



HHS Public Access

Author manuscript

Soc Sci Med. Author manuscript; available in PMC 2018 September 05.

Published in final edited form as:

Soc Sci Med. 2011 May ; 72(10): 1695–1703. doi:10.1016/j.socscimed.2011.02.046.

Prenatal care among immigrant and racial-ethnic minority women in a new immigrant destination: Exploring the impact of immigrant legal status

Kim Korinek^{a,*} and Ken R. Smith^b

^aUniversity of Utah, Department of Sociology, 380 S 1530 E, RM 301, Salt Lake City, UT 84112, United States

^bUniversity of Utah, Department of Family and Consumer Studies, and Huntsman Cancer Institute, University of Utah, Salt Lake City, UT 84112, United States

Abstract

Despite the rising share of undocumented immigrants in the US population, research has been quite limited regarding immigrant legal status and how it may limit healthcare access, especially research involving direct identification of undocumented populations. Drawing upon the Utah Population Database, a unique, comprehensive linked system of vital, medical, and administrative records, we analyze the prenatal care utilization in a large and recent cohort of births to mothers residing in the pre-emerging immigrant gateway state of Utah. Our analyses focus on the racial-ethnic, nativity and legal status of mothers as factors that influence prenatal care utilization. State administrative records are used to assess legal status among foreign-born mothers, specifically driver privilege cards made available to undocumented migrants. Our results indicate the importance of disaggregating the expansive categories of Hispanics and the foreign born to better understand health outcomes and healthcare utilization among immigrants. In particular, we find that the legal status of immigrant mothers is one of several important factors influencing prenatal care utilization. Undocumented women are among the least likely to obtain adequate levels of prenatal care. However, undocumented women's prenatal care utilization is enhanced among those using the state's integrative driver privilege program, and among those residing in neighborhoods with high concentrations of immigrants. Results are discussed in light of theory on immigrant integration and healthcare access, and in terms of public policies, such as those extending driver privileges to unauthorized immigrants, which aim to facilitate immigrants' access to institutions within destination communities.

Keywords

Prenatal care; Health inequalities; Immigrant health; Undocumented immigrants; Racial-ethnic disparities; Utilization; USA

*Corresponding author. Tel.: +1 801 581 7112. kim.korinek@soc.utah.edu (K. Korinek).

Introduction

For myriad reasons immigrant and Latino perinatal health outcomes are a rising concern in policy-making, public health and academic circles in the USA. In traditional gateways and new immigration destinations, high rates of in-migration and relatively high immigrant fertility levels indicate that sizable numbers of US citizen children are being born to immigrant mothers, many of whom are undocumented. For instance, in the new immigrant destination of Utah, the context of the current study, 15 percent of births in 2006 were to foreign-born women, up from just 5 percent in the mid-1980s. Furthermore, over 15 percent of births were to Latinas (native-born and foreign-born), also more than a tripling of the share in the mid-1980s. At the national level, nearly one fourth of births were to Hispanic women in 2006, a large share of which occurred among immigrant Hispanics (Martin et al., 2009). The changing demographics of births suggest that the healthcare received by ethnic minority immigrants and their children are critical contributors to public health. Enhancing access to prenatal care for immigrants has been shown to reduce aggregate healthcare costs associated with complications of labor and delivery and relatively costly, yet preventable, perinatal health problems (Lu, Lin, Prietto, & Garite, 2000).

In addition to increasingly diverse national origins, one of the critical lines of stratification among recent immigrants is that of legal status. A paucity of empirical data on undocumented immigrants, due largely to the challenges of identifying and sampling such an elusive population, has limited understanding of their health status and healthcare seeking behavior (Marshall, Urrutia-Rojas, Soto Mas, & Coggin, 2005; Ortega et al., 2007). Estimates of the undocumented population suggest that their numbers are approaching 12 million, many of whom bore children in the United States (Passel & Cohn, 2009). A handful of studies have addressed the health of the undocumented, most of which are restricted to single clinic- or institution-based convenience samples or reliant upon immigrants' self-reports on their status (Berk, Schur, Chavez, & Frankel, 2000). The emerging picture is often one of undocumented immigrants being relatively deprived compared to documented immigrants, in terms of their healthcare access, such as having a regular source of care or any form of health insurance. The undocumented also fare worse in terms of health outcomes, on measures such as self-reported health and low birth weight (Berk & Schur, 2001; Berk et al., 2000; Derose, Escarce, & Lurie, 2007; Kelaher & Jessop, 2002; Marshall et al., 2005; Wolff et al., 2005). Analyses of US communities and workplaces reveal hierarchies of ethnicity and nativity in which undocumented Hispanic immigrants are positioned at the very bottom, not only facing the worst threats to health, but also the most restricted access to healthcare due to socioeconomic hardship and limits on their participation in insurance and other programs (Holmes, 2006).

In this paper we examine the impact of a woman's immigration status on her utilization of prenatal care. Furthermore, we investigate whether levels of destination community integration, as marked by participating in an integrative public policy program, and neighborhood composition, further shape healthcare utilization by undocumented immigrant women.

Utilization of prenatal care, one of the foremost advances in obstetrics in the past century (Healy et al., 2006), has been shown to vary widely across the racial-ethnic, socioeconomic, and cultural backgrounds of mothers in countries like the USA. Immigrant women, whose proportional increase has been especially remarkable in new immigrant gateway communities (Saenz, 2006), display particularly low levels of prenatal care utilization in some settings. Various scholars have documented the rich, informal sources of prenatal care and education in Latino immigrant communities such as those emanating from extended family members and community-based outreach workers, known as *promotoras*, who advance health awareness and education in the population. These informal social resources, rooted in the ethnic community, are often credited with contributing to the particularly positive, paradoxical perinatal health outcomes of populations relatively disadvantaged in terms of socioeconomic resources (Wasserman, Bender, & Lee, 2007). Yet, this does not discount the importance of formal, early prenatal care for immigrants, and immigrant Latinas in particular, in terms of educating expectant mothers, and detecting and treating particular health conditions. The importance of prenatal care is posited to extend beyond enhanced perinatal health outcomes. In the words of Shiono and Behrman (1995:10), “a number of benefits accrue from the receipt of these services which do not relate to the prevention of low birth weight, chief among these is a form of integration into the healthcare system which improves the likelihood of subsequent preventive care and heightens access to social services for mothers and children” (see also Frisbie, Echevarria, & Hummer, 2001). This relationship between prenatal care and subsequent healthcare is particularly relevant in the immigrant Latino population, where advantages at birth are often eroded by early childhood (Wasserman et al., 2007). For instance, if an undocumented woman has obtained a prenatal provider, that provider will likely point the way to sources of post-natal care, vaccinations, and other services geared toward low-income, immigrant mothers and their children.

Immigrants are not a monolith, and failure to address heterogeneity in their origins, legal status, and other dimensions of migration experience has been cited as a reason for observed discrepancies across studies on the relationship between immigrant status and health (Gagnon, Zimbeck, & Zeitlin, 2009). The few studies which disaggregate undocumented and documented immigrants suggest that it is important to critically assess the ‘healthy migrant’ effect, and to consider which groups of immigrants experience the most serious disadvantages in terms of healthcare access and health status (Derose et al., 2007).

Our objective is to explore how degrees of immigrant integration affect use of healthcare systems, in particular prenatal care. Previous longitudinal, cross-national research has shown that immigrants’ pregnancy outcomes are superior in settings with stronger integration policies, a pattern attributed to their enhancement of social participation while limiting stress and discrimination (Bollini, Pampallona, Wanner, & Kupelnick, 2009). For the foreign-born, legal status remains a poorly understood, but likely a highly salient, factor differentiating integration and, therefore, access to healthcare. Being undocumented is particularly compromising because it limits access to insurance and public health assistance programs, and circumscribes employment positions and the ability to make claims on public institutions (Thamer, Richard, Casebeer, & Ray, 1997). Furthermore, undocumented status

often generates a marginalized “life in the shadows” as efforts are made to limit contact with institutions and agencies that could jeopardize one’s residence in the U.S (Chavez, 1998).

Our logic, based on theories of immigrant incorporation (e.g., Portes & Rumbaut, 2006), is that undocumented women face limited access to health care, including prenatal care, due to their socioeconomic, institutional and other forms of marginality, as well as destination contexts that are especially restrictive and unwelcoming to those residing in the U.S. illegally. Previous community-based studies have found that undocumented immigrants are especially likely to mention financial constraints and transportation problems as barriers to seeking prenatal care (Thompson, Curry, & Burton, 1998). However, institutional access should be more open to undocumented women who participate in a policy program intended to promote social integration among undocumented persons. In the study context, such a program is the Utah driver privilege program. Involvement in such a program is posited to facilitate physical mobility necessary to access services, especially in areas lacking reliable public transport, and to generate a more integrated status and legally sanctioned identity in comparison to those completely lacking state documentation (Stewart & Jameson, 2010). A positive association between adequate prenatal care utilization and participation in the driver privilege program may, alternatively, be a byproduct of certain traits possessed by a subset of undocumented women, such as greater resourcefulness, social capital, or local integration, which in turn encourage involvement in both healthcare systems and state policy programs. Thus, we hypothesize that undocumented mothers who have obtained a driver privilege card will be similar to their documented migrant counterparts, whereas undocumented women lacking such identity verification will be particularly marginalized and less inclined to utilize frequent and early prenatal care.

We hypothesize that immigrant women, generally, as well as U.S.-born Hispanic women, will be less likely to obtain formal, early prenatal care than their native-born, non-Hispanic white counterparts. Such a result would be consistent with previous studies in which Hispanic and foreign-born women comprise the group least likely to obtain adequate levels of prenatal care (Echevarria & Frisbie, 2001). Explanations for persistent disparities in prenatal care utilization are wide ranging and include: financial difficulties; lack of insurance coverage among poor, un- and underemployed populations (Kalofonos & Palinkas, 1999; Meikle, Orleans, Leff, Shain, & Gibbs, 1995); structural barriers that impair efforts to locate providers, and make and keep appointments (York et al., 1999); and psychosocial obstacles that make women reluctant to trust or rely upon healthcare professionals.

Degrees of immigrant integration are also reflected in social and geographic locations vis-à-vis mainstream populations and social capital resources. Therefore, we also consider how place of residence, in particular neighborhood poverty rates and levels of immigrant concentration, may make mothers more or less integrated into the societal mainstream and hence more or less likely to access early and adequate prenatal care. A diverse literature has shown that neighborhood poverty rates and other measures of neighborhood socioeconomic status are correlated with general health outcomes, such as self-reported health, and specific health outcomes, such as low birth weight (Do & Finch, 2008; Krieger et al., 2003; Smith & Waitzman, 1997; Waitzman & Smith, 1998). Thus, we hypothesize that residence in

relatively impoverished neighborhoods will lessen the odds of obtaining adequate prenatal care.

While residing in an immigrant enclave may not facilitate integration into mainstream, majority ethnicity communities, previous research suggests that enclaves and the social capital they create may confer a protective effect, such as by surrounding expectant mothers with health-related support and information (Eschbach, Ostir, Patel, Markides, & Goodwin, 2004; Osypuk, Bates, & Acevedo-Garcia, 2009). An immigrant residing in an enclave may be more likely to encounter community services that cater to immigrants, or locals who have successfully located affordable, immigrant-friendly care providers at community clinics or other nontraditional providers serving low-income or uninsured populations. Thus, we posit that residing in a neighborhood with a foreign-born concentration will enhance immigrant mothers' utilization of prenatal care. However, given that immigrant neighborhoods in Utah tend to have poorer populations and poorer infrastructure, this positive association is not expected to accrue to US born women residing in immigrant-concentrated neighborhoods (Osypuk et al., 2009).

Since 1999, with the passage of House Bill 36, the state of Utah has been one of 11 US states to grant undocumented immigrants access to driver licenses or driver privilege cards. This policy provides a unique research opportunity. First, it permits assessment of birth mothers' legal status, allowing for a comparison of prenatal care outcomes across native born whites, native born racial-ethnic minorities, documented immigrants and undocumented immigrants. Second, Utah's driver privilege program is a model of a public policy geared toward the integration of undocumented immigrants. Intended primarily to foster higher rates of insurance coverage among state residents by granting undocumented persons access to driving privileges, the program has the potential to open up participation in other institutional realms, such as healthcare.

Although immigration policy is a federal matter, the Utah state legislature has recently passed several bills addressing undocumented populations that have an integrative tone, such as HB 36 which created the driver license provision for undocumented persons (HB 36), and HB 144 which permits undocumented students to attend colleges and universities at in-state tuition rates (HB 144). However, these integrative policies have at times been met by a hostile public, and they have been accompanied by legislative actions with opposing tendencies, such as SB 81, passed in 2009, which threatens the undocumented with heightened enforcement of the law, legal penalties and exposure to more policing. Thus, as in many states coping with a growing population of undocumented migrants, Utah presents a mixed climate, one that mingles acceptance and integration with hostility and exclusion. In addition to the coexistence of the Utah Population Database (UPDB) and the Utah driver privilege program for undocumented migrants, the current study is also suitably focused on an emerging immigrant gateway (Singer, 2004). As immigrant flows have diffused away from traditional destinations to new gateways, Utah has seen its immigrant population grow more than twice as fast as the national average, with the Salt Lake City-Ogden metropolitan area's immigrant population increasing by 174% between 1990 and 2000 (Singer, 2004).

Materials and methods

Our analyses draw upon data from the Utah Population Database (UPDB), a unique resource for biomedical research housed at the University of Utah's Huntsman Cancer Institute. Containing information on over seven million individuals, the UPDB is a comprehensive, continually updated system of linked vital, medical and administrative records. Health information appearing on birth certificates are obtained from medical records; in the minority of cases where medical data are not accessible, some information is based on mother's self report. Information on the Resource for Genetic and Epidemiologic Research, the Utah state agency governing access to UPDB data, and protocols established to protect access and ensure UPDB data confidentiality, has been published elsewhere (Wylie & Mineau, 2003). The privacy of individuals represented in UPDB records and confidentiality of the data is strictly protected. Research ethical approval for this study has been granted by the University of Utah's Institutional Review Board and the Utah Resource for Genetic and Epidemiological Research.

While the UPDB contains extensive historical data and genealogical linkages, the current study draws upon contemporary birth certificate records issued for all live, singleton births occurring in the state of Utah between 2000 and 2007, and capitalizes on the ability to link maternal birth records to maternal driver license division records. Due to the driver privilege program, mothers' legal residency status can be discerned through state driver license division records.

The focal outcome of this study is prenatal care utilization. Though they may have knowledge of and desire to obtain prenatal care, low income persons, especially undocumented noncitizens, may encounter numerous barriers to doing so. In Utah, as elsewhere, certain low income citizens and legal residents are eligible for medical coverage through state- and federally-funded programs such as Medicaid. For undocumented women, labor and delivery are covered by Emergency Medicaid, but prenatal and post-partum services are not. Thus, those who access prenatal coverage either do so through out-of-pocket payments, private or employer-based insurance, or through a network of non-profit community clinics that provide services to low-income, uninsured groups, including undocumented immigrants.

Among the various approaches to assessing prenatal care utilization, we rely on the Kotelchuck Adequacy of Prenatal Care Utilization Index, which combines information on the timing of prenatal care initiation and the frequency of healthcare provider visits thereafter to determine if utilization is adequate, intermediate, or inadequate, per recommendations of the American College of Obstetricians and Gynecologists (ACOG) (Kotelchuck, 1994). Information on the date of the first prenatal visit and total number of visits, as documented by maternal healthcare providers during pregnancy, is obtained from Utah birth certificates. This information is then combined to categorize each birth as having been preceded by either adequate or inadequate levels of care per ACOG recommendations, yielding a dichotomous outcome variable for multivariate analysis. We acknowledge lack of consensus on the best approach to measuring prenatal care adequacy, with some preferring a less restrictive measure, such as whether mothers initiated care in the second, or third,

trimester, as opposed to the first. To assess the sensitivity of our results to measurement choice, we also analyzed the trimester of prenatal care initiation. The results, in terms of direction and significance, were similar to those observed for the Prenatal Care Utilization (PNCU) index. For the sake of brevity we present results for the prenatal care utilization adequacy index only.

In order to delineate mothers' origins we combine information on country of birth, race-ethnicity, and immigration status as indicated on birth certificates and state-issued driver identification records. From birth certificates we obtain information on the mother's nativity, or country of birth (whether the United States, or elsewhere), and whether or not the mother identifies herself as Hispanic.

For immigrant women, we delineate their ethnicity as Hispanic or Non-Hispanic. We are also equipped to directly observe their documentation status. As mentioned above, since 1999 undocumented immigrants in Utah have been able to use Individual Taxpayer Identification Numbers (ITIN) to apply for driver licenses (or driver privilege cards after 2005). We refer to this category of undocumented mothers who have obtained a driver license or privilege card with an ITIN as holders of driver privilege cards (DPCs); their records have been flagged in the UPDB. Because they must present Social Security cards and other US-issued identification to do so, foreign-born women who have obtained regular Utah driver licenses are identified as being documented. The remainder of immigrant women, those lacking either a regular driver license or DPC, i.e., those with no form of state identification, have unknown legal status. However, given the significant over-representation of Hispanic immigrant women in the 'no license/no DPC' category relative to native born persons and Non Hispanic immigrants, and given their relatively low levels of education (levels comparable to DPC holders) we conclude that Hispanic immigrants lacking any form of state identification are disproportionately undocumented, or illegal, immigrants. They are distinguished from undocumented immigrants with DPCs in that they are likely less integrated in the Utah context, likely draw more heavily from recent immigrant arrivals, relatively unaware of the driver privilege program, and/or lacking in personal resources necessary to participate in the DPC program.

The unique UPDB data linkages permit us to make important strides in delineating documented and undocumented immigrants; however, data limitations prevent a more refined categorization. The residual category of mothers with no driver license or DPC, while comprising largely undocumented women, may include documented immigrants who are otherwise marginalized. For instance, they may lack access to a vehicle, or means to contact the driver license division, and hence do not seek out a regular driver license or state ID, even though eligible. Also, mothers who possess counterfeit documents, such as false social security cards, fit into a category that has been referred to as 'documented illegal.' Women in this group may have been able to acquire a regular Utah driver license and hence would be subsumed into the category with regular driver licenses — which we presume to be legal immigrants.

Birth certificates, replete with demographic and health information on mothers, are the source of other variables in our analyses. Specifically, we incorporate information on

mothers' age at the time of birth, socioeconomic status (as indicated by educational attainment), labor force participation prior to birth, marital status at the time of birth, pregnancy and birth history, and reported smoking and alcohol consumption during the pregnancy. It is important to note that birth certificate records incorporate both objective information collected by clinicians and information provided through maternal self-reports. As with any self-report data, validity of responses may be compromised by cognitive or situational factors, especially with respect to socially stigmatized behavior such as smoking or other health risk behaviors (Brener, Billy, & Grady, 2003). Despite increasing emphasis on smoking cessation in the late versus mid 20th century, several recent studies comparing self-report and biomarker assay concordance to assess smoking behavior during pregnancy have concluded that mothers' self-reports of smoking during pregnancy are reasonably accurate, with little discrepancy in accuracy across ethnicity and other social groups (Klebanoff et al., 2001; Wills & Cleary, 1997). Although previous research suggests self-reported health risk behavior during pregnancy is reasonably accurate, we acknowledge that some biases in these measures may exist and that they may be more prevalent in particular subgroups of women, such as those that are relatively educated and/or acculturated to US health behavior norms.

The UPDB record linkage of birth certificate and DLD records provides data on maternal residence at the time of birth and its association with PNC utilization. Where available, mothers' residential addresses from birth and driver license division records were geocoded and then associated with a census block group. We rely on the 2000 Census of Population to identify average characteristics of block groups across the state of Utah. The "block group" is an administrative unit of the Census, the smallest unit for which socioeconomic variables in Census sample data are reported. We reason that block groups are the most appropriate Census geographic unit to represent neighborhoods in our analysis because detailed data cannot be obtained for smaller units, and larger units (e.g., tracts) often represent quite sizable geographic areas, especially in Utah's sparsely settled rural areas, and these are less likely to represent the proximate contextual influences purported to influence healthcare seeking behaviors. Accordingly, neighborhood socioeconomic conditions were described by reference to the percentage share of block group population with income below the federal poverty threshold. Neighborhood composition, in particular the extent of immigrant concentration, was described with reference to the percent of population in the block group that is foreign-born. We caution that although addresses for mothers are current (within one year of the date of birth) the aggregate data describing census block groups is static and derived from the 2000 decennial census. Thus, slight measurement error may arise for the neighborhood variables, more so for births taking place several years subsequent to the 2000 census.

During the analysis period of 2000—2007, there were 399,206 live, singleton births in the State of Utah (excluding adoptions). The analytical sample size, which excludes birth records with missing information on prenatal care utilization and maternal pregnancy history, is 387,864. Those birth records lacking a valid, geocoded residential address within one year of the date of birth were dropped from the neighborhood contextual analysis (i.e., 19,047 cases, or fewer than 5 percent of the analytical sample).

Results & discussion

In Table 1 we present descriptive statistics for the full analytical sample, as well as for the subsample of births (six percent of the total) in which mothers did not obtain adequate prenatal care. Tests comparing the incidence of inadequate levels of prenatal care utilization across all categories of these variables, and across quintiles of the neighborhood immigrant and poverty concentration variables, consistently indicate statistically significant mean differences across categories ($Pr < .001$). First, we observe a statistically significant association between utilization of prenatal care that is inadequate and low birth weight. We also note that mothers who did not obtain adequate prenatal care are drawn more heavily from Hispanic, foreign-born, and especially African American populations, than from the non-Hispanic white, native born majority group. Teen mothers and those unmarried at the time of birth are significantly less likely to obtain adequate prenatal care than older and married mothers, as are those with relatively low levels of educational attainment. Risky health behaviors, in particular smoking and drinking alcohol during pregnancy, are observed more often among mothers whose prenatal care utilization was inadequate. Finally, we observe that the concentration of poverty and the concentration of foreign-born residents is significantly higher in the neighborhoods surrounding mothers who did not obtain adequate prenatal care as compared to the overall sample of mothers.

Table 2 presents the results of several logistic regression analyses predicting the adequacy of prenatal care utilization among mothers giving birth in Utah between 2000 and 2007. To account for the correlation between repeated observations on mothers with multiple births, we utilize the Huber-White robust variance estimator available in STATA's logistic regression command. Supplementary analyses do not indicate additional or distinct area-based clustering at the block group level, justifying our use of the logistic model with control for individual-level clustering. The results, in the form of odds ratios, are presented in five models. Model A presents results for maternal demographic characteristics only. Model B incorporates both maternal demographic and health behavior characteristics; Model C adds paternal education and ethnicity/nativity information; Model D includes measures of poverty incidence and foreign born concentration in mothers' neighborhoods near the time of birth; and Model E includes all of the above variables, plus the interaction of maternal ethnic and immigration status with neighborhood immigrant concentration.

The results of Model A indicate clear evidence of differences in utilizing prenatal care by mother's racial-ethnic and nativity status, with all groups faring significantly worse than the reference category of U.S. born, Non-Hispanic whites. Those with the greatest odds of inadequate utilization of prenatal care are native born African-American and Asian or Pacific Islander women, whose odds of inadequate prenatal care use are over three times those of native-born Non-Hispanic whites. It is important to mention that in Utah, Pacific Islanders, many of whom are second generation immigrants from Samoa, Tonga, and other islands, outnumber those of East and Southeast Asian descent. Previous studies document specific health problems in the Pacific Islander population, as well as their difficulties in assimilating from tight-knit island cultures to lifestyles in the U.S. West that often include poor job opportunities, educational barriers, and youth gangs (Warner, 1991). Such results are consistent with their high risks of late and infrequent use of prenatal care.

Among Hispanic women giving birth in Utah, we find that, despite healthcare limitations often associated with immigrant status, such as language and cultural barriers, and bars upon participation in health insurance programs, the odds of obtaining adequate levels of prenatal care are approximately the same, if not slightly greater, for documented Hispanic immigrants as compared to their U.S. born Hispanic counterparts. Although falling short of indicating a negative effect of acculturation on prenatal care utilization, it is telling that length of residence in the US does not appear to enhance Hispanics' use of formal prenatal healthcare services.

The disaggregation of foreign-born mothers according to legal/ documentation status provides evidence that undocumented immigrants, in particular those who have availed themselves of the driver privilege program, experience odds of inadequate prenatal care use (1.49) that are on par with their documented immigrant counterparts (1.50). Although both groups are disadvantaged relative to U.S. born Non-Hispanic whites in formal prenatal care utilization they are approximately equally so. Markedly distinct and worse off than the aforementioned Hispanic immigrants in their odds of obtaining adequate prenatal care are those foreign-born Hispanics who have absolutely no form of state identification or driver privilege. This group's composition (i.e., in terms of characteristics such as national origins and educational background) suggests they too are a largely unauthorized immigrant population, but likely less locally integrated or aware of local policies and services than the undocumented who have obtained driver privilege cards.

The remainder of Model A results point to other maternal characteristics that heighten risks of inadequate prenatal care utilization. In particular, mothers who are teens, unmarried, with low levels of education, and out of the labor force have greater odds of not obtaining adequate prenatal care. Mothers' odds of inadequate prenatal health care use also rise with each subsequent birth; for instance, first births have approximately 40 percent lower odds of being preceded by inadequate prenatal care use than third or higher order births.

The results shown in Model B indicate that mothers who report engaging in risky health behaviors during pregnancy, in particular smoking or drinking, are also at greater risk of inadequate prenatal health care use. A comparison of odds ratios across Models A and B is instructive. It is important to disentangle smoking and drinking behaviors during pregnancy, especially since these behaviors are significantly and positively associated with US born status (results not shown). We reason that once we have statistically accounted for smoking and drinking health risks in pregnancy, which occur disproportionately among US born, Non-Hispanic white women, and which correlate positively with poor prenatal care utilization, the gap in prenatal care utilization between native-born majority mothers and racial-ethnic and foreign born mothers is more substantial. While not obtaining early and frequent prenatal care is a health risk behavior, it is one that appears to be closely linked with socioeconomic and institutional structural barriers faced by immigrant women, and thus is distinct from the active health risk behaviors of smoking and drinking that are relatively common among the white, US born majority and very rarely observed among Hispanic immigrant mothers.

Model C expands upon maternal characteristics by incorporating information on fathers' ethnicity-nativity and educational attainment. We find that women are more likely to obtain adequate levels of prenatal care if birth fathers have relatively high levels of formal schooling (13 years or more). Also, compared to cases in which birth fathers are immigrants and/or Hispanic, prenatal care utilization is more common among women where birth fathers are US born and non-Hispanic. The inclusion of fathers' characteristics in Model C attenuates the relationship between maternal characteristics and prenatal care utilization. This pattern suggests that, independent of mothers' characteristics, fathers' characteristics are important in shaping pregnant women's healthcare access, likely through their access to income, insurance, or knowledge of healthcare. It is also important to note that these results are affected by missing data on fathers' characteristics, especially in cases of births to unwed mothers, as well as highly correlated maternal and paternal education and ethnicity-nativity status resulting from high levels of educational and racial-ethnic homogamy in the Utah population. Nonetheless, the results in Model C suggest that fathers' characteristics are salient in prenatal care utilization. It stands to reason that women who parent children with relatively well educated men, or men who share in the social and economic privileges associated with belonging to the racial-ethnic majority group, will garner resources that improve their access to prenatal care and other healthcare resources.

In Model D we include census block group-level measures of poverty incidence and immigrant concentration in the neighborhoods occupied by mothers at or near the time of birth. We find that, net of mothers' individual characteristics, those living in neighborhoods with high concentrations of poverty are less likely to have obtained adequate levels of prenatal care. In addition, mothers' odds of inadequate prenatal care use are significantly lessened as the percentage share of foreign-born neighborhood residents increases. A model with neighborhood poverty rates and foreign-born concentration indicated by categorical variables (results not shown) indicates, in parallel fashion, a linear, positive association between the odds of inadequate prenatal care utilization and rates of both neighborhood poverty and foreign-born prevalence.

Theoretically and substantively, we expect differential effects of neighborhood immigrant concentration on mothers' utilization of prenatal care. The results of Model E confirm this. The statistical interactions between mother's racial-ethnic and immigrant status and neighborhood immigrant concentration indicate that the adverse main effect of foreign born concentration on obtaining adequate prenatal care is much weaker among foreign-born Hispanic mothers. In fact, for Hispanic immigrants who are undocumented, as evidenced by the possession of a driver privilege card, and especially for those lacking any sort of state identification (i.e., those deemed undocumented and particularly marginalized), a greater proportion of foreign born residents in one's neighborhood are associated with improved odds of obtaining adequate prenatal care. For Hispanic immigrant women, especially those of undocumented status, residing in an immigrant enclave, as opposed to being more residentially integrated with the majority population, may deliver beneficial forms of social capital and information that make utilization of prenatal care more likely. Positive effects of enclave residence on perinatal health in the population of Mexican origin have been observed elsewhere (Peak & Weeks, 2002). In addition, neighborhoods where immigrants concentrate may also contain a relative abundance of services that cater to their needs,

creating a proximity and acceptability that facilitates awareness and ease of access. Clearly, residential context matters for this form of healthcare seeking behavior, but the relationship is complex and varied across the state's racial-ethnic and immigrant groups.

Conclusion

The current study contributes to our understanding of disparities across racial-ethnic and immigrant groups in health care access, in particular utilization of prenatal care among expectant mothers in the new immigrant destination of Utah. The unique UPDB data and study methodology permit us to overcome challenges of identifying and sampling undocumented persons, obstacles that have hindered social and biomedical researchers from adequately understanding heterogeneity in health-related outcomes within a growing and increasingly diverse immigrant population. Our results partially confirm previous studies indicating that health care access among Hispanics is stratified along lines of immigrant legal status, with the undocumented particularly vulnerable to low levels of prenatal care utilization (Berk et al., 2000). The current results add a more nuanced understanding on the role of documentation status in shaping healthcare utilization by immigrants, the undocumented in particular. Disaggregating immigrants by documentation status, and isolating a group of undocumented mothers who have availed themselves of a policy that fosters integration into local institutions, we find that the undocumented who possess a driver privilege card resemble their documented counterparts in adequacy of prenatal care utilization. Given this, and the finding that Hispanic immigrants lacking any sort of state identification have the poorest prenatal care outcomes, we come to the conclusion that the marginalization of undocumented immigrants vis-à-vis health care may be mitigated by a policy promoting integration. The intent of the driver privilege program for unauthorized immigrants, implemented by the Utah state legislature in 1999, was to enhance insurance coverage among state drivers. However, we discover initial signs that provision of such an identity document to undocumented persons appears to be associated with wider forms of local integration, especially with respect to healthcare institutions. We interpret this association cautiously, however, noting that particular immigrant women may be inclined toward utilizing both healthcare resources and state-provided driver privilege programs. Further research on the driver privilege and other integrative programs, especially regarding the motivations and consequences of exercising such privileges, can shed greater light on the nature of the relationship between integrative policy and healthcare access.

Besides mothers' immigration status and ethnicity, our analyses reveal that one of the most salient correlates of low prenatal care utilization is maternal smoking during pregnancy. A supplemental analysis indicates a strong association between poor prenatal care utilization and maternal smoking (and maternal drinking) among US born, non-Hispanic white women. However, in Hispanic immigrant women, this clustering of health risk behaviors is not observed. Rather, the least assimilated, i.e., those lacking legal documentation and likely limited in social integration in other ways, are least likely to obtain adequate levels of prenatal care and most likely to abstain from smoking during pregnancy. This pattern of results, relevant for policy-making, suggests the importance of undertaking efforts that maintain healthy lifestyles associated with origin cultures, as seen in low tobacco use, while at the same time encouraging integration into mainstream healthcare institutions and use of

preventive services among less acculturated newcomers (Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005).

Further documenting healthcare disparities by race-ethnicity and nativity is critical to understanding challenges for policymakers and potential threats to public health at the national level and in states with growing segments of noncitizens. While the current study provides unique insights into the role of immigrant legal status as it structures healthcare utilization, relying upon birth certificate data prohibits consideration of other elements relevant to healthcare utilization. Specifically, administrative record keeping in the UPDB does not delineate detailed national origin categories, nor does it provide information on immigrants' duration of US residence. This is a shortcoming of the current research, as each of these factors has been shown to contribute to heterogeneous health status outcomes observed among US born and immigrant Latinos (Lara et al., 2005).

Previous research suggests that policies which exclude undocumented persons from government funded health care programs are unlikely to deter immigration, nor alter intentions to remain in the US (Berk et al., 2000:60). However, denial of services, such as prenatal care, to noncitizen mothers of citizen children, while unlikely to alter birthrates, are likely to heighten the number of mothers and children at risk of poor health outcomes during pregnancy, infancy and early childhood (Berk et al., 2000; Lu et al., 2000). As births to foreign born women rise to unprecedented levels in emerging immigrant gateways like Utah, and as the estimated proportion of undocumented among immigrants in Utah approaches 50 percent (Passel, 2005), it becomes clear that the health of these populations and their children will have a significant bearing on public health, in the aggregate, and future challenges to healthcare provision. Our findings suggest that a mixture of incorporation into mainstream institutions, as facilitated by an integrative policy like the driver privilege program, combined with reinforcement of migrant community ties, like those found in immigrant enclaves, results in a beneficial orientation to healthcare utilization among noncitizens, in particular undocumented immigrants and their children.

Acknowledgement

This research was supported by a grant from the Russell Sage Foundation. We also wish to thank the Huntsman Cancer Foundation for database support provided to the Pedigree and Population Resource of the Huntsman Cancer Institute, University of Utah. We thank Dr. Geraldine P. Mineau and Alison Fraser at the Pedigree and Population Resource of the Huntsman Cancer Institute and as well as the DIGIT lab in the Department of Geography at the University of Utah for facilitating the data linkage that allowed us to undertake this study.

References

- Berk M, & Schur C (2001). The effect of fear on access to care among undocumented Latino immigrants. *Journal of Immigrant Health*, 3, 151–156. [PubMed: 16228780]
- Berk M, Schur C, Chavez L, & Frankel M (2000). Health care use among undocumented Latino immigrants. *Health Affairs*, 19(4), 51–64. [PubMed: 10916960]
- Bollini P, Pampallona S, Wanner P, & Kupelnick B (2009). Pregnancy outcome of migrant women and integration policy: a systematic review of the international literature. *Social Science & Medicine*, 69, 452–461.
- Brener N, Billy J, & Grady W (2003). Assessment of factors affecting the validity of self-reported health-risk behavior among adolescents: evidence from the scientific literature. *Journal of Adolescent Health*, 33, 436–457. [PubMed: 14642706]

- Chavez L (1998). *Shadowed lives: Undocumented immigrants in American Society*. United States: Wadsworth Thomson Learning.
- Derosé K, Escarce J, & Lurie N (2007). Immigrants and health care: sources of vulnerability. *Health Affairs*, 26(5), 1258–1268. [PubMed: 17848435]
- Do D, & Finch B (2008). The link between neighborhood poverty and health: context or composition? *American Journal of Epidemiology*, 168, 611–619. [PubMed: 18687664]
- Echevarria S, & Frisbie W (2001). Race/ethnic-specific variation in adequacy of prenatal care utilization. *Social Forces*, 80, 633–654.
- Eschbach K, Ostir G, Patel V, Markides K, & Goodwin J (2004). Neighborhood context and mortality among older Mexican Americans: is there a barrio advantage? *American Journal of Public Health*, 94, 1807–1812. [PubMed: 15451754]
- Frisbie W, Echevarria S, & Hummer R (2001). Prenatal care utilization among non-Hispanic whites, African Americans, and Mexican Americans. *Maternal and Child Health Journal*, 5, 21–33. [PubMed: 11341717]
- Gagnon A, Zimbeck M, Zeitlin J, & the ROAM Coalition. (2009). Migration to western industrialized countries and perinatal health: a systematic review. *Social Science & Medicine*, 69, 934–946. [PubMed: 19664869]
- Healy A, Malone F, Sullivan L, Porter T, Luthy D, Comstock C, et al. (2006). Early access to prenatal care: implications for racial disparity in perinatal mortality. *Obstetrics and Gynecology*, 107(3), 625–632. [PubMed: 16507934]
- Holmes S (2006). An ethnographic study of the social context of migrant health in the United States. *PLoS Medicine*, 3, 1776–1793.
- Kalofonos I, & Palinkas L (1999). Barriers to prenatal care for Mexican and Mexican American women. *Journal of Gender, Culture and Health*, 4, 135–152.
- Kelahr M, & Jessop D (2002). Differences in low-birthweight among documented and undocumented foreign-born and U.S.-born Latinas. *Social Science & Medicine*, 55, 2171–2175. [PubMed: 12409130]
- Klebanoff M, Levine R, Morris C, Hauth J, Sibai B, Curetevine B, et al. (2001). Accuracy of self-reported cigarette smoking among pregnant women in the 1990s. *Paediatric and Perinatal Epidemiology*, 15, 140–143. [PubMed: 11383579]
- Kotelchuck M (1994). An evaluation of the Kessner adequacy of prenatal care index and a proposed adequacy of prenatal care utilization index. *American Journal of Public Health*, 84, 1414–1420. [PubMed: 8092364]
- Krieger N, Chen J, Waterman P, Soobader M, Subramanian S, & Carson R (2003). Choosing area based socioeconomic measures to monitor social inequalities in low birth weight and childhood lead poisoning: the public health disparities geocoding project. *Journal of Epidemiology and Community Health*, 57, 186–199. [PubMed: 12594195]
- Lara M, Gamboa C, Kahramanian M, Morales L, & Bautista D (2005). Acculturation and Latino health in the United States: a review of the literature and its sociopolitical context. *Annual Review of Public Health*, 26, 367–397.
- Lu M, Lin Y, Prietto N, & Garite T (2000). Elimination of public funding of prenatal care for undocumented immigrants in California: a cost/benefit analysis. *American Journal of Obstetrics and Gynecology*, 182, 233–239. [PubMed: 10649184]
- Marshall K, Urrutia-Rojas X, Soto Mas F, & Coggin C (2005). Health status and access to health care of documented and undocumented immigrant Latino women. *Health Care for Women International*, 26, 916–936. [PubMed: 16263663]
- Martin J, Hamilton B, Sutton P, Ventura S, Menacker F, Kirmeyer S, et al. (2009). Births: Final data for 2006. *National Vital Statistics Reports* 57, 7 Centers for Disease Control and Prevention.
- Meikle S, Orleans M, Leff M, Shain R, & Gibbs R (1995). Women's reasons for not seeking prenatal care: racial and ethnic factors. *Birth - Issues in Prenatal Care*, 22, 81–86.
- Ortega A, Fang H, Perez V, Rizzo J, Carter-Pokras O, Wallace S, et al. (2007). Health care access, use of services, and experiences among undocumented Mexicans and other Latinos. *Archives of Internal Medicine*, 167, 2354–2360. [PubMed: 18039995]

- Osypuk T, Bates L, & Acevedo-Garcia D (2009). Another Mexican birthweight paradox? The role of residential enclaves and neighborhood poverty in the birthweight of Mexican-origin immigrants. *Social Science & Medicine*, 70, 1–11. [PubMed: 19931960]
- Passel J (2005). Estimates of the size and characteristics of the undocumented population Pew Hispanic Center Report, 3 21, 2005 Washington, DC: Pew Hispanic Center.
- Passel J, & Cohn D (2009). A portrait of unauthorized immigrants in the United States Pew Hispanic Center Report, 4 14, 2009 Washington, D.C.: Pew Hispanic Center.
- Peak C, & Weeks J (2002). Does community context influence reproductive outcomes of Mexican origin women in San Diego, California? *Journal of Immigrant Health*, 4, 125–136. [PubMed: 16228756]
- Portes A, & Rumbaut R (2006). *Immigrant America: A portrait*. Berkeley, CA: University of California Press.
- Saenz R (2006). Latino births increase in nontraditional destination states. Population Reference Bureau website. URL: <http://www.prb.org/Articles/2006/LatinoBirthsIncreaseinNontraditionalDestinationStates.aspx> (accessed 22.12.09).
- Shiono P, & Behrman R (1995). Low birth weight: analysis and recommendations. *The Future of Children*, 5, 4–18. [PubMed: 7633867]
- Singer A (2004). *The rise of new immigrant gateways*. Washington, D.C.: The Brookings Institution.
- Smith K, & Waitzman N (1997). Effects of marital status on the risk of mortality in poor and non-poor neighborhoods. *Annals of Epidemiology*, 7, 343–349. [PubMed: 9250629]
- Stewart J, & Jameson K (2010). Driving in a new destination: Migrant rights and state-level policy In Maloney T, & Korinek K (Eds.), *Migration in the twenty-first century: Rights, outcomes, and policy*. New York: Routledge.
- Thamer M, Richard A, Casebeer W, & Ray N (1997). Health insurance coverage among foreign-born U.S. residents: the impact of race, ethnicity and length of residence. *American Journal of Public Health*, 87, 96–102. [PubMed: 9065235]
- Thompson M, Curry M, & Burton D (1998). The effects of nursing case management on the utilization of prenatal care by Mexican-Americans in rural Oregon. *Public Health Nursing*, 15, 82–90. [PubMed: 9564212]
- Waitzman N, & Smith K (1998). Phantom of the area: poverty residence and mortality in the U.S. *American Journal of Public Health*, 88, 973–976. [PubMed: 9618634]
- Warner F (1991). Pacific Islanders find Utah isn't land of opportunity. *Seattle Times*, 6 2, 1991.
- Wasserman M, Bender D, & Lee S (2007). Use of preventive maternal and child health services by Latina women: a review of published intervention studies. *Medical Care Research and Review* 64, 10, 4–45. [PubMed: 17213456]
- Wills T, & Cleary S (1997). The validity of self-reports of smoking: analyses by race/ethnicity in a school sample of urban adolescents. *American Journal of Public Health*, 87, 56–61. [PubMed: 9065227]
- Wolff H, Stalder H, Epiney M, Walder A, Irion O, & Morabia A (2005). Health care and illegality: a survey of undocumented pregnant immigrants in Geneva. *Social Science & Medicine*, 60, 2149–2154. [PubMed: 15743662]
- Wylie J, & Mineau G (2003). Biomedical databases: protecting privacy and promoting research. *Trends in Biotechnology*, 21(3), 113–116. [PubMed: 12628367]
- York R, Grant C, Tulman L, Rothman R, Chalk L, & Perlman D (1999). The impact of personal problems on accessing prenatal care in low-income urban African American women. *Journal of Perinatology*, 19, 53–60. [PubMed: 10685203]

Table 1

Descriptive statistics, live singleton births, Utah, 2000–2007.

	All births, 2000–07 %	All births, 2000–07 (n)	Births to Mothers w Inadequate Use of PNC, 2000– 07 %	Births to Mothers w Inadequate Use of PNC, 2000–07 (n)
First Prenatal Visit: First Trimester	80.1	314,022	15.6	3,756
First Prenatal Visit: Second Trimester	15.8	61,874	16.5	3,963
First Prenatal Visit: Third Trimester	4.2	16,336	67.9	16,336
Use of Prenatal Care: Adequate	93.9	368,177	0.0	0
Use of Prenatal Care: Inadequate	6.1	24,055	100.0	24,055
Normal or Above Normal Birth Weight	95.0	372,412	92.1	22,133
Low Birth Weight	5.0	19,746	7.9	1,903
US Born, Non-Hispanic White	80.0	313,868	60.7	14,605
US Born, Hispanic	4.6	18,063	3.7	2,086
Foreign-born Hispanic with Regular DL	3.3	13,008	4.7	1,140
Foreign-born, Hispanic, with no DL/DPC	2.4	9,524	7.3	1,751
Foreign-born, Hispanic, with DPC	4.0	15,636	8.0	1,925
Foreign-born, Non Hispanic with Regular DL	4.5	17,586	7.1	1,700
US Born, Non Hispanic Black	0.2	739	0.9	219
US Born, Non Hispanic, American Indian/Alaska Native	0.4	1,535	1.1	263
US Born, Non Hispanic, Asian/Pacific Islander	0.4	1,415	0.8	202
Foreign-born, Non Hispanic w DPC	0.2	620	0.4	94
Mother's Age at Birth: 19	7.1	27,673	13.9	3,346
Mother's Age at Birth: 20–34	86.3	338,332	79.6	19,152
Mother's Age at Birth: 35 & Older	6.7	26,203	6.5	1,550
Previous Live Births: Zero	34.7	136,211	31.1	7,473
Previous Live Births: One	29.0	113,755	27.0	6,496
Previous Live Births: Two or more	36.3	142,266	41.9	10,086
Number of Previous Stillbirths/Terminations: Zero	75.7	295,739	77.8	18,525
Number of Previous Stillbirths/Terminations: One or more	24.3	94,932	22.2	5,274
Drinking During Pregnancy - None	98.2	385,016	95.8	23,049
Drinking During Pregnancy - Some reported	1.0	4,098	2.4	578
Drinking During Pregnancy - Missing/unknown	0.8	3,118	1.8	428
Smoking During Pregnancy - None	92.7	363,427	82.1	19,758
Smoking During Pregnancy - Some reported	6.6	25,893	16.2	3,897
Smoking During Pregnancy - Missing/unknown	0.7	2,912	1.7	400
Weight Prior to Pregnancy - Underweight	6.1	23,160	7.9	1,752
Weight Prior to Pregnancy - Healthy Weight	58.3	221,548	56.5	12,611
Weight Prior to Pregnancy - Overweight	21.0	79,755	20.9	4,663
Weight Prior to Pregnancy - Obese	14.6	55,277	14.8	3,305
Mother's Marital Status at Time of Birth - Married	82.3	322,602	42.5	10,214
Mother's Marital Status at Time of Birth - Not Married	17.8	69,630	57.5	13,841

	All births, 2000–07 %	All births, 2000–07 (n)	Births to Mothers w Inadequate Use of PNC, 2000– 07 %	Births to Mothers w Inadequate Use of PNC, 2000–07 (n)
Mother's Educational Attainment - 0–9 years	6.2	24,398	15.0	3,606
Mother's Educational Attainment - 10–12 years	38.8	152,056	50.1	12,039
Mother's Educational Attainment –13–16 years	45.4	178,182	27.7	6,651
Mother's Educational Attainment - Greater than 16 years	8.0	31,205	4.2	1,020
Mother's Educational Attainment - Missing Information	1.6	6,391	3.1	739
Mother's Labor Force Status Prior to Birth - Employed	57.9	227,142	49.3	11,868
Mother's Labor Force Status Prior to Birth - Student	2.8	11,089	3.7	894
Mother's Labor Force Status Prior to Birth - Homemaker	39.2	153,867	46.9	11,270
% of hhs in block group Spanish speaking linguistically isolated	2.0	372,316	3.2	21,447
% of persons in block group that are foreign born	7.6	372,781	10.8	21,477
% of persons in block group below poverty threshold	9.3	372,316	11.6	21,447

Source: Utah Population Database.

Table 2

Logistic regression analysis: predictors of inadequate use of prenatal care among mothers in Utah, 2000–2007.

	Model A –Maternal Demographic Characteristics	Model B – Maternal Demographic & Health Risk Characteristics	Model C - Maternal & Paternal Characteristics	Model D-Parental & Neighborhood Characteristics	Model E - Parental & Neighborhood Characteristics - Main & Interaction Effects
	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]
Mother - US Born, Non-Hispanic White (omitted)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)
Mother - US Born, Hispanic	1.65 *** (0.05)	1.77 *** (0.05)	1.53 *** (0.05)	1.48 *** (0.05)	1.50 *** (0.07)
Mother - US Born, Non Hispanic Black	3.22 *** (0.34)	3.23 *** (0.35)	2.80 *** (0.31)	1.91 *** (0.26)	2.75 *** (0.53)
Mother - US Born, Non Hispanic American Indian	2.14 *** (0.16)	2.33 *** (0.17)	2.23 *** (0.17)	2.17 *** (0.18)	2.10 *** (0.24)
Mother - US Born, Non Hispanic, Asian/Pacific Islander	3.04 *** (0.26)	3.13 *** (0.27)	2.74 *** (0.24)	2.74 *** (0.25)	2.24 *** (0.31)
Mother - Foreign-born, Non Hispanic	2.40 *** (0.07)	2.52 *** (0.07)	2.03 *** (0.07)	2.00 *** (0.07)	1.90 *** (0.09)
Mother - Foreign-born Hispanic with Regular DL	1.50 *** (0.05)	1.73 *** (0.06)	1.38 *** (0.06)	1.35 *** (0.06)	1.63 *** (0.10)
Mother - Foreign-born, Hispanic, with DPC	1.49 *** (0.05)	1.80 *** (0.06)	1.45 *** (0.06)	1.40 *** (0.06)	1.95 *** (0.11)
Mother - Foreign-born, Hispanic, with no DL/DPC	2.58 *** (0.10)	3.09 *** (0.12)	2.47 *** (0.10)	2.34 *** (0.11)	3.72 *** (0.22)
Mother's Age at Birth: 19	1.19 *** (0.03)	1.22 *** (0.03)	1.17 *** (0.03)	1.18 *** (0.03)	1.19 *** (0.03)
Mother's Age at Birth: 20–34 (omitted)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)	0.99 (0.03)
Mother's Age at Birth: 35 & Older	1.01 (0.03)	1.01 (0.03)	1.00 (0.03)	0.99 (0.03)	0.99 (0.03)
Previous Live Births: Zero	0.62 ** (0.01)	0.63 *** (0.01)	0.64 *** (0.01)	0.66 *** (0.01)	0.66 *** (0.01)
Previous Live Births: One	0.74 ** (0.01)	0.74 *** (0.01)	0.75 *** (0.01)	0.76 *** (0.01)	0.75 *** (0.01)
Previous Live Births: Two or more (omitted)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)
Number of Previous Stillbirths/Terminations: Zero (omitted)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)
Number of Previous Stillbirths/Terminations: One or more	0.85 ** (0.02)	0.83 *** (0.01)	0.83 ** (0.01)	0.83 *** (0.02)	0.83 *** (0.02)
Mother's Marital Status at Birth - Not Married (omitted: Married)	2.77 ** (0.05)	2.41 *** (0.05)	1.54 *** (0.04)	1.47 *** (0.04)	1.47 *** (0.04)

	Model A – Maternal Demographic Characteristics	Model B – Maternal Demographic & Health Risk Characteristics	Model C - Maternal & Paternal Characteristics	Model D-Parental & Neighborhood Characteristics	Model E - Parental & Neighborhood Characteristics - Main & Interaction Effects
	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]
Mother's Educational Attainment - 0-9 years	1.69*** (0.05)	1.54*** (0.05)	1.23*** (0.04)	1.18*** (0.04)	1.18*** (0.04)
Mother's Educational Attainment - 10-12 years	1.46*** (0.05)	1.34*** (0.03)	1.15*** (0.02)	1.15*** (0.03)	1.15*** (0.03)
Mother's Educational Attainment - 13-16 years (omitted)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)
Mother's Educational Attainment - Greater than 16 years	0.95 (0.03)	0.95 (0.03)	0.97 (0.04)	0.96 (0.04)	0.97 (0.04)
Mother's Educational Attainment - Missing Information	2.02** (0.09)	1.60*** (0.09)	1.26*** (0.08)	1.27*** (0.08)	1.25*** (0.03)
Mother's Labor Force Status Prior to Birth - Employed (omitted)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)
Mother's Labor Force Status Prior to Birth - Student	1.28** (0.05)	1.31*** (0.05)	1.24*** (0.05)	1.19*** (0.05)	1.18*** (0.05)
Mother's Labor Force Status Prior to Birth - Homemaker	1.31** (0.02)	1.32*** (0.02)	1.36*** (0.02)	1.37*** (0.02)	1.37*** (0.02)
Mother's Labor Force Status Prior to Birth - Missing Information	1.71 (0.47)	1.65 (0.45)	1.63 (0.46)	1.74 (0.51)	1.70 (0.50)
Year of Birth: 2000 (omitted: 2007)	1.78** (0.05)	1.75*** (0.05)	1.74*** (0.05)	1.74*** (0.05)	1.76*** (0.05)
Year of Birth: 2001 (omitted: 2007)	1.72** (0.05)	1.70*** (0.05)	1.68*** (0.05)	1.71*** (0.05)	1.72*** (0.05)
Year of Birth: 2002 (omitted: 2007)	1.63** (0.05)	1.61*** (0.05)	1.60*** (0.05)	1.60*** (0.05)	1.62*** (0.05)
Year of Birth: 2003 (omitted: 2007)	1.29** (0.04)	1.27*** (0.04)	1.25*** (0.04)	1.23*** (0.04)	1.24*** (0.04)
Year of Birth: 2004 (omitted: 2007)	1.31** (0.04)	1.30*** (0.04)	1.25*** (0.04)	1.25*** (0.04)	1.26*** (0.04)
Year of Birth: 2005 (omitted: 2007)	1.13** (0.03)	1.17*** (0.03)	1.14*** (0.03)	1.13*** (0.03)	1.14*** (0.03)
Year of Birth: 2006 (omitted: 2007)	0.99 (0.03)	0.99 (0.03)	0.97 (0.03)	0.98 (0.03)	0.98 (0.03)
Smoking During Pregnancy: None (omitted)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)
Smoking During Pregnancy: Some reported	1.98*** (0.05)	1.98*** (0.05)	1.84*** (0.05)	1.81*** (0.05)	1.79*** (0.05)
Smoking During Pregnancy: Missing/Unknown	1.27 (0.25)	1.27 (0.25)	1.16(0.23)	0.96 (0.19)	0.97 (0.20)
Alcohol During Pregnancy: None (omitted)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)	1.00 (.00)

	Model A - Maternal Demographic Characteristics	Model B - Maternal Demographic & Health Risk Characteristics	Model C - Maternal & Paternal Characteristics	Model D-Parental & Neighborhood Characteristics	Model E - Parental & Neighborhood Characteristics - Main & Interaction Effects
	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]
Alcohol During Pregnancy: Some reported		1.54 ^{***} (0.08)	1.46 ^{***} (0.08)	1.37 ^{***} (0.08)	1.37 ^{***} (0.08)
Alcohol During Pregnancy: Missing/Unknown		1.41 (0.27)	1.32 (0.25)	1.60 [*] (0.30)	1.59 [*] (0.30)
Father's Educational Attainment - 0-9 years			1.33 ^{***} (0.05)	1.29 ^{***} (0.05)	1.30 ^{***} (0.05)
Father's Educational Attainment - 10-12 years			1.26 ^{***} (0.03)	1.24 ^{***} (0.03)	1.24 ^{***} (0.03)
Father's Educational Attainment - 13-16 years (omitted)			1.00 (.00)	1.00 (.00)	1.00 (.00)
Father's Educational Attainment - Greater than 16 years			0.98 (0.03)	0.98 (0.03)	0.99 (0.03)
Father's Educational Attainment - Missing Information			1.23 ^{***} (0.07)	1.18 ^{**} (0.08)	1.17 [*] (0.07)
Father - US Born, Non-Hispanic			1.00 (.00)	1.00 (.00)	1.00 (.00)
Father - Foreign Born, Hispanic			1.45 ^{***} (0.05)	1.39 ^{***} (0.05)	1.35 ^{***} (0.05)
Father - US Born, Hispanic			1.34 ^{***} (0.05)	1.29 ^{***} (0.05)	1.26 ^{***} (0.05)
Father - Foreign Born, Non-Hispanic			1.76 ^{***} (0.06)	1.69 ^{***} (0.06)	1.62 ^{***} (0.06)
Father - US Born, Ethnicity Unknown			1.65 ^{***} (0.12)	1.57 ^{***} (0.12)	1.56 ^{***} (0.12)
Father - Nativity and Ethnicity Unknown			2.78 ^{***} (0.17)	2.66 ^{***} (0.17)	2.63 ^{***} (0.17)
% of persons below poverty threshold		-	-	2.01 ^{***} (0.17)	1.99 ^{***} (0.17)
% of persons that are foreign born		-	-	2.28 ^{***} (0.21)	5.33 ^{***} (0.69)
US Born, Non-Hispanic White [*] Pct Block Group that is Foreign Born (omitted)					1.00 (0.00)
US Born, Hispanic [*] Pct Block Group that is Foreign Born					0.66 (0.17)
US Born, Non-Hispanic Black [*] Pct Block Group that is Foreign Born					0.05 ^{**} (0.06)
US Born, Non-Hispanic American Indian [*] Pct Block Group that is Foreign Born					1.09 (0.76)

	Model A – Maternal Demographic Characteristics	Model B – Maternal Demographic & Health Risk Characteristics	Model C - Maternal & Paternal Characteristics	Model D-Parental & Neighborhood Characteristics	Model E - Parental & Neighborhood Characteristics - Main & Interaction Effects
	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]	Odds Ratio/[Robust SE]
US Born, Non-Hispanic Asian/Pacific Islander * Pct Block Group that is Foreign Born					3.29 (2.52)
Foreign Born, Non-Hispanic * Pct Block Group that is Foreign Born					1.17 (0.32)
Foreign Born, Hispanic, with DL * Pct Block Group that is Foreign Born					0.19 *** (0.06)
Foreign Born, Hispanic, with DPC * Pct Block Group that is Foreign Born					0.10 *** (0.03)
Foreign Born, Hispanic, no DL or DPC * Pct Block Group that is Foreign Born					0.04 *** (0.01)
Observations	387, 864	387,864	386,364	367,822	367,822
Pseudo R2	0.076	0.083	0.093	0.089	0.091
Log Pseudolikelihood	-79782.62	-79269.29	-77651.83	-71756.21	-71634.29

* significant at .05;

** significant at .01;

*** significant at .001.

Source: Utah Population Database.