INTERGENERATIONAL BIRTH WEIGHTS AMONG THE DIRECT FEMALE DESCENDANTS OF US-BORN AND MEXICAN-BORN MEXICAN-AMERICAN WOMEN IN ILLINOIS: AN EXPLORATORY STUDY

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Objective: To explore the intergenerational birth-weight patterns of the direct female descendants of Mexican-American women.

Design: This is a population-based study.

Methods: Stratified analyses were performed on a transgenerational dataset of 1956–1975 and 1989–1991 Illinois computerized vital records of Mexican-American infants.

Results: Among the descendants of generation 1 US-born Mexican-American women (n=1,940), generation 3 females had a birth weight equivalent to that of their generation 2 mothers, (3294 g vs 3283 g); generation 3 infants with unmarried mothers had a birth weight 121 g less than that of generation 2 infants born to unmarried mothers (3163 g vs 3284 g, P<.01); and generation 3 female infants born to teenaged women had a birth weight 70 g less than that of their generation 2 mothers who were born to teenaged women (3178 g vs 3248 g, P<.01). Among the descendants of generation 1 Mexican-born women (n=1,017), generation 3 females had a birth weight equivalent to that of their generation 2 mothers (3335 g vs 3363 g); generation 3 infants with teenaged mothers had a birth weight 108 g less than that of generation 2 infants with teenaged mothers (3264 g vs 3372 g, P<.01).

Conclusions: An intergenerational rise in birth weight does not occur among the direct female descendants of Mexican-American women. (*Ethn Dis*. 2006;16:166–171)

Key Words: Intergenerational, Low Birth Weight, Mexican-American, Nativity

INTRODUCTION

Since Mexican Americans are the second largest and fastest growing minority group in the United States, the birth outcome of Mexican Americans has public health relevance.[1] Mexican-American infants of US-born women have a lower birth weight than Mexican-American infants of Mexican-born women.[2–4] Intergenerational factors are defined as those factors, experiences, and exposures by one generation that relate to the health of the next generation.[5] The extent to which intergenerational factors affect Mexican-American infant birth weight is incompletely understood.

Consistent with studies showing secular improvements in mean birth weight on the order of 40–100 g over decades,[6,7] we previously found that among the US-born female descendants of generation 1 European-born White women, the birth weight of generation 3 infants was shifted upward from that of their generation 2 mothers.[8] A similar intergenerational birth-weight pattern failed to occur among the US-born female descendants of African-born women.[8] These observations suggest that intergenerational factors closely related to lifelong minority status are negatively associated with infant birth weight. The intergenerational birth-weight pattern of the US-born descendants of Mexican-born women is unknown. This population is ideally suited to improve our understanding of the effect of maternal lifelong minority status on infant birth weight.

Mexican-American infants of US-born women have a lower birth weight than Mexican-American infants of Mexican-born women.[2–4]

We undertook an exploratory intergenerational birth-weight analysis of the direct, female descendants of US-born and Mexican-born women in Illinois.

METHODS

Study Population

A detailed description of the dataset has been published elsewhere.[9] Briefly, the birth certificate data tapes for 1989–1991 from the Illinois Department of Public Health were linked to those of their mothers who were born in Illinois between 1956 and 1976. Approximately 338,000 potentially matchable infants were in the 1989–1991 cohort. On the basis of each mother's maiden name (first and last) and exact date of birth, we successfully linked 267,604 (79%)

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infant birth records to maternal records. Failure to match usually arose from minor spelling errors in the mother and infant records. With respect to sibships only one infant from the 1989–1991 cohort was randomly chosen. After the linkage of maternal and infant birth certificates was complete, all identifying information on the individual mothers and their infants was removed.

Nativity status was defined by maternal grandmother nativity status. Maternal grandmothers were classified as generation 1, mothers (1956–1975 birth cohort) were classified as generation 2, and female infants (1989–1991 birth cohort) were classified as generation 3. Illinois birth certificates of generation 3 contained a detailed maternal ethnicity variable that included separate codes for Mexican. Birth certificates of generation 2 contained a maternal nativity variable. It was coded as Illinois, other United States, or remainder of the world. The generational distributions of maternal age and marital status were determined for the US-born descendants of US-born and Mexican-born women. Most birth certificates from the 1956–1975 birth cohort lacked information on maternal education, parity, and prenatal care.

We compared the birth-weight distribution curves, mean birth weight, and low birth weight (<2500 g, LBW) rates of generation 2 Mexican-American infants of generation 1 US-born and generation 2 infants of generation 1 Mexican-born women. As a first step toward exploring the possible contribution of intergenerational factors to the nativity disparity in pregnancy outcome, we compared the birth weight distribution curves of generation 2 and generation 3 Mexican-American female (ie, mothers and daughters) descendants of generation 1 US-born and Mexican-born women (ie, maternal grandmothers). Next, we calculated the mean birth weight and moderately low birth weight (1500–2499 g, MLBW) rates among generation 2 and generation 3 Mexican-American females. Lastly, we calculated the mean birth weight and MLBW rates in generation 2 and generation 3 females according to level of sociodemographic characteristics and maternal grandmother nativity status.

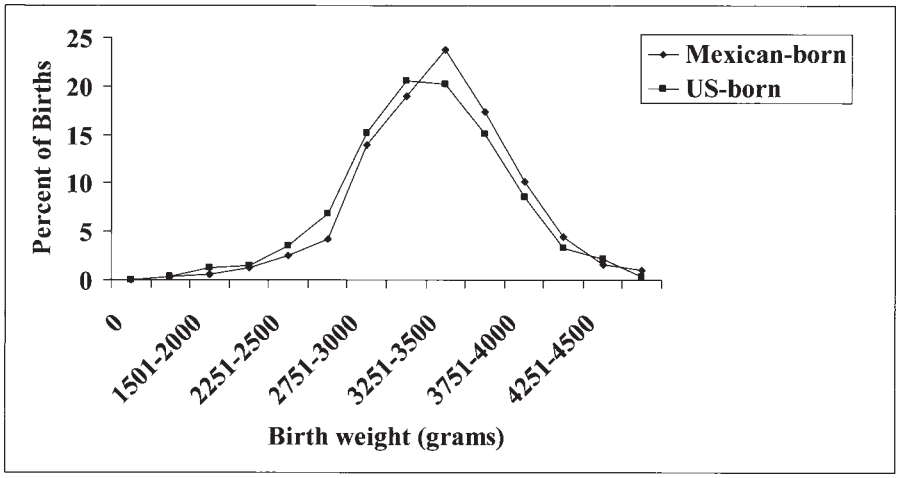

Fig 1. Distribution of birth weights among infants born to generation 1 Mexican-born and US-born women; Illinois, 1956–1975

The 95% confidence intervals (CI) for the relative risk (RR) were calculated by the Taylor series method.[10] Multiple linear regression analysis was used to evaluate the independent effects of maternal birth weight, age, and marital status on daughter's birth weights.[11]

RESULTS

Figure 1 confirms that generation 1 US-born Mexican-American women (n=3,974) had an infant (1956–1975, male and female) birth-weight distribution curve shifted toward the lower end of the scale as compared to generation 1 Mexican-born women (n=2,122). As expected, generation 1 US-born women had a mean infant birth weight 61 g less than that of generation 1 Mexican-born women, 3262 g vs 3323 g, respectively, P<.01. Similarly, generation 1 US-born Mexican-American women had an infant LBW rate of 6.6% compared to 4.6% for generation 1 Mexican-born women, RR=1.5 (95% CI 1.2–1.8).

Among the direct female descendants of generation 1 US-born Mexican-American women (n=1,940), the birth-weight distribution curve for generation 3 infants was equivalent to that of their generation 2 mothers. A similar trend occurred among the direct female descendants of generation 1 Mexican-born women (n=1,017) (data available on request).

Table 1 shows the distribution of young maternal age and unmarried marital status among the direct female descendants of generation 1 US-born Mexican-American and Mexican-born women. In both nativity (as defined by generation 1) cohorts, a greater proportion of infants were born to teenaged mothers among generation 3 (compared to generation 2) infants. Among the female descendants of generation 1 US-born Mexican-American women, generation 3 infants had a greater proportion of unmarried mothers than generation 2 infants.

Figure 2 shows the change in mean birth weight between the generation 3 and generation 2 female descendants of generation 1 US-born Mexican-American women. Generation 3 female infants had a mean birth weight equivalent to that of their generation 2 mothers (3294 g vs 3283 g); generation

Table 1. Distribution of maternal age and marital status in generation 2 and generation 3 females according to generation 1 nativity status, Illinois

Generation 1 (Maternal grandmothers)	Generation 2 (1956–1975 mothers)		Generation 3 (1989–1991 daughters)	
	Maternal age <20 years, % (*n*)	Unmarried marital status, % (*n*)	Maternal age <20 years, % (*n*)	Unmarried marital status, % (*n*)
US-born (*n*=1,940)	23 (437)	37 (714)	29* (545)	52* (1,012)
Mexican-born (*n*=1,017)	10 (99)	38 (382)	35* (359)	41 (412)

* *P*<.01 compares generation 3 with generation 2 according to generation 1 nativity status.

3 female infants born to teenaged women had a birth weight 70 g less than that of their generation 2 mothers who were born to teenaged mother (3178 g vs 3248 g, *P*<.01); and generation 3 infants with unmarried mothers had a birth weight 121 g less than that of generation 2 infants born to unmarried mothers (3163 g vs 3284 g, *P*<.01).

Figure 3 shows the change in mean birth weight between the generation 3 and generation 2 female descendants of generation 1 Mexican-born women. Generation 3 female infants had an overall birth weight 28 g less than that of their generation 2 mothers (3335 g vs 3363 g); generation 3 infants with teenaged mothers had a birth weight 108 g less than that of their generation 2 mothers who were themselves born to teenaged women (3264 g vs 3372 g, *P*<.01); and generation 3 infants of unmarried mothers had a birth weight 67 g less than that of their generation 2 mothers who were born to unmarried women (3260 g vs 3327 g, *P*<.01).

Table 2 shows MLBW rates among the direct female US-born descendants of generation 1 US-born and Mexican-born Mexican-American women. Among the descendants of both generation 1 nativity subgroups, the point estimates of MLBW for generation 3 (compared to generation 2) infants with teenaged mothers were 1.3 and 1.7, respectively; however, the 95% CI intervals were wide and included unity.

Maternal birth weight exerted effects on female infant's birth weights independent of maternal age and marital status (Table 3). Together they accounted for ≈5% and 7% of the birth weight variance among the granddaughters of US-born and Mexican-born women, respectively. A 100-g increase in maternal birth weight predicted a 20- to 21-g increase in female infant birth weight.

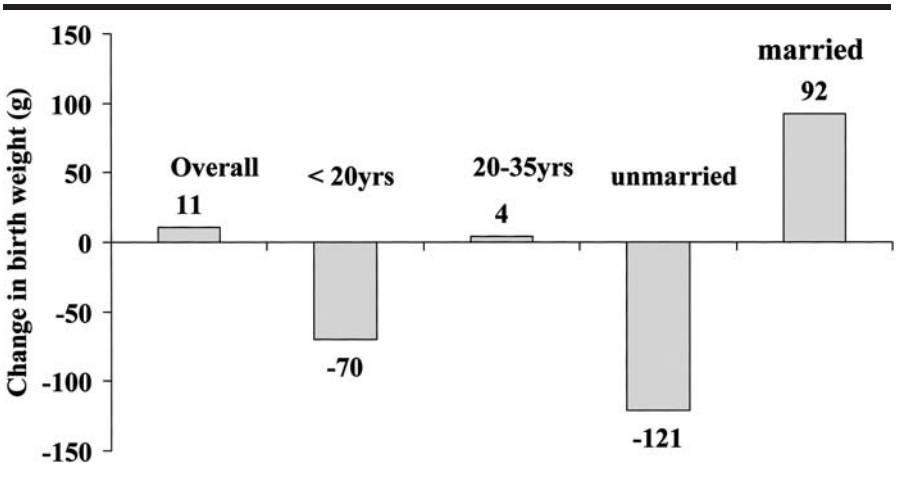

Fig 2. Change in mean birth weight between the generation 3 and generation 2 direct female descendants of generation 1 US-born Mexican-American women, Illinois, 1956–1975, 1989–1991

DISCUSSION

To our knowledge the present study is the first to examine the intergenerational birth weight pattern of Mexican Americans. In contrast to the phenomenon observed among the direct female descendants of generation 1 US-born and European-born White women in Illinois,[8] we found that an intergenerational rise in birth weight fails to occur among the descendants of US-born and Mexican-born Mexican-American women. Most striking, in both cohorts of Mexican Americans an intergenerational deterioration in birth weight occurs among the female descendants born to teenaged or unmarried women. The intergenerational trends in moderately low birth-weight rates tended to parallel that observed in mean birth weight. These exploratory findings provide evidence that unidentified intergenerational factors are detrimental to Mexican-American infant birth weight.

As expected, our data show that infants of Mexican-born women have a favorable birth-weight distribution compared to infants of US-born Mexican-American women.[2–4] Maternal acculturation to a US lifestyle is the major factor postulated to explain this phenomenon.[12–14] However, Balcazar et al noted that acculturation failed to fully explain the maternal nativity disparity in Mexican-American infant birth weight.[15] Our prior investigations sug-

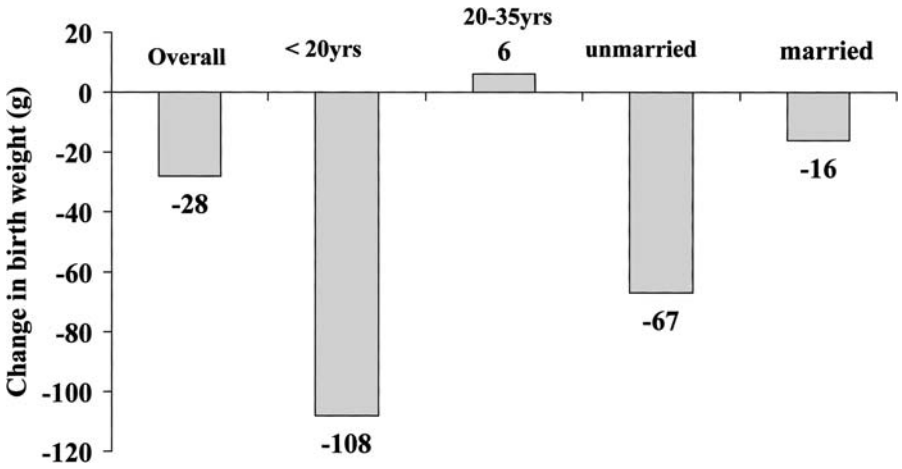

Fig 3. Change in mean birth weight between the generation 3 and generation 2 direct female descendants of generation 1 Mexican-born women, Illinois, 1956–1975, 1989–1991

gest that contextual factors related to maternal lifelong minority status negatively affect the birth weight of urban Mexican-American infants.[2,16]

Generation 2 Mexican-American women born to Mexican-born women are uniquely positioned to ascertain the relationship between maternal lifelong minority status and infant birth weight. If it did not play a major role in determining the reproductive outcome, the birth weight of generation 3 female Mexican-American infants should follow the same trend observed among generation 3 female White infants and show an upward shift from their generation 2 mothers.[8] We found that an intergenerational increase in birth weight does not occur among the direct, female descendants of Mexican-born women. Moreover, their birth-weight pattern more closely parallels that of the African-American descendants of African-born women.[8] Given the probable selective migration of relatively healthy foreign-born women and the improving birth weight of the direct, female descendants of European-born (but not Mexican-born and African-born) women, we speculate that unidentified intergenerational factors closely related to maternal lifelong minority status are deleterious to infant birth weight.

Among the US-born descendents of both Mexican-American female cohorts, the intergenerational (ie, mother-daughter) decline in mean birth weight is essentially confined to infants with teenaged or unmarried mothers. This finding may signal that women with high-risk sociodemographic characteristics are the most vulnerable to the social hardships of minority status. As such, Mexican-American women's loss of protective practices, experiences of interpersonal racial discrimination, and adoption of unhealthy behaviors of the majority population may be detrimental to their reproductive health.

. . . in both cohorts of Mexican-Americans an intergenerational deterioration in birth weight occurs among the female descendants born to teenaged or unmarried women.

The present study highlights the need for further research into the relationship between Mexican-American women's early-life (fetal, infant, and childhood) experiences and reproductive outcome. A limited literature supports the hypothesis that social and environmental hardships during the intrauterine environment of the female fetus are predictive of pregnancy outcome (as measured by infant birth weight) when that fetus becomes an adult.[5,17] Since race and ethnicity capture the social classification and residential environment of people in the US,[18–20] the intergenerational birth-weight pattern observed among the descendents of generation 1 Mexican-born women may partly reflect the adverse impact of generation 2 females (mothers) early-life exposure to unmeasured contextual factors (ie, neighborhood poverty) on generation 3 female infant's (daughters) birth weight. Alternatively, it may signal the contribution

Table 2. Moderately low birth-weight rates (1,500–2,499 g) among female infants according to maternal age and marital status and generation-1 nativity status

Generation 1 (maternal grandmothers)	Variable	Generation 2 (1956–1975 mothers)	Generation 3 (1989–1991 daughters)	
US-born (*n*=1,940)	Maternal Age	**per 100 (*n*)**		**RR (95% C1)**
	<20 years	6.6 (29)	8.6 (47)	1.3 (0.8–2.0)
	20–35 years	6.3 (97)	5.7 (78)	0.9 (0.7–1.2)
	Unmarried	6.2 (44)	7.6 (83)	1.2 (0.9–1.2)
	Married	6.8 (78)	4.6 (42)	0.7 (0.5–1.0)
Mexican-born (*n*=1,017)	Maternal Age			
	<20 years	3.0 (3)	5.0 (18)	1.7 (0.5–5.5)
	20–35 years	4.1 (38)	4.6 (30)	1.1 (0.7–1.8)
	Unmarried	4.7 (18)	4.6 (20)	1.0 (0.6–1.9)
	Married	3.7 (23)	4.6 (28)	1.2 (0.7–2.1)

Table 3. Results of multiple linear regression analysis according to generation-1 nativity status, Illinois

	US-born (Maternal Grandmothers)	Mexican-born (Maternal Grandmothers)
Adjusted R^2	.046	.067
Maternal birth weight (per 100)	+21 g ($P<.0001$)	+20 g ($P<.0001$)
Maternal age <20 years	−46 g (NS)	−70 g (NS)
Unmarried	−82 g ($P=.0019$)	−207 g ($P<.0001$)
Intercept	2,560 g	2,498 g

of paternal birth weight to infant birth weight.[9,21]

Our exploratory study has the same limitations as our earlier investigation of African Americans and non-Latino Whites.[8] First, infants for whom maternal matches were unsuccessful were more likely of low socioeconomic status and thus more prone to low birth weight.[9] This fact would not weaken the finding that an improvement in intergenerational birth weight does not occur among female descendants of Mexican-born women. However, it limits that conclusion somewhat in that it is based on observations confined to the less disadvantaged portion of the population. In addition, our transgenerational dataset contains no information on generation 2 females who did not survive or failed to give birth to a live infant; the birth weights for generation 3 infants are underestimated. Second, a geographically stable immigrant population, as evidence by the ability to perform a transgenerational linkage, may be a powerful independent predictor of pregnancy outcome. Thus, the present study may not be generalizable to a geographically unstable population of Mexican Americans. Third, we implicitly assumed that intergenerational deterioration in mean birth weight is a bad phenomenon. Further research is needed to determine the extent to which it actually increases mortality and morbidity risk. Fourth, because of the poor survival of infants weighing <1,500 g in the generation 2 cohort (1956–1975), we were unable to fully evaluate the effect of intergenerational factors on the very low birth weight tail of the birth-weight distribution curve. In addition, the improved survival of generation 2 infants (particularly those of LBW) born during the later part of the time period (ie, 1970s compared to 1950s) may have masked a positive trend. Reflecting the independent association of maternal and infant birth weight,[9] improved survival of generation 2 LBW females may contribute to the lack of a birth-weight increase in their generation 3 daughters. However, this fact seems unlikely to account for the disparate intergenerational birth weight patterns observed among the US-born descendents of Mexican-born compared to European-born women. Lastly, we had limited information on the sociodemographic and medical risk status for the generation 2 cohort. Intergenerational differences in maternal education, parity, and prenatal utilization may explain some of the observed intergenerational differences in birth weight.

In summary, an intergenerational rise in birth weight does not occur among the direct female descendants of US-born and Mexican-born Mexican-American women.

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