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Frequency of Prenatal Cytogenetic Diagnosis and Pregnancy Outcomes by Maternal Race–Ethnicity, and the Effect on the Prevalence of Trisomy 21, Metropolitan Atlanta, 1996–2005

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Abstract

The prevalence of trisomy 21 has been reported to differ by race–ethnicity, however, the results are inconsistent and the cause of the differences is unknown. Using data from 1996 to 2005 from the Metropolitan Atlanta Congenital Defects Program (MACDP), we analyzed the use of prenatal cytogenetic testing and the subsequent use of elective termination among pregnancies affected with any MACDP-eligible birth defect and trisomy 21, by maternal race–ethnicity. We then examined whether these factors could explain the observed differences in the prevalence of trisomy 21 among race–ethnicity groups. Among all pregnancies with birth defects, prenatal cytogenetic testing as well as elective terminations after an abnormal prenatal cytogenetic test result were observed less frequently among Hispanic women than among non-Hispanic white women (odds ratio [OR] 0.66, 95% confidence interval [CI] 0.56–0.78, respectively). In pregnancies affected by trisomy 21, both the Hispanic and the non-Hispanic black populations had more live births (89.5% and 77.8%, respectively) and fewer elective terminations (5.7% and 15.2%, respectively) compared to the non-Hispanic white population (63.0% live births, 32.3% elective terminations). After adjusting for elective terminations, non-Hispanic white mothers had a higher live birth prevalence of trisomy 21 compared to non-Hispanic black (OR 0.64, 95% CI 0.54–0.76) or Hispanic mothers (OR 0.69, 95% CI 0.55–0.86). Overall, our data suggest that factors associated with decisions made about the use of prenatal testing, and about pregnancy management after testing, might play a large role in the race–ethnicity differences observed in the live birth prevalence of trisomy 21.

Keywords

trisomy 21; Down syndrome; prenatal; cytogenetics; congenital defect; elective termination

INTRODUCTION

There has been debate in the literature regarding whether trisomy 21 (Down syndrome) occurs more often among Hispanic women, with some studies finding as much as a 20%

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higher prevalence estimate compared to non-Hispanic white women [Centers for Disease Control and Prevention, 1994; Hook et al., 1999; Canfield et al., 2006; Shin et al., 2009] while others find no significant difference in prevalence among race–ethnicity groups [Bishop et al., 1997]. To diagnose a pregnancy affected by trisomy 21 or other chromosomal abnormality, a prenatal cytogenetic test is typically performed following the removal of tissue through chorionic villus sampling (CVS) or amniocentesis. Factors influencing the use of prenatal testing are thought to include opinions towards the reliability and usefulness of test results, attitudes regarding elective termination, willingness to proceed with a pregnancy in which a birth defect was recognized, and access to care [Press and Browner, 1998; Li et al., 2008]. Both CVS and amniocentesis have associated risks of pregnancy complications and loss [Caughey et al., 2006], making some women reluctant to utilize these procedures. Use of prenatal cytogenetic testing allows for options in the event of abnormal findings such as arranging for specialized birth facilities and neonatal care, pregnancy termination, acquiring medical knowledge about the condition diagnosed, and finding support communities.

Differences in the utilization of prenatal diagnosis by race–ethnicity have been observed, with reports of less frequent use of amniocentesis among non-Hispanic blacks and Hispanics compared with non-Hispanic whites [Brett et al., 1994; Baker et al., 2004]. In addition, opinions about and use of elective pregnancy termination have been shown to differ by race–ethnicity [Harris and Mills, 1985; Jones et al., 2010; Pazol et al., 2011]. Prenatal diagnostic testing and elective termination affect the live birth prevalence of trisomy 21 [Mikkelsen, 1992; Cornel et al., 1993; Krivchenia et al., 1993; Bishop et al., 1997; Forrester and Merz, 1999], but the specific relationship between race–ethnicity differences in the uptake of prenatal cytogenetic testing and elective termination after prenatal diagnosis, and live birth prevalence has not been carefully examined.

Data from the Metropolitan Atlanta Congenital Defects Program (MACDP) have been used to assess the frequency of elective termination on the prevalence of trisomy 21 by maternal age [Cragan and Gilboa, 2009] and by maternal race [Siffel et al., 2004]. However, these analyses did not evaluate the role of differences in utilization of prenatal cytogenetic diagnosis or of elective pregnancy termination after prenatal diagnosis. We used MACDP data from 1996 to 2005 to examine the utilization of prenatal cytogenetic testing among pregnancies affected with a birth defect, the utilization of elective termination after prenatal diagnosis of a defect, and the prevalence of trisomy 21 by maternal race–ethnicity. We hypothesized that differences in the utilization of prenatal cytogenetic testing and elective termination influence the observed race–ethnicity differences in the prevalence of trisomy 21.

MATERIALS AND METHODS

MACDP is a population-based birth defects surveillance system covering residents of the five central metropolitan Atlanta counties at the time of delivery. MACDP methods have been published previously [Correa et al., 2007]. Briefly, for inclusion in MACDP, the fetus, infant, or child must have been diagnosed with a major structural defect or chromosomal abnormality either prenatally or before the child’s sixth birthday. Since 1968, trained

abstractors have actively ascertained birth defects data for live and stillborn infants delivered, and pregnancies electively terminated, at ≥20 weeks gestation from birth and pediatric hospitals. The Georgia Department of Public Health, Office of Vital Records, and selected clinical laboratories have directly submitted data. Beginning in 1994, to better ascertain pregnancies diagnosed prenatally with birth defects, record collection expanded to include affected pregnancies at any gestational age identified through maternal–fetal medicine departments and perinatal offices, and those electively terminated after prenatal diagnosis. Each abstracted defect is assigned a six-digit code using a coding system modified by the Centers for Disease Control and Prevention that is based on the British Paediatric Association coding system and the *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) [Rasmussen and Moore, 2001; Division of Birth Defects and Developmental Disabilities and National Center on Birth Defects and Developmental Disabilities, 2007].

For these analyses, we categorized maternal race–ethnicity as non-Hispanic white, non-Hispanic black, or Hispanic as designated in the delivery or medical record. We categorized pregnancy outcomes as live birth, fetal death ≥20 weeks gestation, elective termination after prenatal diagnosis of a birth defect at any gestational age, or unknown outcome. The latter were pregnancies diagnosed prenatally with a birth defect for which a delivery record was not found at the MACDP ascertainment sources (birth hospitals, perinatal offices, and maternal–fetal medicine departments). We calculated prevalence estimates as the number of deliveries with cytogenetically confirmed trisomy 21 (whole chromosome and translocations) divided by the total number of live births in the MACDP region. Consistent with other birth defects surveillance systems, population denominators for prevalence estimates were based on live births obtained from birth certificates and did not include fetal deaths or elective terminations [National Birth Defect Prevention Network, 2004].

First, we estimated the unadjusted prevalence of trisomy 21 among all pregnancy outcomes (live births, fetal deaths, elective terminations, and unknown outcome) for the entire MACDP population and for each of the three individual race–ethnicity subgroups, and compared each with that for non-Hispanic white women using chi-square with 95% confidence intervals. We also estimated the total live birth prevalence and the prevalence adjusted for elective terminations for births affected by trisomy 21. Approximately 74% of pregnancies electively terminated after prenatal diagnosis of trisomy 21 would be expected to result in a livebirth if elective termination had not occurred [Hook et al., 1989; Bishop et al., 1997] and thus would have contributed to the live birth rate. To estimate the live birth prevalence adjusted for elective terminations, we multiplied the number of elective terminations for trisomy 21 by 0.74 and added this number to the number of live births with trisomy 21 and the total number of live births [adjusted live births = live births + (elective terminations × 0.74)] [Krivchenia et al., 1993; Bishop et al., 1997].

Next, we used multivariate logistic regression to estimate odds ratios for whether a prenatal cytogenetic test was performed (tested vs. not tested), and whether an elective termination was performed (performed vs. not performed) after prenatal cytogenetic testing regardless of the result and after a prenatal cytogenetic test with an abnormal result, for all pregnancies with birth defects in MACDP comparing each race–ethnicity group with non-Hispanic white

women. We adjusted all models for maternal age as a continuous variable and birth year of the index pregnancy. Finally, we calculated the number of each birth outcome among all pregnancies with defects and among pregnancies with trisomy 21, the percent of the total, and 95% confidence interval for the percentage by race–ethnicity group. Statistical analyses were done using SPSS 18 [SPSS: An IBM Company, 2009] and SAS software version 9.2 [SAS Institute Inc., 2008].

RESULTS

Prevalence of Trisomy 21

We estimated the prevalence of trisomy 21 among all pregnancy outcomes for the three race–ethnicity groups during the years 1996–2005 (Table I). Compared with non-Hispanic whites, a significantly lower prevalence of trisomy 21 was observed among non-Hispanic black and Hispanic pregnancies in the combined maternal age category (prevalence ratio [PR] = 0.62, 95% confidence interval [CI] 0.53–0.73 and PR = 0.64, 95% CI 0.52–0.8, respectively). Non-Hispanic black mothers aged <35 years had a significantly lower prevalence of trisomy 21 pregnancies compared with non-Hispanic white mothers aged <35 years (PR = 0.74, 95% CI 0.58–0.95). However, the prevalence of trisomy 21 among Hispanic mothers aged <35 years was similar to that among non-Hispanic white mothers aged <35 years; the prevalence of trisomy 21 among mothers 35 years and older did not vary significantly by maternal race–ethnicity.

Unadjusted and Adjusted Live Birth Prevalence of Trisomy 21

The live birth prevalence of trisomy 21, and the live birth prevalence adjusted for electively terminated trisomy 21 pregnancies, were calculated for each of the three race–ethnicity subgroups (Table I). The live birth prevalence of trisomy 21 was significantly lower among non-Hispanic black mothers of all ages compared with non-Hispanic white mothers of all ages (PR = 0.77, 95% CI 0.64–0.93; Table I). When adjusted for elective termination, the live birth prevalence of trisomy 21 among both non-Hispanic black and among Hispanic mothers of all ages were statistically significantly lower compared with non-Hispanic white mothers (PR = 0.64, 95% CI 0.54–0.76, and PR = 0.69, 95% CI 0.55–0.86, respectively). Non-Hispanic black mothers aged <35 years also had a significantly lower live birth prevalence when adjusted for elective termination compared with non-Hispanic white mothers aged <35 (PR = 0.76, 95% CI 0.59–0.98). However, the adjusted live birth prevalence of trisomy 21 among Hispanic mothers aged <35 years was similar to that among non-Hispanic white mothers aged <35; the adjusted live birth prevalence of trisomy 21 among mothers 35 years and older did not vary significantly by maternal race–ethnicity.

Prenatal Cytogenetic Testing and Elective Termination in Race–Ethnicity Groups Comprising All MACDP-Eligible Birth Defects

Prenatal cytogenetic testing was reported significantly less frequently among Hispanic women (Table II) compared with non-Hispanic white women (odds ratio [OR] 0.66, 95% CI 0.56–0.78) using a multivariate logistic regression model to adjust for birth year and maternal age. In contrast, non-Hispanic black women underwent a similar frequency of prenatal cytogenetic testing (OR 0.95, 95% CI 0.87–1.00). However, compared with non-

Hispanic white women, both non-Hispanic black and Hispanic women were significantly less likely to undergo elective termination after an abnormal prenatal cytogenetic test result (OR 0.50, 95% CI 0.36–0.70 and OR 0.49, 95% CI 0.27–0.88, respectively).

Pregnancy Outcomes

The outcomes of all pregnancies with defects and of those pregnancies affected by trisomy 21 were analyzed for the years 1996–2005 by maternal race–ethnicity (Table III). Among all pregnancies with defects ascertained by MACDP, live births occurred most frequently among Hispanics and fetal deaths occurred most frequently among non-Hispanic blacks; elective termination occurred most frequently among non-Hispanic white pregnancies. Among pregnancies affected by trisomy 21, live births occurred most frequently among Hispanic and non-Hispanic black pregnancies, while elective terminations occurred most frequently among non- Hispanic white pregnancies. Fetal deaths were similar between race-ethnicities but occurred most frequently among non-Hispanic black pregnancies.

DISCUSSION

Utilization of Prenatal Cytogenetic Testing and Elective Pregnancy Termination

We found that maternal race–ethnicity was associated with both the utilization of prenatal cytogenetic testing and termination of a pregnancy after diagnosis of a birth defect. Compared with non-Hispanic white mothers, Hispanic mothers underwent prenatal cytogenetic testing significantly less often. This finding is in keeping with the literature which also has shown lower use of amniocentesis among Hispanic women [Baker et al., 2004]. It has been hypothesized that race–ethnicity differences in the utilization of prenatal diagnosis are due in part to differences in attitudes towards elective terminations [Press and Browner, 1998; Li et al., 2008]. This is supported by our finding that non-Hispanic black and Hispanic women were significantly less likely to undergo elective termination after an abnormal result from a prenatal cytogenetic test.

Total and Live Birth Prevalence of Trisomy 21

In comparing the overall prevalence of trisomy 21 among race–ethnicity groups, both the non-Hispanic black and Hispanic populations had a statistically significantly lower prevalence than the non-Hispanic white population; however, when only the live birth prevalence was examined, a statistically significant difference remained only for the non-Hispanic black population. The proportion of pregnancies with trisomy 21 that resulted in fetal death was similar among race–ethnicity groups (3.9% non-Hispanic white, 4.5% non-Hispanic black, and 3.8% Hispanic), suggesting that the differences in the overall prevalence of trisomy 21 largely reflect variations in the proportion of affected pregnancies that resulted in elective termination (32.3% non-Hispanic white, 15.2% non-Hispanic black, and 5.7% Hispanic). Indeed, when the live birth prevalence was adjusted for the estimated 74% of elective terminations that would have otherwise resulted in a live birth, both the non-Hispanic black and Hispanic populations again had a significantly lower prevalence of trisomy 21 compared with the non-Hispanic white population in the same age groups.

Effect of Maternal Age Distribution, Prenatal Cytogenetic Testing, and Elective Termination on Prevalence of Trisomy 21

Some of these findings are in contrast to previous reports in the literature. Similar to our observations, some studies have reported a lower prevalence of trisomy 21 among non-Hispanic blacks compared with non-Hispanic whites [Bishop et al., 1997; Canfield et al., 2006; Shin et al., 2009]. Unlike our data, however, others have reported as much as a 20% higher prevalence of trisomy 21 in Hispanic populations compared with non-Hispanic whites, while others have found no statistically significant difference between these race–ethnicity groups [Centers for Disease Control and Prevention, 1994; Bishop et al., 1997; Hook et al., 1999; Canfield et al., 2006; Shin et al., 2009]. Bishop et al. [1997] did report a slightly lower prevalence of trisomy 21 among Hispanics compared with non-Hispanic whites, but only after adjusting for the probability of survival to birth if elective termination had not been chosen; the unadjusted live birth prevalence reported by these authors is similar to other literature reporting a higher prevalence of trisomy 21 among Hispanics [Bishop et al., 1997]. We hypothesize that the cause of the lower prevalence of trisomy 21 among Hispanics in the MACDP surveillance area may be at least twofold, as described below.

Maternal Age Distribution

The Hispanic population in the MACDP area might be younger than those populations reported in other studies, since they did not provide mean maternal age data. During the 1996–2005 time period, the mean age of all women with pregnancies ≥20 weeks gestation (regardless of birth defect status) in the five-county MACDP area was 30.1 years (standard deviation 5.7) for non-Hispanic white mothers and 25.7 (standard deviation 5.7) for Hispanic mothers. There also was a greater proportion of mothers aged ≥35 years in the non-Hispanic white population than in the Hispanic population (22.2% of non-Hispanic white mothers compared with 7.9% of Hispanic mothers). While not reaching the level of significance, the live birth prevalence of trisomy 21 for Hispanic mothers aged ≥35 years was higher than that for white mothers aged ≥35 (48.7 vs. 33.6 per 10,000 live births, respectively, Table I). The role of maternal age is supported by other data presented in Table I. The prevalence ratios for pregnancies affected by trisomy 21 in Hispanic women stratified by maternal age are 1.0 and 0.93 (<35 and ≥35, respectively), which are not significantly different from those for non-Hispanic white women. This comparison is most likely confounded by maternal age, as the overall PR is 0.64 for Hispanic women. If the maternal age distributions for these two race–ethnicity populations were more similar, the overall trisomy 21 live birth prevalence might shift towards a higher prevalence among Hispanics as has been reported by others.

Prenatal Cytogenetic Testing and Elective Termination

As seen in our data and noted by others [Baker et al., 2004; Jones et al., 2010; Pazol et al., 2011], there is a significant difference in the prevalence of prenatal cytogenetic testing and of elective termination among race–ethnicity groups, which would affect the live birth prevalence [Mikkelsen, 1992; Cornel et al., 1993; Krivchenia et al., 1993; Bishop et al., 1997; Forrester and Merz, 1999]. Although speculative, if the same frequencies of prenatal

cytogenetic testing and elective termination observed in the non-Hispanic white trisomy 21 population were applied to the Hispanic trisomy 21 population, the live birth prevalence of trisomy 21 would be nearly identical for non-Hispanic whites and Hispanics (maternal age <35 years, 7.3 and 7.4 per 10,000 live births, respectively; maternal age ≥35 years, 33.9 and 31.4 per 10,000 live births respectively). To our knowledge, no other study has analyzed the prevalence of trisomy 21 for these race–ethnicity groups in light of differences in the maternal age distribution, the frequency of prenatal testing, and the frequency of elective termination after a prenatal diagnosis, which may explain some of the disparate results seen in the literature and why our results differ from previous reports.

Limitations

There are several limitations to these analyses. These results represent the use of prenatal cytogenetic testing and elective termination within a population with confirmed birth defects, rather than within the general population of all pregnant women. Also, MACDP does not receive results from all cytogenetic laboratories that service Atlanta, which probably results in some under-ascertainment of the actual use of cytogenetic testing and of chromosomal diagnoses. Further, there may be differential ascertainment between race–ethnicity groups as a result of the distribution of these groups within the catchment area, as well as differences in access to care. The limited number of cases particularly among the Hispanic population could influence the statistical stability of our estimates. Finally, the probability of survival to birth if elective termination had not been chosen might differ by race–ethnicity; the population used by Hook et al. [1989] to establish the 74% chance of survival was based on survey responses from prenatal cytogenetics laboratories in North America, however no demographic data or information about the responding laboratories were provided.

Strengths

This study has several strengths. This is a population-based study rather than hospital-based or a passive registry. Also, MACDP uses multiple ascertainment sources (such as birth hospitals, pediatric hospitals, specialty clinics, perinatal offices, cytogenetics laboratories, and vital records) to identify all infants, fetuses, or children with birth defects within the five-county catchment area. Highly trained MACDP abstractors actively search multiple sources at each ascertainment site and all medical records of identified cases are thoroughly reviewed to assure completeness of information. Finally, case abstractions are reviewed through a multi-tiered system involving pediatric and clinical genetics staff to ensure accuracy of diagnosis.

CONCLUSION

Overall, our data suggest that, in addition to possible biological causes such as maternal age, social factors (opinions about testing, attitudes regarding elective termination, and access to care) might play a large role in the race–ethnicity differences observed in the prevalence of trisomy 21.

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TABLE I

Prevalence Estimates of Trisomy 21 Among All Pregnancy Outcomes (Sum of Live Births, Fetal Deaths, Elective Terminations, and Unknown Outcomes [*]), Live Birth Prevalence of Trisomy 21, Unadjusted and Adjusted for Elective Termination, Presented by Maternal Race–Ethnicity and Age, Metropolitan Atlanta, 1996–2005

	MACDP Five-County Region			Non-Hispanic White			Non-Hispanic Black			Hispanic		
	All	**<35**	**≥35**	**All**	**<35**	**≥35**	**All**	**<35**	**≥35**	**All**	**<35**	**≥35**
Total live births, n	484,260[a]	407,786	76,474	184,473	143,426	41,047	186,274	163,638	22,636	77,473	71,319	6,154
Trisomy 21 all outcomes, n	790	356	434	386	141	245	243	120	123	104	70	34
Prevalence[b]	16.3	8.7	26.8	21.0	9.8	59.7	13.0	7.3	54.3	13.4	9.8	55.3
95% CI	15.2–17.5	7.9–9.7	51.7–62.3	19.0–23.1	8.3–11.6	52.7–67.6	11.5–14.8	6.1–8.8	45.6–64.8	11.1–16.3	7.8–12.4	39.6–77.1
Prevalence ratio				Referent	Referent	Referent	0.62[c]	0.74[d]	0.91	0.64[c]	1.0	0.93
95% CI							0.53–0.73	0.58–0.95	0.73–1.1	0.52–0.8	0.75–1.3	0.65–1.3
Trisomy 21 live births, n	559	286	273	243	105	138	189	98	91	93	63	30
Prevalence[b]	11.5	7.0	36.0	13.2	7.3	33.6	10.2	6.0	40.2	12.0	8.8	48.7
95% CI	10.6–12.5	6.3–7.9	31.7–40.2	11.6–14.9	6.1–8.9	28.5–39.7	8.9–11.7	4.9–7.3	32.8–49.3	9.8–14.7	6.9–11.3	34.3–69.5
Prevalence ratio				Referent	Referent	Referent	0.77[e]	0.81	1.2	0.91	1.2	1.5
95% CI							0.64–0.93	0.62–1.1	0.92–1.56	0.72–1.2	0.88–1.7	0.98–2.2
Trisomy 21 elective term, n	186	54	132	125	29	96	37	16	21	6	4	2
Adjusted prevalence[f]	14.4	8	48.5	18.2	8.9	50.8	11.6	6.7	47.0	12.5	9.3	52.0
95% CI	13.4–15.5	7.1–8.9	43.8–53.6	16.4–20.3	7.4–10.5	44.4–58.2	10.2–13.3	5.6–8.1	39.1–57.1	10.3–15.3	7.3–11.8	36.9–73.3
Prevalence ratio				Referent	Referent	Referent	0.64[g]	0.76[h]	0.92	0.69[g]	1.0	1.0
95% CI							0.54–0.76	0.59–0.98	0.74–1.2	0.55–0.86	0.78–1.4	0.73–1.5

CI, confidence interval.

[*] Pregnancies diagnosed prenatally with trisomy 21 for which a delivery record was not found at the MACDP ascertainment sources.

[a] Total number of live births in the Metropolitan Atlanta Congenital Defects Program (MACDP), including those of other race-ethnicities.

[b] Prevalence per 10,000 live births in the MACDP region.

[c] Statistically significant difference compared with all birth outcomes among all non-Hispanic white mothers ($P < 0.0001$).

[d] Statistically significant difference compared with all birth outcomes among non-Hispanic white mothers aged <35 years ($P < 0.05$).

[e] Statistically significant difference compared with unadjusted live birth prevalence among all non-Hispanic white mothers (P <0.01).

[f] Prevalence per 10,000 live births in the Metropolitan Atlanta Congenital Defects Program region adjusted for 74% survival of trisomy 21 elective terminations [adjusted live births = live births + (elective terminations × 0.74)].

[g] Statistically significant difference compared with adjusted live birth prevalence among all non-Hispanic white mothers ($P \leq 0.001$).

[h] Statistically significant difference compared with adjusted live birth prevalence among non-Hispanic white mothers aged <35 years ($P < 0.05$).

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TABLE II

Adjusted Odds Ratios* for Prenatal Cytogenetic Testing and for Elective Termination Among Pregnancies With Birth Defects by Maternal Race–Ethnicity, Metropolitan Atlanta, 1996–2005

	Non-Hispanic White	Non-Hispanic Black	Hispanic
All pregnancies with defects ascertained by MACDP	7,995	6,326	2,473
Prenatal cytogenetic test (PCT), n	1,550	912	208
Odds ratio	Referent	0.95	0.66[a]
95% CI		0.87–1.0	0.56–0.78
Elective termination after PCT, n	325	130	29
Odds ratio	Referent	0.64*	0.66
95% CI		0.51–0.81	0.43–1.0
Elective termination after abnormal PCT result, n	242	78	18
Odds ratio	Referent	0.50	0.49*
95% CI		0.36–0.70	0.27–0.88

MACDP, Metropolitan Atlanta Congenital Defects Program; CI, confidence interval.

*Adjusted for maternal age and year of index pregnancy.

[a]Statistically significant difference compared to non-Hispanic white mothers.

TABLE III

Numbers and Percent of Each Pregnancy Outcome Affected With Trisomy 21 by Maternal Race–Ethnicity, Metropolitan Atlanta, 1996–2005

	Live Births			Fetal Deaths			Elective Terminations			Unknown Outcomes[a]			
	n	%	95% CI	n	%	95% CI	n	%	95% CI	n	%	95% CI	Total
All pregnancies with defects ascertained by MACDP	16,465	92.5	92.1–92.9	441	2.5	2.3–2.7	802	4.5	4.2–4.8	92	0.5	0.4–0.6	17,800
Non-Hispanic White	7,401	92.6	92.0–93.1	144	1.8	1.5–2.1	422	5.3	4.8–5.8	28	0.4	0.2–0.5	7,995
Non-Hispanic Black	5,872	92.8	92.2–93.4	199	3.1	2.7–3.6	229	3.6	3.2–4.1	26	0.4	0.3–0.6	6,326
Hispanic	2,330	94.2	93.2–95.1	67	2.7	2.1–3.4	68	2.7	2.2–3.5	8	0.3	0.2–0.6	2,473
All pregnancies with trisomy 21	561	70.8	67.6–73.9	30	3.8	2.6–5.3	186	23.5	20.6–26.5	15	1.9	1.1–3.0	792
Non-Hispanic White	244	63.0	58.1–67.7	15	3.9	2.4–6.3	125	32.3	27.8–37.1	3	0.8	0.3–2.2	387
Non-Hispanic Black	189	77.8	72.1–82.5	11	4.5	2.6–7.9	37	15.2	11.3–20.3	6	2.5	1.1–5.3	243
Hispanic	94	89.5	82.2–94.0	4	3.8	1.5–9.4	6	5.7	2.7–11.9	1	1.0	0.2–5.1	105

MACDP, Metropolitan Atlanta Congenital Defects Program; CI, confidence interval.

[a]Unknown outcomes include pregnancies diagnosed prenatally with a defect for which a delivery record was not found at the MACDP ascertainment sources.