

PERINATAL OUTCOMES AMONG MEXICAN AMERICANS: A REVIEW OF AN EPIDEMIOLOGICAL PARADOX

This article presents a review of 3 possible explanations for the seemingly apparent paradox of favorable birthweight outcomes among Mexican Americans. Evidence is grouped into 3 explanations: cultural, under-reporting, and bio-medical. With an emphasis on the link between acculturation among Mexican Americans and their perinatal outcomes, the key correlates associated with lower rates of low birth weight (LBW) are examined and critiqued. This review of the literature also explores policy and health implications for this important public health issue. (*Ethn Dis.* 2002;12:480–487)

Key Words: Birth Weight; Mexican Americans; Acculturation; Perinatal Outcomes

INTRODUCTION

Foreign-born mothers who have immigrated to the United States tend to have significantly better pregnancy outcomes relative to their US-born counterparts.^{1–9} This advantage exists after controlling for sociodemographic and economic factors. For example, analysis by Singh and Yu¹⁰ of nationally linked infant birth/death data demonstrated that regardless of ethnic group, foreign-born mothers reported lower rates of infant mortality, low birth weight (LBW), and preterm birth. Moreover, the foreign-born mothers of ethnic groups with the most favorable pregnancy outcomes also exhibited lower prevalence of the risk factors known to influence pregnancy outcome. Immigrant mothers reported substantially lower rates of teenage births and unmarried status, with Chinese and Japanese immigrants having the lowest rates. Further analysis shows that regardless of ethnicity and other sociodemographic and economic factors, US-born mothers have a 24% higher risk of infant mortality, and an 8% higher risk of LBW relative to their immigrant mother counterparts.

Mexican-American infants, the focus group of this paper, have a LBW rate similar to that for White infants.^{8,11–13} Surprisingly, these rates persist despite the disproportionate number of Mexican-American women of childbearing age who live below the poverty line, have late or no prenatal care, have low levels of educational attainment, encounter numerous barriers that prevent access to health services, and reside in environments hazardous to fetal development.^{14–22} However, researchers have reported differences in perinatal outcomes among Mexican-American women. Singh and Yu¹⁰ show that US-born

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mothers have a 16% higher risk of infant mortality, and a 38% higher risk of LBW, relative to mothers born in Mexico.

A similar pattern was found when Cervantes et al¹⁴ applied multivariate logistic regression to 57,324 live singleton infants born to White, African-American, Mexican, and Puerto Rican residents of Chicago in a 1994 linked birth-death data set. Consistent with Singh and Yu's¹⁰ finding, this study found that, for all race and ethnic groups, immigrants generally had lower rates of LBW and preterm births compared to natives. Moreover, after controlling for sociodemographics, immigrant Mexican mothers had a significantly reduced risk for LBW (AOR: 0.76, 95%CI: 0.64–0.90) and for preterm birth (AOR: 0.76, 95%CI: 0.65–0.88), as compared to their US-born counterparts. This pattern is even more perplexing given that more acculturated Mexican-American women report higher levels of educational attainment, higher income, and greater utilization of prenatal care services.^{3,14,23–29}

To explain what appears to be an epidemiological paradox, one popular hypothesis has emerged: that favorable perinatal outcomes are attributable to traditional "Mexican culture."^{3,14,16,31–36} In this article, we will review the evidence surrounding this cultural argument. In addition, alternative explanations will be presented and briefly discussed. Further, policy and program implications of existing evidence will be explored.

METHODOLOGY

This literature review consists primarily of empirical studies that exam-

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ined LBW/infant mortality data among Mexican-American populations. Studies under review were initially identified using MEDLINE, PsycINFO, PubMed, and Wilson article database search engines. Key search terms included: birth weight, birth outcome, LBW, pregnancy, Mexican Americans, Hispanic, culture, ethnicity and epidemiological paradox. Key terms were used independently and then combined. The search strategies were limited to English and Spanish language references from 1975 to 2001, with an emphasis on empirical studies published within the last 5 years. In addition, articles on other empirical studies were selected from the reference list of the articles reviewed. Focused searches were conducted on specific topic areas, (eg, gestational diabetes mellitus and Mexican Americans). This search strategy identified 61 studies that provided empirical data on infant mortality or LBW among Mexican-American populations, and 34 related articles that provided conceptual or interpretive views on the epidemiological paradox. The articles were then sorted by type of argument, and were critically reviewed, and summarized within each category. These summaries were entered into a reference database using ProCite. This allowed for further critical review and sorting. Unless otherwise specified, the period of time covered by the data cor-

responds to date of publication. The term "Hispanic," as used in this literature review, is vague, as the ethnic groups the term encompasses are often not specified; therefore, the term is used here as it was defined in each original paper under review.

EXPLANATIONS OF THE EPIDEMIOLOGICAL PARADOX

Cultural Argument

The most popular explanation for the epidemiological paradox proposes that favorable LBW outcomes among Mexican Americans are attributable to traditional Mexican culture,^{3,11,14,16,30,32,37-43} ie, traditional cultural beliefs and practices about childbearing and nutrition help to ensure a favorable delivery and neonate of normal weight.^{31,34} The first study to consider a cultural explanation was conducted by Gee et al.³⁸ Controlling for marital status of birth mother, maternal age, birth order, and birth weight, a cross-sectional analysis of 46,320 linked birth/death certificates showed that Spanish surname infants had a neonatal mortality risk about 2% below the average of the general population. Researchers speculated that this birth outcome may, however, be the result of a cultural emphasis placed on better care of pregnant women by the family. However, the form this care takes is not specified.

A second study used matched birth/death certificates from the live singleton births in California during 1981.³⁰ Investigators found virtually identical risk profiles between US-born Spanish surname mothers and African Americans; similar results were obtained in the percentages of mothers under 18 years of age, with a parity greater than 5, an interpregnancy interval of less than 12 months, and late or no prenatal care. The one salient difference reported was that Spanish surname infants were more likely to be born to a married couple.

Moreover, Mexican-born Spanish surname women (maternal nativity indicated on birth certificate) differed from their US-born counterparts in the following ways: Mexican-born Spanish surname mothers were more likely to be older, to receive late or no prenatal care, and to have more than one child. Despite this high-risk profile, Mexican-born Spanish surname mothers had the lowest LBW rate, as compared to US-born Spanish surname mothers, as well as to African-American and White mothers. Authors attributed this birth-weight distribution to either a migration effect or to differences in culturally determined parental attitudes and behaviors toward childbearing, possibly indicated by marital status.

A note of caution must be mentioned: Williams et al³⁰ erroneously assumed the US-born Spanish surname category to be specific to Mexican-American mothers. The Spanish surname population of California comprises large Central and South American communities, non-Latinos, and Latinos whose Mexican heritage is far removed. This heterogeneous grouping is known to have distinctly different risk profiles and birth-weight outcomes.^{11,44} In addition, similar to many studies utilizing Spanish surname as an ethnic identifier, a Buechley method was employed. This method consists of a computerized search pattern combining a name list and a set of phonetic rules to infer Spanish surname. It is possible for such a method to produce an ambiguous ethnic composition of the sample population.

The migration effect concept hypothesizes that migration is selective.⁴⁵ That is, migrants do not represent a random selection from the country of origin. Rather, positive and negative factors at the origin and host country either push or pull individuals toward a change of residence. For example, political upheaval in the country of origin tends to push people out, while the news of a job or the reunification of

PERINATAL OUTCOMES AMONG MEXICAN AMERICANS - *de la Rosa*

family tends to pull individuals toward the host country. However, persons differ systematically in how they react to these positive and negative forces, as well as to obstacles encountered in the migration journey. Although inconclusive, the healthy migrant hypothesis has been explored in several international adult mortality studies.^{17,22,46-49} As speculated by Williams et al³⁰ the application of this concept to birth-weight outcome would support the hypothesis that migration systematically selects healthier parents.

Only one study was found that tested the "healthy migrant" hypothesis relative to birth outcome. Notzon et al⁵⁰ obtained information on Mexican Americans from Vital Statistics for 5 southwestern states (Arizona, California, Texas, Colorado, and New Mexico) from 1980 to 1984. These data were matched to information obtained from a study ($N=32,760$) of Mexican nationals conducted by the Mexican Ministry of Health to determine the quality of medical care and perinatal mortality. Unadjusted data demonstrated that Mexican nationals had a LBW rate 2 times that of Mexican Americans. However, controlling for altitude largely eliminated these differences.^a This evidence suggests that adverse living conditions are not the only determinants of birth-weight distribution, and that a migration effect may not be the only pertinent factor. However, this study is flawed by its use of the Spanish surname method of identifying Mexican Americans, possible international differences that may act as spurious correlates to birth weight, and the lack of adequate information about the Mexican national study. For example, the study neglected to examine whether altitude in the Mexican survey sites was associated with

SES, access to health care, or hazardous elements in the environment.

Returning to cultural explanations of birth outcomes, Scribner and Dwyer⁵¹ offered another piece of the paradox puzzle. In their use of an acculturation scale, their study represented a shift in our understanding of acculturation by acknowledging its multi-dimensionality. The data were cross-tabulated according to each subject's Mexican or US-orientation, as measured by an 18-item acculturation scale (measuring language preference, ethnic identification, and nativity). An analysis of the Hispanic Health and Nutrition Examination Survey (HHANES), showed that a one-point increase in the acculturation scale was significantly associated with a 1.19 times increase in the risk of LBW. Moreover, after controlling for age, education, wealth, size of city, and smoking status, highly acculturated US-oriented Mexican Americans were at a 1.86 times increased risk of LBW, as compared to less acculturated Mexico-oriented mothers. Even more interesting, years of education were unrelated to risk of LBW among Mexico-oriented mothers, while increased education was associated with reduced risk in the US-oriented group. Finally, Scribner and Dwyer⁵¹ found that maternal birth Mexican nativity was associated with reduced risk of LBW. However, after controlling for acculturation, the difference in LBW disappeared. Therefore, data suggest that it is not the mother's place of birth, but rather her cultural orientation that is important.

In a re-analysis of Scribner and Dwyer's¹² study, Cobas et al⁵² used structural equation modeling to demonstrate that acculturation, as defined by language preference, influenced LBW via diet and smoking behaviors. Using a population-based cross-sectional study of 4,404 births to Mexico-born and US-born Mexican-American women in California, English, Kharrazi, and Guendelman⁵³ found that compared to US-born English speakers, US-born Spanish

speakers exhibited a higher risk profile and Mexico-born English speakers a lower risk profile for adverse pregnancy outcomes. After controlling for covariates, US-born Spanish speakers had the highest odds for LBW (OR=1.98, 95% CI=1.00, 3.93), and Mexico-born English speakers had the lowest odds for preterm delivery (OR=0.70, 95% CI=0.35, 1.40) as compared to US-born English speakers. These nativity/language differences in risk profiles and pregnancy outcomes suggest that Mexican Americans do not experience a simple negative mode of adaptation to US society, but rather undergo a complex process of positive and negative acculturation. These studies, in addition to those of Balcazar et al,⁵⁴ Balcazar and Krull,³¹ and Guendelman et al³⁴ support the importance of cultural orientation and nativity/language differences in risk profiles when predicting adverse pregnancy outcomes among Mexican-American women.

In a similar study, Crump, Lipsky, and Mueller³ conducted a retrospective cohort analysis of birth outcomes among 4,800 Mexico-born and 4,800 US-born Mexican-American women using the Washington state birth certificate data. Their analysis found that the risk of preterm delivery among Mexico-born women increased with increasing time spent in the United States, such that US-born mothers had a significant increased risk of preterm birth, relative to their Mexico-born counterparts [relative risk (RR): 1.18, 95% CI: 1.04-1.33]. Further, this study found that US-born mothers tended to be younger, and unmarried, and to smoke or consume alcohol during pregnancy, as compared to their Mexico-born counterparts, which suggests that while newly arrived immigrants initially have better birth outcomes than immigrants who have been in this country for a longer time, they eventually lose any protective advantage after several years.

In the most revealing study to date, Zambrana et al³⁶ argue that traditional

^a High altitude is thought to retard growth because of the lower oxygen content of air at higher elevations, resulting in fetal hypoxia.

culture protects against preterm birth and LBW by promoting positive perinatal behaviors and a healthy maternal psychosocial status. In a prospective survey of 1,071 low-income, primiparous African-American and Mexican-American patients of community-based prenatal care clinics, the researchers conducted face-to-face interviews to examine substance use, prenatal stress, social support, attitudes toward pregnancy, initiation of prenatal care, and medical risk. These psychosocial and behavioral data were linked to birth outcome data as indicated in maternal medical records. Using structural equation modeling, Zambrana et al³⁶ found that ethnic differences in birth weight and preterm births disappear after controlling for stress, substance use, and pregnancy attitudes, such that, African-American women compared to Mexican-American counterparts, experienced greater prenatal stress, used more substances and had less-positive attitudes toward their pregnancy. All of these indicators were associated with an earlier delivery, which in turn was associated with lower birth weight. The findings on attitude toward pregnancy are consistent with those of Guendelman et al³⁴ whose qualitative study of 60 Mexican national and Mexican-American women demonstrated that unlike Mexican-American women, Mexican-born participants place more emphasis on developing a relaxed, serene attitude toward pregnancy and on simplifying their lives.

In sum, the data supporting the cultural argument are growing. We now know that: 1) Mexican-American women represent a heterogeneous group with a various perinatal health outcomes; 2) less-aculturated Mexican-American women have the most favorable birth-weight outcome; and 3) traditional cultural orientations as evidenced by reduced prevalence of smoking, alcohol and drug use, emphasis on family unity, and nutritional behaviors during the perinatal period constitute a protective buffer. The data to date have

become increasingly sophisticated in their ability to identify the mechanisms by which culture is linked to higher birth weight.

Under-Reporting Argument

Much of the evidence supporting an under-reporting argument derives from the paradoxically low infant mortality (IM) rates among Mexican Americans. Some researchers argue that a simple case of under-reporting has resulted in the similar rates of LBW and IM between Mexican Americans and Whites.^{12,44,55,56} This hypothesis of under-reporting first appeared in an ecological study of infant mortality rates using Texas Vital Statistics and Census tracts from 1968–1972.⁵⁶ This study found that after controlling for the percentage of families living below the poverty line, Spanish surname infants in Texas border counties are at an advantage in the neonatal and postneonatal period, as compared to their African-American and White counterparts.

A subsequent study, also using the Spanish surname method, revisited the issue of uncounted infant mortality cases among Mexican Americans.⁴⁴ In this study, researchers conducted a cross-sectional analysis of linked birth/death certificates among 68,584 African-American, White, and Spanish surname residents of Harris County, Texas. Their data confirmed the neonatal mortality pattern found by Markides and Hazuda,⁵⁶ with Mexican Americans being at an advantage in the neonatal period. However, the foreign-born Spanish surname mothers had the highest risk profile: these foreign-born mothers were more likely to have the highest parity, greatest number of births to advanced aged mothers (≥ 35 years), and the highest percentage of deliveries with late or no prenatal care.

Based on the prevalence of these risk factors, Selby et al⁴⁴ argue that the infant mortality rate among Mexican Americans is not a valid health indi-

cator. The researchers further state that it is highly unlikely that Mexican-American culture is a protective factor against poor birth outcomes, given the socioeconomic situation and elevated rates of infant mortality from the country of origin, as well as traditional childbearing practices, which produce high risk pregnancies. Moreover, these proponents hold that “although better nutritional practices, higher regard for parental roles, and lower rates of smoking and alcohol consumption have been proposed as possible reasons for the better birthweight distribution among Hispanics, these factors partially explain, but do not totally account for, the differences.”^{12(p220)} Alternative explanations have been proposed: 1) dual citizenship^b; 2) back migration in which the infant death occurs outside of US registry^{17,46,49,57,58}; 3) undocumented migrants or indigenous midwives failing to report infant deaths for fear of deportation; and 4) selective migration of the most healthy mothers as evidenced by favorable birth outcomes.^{17,22,46,48}

The argument for the under-reporting of infant mortality rates, however, is methodologically problematic. First, many of the reviewed studies supporting the migration argument have one major limitation: inadequate measurement of Latino ethnicity. The label “Spanish surname”: 1) may falsely identify a non-Latino; and 2) lumps together individuals of different ethnicities, different ages, and different SES.^{17,57,59,60} Second, no empirical evidence is available to support the hypotheses of back migration or dual citizenship pattern among

^b Pregnant Mexican nationals cross the US/Mexico border to deliver the child and receive US citizenship and then return to Mexico. Therefore, if the infant dies, its death goes unregistered in the US. However probable these may seem, no data were found which documents the prevalence of dual citizenship practice among Mexican residents.

Mexican Americans. Finally, even if out-migration (or its conceptual equivalent of "Salmon bias hypothesis"^c artificially deflates the postneonatal mortality rate, it does not influence the documented favorable birth-weight outcomes among poor Mexican-American women.

Bio-Medical Argument

The low incidence of LBW among Mexican Americans leads many researchers to seek out factors that protect fetus development. However, as questioned by Kieffer et al⁶⁰ and Kieffer⁶¹ when examining the pregnancy outcomes among Pacific Islanders, it is not clear that an infant born with normal birth weight is a healthy baby.⁶² In fact, evidence is accumulating that birth weight does not necessarily reflect the fetal growth experience and maturity of Mexican-American infants.^{23,63} One alternative explanation may be that infant morbidity and mortality risks are expressed differently within the Mexican-American population. For example, increased attention needs to be placed on the role of diabetes during pregnancy. Gestational diabetes mellitus (GDM) is a condition in which hormones necessary for the preservation of a pregnancy, such as estrogen, cortisol, and human placental lactogen, block the effect of insulin on blood sugar levels. The onset of this contra-insulin effect begins around 20–34 weeks of gestation. Upon delivery, a reduction in hormones is followed by a removal of the blocks on insulin. With the disappearance of GDM, blood sugar levels often return to normal.

In the United States, GDM affects approximately 2%–3% of all pregnan-

cies and is associated with fetal macrosomia (birth weight $\geq 4000\text{g}$).^{64–66} Overall, clinical and population based studies which examine the association between gestational diabetes and birth weight find a GDM prevalence of approximately 4.5% among Mexican-American women.⁶⁷ Women with GDM tend to be older, shorter, heavier, and to have more children.⁶⁸ Hispanic women and Mexican Americans in particular are at higher risk of developing this complication during pregnancy.^{64,67,69} In fact, after administering an oral glucose tolerance test and controlling for maternal age, race, and body weight, Dooley et al⁶⁹ found that Hispanic women tend to be 2.45 times more likely to develop GDM, compared to their White counterparts ($P < .001$).

One promising national study sheds light on the debate regarding GDM's influence on the LBW. Buekens et al⁶³ analyzed data from 1994 US birth certificates. Using a Wilcoxon-Russell analysis, these researchers calculated the Gaussian distribution of pre-term and term babies for 454,264 Mexican-American babies and 2,436,634 White babies. They found that Mexican-American babies are, on average, smaller per gestational age than White babies, such that the Gaussian distribution for Mexican Americans was 61g lower than that of Whites (3,394g vs 3,455g). This finding is consistent with other studies.^{11,20} Such findings appear to support the explanation that LBW is an appropriate indicator of health among Mexican Americans, and that their lower prevalence of LBW represents a true favorable perinatal outcome.

Given the high prevalence of obesity^{70,71} and GDM among Mexican-American women, and their association to macrosomia, further studies, such as that conducted by Buekens et al⁶³ are needed to determine the relative risk of heavier babies and to explore further the conditions in which it tends to occur, (ie, physical health, acculturation, and other psychosocial factors).

RESEARCH AND POLICY IMPLICATIONS

Research

The low incidence of LBW among Mexican Americans has numerous research and policy implications. Further research is needed to examine the roles of obesity and GDM and their association with acculturation. Moreover, further research needs to identify cultural attitudes that promote positive perinatal health behaviors. Current research provides some direction. For example, Crump, Lipsky, and Mueller³ suggest that over time, Mexican-American immigrants tend to lose the birth-weight advantage, as they are more likely to deliver at an earlier age, to be unmarried, and to engage in risky perinatal health behaviors. Moreover, Zambrana et al³⁶ demonstrated that perinatal stress, substance use, and attitudes toward pregnancy represent mechanisms by which culture plays a role in preterm birth and LBW.

Such evidence supports a central thesis of acculturation, as it relates to birth outcomes, representing an erosion of traditional practices and beliefs about pregnancy. Therefore, we have answered the "how" of the epidemiological paradox. That is, in identifying the covariation of factors that lead to LBW, current research maps the mechanisms that cause Mexican Americans, and less acculturated immigrants in particular, to have a relatively low incidence of LBW. What remains unclear, however, is the "why." Why do we see a change in perinatal health behaviors for immigrants with increased levels of acculturation? The next step is to deconstruct the meaning of "pregnancy," to identify the conceptual elements, and to determine how these elements change as one becomes acculturated. Guendelman et al³⁴ have begun some of this work. Through qualitative research methods, we now need to better understand the cultural schemas that lead to action about pregnancy and delivery.⁷²

^c The Salmon bias hypothesis proposes that Latinos tend to return to their country of birth when seriously ill or to retire. Thus, their death goes unreported in US Vital Statistics. Although unsubstantiated, this hypothesis has been cited as a possible explanation for paradoxical mortality rates among adult Latinos.

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Health Policy Implications

In terms of health policy, health promotion and prevention can occur at various levels. First, public health officials and front line healthcare providers can help to prevent Mexican-American women (especially those with high acculturation levels) from experiencing increased rates of LBW. One method is to identify and promote culturally appropriate interventions to reduce risky perinatal health behaviors.⁷³ For example, Healthy Start comprises 94 federally funded projects in the United States, promotes community-based maternal and child health programs, particularly those that focus on the reduction of infant mortality, LBW, and racial disparities in perinatal outcomes. The projects utilize case management services to improve the pregnancy outcome of economically disadvantaged communities.⁷⁴ Such programs can target disadvantaged communities with a high concentration of Mexican Americans who exhibit increased levels of acculturation and risky perinatal health behaviors.⁷³ A national evaluation of the Healthy Start programs assessed their effectiveness.⁷⁵ In the provision of obstetrical and social service-related needs, program participation was significantly related to the receipt of case management services

(AOR: 3.25, 95% CI: 2.44, 4.34) when compared to a comparison group of postpartum recipients of a special supplemental nutrition program for women, infants, and children (WIC). Moreover, program participants were more likely to rate their prenatal care as higher in qualitative terms and to be using birth control at the time of the interview. Although no direct relationship was found between program participation and a decrease in LBW for Mexican-American populations, such evaluations provide a model for the assessment of effective interventions. Moreover, Healthy Start Initiative projects that served communities with a high concentration of Mexican-American immigrant residents utilize *promotoras*, women respected in the community who are trained as village workers to inform pregnant mothers about the risks of certain behaviors to maternal and fetal well being, and about the benefits of seeking prenatal care early. Comparable results were found with programs adopting similar modes of intervention.⁷³ Public Health departments and commissioners need to consider increased funding, and replication of these programs throughout the country.

Second, through a better understanding of the "paradox," public health officials and healthcare providers can explore the possibility of applying the knowledge that a positive approach to pregnancy can lead to improved birth outcomes. Such interventions could encourage the adoption of the favorable health behaviors or attitudes known to be efficacious for Mexican Americans with low levels of acculturation. The assumption here is not that Mexican Americans with low levels of acculturation are "superior health achievers," with an innate ability to overcome dangerous health conditions, but rather that this group has developed strategies which improve birth weight outcomes. For example, Wolf et al,⁷⁶ Wolf and Portis,⁷⁷ and Coonrod et al⁷⁸ examined smoking behaviors among Mexican

Americans. In a cross-sectional survey of gynecologic patients of a public hospital women's clinic, Coonrod et al⁷⁸ found that US-born (prevalence ratio: 3.8, 95% CI: 1.9, 7.8) and US-oriented Mexican-American women (prevalence ratio: 2.7, 95% CI: 1.4, 5.2), as well as Mexican-American women who reported a less cohesive family unit (prevalence ratio: 2.4, 95% CI: 1.2, 4.8) are more likely to smoke. Moreover, Sherraden and Barrera⁷⁹ found that women use various strategies for self-care during pregnancy. These strategies fall into 2 categories: everyday care and medical care. In the medical care strategy, the woman learns of her pregnancy, seeks prenatal care, and works with medical providers throughout the pregnancy to ensure a healthy delivery and infant. Conversely, many immigrant Mexican women acknowledge that they must "eventually" seek medical care, but until they do, they receive social support from traditional practitioners, family members and friends. Examples of such support are assistance with house chores, encouragement of healthy eating habits, information on traditional practices to ease bodily discomforts during pregnancy, financial assistance, and emotional support. Evidence suggests that daughters, mothers, and grandmothers are the most likely to come to the aid of an expectant mother.⁸⁰⁻⁸³ This type of care, received daily by Mexican women, exemplifies a collective vs individual approach to pregnancy. In a collective approach, pregnancy represents a communal event, where family members and friends act to protect maternal and fetal well-being. This collective approach to pregnancy is a positive aspect of traditional Mexican health culture. In learning and promoting these strategies we can work to prevent LBW and infant mortality.

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PERINATAL OUTCOMES AMONG MEXICAN AMERICANS - de la Rosa

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Data analysis and interpretation: de la Rosa

Manuscript draft: de la Rosa

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