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Immigrant Latino Neighborhoods and Mortality among Infants Born to Mexican-Origin Latina Women

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Abstract

Objectives—To compare the association between neighborhood Latino immigrant concentration and infant mortality by maternal nativity among singleton births to Mexican-origin women in Los Angeles County.

Methods—Information about births, infant deaths, and infant and maternal characteristics were obtained from geocoded Los Angeles County vital statistics records (2002–2005). Linked data on neighborhood characteristics (census tracts) were obtained from the 2000 Census. Logistic regression models were used to predict infant mortality while accounting for spatial clustering by census tract.

Results—Two-thirds of births to Mexican-origin mothers were to foreign-born women. Foreign-born mothers were older, had less education, and were more likely to have delivery costs paid by Medicaid than US-born mothers. Infants born to foreign-born women had a lower infant mortality rates than infants born to US-born women (3.8/1000 live births vs. 4.6, p=.002)). Among infants of foreign-born mothers, the odds of infant mortality increased with increasing immigrant concentration (OR: 1.29; 95%CI: 1.01–1.66). There was a similar pattern of association between immigrant concentration and mortality for infants of US-born mothers (OR: 1.29; 95% CI: 0.99–1.67).

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Conclusions—In Los Angeles County, the odds of infant mortality among foreign-born Mexican-origin Latina were higher in higher-density immigrant neighborhoods, with a similar trend among US-born mothers. Thus, living in immigrant enclaves likely does not help to explain the lower than expected infant mortality rate among infants born to Latina women. Instead, higher neighborhood Latino immigrant concentration may indicate a neighborhood with characteristics that negatively impact maternal and infant health for Latinos.

INTRODUCTION

One-quarter of all childbearing women in the United States (US) are Latina, and half of childbearing women in California and Texas are Latina.(1,2) Latino infants have better than expected birthweight distribution and infant mortality, based on their relatively low socioeconomic status (SES).(3–6) Analysis of Latino subgroups is necessary to understand this “epidemiologic paradox” because there are differences in birth outcomes based on country of origin, maternal birthplace, and acculturation.(3–6) Since the share of births to Latina women is projected to increase, Latino subgroup differences in birth outcomes have important implications for US infant health metrics.(7)

Maternal nativity is a particularly important stratifying characteristic; foreign-born Latina women, who often have low SES, are less likely to smoke or drink alcohol during pregnancy, or have a comorbid chronic medical condition. Latina women also experience fewer complications of labor and delivery than White or Black women and have lower rates of low birthweight compared with Black women. (3,5,8,9) These factors partially account for the “paradoxical” birth outcomes among Latinos.(4,10–13) These differences in maternal characteristics and resultant birth outcomes are often attributed to traditional Latino culture. (3,14,15) The hypothesized protective effect of Latino culture is supported by research findings demonstrating that foreign-birth and lower acculturation to US cultural norms among Latina women are associated with positive health behaviors, such avoidance of tobacco and alcohol, and a cultural orientation prioritizing family relationships.(5,6,14–18) These individual-level characteristics, however, do not fully explain the paradoxical birth outcomes among foreign-born Latina women.

Neighborhood context may also shape the cultural environment through normative beliefs and behaviors, group interactions that result in the availability of culturally-specific goods and resources, and social networks which maintain traditional Latino cultural norms.(19) This cultural context may affect birth outcomes, beyond the effects of individual level factors such as maternal foreign-birth. Areas of high Latino immigrant density may represent a local culture more aligned with Latino, rather than US, cultural norms, and thus may contribute to unexpectedly favorable birth outcomes among Latinos. In fact, several studies have demonstrated reduced odds of infant mortality and low-birth weight among infants born to Latina mothers in areas of higher Latino density.(12,20–22) Prior studies examining the association of Latino density and infant mortality have utilized measures of Latino density based on the county or metropolitan area of residence, as have some studies of birthweight.(12,20,21,23) However, contextual exposures defined by attributes of the county or metropolitan statistical area may not capture the interactions and resource availability at the neighborhood-level, which may be more important and relevant for

individual health and health behaviors.(24) To date, research on neighborhood-level contextual effects of Latino and immigrant density using infant birthweight as an outcome and census tracts or block groups as measures of neighborhood context have demonstrated no clear pattern of associations.(22,25–27) Lack of consistent findings by maternal nativity or Latino density underscore the complexity underlying the population-level findings of the epidemiologic paradox.

Improving our understanding of neighborhood contextual effects on infant health outcomes may be especially salient for local policy and programming. One significant gap in smaller-area contextual research on birth outcomes for Latinos is the paucity of information about neighborhood context and infant mortality. To our knowledge, the relationship between smaller-area contextual effects and infant mortality among infants born to Latina mothers has not been examined. Our analysis was guided by a social-ecological model to reflect the theoretical perspective that infant health is determined demographic, economic, social, and behavioral factors that operate at multiple levels, including the individual, family, and neighborhood levels.(28,29) The focus of our analysis is on the role of neighborhood factors. Additionally, in this study we concentrate on Latina mothers of Mexican-origin because they are the largest US Latino subgroup.(30) Our study setting is Los Angeles County, which has the largest Latino population of any US city and it alone accounts for 9% of the total US Latino population.(31) We examine the association between infant mortality and neighborhood Latino immigrant concentration, using census tracts to define neighborhoods. Neighborhood Latino immigrant concentration may be a relevant measure of neighborhood cultural orientation and thereby could be an important factor in accounting for observed differences in birth outcomes between US- and foreign-born Mexican-origin Latina women. Our study addresses unanswered questions about the relationship between exposure to Latino culture in the neighborhood context and infant mortality and may provide additional insights into the epidemiologic paradox.

METHODS

Data Source

We analyzed linked California infant birth and death records for live-born singleton infants born to Mexican-origin woman in Los Angeles County from 2002–2005. We restricted the analyses to infants for whom we were able to assign a census tract, based maternal birth record address or census tract (96% of the eligible births). Ninety percent of eligible births had census tract information already listed on the birth record. To verify the accuracy, we used ArcGIS 9 to perform automated assignment of census tract for a random subsample of the addresses that had census tract information in the birth record.(32) When we compared the recorded census tract with the census tract obtained from ArcGIS, we found 93% concordance. Discordant census tract assignments generally occurred when the mother’s address bordered two census tracts and ArcGIS assigned the address to an adjacent tract due to different programming specifications for assignment of addresses on tract borders. Having verified high accuracy of the birth record census tract assignment, we retained this assignment for the analyses. For birth records with missing tract information, we used the ArcGIS 9 automated geocoding function with the birth record address to assign tracts to

60% of these records. Remaining records had either missing address data or presumed typographical errors in data entry. We attempted to correct spelling and zip code errors for all deaths. We attempted correction for random subset of the remaining records. We chose only a subset of surviving infants for manual address correction tract due to limited resources for hand-coding of cases with address errors.

Measures

The primary outcome was infant death (death of a live born infant prior to the first birthday). All individual measures were based on birth record information except for infant death information, which was obtained from the linked death record. Characteristics of neighborhoods, represented by census tracts, were obtained from the 2000 US Census using measures publicly available from the Los Angeles Family and Neighborhood Survey's Neighborhood Services and Characteristics Database (LA NSC).(33)

Maternal sociodemographic information included maternal age, which was categorized as <18, 18–25, 26–34, and ≥35 years. Maternal education was categorized as <9, 9–11, 12, and > 12 years. Insurance payor for delivery was categorized as private, Medicaid, uninsured, and other (e.g. Indian Health Service, Tricare). We did not include marital status because it was not collected during the birth registration process across all years of the study period.

We included several variables from the birth record to characterize the pregnancy and delivery. Prenatal care utilization was classified as inadequate, intermediate, adequate, and adequate plus according to Kotelchuck's Adequacy of Prenatal Care Utilization Index.(34) The number of prior live births was categorized as 0, 1–3, and >3. We identified women as having a previous adverse pregnancy outcome if the birth record listed prior history of a premature or low birthweight infant. Dichotomous variables for the presence of tobacco use, diabetes, or anemia were created from pregnancy complication codes listed on the birth record. We classified women as having other medical complications if at least one of the following was listed among the pregnancy complications: cardiac disease, chronic hypertension, or renal disease. Similarly, we classified women as having a labor/delivery complication if at least one of the following complications was listed: abnormal presentation, placental abruption, amnionitis and sepsis, cord prolapse, fever, labor eclampsia, placenta previa, precipitous labor, or preeclampsia during labor.

Infant characteristics included birthweight, gestational age, and sex. Birthweight was analyzed as a continuous variable. Gestational age categories were: very preterm (< 28 weeks), moderately preterm (28–33 weeks), late preterm (34–36 weeks), term (37–41 weeks), and postterm (≥42 weeks).

The main variable of interest was neighborhood Latino immigrant concentration score, which is a scaled variable from the LA NSC that was constructed using factor analysis and includes the proportion of foreign-born residents, non-citizens, immigrants, Spanish-speaking adults, and Latinos in the census tract (Cronbach's alpha: 0.89). Other scaled neighborhood measures from the LA NSC included residential stability score (constructed using the proportion of: dwellings in multi-unit housing, housing that is owner-occupied, households occupying the same dwelling in 1995 and 2000, and non-family households in

the census tract) and neighborhood diversity score (constructed by calculating one minus the sum of the squared percentages of each racial/ethnic group within the census tract). We characterized neighborhood income using census tract median household income.

Statistical Analyses

The Pearson χ^2 statistic was used to test the statistical significance of differences in proportions for categorical maternal and infant characteristics by nativity among Mexican-origin mothers. Differences in means (birthweight, neighborhood characteristics) were assessed using a two sample t-test. The two-sample Kolmogorov-Smirnov test for equality of distribution functions was used to compare the distributions of neighborhood characteristics between groups. We stratified the logistic regression models by maternal nativity to account for potentially different mechanisms by which individual and neighborhood characteristics impact infant mortality. We included a log transformation of the tract median household income variable to obtain a linear relationship with infant mortality. We improved the model fit by including a quadratic term for immigrant concentration. In the logistic models we employed census tract-specific random effects to account for spatial clustering. For each group, three model specifications were used. The first model included maternal SES factors (education and delivery payor); the second model included SES factors and neighborhood characteristics, and the third model included SES factors, neighborhood characteristics and all remaining maternal and infant covariates. Based on the logistic regression models, we constructed model-based probabilities for infant mortality at varying levels of neighborhood immigrant concentration by nativity group. All maternal, infant, and neighborhood characteristics were held at their mean value for each nativity group when determining the predicated infant mortality rate. Finally, we employed the following procedures to manage missing data: 1) We used an algorithm by Kotelchuck that estimates gestational age using infant sex and birthweight to assign gestational age for birth records missing this information (6.7%);(34,35) 2) Missing information on maternal education (1.4%) was imputed using the mode of educational attainment for each age category within each race/ethnicity/nativity group; and 3) We excluded 0.16% of records that were missing data for any of the other covariates. Sample summary statistics were calculated using non-imputed values; the regression analyses used imputed data. All analyses were performed using Stata version 12.1 (StataCorp LP, College Station, TX). This research was approved by the California Health and Human Services Agency Committee for the Protection of Human Subjects and the University of Michigan and Johns Hopkins Medicine Institutional Review Boards.

RESULTS

Our analyses were based on 289,464 singleton births to Mexican-origin Latina women. Two-thirds of births were to foreign-born mothers (Table 1). Foreign-born mothers had births at older ages than US-born mothers and had significantly less educational attainment. Nearly three-quarters of US-born mothers had completed high school or more education (71.4%), but only 37% of foreign-born women had at least a high school education. Births to foreign-born women were much more likely to have Medicaid listed as the payor for delivery than births to US-born women (79.5% vs. 50.8%, respectively; $p < .001$). There

were no substantive differences between births to US- and foreign-born Mexican-origin mothers in prenatal care utilization, mean birthweight, or the distribution of births by gestational age. The infant mortality rate was higher among births to US-born women than among births to foreign-born women (4.6/1000 live births vs. 3.8, respectively; p=.002)). There were also differences in the distribution of timing of death. Among infant of US-born mothers who died during the first year 53% were classified as a neonatal death, while 67% of infant deaths among foreign-born mothers were in the neonatal period.

In general, the distribution of neighborhood characteristics was similar between US- and foreign-born Mexican-origin mothers (Figure 1). However, foreign-born mothers were more likely to reside in neighborhoods with a higher proportion of immigrants, lower income, and less residential stability.

In the first set of multivariate models that focused on the association of infant death with SES factors, there was no significant association between SES characteristics and infant mortality among births to foreign- or US-born women (Table 2). In the second model, which added neighborhood characteristics to the first model, the odds of infant mortality increased as neighborhood immigrant concentration increased for infants born to both US- and foreign-born women. In the final model, which included the full set of covariates, immigrant concentration remained associated with increased odds of mortality for infants of foreign-born mothers (OR: 1.29; 95% CI: 1.01–1.66), with a similar trend for infants of US-born mothers (OR: 1.29; 95% CI: 0.99–1.67). For both groups, there was a strong association between very preterm birth and increased infant mortality. There was also an association between late preterm birth and infant mortality among foreign-born women (OR: 1.61; 95%CI: 1.24–2.10). We also completed several additional regression analyses to further explore the relationship between immigrant concentration and infant mortality (results not shown). To assess whether the results varied by infant age at death, we undertook stratified analyses of deaths in the neonatal and post-neonatal periods. The regression results for the neonatal and post-neonatal periods were similar to the findings presented here for deaths among all infants and did not change any of our main substantive results and conclusions, although the confidence intervals were larger as a result of the smaller sample sizes. We were unable to examine models based on causes of infant deaths, due to small sample sizes. We also evaluated for an interaction between maternal nativity and immigrant concentration in a model including both nativity groups and there was no significant interaction.

Finally, we generated model-based probabilities of the risk of infant mortality among births to US- and foreign-born Mexican-origin mothers at varying levels of neighborhood immigrant concentration (Figure 2). For both subgroups of Mexican-origin women we found a pattern of increased rates of infant death as immigrant concentration increased.

DISCUSSION

In this study of Mexican-origin women in Los Angeles County, we found that living in higher-density immigrant Latino neighborhoods was associated with increased odds of infant mortality among infants born to foreign-born women, with a similar association among US-born women, though immigrant concentration did not remain significant after

adjustment for individual-level maternal and infant characteristics. Thus, living in immigrant enclaves likely does not help to explain the lower than expected infant mortality rate among infants born to Latina women. Our finding of higher infant mortality for Latinos at higher levels of neighborhood immigrant concentration stands in contrast to studies examining mortality among Latino infants and where context was defined using large areas, such as a metropolitan statistical areas.(12,20,21) Our study used a substantially smaller contextual area, which may be more reflective of the daily interactions that contribute to maternal and infant health.(36) This study is among the first to examine the relationship between neighborhood immigrant context and infant mortality among Latinos.

Our findings, though distinct from some prior contextual effects research, are not entirely unexpected. The association between high density Latino or immigrant neighborhoods, or enclaves, has been examined for several other health outcomes, and both positive and negative health effects of enclaves have been demonstrated.(19,37–41) Factors common to high density immigrant neighborhoods, such as concentrated poverty, crime, and fewer neighborhood resources, have been shown to negatively affect health and may overshadow positive health effects of immigrant enclaves.(19,37) Unfavorable neighborhood characteristics are thought to result in “unhealthy” or “low opportunity” neighborhoods that have deleterious effects across the lifecourse.(26,42,43) Neighborhood poverty and structural disadvantage have been shown to adversely affect infant health outcomes across racial-ethnic groups.(13,26,27,44,45) We did not find a significant relationship between neighborhood income and infant mortality among Latinos in Los Angeles County, and we performed several different analyses to ensure that our measure of neighborhood income did not result in the lack of association. Sensitivity analyses that replaced neighborhood income with measures of concentrated advantage or disadvantage, did not yield a statistically significant relationship with mortality. Additionally, we found no significant interaction effect between immigrant concentration and neighborhood median income in our infant mortality models. These findings support those of a prior large-area contextual study, which found that the association between infant birthweight among Latinos and immigrant enclaves was more robust than the association with neighborhood poverty.(23)

Prior work has demonstrated that neighborhood structural characteristics, such as neighborhood racial/ethnic composition and poverty, are markers for underlying social processes that that have more direct effects on health outcomes. For example, negative effects of neighborhood poverty on birth outcomes are thought to be mediated through neighborhood social processes such as neighborhood crime, physical disorder, and lack of collective efficacy.(26,27,46–48) However, the relationship between Latino immigrant neighborhoods and associated social processes are poorly characterized. Among previous studies that have found a protective effect of Latino immigrant enclaves on health outcomes and mortality, the effect was attributed, in part, to enhanced social cohesion resulting from the cultural orientation of Latino immigrants. However, several studies have demonstrated that high-density immigrant communities have lower social cohesion compared to less concentrated immigrant areas.(19,37,49) Additionally, at an individual level immigrant Latina women report less social support than US-born Latina women.(50) Increased social support, when characterized at the individual or contextual-level, has been associated with improved birth outcomes.(12,20,51) Latino immigrant concentration itself may or may not

be a proxy for other neighborhood characteristics that influence birth outcomes. Further understanding the role of Latino immigrant enclaves on birth outcomes requires additional study of the type and distribution of neighborhood social processes in high-density Latino immigrant neighborhoods.

Our findings must be interpreted in the context of certain limitations. First we used a composite measure to define neighborhood Latino immigrant concentration. This measure may not be the best way to characterize neighborhood cultural orientation, and the health effects of living in such a neighborhood. Additionally, the high correlation among the different components of this index means that it is difficult to determine which specific aspects of this measure are important for infant mortality. Second, we may not have adequately adjusted for the role of individual economic factors in our models. Family income is not reported on California birth records, so we used California Medicaid (Medi-Cal) payment for delivery as a proxy for low-income status. Delivery coverage denoted on California birth records has been shown to be very reliable. Medi-Cal coverage nearly always reflects a family income at or below 200% of the federal poverty level, though it is not uncommon for women who are income-eligible for MediCal to have private insurance.(13) Misclassification of low-income women due to their eligibility for private insurance coverage would bias our adjustment for individual low-income towards the null. Third, birth record data may include substantial underreporting of maternal and family characteristics that may be important factors in infant mortality. We did not account for paternal race/ethnicity and nativity in our analyses because birth records had substantial missing data about paternal characteristics. Paternal characteristics may be important in understanding birth outcomes, but obtaining valid and complete information from birth registration data remains challenging.(52) Marital status was not collected across all years of data, and thus could not be included. Additionally, tobacco use is underreported and labor and delivery complications are not well-specified in in birth registration data.(4,52) Fourth, we cannot capture return migrants using these data, which would artificially lower the infant mortality rate among foreign-born women. The contribution of return migrants to lower infant mortality among foreign-born Latina women remains in question, but likely is not a significant contributor to the lower IMR among foreign-born Latinas.(53) Fifth, our findings may not reflect Mexican-origin mothers across the US. Los Angeles County has the highest density of Latinos in the US, and the influence of contextual factors may differ across settings. Finally, we caution that our analyses were based on cross-sectional data so causality cannot be determined and that we used census tract as a proxy for neighborhood characteristics, but the census tract may not reflect an individual's experience, or the health effects, of a neighborhood.

In conclusion, even though infants of Mexican-origin mothers have unexpectedly low infant mortality rates based on their family SES, the neighborhoods in which these mothers live may play a role in increasing mortality risk for their infants. Latino immigrant enclaves might be expected to extend the protective effect of individual cultural orientation because they likely have a higher concentration of people with a Latino cultural orientation. However, we found that living in high-density Latino immigrant neighborhoods increased the odds of infant mortality for infants of foreign-born Mexican-origin mothers, with a similar, though not statistically significant association for infants of US-born mothers. There

may be characteristics of Latino immigrant neighborhoods that make them “unhealthy” places to live and undermine positive cultural benefits. Further study is warranted to determine whether, and how, neighborhood factors affect birth outcomes among Latinos by nativity, country of origin, infant age and cause of death, and in varied settings. Achieving national health goals for decreasing infant mortality rates requires careful attention to Latinos as the proportion of US births to Latinos continues to grow. Policies that promote healthier neighborhoods and communities may benefit Latino infants and generate opportunities for improvement in US birth outcomes across racial/ethnic groups.

References

1. Martin, JA.; Hamilton, BE.; Ventura, SJ., et al. Births: Final Data for 2009. Hyattsville: National Center for Health Statistics; 2011.
2. PewResearch Hispanic Trends Project. Washington, D.C: Pew Research Center; 2011. Latinos as Percent of Population, By State, 2011. Available at: http://www.pewhispanic.org/states/ [Last accessed: January 28, 2014]
3. FuentesAfflick E, Lurie P. Low birth weight and Latino ethnicity - Examining the epidemiologic paradox. Arch Pediatr Adolesc Med. 1997; 151(7):665–674. [PubMed: 9232039]
4. Hessol NA, Fuentes-Afflick E. Ethnic differences in neonatal and postneonatal mortality. Pediatrics. 2005; 115(1):e44–51. [PubMed: 15629965]
5. Fuentes-Afflick E, Hessol NA, Perez-Stable EJ. Maternal birthplace, ethnicity, and low birth weight in California. Arch Pediatr Adolesc Med. 1998; 152(11):1105–1112. [PubMed: 9811289]
6. Zambrana RE, Scrimshaw SCM, Collins N, DunkelSchetter C. Prenatal health behaviors and psychosocial risk factors in pregnant women of Mexican origin: The role of acculturation. Am J Public Health. 1997; 87(6):1022–1026. [PubMed: 9224189]
7. Krogstad, JM.; Lopez, MH. PewResearch Hispanic Trends Project. Washington, D.C: Pew Research Center; 2014. Hispanic Nativity Shirt: US Births drive population growth as immigration stalls. Available at: http://www.pewhispanic.org/files/2014/04/2014-04_hispanic-nativity-shift.pdf [Last accessed: September 14, 2014]
8. Guendelman S, Thornton D, Gould J, Hosang N. Social disparities in maternal morbidity during labor and delivery between Mexican-born and US-born white Californians, 1996–1998. Am J Public Health. 2005 Dec; 95(12):2218–24. [PubMed: 16257944]
9. Guendelman S, Thornton D, Gould J, Hosang N. Obstetric complications during labor and delivery: assessing ethnic differences in California. Womens Health Issues. 2006 Jul-Aug;16(4):189–97. [PubMed: 16920523]
10. Sastry N, Hussey JM. An investigation of racial and ethnic disparities in birth weight in Chicago neighborhoods. Demography. 2003; 40(4):701–725. [PubMed: 14686138]
11. Hessol NA, Fuentes-Afflick E. The perinatal advantage of Mexican origin Latina women. Ann Epidemiol. 2000; 10(8):516–523. [PubMed: 11118931]
12. Shaw RJ, Pickett KE, Wilkinson RG. Ethnic Density Effects on Birth Outcomes and Maternal Smoking During Pregnancy in the US Linked Birth and Infant Death Data Set. Am J Public Health. 2010; 100(4):707–713. [PubMed: 20167891]
13. Pearl M, Braveman P, Abrams B. The relationship of neighborhood socioeconomic characteristics to birthweight among 5 ethnic groups in California. Am J Public Health. 2001; 91(11):1808–1814. [PubMed: 11684609]
14. Acevedo-Garcia D, Soobader MJ, Berkman LF. The differential effect of foreign-born status on low birth weight by race/ethnicity and education. Pediatrics. 2005; 115(1):e20–30. [PubMed: 15629963]
15. Campos B, Schetter CD, Abdou CA, Hobel CJ, Glynn LM, Sandman CA. Familialism, Social Support, and Stress: Positive Implications for Pregnant Latinas. Cult Divers Ethn Minor Psychol. 2008; 14(2):155–162.

16. Kasirye OC, Walsh JA, Romano PS, et al. Acculturation and its association with health-risk behaviors in a rural Latina population. Ethn Dis. 2005; 15(4):733–739. [PubMed: 16259501]
17. Guendelman S, English PB. Effect of United States residence on birth outcomes among Mexican immigrants-an exploratory-study. Am J Epidemiol. 1995; 142:S30–38. [PubMed: 7572985]
18. Coonrod DV, Bay RC, Balcazar H. Ethnicity, acculturation and obstetric outcomes - Different risk factor profiles in low- and high-acculturation Hispanics and in white non-Hispanics. J Reprod Med. 2004; 49(1):17–22. [PubMed: 14976790]
19. Osypuk TL, Diez Roux AV, Hadley C, Kandula NR. Are immigrant enclaves healthy places to live? The Multi-ethnic Study of Atherosclerosis. Soc Sci Med. 2009; 69(1):110–120. [PubMed: 19427731]
20. Shaw R, Pickett K. The health benefits of Hispanic communities for non-Hispanic mothers and infants: another Hispanic paradox. Am J Public Health. 2013; 103(6):1052–7. [PubMed: 23597369]
21. Jenny AM, Schoendorf KC, Parker JD. The association between community context and mortality among Mexican-American infants. Ethn Dis. 2001; 11(4):722–731. [PubMed: 11763295]
22. Peak C, Weeks J. Does community context influence reproductive outcomes of Mexican origin women in San Diego, California? J Immigrant Health. 2002; 4(3):125–36.
23. Osypuk TL, Bates LM, Acevedo-Garcia D. Another Mexican birthweight paradox? The role of residential enclaves and neighborhood poverty in the birthweight of Mexican-origin infants. Soc Sci Med. 2010; 70(4):550–560. [PubMed: 19926186]
24. Diez Roux AV. Investigating neighborhood and area effects on health. Am J Public Health. 2001; 91(11):1783–1789. [PubMed: 11684601]
25. Johnson MA, Marchi KS. Segmented assimilation theory and perinatal health disparities among women of Mexican descent. Soc Sci Med. 2009; 69(1):101–109. [PubMed: 19450913]
26. Kane RJ. The ecology of unhealthy places: Violence, birthweight, and the importance of territoriality in structurally disadvantaged communities. Soc Sci Med. 2011; 73(11):1585–1592. [PubMed: 22001230]
27. Masi CM, Hawkley LC, Piotrowski ZH, Pickett KE. Neighborhood economic disadvantage, violent crime, group density, and pregnancy outcomes in a diverse, urban population. Soc Sci Med. 2007; 65(12):2440–2457. [PubMed: 17765371]
28. Bronfenbrenner, U. The Ecology of Human Development: Experiments by Nature and Design. Cambridge, MA: Harvard University Press; 1979.
29. Bronfenbrenner, U.; Morris, PA. The Bioecological Model of Human Development. In: Lerner, RM.; Damon, W., editors. The Handbook of Child Psychology, Vol. 1: Theoretical Models of Human Development. 6. Hoboken, NJ: Wiley; 2006. p. 793-828.
30. Gonzalez-Barrera, A.; Cuddington, D. PewResearch Hispanic Trends Project. Washington, D.C: Pew Research Center; 2013. Diverse Origins: The Nation's 14 Largest Hispanic-Origin Groups. Available at: http://www.pewhispanic.org/2013/06/19/diverse-origins-the-nations-14-largest-hispanic-origin-groups/ [Last accessed: December 19, 2013]
31. Brown, A.; Lopez, MH. PewResearch Hispanic Trends Project. Washington, D.C: Pew Research Center; 2013. Mapping the Latino Population, By State, County, and City. Available at: http://www.pewhispanic.org/2013/08/29/mapping-the-latino-population-by-state-county-and-city/ [Last accessed: January 28, 2014]
32. ArcGIS Desktop: Release 9. Redlands, CA: Environmental Systems Research Institute; 2004.
33. Peterson, CE.; Pebley, AR.; Sastry, N. The Los Angeles Neighborhood Services and Characteristics Database: Codebook. Santa Monica, CA: RAND Coporation; 2007. Available at: http://www.rand.org/pubs/working_papers/WR240z12.html [Last accessed August 29, 2012]
34. Kotelchuck M. An evaluation of the Kessner adequacy of prenatal-care index and a proposed adequacy of prenatal-care utilization index. Am J Public Health. 1994; 84(9):1414–1420. [PubMed: 8092364]
35. Kotelchuck, M. [Last accessed: August 20, 2012] Adequacy of prenatal care utilization index. SAS Coding. Available at: http://www.mchlibrary.info/databases/HSNRCPDFs/APNCU994_20SAS.pdf

36. Sastry, N.; Pebley, AR.; Zonta, M. Labor and Population Program Working Paper Series. Santa Monica, CA: RAND Coporation; 2002. Neighborhood Definitions and the Spatial Dimension of Daily Life in Los Angeles. DRU-2400/8-LAFANS
37. Bjornstrom E. To live and die in LA County: Neighborhood economic and social context and premature age-specific mortality rates among Latinos. Health Place. 2011; 17(1):230–237. [PubMed: 21075034]
38. Lee MA. Neighborhood residential segregation and mental health: a multilevel analysis on Hispanic Americans in Chicago. Soc Sci Med. 2009; 68(11):1975–1984. [PubMed: 19359082]
39. Lee MA, Ferraro KF. Neighborhood residential segregation and physical health among Hispanic Americans: good, bad, or benign? J Health Soc Behav. 2007; 48(2):131–148. [PubMed: 17583270]
40. Cagney KA, Browning CR, Wallace DM. The Latino paradox in neighborhood context: the case of asthma and other respiratory conditions. Am J Public Health. 2007; 97(5):919–925. [PubMed: 17395846]
41. Kim Y, Collins T, Grineski S. Neighborhood Context and the Hispanic Health Paradox: Differential Effects of Immigrant Density on Children's Wheezing by Poverty, Nativity and Medical History. Health Place. Jan 24.2014 E-published ahead of print.
42. Acevedo-Garcia D, Osypuk TL, McArdle N, Williams DR. Toward a policy-relevant analysis of geographic and racial/ethnic disparities in child health. Health Aff. 2008; 27(2):321–333.
43. Osypuk TL, Acevedo-Garcia D. Beyond individual neighborhoods: a geography of opportunity perspective for understanding racial/ethnic health disparities. Health Place. 2010; 16(6):1113–1123. [PubMed: 20705500]
44. Janevic T, Stein CR, Savitz DA, Kaufman JS, Mason SM, Herring AH. Neighborhood deprivation and adverse birth outcomes among diverse ethnic groups. Ann Epidemiol. 2010; 20(6):445–451. [PubMed: 20470971]
45. Buka SL, Brennan RT, Rich-Edwards JW, Raudenbush SW, Earls F. Neighborhood support and the birth weight of urban infants. Am J Epidemiol. 2003; 157(1):1–8. [PubMed: 12505884]
46. Morenoff JD. Neighborhood mechanisms and the spatial dynamics of birth weight. Am J Sociol. 2003; 108(5):976–1017. [PubMed: 14560732]
47. Schempf A, Strobino D, O'Campo P. Neighborhood effects on birthweight: An exploration of psychosocial and behavioral pathways in Baltimore, 1995–1996. Soc Sci Med. 2009; 68(1):100–110.42. [PubMed: 18995941]
48. Messer LC, Vinikoor LC, Laraia BA, et al. Socioeconomic domains and associations with preterm birth. Soc Sci Med. 2008; 67:1247–1257. [PubMed: 18640759]
49. Almeida J, Kawachi I, Molnar BE, Subramanian SV. A multilevel analysis of social ties and social cohesion among Latinos and their neighborhoods: Results from Chicago. J Urban Health. 2009; 86(5):745–759. [PubMed: 19543835]
50. Viruell-Fuentes EA, Schutz AJ. Toward a dynamic conceptualization of social ties and context: Implications for understanding immigrant and Latino health. Am J Public Health. 2009; 99(12): 2167–2175. [PubMed: 19833986]
51. Kieffer EC, Caldwell CH, Welmerink DB, et al. Effect of the Healthy Moms lifestyle intervention on reducing depressive symptoms among pregnant Latinas. Am J Community Psychol. 2013; 51:76–89. [PubMed: 22638902]
52. Martin, JA.; Wilson, ED.; Osterman, MJK., et al. National vital statistics reports. Vol. 62. Hyattsville, MD: National Center for Health Statistics; 2013. Assessing the quality of medical and health data from the 2003 birth certificate revision: Results from two states. Available at: http://www.cdc.gov/nchs/data/nvsr/nvsr62/nvsr62_02.pdf [Last accessed: September 14, 2014]
53. Hummer RA, Powers DA, Pullum SG, Gossman GL, Frisbie WP. Paradox found (again): infant mortality among the Mexican-origin population in the United States. Demography Aug. 2007; 44(3):441–457.

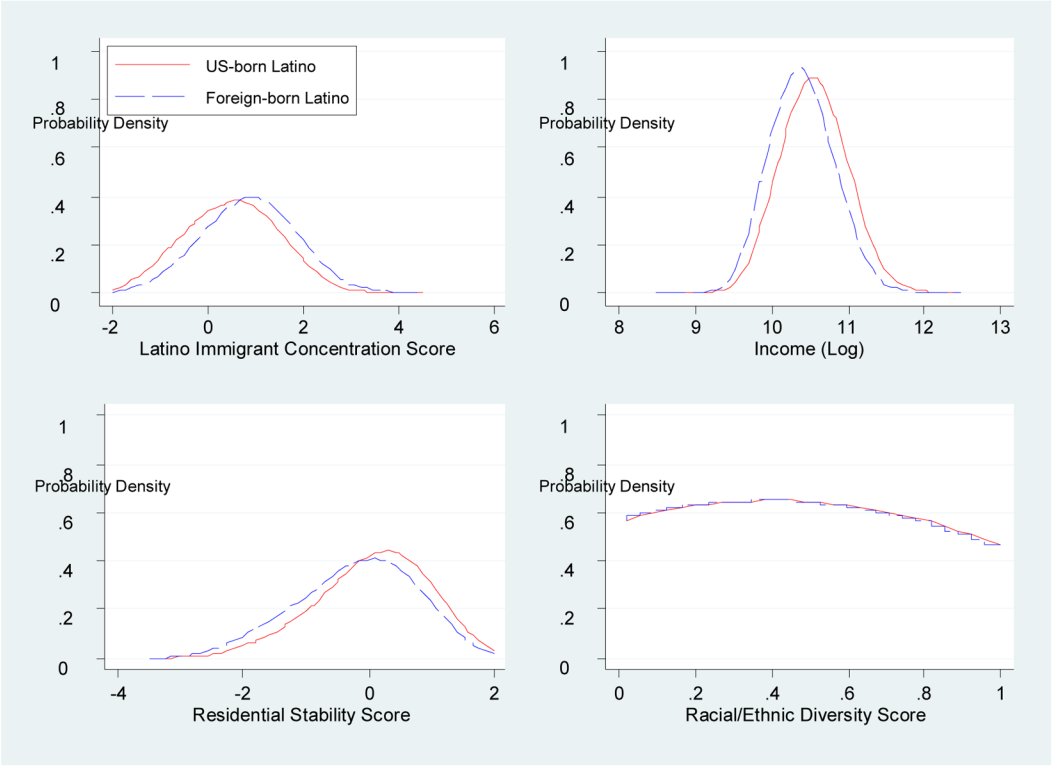

Figure 1.

Distribution of neighborhood characteristics by maternal nativity among births to Mexican-Origin Latina Mothers in Los Angeles County (2002–2005)*

*Using the Two-sample Kolmogorov-Smirnov test for equality of distribution functions there were significant differences (p <.001) in the distribution of each of these neighborhood characteristics by maternal nativity.

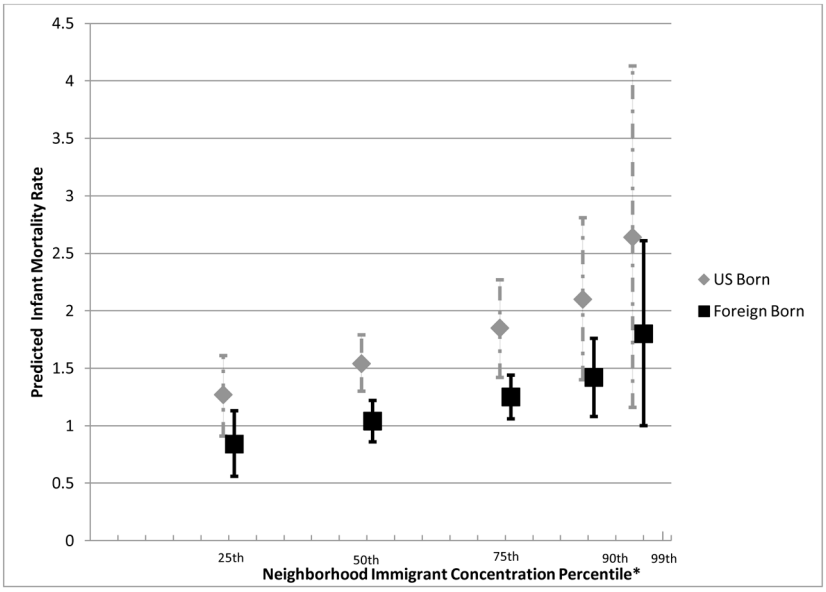

Figure 2.

Predicted infant mortality rate by neighborhood Latino immigrant concentration among births to Mexican-Origin mothers, by maternal nativity†

†The predicated infant mortality rate was derived from logistic regression models that were adjusted for maternal age, education, payor for delivery, prenatal care utilization, prior birth history, prior adverse pregnancy outcomes, pregnancy complications (tobacco use, anemia, diabetes, other medical complications), and labor/delivery complications, infant sex, birthweight, and gestational age, and neighborhood Latino immigrant concentration, income, residential stability, and diversity. Excepting neighborhood Latino immigrant concentration, all maternal, infant, and neighborhood characteristics were held at their mean value for each nativity group when determining the predicated infant mortality rate.

*Denotes percentile of neighborhood Latino immigrant concentration across all Los Angeles County census tracts included in this study

Table 1

Selected maternal and infant characteristics by maternal nativity among births to Mexican-origin Latina women from the Los Angeles County Birth Cohort 2002–2005 (*n*=289,464)

	US-born mothers *n*=105,606	Foreign-born mothers *n*=183,858	*p*-value*
Maternal Characteristics			
Age, years (%)			
< 18	8.1	3.1	<.001
18–26	52.2	35.4	
27–34	33.5	46.8	
>34	6.2	14.8	
Education, years (%)			
<9	2.1	30.2	<.001
9–11	26.5	32.4	
12	40.6	25.3	
>12	30.8	12.0	
Payor for delivery, %			
Medicaid	50.8	79.5	<.001
Private Insurance	46.6	18.4	
Prenatal care utilization**			
Inadequate	11.1	11.4	.02
Intermediate	18.7	19.0	
Adequate	43.3	43.0	
Adequate plus	26.9	26.6	
Prior Live Births			
0	42.0	29.6	<.001
1–3	54.1	63.8	
>3	3.9	6.6	
Infant Characteristics			
Male infant, %	50.9	51.0	0.5
Mean birthweight, g (SD)	3338 (552)	3358 (540)	<.001†
Gestational age, weeks (%)			
Very preterm, <28	0.6	0.5	<.001
Moderately preterm, 28–33	2.3	2.1	
Late preterm, 34–36	7.6	7.5	
Term, 37–41	81.9	83.2	
Post-term, ≥ 42	7.6	6.8	
Mortality Rate (per 1000 live births)	4.6	3.8	.002
Neonatal Deaths, (% of deaths among infants <28 days)	52.9	67.0	<.001

*Determined by Pearson χ^2 except where noted

†Determined using Student's t-test

** Determied using Kotelchuck's Adequacy of Prenatal Care Utilization Index

Table 2

Adjusted odds ratios (95% confidence intervals) for infant mortality among births to Mexican-Origin Latina mothers, by maternal nativity

	US-born mothers OR(95% CI)			Foreign-born mothers OR(95% CI)		
	SES Factors	**SES Factors + Neighborhood Characteristics**	**Fully Adjusted***	**SES Factors**	**SES Factors + Neighborhood Characteristics**	**Fully Adjusted**
Socioeconomic Status						
Maternal Education, years						
<9	1.28 (0.70–2.34)	1.20 (0.66–2.21)	1.09 (0.55–2.14)	1.08 (0.83–1.41)	1.04 (0.80–1.36)	0.96 (0.72–1.30)
9–11	1.27 (0.98–1.65)	1.21 (0.93–1.57)	1.13 (0.83–1.52)	1.09 (0.84–1.42)	1.05 (0.81–1.37)	1.03 (0.76–1.38)
12	1.18 (0.94–1.49)	1.14 (0.90–1.44)	1.06 (0.82–1.37)	0.99 (0.76–1.30)	0.97 (0.74–1.27)	0.99 (0.74–1.33)
>12	1.0	1.0	1.0	1.0	1.0	1.0
Payor for delivery-Private (vs. Medicaid)	0.82 (0.67–1.00)	0.86 (0.70–1.05)	0.94 (0.75–1.17)	1.05 (0.86–1.28)	1.09 (0.89–1.33)	0.97 (0.77–1.22)
Neighborhood Characteristics						
Latino immigrant concentration score		**1.31 (1.03–1.67)**$	1.29 (0.99–1.67)		**1.30 (1.03–1.63)**	**1.29 (1.01–1.66)**
Median income, log		0.96 (0.61–1.51)	1.07 (0.65–1.76)		1.20 (0.84–1.73)	1.35 (0.92–1.99)
Racial/ethnic diversity score**		1.53 (0.76–3.07)	1.65 (0.78–3.49)		0.84 (0.47–1.49)	0.98 (0.52–1.84)
Residential stability score***		1.02 (0.86–1.20)	1.05 (0.87–1.26)		0.95 (0.83–1.10)	0.95 (0.81–1.11)
Maternal & Infant Characteristics						
Prenatal care utilization						
Inadequate			1.28 (0.93–1.77)			1.10 (0.84–1.46)
Intermediate			1.15 (0.83–1.60)			0.94 (0.71–1.24)
Adequate			1.0			1.0
Adequate plus			1.04 (0.80–1.34)			0.99 (0.81–1.22)
Infant sex (Male)			1.19 (0.98–1.45)			1.16 (0.99–1.36)
Gestational age						
Very preterm, (<28 weeks)			**2.79 (1.73–4.52)**			**2.59 (1.76–3.81)**
Moderately preterm, (28–33 weeks)			1.10 (0.74–1.65)			1.22 (0.88–1.70)
Late preterm, (34–36 weeks)			1.03 (0.73–1.45)			**1.61 (1.24–2.10)**
Term, (37–41 weeks)			1.0			1.0
Post-term, (≥ 42 weeks)			0.90 (0.52–1.55)			1.00 (0.61–1.64)

[*] The fully adjusted model included SES factors, neighborhood characteristics, and the listed maternal, infant, and neighborhood characteristics as well as maternal age, prior birth history, prior adverse pregnancy outcomes, pregnancy complications (tobacco use, anemia, diabetes, other medical complications), labor/delivery complications, and infant birthweight.

[$] All bolded values $p<0.05$

[**] Scaled variable from the LA NSC that characterizes the racial/ethnic diversity of the census tract

[***] Scaled variable from the LA NSC that characterizes tract households (e.g. proportion of multi-unit housing, owner-occupied housing)