹ Like the work conducted by Reichman et al in New Jersey,²⁹ Egbe et al. found that race attenuated the Hispanic paradox within US-born groups. Furthermore, the immigrant paradox was differentially protective for foreign-born women of different races.⁶¹

The immigrant birthing paradox has also been documented in the Hispanic population.^{33,39,40,61} Three studies documented a nativity advantage specifically among Mexican women, one looked at births in Texas,⁴⁶ while two examined births in California.^{40,55} In the largest study looking exclusively at 2013 Hispanic birth outcomes across the country, Mexican-born women were used as the reference group to examine variation by country of origin.³⁹ In this analysis, Hispanic women born in Costa Rica, Cuba, and Ecuador had a significantly lower risk of PTB compared to Mexican-born women, while women born in the Dominican Republic, El Salvador, Guatemala, Nicaragua, Panama, and Puerto Rico had a significantly higher risk.³⁹ There was only one paper in our review which did not find evidence of the immigrant paradox with respect to PTB within Hispanic women, but this cohort included only 116 foreign-born women and thus had limited statistical power.³⁸

Subgroup variation in risk of PTB was also noted in studies of Asian women.^{51,55} Using California data from 1992-2003, Qin et al. noted that US-born Filipino-, Chinese-, and Japanese-origin mothers had significantly higher rates of PTB compared to their foreign-born counterparts, even after adjusting for maternal age, prenatal care, and socioeconomic factors.⁵¹ Similar analyses reported no difference in PTB rates between US and foreign-born Korean-, Vietnamese-, and Cambodian/Laotian-origin mothers. Although the authors did not compare across subgroups, the US and foreign-born Cambodian/Laotian-origin mothers had the highest rates of PTB (17.4% and 14.0%, respectively), while Korean mothers had the lowest (6.4% among US-born and 6.0% among foreign-born).⁵¹ Rates of PTB among US- and foreign-born Filipina mothers (11.4% and 11.0% respectively) were the second highest in Qin's analysis⁵¹ and similar to rates reported a more recent cohort of San Diego births. Using data from 2007 to 2012, Araneta et al. found that US-born Filipino-origin mothers had PTB rates which were nearly as high the rates among US-born Black women in their cohort (10.8% among Filipino mothers and 10.9% among Black mothers).⁵⁵

There was one paper that reported on the immigrant paradox with respect to PTB among non-Hispanic White women of Eastern European background.³¹ Exploring outcomes among women from Russia, Ukraine, Poland and the former Yugoslavic Republics, Janevic's group found that only women born in Russia, Ukraine and former Yugoslavia had lower rates of PTB compared to US-born non-Hispanic White women, while women born in Poland did not not.³¹

Finally, some research groups considered the underlying factors which contribute to nativity-based differences in risk of PTB. For instance, in a cohort of Hispanic women, von Ehrenstein reported that the risk of PTB varied by maternal nativity and type of employment.⁵² In another study, later initiation of prenatal vitamin supplementation was associated with increased risk of PTB primarily among US-born Hispanic women, rather than foreign-born Hispanic women.⁵⁴ In Janevic's study on Eastern European women, education seemed to modify risk of PTB across ethnic groups.³¹ Foreign-born women with the lowest levels of education had the most decreased risk of PTB relative to the US-born non-Hispanic White women in this cohort, while increasing educational levels only appeared to be protective against PTB for US-born women.³¹

Nativity and risk of infant mortality

The body of literature exploring the impact of nativity on infant mortality (i.e, death occurring anytime within the first 365 days of life⁶²) in the United States is much more limited than the literature base for LBW or PTB (Table 3). However, each study that looked for a nativity advantage for infant mortality found it. Lower rates of infant mortality among foreign-born infants have been documented in New York City,^{63,64} in Mexican families in Los Angeles⁶⁵ and New Jersey,²⁹ in Filipino communities in California,⁵¹ and among Black people in California.³⁰ In addition, a national analysis of 20 million births from 1995-2000 by Hummer et al. found an overall nativity advantage for infants of nearly every sub-group of immigrant women compared to their US-born counterparts (Mexican, Cuban, Other Hispanic, non-Hispanic Black and non-Hispanic White). Furthermore, this group found that infants of foreign-born Hispanic women (and specifically Cuban and Mexican immigrant women) had the lowest rates of infant mortality rates overall.⁶⁶ Critically, the only exception to the nativity advantage in Hummer's work was seen among infants born to Puerto Rican women. This group noted that infants of island-born Puerto Rican women did not have a significantly lower risk of infant mortality compared to infants of mainland US-born Puerto Rican women.⁶⁶ Another national analysis of IMR used data from 2003-2004 to document a similar nativity advantage among infants born at term to White, African-American and Mexican-American mothers.⁶

Discussion

In our review of studies that explored the association between nativity and risk of low birth weight, PTB, and infant mortality, we identified a broad literature base which included epidemiologic evaluations of city, state, and national-level data. In general, nativity is an important variable to consider for risk of adverse perinatal and infant out-comes and

foreign-born birthing people tend to have lower rates of poor outcomes than their US-born counterparts.

Our review identified four concepts associated with the immigrant birth outcomes paradox which deserve further study (Fig. 1). First, the immigrant birth outcomes paradox does not apply to all subgroups of birthing people, even when birthing people share racial or ethnic identities. Second, acculturation is a complex process that may not apply consistently across different racial, ethnic, and country of origin subgroups of immigrants. Third, the impact of local physical context is variable among immigrant birthing people and may represent either a risk or resilience factor. Finally, structural drivers of health may help explain the variability that exists within the immigrant birth paradox.

Evidence for the variability of the immigrant paradox is best exemplified by studies which reported deeper or new disparities when immigrants' race was considered.^{29,35,61} While foreign-born birthing peoples' rates of adverse outcomes were generally lower than their US-born racial or ethnic counterparts, racial disparities in birth outcomes still existed within the foreign-born cohorts.^{33,61} For instance, US-born Hispanic birthing people might have lower rates of PTB than foreign-born Hispanic people, but rates of PTB were higher among foreign-born Hispanic Black women compared to foreign-born Hispanic White women.⁶¹ The non-homogeneity or even non-applicability of the immigrant paradox across all immigrant birthing people was highlighted by nearly every paper that analyzed ethnic subgroup variation, including Black,⁵⁰ Asian,^{36,51} Hispanic,^{29,39} and European White³¹ maternal groups. Certain subgroups within each racial/ethnic group were repeatedly found to be at higher risk for adverse birth outcomes than other subgroups, such as birthing people from Puerto Rico^{29,39} and the Philippines.^{51,55} Relatedly, among Black birthing people, foreign-born Somalian mothers were consistently noted to have among the lowest rates of PTB.^{55,56} In one study, rates PTB among Somalian-born mothers were even lower than foreign-born Hispanic and non-Hispanic White women.⁵⁵

The reasons for variability in the immigrant birth outcome paradox, and the disparities that existed within foreign-born groups, are not fully understood. However, they may reflect the timing of migration, both at individual and subgroup levels, which is also associated with exposure to both individual and structural racism and xenophobia, especially for immigrants of color.⁸ Socioeconomic factors and access to health-care, conversely, may be less important, given that most foreign-born birthing people had higher socioeconomic risk profiles than their US-born counterparts.^{15,38}

The second overarching tenet is that acculturation as a variable is not uniformly or even widely assessed in research on immigrant birth outcomes (Table 4). Thus, perhaps unsurprisingly, the association between acculturation and birth outcomes varied across the literature. For instance in Jones and Bond's work, birth parents' acculturation status, as measured using a validated acculturation scale, was significantly negatively correlated with birth weight, whereas the birth parents' acculturation status, measured by generation in the US, was not.⁴³ Even very similar acculturation variables appeared to function differently among different birthing cohorts. In work by Minhas et al., immigrant non-Hispanic Black birthing people in Boston who resided in the US less than 10 years had a lower risk of PTB,

but after the 10 year milestone, there was no significant difference between Black immigrant and US-born Black birthing parents.⁵⁹ Conversely, when time in the US was measured as a continuous variable in a nationally representative survey of Hispanic birthing parents, there was no significant association between this measure of acculturation and risk of PTB.³⁸ In comparing the results from Black birthing individuals in Boston and a national sample of Hispanic birthing individuals, one might hypothesize that the divergent results could be related to varying acculturation experiences in different geographic and policy contexts. We believe it is important to consider the underlying hypothesis or mechanism by which acculturation influences health outcomes. It may represent differential health behaviors or differential access to culturally concordant care and resources in areas where those exist. But in a different context, it might better serve as a proxy for documentation status or language preference, and as such, represent barriers to health insurance, high-quality health care or stable employment opportunities.

This leads to the third tenet that emerged from this literature review: place of residence might be functioning as a risk factor or a resilience factor for immigrant birth outcomes, even for similar racial/ethnic/native groups. There is robust evidence that structural systems over time have led to racial and ethnic segregation of minoritized individuals in purposeful ways.^{67,68} There is also a broad literature base documenting an association between segregation, decreased healthcare access, decreased access to quality healthcare and adverse health outcomes.^{67,68} For immigrant birthing people, the impact of residential segregation is complicated by the notion of the ethnic enclave. Living in an ethnic enclave is conceived of as protective of immigrants' health outcomes.⁶⁹ Indeed, some have documented a positive relationship between exposure to an immigrant enclave and improved birth outcomes (i.e. lower PTB risk or increased birth weight) among certain immigrant birthing groups.^{37,70} However, neighborhoods with high proportions of immigrants may also represent modern-day socioeconomic or cultural segregation that reflects ongoing structural disinvestment in food, housing, healthcare, and education.⁶⁵

The potentially variable ways in which place of residence affects immigrant birth outcomes is highlighted by three case examples. The first is Johnson & Marchi's study using California-based survey data. They found that English-speaking Mexican birth parents living in predominantly Hispanic immigrant neighborhoods had increased odds of LBW compared to the Spanish-speaking immigrant birth parents living in those same neighborhoods. However, they also had increased odds of LBW compared to English-speaking birth parents in neighborhoods with lower proportions of Hispanic immigrants.⁴² One might hypothesize that the immigrant enclave effect protecting against risk of LBW in this case was restricted to Spanish-speakers, and once language concordance was removed, structural or neighborhood level factors predominated to create a risk-promoting environment.

The divergent conclusions found by two separate groups looking at PTB rates among US and foreign-born Black women in the same state are a second case example. Bloch et al. found no difference in PTB rates between US and foreign-born Black mothers in Philadelphia from 2003 to 2005,⁶⁰ while Egbe et al.'s team documented an immigrant advantage among non-Hispanic Black women using statewide Pennsylvania data from 2011 to 2014.⁶¹ Given that many other studies in other contexts have found an immigrant paradox

with respect to PTB among Black birthing people, Bloch's group's analyses and findings may have been biased by their small sample size. However, an alternate hypothesis might be that the local context of Philadelphia was particularly deleterious for all Black women, such that PTB rates were uniformly high in this context and the immigrant paradox melted away.

The nuances surrounding Puerto Rican birth outcomes provide a third case example that highlights why individual characteristics like nativity and acculturation need to be examined together with place of residence. Puerto Rican birthing people are US-born with US citizenship regardless of whether they are born on the island of Puerto Rico or on the mainland US.⁷¹ As such, they have fewer barriers to migration to and from Puerto Rico. However, studies which have specifically commented on Puerto Rican birthing people's outcomes have often grouped island-born Puerto Ricans as foreign-born, in part because of linguistic, cultural, socioeconomic, and political differences between people who live in Puerto Rico and those who were born in or have established residence in the mainland US.⁷² For instance, island-born Puerto Rican people do not share the same voting privileges as mainland-based Puerto Ricans.⁷¹ Birth outcomes among Puerto Rican people have consistently been shown to be worse than the outcomes of other Hispanic people.^{15,39} Furthermore, the nativity advantage seen among other Hispanic and immigrant groups is not consistent among Puerto Rican people; some have found no difference,⁶⁶ while others have documented higher rates of adverse outcomes among island-born Puerto Rican people (i.e. the purportedly foreign-born category).⁷³ In addition, the scarce work which has explored acculturation within Puerto Rican birthing people has shown trends opposite of what is seen in most other papers; improved birth outcomes as acculturation increased.⁷⁴

These case examples highlight the multidimensional ways in which individual characteristics likely interact with place-based factors to affect immigrant birthing outcomes. This leads us to the fourth tenet we noted from this rich literature base: there is a relative paucity of work studying structural-level drivers of immigrant birth outcomes (Table 4). The study of structural drivers of birth inequities has traditionally used variables such as area-level deprivation and both racial and economic segregation as risk factors for poor birth outcomes, particularly among Black birthing people.^{4,34,75} Immigrant birth outcomes have been examined with respect to neighborhood level poverty,^{34,42,50,60,72,76} segregation,^{34,37,50,65,72} and among Hispanic birthing people, with respect to immigration policies.^{41,45} In addition, we found one paper which examined the role of green space as a potentially positive structural driver of birth outcome disparities among Black immigrant birthing people.³⁴ However, the impact of other structural drivers of health, such as the policies regulating housing access and quality, food access, pollution, rates of incarceration, and the degree to which healthcare, education and food are governmentally subsidized for immigrants,^{77,78} remain understudied.

Recommendations for future research

We close by offering a series of considerations for research teams investigating disparities in perinatal and infant outcomes, and especially teams with access to data that can identify the nativity status of maternal-infant dyads. It is clear from this literature that the breadth of disparities across and within different racial, ethnic and immigrant communities has been

underreported due to traditional data collection techniques. It is also clear that nativity data can be collected both on a small and large scale. However, it is important to consider how to collect data on country of origin, immigration status, acculturation and/or acculturative stress in a way that is relevant to the research question and sensitive to the complicated realities of living as an immigrant in the US.⁵ Researchers should not shy away from collecting such data, but rather ensure their teams are doing so in trauma-informed ways that seek and incorporate feedback from community members with lived experiences.^{79,80}

It is also clear that limitations in the literature arise when nativity is not considered in conjunction with both race and ethnicity. This is particularly true when studying immigrants of color given the variation in outcomes that we found within Hispanic birthing communities by race, or within Asian communities by ethnicity. This may reflect how colorism, or discrimination towards people with darker skin tones both within and between races,⁸¹ intersects with xenophobia or nativism to create compounded risk for immigrant birthing people of darker skin tones. The impact of colorism within non-Black communities on health in general is also understudied and thus merits further exploration.

Finally, there is a paucity of data that combines individual and structural-level factors associated with poor birth outcomes, especially among immigrant birthing people. Addressing this gap will benefit from mixed-methods research or the use of multiple datasets, such as merging individual-level birth outcome datasets with data on deprivation⁸² or segregation,⁷⁵ from the American Community Survey, or tools such as the Maternal Vulnerability Index.⁸³ Conducting multi-level, large data-set work will require addressing analytic challenges but will also provide opportunities for scientific innovation and the advancement of health equity among immigrant birthing communities.

Conclusion

The study of birth outcomes among immigrants in the United States is a priority in order to advance the health of the US population and ensure national goals related to health equity. Although there is a strong literature base on this topic, the field can be moved forward if researchers consider the inter-sectional identities of immigrant birthing people and the ways in which such identities contribute to both individual and structural discrimination and resilience.⁸⁴ Such considerations are also critical for the design of fourth-generation health equity research aimed at implementing and evaluating interventions to dismantle disparities.⁸⁵

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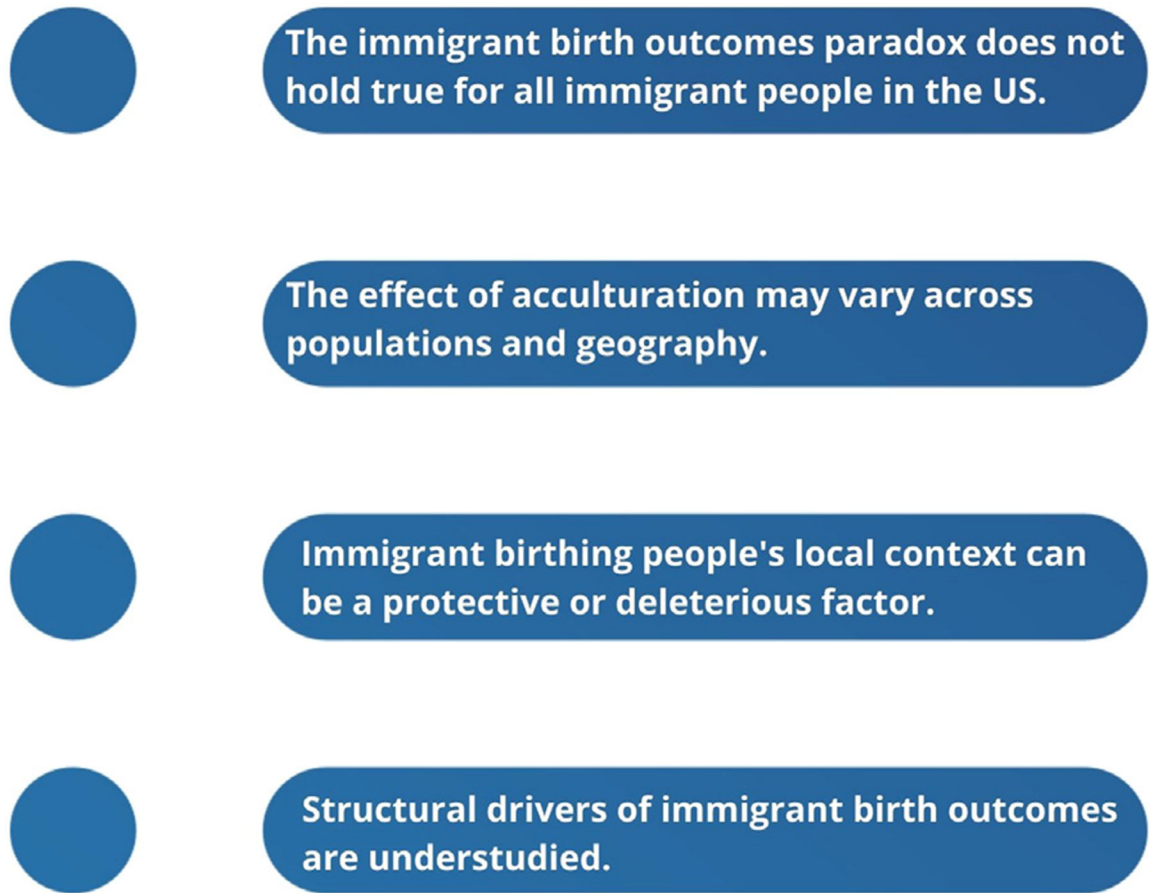


Fig. 1- Nuances of the immigrant birth outcomes paradox which merit further research exploration.

Table 1 – Studies Comparing Low birthweight (LBW, <2500 g) in US-born vs. Foreign-born Birthing People

| Study | Setting | Study Time Frame | Sample Size | Subgroups Examined | Major Conclusions |
|------------------------|-------------------------|------------------------|-------------|--|---|
| Reichman & Kenney 1998 | New Jersey | 1989-1990 | 215,377 | Cuban, Mexican, Puerto Rican | All foreign-born and foreign-born Hispanic Black women were significantly less likely to have a LBW infant compared to their US-born counterparts. There was no significant difference in odds of LBW by nativity among White and White Hispanic women. |
| David & Collins 1998 | Illinois | 1980-1995 | 44,046 | Sub-Saharan African-born | Compared to US-born White women, the relative risks of LBW and very LBW (i.e. <1500 grams) were significantly higher among infants of US-born Black women than those of Sub-Saharan African-born women. |
| Jones & Bond 1999 | Southwest United States | 1997 | 382 | Mexican | There was no significant correlation between nativity and LBW among foreign-born and first-generation Mexican women. Women with higher acculturation levels were found to have significantly lower birth weights. |
| Palloto 2000 | Illinois | 1980-1995 | 103,746 | Caribbean | Infants of US-born Black women have a greater moderate LBW (1500 to <2500 grams) rate than infants born to Caribbean-born Black women. There were no significant differences in the rates of very LBW (<1500 g) infants for US-born vs. Caribbean-born Black women. |
| Collins 2002 | Illinois | 1956-1975 1989-1991 | 126,203 | European and African/Caribbean | There were no significant differences in female LBW rates between European-born White women and the daughters of their US-born female descendants (i.e. no difference between 1 st and 3 rd generations). 3 rd generation infants of US-born Black mothers were more often LBW than the 2 nd generation US-born infants of African/Caribbean-born Black women. |
| Howard 2006 | New York, NY | 1998-2002 | 168,039 | Black African, American, Asian, Cuban, European, Puerto Rican, South & Central America, West Indian, Brazilian | Among Black women, all foreign-born women from each region examined had significantly lower risks of LBW than U.S.-born women, except for Cuban-born Black women. However, US-born non-Hispanic White women still had the lowest relative risk of LBW compared to US-born Black women overall. |
| Hayes 2008 | United States | 1998-2003 | 293,211 | Asian Indian and Chinese | Foreign-born Chinese mothers had similar proportions of very LBW (<1,500 g) infants, but significantly higher proportions of moderately LBW compared to US-born Chinese mothers. There were no significant differences in the proportions of very LBW and moderately LBW infants when comparing foreign-born and US born Asian Indian mothers. |
| Johnson & Marchi 2009 | California | 1999-2005 | 6,442 | Mexican | There was no significant difference in the prevalence of LBW between foreign-born Mexican and US-born Mexican women. English-speaking mothers had a significantly higher prevalence of LBW infants than Spanish-speaking women. |
| Osypuk 2010 | United States | 2000 | 490,332 | Mexican | There was a significant negative association between exposure to US-born Mexican <i>ethnic enclaves</i> and the birthweight of infants of US-born mothers of Mexican-origin, even after adjusting for covariates. Though there was a positive association between exposure to Mexican <i>immigrant enclaves</i> and the birthweight of infants of US-born mothers of Mexican-origin, this association became nonsignificant in adjusted models. |
| Qin 2010 | California | 1992-1997 1999-2003 | 486,451 | Chinese, Japanese, Filipino, Vietnamese, Cambodian/Laoatian, Korean | US-born Filipino, Chinese, Vietnamese, and Cambodian/Laoatian mothers had significantly higher rates of LBW compared to their foreign-born counterparts. US-born Cambodian/ Laoatian mothers had significantly higher rates of very LBW compared to their foreign-born counterparts. There were no significant differences in LBW between the US-born and foreign-born Korean and Japanese mothers. |
| Romero 2012 | Colorado | 1989-2004 | 151,422 | Mexican | Foreign-born Mexican women had significantly lower odds of LBW compared to US-born Mexican women. |

| Study | Setting | Study Time Frame | Sample Size | Subgroups Examined | Major Conclusions |
|-------------------------|----------------|------------------|-------------|---|---|
| Sullivan 2012 | Texas | 2006 | 369,839 | White, Black, Mexican, Hispanic, Other | Foreign-born White women had significantly lower rates of low-birth weight than U.S.-born white mothers. U.S.-born Black mothers had significantly higher rates of low-birth weight compared to foreign-born Black mothers. Foreign-born Mexican mothers had a lower prevalence of infants with LBW than U.S.-born Mexican and U.S.-born White mothers. |
| Yang 2013 | New Jersey | 2002-2006 | 73,907 | Black Women from Sub-Saharan Africa and the non-Spanish speaking Caribbean | U.S.-born Black mothers had infants with significantly lower birth weight compared to foreign-born African Black mothers and foreign-born Caribbean mothers ($p<.001$). |
| Fleuriet 2015 | Harrington, TX | 2011 | 300 | Mexican | There was no significant difference in prevalence of LBW between foreign-born Mexican women and U.S. born women. The infants of U.S. born women had significantly lower mean birth weight compared to foreign-born Mexican immigrant women. |
| Sanchez - Vaznaugh 2016 | California | 2003-2010 | 21,227 | Mexican, Other Latina | There were no significant differences in LBW among U.S.-born non-Latina White women U. S.-born Mexican American women, U.S.-born Non-Mexican Latinas, Mexican immigrants, and Non-Mexican Latina immigrants in adjusted models. |
| Novak 2017 | Iowa | 2006-2010 | 209,389 | Latinas | LBW rates among foreign-born Latina women were lower compared to US-born White-women and US-born Latina women a year before the Postville immigration raid. After the raid, rates of LBW rose by 24% for all Latina women (US and foreign-born) but not White women. |
| DeSisto 2018 | United States | 2013 | 795,658 | Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, Puerto Rico, Spain, Venezuela, other South America | Infants of U.S. born mothers were significantly more likely to have a LBW compared to foreign-born mothers in both unadjusted and adjusted models. |
| Adegoke 2022 | Boston, MA | 2010-2015 | 11,518 | Black, White, Hispanic, Other | U.S.-born groups were more than twice as likely to have an infant with LBW at term than their foreign-born counterparts. |
| Planey 2022 | New York, NY | 2010-2014 | 156,711 | African and Caribbean | After controlling for all individual and census tract level variables, African-born and Caribbean-born women had significantly lower odds of having a LBW infant than US-born Black mothers. |

Table 2 –
Studies Comparing Preterm Birth (PTB) in US-born vs. Foreign-born Birthing People

| Study | Setting | Study Time Frame | Sampl Size | Subgroups Examined | Major Conclusions |
|-------------------------|------------------|------------------------|------------|---|---|
| Howard 2006 | New York | 1998-2002 | 168,039 | Black African, American, Asian, Cuban, European, Puerto Rican, South & Central America, West Indian, Brazilian | There was no significant difference in risk for preterm birth among foreign-born and US-born West Indian and Brazilian women. |
| Fuller 2010 | United States | 2001 | 8,114 | Mexican and other Hispanic | There was no significant difference in risk for PTB between foreign-born and US-born Hispanic women. |
| Qin 2010 | California | 1992-1997 1999-2003 | 486,451 | Chinese, Japanese, Filipino, Vietnamese, Cambodian/Laoitain, Korean | U.S.-born Filipino, Chinese, Japanese, and Cambodian/Laoitain women had significantly higher rates of PTB compared to their foreign-born counterparts. There were no significant differences in LBW between the US-born and foreign-born Korean and Vietnamese women. |
| Kaufman 2011 | New York, NY | 1995-2003 | 258,680 | Mexican, Puerto Rican, Cuban, Dominican, Central American, South American and Other/Unknown | US-born mothers had higher absolute risk of PTB except for women from Puerto Rico and South America. |
| Janevic 2011 | New York, NY | 1995-2003 | 253,363 | Polish, Former Yugoslavian, Russian and Ukrainian | After adjusting for covariates, women from Russia or Ukraine (one group) and Former Yugoslavians had lower risk of PTB compared to U.S.-born non-Hispanic White women. There was no significant difference in PTB rates between foreign-born Polish and U.S.-born non-Hispanic White women. |
| Bloch 2011 | Philadelphia, PA | 2003-2005 | 58,913 | Black | There was no significant difference in PTB rates among foreign-born Black mothers compared to US-born Black mothers. |
| Sullivan 2012 | Texas | 2006 | 369,839 | White, Black, Mexican, other Hispanic, other | Foreign-born Black, Mexican, other Hispanic and other race mothers had significantly lower prevalence of PTB compared to their US-born counterparts. There were no significant differences in prevalence of PTB among US-born and foreign-born White women. |
| Von Ehrenstein 2014 | Los Angeles, CA | 2003 | 2,543 | Hispanic | US-born Hispanic women had significantly higher odds of PTB if they worked shift work and physically demanding work, while foreign-born Hispanic women' odds were not affected. |
| Leonard 2015 | Los Angeles, CA | 2010 | 1,174 | Hispanic | There was not any significant association found between maternal nativity and PTB. |
| Alfonso 2016 | Los Angeles, CA | 2003 | 1,647 | Non-Hispanic White, Hispanic | The association between higher odds of PTB and later initiation of prenatal supplements in pregnancy was more evident in US-born than foreign-born Hispanic women. |
| Sanchez - Vaznaugh 2016 | California | 2003-2010 | 21,227 | Mexican, Other Latina | US-born Mexican Americans and non-Mexican Latinas, foreign-born Mexicans and foreign-born non-Mexican Latinas had higher odds of PTB compared to US-born non-Latina White women. |
| DeSisto 2018 | United States | 2013 | 795,658 | Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, Puerto Rico, Spain, Venezuela, other South America | US-born mothers were significantly more likely to have a PTB compared to foreign-born mothers in both unadjusted and adjusted models. |

| Study | Setting | Study Time Frame | Sampl Size | Subgroups Examined | Major Conclusions |
|-----------------------|---------------|------------------|------------|---|--|
| Oliver 2018 | Ohio | 2000-2015 | 1,960,693 | Somalian, African | After adjusting for covariates, foreign-born Somalian mothers had significantly lower rates of PTB compared to US-born non-Hispanic Black, US-born non-Hispanic White, and foreign-born African mothers. Foreign born-African women PTB rates were not statistically different from rates among non-Hispanic White women. |
| Araneta 2020 | San Diego, CA | 2007-2012 | 230,878 | non-Hispanic White, Hispanic, Black, Filipina, Other Asian, Other race/ethnicity, Not Specified | After adjusting for covariates, Somalian and Mexican-born women had lower odds of overall and spontaneous PTB compared to their US-born counterparts. Foreign-born Black women not born in Somalia had significantly lower risk of spontaneous PTB compared to US-born Black women. There were no significant differences in overall or spontaneous PTB risk by nativity for Hispanic (not born in Mexico), non-Hispanic White, Filipinas, Asians, or women of "other" race/ethnicity. |
| Scott 2020 | California | 2013-2017 | 8,609 | Black | Adjusted analyses found foreign-born Black women had significantly lower odds of early and late PTB and early term birth than US-born Black women. |
| Adegoke, 2021 | Boston, MA | 2010-2015 | 11,518 | Black, White, Hispanic, Other | US-born women had significantly higher prevalence of PTB than foreign-born women. |
| Egbe 2021 | Pennsylvania | 2011-2014 | 4,499,259 | Non-Hispanic White, Non-Hispanic Black, Hispanic White, Other | Foreign-born women were less likely to experience PTB overall and stratified by severity of PTB. Only foreign-born White women had lower adjusted relative risks of moderate and extreme preterm birth compared with US-born non-Hispanic White women. All ethnic/native sub-groups of Black women had a significantly increased risk of extreme pre-term births compared with US born non-Hispanic White women. |
| Ekeke 2021 | United States | 2013 | 247, 806 | Black | Foreign-born Black women had a lower PTB rate than US-born Black women. |
| McKenzie-Sampson 2021 | California | 2011-2017 | 146,671 | Black | US-born Black women had significantly higher risk for PTB than foreign-born Black women after adjusting for covariates. |
| Minhas 2022 | Boston, MA | 1998-2016 | 2,760 | Non-Hispanic Black | After adjusting for covariates, foreign-born women had lower odds of PTB compared to their US-born counterparts. Foreign-born non-Hispanic Black women with < 10 years of US residence were significantly less likely to experience PTB compared to their US-born non-Hispanic Black women. There was no difference in PTB rates among foreign-born women living in the US for 10 years and U.S.-born non-Hispanic Black women. |
| Planey 2022 | New York | 2010-2014 | 135,701 | African and Caribbean | After controlling for individual and tract level variables, African-born and Caribbean-born women had significantly lower odds of having an infant preterm than US-born Black women. |

Table 3 – Studies Comparing Infant Mortality Rates (IMRs) Among Infants of US vs. Foreign-born Birthing People

| Study | Setting | Study Time Frame | Sample Size | Subgroups Examined | Major Conclusions |
|------------------------|-----------------|------------------------|-------------|---|---|
| Reichman & Kenney 1998 | New Jersey | 1989-1990 | 215,377 | Cuban, Mexican, Puerto Rican | All foreign-born Black women were significantly less likely than US-born Black women to have an infant who died in the first year of life. |
| Liu 2006 | New York City | 1995-1998 | 3871 | Hispanic, and Non-Hispanic White, Black, Asian, and Other | Infants of US-born mothers had a higher IMR compared to foreign-born mothers; infants of foreign-born Black and Hispanic mothers' infants had significantly lower IMRs than their US-born counterparts. |
| Hummer 2007 | United States | 1995-2000 | 20 million | Mexican, Puerto Rican, Cuban, other Hispanics, non-Hispanic Blacks, non-Hispanic Whites | US-born Puerto Rican, Mexican-American, other Hispanic, non-Hispanic Black, island-born Puerto Ricans, and foreign-born non-Hispanic Black women's infants had higher IMR rates than US-born non-Hispanic White women. Foreign-born Mexicans, Cubans, other Hispanics, and non-Hispanic White women had significantly lower IM rates than US-born non-Hispanic White women. |
| Qin 2010 | California | 1992-1997 1999-2003 | 486,451 | Chinese, Japanese, Filipino, Vietnamese, Cambodian/Laoitian, Korean | US-born Filipino mothers' infants had significantly higher IMR compared to foreign-born counterparts but not neonatal mortality rates. There were no significant differences by nativity in the IMR of infants born to Chinese and Japanese women. |
| Collins 2013 | United States | 2003-2004 | 5,911,062 | non-Latina Whites, African American, Mexican | US-born non-Latina White mothers, African, and Mexican mothers' infants experienced significantly greater IM compared to their foreign-born counterparts' infants. |
| DeCamp 2015 | Los Angeles, CA | 2002-2005 | 289,464 | Mexican | Infants of US-born Mexican mothers had significantly greater IMR than infants of foreign-born Mexican mothers. |
| Chu 2015 | New York, NY | 2004-2012 | 344 | US vs. foreign-born; Black non-Hispanic vs. non-Black | Sleep-related infant injury death was significantly higher among US-born mothers than foreign-born mothers. |
| McKenzie-Sampson 2021 | California | 2011-2017 | 146,671 | Black | The relative risk of IMR was significantly higher among US-born mothers' infants than among the infants of foreign-born Black women, after covariate adjustment. |

Table 4 – Studies Assessing Individual Acculturation & Structural/Regional Drivers of Immigrant Low birthweight, Pre-term birth, and Infant Mortality

| Study | Individual Acculturation / | | Regional Level Factor | | |
|---------------------------|---|--|---|---|--|
| | Proxy measure | Validated scale | Segregation ³ | Enclave ² | Other |
| Low Birthweight | | | | | |
| Jones & Bond 1999 | Birthing person's immigrant generation in the US (e.g., 1 st vs. 2 nd) | The Acculturation Rating Scale for Mexican Americans-II (ARMSA-II) | - | - | - |
| Johnson & Marchi 2009 | Language of interview (English or Spanish) | - | Neighborhoods with 55% or more of the total population self-classified as foreign-born Hispanic | - | Neighborhood poverty |
| Osypuk 2010 | - | - | Metropolitan Statistical Areas in the top three quartiles with respect to the proportion of US-born Mexican-origin residents. | Metropolitan Statistical Areas in the top three quartiles with respect to the proportion of US-born Mexican-origin residents. | Neighborhood poverty |
| Fuller 2010 | Home language (English or Spanish) and years residing in US | - | - | - | - |
| Vang 2013 | - | - | - | Degree of minority diversity within a census tract | Residential instability and neighborhood deprivation |
| Barcelona de Mendoza 2016 | Language preference & generation in the US | Psychological Acculturation Scale | - | - | - |
| Novak 2017 | - | - | - | - | 2008 immigration raid in Postville, Iowa |
| Torche & Siros 2019 | - | - | - | - | Arizona's Senate Bill 1070 |
| Planey 2022 | - | - | - | Racial segregation using kernel density estimation | Census tract socioeconomic status; access & exposure to greenspace |
| Preterm Birth | | | | | |
| Bloch 2011 | - | - | - | - | Neighborhood poverty and ambient neighborhood violence |
| Britton 2015 | - | - | - | Metropolitan residential isolation using the P-star index and evenness/dissimilarity using the dissimilarity index | Neighborhood poverty exposure index |
| Minhas 2022 | Binary length of time in the US (+/-10 years) | - | - | - | - |

| Study | Individual Acculturation ¹ Proxy measure | Validated scale | Regional Level Factor Segregation ³ | Enclave ² | Other |
|--------------------------|--|-----------------|---|---|-------------------------|
| Mortality DeCamp 2015 | - | - | - | Neighborhood Latino immigrant concentration score | Median household income |

¹ All studies in this review categorized people by maternal nativity. Thus, we did not include studies which used maternal birthplace as a proxy for acculturation in this table, but rather highlight groups which included at least one other variable meant to represent acculturation separate from maternal birthplace.

² Enclave is defined as a place or group within a larger territory where individuals share cultural or ethnic ties.(Portes and Manning, 2006)

³ Racial segregation is defined as the practices or policies that compel different racial groups to have separate housing, education or other services.(Kendi, 2016)