

Impact of Maternal Nativity on the Prevalence of Diabetes During Pregnancy Among U.S. Ethnic Groups

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OBJECTIVE — This study examines the impact of maternal nativity (birthplace) on the overall prevalence of diabetes during pregnancy and among 15 racial and ethnic groups in the U.S.

RESEARCH DESIGN AND METHODS — Birth certificate data for all resident single live births in the U.S. from 1994 to 1996 were used to calculate reported diabetes prevalence during pregnancy and to assess the impact of maternal birthplace outside of the 50 states and Washington, DC, on the risk of diabetes before and after adjustment for differences in maternal age, other sociodemographic characteristics, and late or no initiation of prenatal care overall and for each racial and ethnic group.

RESULTS — Mothers born outside of the U.S. are significantly more likely to have diabetes during pregnancy. The impact of maternal nativity on diabetes prevalence is largely explained by the older childbearing age of immigrant mothers. However, adjusted diabetes risk remains elevated for Asian-Indian, non-Hispanic black, Filipino, Puerto Rican, and Central and South American mothers who were born outside the U.S. Conversely, birthplace outside the U.S. significantly reduces diabetes risk for Japanese, Mexican, and Native American women.

CONCLUSIONS — Identification, treatment, and follow-up of immigrant mothers with diabetes during pregnancy may require special attention to language and sociocultural barriers to effective care. Systematic surveillance of the prevalence and impact of diabetes during pregnancy for immigrant and nonimmigrant women, particularly in racial and ethnic minority groups, and more detailed studies on the impact of acculturation on diabetes may increase understanding of the epidemiology of diabetes during pregnancy in our increasingly diverse society.

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The prevalence of type 2 diabetes among women of childbearing age is elevated in many immigrant and native populations undergoing lifestyle changes associated with urbanization and modernization (1–4). Studies from Great Britain and Australia have observed that diabetes during pregnancy is more common among immigrant women, particularly if those women are members of racial or ethnic minority groups (5,6). In the U.S.,

women born outside the 50 states and Washington, DC, account for >40% of births to minority mothers compared with 5% of non-Hispanic white mothers (7). A study conducted in a New York City medical center during the 1980s reported that Hispanic women born in Puerto Rico or outside the 50 states and Washington, DC, had a higher incidence of gestational diabetes compared with those born in the continental U.S. (8). However, the possible

impact of birthplace (nativity) on diabetes prevalence during pregnancy for other racial and ethnic groups, or for U.S. residents overall, has not been systematically analyzed. This study examines the impact of nativity on the prevalence of diabetes during pregnancy among 15 racial and ethnic groups in the U.S. from 1994 to 1996.

RESEARCH DESIGN AND METHODS — The U.S. birth certificate files of the National Center for Health Statistics offer the only systematic means of estimating the national prevalence of diabetes during pregnancy by maternal race and ethnicity, nativity, and several other characteristics potentially associated with diabetes risk (9,10). Since 1989, maternal diabetes during pregnancy has been reported by including a checklist on the birth certificate titled “medical risk factors for this pregnancy” (10). Type of diabetes (e.g., pregestational [type 1 or type 2 diabetes diagnosed before pregnancy] or gestational diabetes) is not reported in the national file. Gestational diabetes, which is carbohydrate intolerance with first onset or recognition during pregnancy, accounts for the vast majority of cases of diabetes during pregnancy (11,12). All single live births to U.S. residents during 1994–1996 were selected for analysis. Data for the 3-year period were combined to improve the stability of racial and ethnic group-specific analyses. The mother’s birthplace was not reported in 0.2% of the records. After excluding 1.3% of records with missing values for whether diabetes was a medical risk factor for the pregnancy, 10,854,224 records were included in the analyses of diabetes prevalence.

Maternal nativity was categorized according to maternal birthplace inside or outside of the 50 states and Washington, DC. (Hereafter, for brevity, birthplace inside the 50 states and Washington, DC, will be referred to as “inside the states,” and birthplace outside the 50 states and Washington, DC, will be referred to as “outside the states” or “elsewhere.”) Racial and ethnic categories are based on maternal self-report. These categories include non-Hispanic white, non-Hispanic black,

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A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

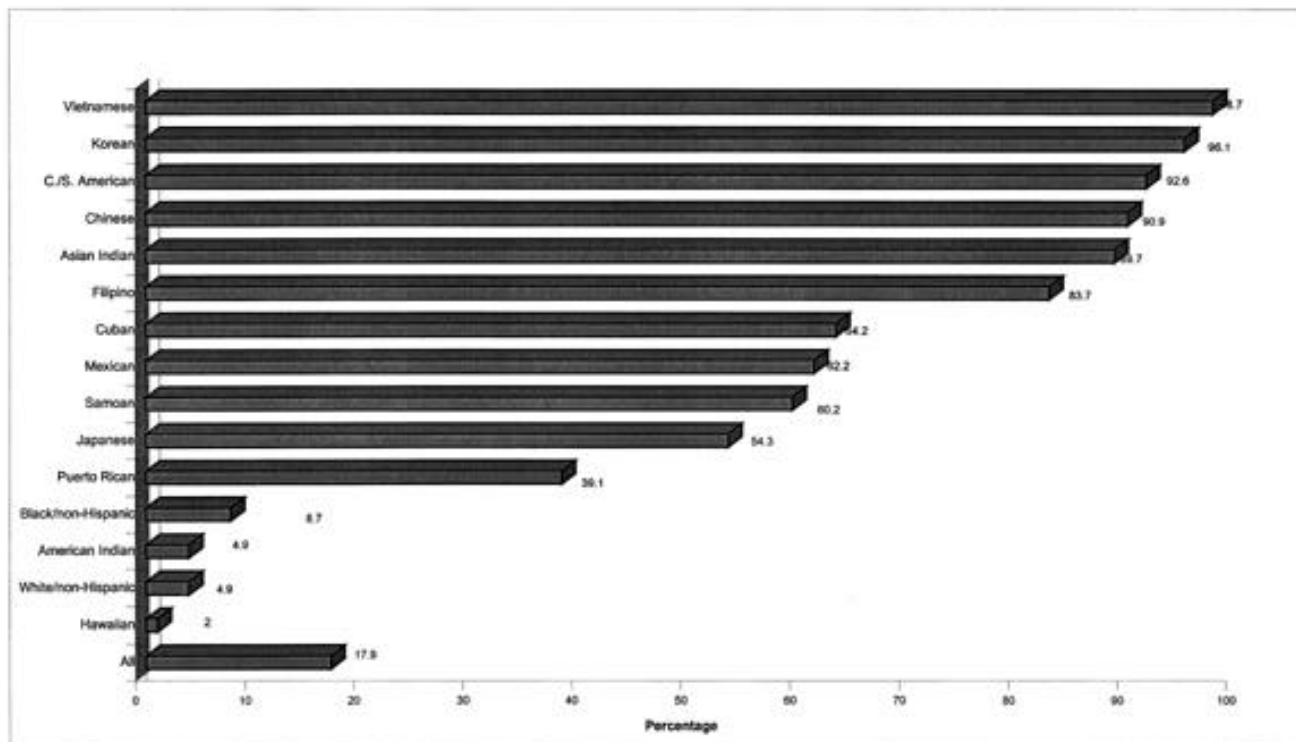


Figure 1—Percentage of mothers born outside the 50 states and Washington, DC (U.S. resident single, live births during 1994–1996).

Mexican, Puerto Rican, Cuban, Central and South American, Native American, Hawaiian, Samoan, Filipino, Asian-Indian, Chinese, Japanese, Korean, and Vietnamese. Data for births to Asian-Indian, Korean, Vietnamese, and Samoan mothers were available from a seven-state reporting area (California, Hawaii, Washington, Texas, Illinois, New Jersey, and New York) for 1994–1995 (13). Minnesota was added in 1996. Most of the U.S. population of each of these four groups resides in these states.

The proportion of births to U.S. resident mothers whose birthplace was outside the states was calculated for each racial or ethnic group. The proportion of mothers for whom diabetes during pregnancy was reported was calculated overall and by nativity status for each group. Several maternal characteristics (e.g., age, parity, years of education, marital status, and prenatal care use) that have been associated with diabetes risk and with the likelihood of screening and reporting of maternal diabetes are available from the national natality files (3–17). Because mothers who entered prenatal care late in pregnancy or received no prenatal care may have been less likely to have diabetes identified, the proportion of mothers who entered prenatal care in the eighth or ninth month of pregnancy (i.e.,

late care) or who received no prenatal care was used as a proxy measure of inadequate or no screening for diabetes (7,8). The proportion of women who were ≥ 25 years of age, were multiparous, had < 16 years of education, were married, and had late or no prenatal care were examined by maternal nativity status for each racial and ethnic group. Because young women have had less time than older women to complete 16 years of education or to become multiparous, only those ≥ 25 years of age were included in those categories.

Logistical regression analysis was used to estimate the crude risk of diabetes during pregnancy associated with maternal birthplace outside the states for the study population as a whole. Multiple logistical regression was used to analyze this risk after adjusting for age ≥ 25 years and then after adding late or no prenatal care, multiparity, < 16 years of education, married, and racial or ethnic group to the model. Separate models were also created for each racial and ethnic group by following the same pattern of analysis and adjusting for the same covariates, with the exception of race and ethnicity. The parameters in the logistic models were estimated by the maximum likelihood method. Adjusted odds ratios and 95% CIs were calculated from the logistical analyses.

RESULTS— The proportion of mothers whose birthplace was outside the states ranged from 98.7% of Vietnamese mothers to 2.0% of Hawaiian mothers (17.9% for the study population overall) (Fig. 1). The vast majority of non-Hispanic white, non-Hispanic black, Puerto Rican, Native American, and Hawaiian mothers were born inside the states. Most Vietnamese, Korean, Chinese, Japanese, Filipino, Asian-Indian, and Samoan mothers were born outside the states, as were most Mexican, Cuban, and Central and South American mothers.

Maternal diabetes was reported in 2.52% of U.S. pregnancies that ended in a single live birth during 1994–1996, including 2.46% of mothers born inside the states compared with 2.79% of mothers born elsewhere (Table 1). For 10 of the 15 racial and ethnic groups, mothers born outside the states had a greater prevalence of diabetes than mothers born inside the states. The highest diabetes prevalence was reported among Asian-Indian mothers born outside the states (6.49%), followed by Native American mothers born inside the states (4.45%) and Native American (4.25%), Filipino (4.24%), and Chinese mothers (4.04%) born elsewhere.

Mothers born outside the states were more likely to be at least 25 years of age versus their counterparts who were born

Table 1—Percentage of mothers with diabetes during pregnancy by nativity status* among racial and ethnic groups (U.S. resident single live births, 1994–1996)

Race/ethnicity	Number of births	All	Inside states	Outside states
All	10,854,224	2.52	2.46	2.79
Non-Hispanic white	6,877,668	2.52	2.51	2.69
Non-Hispanic black	1,705,672	2.33	2.17	3.99
Mexican	1,377,291	2.29	2.30	2.28
Central and South American	277,224	2.58	1.71	2.65
Puerto Rican	158,097	3.23	2.94	3.68
Native American	107,536	4.44	4.45	4.25
Filipino	89,766	3.99	2.67	4.24
Chinese	79,941	4.02	3.87	4.04
Asian-Indian†	37,292	6.23	3.93	6.49
Cuban	35,821	2.36	2.11	2.50
Vietnamese†	35,039	2.49	1.77	2.50
Japanese	36,056	2.51	3.27	1.87
Korean†	24,702	2.09	2.17	2.09
Hawaiian	17,076	2.93	2.94	2.59
Samoan†	4,743	2.61	1.69	3.23

*Born inside versus outside the 50 states and Washington, DC. †Data are available for seven states for 1994–1995 and for eight states for 1996.

inside the states, regardless of racial and ethnic group, with the greatest discrepancies evident for non-Hispanic black, Filipino, Vietnamese, Central and South American, and Korean mothers (Table 2). Mexican mothers born outside the states were much more likely to have late or no prenatal care than their counterparts born inside the states, whereas the reverse was

true for Vietnamese mothers. The data for this group of Vietnamese mothers may be unstable due to the small number of women ($n = 27$) in that category. Among women ≥ 25 years of age, Native American and Filipino mothers born inside the states were much more likely to have < 16 years of education than their counterparts born elsewhere. Chinese, Cuban, Vietnamese,

and Japanese mothers born outside the states had substantially lower educational levels than mothers in the same racial and ethnic groups born inside the states. Parity differences among mothers ≥ 25 years of age were greatest among Central and South American mothers (those born outside the states were more likely to be multiparous) and Native American mothers (those born inside the states were more likely to be multiparous). Mothers born inside the states were less likely to be married than mothers born elsewhere, regardless of race or ethnicity, with the greatest nativity differences evident for non-Hispanic black, Filipino, Vietnamese, and Korean mothers.

When the odds of diabetes were examined without adjustment for sociodemographic characteristics and prenatal care initiation, mothers born outside the states were 6% more likely to have diabetes reported during their pregnancies than mothers born inside the states (Table 3). Adjusting for differences in maternal age by nativity status reduced the odds of having diabetes for mothers born outside the states to 3%. Only a 1% increased risk of diabetes associated with birthplace outside the states remained after adjusting for the remaining sociodemographic variables, prenatal care initiation, and race or ethnicity.

The unadjusted odds of diabetes during pregnancy associated with birthplace

Table 2—Percentage of selected maternal characteristics among racial and ethnic groups by nativity status* (U.S. resident single live births, 1994–1996)

Race/ethnicity	Age ≥ 25 years		Late/no prenatal care†		Education < 16 years‡		Multiparous‡		Married	
	Inside states	Outside states	Inside states	Outside states	Inside states	Outside states	Inside states	Outside states	Inside states	Outside states
All	60.8	66.2	2.3	4.0	65.0	75.4	67.8	70.4	67.0	70.0
Non-Hispanic white	67.2	78.4	1.4	2.3	61.4	57.3	65.9	62.8	78.3	86.2
Non-Hispanic black	43.2	73.4	5.1	4.0	82.0	72.0	76.9	69.4	27.4	54.3
Mexican	40.1	54.4	3.5	5.7	85.9	93.8	77.4	80.9	54.4	65.1
Central and South American	42.8	66.4	2.3	3.6	64.5	84.1	60.1	71.8	52.9	55.5
Puerto Rican	40.1	54.4	3.5	3.5	83.6	78.8	73.5	75.9	37.4	43.1
Native American	45.8	66.1	5.7	4.8	88.5	61.9	83.8	64.3	41.5	70.2
Filipino	51.8	81.8	2.1	2.1	63.9	51.6	63.4	62.0	63.0	84.3
Chinese	88.1	92.4	1.1	1.6	25.1	49.9	52.0	51.1	85.8	92.5
Asian-Indian§	78.4	82.8	2.8	3.0	44.1	48.3	56.3	58.1	83.7	88.0
Cuban	63.2	77.9	1.1	1.0	56.5	70.1	59.0	56.5	75.4	76.5
Vietnamese§	32.1	76.1	5.9	2.2	41.4	76.7	55.2	60.7	57.6	83.4
Japanese	85.2	91.9	1.0	1.5	40.6	54.7	55.8	49.5	83.4	93.3
Korean§	59.9	91.0	2.3	2.3	40.4	49.5	51.5	55.9	66.8	94.0
Hawaiian	50.7	54.1	2.9	4.1	81.9	77.0	77.6	79.8	50.5	58.1
Samoan§	43.1	64.9	6.2	6.2	92.4	91.3	81.9	83.6	54.4	63.9

*Born inside versus outside the 50 states and Washington, DC. †Prenatal care initiated after 7 months or not at all. ‡Women ≥ 25 years of age. §Data are available for seven states for 1994–1995 and for eight states for 1996.

Table 3—Crude and adjusted odds for diabetes during pregnancy associated with maternal birthplace outside of the 50 states and Washington, DC, among racial and ethnic groups (U.S. resident single live births, 1994–1996)

Race/ethnicity	Crude odds	Adjusted (age only) odds*	Adjusted odds†
All	1.06 (1.06–1.07)	1.03 (1.02–1.03)	1.01 (1.01–1.02)
Non-Hispanic white	1.03 (1.02–1.04)	1.00 (0.99–1.01)	1.00 (0.99–1.02)
Non-Hispanic black	1.36 (1.34–1.38)	1.17 (1.15–1.18)	1.14 (1.12–1.16)
Mexican	0.99 (0.98–1.00)	0.91 (0.90–0.92)	0.91 (0.90–0.92)
Central and South American	1.24 (1.17–1.31)	1.09 (1.03–1.16)	1.07 (1.01–1.13)
Puerto Rican	1.12 (1.09–1.15)	1.07 (1.04–1.10)	1.07 (1.04–1.10)
Native American	0.98 (0.90–1.06)	0.87 (0.81–0.95)	0.89 (0.82–0.96)
Filipino	1.27 (1.20–1.34)	1.11 (1.05–1.17)	1.09 (1.03–1.16)
Chinese	1.01 (0.95–1.08)	1.00 (0.94–1.06)	1.02 (0.95–1.08)
Asian-Indian‡	1.29 (1.19–1.41)	1.27 (1.17–1.39)	1.27 (1.17–1.39)
Cuban	1.10 (1.02–1.18)	1.03 (0.96–1.11)	1.02 (0.95–1.10)
Vietnamese‡	1.74 (0.99–3.08)	1.19 (0.67–2.12)	1.19 (0.67–2.10)
Japanese	0.75 (0.69–0.82)	0.74 (0.69–0.81)	0.74 (0.69–0.81)
Korean‡	0.95 (0.76–1.19)	0.87 (0.67–1.09)	0.90 (0.71–1.14)
Hawaiian	0.77 (0.51–1.15)	0.76 (0.51–1.14)	0.76 (0.50–1.15)
Samoan‡	1.38 (1.12–1.70)	1.23 (1.00–1.52)	1.23 (1.00–1.52)

Data are odds ratios (95% CI). *Adjusted for age ≥25 years. †Adjusted for age ≥25 years, prenatal care initiated after 7 months or not at all, <16 years of education, married, multiparous; model for all mothers also adjusts for ethnicity. ‡Data are available for seven states for 1994–1995 and for eight states for 1996.

outside the states were greatest among non-Hispanic black, Filipino, Asian-Indian, Vietnamese, and Samoan women. Central and South American, Puerto Rican, Cuban, and non-Hispanic white mothers born outside the states were also significantly more likely to have diabetes during pregnancy than their counterparts born inside the states. Conversely, Japanese mothers born outside the states were 25% less likely to have diabetes during pregnancy than those born inside the states. Birthplace outside the states was not a significant protective factor for any other racial or ethnic group in the unadjusted analysis.

Adjustment for differences in maternal age between mothers born inside the states versus elsewhere reduced the association between nativity and diabetes during pregnancy substantially in most racial and ethnic groups. However, the increased odds of diabetes for immigrant Asian-Indian mothers were almost unaffected by age adjustment. Adjustment also had little impact on the reduced prevalence of diabetes among immigrant Japanese mothers. Birthplace outside the states became a significant protective factor (i.e., reducing the risk of diabetes) among Mexican and Native American mothers after adjusting for maternal age. Adjusting for the older age of immigrant Samoan mothers substantially reduced the discrepancy in the risk of diabetes during

pregnancy between them and their counterparts who were born inside the states. Although immigrant Samoan mothers were 23% more likely to have diabetes, these results were no longer statistically significant. There was a trend toward a protective effect of birthplace outside the states among Vietnamese, Korean, and Hawaiian mothers, but these results were not statistically significant, possibly due to small numbers of

women in these groups. After age adjustment, the slightly increased risk of diabetes associated with birth outside the states in the unadjusted data became insignificant among non-Hispanic white and Cuban women. Nativity did not have a significant impact on either crude or age-adjusted diabetes prevalence among Chinese mothers.

Additional adjustment for differences by nativity in prenatal care initiation, parity, education, and marital status showed little further effect of nativity on the risk of diabetes. Among groups in which nativity remained a significant factor after adjustment, the increased risk of diabetes associated with birthplace outside the states was 7% for Central and South American and Puerto Rican mothers, 9% for Filipino mothers, 14% for non-Hispanic black mothers, and 27% for Asian-Indian mothers. The decreased risk of diabetes associated with birthplace outside the states was 26% for Japanese mothers, 11% for Native American mothers, and 9% for Mexican mothers (Fig. 2).

CONCLUSIONS — Mothers born outside the 50 states and Washington, DC, are significantly more likely to have pregnancies complicated by diabetes. The impact of maternal nativity on the reported prevalence of diabetes during pregnancy in the U.S. is largely explained by the older age at childbearing among mothers born outside the states. However, nativity is associated with significant differences in diabetes prevalence among mothers from several

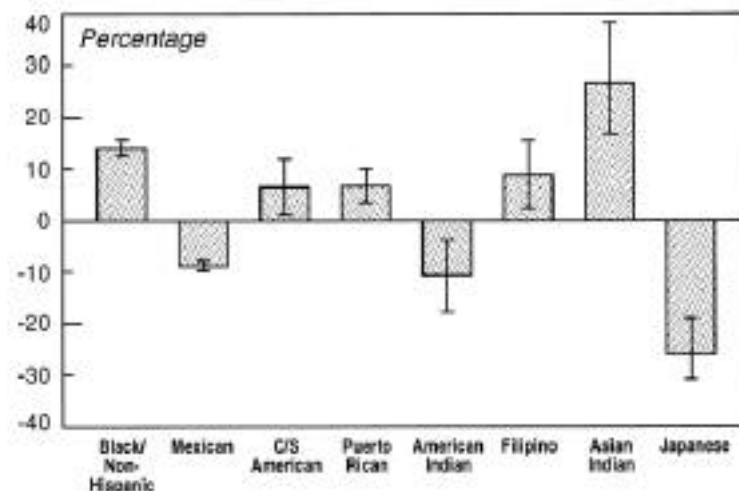


Figure 2—Adjusted risk* for diabetes during pregnancy associated with birthplace outside of the 50 states and Washington, DC (U.S. resident single live births during 1994–1996). *Derived from odds ratios and their 95% CIs (see Table 3 for detailed information) and including only those groups for whom nativity remained a significant factor after adjustment; I, 95% CIs.

racial and ethnic groups even after adjustment for differences in maternal age, timing of prenatal care initiation, and other sociodemographic characteristics. Asian-Indian mothers have the highest reported prevalence of diabetes, and they have an elevated risk among mothers born outside the states that was barely altered by adjustment for the relatively small variations in this population in maternal age and other possibly explanatory factors. Age adjustment reduced the odds of diabetes among immigrant non-Hispanic black, Filipino, Puerto Rican, and Central and South American mothers, but these women remained at significant risk for diabetes compared with their counterparts born inside the states. Conversely, immigrant Japanese mothers had the lowest prevalence of diabetes among the 30 ethnic group–nativity combinations in the study, although, among women born inside the states, Japanese mothers had the fourth highest prevalence. Adjustment for covariates did not reduce the strongly protective effect of birthplace outside the states in this ethnic group. The relative youth of Native American and Mexican mothers born inside the states compared with elsewhere masks their increased risk of diabetes. Adjustment for maternal age and other covariates emphasized the protective effect of birthplace outside the states in these groups.

Several limitations to this study exist. Birth certificate data do not indicate whether diabetes screening was conducted, and the prevalence of diabetes during pregnancy may be underestimated (9,10,16,17). Higher prevalence estimates have been obtained in most universally screened clinic populations (3,16,17). An estimated 4% of respondents to the 1988 National Maternal and Infant Health Survey had diabetes reported during their pregnancies (12). The prevalence of diabetes found by Berkowitz et al. (8) among Puerto Ricans born in the continental U.S. was identical to the 2.9% in this study. In the New York study (8), 6.1% of Puerto Rican mothers born outside the continental U.S. had diabetes compared with 3.7% in this study, suggesting that underreporting may be more common among women born outside the states in this ethnic group.

Prevalence underestimates may be greater in populations that are less likely to be screened because of younger maternal age distributions and late or no prenatal care (9,10,18). Selective screening based on maternal age may fail to identify a significant

number of young women with diabetes (18). The proportion of women <25 years of age was greater among women born inside the states in all racial and ethnic groups, which could exaggerate the estimated impact of birthplace outside the states on diabetes prevalence. Late or no prenatal care was much more common among Mexican mothers born outside the states and Vietnamese mothers born inside the states. This pattern could decrease the risk of diabetes associated with birthplace outside the states for Vietnamese mothers and reduce the protective effect of birthplace outside the states for Mexican mothers. We attempted to minimize the impact of discrepancies in age and prenatal care initiation between nativity groups by controlling for these variables during regression analysis. Preterm birth may preclude identification of gestational diabetes if delivery occurs before screening. Because the proportion of such births varies by race and ethnicity, and by nativity status in some groups, models were also estimated for the subset of term births within the study cohort and with adjustments for gestational age of the infant at birth. The results of these analyses did not change the findings of this study.

This study does not measure the true prevalence of diabetes during pregnancy because the analysis was limited to pregnancies that resulted in a single live birth. Both induced and spontaneous abortions reduce the number of pregnancies among women with or who may develop diabetes that result in a live birth. Available data suggest little racial or ethnic variation in the percentage of pregnancies that end in spontaneous fetal loss, although marked racial and ethnic differences are evident in reported rates of induced abortions (19). Socioeconomic and cultural factors that contribute to these variations are also likely to result in differences in induced abortion rates by nativity status for women of the same racial or ethnic group. No data are available to characterize the range of pregnancy outcomes for the racial, ethnic, and nativity groups described in this study or to estimate the impact of these outcomes on diabetes prevalence by nativity status.

Variations in maternal BMI, body fat distribution, weight gain, physical activity level, substance use, and other risk factors for diabetes during pregnancy between nativity groups might explain the persistent difference in risk of diabetes after adjusting for age and other characteristics (3,4,8,20). Data to assess these relationships are not available from national birth certificate files.

Within ethnic groups, many migrant and urban populations are reported to have a greater prevalence of type 2 and gestational diabetes than their native or rural counterparts (1,2,21–25). The diverse patterns of risk observed in this study may reflect differences in baseline prevalence in the country of origin and variations in rural or urban origin of the immigrating population (1–4). Metabolic susceptibility to diabetes may exist before and become more marked after migration, which is possibly associated with increases in physical inactivity, obesity, smoking, psychosocial stress, and dietary changes (26–29). Acculturation has been linked to changes in average BMI in many populations, although the direction of this effect varies by ethnic group, duration of residence in the U.S., extent of acculturation, and socioeconomic status (30–32).

The very low prevalence of diabetes during pregnancy among Japanese mothers born outside the states in this study may reflect the background prevalence in Japan. The percentage of Japanese mothers with diabetes who were born inside the states is well above the U.S. average, which suggests an increase in risk status associated with U.S. birthplace. The prevalence of type 2 diabetes is lower in Japan than in the U.S., but rates in Japan are increasing (2,23). Several studies have demonstrated that age- and sex-specific type 2 diabetes prevalence is greater among U.S.-born Japanese-Americans compared with residents of Japan (23,28,29). Second-generation Japanese-Americans have higher diabetes prevalence rates than first-generation Japanese-Americans (30). Mexican residents of the U.S. are more likely to have type 2 diabetes than residents of Mexico, with the highest prevalence reported among moderately acculturated individuals (23,31). This pattern corresponds with the protective effect of birthplace outside the states on diabetes risk among U.S.-resident Mexican mothers. Gestational diabetes is reportedly more common among first-generation Southeast Asian, Asian-Indian, and black immigrant women compared with white women born in the U.K. and Australia, after adjusting for age, parity, and BMI (5,6). Birthplace outside of Australia was not associated with differences in diabetes risk among white women, but members of the same ethnic group were not compared by nativity (5), as has been done in this study.

Although the importance of early and adequate prenatal care for all pregnant women has been the intense focus of pub-

lic health policy in the U.S., evaluation of its success has centered on the prevention of low birth weight rather than on delivery-of-care components such as diabetes screening and treatment (33). The relatively low prevalence of diabetes during pregnancy in the general U.S. obstetrical population may have contributed to the dearth of epidemiological studies on the prevalence and impact of diabetes during pregnancy among ethnic minorities, including immigrant women (34). The prevalence of diabetes among women of childbearing age is increasing in the U.S. (35). Immigration to the U.S. by populations with high or increasing diabetes prevalence is also on the rise (1-4). Many women may enter pregnancy with undiagnosed or untreated pregestational diabetes or a susceptibility to the development of gestational diabetes (3,4). The further effect of acculturation on diabetes risk and the increasing prevalence of obesity and delayed childbearing among women in the U.S. all suggest a need for systematic surveillance of the prevalence and effect of diabetes during pregnancy among both immigrant and nonimmigrant women, particularly in racial and ethnic minority groups (36,37).

Diabetes during pregnancy is associated with an increased risk of adverse pregnancy outcomes for both mother and infant (38,39). Diabetes that first appears during pregnancy may be an early indicator of an increased risk of type 2 diabetes, which often will present within a few years after the affected pregnancy (40). Although maternal age is a more important risk factor than immigrant status in many racial and ethnic groups, identification, treatment, and follow-up of mothers with diabetes who were born outside the states may require special attention to language and sociocultural barriers to effective care (41). More detailed studies of factors underlying the greater diabetes risk among Asian-Indian women and women from several other immigrant groups, and the protective effect of birthplace outside of the U.S. among Japanese, Native American, and Mexican women may contribute to an increased understanding of the epidemiology of diabetes during pregnancy in our increasingly diverse society.

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