estimate the proportion of total benefits that would be realized if a proportion of the fleet were outfitted.

The use of different data sets for deriving effectiveness rates also had no effect on the overall results. Besides the rates reported in table 3 that were based on 3 years (1983–85) of auto accident data, effectiveness rates and the number of potential school bus injuries prevented were also calculated using 1983–84 data and 1985 data. The differences were small, and for each injury category the estimate of the number of cases prevented was higher using the 1983–85 data than it would have been using the other data sets.

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Discrepancies in Racial Designations of School Children in Minneapolis

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Synopsis

To determine the frequency of inaccuracies in racial designations of school children in a health survey, racial designations were examined for a sample of 1,509 children in Minneapolis public schools who participated in the first home interview of the Minneapolis Children's Blood Pressure Study. The data were obtained from three sources: the school enrollment data based on parentally supplied information and teachers' visual judgments, school survey interviewers participating in a research project, and the parents themselves, at home interviews. Assuming the correctness of the information obtained from the parent in the home interview, cross tabulation comparisons were made of the accuracy of the information obtained from the other sources, and within sources.

Results show a high degree of agreement between the parents' or teachers' designations at enrollment, and survey interviewers' sight judgments. Furthermore, sight judgments of interviewers show high repeatability. There was a significant degree of disagreement between the designations by teachers' and screeners' visual judgments, obtained in school, and the interviews with the parents. Misidentification occurred for up to 20 percent of Native American children, a rate which, if prevalent, may significantly affect public health studies

which are based on racial identifications of school children. When possible, researchers studying Native American or mixed race populations should verify racial designations from school documents or sight judgments. Questionnaires to be answered by parents need to have sufficiently detailed categories to enable parents of different racial groups to identify different racial groups accurately.

RACIAL DESIGNATIONS of persons, determined for statistical or administrative purposes, are often assigned arbitrarily, particularly with regard to blacks (*1*). For example, persons of predominantly European ancestry may be designated as black because of known minimal African ancestry and cultural identification.

Arbitrary assignments of racial designations result from legal, social, and administrative factors of long standing and may have far-reaching implications for public health statistics and health studies. Laws vary widely and sometimes are ambiguous. Racial designation may, in a given official encounter, depend on the decision of a particular official involved. In public schools, the racial designation of a child is likely to be determined by a teacher's visual judgment. Surveys of children may involve the visual judgment method or a question posed to the child or the child's parents.

Noting discrepancies in school children's racial designations in a survey, we compared responses from three sources: school enrollment data, home interviews, and school survey screenings of a multiracial urban school population.

Methods

In 1977, 10,423 students, 99 percent of those in the first, second, and third grades of Minneapolis public schools, were screened in the Minneapolis Children's Blood Pressure Study (*2*). Racial information on the children had been provided by parents as part of the school enrollment procedure. This information was supplemented when necessary by teachers' visual judgments if data were missing, and from survey interviewers' visual judgments at subsequent school survey screenings.

A random sample of 2,641 children was selected and written consent was requested from their parents for a long-term followup study of blood pressure. The 1,799 children with parental consent, and their families, were invited to participate in a home interview. Of them, 1,509 (84 percent) families responded and were interviewed at home in 1979 and 1980. A questionnaire given to parents asked the race of the child and the biologic parents (*3*). During the home interview the parents selected a racial designation from among ethnic groups listed on a card. Children in the sample were followed in biannual school survey screenings through 1986. We assessed the agreement of the racial designations provided by the different sources, both between and within sources, by cross tabulation and by Kappa statistics (*4*).

Results

The following racial categories were listed on school enrollment forms filled out by parents or teachers: white, black, Native American and American Indian, and other.

In the home interview, parents specified from the following list: American Indian or Alaskan Native, Asian or Pacific Islander, black or Negro, white or Caucasian, Hispanic, or another group not listed, which required specifying either mixed black-white, mixed American Indian-white, or mixed other.

Table 1 shows a cross tabulation of the children's racial designations provided by parents or teachers at school enrollments, compared with the sight designations made by school survey interviewers. Agreement was 99 percent.

Table 2 shows a cross tabulation of the children's racial designations made by parents or teachers at school enrollments and those provided by parents in the home interviews. Assuming that the parents' home interview responses are correct designations, misclassifications exist in school records for 8 of the 82 Native Americans (10 percent), 5 of the 61 Asians (8 percent), 9 of the 357 blacks (3 percent), and 9 of the 845 whites (1 percent). However, there was 95 percent agreement, or 1,420 out of 1,596, if agreement was allowed when teachers categorized Hispanics as white or other, mixed black-white as black, mixed Indian-white as either white or Indian, and mixed other as either white or other.

Table 3 shows a cross tabulation of children's racial designations by a school survey interviewer, compared with the designation provided by the parents in the home interview, after the parents' designations were recoded. The designations were

recoded as white if given as Hispanic, as black if given as mixed black-white, as Native American if given as mixed Native American, and as other if given as Asian or mixed other. Twenty of 100 Native American children were misclassified. The recoded categories provide a 93 percent overall agreement, and a highly significant Kappa value of 0.87 (SE = 0.0187, $P < 0.001$). (Kappa value corrects for agreement that could be expected by chance.)

A cross tabulation was performed of the race of the biological mother against the race of the biological father, as designated by a parent (usually the mother). Separate cross tabulations were made for black, white, Native American, and mixed race children. Both parents had the same racial designation as the child for 97 percent of the black children, and 100 percent of the white and Native American children. Among 60 children designated mixed black-white, 35 (58 percent) had a black father and a white mother, 3 (5 percent) had a black mother and a white father, 4 had mixed parents, 4 had some combination of mixed-race parents, and for 14 there were missing designations for 1 or both parents. Of 18 children designated mixed American Indian-white, 17 were correctly classified based on parents' race. Thus, questions about the parents' race can be used to verify or determine the racial designations of Native American or mixed race children.

Table 4 shows the repeatability of the results of survey interviewers' sight judgments performed 1, 5, and 8 years apart. The Kappa value for the 1-year interval was 0.91 (SE = 0.0226, $P < 0.001$), 0.93 for the 5-year interval (SE = 0.0263, $P < 0.001$), and 0.93 for the 8-year interval (SE = 0.0271, $P < 0.001$). Followup assessments were largely independent of previous assessments, as children's race was not designated on materials taken to the field by interviewers. A child was not generally followed by the same interviewer on subsequent visits.

Discussion

This analysis documents the frequency of discrepancies in racial designations of school children in Minneapolis based on three sources of data. The discrepancies found between data from school records and parents at home interviews (table 2) could arise from differing methods of collecting data from parents, lack of repeatability of parents' responses between school enrollment and home interview, errors in teachers' sight judgments of race, and data processing errors. Sight judgments by survey interviewers also varied from parents' responses, especially for Native Americans and children of mixed races. However, sight judgments of interviewers showed high repeatability over 1 to 8 years. For Native Americans, the discrepancies were frequent enough to adversely affect survey data collected for scientific or public health purposes.

Table 1. Children's racial designations assigned by parents or teachers at school enrollments, compared with those assigned by school survey interviewers

	Survey interviewer				
Parent or teacher	*White*	*Black*	*Native American*	*Other*	*Total*
White	897	0	0	0	897
Black	0	434	0	0	434
Native American	1	0	100	0	101
Other	2	1	0	74	77
Total	900	435	100	74	1,509

SOURCE: Minneapolis Children's Blood Pressure Study.

Is there any practical way to improve the utility of designated race as a genetic as well as a sociologic marker in epidemiologic studies?

Most black-white genetic admixture occurred between the time of the first transport of black slaves to the American colonies in 1619 and the emancipation of slaves in 1863. The subjugation of black women to white men resulted in such extensive mixing that by 1850 there were 246,000 mixed race slaves out of a total slave population of 3.2 million. By 1860 there were 411,000 mixed race slaves out of a total slave population of 3.9 million (*5*).

Only 38 (3 percent) of the 1,506 Minneapolis school children interviewed at home could be documented by the parental questionnaire as children of parents of different races. However, these 38 included 9 percent of the black children, a figure which likely is much higher than is the case for other parts of the country, because of a greater frequency of interracial marriages in the Twin Cities area than in most other areas. The usefulness of identifying a small number of subjects as of mixed race, that is, with a greater than average admixture, appears to be of little value, except for Native Americans and possibly in Minnesota and other areas with a substantial recent racial admixture.

Large discrepancies between interviewers' sight classifications and participants' responses to a question on main ethnic origin have been docu-

Table 2. Children's racial designations assigned by parents or teachers at school enrollments, compared with those assigned by parent at home interview

Parent or teacher at school	Parent at home interview[1]									
	White	Black	Native American	Other	Asian	Hispanic	Black white mixed	Native American white mixed	Other mixed	Total
White	836	7	6	1	3	6	5	11	14	889
Black	4	348	1	3	0	4	53	0	17	430
Native American	3	0	74	0	2	3	0	7	12	101
Other	2	2	1	1	56	4	2	0	8	76
Total	845	357	82	5	61	17	60	18	51	1,496

[1]Information from this source was missing for 13 children.

SOURCE: Minneapolis Children's Blood Pressure Study.

Table 3. Children's racial designations assigned by school survey interviewers, compared with those assigned by parents at home interview, with parent category recoded[1]

Interviewer	Parent at home interview				
	White	Black	Native American	Other	Total
White	844	12	18	18	892
Black	8	401	1	21	431
Native American	6	0	80	14	100
Other	4	4	1	64	73
Total	862	417	100	117	1,496

[1]Categories given by parents were recoded as follows: Hispanic as white, black-white mixed as black, Native American-white mixed as Native American, Asian as other, and other mixed as other.

SOURCE: Minneapolis Children's Blood Pressure Study.

Table 4. Children's racial designations assigned by school survey interviewers in original interview, and 1, 5, and 8 years later

Subsequent Interviews	Original interview				
	White	Black	Native American	Other	Total
After 1 year	729	293	54	63	1,139
White	708	5	7	6	726
Black	7	284	0	2	293
Native American	4	1	40	2	47
Other	10	3	7	53	73
After 5 years	613	273	32	40	958
White	604	3	4	5	616
Black	3	269	2	3	277
Native American	3	1	22	3	29
Other	3	0	4	29	36
After 8 years	572	252	28	41	893
White	562	2	6	8	578
Black	3	248	1	3	255
Native American	1	1	20	0	22
Other	6	1	1	30	38

NOTE: School interviews were conducted in 1978, 1979, 1983, and 1986.

SOURCE: Minneapolis Children's Blood Pressure Study.

mented in a national survey for racial designations of Native Americans (*6*). In this study, we found that interviewers often classified persons reporting Native American origin as white (table 3). There is, however, fairly good agreement among the three sources of data for the racial designations for blacks and whites. Because of this, data from the three sources for blacks and whites probably can be used interchangeably. When possible, researchers of Native American or mixed race populations should verify racial designations from school records or sight judgments, and use questionnaires with sufficiently detailed categories to allow for identifying accurately parents of different racial groups.

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