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Association Between the Birth of Twins and Parental Divorce

Anupam B. Jena, MD, PhD, Dana P. Goldman, PhD, and Geoffrey Joyce, PhD

OBJECTIVE: Mothers of multiple births face higher rates of postpartum depression, yet evidence on the marital consequences of multiple births is limited. We examined the association between twin births and parental divorce.

METHODS: We used the 1980 U.S. Census to identify a large sample of mothers with and without twin births. The goal was to estimate multivariate logistic models of the association between birth of twins and divorce adjusting for race, age at marriage and first birth, and college education. We examined whether the association was affected by maternal education, age and sex composition of twins, and family size.

RESULTS: Twins at first birth were associated with greater parental divorce compared with singletons (odds ratio, 1.08; 95% confidence interval, 1.01–1.16; absolute risk 13.7% with twins compared with 12.7%; $P=.02$). The association was statistically greater among mothers not attending college (14.9% with twins compared with 13.3%; $P=.01$) compared with those with some college (10.4% with twins compared with 10.5%; $P=.34$); those with children older than 8 years (15.6% with twins compared with 13.5%; $P<.01$) compared with younger children (10.6% with twins compared with 10.8%; $P=.42$); and those with at least one twin girl (13.8% with twins compared with 12.6%; $P=.03$) compared with twin boys (12.1% with twins compared with 12.5%, $P=.38$). Mothers with four or more children had a larger association between birth of twins and divorce (15.4% for mothers with twins at fourth birth compared with 11.3% for all other

mothers with four or more children; $P<.01$) compared with mothers with twins at first birth (13.7% for twins at first birth compared with 12.7%; $P=.02$).

CONCLUSION: Health consequences of twin births for children and mothers are well known. Twin births may be associated with longer-term parental divorce. Specific groups, namely mothers not completing college and mothers who already have more children, may be at higher risk.

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LEVEL OF EVIDENCE: II

The rate of multiple births in the United States increased dramatically in the last three decades, from 19.3 per 1,000 births in 1980 to 32.1 per 1,000 births in 2005.¹ Much of this recent increase can be attributed to the both the growing use of assisted reproductive technology (ART) in the last three decades as well as the delayed average age of child bearing.² Risks associated with multiple births include an increased risk of congenital anomalies, prematurity, and low birth weight.^{3–5} Multiple births have important medical and nonmedical consequences for mothers as well, including increased rates of postpartum depression, compared with mothers of singletons.⁶ Multiple births also reduce labor force participation by mothers,^{7–9} reduce educational spending toward siblings of children born in multiple births,⁹ and are associated with higher rates of divorce (although the timing of divorce and factors affecting the association have not been explored).^{9,10}

In light of these important socioeconomic consequences of multiple births, we more closely examined the association of naturally conceived twin births on one specific outcome: short- and long-term marital stability. Using the large sample size and span of time afforded by the U.S. Census, we identified mothers who had twin births and compared their short- and long-term divorce rates (defined as occurring before or after twins turned 8 years old) with mothers

From the Department of Medicine, Massachusetts General Hospital, Harvard Medical School, Wang Ambulatory Care Center, Boston, Massachusetts; and the Leonard D. Schaeffer Center for Health Policy and Economics, University of Southern California, Los Angeles, California.

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Corresponding author: Anupam B. Jena, MD, PhD, Department of Medicine, Massachusetts General Hospital, Harvard Medical School, Wang Ambulatory Care Center, 15 Parkman Street, Boston, MA 02114; e-mail: jena.anupam@mgm.harvard.edu.

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without twins. We also examined how this association was affected by college education of the mother, the sex composition of the twins, and the number of children a mother had before having twins.

METHODS

A natural difficulty of examining the association of twin births with any socioeconomic outcome is that the frequency of twin births is low. To ensure a sufficient number of observations on twin births, we used data from the A and B samples of the 1980 U.S. Census Public Use Microdata Sample, which constitutes a nearly 6% sample of the entire U.S. population in 1980. The A sample contains data representing 5% of the U.S. population and samples from all states and various subdivisions within them, including most counties with 100,000 or more inhabitants. The B sample contains data for an additional 1% of the population but, contrary to the A sample, samples households in metropolitan areas that are too small to be separately identified, that cross state boundaries, or both. Data included in the Public Use Microdata Sample are drawn from the Census questionnaire and include no additional information. Although Census data have primarily been used outside the field of medicine, they provide a unique opportunity to examine the marital consequences of twin births, a task that has been difficult to achieve in earlier medical studies as a result of limited sample sizes. The Census data are publicly available and deidentified and therefore were exempt from review by the institutional review board of the corresponding author's institution.

The Census samples households, and the Public Use Microdata Sample data are organized such that each record in the data identifies an individual in a particular household, their relationship to the head of the household, and a number of demographic and socioeconomic variables pertinent to them. Because we were primarily interested in the association of twin births with divorce, we restricted our data to include only those women who reported ever being married, who at the time of the Census were living with all children they ever reported having delivered, and who had at least one child, the oldest of whom was younger than 18 years.

We identified twin births as children in a household sharing the same year and quarter of birth following established methods.⁸⁻¹⁰ We limited our attention to twin births because triplets and beyond occurred at a substantially lower frequency. Twins conceived in this sample predate the introduction of ART (1978) and were therefore a result of natural conception. Despite its age and arguable applicability

to recent secular trends in divorce, the 1980 Census was the last to record both the year and quarter of birth of each child and was therefore the last Census to permit identification of such a large sample of couples giving birth to twins. Although restricting the sample to women with all children living at home would omit divorced women with child custody awarded to the father, the restriction was not only necessary to correctly identify twins, but is unlikely to be important given the majority of child custody is awarded to the mother.

Our primary outcome of interest was divorce. Because the Census details the relationships between each member of a household, eg, if they are biologically related or not, we were able to identify those mothers who divorced after conceiving twins by whether they reported ever being divorced and did not have the biological father living in the household. When both conditions were met, a female was considered to have divorced some time after conceiving twins.

We estimated multivariate logistic models of the probability of divorce with our baseline model comparing mothers with twins at first birth with a control group of mothers without twins at first birth. Following established methods, we focused on first births because all couples choosing to have children must start with the first birth, whereas those choosing to have more than one child may have unobserved characteristics that, even after adjusting for number of children, are correlated with the likelihood of divorce.^{8,9} We adjusted for mother's age at marriage (linear), age at first birth (linear), a categorical indicator variable for whether the mother had any college education, and a categorical indicator variable for whether the mother was white. Importantly, although the Census collects detailed information on work status and income, these variables are measured at the time of the survey and may not reflect the socioeconomic condition of the mother at the time of divorce⁸; we therefore did not consider these variables as independent variables in our final analyses, although our results were invariant to their inclusion. Finally, because the Census sampled mothers at a given point in time, mothers who had earlier ages at first marriage would have higher likelihoods of being divorced at the time of Census sampling. We therefore included as a covariate the number of years elapsed from the age at marriage to the age at Census survey date.

In addition to our baseline model, we examined whether maternal education (college education or not), age of twins (younger or older than 8 years), and sex of twins (at least one girl compared with male



Table 1. Characteristics of Mothers With and Without Twins, U.S. Census Data, 1980

Variable	Mothers Without Twins (n=835,218)	Mothers of Twins (n=13,595)	Mothers of Twins at First Birth (n=6,224)
No. of children	2.0±0.9	3.2±1.1	2.7±1.0
Age at first birth (y)	23.3±4.3	23.3±4.2	24.1±4.2
Age at first marriage (y)	20.3±3.4	20.4±3.5	20.9±3.5
White (%)	90.4±29.8	88.1±32.4	88.5±32.5
Any college education (%)	35.6±17.9	35.6±17.8	38.2±18.1
Divorced (%)	12.6±3.3	13.1±3.3	13.2±3.3

Data are mean±standard deviation.

twins) modified the estimated association between twins at first birth and divorce. For each effect modification, we estimated a separate multivariate logistic model in which twins at first birth was interacted with the effect-modifying variable of interest. Each model adjusted for maternal age at first marriage, age at first birth, and indicators for any college attendance and being white. We also analyzed whether family size (defined as one, two, three, or four or more children before birth of twins) modified the association between birth of twins and divorce. We estimated a multivariate logistic model with the same set of controls as well as interactions between birth of twins at each order and indicator terms for family size at the time of twin birth.

STATA 10 was used for statistical analyses and the 95% confidence interval (CI) around reported odds ratios (ORs) reflects .025 in each tail or $P \leq .05$.

RESULTS

Our sample selection resulted in 841,442 women with at least one birth, 13,824 of which had twin births at any point in the birth order. Among mothers with twins, 6,224 had twins at first birth, 4,967 at second birth, 2,064 at third birth, and 607 at fourth birth. These figures result in a probability of twins at first birth of roughly 0.0074, very close to estimates from the 1965 and 1973 National Survey of Family Growth.⁷ Within all twin births, 35% were comprised of two boys, 36% with two girls, and the remainder with one boy and one girl.

Demographics of mothers with twins at any birth, twins at first birth, and those without twins were comparable (Table 1). Mothers with twins had similar ages at first birth and marriage, were equally likely to have at least some college education, and were slightly less likely to be white compared with mothers without twins. Mothers with twins at first birth had, on average, 0.7 more children than those without; the difference was not equal to one because mothers with singletons at first birth were more likely to have

additional children before the date of Census survey than mothers with twins. Although couples with twins (at any birth and first birth) had slightly higher rates of divorce, this difference was not statistically significant using chi square testing at $P < .05$.

Maternal age at first birth and race are known to affect the probability of twinning and may confound the unadjusted association (or lack thereof) between the birth of twins and divorce. African American women and those delaying first birth are more likely to give birth to twins.¹¹ To account for potential confounding, we estimated multivariate logistic models of the association between birth of twins and subsequent divorce (Table 2). Compared with mothers without twins at first birth, mothers with twins had higher rates of divorce (OR 1.08; 95% CI 1.01–1.16; predicted absolute risk 13.7% compared with 12.7%; $P = .02$). Women who had children later, married later, had at least some college education, and were white were also less likely to divorce.

Several variables modified the association between twins at first birth and divorce (Table 3). Adjusting for age at marriage, age at first birth, and an indicator for being white, the association between twins at first birth and divorce was statistically greater

Table 2. Adjusted Odds Ratios of the Association Between Birth of Twins at First Birth and Divorce, U.S. Census Data, 1980

Variable	Divorce*
No. of observations	841,442
Twins at first birth	1.08 (1.01–1.16)
Age at first birth	0.93 (0.93–0.93)
Age at marriage	0.99 (0.99–0.99)
Any college education	0.93 (0.91–0.94)
White	0.38 (0.37–0.39)

Data are odds ratio (95% confidence interval) unless otherwise specified.

* Odds ratios are adjusted for age of mother at first birth, age at marriage, and indicators for college attendance and being white.



Table 3. Multivariable Logistic Models Showing Effect of Mother's Education, Age of Twins, and Sex of Twins on Adjusted Odds Ratios of Association Between Twin Births and Divorce, U.S. Census Data, 1980

Variable	Divorce	P*
No. of observations	841,442	
Mother completed more than 1 y of college		
Yes	0.99 (0.94–1.04)	.04
No	1.12 (1.04–1.20)	
Age of twins at time of survey (y)		
Younger than 8	0.95 (0.84–1.07)	<.01
8 or older	1.15 (1.05–1.24)	
Sex of twins		
Two boys	0.96 (0.84–1.08)	.02
At least one girl	1.15 (1.07–1.25)	

Data are odds ratio (95% confidence interval) unless otherwise specified.

* Reported *P* values reflect two-sided tests of equivalence of odds ratio of divorce associated with twin births when comparing groups (eg, mothers completing at least one year of college with mothers not). All models adjusted for age of mother at first birth, age at marriage, and an indicator for being white.

(*P*=.04) among mothers without any college education (OR 1.12; 95% CI 1.04–1.20; absolute risk 14.9% with twins compared with 13.3%; *P*=.01) compared with mothers with at least some college (OR 0.99; 95% CI 0.94–1.04; absolute risk 10.4% with twins compared with 10.5%; *P*=.34). Birth of twins was also associated with divorce only when twins were between the ages of 8 and 18 (Table 3). Adjusting for the same covariates, the association between twins at first birth and divorce was statistically larger (*P*<.01) when twins were older than 8 years (OR 1.15, 95% CI 1.05–1.24; absolute risk 15.6% with twins compared with 13.5%; *P*<.01) compared with

younger (OR 0.95; 95% CI 0.84–1.07; absolute risk 10.6% with twins compared with 10.8%, *P*=.42). Twins at first birth were associated with divorce when couples had at least one twin girl (OR 1.15; 95% CI 1.07–1.25; absolute risk 13.8% with twins compared with 12.6%; *P*=.03); this association was statistically greater (*P*=.02) than among couples with twin boys, who exhibited no statistically significant difference in divorce when compared with mothers without twin births (OR 0.96; 95% CI 0.84–1.08; absolute risk 12.1% with twins compared with 12.5%; *P*=.38).

Adjusting for age at marriage, age at first birth, and indicators for college attendance and being white, family size before birth of twins had mixed effects on the association between birth of twins and divorce (Table 4). Couples giving birth to twins at first through third births had higher rates of divorce when compared with mothers delivering singletons at the respective birth, but these associations were not statistically significant from one another. For example, adjusted rates of divorce associated with twins at second and third birth were 1.11 (95% CI 1.03–1.23; absolute risk 11.9% with twins compared with 10.7%) and 1.12 (95% CI 1.01–1.25; absolute risk 11.5% with twins compared with 10.3%), respectively. Twins at fourth birth, however, were associated with divorce rates (OR 1.36; 95% CI 1.08–1.65; absolute risk 15.4% with twins compared with 11.3%; *P*<.01) that were statistically greater than estimated associations for twins at first through third births (*P*=.04).

DISCUSSION

Using large samples from the 1980 U.S. Census, we found that birth of twins was associated with divorce. The size of the association was largest among mothers without any college education, those with twins older than 8, and those with at least one twin girl. Couples

Table 4. Multivariable Logistic Model Showing Effect of Family Size at the Time of Twin Birth on Adjusted Odds Ratio of Association Between Birth of Twins and Divorce, U.S. Census Data, 1980*

Position of Twins in Birth Order	Odds Ratio of Divorce (95% CI)	Effect of Twins on Divorce at First Through Third Births Compared With Twins at Fourth Birth (<i>P</i>)
No. of observations	841,442	
First birth	1.14 (1.06–1.22)	.04
Second birth	1.11 (1.03–1.23)	.04
Third birth	1.12 (1.01–1.25)	.04
Fourth birth	1.36 (1.08–1.65)	

CI, confidence interval.

* Adjusted for age of mother at first birth, age at marriage, and indicators for college attendance and being white. Reported *P* values reflect comparisons of odds ratios of divorce among mothers with twins at fourth birth compared with mothers with twins at first through third births.



with four or more children before having twins had a significantly larger association between twins and divorce than couples with twins earlier in the birth order.

Although the nature of the Census data allowed us to evaluate the potential effect on marital stability of a relatively rare event—the incidence of twin births—it cannot inform us as to why the observed association occurs. Most couples experience some disruption in their relationship when they have a first child and these effects may be exacerbated by twin births. It is perhaps not surprising, then, that prior studies find that a first child substantially increases parental well-being, whereas additional children beyond the first child can have a negative effect on the subjective well-being of the mother.^{12,13}

One might speculate that the financial, emotional, and time costs of simultaneously added children may play a large role, particularly among families with large numbers of children already. This is certainly plausible given evidence that postpartum depression rises in mothers conceiving multiple births.⁶ Our results specifically suggest that the potential effect of twins on divorce may, in fact, be greatest in the longer term, when children are older. This is important because most prior studies have focused on outcomes immediately postpartum or during the first year after birth. Twin births may have only long-term effects on divorce if parents delay divorce out of fear of harming their young children or if the stresses associated with having an additional child rise with age.

Our results on the importance of sex composition directly relate to findings by others that child sex affects the marital stability of a significant number of American families.¹⁴ In the United States, for example, parents with first-born daughters are significantly more likely to end up divorced.¹⁴ Divorcing fathers are also more likely to seek custody of sons than daughters.¹⁴ Postulated mechanisms include sex preference by parents; a belief that sons will be more negatively affected by divorce than daughters; and greater monetary, psychological, or time costs of raising daughters compared with sons.¹⁴ Indeed, there is evidence that fathers play a greater role in child development for sons and that divorce has greater psychological effects on boys than girls.¹⁵ The average annual monetary cost of raising daughters also exceeds the cost of raising boys by nearly \$1,000.¹⁶ Our finding that divorces tend to occur later in marriage may speak to the fact that sex differences between children become more important as children grow older.

Our findings have several implications. Although much is known about the clinical consequences of

twin births, limitations of data have prohibited a full understanding of some of the longer-term social consequences. Clinicians involved in the care of families conceiving twins may benefit from knowledge of the long-term marital consequences of these births. In this sense, our recommendations closely mirror those by Choi et al.⁶ who argue that mothers of multiple births be more carefully monitored for postpartum depression. Our results also indicate that noncollege-educated mothers may be more likely to divorce after conceiving twins, suggesting that counseling and monitoring for lower educated mothers may be warranted. Similarly, mothers with large families already may benefit from additional counseling when conceiving twins.

Our study has several important limitations. First, the Census data represent the divorce experiences of women more than three decades ago. Secular trends affecting divorce may affect the association between twins and divorce among mothers today. Survey limitations on censuses subsequent to the 1980 Census prohibited us from identifying a more contemporary cohort of mothers with twins. The age of the data also limits our ability to understand the experiences of women with twins arising from ART, a technology that became widely used years after the survey date. Because women conceiving through ART may be different than those who conceive multiples spontaneously, our results cannot be directly extrapolated to multiples from ART pregnancies. Second, the estimated association between twins and divorce is small and may reflect residual confounding, even after adjusting for race and maternal age. A third limitation of our analysis is potential mismeasurement of twins, divorce, and other variables occurring at or before the time of divorce. For example, mothers who divorced but had child custody awarded to the father were unable to be included in our analysis. Maternal education, as asked at the time of the survey, may also not reflect education at the time of divorce if women went back to school after the divorce. Despite these limitations, it is important for physicians to be cognizant of the potential long-term effects of these births for families.

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