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Yesenia Ramirez Date

Immigration Policy and Preterm Birth
Among Hispanic Women in Georgia from 2009-2014

By

Yesenia Ramirez
Master of Public Health

Department of Epidemiology

_____

Committee Chair

Immigration Policy and Preterm Birth
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By

Yesenia Ramirez

Bachelor of Arts
Wellesley College
2015

Thesis Committee Chair: Dr. Michael Kramer

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Abstract

Immigration Policy and Preterm Birth
Among Hispanic Women in Georgia from 2009-2014

By Yesenia Ramirez

Background: Immigration remains one of the most divisive policy topics debated in state legislatures. In 2011, the Georgia House Bill 87 (HB 87) was enacted and cultivated a prevalent anti-immigrant environment that increased fear, anxiety, and stress throughout Hispanic communities. The purpose of the law remains to apprehend and remove undocumented individuals from the state. Few studies have analyzed the effect of immigration policy on birth outcomes and none have analyzed HB 87 as a primary exposure to preterm birth.

Objective: The goal of this study is to evaluate the measure of effect of HB 87 implementation on preterm birth risk among Hispanic women in Georgia.

Methodology: Using vital records data from 2009-2014 for all singleton live-births to Hispanic mothers in Georgia and Florida, difference-in-difference modeling with fixed effects was used to estimate the intervention effect. Triple difference models were used to estimate the interaction across nativity status or Hispanic origin. Logistic regression was used to determine the validity of model assumptions, while Wald and likelihood ratio tests were used to determine the statistical significance of model coefficients. All statistical analyses was conducted in SAS.

Results: After adjusting for maternal education, age, Medicaid status, nativity, Hispanic origin, and early entry into prenatal care, the risk of preterm birth was 11% lower among Hispanic women in Georgia relative to what would have been expected in absence of the law (RR: 0.89; 95 % CI: (0.86, 0.93)). There was a slight 3% increase in risk of preterm delivery among women of Mexican, South or Central American origin, although the results straddle the null (RR: 1.03; 95% CI: (0.94, 1.12)). Contrarily, women of Puerto Rican, Cuban and other Hispanic origin experienced a decrease in risk of the outcome (RR: 0.92; 95% CI: (0.83, 1.03)). Lastly, HB 87 was most protective against foreign born women, with a decreased risk of 16% (RR: 0.84; 95% CI (0.80,0.90)).

Discussion: Results for this analysis were contrary to the established hypothesis which predicted a harmful effect of the law. However, findings from models assessing interaction by Hispanic origin suggest that the level of risk varies across groups.

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Introduction

In the last year alone, the world witnessed refugee crises caused by climate change, fueled by drug violence, and destabilized by economic and political tensions. As nations grapple with the socio-demographic changes associated with new influxes of asylum seekers and migrants, the health landscape of each country will change towards one that demands a more in-depth inclusion of immigrant health for the well-being of all residents. History has shown that the immigration policy following demographic shifts can veer in two directions: inclusivity or exclusivity. Policies guided by inclusive measures can make vital public health communication easier by encouraging immigrants to interact with the health care system; while exclusive ones can place entire populations at increased risk of diseases by penalizing immigrants for using government resources (De Trinidad, 2019; Pham, 2018; Philbin, 2018).

So far, immigrant health research has largely focused on individual level health factors, but theories relating to the social determinants of health call for a more structural perspective. Understanding the social determinants requires focus on macro-level factors, like political structures, that can influence local environments at multiple levels and can affect one's health across the life course. There is no doubt that prenatal development is tied to long-term health outcomes. For pregnant immigrant mothers, immigration policy has the potential to shape social and institutional resources available to them during pregnancy. Thus, appropriate analyses of immigration policies and the socio-political environments they establish is needed to support and implement health practices that reduce health disparities for not only immigrants and their families, but all residents and future generations.

Problem Statement

Preterm Birth

Preterm birth is a major cause of neonatal morbidity and a significant contributor to infant mortality. According to the World Health Organization, a preterm birth is one that occurs at less than 37 weeks of gestation. Preterm-born infants are at an increased risk for congenital birth defects, chronic conditions, and social and developmental disabilities (Moster et al., 2008). In 2014, nearly 15 million infants were born preterm, making the yearly global rate approximately 10.6% (Chawanpaiboon et al., 2018). Relative to other high-income countries like Sweden, Ireland, and France with rates 6.0 and under, the preterm birth rate in the United States is alarmingly high, oscillating between 9.6 and 10.5%, for over the past 10 years (Delnord et al., 2018; *2018 Premature Birth Report Card*, 2019). Notably, the highest rates are clustered in the Southeast, where states generally have worsened health outcomes compared to the national average. Given the extensive reach and long-term health implications associated with preterm birth, there is an imperative need to examine possible causal pathways and risk factors associated with the condition.

Although the exact causes of preterm birth are unknown and varied, research points to a combination of individual and structural risk factors that are more prevalent among certain demographic groups. Poor prenatal care, infection, maternal substance use, pre-pregnancy chronic conditions, and maternal stress are all proposed contributors of preterm labor (Goldenberg et al., 2008; Wadhwa et al., 2011). As of 2019, the March of Dimes noted that the rate of preterm birth among black mothers is nearly 50% higher when compared to the rates of all other demographic groups (March of Dimes, 2019). Staggering differences in the prevalence of birth outcomes along racial divides have sparked serious scientific discussion regarding the potential mechanisms that

exacerbate negative birth outcomes (Lu & Halfon, 2003). The effect of neighborhoods has been proposed as an explanation for observed disparities in preterm birth, particularly because African American women are more likely to live in areas with low-socioeconomic status and increased barriers to health resources (Culhane & Goldenberg, 2011). Additionally, the weathering hypothesis is one of the earliest theories to dissect racial disparities. It states that the health of black women is a direct consequence of the physical manifestations caused by cumulative stress induced by their socioeconomic circumstances (Geronimus, 1992). Likewise, the life course perspective approach proposes that the reproductive health of a women is either improved via health promoting factors; or worsened via risk promoting factors- throughout their entire lives emphasizing influential development periods (Lu & Halfon, 2003). Both models underscore the aggregated physiological effect of acute and long-term stressors which can be single discrete events- including singular moments of tragedy- or even continuous exposures like discriminatory state policy.

Post-911 Immigration Policy Overview

Shortly after 9/11, federal and state legislatures enacted restrictive immigration policy that further exacerbated the health of immigrant families. Federally, the Homeland Security Act of 2002 created three key immigration enforcement agencies under the Department of Homeland Security (DHS): Customs and Border Patrol (CBP), Immigration and Customs Enforcement (ICE), and U.S. Citizenship and Immigration Services (*Delegation of Immigration Authority Section 287(g)*, 2020). Additionally, local governments enacted federal-state partnerships through programs like 287g, DHS-sponsored Secure Communities, and ICE-backed National Fugitive Operations Programs (NFOP). In response to the creation of these agencies, immigrants quickly voiced widely-held concerns including fears of deportation, local government collaboration with

ICE, inability to apply for health insurance, and overall increased levels of stress (Hacker, 2011). However, since the early 2000s, state level policy has been much more varied, with some states passing bills that support, and others passing bills that restrict, access to health care. In 2011 alone, 1,607 pieces of legislation relating to immigrants were introduced across all 50 states and 42 states enacted 306 laws and resolutions related to immigration (Meyer et al., n.d.). The National Conference of State Legislatures notes that from 2005 to 2011 the number of immigrant related laws increased from 39 in 2005 to 197 in 2011 (Meyer et al., n.d) (Figure 1).

Not surprisingly, anti-immigrant policies from the past two decades have had the most impact on the undocumented community where levels of fear, depression, post-traumatic stress disorder, and anxiety were highest (Martinez et al., 2015). According to the Migration Policy Institute, as of 2016, there were approximately 11.4 million unauthorized immigrants in the country with over 60% Latin American origin (*Profile of the Unauthorized Population: United States*, 2020). Nationwide, there are over 16 million people living with at least one undocumented family member (Mathema, 2017), making the effects of immigration policy a significant reality for many US citizens. Coinciding with shifts in state demographics, the 2010s heralded a new wave of restrictive immigration policy rolled out by individual state governments that affected every sector of society not only for immigrants but for all state residents.

An omnibus bill is a draft law that groups together seemingly unrelated topics and presents them under one singular legislative piece which can then be put to a vote (*Omnibus Bill Definitionl*, 2020). In 2011, Arizona State Senator Russell Pearce introduced SB 1070, an omnibus bill focused on immigration and the apprehension of unauthorized individuals, which was drafted in collaboration with national anti-immigrant organizations (Lacayo, 2011). A year after its passing, 31 states introduced similar, "copycat" bills but only 6 states passed the legislation, while 20 states

rejected or refused to consider them (Lacayo, 2011). Of all the states that did pass SB 1070-like legislation, Georgia's HB 87 omnibus bill has been one of the most extensive and pervasive anti-immigrant laws.

Purpose Statement

This analysis will examine the direct relationship between immigration policy in Georgia and the observed preterm birth risk among Hispanic women – especially salient due to the recent rise of anti-immigrant state policies, a hostile immigrant climate, an increasingly vulnerable Hispanic population, and the notably disparate preterm birth rate in the American South. Specifically, this study will estimate the effect of Georgia's Illegal Immigration Reform and Enforcement Act of 2011 (House Bill 87 or HB 87) on preterm birth risk among Hispanic women in the U.S. in Georgia between 2009-2014. The aim of this study will be to evaluate the change in preterm birth risk for women of Hispanic descent in Georgia before and after implementation of HB 87 compared to women in Florida, a state that did not pass an omnibus bill.

Background

Restrictive Immigration Policies (2010 – 2011)

Arizona: SB 1070

On April 23, 2010, Arizona Governor Jan Brewer signed into law a bill that served as the precursor to restrictive immigration bills across the nation and sparked a wave of public protest – Arizona State Bill 1070 or SB 1070. Officially called the "Support Our Law Enforcement and Safe Neighborhoods Act", the law was notoriously dubbed the "Show Me Your Papers Law" by media and community organizations, referring to a key provision that sought to expand law enforcement authority to inquire and act on matters regarding citizenship status. The aim of the bill was to "make attrition through enforcement the public policy of all state and local government agencies in Arizona" (*AZ SB1070*, 2010). Prior to the passing of SB 1070, hundreds of stringent immigration laws had been passed across the nation (Meyer et al., 2011), especially after 9/11, but this particular bill was unique in that it outlined multiple provisions – an omnibus bill - that confined and targeted immigrants across varying sectors of society, embedding fear in individuals' everyday lives. Specifically, the bill sought to accomplish its goal by requiring law enforcement officers to determine an individual's immigration status where "reasonable suspicion exists that the person is an alien who is unlawfully present in the United States": expanding federal law and making it a state crime to reside in Arizona without valid documentation, imposing fees and penalties to individuals or businesses employing undocumented persons, and by allowing an officer to make an arrest without a warrant if they have probable cause to believe that the person at any point committed any deportable act (*AZ SB1070*, 2010). All these provisions together make it clear that immigration enforcement and the deportation of undocumented citizens was a top priority for the 2010 Arizona state legislature.

Citing public fear of shifting population demographics, especially because of a high concentration of Hispanics, growing worries over drug smuggling across the Mexico-US border, and lingering economic concerns due to the 2008 recession, the bill was drafted, scapegoating immigrants for the state's socio-economic problems (Archibold & Steinhauer, 2010). Even before the bill's passing, the state was known for tactics that approached human rights violations. Infamous Sherriff Joe Arpaio was already testing the constitutional limits of "reasonable suspicion" and under his command, the Sherriff's department was frequently accused of racial profiling. Arpaio and his forces were known for "crime suppression sweeps" throughout the Maricopa County, a county with the highest concentration of undocumented individuals, where police raids would descend upon factories, schools, and other social gathering locations (Pilkington, 2010). Despite a legal challenge by the ACLU, nearly two years later, the Supreme court upheld the law. Arizona's boldness and strict immigration enforcement principals, alongside the Supreme Court's ruling, emboldened states like Georgia to pass their own immigration omnibus legislation.

Georgia: HB 87

On the heels of SB 1070, the Georgia state legislature introduced the Georgia House Bill 87 (HB 87) entitled "The Illegal Immigration Reform and Enforcement Act of 2011" on January 27, 2011. The law was authored by Republican Matthew L. Ramsey and his fellow peers and was signed into law by Governor Nathan Deal on May 13, 2011 (*HB 87*, 2011). The law become effective July 1, 2011 and immediately required compliance to the federal work authorization program, E-verify, for employers with more than 10 workers (*HB 87*, 2011). The bill penalized noncompliant business with fines up to $10,000 (*HB 87*, 2011). Although the original, more

draconian, version of the bill was not entirely enacted, HB 87 is the current law of the state and retained some of the most contentious provisions, specifically those surrounding law enforcement. Section 8 of the bill outlines the powers extended to police officers including the ability to determine documentation status if there exists "probable cause" that the person in question committed a crime, essentially granting them immigration officer authority (*HB 87*, 2011). Section 8 echoed the "show me your papers" sentiment originally expressed in the Arizona bill and likewise caused fear and distrust in local law enforcement among Hispanic communities.

Legislation like HB 87 cultivated a prevalent anti-foreign, nativist language throughout Georgia state policies that may have made access to health and government resources difficult for many immigrants during moments of heightened need. The Immigrant Climate Index (ICI) categorizes and ranks US states by how welcoming their overall legislation is towards immigrants, where a positive score means the state has an overall welcoming attitude towards immigrants and a negative score means they are hostile (Pham, 2018). Georgia has consistently ranked on the lower spectrum and, as of 2020 is ranked the second most hostile state, behind Arizona, with a score of -90 (Pham, 2018). These policies augmented anxieties surrounding identification and documentation and led to the creation of an underground medical market which has pushed residents to seek shoddy treatments in fraudulent clinics (Kline, 2017). Additionally, the increased frequency of driver checkpoints, well-known to be a tactic of and rounding-up undocumented individuals, creates and "immigrant policing" environment which makes immigrants in those communities fearful of any law enforcement contact (Kline, 2019). This in turn drives down motivation to report violent crimes, robberies and other infractions, especially if one is the victim (Kline, 2019). The social conditions created by HB 87 were akin to those that arose following SB 1070, including the legal challenges that followed.

Key similarities between SB 1070 and HB 87 include an overall similar anti-immigrant sentiment, allowing local law enforcement authority to investigate legal status during routine encounters with suspected individuals; enforcing employer compliance with the federal work authorization program; and imposing penalties for individuals seeking to employ undocumented persons. Likewise, the law was also met with legal and social challenges, including a lawsuit filed by the ACLU, the Southern Poverty Law Center, the Asian Law Caucus, and the National Immigration Law Center (Ceasar, 2011). By 2013, the U.S. Court of Appeals for the 11th Circuit blocked key provisions including laws promoting warrantless arrests solely based on reasonable suspicion (Preston, 2012). There were many unforeseen outcomes with the Georgia law including an immediate hit to the agricultural economy due to immigrant worker shortages attributed to the law (Mcardle, 2011), which raises the question: What influences the formation of such anti-immigrant legislation?

Politics of Places

Immigration Policy Formation

When it comes to immigration politics, academics have sought to rationalize and predict the circumstances that might make a government more likely to introduce and pass anti-immigrant legislation like those passed in Arizona and Georgia. In political landscapes, prominent theories involve "racial threat" or "power threat" which have analyzed the factors influencing public sentiment toward immigration itself (Campbell et al., 2006). Some research has noted weak correlations with individual economic conditions, and instead finds that group attitudes towards immigration are more strongly associated with "sociotropic concerns about its cultural impacts" (Hainmueller et al., 2014). Hainmueller's findings pose one reasoning for attitude formation among non-immigrants about immigrants that possibly reflects fears of a changing status quo and cultural clashes.

Among other theories, the politicized places hypothesis integrates both local and national circumstances and explores the interaction between the two settings to deduce how immigrants are perceived as threatening (Hopkins, 2010). A time series cross-sectional study completed at Georgetown University examining 1992 through 2009 found that "when communities are undergoing sudden demographic changes at the same time that salient national rhetoric politicizes immigration, immigrants can quickly become the targets of local political hostility" (Hopkins, 2010). Unique attributes of this theory include the emphasis on the pace at which the demographic change occurs and that it suggests that these restrictive policies are uncommon reactions to immigrant populations themselves (Hopkins, 2010).

An area's demographic composition plays a large role in determining individuals' lived environments, including the food they eat, the people they interact with, and the cultural norms

practiced. However, as previously outlined, demographic composition can also heavily influence perceptions on immigrant populations in support or against anti-immigrant legislation. In turn, these policies have tangible negative health outcomes that diffuse into societal infrastructure and have the potential to alter acute and chronic stressors to those living under their rule.

Policy as a Social Determinant of Health: Pregnancy & Infant Outcomes

There is no question that governments mold the environment one inhabits. Via legislative tools, populations are either hindered or aided in accessing crucial resources like medical coverage, housing assistance, financial assistance, or supplemental nutrition that can alter the physical, mental, and emotional well-being of communities and individuals. Particularly for vulnerable populations, like mothers, children and immigrants, public policy is crucial during moments of transition, not only throughout the life course, but also during sociopolitical change. The negative outcomes of policies can be detected as early as pregnancy and have the potential to last an entire lifetime.

To cement the inclusion of policy in conversations of health and health promotion, the politics hypothesis states that "political forces comprise either a powerful predecessor of the social determinants of health or are essential social determinants of health themselves" (Rodriguez, 2019). As partial evidence for this hypothesis, presidential party was analyzed as an indicator of US infant mortality between 1965-2010. Researchers concluded that Republican presidential terms coincided with greater infant mortality rates compared to their Democratic counterparts, attributing about 20,000 additional infant deaths (Rodriguez, 2019). Such findings elucidate how policy is a mechanism by which health inequalities originate and prosper, especially among racial lines or residency status.

Public policy also has the potential to positively impact pregnancy health care utilization. For example, there was a substantial increase in prenatal care utilization and early entry into prenatal care among foreign-born Latinas after the expansion of the State Children's Health Insurance Program, under the 2002 "unborn child ruling" granting coverage to any expectant mother regardless of residency status (Drewry et al., 2014). Health care expansions have also promoted health care utilization across the lifespan, positively affecting the frequency of well child visits (Swartz et al., 2017). However, additional health policy research associated with the 1996 welfare reform demonstrated the limits of available government assistance to immigrants. During welfare reform, studies have not linked decreases in prenatal care utilization or overall outcomes with the welfare reform (Joyce et al., 2001), however, the quality of prenatal care remained inadequate for a significant proportion of foreign-born women (Korenbrot et al., 2000). These same policies also increased the number of overall uninsured foreign-born women (Korenbrot et al., 2000).

Immigration Policy and Latino Health

Arguably, no other policy category has challenged American morals and ideals more than immigration policy. Although not all legislation strictly relates to health, the social atmosphere that these acts create can act as mechanism for stress-induced disease and morbidity. Through welfare reform, immigrant enforcement policies, and state and federal policies, the US government has either promoted or impeded immigrant's access to health-promoting resources.

Health Care Utilization

In the early 2000's federal policy failed to reform the nation's immigration system; however, state-specific immigration policies did not encounter the same fate and heavily impacted health care access and utilization in the Latino community. State-level immigration policies affect Latino health via direct and indirect sociopolitical pathways involving structural racism, stress, and access to health care – social institutions and material conditions often resulting in increased risk of disease and adverse health outcomes (Philbin et al., 2018). Like previously mentioned, under the 1996 Personal Responsibility and Work Opportunity Reconciliation Act during the era of welfare reform, public assistance for immigrants was restricted and this soon induced a decline in health care coverage and utilization for immigrants and their families (Perreira & Pedroza, 2019). Additionally, possibly due to fears associated with residency and learned health behaviors, undocumented individuals and their families have the lowest rates of medical insurance, factors that can exasperate short and long-term stressors (Perreira & Pedroza, 2019). Furthermore, undocumented women are at an increased risk for failure to receive adequate prenatal care, but integrative policies can help mitigate the health disparities linked to prenatal health (Korinek & Smith, 2011). Local policy can foster a hostile or an inviting environment that molds the

perceptions, actions, and beliefs of immigrant communities, where restrictive policies can hinder access to health resources and inclusive policies can expand their reach.

Mental & Physical Health

Given the stated link between policy and health care utilization, it is no surprise that biopsychosocial health declines in atmospheres that foster fear and exclusive enactments. The national inconsistency of immigration policies has temperamentally oscillated the psychosocial well-being of Latinos, increasing perceptions of racial discrimination, and these effects are not solely contained to the undocumented population, often the target population, and easily diffuse to Latino and non-Latino US citizens (Perreira & Pedroza, 2019). Among Latinos, increases in exclusionary government rhetoric decrease self-reports of optimal health (Vargas et al., 2017), which crumbles confidence in individual health care management; increases the likelihood of disability later in life (Mueller & Bartlett, 2019), guaranteeing augmented senior health care dependency; and increases perceptions of one's likelihood to be arrested or imprisoned (Nichols et al., 2018), weakening trust in the local law enforcement and marring self-image.

Lack of valid documentation status can create internal distress that psychologically manifests into increased risk of mental disorders (Garcini et al., 2016; Garcini et al., 2017; Sullivan & Rehm, 2005). Mexican immigrants who arrived in the US relative to the Immigration Reform Control Act of 1986, one of the first major revisions to the American immigration system, demonstrated an association significantly higher for symptoms of depression compared to Mexican individuals that arrived during the Bracero Era between 1942-1964 (Miranda et al., 2011). Across 31 states, from 2000 to 2010, those that implemented exclusionary policies had higher rates of poor mental health (Hatzenbuehler et al., 2017). Rates were even more pronounced when

comparing Latinos to non-Latinos and were specifically associated with exclusionary immigration policy and not purely to race/ethnicity, language, or agricultural legislation (Hatzenbuehler et al., 2017). State and federal policy also includes singular immigration enforcement acts like raids that, although occur in the span of a few hours, have long-lasting effects on immigrant individuals, families and communities.

Since 2006, immigration raids have been conducted by ICE with the sole purpose of apprehending and deporting undocumented individuals (Kammer, 2009). These raids often occur in food factories and other places of work known by ICE, sometimes via the employer themselves, to have a high proportion of unauthorized workers (Kammer, 2009). On November 7, 2013 there was a work-place immigration raid in Washtenaw County, MI during a time were a community study on Latinos was already being conducted (Lopez et al., 2017). Researchers where then able to use this data and analyze the resulting health effects before and after the raid. Aside from the detrimental health effects inflicted on individuals directly apprehended by the raid, the mental health of entire Latino communities also suffered. Among community members, reports of declined self-esteem and magnified fearfulness pervaded Latino homes long after the Michigan raid ended (Lopez et al., 2017). More broadly, immigration raid research among Latinos in Michigan demonstrated that the reproductive autonomy of women and their partners was limited due to financial and mental health effects associated with the Washtenaw raid (Fleming et al., 2019).

Luckily, although there is much fewer research, policies of inclusion seem to have positive effects on the health of Latinos. Mental health outcomes documented in DACA recipients before and after their documentation status had improved states of psychological well-being and

reductions in self-reported physical health (Patler & Laster, 2018; Venkataramani et al., 2017). In analyzing the effect of in-state residence tuition on self-rated health, researchers found that the tuition policies were significantly associated with positive health outcomes among undocumented Mexican youth, with possible benefits also affecting family members (Potochnick et al., 2019). Aside from increasing undocumented individual's autonomy, inclusive policies can also improve outcomes for the state. After California allowed undocumented immigrants to apply for provisional driver's licenses, through the state law AB 60, the state experienced a decrease in the rate of hit and run accidents (Lueders et al., 2017). Despite the observed positive health and state outcomes, inclusionary policies are more readily passed and socially accepted in overwhelmingly liberal states like California. Immigrant exclusionary policies remain the norm in conservative areas like the Midwest and the South.

Immigration Policy & Birth Outcomes

Immigration Raids

As previously noted, immigration raids enforced by ICE have a detrimental influence on the collective and individual mental health of the Hispanic population. Raids often occur quickly but are public and unexpected events that cause immense levels of stress, fear and anxiety which can have devastating effects on developing life. However, few studies have considered the effects of these raids on birth outcomes.

On May 12, 2008, ICE descended on unsuspecting employees at a meat packing plant in Postville, Iowa and apprehended approximately 400 employees (Crowder & Elmer, 2018). Findings from the post-raided community in Iowa showed that children born to Latina mothers had a 24% increased risk of low birth weight (Novak et al., 2017). Increased risk of low birth weight was also observed for infants born to both US and foreign-born Latinas and was not observed among those born to non-Latina white mothers compared to risks from one year prior (Novak et al., 2017). One of the limitations of the Novak study includes their comparison group which compared the risk with women one year earlier. This comparison could be non-ideal if there were demographic changes in the Hispanic population, which might lead to selection bias.

State Omnibus Bills

Under SB 1070, several studies noted significant decreases in overall self-reported health among Spanish-speaking Latinos (Anderson et al., 2014), a strong correlation between fear of deportation and increased inflammatory markers (Martinez et al., 2018), and decreases in health care and public assistance utilization among Mexican adolescent mothers and their respective mothers (Toomey et al., 2013). Likewise, in Georgia, implementation of HB 87 and general

immigrant policing tactics has differentiated health care utilization among Hispanics. Additionally, after HB 87 implementation, Hispanics were the only control groups to demonstrate a decrease in pediatric emergency room visits, while also having the most patients admitted to hospital care (Beniflah et al., 2013).

Of particular interest to this analysis are the birth outcomes associated with enactment of immigration omnibus bills, but few studies have analyzed this relationship. Arizona and Georgia's omnibus bills both included provisions either expanding or upholding the federal work authorization program, E-verify. Under this program, employers are required to verify the legal status of potential employees and are penalized for knowingly hiring unauthorized individuals. Across the nation, among states that passed E-verify mandates, there were substantial declines in birthweight and increases in premature birth among immigrant mothers (Strully et al., 2019). The only known study considering the SB 1070 and preterm birth observed, not only increased rates of preterm birth and significant declines in birth weight for the infants of Hispanic mothers, but also noted these effects regardless of the law's implementation (Torche & Sirois, 2019). From this study, the authors suggested that the rise in preterm birth was significantly associated with the timing of related media and political attention before the bill's passing (Torche & Sirois, 2019). Strengths of the Torche and Sirois study included the overall study design that allowed for analysis of the law at multiple significant timepoints.

One can imagine the sensationalism and media engrossment punitive laws can create. Indeed, studies analyzing social media outlets like twitter found that SB 1070 had an average negative effect on the sentiment of content relating to immigrants, particularly Mexicans and Hispanics, while not affecting other minority groups. (Flores, 2017). National media was more likely to frame the context of SB 1070 in terms of nationally security and economic threats

compared to local media (Fryberg et al., 2017). The constant fear of actions such as deportation under the "show me your papers" provisions contrives social atmospheres saturated with heightened stress levels and has potential to impede proper prenatal development.

Georgia

Georgia is simultaneously home to a bustling, diverse immigrant population and to an exclusionary immigration enforcement infrastructure, encompassing state and federal policies, that has disrupted immigrant communities. As of 2017, one in ten Georgia civilians were foreign-born with approximately 40% of immigrants arriving from Latin America (*State Immigration Data Profiles: Georgia*, 2020). Partly due to Georgia's agricultural and food-processing workforce demand, the state also has the 7th largest unauthorized workforce (*Profile of the Unauthorized Population*, 2020). Although Georgia has a relatively small unauthorized population, about 350,000 (*Profile of the Unauthorized Population*, 2020), the levels of ICE operations are disproportionately high and actively function at the county-level. For example, the 287g program, an ICE and County Sherriff's partnership which expands immigration officer authorities to local law enforcement, is active in 7 counties (*Delegation of Immigration Authority Section 287(g)*, 2020). Similarly, although Gwinnett county ranks 28th in magnitude of undocumented population across all counties, it ranks fifth in the number of ICE-issued detainers (Capps et al., 2018).

Alongside noted increased immigration policing efforts, Georgia suffers from high rates of preterm birth and infant mortality. The state ranks 5th in the nation for worst preterm birth rate (11.4%) and ranks 7th for infant mortality - with an excess 1.4 deaths per 1,000 live births (Martin et al., 2018). The March of Dimes measures racial and ethnic disparities using a disparity ratio based on Healthy People 2020 and Georgia has a greater than average disparity measure at 1.31. They also note that the worst preterm birth rates are in Clayton (12.7%) and Chatham (11.7%) counties and that the overall preterm birth rate of the state has shown no improvement since 2008 (March of Dimes, 2019).

Given the observed disparities in preterm birth prevalent in the state of Georgia, lack of studies on the effect of immigration on in utero life, and Georgia's hostile immigration legislation, this analysis seeks to address the existent gap between immigration policy and its effect on birth outcomes in Georgia. As previously discussed, the expansive reach of immigration policy into immigrant health urges social epidemiologists to research the links between the two factors. A review of relevant literature establishes the basis for immigration policy as a social determinant of health, however, it also highlights an absence of analyses on omnibus bills and their effect on birth outcomes. Given that no known research project has aimed to study the effect of Georgia's HB 87 on preterm birth, this study will seek to do so among Hispanic women in order to improve understanding of how to combat health disparities among immigrant communities.

Methods

Data Sources

Data for all US live births and maternal demographics from 2009 - 2014 were obtained from the National Center for Health Statistics (NCHS) vital records data. For state-level population demographics, data was drawn from the American FactFinder, an online data access tool created by the US Census Bureau that pools data from the American Community Survey, the decennial census, American Housing Survey and the Economic Census (American FactFinder, 2020). Additional socio-demographics were taken from the National Welfare Data from the Center for Poverty Research at the University of Kentucky (*National Welfare Data*, 2020). The American FactFinder and the National Welfare Data are both publicly available datasets while access to restricted use NCHS vital statistics was made possible through a data use agreement with NCHS and approved under the Emory University IRB (protocol # IRB00101281).

Study Sample

For this study, the population was restricted to singleton live births from 2009 – 2014 to Hispanic women aged 15-50 years residing in Georgia (N = 113,446) or Florida (N = 349,054). Births documented not using the 2003 Standard US Birth Certificate were excluded. Other exclusions were due to missing gestational age and non-viable birth.

Exposure

The primary exposure of interest was HB 87 implementation, an immigration policy eventually signed into Georgia law. Pregnancies resulting in live birth were considered exposed if their estimated date of conception was on or after May 13, 2011, the implementation of the bill, and if the mother resided in Georgia at the time of birth. Births were unexposed if they were

conceived before January 1, 2011 within the 2009 – 2014 live births dataset and/or did not reside in Georgia. Births that were partially exposed and preterm births whose estimated delivery date was outside the study period were also excluded.

Outcome

Singleton preterm birth, defined as a birth occurring before 37 weeks of gestation, was the primary outcome of interest. Non-viable births were excluded from the analysis, which are defined as births occurring under 22 gestational weeks. Thus, births between 22 – 37 weeks of gestation were coded as experiencing the outcome, and those occurring greater than 37 weeks did not.

Target Population

The target population, of which this study seeks to make inference on, is undocumented Hispanic women residing in Georgia exposed to HB 87 because it is hypothesized that this population would be at increased risk for preterm birth given that they would be primary targets of the anti-immigrant policy. Since authorization status is unknown, nativity status and Hispanic origin are important characteristics to consider in the model and comparison populations. Based on literature (Perreira & Pedroza, 2019; Novak et al., 2017; Torche & Sirois, 2019; Lopez, 2017), the target population would hypothetically have the following characteristics: foreign born and be of Mexican, South or Central American.

Statistical Analyses

Difference- in-difference (DD) modeling with fixed effects was chosen as the most appropriate modeling strategy to measure the effect of HB 87 on preterm birth and to examine causal inference. DD allows for control of time-invariant unobserved confounding by fixing differences at the state-level. Of particular interest is the change in preterm birth risk before and

after the implementation of HB 87 between a state with the law (Georgia) and without the law (Florida). The DD interaction term between state residence and intervention status relative to HB 87 implementation was used to estimate the effect of interest. Triple difference (DDD) modeling was also used to asses a three way interaction between state residence, intervention status, and foreign born status or Hispanic origin. In DDD, we hope to estimate the effect of HB 87 among foreign born individuals and among US- born individuals across states. An additional DDD model also analyzed the intervention effect among individuals of Mexican, South or Central American and among other Hispanic origin individuals across states. An interaction coefficient value statistically different from zero would suggest that there was an intervention effect above and beyond any background secular trends.

The intervention of interest is HB 87 which occurred May 13, 2011 and births conceived before this date were included in the pre-intervention phase while births conceived after where included in the post-intervention phase. Estimated date of conception was calculated by subtracting the number of gestational days for each birth from the estimated date of delivery. Partially exposed births were excluded from analysis which coincided with an estimated date of conception between January 1, 2011 – May 12, 2011,

The primary challenge in DD modeling is choosing an appropriate comparison population. The ideal comparison population would represent the counterfactual outcome if Georgia were not exposed to the HB 87. Based on the work of Torche and Sirous, we excluded states that enacted omnibus immigration bills during a similar time period, leaving Florida, Louisiana, North Carolina and New Jersey as comparison population contenders (Torche & Sirois, 2019). Additionally, a review of immigration policy one year after SB 1070 by the National Council of La Raza analyzed the enactment and considerations of states in passing similar laws to SB 1070 (Lacayo, 2011).

From this report, it was determined that Florida served as an appropriate comparison given that the state had considered and rejected omnibus immigration legislation in 2010 and 2011 (Lacayo, 2011). Lastly, among the considered states Florida had the most complete data for considered covariates for live births during 2009-2014. Consequently, Florida was chosen as the comparison population, however additional adjustment was conducted for state differences with the inclusion of individual-level covariates, explained in the following section.

Also, a key assumption of DD assumes that there are parallel trends in the risk of preterm birth before the intervention of interest takes place. To assess parallel trends, logistic regression was used to determine yearly preterm birth risks for each state adjusting for all covariates listed in the fully adjusted model- nativity status, Hispanic Origin, age, education, prenatal care, and Medicaid insurance payment for the birth delivery. The pre-intervention trends between Georgia and Florida were graphed and visually assessed. A likelihood ratio test assessing the significance of the interaction between state of residence and intervention status was also conducted for DD models, while a chunk test was completed for DDD models.

Additional Covariates

A key assumption for the DD modeling is the similarity between the comparison and exposed population prior to the intervention of interest, HB 87 being signed into law. After parallel trends have been determined, the main difference between both populations should be the exposure itself. Thus, careful comparisons across state-level covariates were considered to assure an appropriate comparison population.

In comparing the demographics of Georgia and Florida, the total population and population demographics, specifically percent foreign born and percent Hispanic, were analyzed as population-level covariates. Nativity and Hispanic origin were important to include due to the

hypothesis, based on literature on the undocumented population, that undocumented and immigrant women are among those that would be most affected by immigration legislation. Statewide economic, medical and political indicators were also cross-referenced including unemployment rate, poverty rate, percent uninsured, the status Medicaid expansion to immigrant pregnant women, and the political make-up of the state.

In terms of economic, clinical and political measures Georgia and Florida both had similar values, however the Hispanic and foreign born population make up was significantly different from one another (Table 2a and 2b). Due to these state-level differences, it was important to control for these factors at the individual level by including Hispanic origin and foreign born status in the final model. Based on literature identifying confounders associated with preterm birth, further maternal individual-level covariates of interest included in the model were age, education, early entry into prenatal care, and Medicaid insurance payment for the birth delivery. Thus, the final fully adjusted model and covariate coding was as follows:

$$PTB_{it} = \alpha + \beta_1 STATE_i + \beta_2 POST_i + \beta_3 FOREIGN_i + \beta_4 HISPANIC_i + \beta_5 AGE1_i + \beta_6 AGE2 + \beta_7 EDUCATION_i + \beta_8 PRENATAL + \beta_9 MEDICAID_i + \beta_{10} STATE_i \times POST_i + e_{it}$$

Variable	Definition
STATE	1: Georgia Residence 0: Florida Residence
POST	1: After the signing of HB 87 0: Before the signing of HB 87
FOREIGN	1: Foreign Born 0: US Born
HISPANIC	1: Mexican, South or Central American 0: Other Hispanic
AGE1	1: Age less than or equal to 25 years 0: else
AGE2	1: Age greater than or equal to 31 years 0: else
EDUCATION	1: High School Graduate 0: Non-High School Graduate
PRENATAL	1: Entered prenatal care before 5 months of pregnancy 0: Entered prenatal care after 5 months of pregnancy
MEDICAID	1: Medicaid insurance payment at time of delivery 0: Other or no health insurance

Adjusting for all covariates, we fit a fully adjusted model using log binomial regression using PROC GENMOD to determine risk of preterm birth. Statistical analysis was conducted using SAS Version 9.4.

Results

The analytical population consisted of singleton live-births from 2009-2014 to Hispanic women in Georgia and Florida with exclusion for non-use of the 2003 Standard US Birth Certificate ($N_{Georgia}$ = 48; $N_{Florida}$= 110), missing gestational age and non-viable births ($N_{Georgia}$ = 588; $N_{Florida}$= 379) and partial exposure ($N_{Georgia}$ = 7,585; $N_{Florida}$= 25,479). The final Georgia population sample consisted of 105,225 singleton live births to Hispanic mothers, while Florida consisted of 323,086.

The preterm birth characteristics of singleton live-births for Hispanic women aged 15-50 years occurring between 2009-2014 stratified by intervention status and state of residence are shown in Table 1. Overall, the number of eligible, live- singleton births to Hispanic women was greater in Florida compared to Georgia for pre ($N_{Florida}$= 161,952 v. $N_{Georgia}$= 58,452) and post ($N_{Florida}$= 161,134 v. $N_{Georgia}$= 46,773) intervention years. Likewise, the number of preterm births in Florida compared to Georgia were also greater across intervention status, pre ($N_{Florida}$= 18,790 v. $N_{Georgia}$= 6,369) and post ($N_{Florida}$= 20,267 v. $N_{Georgia}$= 4,964).

The unadjusted preterm birth risk increased for Florida from 0.12 to 0.13 and remained the same for Georgia at 0.11 across intervention status (Table 1). The unadjusted risk of experiencing the outcome was similar across states, ranging from 0.10 to 0.12 in the pre-intervention phase and 0.10 to 0.13 in the post-intervention phase (Table 1). Hispanic origin and maternal age were the strongest predictors of preterm birth risk. Among Hispanic origin groups, the highest risk was among Florida women of Cuban descent (R_{Pre}: 0.12; 95% CI: (0.12, 0.12) v. R_{post}: 0.14; 95% CI: (0.13, 0.14)) in both intervention stages. As for maternal age, the highest risk of preterm birth were among Florida ($R_{Florida}$: 0.22; 95% CI: (0.16, 0.27)) and Georgia women 45 or older ($R_{Georgia}$: 0.21; 95% CI: (0.11, 0.31)).

In the pre-intervention phase, among preterm births to Hispanic women in Georgia, women were more likely to be foreign born (71.4%), Mexican (63.4%), have entered into prenatal care before 5 months of their pregnancy (51.7%), not on Medicaid (71.3%), high school graduates (53.6%) and between 25-29 years old (26.6%) (Table 1). These characteristics did not significantly change for any covariate in the Georgia post-intervention phase. Hispanic origin is one key demographic difference between Florida and Georgia. Notably, after the implementation of HB 87, the crude risk of preterm birth among Hispanic women was higher across all origin groups in Florida compared to Georgia. The post uncontrolled risk was significantly different among Puerto Ricans ($R_{Georgia}$= 0.11; 95% CI: (0.10, 0.12); $R_{Florida}$ = 0.13; 95% CI: (0.13, 0.13)), Central and South Americans ($R_{Georgia}$= 11; 95% CI: (0.10, 0.11); $R_{Florida}$ = 0.12; 95% CI: (0.12, 0.13)), and other Hispanics ($R_{Georgia}$= 0.10; 95% CI: (0.09, 0.11); $R_{Florida}$ = 0.11; 95% CI: (0.12, 0.13)).

Table 2a and 2b demonstrate the ecological characteristics of Georgia and Florida, respectively, stratified by year. The intervention state, Georgia, and the comparison state, Florida, both had similar population demographics and economic, clinical, and political indicators. However, from 2009 – 2014, Florida had a considerably larger Hispanic and foreign born population, roughly 20% - 25% of the total population per year, compared to Georgia, with about 8.5% - 10% of the population constituting Hispanic and/or foreign born individuals. Although poverty rates remained under 20% for the time frame of interest, unemployment increased over the years in Georgia, 8% to 10.8%, while it decreased in Florida, 9.9% to 7.2%. Additionally, Georgia's state minimum wage remained at $5.15, while Florida increased the amount from $7.21 in 2009 to $7.93 in 2014. Regarding state clinical measures, both states experienced an approximate 4% decrease in percent medically uninsured and neither state expanded Medicaid benefits from 2009 to 2014 to unauthorized pregnant women. In terms of the political landscape,

neither state experienced Democratic gubernatorial rule, while both also had roughly 30% to 40% Democratic senators and representatives in each respective state congress.

Figure 2 describes the risk of preterm birth among 2009-2014 singleton, live-births to Hispanic women by the estimated year of conception adjusted for nativity status, Hispanic origin, age, entry into prenatal care, education and Medicaid status, excluding births that were partially exposed in utero from January 1, 2011 to May 12, 2011. During the pre-intervention phase the adjusted risk did not significantly differ between Georgia and Florida ($LR \sim \chi^2_{df=1}$: 0.23; p = 0.63). A visual analysis of the adjusted preterm birth risk based on the estimated date of conception year during the pre-intervention phase (2008- 2010), demonstrated a parallel increase for both states, with no significant interaction. Florida's risk of preterm birth increased from 0.10 to 0.12 while Georgia's increased from 0.09 to 0.11 (Figure 2). However, there was greater variation in the adjusted risk after the implementation of HB 87. Births conceived between 2011 to 2012 experienced a slight decrease in risk for preterm birth while those conceived between 2012 to 2014 demonstrated an increase from 0.07 to 0.10 for Georgia and 0.09 to 0.12 for Florida.

Similarly, Figure 3 portrays the aggregated risk for births before the implementation of HB 87 and after the bill was signed into law, with estimated years of conception between 2008-2010 being pre-intervention and those between 2011-2014 being post-intervention. Overall, the adjusted risk for preterm birth decreased for both states from pre to post intervention, for Florida from 0.11 to 0.10 and for Georgia from 0.10 to 0.08. However, births in Florida consistently had a higher risk of preterm birth after full adjustment for nativity status, Hispanic origin, age, entry into prenatal care, education and Medicaid status.

Finally, Table 3 demonstrates crude and adjusted risk ratio estimates using Difference in Difference modeling across various models. Compared to what would have been expected in the

absence of the law, the crude estimate predicted an 11% greater risk of preterm birth among Hispanic women in Georgia compared to Florida (RR: 1.11; 95 % CI: (1.07, 1.16)). However, after fully adjusting for individual covariates, the risk of preterm birth was approximately 11% lower among Hispanic women in Georgia relative to what would have been expected in absence of the law (RR: 0.89; 95 % CI: (0.86, 0.93)). Triple difference models assessing Hispanic origin demonstrated a slight 3% increase in risk of preterm delivery among women of Mexican, South or Central American origin attributable to the implementation of the law, although the results straddle the null (RR: 1.03; 95% CI: (0.94, 1.12)). Contrarily, women of Puerto Rican, Cuban and other Hispanic origin experienced a decrease in risk of the outcome associated with the implementation of HB 87 (RR: 0.92; 95% CI: (0.83, 1.03)). Overall, the 3-way interaction between state of residence, intervention status and Hispanic origin was statistically significant ($Wald \sim \chi^2_{df=3}$: 20.69; p = 0.001). Additionally, in assessing the interaction between the law and nativity status using triple difference models, the HB 87 was apparently most protective for foreign born women, with a decreased risk of 16% (RR: 0.84; 95% CI (0.80,0.90)). However, results were null among births to US-Born mothers (RR: 0.96%; 95% CI: (0.88,1.04)). Lastly, the DDD model assessing interaction by nativity status was also statistically significant ($Wald \sim \chi^2_{df=3}$: 11.87; p = 0.008).

Discussion

In this analysis of US live-singleton births to Hispanic women residing in Georgia and Florida from 2009-2014, there was an approximate 11% decrease in preterm birth among Hispanic women exposed to HB 87 implementation compared to what would have been expected in the counterfactual outcome using difference-in-difference modeling. Overall, there was a downward trend in risk of preterm birth from before the implementation of the bill to its implementation in both states. The result was more pronounced for foreign-born women, who showed the most decrease in risk attributable to the bill implementation. These findings were observed despite controlling for differences at the individual-level across states which might affect preterm birth.

Drawing from literature based on immigration research, it was hypothesized that among Hispanic women, the change in risk of preterm birth associated with exposure to HB 87 implementation would increase compared to the expected risk had the bill not been signed into law. Although no known study analyzing the effect of HB 87 on preterm birth has been conducted, it was expected that the estimated measures of effect would align with studies analyzing the effects of its precursor, SB 1070 in Arizona, which have overwhelmingly demonstrated negative associations in pregnancy and birth outcomes associated with the policy (Torche & Sirois, 2019; Toomey et al., 2014; Anderson et al., 2014). Hence, the observed results suggesting a protective effect, especially among the population that was predicted to be most at-risk, is surprising and counterintuitive.

Some important factors to consider in analyses concerning the health of immigrants and Hispanics include health phenomena like the Hispanic Paradox and the "healthy immigrant effect". The Latina Birth Outcomes Paradox, a derivative of the Hispanic Paradox which observes that Hispanics usually live longer than their white counterparts despite experiencing adverse

circumstances, could provide insight into the unanticipated results (Franzini, 2001). The Latina Birth Outcomes Paradox presupposes that despite low socioeconomic status Latina mothers are less likely to give birth to infants of low birth weight and have decreased rates of infant mortality (McGlade, 2004). Similarly, foreign-born immigrant mothers are more likely to experience positive birth outcomes compared to their native-born counterparts, which has been frequently referred to as the "healthy immigrant effect" (Guendelman, 2019). These observations have been detected when comparing US-born to foreign born Latinas, where foreign born Latinas are less likely to have a preterm delivery and other negative birth outcomes (DeSisto 2018; Flores, 2012). Although, it is believed that policy does have an effect on birth outcomes, the established social observations among Hispanic women suggest that there are aspects among Hispanic communities, especially surrounding pregnancy, that might increase resiliency against preterm birth among Hispanic women. This study does not examine mechanisms by which the observed birth outcomes manifest, but social science research among Hispanic women's sentiment of HB 87 in Georgia points to individual boldness when confronting an anti-immigrant climate as a source of strength (Lane, 2019).

Again, results for this study oppose our hypothesis, but possible factors influencing the observed outcome could be due to reporting changes surrounding preterm birth that occurred in Florida but not in Georgia. If preterm birth reporting guidelines changed in Florida that would make it more likely for a birth to be classified as preterm or make it more likely for Hispanic women to actually have a preterm delivery, then that could explain the increase in preterm birth risk in Florida and make the risk comparison to Georgia much more pronounced. Additionally, if there were compositional differences between the immigrant populations, like documentation status or whether someone is a recent immigrant or not, that occurred near the bill's

implementation due to national policy, then it could suggest that the "healthy migrant effect" could have been magnified among the Hispanic population in Georgia. Additionally, along with the Torche and Sirois, studies analyzing the effect of anti-immigrant rhetoric concerning the 2016 US presidential election found that the election increased fears of deportation and family separation (Fleming et al., 2019) and that, among births to Latina women across the nation who were pregnant during the US presidential election, there was a significant increase in preterm births across the nation (Gemmill, 2019). Given these studies, another possible explanation for noted findings could be that rhetoric, regardless of law implementation, is the principal exposure influencing a preterm birth outcome, which was not studied in this analysis. If that were the case, Georgia is a relatively new destination for immigrants and Hispanic communities are less established and more isolated, thus possible exposure to such rhetoric could be more limited compared to Florida which is more established and has more bilingual media outlets.

Although no major alternative state demographic change or policy enactment could be identified, there exists the possibility that an unaccounted event could have affected and biased the results. Other limitations of this study include the inability to account for authorization status which would have allowed the estimation of preterm birth risk among the undocumented population, a target population hypothesized for being at the greatest risk. Additionally, only the month and year of birth were accessible in this dataset and delivery dates were assigned the first of the month for each respective birth date for the calculation of estimated date of conception. This calculation could have misclassified exposure status and produced an underestimated measure of effect if exposed births were undercounted. Spillover due to migration patterns from Georgia to Florida could also have biased the results.

Strengths of this study included the use of difference-in-difference modeling which allowed for causal inference to be established on an immigration policy that had not been analyzed with the method before. Use of population level data allowed for the inclusion and analysis of all births that occurred in each state of interest, regardless of maternal documentation status, allowing the researchers to capture information that otherwise might not have been counted. Inclusion of additional covariates also allowed for the analysis of preterm birth risk across Hispanic origin and nativity status to determine if different groups had different effects to HB 87. Aside from study design, this study adds to the growing body of research that considers immigration policy as a social determinant of health and is the first to analyze the birth outcomes associated with HB 87.

Future studies should consider alternative comparison populations, possibly using a synthetic control group to mimic Georgia state demographics more closely. Models should continue to assess three way and/or four way interaction effects between nativity status and/or Hispanic origin particularly due to the slight, but imprecise, increase in preterm birth risk among women of Mexican, South, and Central American origin. Expanding the categorization of exposure on the basis of time, like those in the Torche and Sirois study, could also shed light on which aspects of the bill has greater effect. For example, though this study only analyzed the effects associated with the implementation of the bill, there could be differing levels of effect associated with the exposure to the debates or challenges surrounding the bill before and after its implementation, so a time-series analysis could be appropriate. Lastly, efforts should be made to capture the effect among the undocumented population via a proxy given that this population is hypothesized to be most at-risk.

Contrary to the results of this study, and more aligned with the proposed hypothesis, a new wave of policy analysis including more recent immigration policy also reinforces the belief that

anti-immigrant legislation does negatively affect the birth outcomes of Latina pregnancies. Also, as previously mentioned, studies regarding the 2016 US presidential election support the hypothesis that mere anti-immigrant rhetoric can be detrimental to birth outcomes, which is salient given the national coverage received from such elections. Lastly, the new presidential administration has shown their capability of enacting harsher immigration restrictions, notably the zero tolerance policy with regards to family separation, and this in turn could embolden more states to pass similar measures as was seen after the passing of Arizona SB 1070. Given these political circumstances and the need to improve preterm birth rates across the nation, future research should continue to consider immigration policy as a health indicator for birth outcomes.

Table 1. 2009 -2014 Birth Characteristics and Risk of Preterm Birth[a] for Singleton, Live Births in Georgia and Florida Stratified by Pre and Post Intervention[b] Status Based on U.S. Birth Certificate[c] Data Among Hispanic Women 15-50 years

	Pre - Intervention				Post - Intervention			
	Georgia (N=58,452)		Florida (N=161,952)		Georgia (N=46,773)		Florida (N=161,134)	
	Preterm N (%) (n=6,369)	Risk (95% CI)	Preterm N (%) (n=18,790)	Risk (95% CI)	Preterm N (%) (n=4,964)	Risk (95% CI)	Preterm N (%) (n=20,267)	Risk (95% CI)
Preterm Birth								
Yes	6,369 (10.9)	0.11 (0.10, 0.11)	18,790 (11.6)	0.12 (0.11, 0.12)	4,964 (10.6)	0.11 (0.11, 0.11)	20,267 (12.6)	0.13 (0.12, 0.13)
No	52,083 (89.1)	-	143,162 (88.4)	-	41,809 (89.4)	-	140,867 (87.4)	-
Foreign Born								
Yes	4,546 (71.4)	0.11 (0.11, 0.11)	12,409 (66.1)	0.12 (0.11, 0.12)	3,393 (68.4)	0.11 (0.10, 0.11)	12,389 (61.1)	0.13 (0.13, 0.13)
No	1,688 (26.5)	0.11 (0.10, 0.11)	6,363 (33.9)	0.12 (0.11, 0.12)	1,483 (29.9)	0.11 (0.10, 0.11)	7,856 (38.8)	0.12 (0.12, 0.13)
Maternal Hispanic Orgin								
Mexican	4,041 (63.4)	0.11 (0.11, 0.11)	4,064 (21.6)	0.11 (0.11, 0.11)	2,976 (60.0)	0.11 (0.10, 0.11)	3,849 (19.0)	0.12 (0.11, 0.12)
Puerto Rican	285 (4.5)	0.11 (0.11, 0.11)	3,823 (20.4)	0.12 (0.12, 0.13)	327 (6.6)	0.11 (0.10, 0.12)	4,270 (21.1)	0.13 (0.13, 0.13)
Cuban	73 (1.2)	0.10 (0.08, 0.13)	3,72 (19.5)	0.12 (0.12, 0.12)	89 (1.8)	0.12 (0.09, 0.14)	4,609 (22.7)	0.14 (0.13, 0.14)
Central or South American	1,271 (20.0)	0.11 (0.11, 0.12)	6,257 (33.3)	0.11 (0.11, 0.12)	1,078 (21.7)	0.11 (0.10, 0.11)	6,254 (30.9)	0.12 (0.12, 0.13)
Other or Unknown Hispanic	699 (11.0)	0.10 (0.10, 0.11)	974 (5.2)	0.11 (0.10, 0.12)	494 (10.0)	0.10 (0.09, 0.11)	1,285 (6.3)	0.12 (0.12, 0.13)
Prenatal Care Prior to 5 Months								
Yes	3,291 (51.7)	0.11 (0.11, 0.12)	14,284 (76.0)	0.12 (0.11, 0.12)	2,991 (60.3)	0.10 (0.10, 0.11)	16,785 (82.8)	0.13 (0.12, 0.13)
No	2,667 (41.9)	0.10 (0.10, 0.10)	4,073 (21.7)	0.11 (0.11, 0.12)	1,682 (33.9)	0.10 (0.10, 0.11)	3,110 (15.4)	0.12 (0.11, 0.12)
Medicaid								
Yes	1,827 (28.7)	0.10 (0.10, 0.11)	9,198 (49.0)	0.12 (0.12, 0.12)	2,141 (43.1)	0.11 (0.11, 0.11)	11,228 (55.4)	0.13 (0.13, 0.13)
No	4,542 (71.3)	0.11 (0.11, 0.11)	9,592 (51.1)	0.11 (0.11, 0.12)	2,822 (56.9)	0.10 (0.10, 0.11)	9,038 (44.6)	0.12 (0.12, 0.12)
High School Graduate								
Yes	2,538 (53.6)	0.10 (0.09, 0.10)	13,328 (70.9)	0.11 (0.11, 0.11)	2,358 (47.5)	0.10 (0.09, 0.10)	15,563 (76.8)	0.12 (0.12, 0.13)
No	3,415 (39.9)	0.12 (0.12, 0.13)	5,378 (28.6)	0.12 (0.12, 0.13)	2,291 (46.1)	0.12 (0.11, 0.12)	4,555 (22.5)	0.13 (0.13, 0.13)
Maternal Age								
15-19	800 (12.6)	0.12 (0.11, 0.13)	1,889 (10.1)	0.13 (0.13, 0.14)	550 (7.2)	0.13 (0.12, 0.14)	1,454 (11.1)	0.13 (0.13, 0.14)
20-24	1,564 (24.6)	0.11 (0.10, 0.11)	4,400 (23.4)	0.11 (0.11, 0.11)	1,083 (22.1)	0.10 (0.09, 0.10)	4,486 (21.8)	0.12 (0.12, 0.12)
25-29	1,692 (26.6)	0.10 (0.10, 0.11)	4,729 (25.2)	0.11 (0.10, 0.11)	1,220 (26.6)	0.10 (0.09, 0.10)	5,396 (24.6)	0.12 (0.11 0.12)
30-34	1,390 (21.8)	0.11 (0.10, 0.11)	4,337 (23.1)	0.12 (0.11, 0.12)	1,150 (24.4)	0.10 (0.10, 0.11)	4,941 (23.2)	0.12 (0.12, 0.13)
35-39	738 (11.6)	0.12 (0.11, 0.13)	2,706 (14.4)	0.13 (0.12, 0.14)	731 (15.2)	0.12 (0.11, 0.13)	3,072 (14.7)	0.14 (0.14, 0.14)
40-44	176 (2.8)	0.14 (0.12, 0.16)	691 (3.7)	0.15 (0.14, 0.16)	217 (4.3)	0.15 (0.14, 0.17)	866 (4.4)	0.17 (0.16, 0.18)
45-50	9 (0.1)	0.14 (0.06, 0.23)	38 (0.2)	0.16 (0.11, 0.20)	13 (0.3)	0.21 (0.11, 0.31)	52 (0.3)	0.22 (0.16, 0.27)

[a] Unadjusted Risk of preterm birth

[b] Pre intervention includes births conceived before May 13, 2011 and post intervention includes births conceived after

[c] Data obtained from NCHS Vital Records and only includes births using 2003 Standard Birth Certificate

Table 2a. Georgia State Characteristics [a] from 2009-2014 Stratified by Year						
	2009	**2010**	**2011**	**2012**	**2013**	**2014**
Population Demographics						
Total Population	9,497,667	9,468,815	9,600,612	9,714,569	9,810,417	9,907,756
Percent Foreign Born	9.69%	9.96%	9.82%	9.68%	9.90%	10.04%
Percent Hispanic	8.59%	9.05%	9.17%	9.31%	9.22%	9.31%
Economic Indicators						
Unemployment rate	8.00%	8.80%	9.90%	10.70%	11.40%	10.80%
Poverty Rate	16.50%	17.90%	19.10%	19.20%	19.00%	18.30%
State Minimum Wage	$ 5.15	$ 5.15	$ 5.15	$ 5.15	$ 5.15	$ 5.15
Clinical Indicators						
Percent Uninsured	19.10%	19.70%	19.60%	18.40%	18.80%	15.80%
Medicaid Expansion [b]	No	No	No	No	No	No
Political Indicators						
Democratic Governor	No	No	No	No	No	No
Average Percent of State House Democrats	41%	41%	35%	35%	34%	34%
Average Percent of State Senate Democrats	39%	39%	36%	36%	32%	32%

[a] Data for population demographics, economic and clinical indicators were obtained from the US Census Bureau FactFinder. Data for clinical and political indicators were obtained from the Center for Poverty Research.
[b] Medicaid expansion for unauthorized immigrant women who are pregnant

Table 2b. Florida State Characteristics [a] from 2009-2014 Stratified by Year						
	2009	**2010**	**2011**	**2012**	**2013**	**2014**
Population Demographics						
Total Population	18,537,969	18,843,326	19,057,542	19,317,568	19,552,860	19,893,297
Percent Foreign Born	18.79%	19.41%	19.43%	19.40%	19.42%	19.97%
Percent Hispanic	21.52%	22.57%	22.85%	23.21%	23.62%	24.07%
Economic Indicators						
Unemployment rate	9.90	10.80	10.30	9.40	8.40	7.20
Poverty Rate	14.90%	16.50%	17.00%	17.10%	17.00%	16.50%
State Minimum Wage	$ 7.21	$ 7.25	$ 7.25	$ 7.67	$ 7.79	$ 7.93
Clinical Indicators						
Percent Uninsured	20.90%	21.30%	20.90%	20.10%	20.00%	16.60%
Medicaid Expansion [b]	No	No	No	No	No	No
Political Indicators						
Democratic Governor	No	No	No	No	No	No
Average Percent of State House Democrats	37%	37%	32%	33%	37%	38%
Average Percent of State Senate Democrats	35%	35%	30%	30%	35%	35%

[a] Data for population demographics, economic and clinical indicators were obtained from the US Census Bureau FactFinder. Data for clinical and political indicators were obtained from the Center for Poverty Research.
[b] Medicaid expansion for unauthorized immigrant women who are pregnant

Table 3. Difference in Difference Risk Ratio Estimates for the effect of HB 87[a] on Preterm Birth [b] among Hispanic women in Georgia compared to Florida for Live-Singleton 2009- 2014 Births [c]			
Model	**Covariates**	**RR (95% CI)**	
0	Intervention Status + State Fixed Effects	1.11 (1.07, 1.16)	
1	M0 + Hispanic Origin + Age + Education + Foreign-Born + Medicaid	0.89 (0.86, 0.93)	
2	M1 + interaction by Hispanic Origin	**Mexican, South and Central American**	**All Other Hispanic**
		1.03 (0.94, 1.12)	0.92 (0.83, 1.03)
3	M1 + Interaction by Nativity	**US-Born**	**Foreign-Born**
		0.96 (0.88, 1.04)	0.84 (0.80, 0.90)

[a] Immigration policy bill passed on May 13, 2011
[b] Includes births occurring before 37 completed gestational weeks
[c] Data obtained from NCHS Vital Records and only includes births using 2003 Standard Birth Certificate

Figures

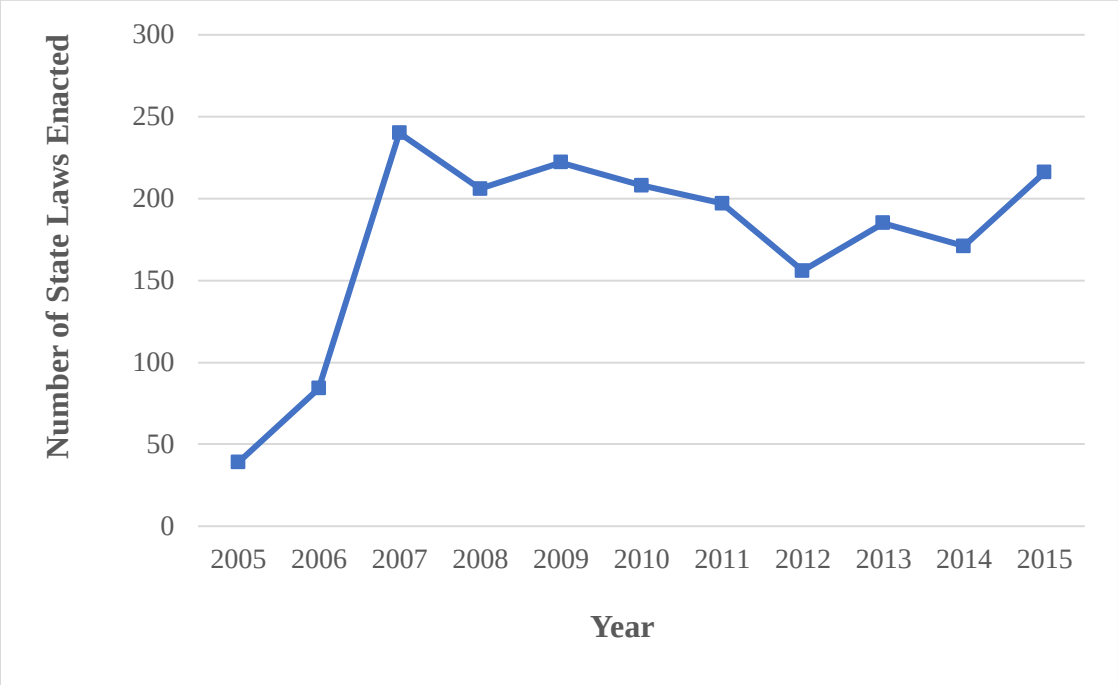

Figure 1. State Immigration-Related Laws Enacted, 2005-2015.[a]

Note. Reprinted from "State-level immigration and immigrant-focused policies as drivers of Latino health disparities in the United States", by Philbin, M et al. (2018), retrieved from https://doi.org/10.1016/j.socscimed.2017.04.007 Copyright 2018 Philbin, M et al.

[a] Data for this graph was obtained by the National Conference for State Legislatures (Meyer et al., n.d; Morse et al., 2016).

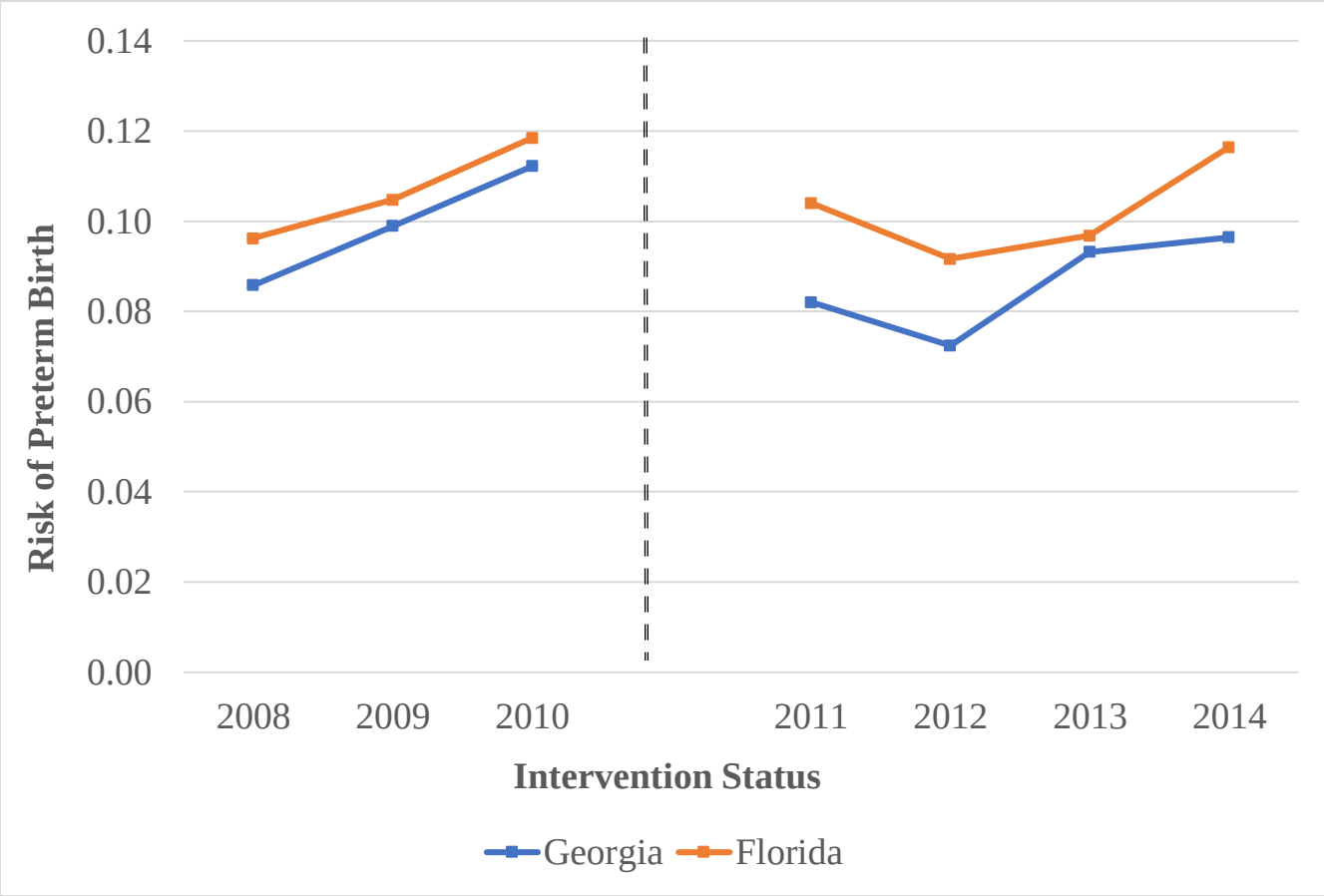

Figure 2. Pre and Post Intervention[a] Adjusted [b] Risk of Preterm Birth by Year of Estimated Conception[c] Among Hispanic Women for 2009-2014 Live-Singleton Births [d]. Dashed line at the center of the figure represents an exclusion of births from January 1, 2011- May 12, 2011.

[a] Pre-Intervention births are to the left of the dashed line while post intervention are to the right. Intervention occurred May 13, 2011. Births with estimated date of conception between January 1, 2011 and May 12, 2011were excluded.
[b] Adjusted for Nativity, Hispanic Origin, Age, Education, Entry into Prenatal Care, and Medicaid Insurance Payment at Delivery
[c] Calculated by subtracting gestational days at birth from the delivery date
[d] Data was obtained from Vital Records provided by the National Center for Health Statistics

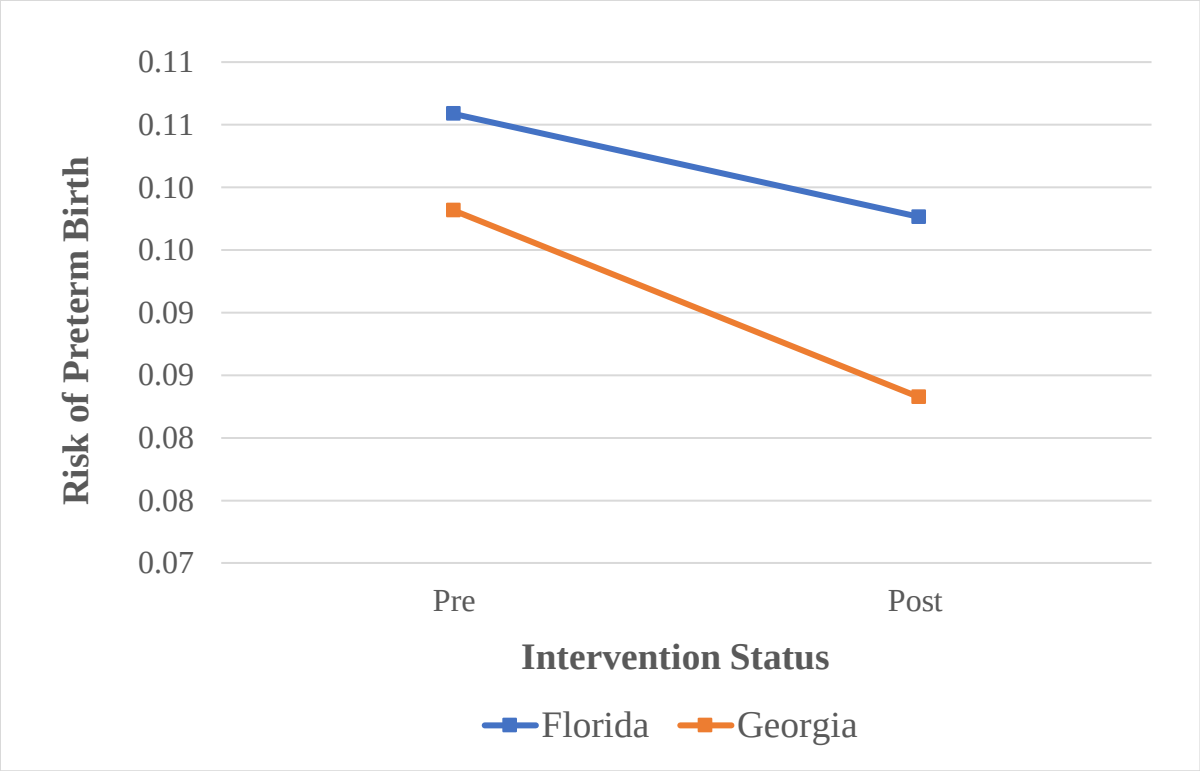

Figure 3. Adjusted [a] Risk of Preterm Birth by Aggregated Intervention Status [b] for 2009 -2014 Live-Singleton Births [c] Among Hispanic Women.

[a] Adjusted for Nativity, Hispanic Origin, Age, Education, Entry into Prenatal Care, and Medicaid Insurance Payment at Delivery

[b] Pre intervention includes births conceived before May 13, 2011 and post intervention includes births conceived after. Partially exposed births were excluded.

[c] Data was obtained from 2009-2014 Vital Records provided by the National Center for Health Statistics

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