

# Mild Mental Retardation in Black and White Children in Metropolitan Atlanta: A Case-Control Study

## ABSTRACT

**Objectives.** This study assessed differences in the prevalence of mild mental retardation, defined as an intelligence quotient (IQ) from 50 to 70, between Black and White children.

**Methods.** A case-control study design was used. Ten-year-old children with mental retardation were identified from multiple sources. Information on race, sex, maternal age, birth order, economic status, and maternal education was abstracted from birth certificates of 330 case children and 563 control children (public school students).

**Results.** The crude Black-White odds ratio (OR) was 2.6, but it was reduced to 1.8 after the other five covariates were controlled. The disparity was largest among children whose mental retardation was first diagnosed when they were 8 to 10 years old (adjusted OR = 2.5). We found no significant difference in the occurrence of mild mental retardation between Black and White children diagnosed before the age of 6 years (adjusted OR = 1.2). Black children had a higher prevalence of mild mental retardation within all strata of the other five covariates.

**Conclusions.** Five sociodemographic factors accounted for approximately half of the excess prevalence of mild mental retardation among Black children. Possible reasons for the residual difference are discussed. (*Am J Public Health.* 1995;85:324-328)

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## Introduction

In the United States a higher than expected proportion of Black children are placed in classes for the educable mentally retarded.<sup>1-4</sup> In parallel, prevalence rates of mental retardation have generally been found to be higher among Blacks than among Whites.<sup>1,2,5-7</sup> Since approximately 80% of people with mental retardation are mildly retarded, the higher prevalence among Blacks is likely to be due mainly to mild mental retardation.

In a cross-sectional survey in metropolitan Atlanta, the crude prevalence of mild mental retardation, defined as an intelligence quotient (IQ) from 50 to 70, was about three times higher among Black than among White 10-year-old children.<sup>8</sup> We are aware of only one other comparison of the prevalence of mild mental retardation among Blacks and Whites; in children followed to age 7 years the prevalence of mild mental retardation was nearly four times higher among Black than among White children (46 vs 12 per 1000).<sup>7</sup>

Many reasons could account for these differences. In particular, mild mental retardation is consistently reported to be associated with low socioeconomic status,<sup>7,9-16</sup> and race is highly correlated with socioeconomic status.<sup>17</sup> Thus, confounding with socioeconomic status could explain the observed excess of mental retardation among Blacks. We therefore examined the relationship between race and mild mental retardation after controlling for selected sociodemographic factors.

## Methods

These analyses use data from the Metropolitan Atlanta Developmental Dis-

abilities Study. The details of case definition, ascertainment procedures, and the prevalence rates of mental retardation have been reported elsewhere.<sup>8,18</sup> Children with mental retardation in this report were a subset of children identified during the prevalence survey,<sup>8</sup> namely the fixed cohort born in 1975 or 1976 to residents of the five-county metropolitan Atlanta area and living in the area at age 10. For this case-control study, we identified 379 children with mild mental retardation (defined as an IQ from 50 to 70 on the most recent psychometric examination) in a review of records from multiple sources.

We randomly selected 1200 control children from all 10-year-old children listed in public schools in the metropolitan Atlanta area in 1985 or 1986. After excluding all children previously identified as having mental retardation, cerebral palsy, visual impairment, hearing impairment, or epilepsy; those enrolled in any kind of special education class (except high achievers); and those not born to a resident of the Atlanta area, we were left with 650 children.

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**Editor's Note.** See related editorial by Zigler (p 302) and annotation by Satcher (p 304) in this issue.

**TABLE 1—The Distribution of Study Characteristics among 10-Year-Old Children with Mild Mental Retardation and Control Children, Metropolitan Atlanta, 1985 through 1986**

	Case Children (n = 330)		Control Children (n = 563)	
	No.	%	No.	%
<b>Children</b>				
<b>Sex</b>				
Male	199	60.3	267	47.4
Female	131	39.7	296	52.6
<b>Birth order</b>				
1st	116	35.2	232	41.2
2nd	95	28.8	212	37.7
≥3rd	119	36.1	119	21.1
<b>Mothers</b>				
<b>Race</b>				
White	98	29.7	296	52.6
Black	232	70.3	267	47.4
<b>Age at delivery, y</b>				
<20	86	26.1	118	21.0
20–29	191	57.9	346	61.5
≥30	53	16.1	99	17.6
<b>Education level at delivery, y</b>				
<12	177	53.6	156	27.7
12	121	36.7	245	43.5
>12	32	9.7	162	28.8
<b>Economic status</b>				
Low	187	56.7	196	34.8
Middle	97	29.4	186	33.0
High	46	13.9	181	32.2

We defined a child's race as the mother's race as recorded on the birth certificate. We excluded five children (four case children and one control child) because maternal race was not recorded, and four (one case child and three control children) because the mother was neither Black nor White. Thus, our study sample was reduced to 374 children with mild mental retardation and 646 control children.

As potential confounders or effect modifiers, we selected from the birth certificates sex, maternal age, birth order, maternal education, and economic status. We used the mother's address to identify the census block group (a subdivision of a census tract) in which the mother was living at the time of the child's birth.<sup>19</sup> The median family income in 1979 (1980 census data) for all families living in the mother's block group was used as a proxy for the family's economic status. The median family incomes of the block groups of all study families were divided into terciles based on the distribution of median family incomes among the control children.

We excluded from the analysis children (44 case children and 83 control children) for whom information on any study variable except birth order was missing; 83% had missing information on maternal education. We assumed that 78 case children and 85 control children with birth order not recorded were firstborn children, because in subsequent interviews we found that 96 of 101 mothers of children for whom birth order was not recorded reported the index child to be their first live-born child. Thus, 330 children with mild mental retardation and 563 control children were included in the final study group.

We used exposure odds ratios (ORs) to estimate the prevalence of mild mental retardation among Black children relative to that among White children. To calculate odds ratios and their 95% confidence intervals (CIs), we used SAS Proc Logist.<sup>20,21</sup> We entered all variables into logistic regression models as dummy variables and used White race, firstborn status, female sex, maternal age 20 to 29 years, more than 12 years of maternal

**TABLE 2—The Association between Race and Mild Mental Retardation among 10-Year-Old Children, Metropolitan Atlanta, 1985 through 1986**

Variable(s) in Model	Odds Ratio <sup>a</sup>	95% Confidence Interval
Race only	2.6	2.0, 3.5
Race and		
Sex	2.6	1.9, 3.4
Maternal age	2.6	1.9, 3.5
Birth order	2.5	1.9, 3.4
Maternal education	2.1	1.6, 2.9
Economic status	1.8	1.3, 2.5
Sex, maternal age, birth order, maternal education, and economic status	1.8	1.3, 2.6

<sup>a</sup>Odds ratio from each of seven different logistic regression models comparing the prevalence of mild mental retardation in Black children with that in White children.

education, and the highest economic level as referent categories.

## Results

Sixty percent of the children with mild mental retardation were male, whereas only 47% of the control children were male (Table 1). Children with mild mental retardation were more likely to have two or more older siblings than were control children (36% vs 21%). Mean maternal age was similar in both groups (23.9 years for case children vs 24.7 years for control children). Mothers of children with mild mental retardation were less likely to have completed 12 or more years of education at the time of delivery than were mothers of control children (46% vs 72%). Families of case children also tended to live in neighborhoods with a lower median family income.

The mothers of children with mild mental retardation were more likely to be Black than were the mothers of control children (70% vs 47%). We estimated the crude odds ratio for the association between mild mental retardation and race to be 2.6 (Table 2). The odds ratio was reduced to 1.8 when we simultaneously controlled for the other five sociodemo-

**TABLE 3—The Association between Race and Mild Mental Retardation among 10-Year-Old Children within Strata Defined by Age at First Diagnosis, Metropolitan Atlanta, 1985 through 1986**

Age at First Diagnosis, y <sup>a</sup>	Median IQ		Black-White Adjusted Odds Ratio <sup>b</sup> (95% Confidence Interval)
	Whites (n = 98)	Blacks (n = 232)	
< 6	54.5 (n = 28)	56.5 (n = 42)	1.2 (0.6, 2.2)
6-7	67.0 (n = 41)	62.0 (n = 102)	1.7 (1.0, 2.7)
8-10	68.0 (n = 29)	67.0 (n = 88)	2.5 (1.5, 4.4)

<sup>a</sup>All control children are included in the analysis for each stratum.

<sup>b</sup>Black-White odds ratio adjusted for maternal age, sex, birth order, maternal education, and economic status.

**TABLE 4—The Association between Race and Mild Mental Retardation among 10-Year-Old Children within Strata Defined by Sociodemographic Factors, Metropolitan Atlanta, 1985 through 1986**

	Case Children (n = 330)	Control Children (n = 563)	Black-White Adjusted Odds Ratio <sup>a</sup> (95% Confidence Interval)
<b>Sex</b>			
Male	199	267	1.8 (1.0, 3.0)
Female	131	296	1.9 (1.1, 3.1)
<b>Maternal age, y</b>			
< 20 <sup>b</sup>	86	118	1.7 (0.8, 3.5)
20-29	191	346	1.8 (1.1, 2.9)
≥ 30	53	99	1.6 (0.6, 4.2)
<b>Birth order</b>			
1st <sup>c</sup>	116	232	2.9 (1.6, 5.3)
2nd	95	212	1.4 (0.7, 2.6)
≥ 3rd	119	119	1.3 (0.7, 2.5)
<b>Maternal education, y</b>			
< 12	177	156	1.5 (0.9, 2.6)
12	121	245	2.0 (1.1, 3.6)
> 12	32	162	2.3 (0.9, 5.7)
<b>Economic status</b>			
Low	187	196	1.6 (0.9, 3.3)
Middle	97	186	1.5 (0.9, 2.7)
High	46	181	2.9 (1.3, 6.4)

<sup>a</sup>Black-White odds ratio adjusted for all other study variables.

<sup>b</sup>In this model, education was categorized as < 12 y or ≥ 12 y and birth order was categorized as firstborn, secondborn, or higher.

<sup>c</sup>In this model, age was categorized as < 20 y or ≥ 20 y.

<sup>d</sup>In this model, age was categorized as < 30 y or ≥ 30 y.

graphic variables. Limiting the analysis to children with birthweights above 2500 g did not substantially alter the magnitude of the observed association (adjusted OR = 1.6, 95% CI = 1.1, 2.4). Moreover, the Black-White odds ratio was 1.7 (95% CI = 1.3, 2.3) when we controlled for birthweight (i.e., < 2500 g, ≥ 2500 g) as well as the other five covariates.

The median IQ among both Black and White children diagnosed before they were 6 years old was lower than the

median IQ among children whose mental retardation was diagnosed when they were at least 6 years old (Table 3). There was no significant difference in the prevalence of mild mental retardation between Black and White children whose mental retardation was diagnosed when they were less than 6 years old (adjusted OR = 1.2). The adjusted Black-White odds ratio was the highest for children first diagnosed at ages 8 to 10 years (adjusted OR = 2.5).

The prevalence of mild mental retardation was higher among Black children than among White children within all strata defined by our five sociodemographic variables (Table 4). There was a tendency for the odds ratios to be highest within the highest education and economic strata and for firstborn children.

## Discussion

We found that the excess prevalence of mild mental retardation among Black children was reduced by nearly 50% when we controlled for sex, maternal age at delivery, birth order, maternal education, and economic status. However, the residual excess among Black children does not necessarily indicate that Black children are at higher risk for mild mental retardation. The true odds ratio might be smaller than 1.8 if other unmeasured confounders shown previously to be associated with mild mental retardation, such as maternal intelligence and housing density,<sup>7</sup> were controlled. We did not control for birthweight in most of our analyses because it was unclear whether birthweight should be considered as a confounder or an intervening variable.<sup>22</sup>

There may be residual confounding due to inaccuracies in the measurement of the other five covariates that we used. For example, it is unlikely that our measure of economic status accurately reflects the economic status of each study family in that block group. Further, information obtained from birth certificates is likely to contain errors.<sup>23</sup> Misclassification of information on birth order may be a particular problem, since we assumed that if birth order was not recorded, the child was the firstborn. However, our results did not change when children of undetermined birth order were excluded from the analysis (adjusted OR = 1.8). The omission of 105 children whose mothers' education was missing on the birth certificate probably did not substantially alter our findings, since the overall crude odds ratio with those children included was almost the same (2.7) as the crude odds ratio with them excluded (2.6). Residual confounding may also result from the fact that some educational and economic strata include a heterogeneous mix of individuals. For example, mothers of control children in the highest economic stratum lived in block groups in which the median family income ranged from \$22 036 to \$43 622.

Although we believe we have identified most children who were diagnosed

with mild mental retardation, our control population was limited to children enrolled in public schools. On the basis of data from the 1980 census, we found our controls to be somewhat less likely than all children in the study area to live in census block groups with the highest median incomes. However, within a given economic stratum, the probability of being selected as a control subject did not vary appreciably by race. Moreover, we do not believe that our choice of public school students as control children created a substantial selection bias because only about 6% of metropolitan Atlanta schoolchildren attended private school in 1986.<sup>24</sup>

Our findings are based on administrative prevalence, that is, on the number of children with mild mental retardation who had been previously identified for the purpose of providing services. Racial differences in the rates at which children are referred for psychometric testing or placed in special education classes could create spurious differences in the prevalence of mild mental retardation.<sup>2</sup> In some studies, researchers have found a tendency for children from minority racial or ethnic groups to be overrepresented among children who are tested and placed in classes for children with mild mental retardation.<sup>2-4</sup> Unlike possible referral and testing biases, educational placement should have little effect on our findings, because we did not limit our study to children who were placed in special education classes.<sup>18</sup> Further, the Collaborative Perinatal Project researchers, who tested all children from a defined cohort, found a marked difference between Black and White children in the prevalence of mild mental retardation.<sup>7</sup>

It has been suggested that many test instruments may penalize racial minorities and non-English-speaking children.<sup>25,26</sup> Psychometric test scores may be lower for Black children than for White children because some Black children are being raised in environments where they do not have access to the skills and knowledge being assessed by most IQ tests.<sup>27</sup> Thus, studies such as this one that depend on the results of traditional IQ tests to define mild mental retardation may overestimate the number of minority children with this condition.

We found little difference in the prevalence of mild mental retardation between Black and White children diagnosed before reaching school age, but Black children were overrepresented among children diagnosed after they

entered school. These findings suggest that differential referral of school-aged children for IQ testing contributes to the association between race and mild mental retardation that has been found in many studies.<sup>1,5,6</sup> An alternative explanation is that different identification or referral factors may operate for Black children than for White children before the age of 6. Either of these possibilities could produce the patterns that we observed.

Like the Collaborative Perinatal Project researchers, we found that the excess of mild mental retardation among Black children was present in all socioeconomic strata and that odds ratios were greatest among children with the lowest baseline prevalence of mild mental retardation (i.e., children of mothers with the highest educational or economic status).<sup>7</sup> Investigators have found that the relative risks between Blacks and Whites for a variety of reproductive outcomes greatest in the low baseline risk groups.<sup>28-31</sup> However, these findings may be artifacts of the use of a ratio measure to assess the magnitude of the association in groups with different baseline risks. These results may also be due to the possibility that within the lowest baseline risk stratum of a given factor, Black mothers are not comparable to White mothers with regard to that factor or other risk factors for adverse reproductive outcomes. This was evidenced in our data, since within the highest income tercile, White mothers tended to come from areas with higher median incomes than Black mothers (e.g., 26% of White control-group mothers in the highest economic stratum lived in block groups with median incomes above \$30 000, compared with only 8% of Black control-group mothers).

Black children may be at increased risk for mental retardation because they may be more likely than White children to be exposed to the cumulative effects of deleterious postnatal factors, such as ambient lead or anemia. Further, some maternal medical or biological conditions that are more common among Blacks may alter the in utero environment in such a way that the child's risk of mild mental retardation is increased (these conditions include anemia, elevated lead levels, hypertension, diabetes, chronic renal disease due to hypertension or diabetes, and sickle cell anemia).<sup>32-36</sup> Systematic differences in the early treatment of maternal or pediatric medical conditions may also affect the child's risk of developing mild mental retardation. For example, a 1986 national survey of the use of health

services showed that Black Americans had less access to health care than White Americans at all socioeconomic levels.<sup>37</sup> In addition, differences in cognitive stimulation and early educational experiences may contribute to the increased risk for mental retardation among Black children.<sup>38-41</sup>

Traditional measures of socioeconomic status may be insufficient to control for racial differences in lifestyle or behavior that could affect pregnancy outcome.<sup>28</sup> Further, poverty in previous generations may affect the risk of mild mental retardation in subsequent generations through a family's persistent lack of economic resources, through its lack of access to quality education or social services, or through sustained physiologic deprivation. Some researchers have suggested that the mother's own prenatal and childhood environment may be important determinants of the outcome of her pregnancies.<sup>34,42</sup> Since proportionately more Blacks than Whites have had a history of poverty in previous generations, possible intergenerational factors may contribute to an increased rate of a variety of poor reproductive outcomes among Blacks, including mild mental retardation.<sup>42</sup>

We recommend that additional research focus on how differences between Black and White children in the prevalence of mild mental retardation are affected by factors such as environmental exposures, maternal health conditions, poverty in previous generations, maternal cognitive level, and children's early cognitive experiences. Previous studies have demonstrated that less advantaged Black children who received early, structured, and intensive social, medical, and educational interventions scored higher, on average, on tests of cognitive ability than Black children from similar backgrounds who had not received these interventions.<sup>38-41</sup> Thus, we believe that much of the excess prevalence of mild mental retardation among Black children is preventable. □

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