

Hepatitis B Surface Antigen Prevalence Among Pregnant Women in Urban Areas: Implications for Testing, Reporting, and Preventing Perinatal Transmission

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ABSTRACT. *Objectives.* To estimate race/ethnicity-specific prevalence of hepatitis B surface antigen (HBsAg) in pregnant urban women and to evaluate factors associated with maternal HBsAg testing.

Methods. A multicenter, retrospective chart review was conducted of a racially/ethnically stratified random sample of maternal/infant charts of 10 523 women who gave birth to live infants during 1990–1993 in 4 urban areas in the United States. Data were collected on multiple variables, including demographic variables, HBsAg test dates and results, prenatal care type, and amount and source of payment.

Results. HBsAg prevalence among white non-Hispanics was 0.60% (95% confidence interval [CI]: 0.22–0.98), black non-Hispanics 0.97% (95% CI: 0.48–1.47), Hispanics 0.14% (95% CI: 0.01–0.26), and Asians 5.79% (95% CI: 4.42–7.16). HBsAg testing rates increased from 56.6% in 1990 to 78.2% in 1993. Factors associated with not being tested varied by urban area, but in the combined area model, they were having no or private prenatal care (odds ratios: 18.75 and 5.07, respectively) and being black (odds ratios: 2.08). Only 20.9% (95% CI: 19.1%–22.8%) of those not tested prenatally were tested at delivery. The expected number of infants born to HBsAg-positive study-area women was 3327 using study prevalence rates, compared with 1761 using national rates.

Conclusions. To help ensure that all urban infants who are born to HBsAg-positive women receive appropriate prophylaxis, health officials in urban areas should use urban-area prevalence rates to ascertain completeness of reporting maternal HBsAg positivity. Needed steps to increase maternal HBsAg testing rates include ensuring that more pregnant women receive prenatal care, promoting testing by private providers, educating providers about testing in all racial and ethnic groups, and reminding providers to test at delivery those women not tested prenatally. *Pediatrics* 2003;111:1192–1197; hepatitis B, hepatitis B surface antigen, infant, maternal, pregnancy, prevalence, vaccination.

ABBREVIATIONS. HBsAg, hepatitis B surface antigen; HBV, hepatitis B virus; ESPHB, Enhanced Surveillance-Perinatal Hepatitis B Prevention; CI, confidence interval; CDC, Centers for Disease

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Control and Prevention; HBIG, hepatitis B immunoglobulin; NHANES, National Health and Nutrition Examination Survey.

Each year in the United States—as reported by physicians—the number of women who give birth and are hepatitis B surface antigen (HBsAg)-positive is approximately 9000,¹ but according to data from a national and several local surveys, the true number may be as many as 20 000.^{1–5} Precise estimates are needed to plan suitable interventions so that all infants exposed to the hepatitis B virus (HBV) at birth in the United States receive appropriate immunoprophylaxis.¹

In this article, we report an analysis of data from the Enhanced Surveillance-Perinatal Hepatitis B Prevention (ESPHB) project, which evaluated the impact of perinatal hepatitis B prevention programs in 4 US urban areas. We report maternal race/ethnicity-specific HBsAg positivity in these cities and trends in maternal HBsAg testing rates. Recommendations by the Advisory Committee on Immunization Practices call for HBsAg testing of all pregnant women.⁶ Using the positivity rates, we estimate the number of children in these urban areas born to HBsAg-positive women and compare that with the estimate obtained using previously published national prevalence rates.^{7–15} We estimate the number of exposed newborns in the 4 urban areas who likely did not receive appropriate prophylaxis, based on 1) extrapolating the positivity rates found in this study to the women who were not tested and 2) applying estimated undertreatment rates to those testing positive. We also report sociodemographic factors associated with maternal testing.

METHODS

We conducted retrospective annual birth record reviews of births in 1990–1993 in 4 urban areas (Hartford and New Haven counties, CT; DeKalb and Fulton Counties, GA; Wayne County, MI; and Dallas County, TX) using a stratified systematic random sample of vital birth records of hospital births in those years. These areas were chosen for geographic diversity from volunteer sites that met the minimum criteria of 100 births to HBsAg-positive women per year. For each urban area, approximately 200 records were sampled for each racial/ethnic group (white, black, Hispanic, and Asian) for each year studied. Among Asians, ethnicity was collected to allow ethnicity-specific HBsAg prevalence estimates. Data were collected in all 4 areas for 1990 and 1992, in all areas except Michigan for 1991, and in all areas except Georgia for 1993. During 1991 through 1994, 12 529 hospital charts were reviewed: 2200–3500 in each area. Public health workers ab-

stracted patient demographic information, sources of prenatal care and payment information, and dates and results of HBsAg tests. Only HBsAg tests for which a date was recorded were counted as valid. Hospital records of 10 523 pregnant women (84% of records sampled) met inclusion criteria (residence and birth in study area) and were analyzed, including 2701 white non-Hispanics, 2667 black non-Hispanics, 2394 Hispanics, and 2761 Asians.

Statistical Analysis

We calculated race/ethnicity-specific weighted estimates of maternal HBsAg positivity. Because some subgroups had relatively few subjects or point estimates close to 0, we calculated exact binomial confidence intervals (CIs) modified for our sampling design for all estimates of maternal HBsAg positivity.¹⁶ A weighting factor was created to account for the differential probabilities of selection across race/ethnicity, city, and year of birth, and the data were weighted using a poststratification ratio-estimation procedure. Next, we calculated rates of HBsAg testing among pregnant women (during prenatal care and at delivery) and 95% CIs. We used SUDAAN software, which accounts for the sampling design.¹⁷

The total number of infants recorded in the county's vital records, born during the years studied, was 205 045 whites, 145 799 blacks, 60 343 Hispanics, and 10 325 Asians. The mean annual number of births in each urban area was 14 646 whites, 10 414 blacks, 4310 Hispanics, and 738 Asians. The national HBsAg positivity rates for whites, blacks, and Hispanics were 0.13%, 0.5%, and 0.12%, respectively, and 2 national rates were used for Asians: 1.6% for US born and 8.9% for foreign born.² These 2 Asian rates were combined to form a weighted average national rate for Asians of 6.71%, which was calculated assuming that 30% of Asian women who gave birth in the United States were US born and 70% were foreign born.¹⁸ This weighted average was necessary for comparison with the rates seen on our study population where country of birth was not available.

We also estimated the number of infants in the study areas born to HBV-infected women who most likely did not receive the recommended postexposure prophylaxis. We used rates of not receiving maternal testing reported in this article and rates of incomplete or missed prophylaxis of infants born to women who tested HBsAg-positive from another database. In the public health departments' perinatal tracking databases of the same ESPHB urban areas during the 14 site-years studied, 17% of the infants whose HBsAg-positive mothers were tested did not receive hepatitis B immunoglobulin (HBIG) and hepatitis B vaccine within 48 hours of birth (Centers for Disease Control and Prevention [CDC], unpublished data).

To determine factors associated with testing, we examined

bivariate associations between each of the independent variables in the database and maternal HBsAg testing by performing χ^2 tests. Logistic regression models were fit to examine independent effects on maternal testing rates of demographic factors and sources of prenatal care and payment. All stated differences among rates are significant at the .05 level. For each urban area and all areas combined, we fit a multivariable model that included race/ethnicity, prenatal care, source of pay, maternal age, and year of infant's birth. Parity and number of prenatal visits were not included in the multivariable model because no effect on maternal testing was found in the bivariate analyses.

RESULTS

The weighted HBsAg positivity rate among those tested varied widely by race/ethnicity (Table 1). Rates among Asians were substantially higher than among whites, blacks, and Hispanics. Overall positivity rates for urban areas did not differ by a statistically significant amount. Positivity rates did not vary significantly by any other sociodemographic characteristic. On the basis of our area-specific prevalence estimates, the expected number of infants born to HBsAg-positive women in these urban areas during the years of this study was 3327. Using the national prevalence rates,² the number would be 1761.

From this study, 69.3% (95% CI: 68.1%–70.4%) of the population from which the sample was drawn (the weighted percentage) were tested for HBsAg, 56.5% (95% CI: 55.3%–57.8%) were tested prenatally but not at delivery, 8.1% (95% CI: 7.4%–8.9%) were tested at delivery only, and 4.6% (95% CI: 4.1%–5.1%) were tested both prenatally and at delivery. (When HBsAg tests without a documented date were included, the rate of testing was 75.5% compared with 69.3%.) The percentage of women tested at delivery differed across the 4 urban areas. In Texas and Michigan, 21.1% (95% CI: 19.3%–22.9%) and 15.0% (95% CI: 13.0%–17.0%) were tested, respectively. In Georgia and Connecticut, a smaller percentage were tested at delivery: 6.4% (95% CI: 5.2%–7.7%) and

TABLE 1. Weighted Maternal HBsAg Positivity by Race/Ethnicity and ESPHB Urban Area, 1990–1993 (*n* = 7497)

	Sample Size	Prevalence of Maternal HBsAg Positivity (%)	(95% CI)*
Race/ethnicity			
White	1910	0.60	(0.28–1.11)
Black	1855	0.97	(0.54–1.60)
Hispanic	1732	0.14	(0.02–0.45)
Asian	2000	5.79	(4.50–7.32)
Asian Indian	366	3.22	(0.76–8.61)
Cambodian	61	11.06	(3.12–25.86)
Chinese	314	10.39	(6.85–14.94)
Filipina	130	2.51	(0.57–6.89)
Hmong	11	31.63	(2.62–80.31)
Japanese	120	0.70	(0.01–4.33)
Korean	208	2.45	(0.81–5.58)
Laotian	113	8.15	(2.48–18.77)
Thai	30	8.70	(0.54–33.52)
Vietnamese	260	8.16	(4.73–12.92)
Other Asians	387	5.25	(2.14–10.51)
ESPHB urban area			
Connecticut (Hartford/New Haven)	2227	0.77	(0.33–1.52)
Georgia (Atlanta area)	2302	1.22	(0.68–2.00)
Michigan (Detroit area)	1164	0.58	(0.16–1.45)
Texas (Dallas area)	1804	0.64	(0.33–1.13)

* Exact binomial CI modified for the sampling design.¹⁶

2.4% (95% CI: 1.7%–3.1%), respectively. Among those not tested prenatally, 20.9% (95% CI: 19.1%–22.8%) were tested at delivery.

Of women tested at delivery with test results available, 0.95% (95% CI: 0.01%–1.91%) tested HBsAg-positive. Although a higher point estimate, this rate is not statistically different from the rate among those tested only prenatally—0.66% (95% CI: 0.41%–0.91%). Of the estimated 398 women who tested negative prenatally and were tested at delivery, none was positive at delivery.

Overall maternal HBsAg testing rates in the ESPHB urban areas varied across years, sites, racial/ethnic groups, type of prenatal care, and source of pay (Table 2). They increased substantially from 1990–1991, and the increase from 1992–1993 was statistically significant. Testing rates were lower in Michigan and Connecticut compared with in Texas and Georgia. Race/ethnicity-specific testing rates for all sites and years combined were lower among blacks and whites than among Asians and Hispanics. Testing rates were much lower in women who did not receive any prenatal care or received their prenatal care from private providers than among women who received prenatal care from public providers.

By the last year studied, in 3 of the 4 study areas, testing rates had increased significantly to 84% and 85% (Fig 1). Despite a hepatitis B testing law enacted in Michigan in 1988, Michigan's highest testing rate (1993) remained comparatively low. Connecticut reported the largest single-year increase in testing rates, up 25 percentage points from 1992 to 1993.

The weighted odds ratios for pregnant women not tested for HBsAg adjusted for year of infant's birth, mother's age, race/ethnicity, type of prenatal care, and source of payment for each urban area and all

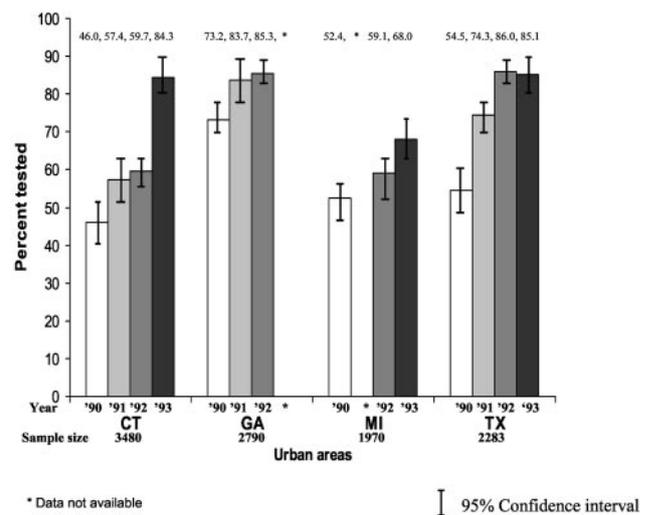


Fig 1. Trends in weighted maternal HBsAg testing rates among residents in ESPHB urban areas, 1990–1993.

areas combined indicated some increased risk associated with race/ethnicity, type of prenatal care, and payment source for prenatal care (Table 3). Overall, blacks were slightly more likely to not be tested for HBsAg than Asians, and pregnant women who did not receive prenatal care or received private prenatal care were more likely not to be tested for HBsAg than women who received public prenatal care. However, in Connecticut, private prenatal care recipients were at lower risk for not being tested. When all urban areas were combined, the odds of not being tested did not differ between pregnant women who used private sources of pay for medical services and women who used public sources of pay. However, women in Connecticut who used private sources of payment were more likely not to be tested than

TABLE 2. Weighted Maternal HBsAg Testing Rates by Year, Urban Area, Race/Ethnicity, Prenatal Care, and Payment Source (ESPHB), 1990–1993

	Sample Size (%)	Maternal HBsAg Testing Rate (%)	95% CI	P Value
Year				
1990	2487 (23.6)	56.6	(54.0–59.2)	
1991	2223 (21.1)	73.0	(70.5–75.4)	.01*
1992	3543 (33.7)	72.9	(70.9–74.9)	
1993	2270 (21.6)	78.2	(75.9–80.4)	
Urban area				
Connecticut (Hartford/New Haven)	3480 (33.1)	61.3	(59.2–63.4)	
Georgia (Atlanta area)	2790 (26.5)	80.7	(78.7–82.6)	.01*
Michigan (Detroit area)	1970 (18.7)	59.9	(57.1–62.7)	
Texas (Dallas area)	2283 (21.7)	74.5	(72.3–76.7)	
Race/ethnicity				
White	2701 (25.7)	68.1	(66.2–70.0)	
Black	2667 (25.3)	67.4	(65.3–69.5)	.01*
Asian	2761 (26.2)	73.3	(71.0–75.6)	
Hispanic	2394 (22.8)	76.9	(74.6–79.3)	
Prenatal care				
None	237 (2.2)	64.8	(56.6–73.0)	
Private	7657 (72.8)	68.5	(67.0–69.9)	.01*
Public	1791 (17.0)	88.0	(85.8–90.1)	
Unknown	838 (8.0)	(Excluded)		
Source of pay				
Private	7066 (69.1)	68.1	(66.6–69.7)	.01*
Public	3166 (30.9)	73.2	(71.2–75.3)	

* χ^2 test for the null hypothesis of no difference in the percentage tested across subgroups.

TABLE 3. Weighted Multivariable Odds Ratios (95% CI) of Not Being Tested* Prenatally or at Delivery for HBsAg Among Women by ESPHB Urban Area, Race/Ethnicity, Prenatal Care, and Source of Pay†

	Connecticut (n = 2881)	Georgia (n = 2685)	Michigan (n = 1782)	Texas (n = 1986)	All 4 Areas (n = 9334)
Race/ethnicity					
White	1.4 (1.1–1.8)‡	0.6 (0.4–0.9)‡	0.9 (0.6–1.1)	1.5 (1.0–2.3)	1.1 (0.9–1.4)
Black	1.6 (1.2–2.1)‡	1.3 (0.9–1.7)	1.1 (0.8–1.5)	1.4 (0.9–2.2)	1.5 (1.2–1.8)‡
Hispanic	0.8 (0.6–1.1)	1.0 (0.7–1.4)	1.0 (0.8–1.4)	1.3 (0.8–2.1)	0.9 (0.7–1.2)
Asian	Ref.	Ref.	Ref.	Ref.	Ref.
Prenatal care					
None	0.9 (0.4–2.3)	7.2 (2.6–20.3)‡	0.7 (0.2–2.4)	4.0 (1.6–9.8)‡	3.0 (1.8–4.9)‡
Private	0.3 (0.2–0.6)‡	9.7 (5.1–18.6)‡	1.9 (0.8–4.4)	2.7 (1.7–4.5)‡	2.9 (2.2–3.9)‡
Public	Ref.	Ref.	Ref.	Ref.	Ref.
Source of pay					
Private	1.7 (1.2–2.4)‡	0.4 (0.3–0.7)‡	0.9 (0.7–1.3)	1.1 (0.7–1.7)	1.0 (0.8–1.2)
Public	Ref.	Ref.	Ref.	Ref.	Ref.

* If chart review did not indicate whether a test was conducted, then the woman was considered “not tested.” If there was an indication of a test being conducted but there was no test data recorded, then the woman was considered “not tested.”

† The model used for each urban area includes race/ethnicity, prenatal care, source of pay, maternal age, and year of infant’s birth. The all 4 areas model also includes the area variable.

‡ $P < .01$.

women who used public sources. In Georgia, the reverse was seen.

To determine whether the effects of prenatal care and source of pay on not being tested for HBsAg were different across racial/ethnic groups, we tested for interaction between each of these factors and race/ethnicity while controlling for the other factors in our multivariable model. The only statistically significant interaction detected was between prenatal care and race/ethnicity in Georgia and in all urban areas combined (Table 4). In Georgia, lack of prenatal care was associated with higher risk of not being tested only among black women. For all areas combined, lack of prenatal care put Asians at a very high risk and blacks and Hispanics at a more modest level of risk.

Of the estimated 3327 infants born to HBsAg-positive women during the study years/areas, we estimate that 1413 (42%) did not receive the recommended prophylaxis, because the mother either was never tested for HBsAg or was tested but proper prophylaxis was not given. We found that 30.7% of women were not tested for HBsAg; thus, we estimate 1021 exposed infants to have been unidentified. Although some of these infants may have received a birth dose of vaccine, none was likely to receive HBIG. In addition, 17% of infants born to HBsAg-positive women in the infant tracking databases did not receive HBIG and hepatitis B vaccine within 48

hours of birth (CDC, unpublished data); thus, it is likely that an additional 392 were untreated. The annual average number of infants who potentially did not receive adequate prophylaxis or were missed in each of the study areas was 101 per area per year, or 42% of the annual expected number of infants born to HBsAg-positive women.

DISCUSSION

This work shows that the prevalence of HBsAg in pregnant women in urban blacks and whites is greater than previously recognized: 0.97% and 0.6% among blacks and whites, respectively, in our study versus 0.5% and 0.13% derived from National Health and Nutrition Examination Survey (NHANES) III.² ESPHB rates among Hispanic and Asian women were similar to rates found in NHANES III and the medical literature.² Women of child-bearing age who are white or black and living in urban areas may have more HBV exposure than those in the rural population, as a result of higher rates of risky lifestyle practices.⁵ ESPHB findings indicate that for urban populations, the HBsAg prevalence rates from NHANES III used in the national algorithm² may underestimate by as much as one half the actual number of infants born to HBsAg-positive women in large US cities. Use of the higher expected numbers found in this study may stimulate identification of

TABLE 4. Weighted Multivariable Odds Ratios of Not Being Tested Prenatally or at Delivery for HBsAg Among Women, by Prenatal Care and Race/Ethnicity, Georgia and All ESPHB Urban Areas*

Prenatal Care	Weighted Odds Ratio (95% CI) Race/Ethnicity			
	White	Black	Hispanic	Asian
Georgia				
None	3.6 (0.1–132.2)	8.8 (2.9–26.5)	4.6 (0.4–52.4)	1.9 (0.2–15.5)
Private	2.9 (0.7–11.4)	12.6 (6.2–25.5)	11.7 (5.6–24.6)	2.5 (1.3–4.7)
Public	Ref.	Ref.	Ref.	Ref.
All ESPHB urban areas				
None	2.8 (0.9–8.5)	2.8 (1.5–5.3)	4.5 (1.8–10.9)	18.8 (6.2–56.9)
Private	2.8 (1.5–5.5)	3.6 (2.5–5.2)	1.9 (1.2–2.8)	5.1 (2.6–9.7)
Public	Ref.	Ref.	Ref.	Ref.

* Odds ratios are adjusted for source of pay, maternal age, and year of infant’s birth. Odds ratios for all urban areas are also adjusted for urban area.

more of these women and help ensure protection of a greater number of exposed infants.

The HBsAg prevalence rates identified in this study were for 1990–1993; however, the comparison of local urban to national methods of estimating rates should still apply today. Although HBsAg rates among pregnant women in the United States are expected to be lower now as a result of changes in high-risk lifestyle, they are not expected to decline substantially until children who were born after 1993, most of whom were vaccinated under the routine universal infant hepatitis B vaccination recommendation, become young adults. Also, maternal prevalence rates of HBV infection in the United States remained stable between 1976 and 1994.⁴ With the impact of the gradually increasing hepatitis B vaccination coverage rates among older teenagers and young adults, the overall maternal HBV infection prevalence by 2010 will be lower. Prevalence among Asian women, however, will remain high during the next decade as long as current immigration patterns continue and infant hepatitis B vaccination programs have not lowered adult HBV infection prevalence rates in other countries.

Reporting to the local health department HBsAg-positive women who give birth is the first step in ensuring that these high-risk infants are protected. To assess adequately physician reporting levels, accurate estimates of expected numbers are necessary at the local level. This study indicates the importance of using accurate prevalence rates to determine the expected number of infants born to HBsAg-positive women in urban areas.

Identification and treatment of infants born to HBsAg-positive women is important, because without prophylaxis, 48% of infants born to HBsAg-positive women become infected.¹⁹ An estimated 24% of the 1.25 million people with chronic HBV infection in the United States were infected during the perinatal period.^{3,20} With appropriate timely immunoprophylaxis, >90% of these perinatal infections can be prevented.^{21–26} Attempts to identify HBsAg-positive women by selectively testing those with identifiable risk factors resulted in identification of only 50% of those who were infected.^{27–29} Implementation of the 1988 recommendation to routinely test all pregnant women (during each pregnancy) for HBsAg at an early prenatal visit would prevent an estimated 3414 chronic HBV infections each year at a relatively moderate cost per infection averted of \$3700 (1993 dollars).²⁰

Implementation of recommended testing has progressed with the help of state laws. Between 1988 and 1993, prenatal HBsAg testing rates in 5 states varied widely, from 30% in 4 Georgia hospitals in 1989 (CDC, unpublished data) to 98% in 2 California counties in 1992.³⁰ By 1993, a nationwide survey of birthing hospitals estimated that 84% of women who gave birth were tested for HBsAg.³⁰ At that time, 12 states (California, Florida, Hawaii, Illinois, Kansas, Louisiana, Massachusetts, Michigan, Missouri, New York, Nevada, and North Carolina) had passed laws or regulations that require HBsAg testing of all pregnant women. By 2002, the total had reached 20 (with

the addition of Arkansas, Kentucky, Montana, Tennessee, North Dakota, Texas, Virginia, and West Virginia).³¹ More recent studies indicate that maternal HBsAg testing rates in the United States have increased to approximately 90% (CDC, unpublished data).

Factors other than state laws may determine how rapidly physicians implement the maternal HBsAg testing recommendations. State laws do not always guarantee that testing rates will be high, as illustrated in our Michigan study site. Michigan's law requiring providers to test pregnant women for HBsAg did not contain an enforcement mechanism and did not include any sanctions for failure to test. Private-sector implementation of the recommendation to test all pregnant women for HBsAg seemed to lag behind implementation in the public sector in the ESPHB study population, similar to what was seen in Georgia in 1989.³⁰

This study revealed that as many as 42.5% (1413) of the expected number of infants born to HBsAg-positive women in the study areas during this study did not receive the most effective prophylaxis to ensure prevention of HBV infection at birth. For 1021 of these infants, the cause was that their mother was not tested. In hospitals with a policy to provide hepatitis B vaccination within 12 hours of birth for all infants, most of these infants born to infected women are protected. For the other infants who were "missed" (392), it was because of late prophylaxis of infants born to positive-tested women. These are aspects of perinatal hepatitis B prevention where much improvement is needed.

Improvement was also needed in testing women for HBsAg at delivery, who were not tested during their pregnancy as is recommended.^{6,32,33} In this study, only 20.9% of women not tested prenatally were tested at delivery; 0.95% of those were positive.

Several limitations may affect interpretation of these data. The sample may not represent the HBsAg positivity rate among pregnant women in all urban areas or for all ethnic subgroups. Prevalence estimates for the smallest Asian ethnic groups may have been slightly inflated if women with multiple pregnancies entered the sample multiple times. Because of small sample sizes and a nonrandom selection process, prevalence estimates may not represent the ethnic subgroups, although most of the point estimates are comparable to other published rates.^{7–15} Because the ESPHB sample used to measure HBsAg prevalence is composed only of those women whom providers chose to test, there may be a selection bias toward women who were more likely to be infected, raising our prevalence estimates.

Maternal HBsAg testing rates have improved in the years since these data on testing were collected (CDC, unpublished data). In addition, because some medical charts did not contain dates and results of all HBsAg tests conducted, our testing rates will underestimate the true rates. Variations in charting methods and record storage from hospital to hospital and state to state may have also introduced a bias to study results. For example, abstractors in Georgia searched computerized laboratory records, whereas

those in the other sites relied on the paper record in the mothers' and infants' charts only.

CONCLUSIONS

For large urban areas, national race/ethnicity-specific HBsAg prevalence rates used to estimate expected annual numbers of births to HBsAg-positive women are likely to underestimate the actual number. Large cities may need to use the ESPHB race/ethnicity-specific prevalence rates instead of those from NHANES III to calculate more accurately expected annual births to HBsAg-positive women. Using urban race/ethnicity-specific rates to estimate expected or target numbers will most likely result in identifying more of these high-risk infants born to HBsAg-positive women in urban areas as efforts to improve physician reporting of HBsAg-positive pregnant women are renewed.

Although maternal HBsAg testing rates increased during the years of this study in all 4 sites (from 46.0% to 73.2% in 1990 to 68.0% to 85.1% by 1993), the rates fell short of the CDC's goal of 90%. Improvement was needed across all racial/ethnic groups and among women with private or no prenatal care. In addition, testing at delivery women who were not tested prenatally needed to be more widely implemented to improve identification of high-risk infants.

Our retrospective annual reviews of birth records provided reliable estimates of maternal hepatitis B testing and HBsAg prevalence by race/ethnicity in 4 geographically distinct urban areas. These methods of sampling vital records or similar study designs³³ can be adapted readily in other states and local areas.

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