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Extent of Maternal Morbidity in a Managed Care Population in Georgia

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Summary

Although maternal deaths are among the most tragic events related to pregnancy, they are uncommon in the United States and therefore, inadequate indicators of a woman's pregnancy-related health. Maternal morbidity has become a more useful measure for surveillance and research. Traditional attempts to monitor maternal morbidity have used hospital discharge data, which include data only on complications that resulted in hospitalization, thus underestimating the frequency and scope of complications. To obtain a more accurate assessment of morbidity, we applied a validated computerized algorithm to identify pregnancies and pregnancy-related complications in a defined population of women enrolled in a health maintenance organization in the southeastern United States. We examined the most common morbidities by pregnancy outcome and maternal characteristics.

We identified 37,741 pregnancies; in half (50.7%), at least 1 complication occurred. The 5 most common were urinary tract infections, anemia, mental health conditions, pelvic and perineal complications, and obstetric infection. We observed that in pregnancies among non-Hispanic White women, low socioeconomic status (SES) had a modest effect on the adjusted odds of preexisting medical conditions [adjusted odd ratio (AOR) 1.33, 95% confidence interval (CI) 1.21, 1.47] or having any morbidity [AOR 1.27, 95% CI 1.16, 1.38]. Low SES had little effect on complications among non-Hispanic Black women. Compared with pregnancies among non-Hispanic White women, those among non-Hispanic Black women had more complications and occurred more often in women with low SES; however, SES did not affect their likelihood of morbidity. Even for non-Hispanic White women, the effect of SES was small, suggesting that the influence of SES on the risk of morbidity may be ameliorated by comprehensive health insurance coverage.

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Introduction

Maternal deaths, among the most tragic events related to pregnancy, are uncommon in the United States[1–4] and thus are difficult to use as an indicator of a woman's health and health care during pregnancy, delivery, and the postpartum period. Maternal morbidity, defined as conditions resulting from or exacerbated by pregnancy that adversely affect the woman's health, has not been the focus of measurement, monitoring, or research as no systematic population-based collection of data on pregnancy-related complications exists. Nonetheless, as our knowledge of maternal morbidity has evolved, understanding the development of morbidity affords a more comprehensive picture of women's health during pregnancy. While severe complications pose greater risks to a woman's well-being, mild and moderate complications are more common and some of these can have a substantial impact on the economic, psychological, and physical health of the woman and her family. Given the approximately 6 million pregnancies each year in the United States, even small advances in our knowledge of maternal morbidity can improve the pregnancy experience of many women and inform research and clinical efforts to identify complications early and prevent progression along the morbidity continuum.[1,3,5–8]

When attempting to estimate the types and prevalence of maternal morbidity, researchers have considerable obstacles to overcome. In traditional attempts to monitor maternal morbidity, hospital discharge databases have been used, but these contain data only on complications that resulted in hospitalization during the antepartum and intrapartum periods.[9,10] Prevalences derived from these data sources underestimate the actual frequency of maternal complications because they do not include morbidity treated in outpatient settings or occurring during the postpartum period. Many of the most common complications of pregnancy, such as anemia, urinary tract infections, and mental health conditions, usually do not require hospitalization and, therefore, are not ascertained accurately in estimates based on hospitalization data.

We previously reported the extent of maternal morbidity in an integrated healthcare delivery system in the Pacific Northwest.[11,12] For the current study, we adapted the validated computerized algorithms developed in the previous project to identify pregnancies and associated complications in a defined and more diverse population of women enrolled in a health maintenance organization (HMO) in the southeastern United States. We present prevalence estimates of the most common morbidities by pregnancy outcome and maternal characteristics, including an index of neighborhood socioeconomic status (SES).

Methods

This study was conducted using 2000–2006 electronic data from Kaiser Permanente Georgia (KPGA), a nonprofit group- and network-model HMO that provides comprehensive medical insurance coverage and services to approximately 275,000 members in the Atlanta, GA metropolitan area. We adapted a validated computerized algorithm that links indicators and dates of pregnancies and pregnancy outcomes to create pregnancy "episodes". Then we searched these pregnancy episodes for ICD-9-CM (International Classification of Diseases, 9th Revision, Clinical Modification) codes indicating 36 predetermined, clinically-relevant

morbidity groups. A detailed description of the methods used to develop and validate this algorithm[11] and the rates of maternal morbidity found using the morbidity algorithm in the Kaiser Permanente Northwest (KPNW) population[12] are published elsewhere.

Pregnancy outcomes included were live birth, stillbirth, ectopic gestation, spontaneous abortion, and therapeutic abortion. The study population comprised females aged 11–54 years who were insured by KPGA from the beginning of the pregnancy episode through 8 weeks after delivery. The analytic unit was the pregnancy episode. If a woman had more than 1 pregnancy episode during the study period, data from all episodes were included.

Pregnancy episodes and outcomes were initially identified by using the original algorithm to search individual-level KPGA outpatient, inpatient, emergency services, laboratory, and imaging computerized administrative databases for ICD-9-CM diagnosis and procedure codes, CPT-4 and NDC codes, or other indicators of pregnancy.[11] An electronic file of all the pregnancies identified by the algorithm was provided to the Vital Statistics Department of the Georgia Division of Public Health. The Vital Statistics Department linked the KPGA live birth and stillbirth data with their Georgia birth and fetal death certificates using the woman's Social Security Number, name, date of birth, and date of delivery.

For live births and stillbirths, the majority of data on gestational age, race, ethnicity, and parity (number of viable previous pregnancies) came from Georgia birth certificates and the remaining data from KPGA files; for other pregnancy outcomes, all data came from KPGA files. Maternal age and neighborhood SES index quartile were obtained or computed from KPGA files. After identifying pregnancies, we used the morbidity algorithm to ascertain the corresponding morbidities.[12]

Race and ethnicity data from birth certificate files are self-reported and grouped according to the Office of Management and Budget (OMB)-defined race and ethnicity categories. We examined pregnancy-related complications by race and ethnicity to improve our understanding of potential differences in these health outcomes by race category, with the ultimate goal of reducing these disparities. Because of the well-established differences in obstetric outcomes between non-Hispanic Black and White women, we were particularly interested in examining these relationships more closely.

The SES index variable was computed by creating a factor score using principal components analysis of 7 variables from the U.S. Census SF3 file (http://www.census.gov/census2000/sumfile3.html) and the KPGA enrollee's geocoded address. Addresses were geocoded by mapping to the exact latitude and longitude and to county, zip code, and 2000 U.S. Census tract or block group using MapMarker® Plus (MapInfo Corporation, Troy, NY). The 7 Census variables were percentage of households: (1) with income below poverty level; (2) receiving public assistance; (3) with annual income <$30,000; (4) with working-age adult males not in the labor force; (5) with adults aged ≥25 years who had a high school education or less; and log of: (1) median household income; and (2) median value of single family homes.[13,14] In descriptive analyses, the SES index was categorized into quartiles (low, mid-low, mid-high, and high). For multivariable modeling, a 2-level variable was computed (low and mid-low categories were combined into 'low', mid-high and high were combined into

'high'). The SES index has been validated for KPGA by comparison with self-reported education attainment and household income from 3 surveys of KPGA adult enrollees.

Using the 36 maternal morbidity groups, we computed morbidity rates overall and for each pregnancy outcome. Women could have had more than 1 complication during a pregnancy episode. Among pregnancies that resulted in a live birth, we examined differences in morbidity by 4 categories of race/ethnicity (non-Hispanic Black, hereafter referred to as Black; non-Hispanic White, hereafter referred to as White; Asian/Pacific Islander (API); and Hispanic). To look more closely at the relationships among race/ethnicity, SES index, and morbidity, we conducted a sub-analysis using logistic regression and constructed separate multivariable models for Black women and White women. We assessed the odds of any morbidity as well as 3 categories of morbidity (preexisting medical conditions, obstetric conditions, and mental health conditions) associated with the 2-level SES index variable, stratified by race/ethnicity and adjusted for age and parity. Logistic regression analyses were conducted using SAS software (version 9.1; SAS Institute Inc., Cary, NC). Because mothers with >1 pregnancy are included in our data set, we performed analyses using generalized estimating equations (GEE) to correct for correlation within subjects. This study was approved by the Institutional Review Boards of the Centers for Disease Control and Prevention, Kaiser Permanente Northwest, and Kaiser Permanente Georgia.

Results

We identified 37,741 pregnancies among 28,916 women enrolled in KPGA between January 1, 2000 and December 31, 2006. Evidence in the KPGA databases indicated that 25,342 of these pregnancies resulted in live birth or stillbirth outcomes. Georgia birth and fetal death certificates were linked to 24,020 live births and stillbirths (match rate = 94.8%). Most of the 37,741 pregnancies were among women who were between ages 20 and 39, parous, and had a live birth; 42.9% were Black, 33.2% White, 8.0% API, and 4.4% Hispanic (Table 1). Race/ethnicity was obtained mostly from birth certificate files. Consequently, this information was missing for 10.9% of pregnancies, the majority of which (90.6%) resulted in a spontaneous or therapeutic abortion; no birth certificate would have been generated for these pregnancy outcomes. The proportion of White and API pregnancies in each SES category increased as the SES index increased. The pattern was the opposite for Black women: over half of the pregnancies among Black women were in the low and mid-low SES index quartile.

The prevalence of each of the 36 morbidity groups and their corresponding ICD-9-CM codes are presented in Table 2. We examined the 10 most common morbidities by pregnancy outcome (Table 3). At least 1 complication occurred in 50.7% of pregnancies, and >1 complication occurred during many pregnancies. The prevalence of morbidity varied by pregnancy outcome: 60.6% among live births, 52.4% among stillbirths, 31.0% among spontaneous abortions, and 26.5% among therapeutic abortions.

Overall, the 5 most common complications were urinary tract infections, nonhereditary nonhemolytic anemia, mental health conditions, pelvic and perineal complications, and obstetric infection. Each of the 10 most common morbidities had a prevalence of 5% or

greater in at least 1 pregnancy outcome group. Urinary tract infections, mental health conditions, and chronic hypertension occurred frequently during pregnancies with all outcomes; however, these conditions predominated among pregnancies resulting in a live birth.

Restricting the analysis to pregnancies ending in a live birth, we examined the 10 most common complications by maternal race/ethnicity (Table 4). At least 1 complication was recorded during 64.2% of pregnancies among Black women, 59.2% among White women, 53.8% among Hispanic women, and 56.0% among API women. Most of the individual complications occurred more frequently among Black women; the exceptions were mental health conditions, pregnancy-induced hypertension, and pelvic and perineal complications. Nearly 20% of pregnancies among Black women were complicated by anemia. Rates of urinary tract infections were common in pregnancies across all race and ethnic groups (10.2–15.9%) as were pelvic and perineal complications (6.5–11.3%) and obstetric infection (4.4–8.1%). Pregnancies in all race and ethnic groups were frequently complicated by gestational diabetes (abnormal glucose tolerance). The prevalence ranged from 4.6% among Black women to 8.6% among API women.

Given the differences we observed in the neighborhood SES index for pregnancies among Black and White women (Table 1), as well as the variation in the prevalence of complications between these 2 groups (Table 4), we conducted multivariable modeling to examine the relationship between neighborhood SES and morbidity overall and stratified by race/ethnicity. Crude analyses indicated that the odds ratio (OR) of any morbidity occurring in pregnancies of Black women compared with those of White women was 1.23 [95% confidence interval (CI) 1.17, 1.30]. For women whose SES index was low compared with high, the crude OR was 1.24 [95% CI 1.18, 1.31] (data not shown). Odds ratios and 95% CI for morbidities associated with SES index and adjusted for age and parity are shown separately for Black and White women in Table 5. During pregnancies among White women, low SES index had a modest effect on the odds of preexisting medical conditions complicating the pregnancy [OR 1.33, 95% CI 1.21, 1.47] and on the odds of having any morbidity [OR1.27, 95% CI 1.16, 1.38]. Low SES had little effect on complications among Black women.

Discussion

Although the prevalence and type of morbidity varied by pregnancy outcome, 51% of pregnancies in our study were affected by at least 1 complication during the prenatal, labor and delivery, or postpartum period. The prevalence ranged from 54% among Hispanic women to 64% among Black women. Among pregnancies ending in a live birth, urinary tract infection (14.8%) and anemia (13.4%) were the most common complications. While these conditions are usually mild, they affect large numbers of women and increase the use of health care services.

As in other health indicators, racial/ethnic differences in many obstetric outcomes are well known. The risk of maternal mortality is 4 times higher for Black women compared with White women.[15–17] Black women have about twice the risk of preterm delivery[18] and

stillbirth,[19] compared with White women. Black infants have 2.4 times the mortality rate of White infants.[20] In a review of racial/ethnic disparities in pregnancy outcomes, obstetric care, and selected maternal morbidities, Bryant and colleagues[2] found that, compared with White women, Black women had a higher risk of hypertensive disorders of pregnancy, prepregnancy hypertension, and prepregnancy diabetes. They also found that Black women with asthma, genitourinary infections, and periodontal disease fared worse during pregnancy than White women with these conditions.

We observed that compared with all other race/ethnic groups, a greater proportion of pregnancies of Black women were in the lowest neighborhood SES group and were associated were at least 1 complication. However, in multivariable analyses, SES had essentially no effect on the complication risk for Black women. Others have found a similar lack of effect of SES on infant outcomes for Black women. In a study comparing very low birthweight rates between Black and White women in Georgia, Berg and colleagues[21] found that although Black women were more socioeconomically disadvantaged than White women, low SES did not increase their risk of having a very low birthweight infant.

Little has been published on the joint relationships among SES, race/ethnicity, and maternal morbidity in an insured population of women. Moreover, studies of maternal morbidity often have marked differences in methodology, populations, and conditions studied, making comparisons difficult. In our study, all women had health insurance coverage for obstetric care and thus, theoretically at least, had similar financial access to similar quality antepartum, intrapartum, and postpartum care. Although the rate of complications during pregnancies among Black women, compared with those among White women was higher (64% compared with 59%), and low SES was more prevalent among Black women (64% compared with 34%), SES did not affect the likelihood of morbidity in pregnancies among Black women as it did for White women. The SES variable in our study has been validated using a KPGA member survey; further, it represents socioeconomic features of the neighborhood in which the woman resides, which has been shown to be a robust metric.[22] However, our findings suggest that this variable may function differently or have a different significance for Black and White women. Despite our study population's universal health insurance coverage, there may have been differences in access and proximity to health care facilities, and in health-related behaviors. Other unidentified or unmeasured factors also may have played a role in our results. Finally, even for White women, the effect of SES is small, suggesting that the degree to which SES influences the risk of morbidity may be ameliorated by comprehensive health insurance coverage. Research is warranted to explore these relationships further. Monitoring to determine whether these patterns persist may be useful as health insurance coverage expands under health care reform.

Our study was limited by our reliance on ICD-9-CM codes for diagnoses of pregnancy-related complications. When used to identify specific conditions, these codes vary in their accuracy. The effect of coding errors appears to be greater, however, when used to identify rare or ill-defined conditions or severe morbidity.[1,6,24] In validation studies, several investigators have found that morbidity codes have acceptable sensitivity and high specificity.[23,24] Moreover, we had the ability to detect ICD-9-CM codes at multiple

encounters throughout the pregnancy, not just at the hospitalization for delivery, thus enhancing sensitivity.

To the extent that findings from studies of maternal morbidity can be compared, our results are similar to patterns observed by others, but ours are of broader scope. Data from the National Hospital Discharge Survey (NHDS)[25] and the Nationwide Inpatient Sample (NIS) from the Healthcare Cost and Utilization Project (HCUP)[27] are the primary national data sources for monitoring pregnancy-related complications. However, analyses using NHDS, NIS, or HCUP likely underestimate morbidity as they include only complications that result in hospitalization, or that occur and are coded during delivery hospitalizations; conditions treated in outpatient settings and those that occur in the postpartum period are not captured. Moreover, hospitalization databases contain events of hospitalizations and they are not longitudinally linked to a person. Finally, race data from nationally representative hospital discharge databases are incomplete because many hospitals do not collect or provide race data.[9,25–27] We obtained race from both KPGA and birth certificate data; notably, in 2005, race of mother was reported on U.S. birth certificates for 99.3% of all births.[28] Because of the racial, ethnic, and socioeconomic diversity of the KPGA population, we were able to examine how these factors affect maternal morbidity. Our study was further strengthened by having individual-level data from every inpatient and outpatient encounter within the KPGA health system, enabling us to estimate morbidity rates per woman.

Several studies have examined rates of severe maternal morbidity, intrapartum morbidity, and selected complications during the delivery hospitalization.[1,3,5,6,10,26,29–31] While each of these studies suggests a useful framework for measuring important aspects of maternal morbidity, none provides a comprehensive system. We present an approach for estimating overall and specific pregnancy-related complication rates in a defined population. With minor adjustments to our original algorithm, we were able to replicate our earlier study in a different managed care setting. Our data source allowed us to capture a broad spectrum of antepartum, intrapartum, and postpartum morbidity in a diverse population of women experiencing all pregnancy outcomes.

Complications of pregnancy range from mild to life-threatening. They are common, and can have a significant impact on women, their families, and the health care system. Many complications are likely to recur in subsequent pregnancies. Several researchers have called for the development of a national surveillance system so that complications can be better ascertained, monitored, and studied.[5,32–35] However, the lack of clear definitions and consistent methods hinders attempts to conduct national surveillance. A practical alternative may be to establish a system of monitoring selected priority morbidities, and factors associated with them, in defined populations, such as multiple managed care organizations[36–38]. Such a system could be built on routinely collected data, as described in our study, or modified to collect data prospectively. These data could be used to estimate incidence and prevalence; review cases and explore factors associated with progression of the morbidity; examine the organization and management of obstetric care; and implement guidelines and monitor practice changes aimed at prevention of adverse pregnancy-related events.

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Table 1

Characteristics (N [%]) of study population by race/ethnicity, all pregnancy outcomes except where noted, 2000–2006

	Black N = 16,175	**White N = 12,534**	**Hispanic N = 1,670**	**API[a] N = 3,020**	**Other N = 214**	**Missing N = 4,128**	**Total N = 37,741**
Age (y)							
≤19	1,479 (9.1)	411 (3.3)	82 (4.9)	26 (0.9)	18 (8.4)	519 (12.6)	2,535 (6.7)
20–29	6,921 (42.8)	5,183 (41.4)	777 (46.5)	1,232 (40.8)	106 (49.5)	1,607 (38.9)	15,826 (41.9)
30–39	7,066 (43.7)	6,450 (51.5)	746 (44.7)	1,658 (54.9)	84 (39.3)	1,628 (39.4)	17,632 (46.7)
≥40	709 (4.4)	490 (3.9)	6 (3.9)	104 (3.4)	6 (2.8)	372 (9.0)	1,746 (4.6)
Unknown	0	0	0	0	0	≤5	≤5
Parity[b]							
0	4,147 (40.9)	4,536 (43.4)	503 (36.6)	1,203 (48.2)	87 (60.8)	0	10,476 (42.3)
1–3	5,276 (52.0)	5,402 (51.6)	765 (55.7)	1,144 (45.9)	50 (35.0)	0	12,637 (51.0)
≥ 4	285 (2.8)	163 (1.6)	35 (2.5)	19 (0.8)	≤5	0	505 (2.0)
Unknown	429 (4.2)	361 (3.5)	70 (5.1)	129 (5.2)	≤5	177 (100.0)	1,169 (4.7)
Pregnancy outcome							
Live birth	10,137 (62.7)	10,462 (83.5)	1,373 (82.2)	2,495 (82.6)	143 (66.8)	177 (4.3)	24,787 (65.7)
Stillbirth	306 (1.9)	152 (1.2)	19 (1.1)	37 (1.2)	≤5	39 (0.9)	555 (1.5)
Ectopic	146 (0.9)	66 (0.5)	13 (0.8)	10 (0.3)	≤5	119 (2.9)	358 (0.9)
SAB[c]	1,643 (10.2)	1,383 (11.0)	161 (9.6)	284 (9.4)	25 (11.7)	1,126 (27.3)	4,622 (12.2)
TAB[d]	3,912 (24.2)	448 (3.6)	101 (6.0)	187 (6.2)	40 (18.7)	2,616 (63.4)	7,304 (19.4)
Other/unknown	31 (0.2)	23 (0.2)	≤ 5	7 (0.2)	0	51 (1.2)	115 (0.3)
SES[e] index quartile							
Low	5,419 (33.5)	2,004 (16.0)	330 (19.8)	376 (12.5)	51 (23.8)	999 (24.2)	9,179 (24.3)
Mid-low	4,904 (30.3)	2,271 (18.1)	416 (24.9)	612 (20.3)	38 (17.8)	1,041 (25.2)	9,282 (24.6)
Mid-high	3,646 (22.5)	3,321 (26.5)	482 (28.9)	768 (25.4)	59 (27.6)	1,006 (24.4)	9,282 (24.6)
High	1,905 (11.8)	4,717 (37.6)	408 (24.4)	1,211 (40.1)	59 (27.6)	907 (22.0)	9,207 (24.4)
Unknown	301 (1.9)	221 (1.8)	34 (2.0)	53 (1.8)	7 (3.3)	175 (4.2)	791 (2.1)
Total	10,137	10,462	1,373	2,495	143	177	24,787

[a]API = Asian/Pacific Islander

[b]Parity is among women who had a live birth.

[c]SAB = Spontaneous abortion

[d]TAB = Therapeutic (induced) abortion

[e]SES = Socioeconomic status index

Table 2

Prevalence of the 36 morbidity groups and their corresponding ICD-9-CM codes, all pregnancy outcomes[a]

Morbidity group	Frequency N (%)	ICD-9-CM codes
Obstetric complications		
Hemorrhage		
Placenta previa without hemorrhage	317 (0.84)	641.0
Antepartum hemorrhage	1387 (3.67)	641.1–641.3, 641.8–641.9, 762.0–762.1
Postpartum hemorrhage	874 (2.32)	666.0–666.2, 639.1
Obstetric trauma		
Pelvic and perineal trauma	2134 (5.65)	654.3, 664.2–664.3, 664.5, 665.2–665.5, 665.7–665.9, 674.1–674.3, 674.8–674.9 (if live birth or still birth: 639.2)
Uterine rupture	28 (0.07)	665.0, 665.1
Hypertensive disorders		
Chronic hypertension	1668 (4.42)	401–405, 642.0, 642.1, 642.2, 760.0
Pregnancy-induced hypertension	1638 (4.34)	642.3, 642.4, 642.5, 642.6, 642.7, 642.9
Infection		
Obstetric infection	1724 (4.57)	038.0–038.9, 041.0–041.9, 567.0–567.9, 614.3, 615.0–615.9, 639.0, 658.4, 659.3, 670.X[c], 672.X, 760.2, 762.7
Urinary tract infection	4519 (12.0)	590.0–590.9, 595.0–595.9, 599.0, 646.5, 646.6
Pneumonia	201 (0.53)	480.0–480.9, 481.X, 482.0–482.9, 483.X, 485.X, 486.X
Appendicitis	36 (0.10)	540.0–540.9, 541.X, 542.X
Infections not classified elsewhere	263 (0.70)	052.0–052.9, 070.0–070.9, 487.0–487.8
Other		
Abnormal glucose tolerance	1327 (3.52)	648.8
Excess vomiting	1515 (4.01)	643.0–643.9
Thrombophlebitis and embolism	93 (0.25)	415.1, 451.1, 671.3–671.5, 673.0–673.8
Cerebrovascular disorders	52 (0.14)	430.X, 431.X, 432.0–432.9, 434.0–434.0, 436.X, 437.6, 674.0
Disseminated intravascular coagulation	112 (0.30)	286.6–286.9, 666.3
Breast disorders	616 (1.63)	611.0, 611.2, 675.0–675.9
Complications of anesthesia	125 (0.33)	349.0, 668.X
Complications of spontaneous abortion	348 (0.92)	634.X, 637.X, 639.X
Complications of therapeutic abortion	59 (0.16)	635.X, 637.X, 639.X
Preexisting medical conditions		
Nonhereditary, nonhemolytic anemia	3614 (9.58)	280.0–280.9, 281.0–281.9, 285.9, 648.2
Hereditary hemolytic anemia	341 (0.90)	282.X
Clotting disorders	189 (0.50)	286.4, 287.3, 287.5
Tuberculosis	22 (0.06)	010.0–010.9, 011.0–011.9, 012.0–012.8, 013.0–013.9, 014.0–014.9, 015.0–015.9, 016.0–016.9, 017.0–017.9, 018.0–018.9, 647.3
HIV	37 (0.10)	042, 043, 044
Diabetes in pregnancy	1124 (2.98)	250.0–250.9, 648.0

Morbidity group	Frequency N (%)	ICD-9-CM codes
Thyroid disorders	638 (1.69)	242.0–242.9, 648.1
Gall bladder disease	202 (0.54)	574.0–574.9, 575.0–575.9
Renal disease	283 (0.75)	580.0–580.9, 581.0–581.9, 582.0–582.9, 583.0–583.9, 585.X, 586.X, 592.0–592.9, 646.2, 760.1
Liver disorders	52 (0.14)	571.0–571.9, 646.7
Asthma	1035 (2.74)	493.X
Neurologic conditions	38 (0.10)	351.0, 646.4
Cardiovascular condition	684 (1.81)	393.X, 394.0–394.9, 395.0–395.9, 396.0–396.9, 397.0–397.9, 398.0–398.9, 410.0–410.9, 413.0–413.9, 414.0, 424.0–424.9, 648.5–648.6, 441.0–441.9, 442.0–442.9
Other chronic disease	247 (0.65)	135.X, 555.X, 556.X, 710.X, 714.X, 760.3, 760.8
Mental health conditions	2349 (6.22)	295.0–295.9, 296.0–296.9, 297.0–297.9, 298.0–298.9, 300.0–300.9, 309.0, 309.1, 311.X, 648.4, E950–958

[a]"X" in the place of the fourth digit means that each fourth and fifth digit of the code is included or that the code has no digits to the right of the decimal point.

Table 3

Prevalence (N [%]) of the 10 most common pregnancy-related complications by pregnancy outcome[a]

	Live birth	Stillbirth	SAB [b]	TAB [c]	All outcomes
Any complication	15031 (60.6)	291 (52.4)	1435 (31.0)	1937 (26.5)	19116 (50.7)
Urinary tract infection	3666 (14.8)	87 (15.7)	296 (6.4)	417 (5.7)	4519 (12.0)
Anemia	3318 (13.4)	48 (8.6)	131 (2.8)	74 (1.0)	3614 (9.6)
Mental health conditions	1686 (6.8)	51 (9.2)	238 (5.1)	350 (4.8)	2349 (6.2)
Pelvic and perineal complications	2116 (8.5)	6 (1.1)	≤5	0	2134 (5.7)
Obstetric infection	1558 (6.3)	56 (10.1)	69 (1.5)	25 (0.3)	1724 (4.6)
Chronic hypertension	1330 (5.4)	45 (8.1)	151 (3.3)	116 (1.6)	1668 (4.4)
Pregnancy-induced hypertension	1615 (6.5)	12 (2.2)	≤5	≤5	1638 (4.3)
Excess vomiting	1366 (5.5)	20 (3.6)	43 (0.9)	83 (1.1)	1515 (4.0)
Antepartum hemorrhage	1111 (4.5)	38 (6.8)	193 (4.2)	21 (0.3)	1385 (3.7)
Abnormal glucose tolerance	1305 (5.3)	6 (1.1)	12 (0.2)	≤5	1327 (3.5)

[a] Includes Other/Missing race/ethnicity and all pregnancy outcomes.

[b] SAB = Spontaneous abortion

[c] TAB = Therapeutic (induced) abortion

Table 4

Prevalence of the 10 most common pregnancy-related complications among those with known race/ethnicity; live births only

	Live Births N (%)			
Complications	**Black N=10,137**	**White N=10,462**	**Hispanic N=1,373**	**API[a] N=2,495**
Any	6507 (64.2)	6198 (59.2)	738 (53.8)	1397 (56.0)
Urinary tract infection	1611 (15.9)	1555 (14.9)	197 (14.3)	255 (10.2)
Anemia	1944 (19.2)	915 (8.7)	151 (11.0)	264 (10.6)
Pelvic and perineal complications	796 (7.9)	912 (8.7)	89 (6.5)	281 (11.3)
Mental health conditions	523 (5.2)	1002 (9.6)	64 (4.7)	69 (2.8)
Pregnancy induced hypertension	650 (6.4)	791 (7.6)	73 (5.30	82 (3.3)
Obstetric infection	817 (8.1)	510 (4.9)	61 (4.4)	149 (6.0)
Excess vomiting	666 (6.6)	478 (4.6)	61 (4.4)	138 (5.5)
Chronic preexisting hypertension	828 (8.2)	414 (4.0)	30 (2.2)	48 (1.9)
Abnormal glucose tolerance	467 (4.6)	521 (5.0)	92 (6.7)	215 (8.6)
Antepartum hemorrhage	496 (4.9)	429 (4.1)	50 (3.6)	117 (4.7)

[a] API = Asian/Pacific Islander

Table 5

Association between morbidity and socioeconomic status (SES) index, stratified by race/ethnicity; live births only[a]

Characteristics	Conditions			
White N = 10,462	**Preexisting**	**Obstetric**	**Mental health**	**Any morbidity**
SES category	**AOR [b] [95%] CI [c]**	**AOR [95% CI]**	**AOR [95% CI]**	**AOR [95% CI]**
Low	1.33 [1.21, 1.47]	1.15 [1.06, 1.25]	1.16 [1.01, 1.33]	1.27 [1.16, 1.38]
High	Reference	Reference	Reference	Reference
Black N = 10,137				
SES category	**AOR [95% CI]**	**AOR [95% CI]**	**AOR [95% CI]**	**AOR [95% CI]**
Low	1.13 [1.03, 1.23]	1.05 [0.97, 1.15]	1.08 [0.89, 1.31]	1.11 [1.02, 1.21]
High	Reference	Reference	Reference	Reference

[a] Analyses adjusted for age group and parity.

[b] AOR = Adjusted odds ratio

[c] CI = Confidence interval