The Role of Reported Primary Race on Health Measures for Multiple Race Respondents in the National Health Interview Survey

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SYNOPSIS

Objectives. As data for multiple race groups have only recently been collected and tabulated, the current understanding of the health of multiple race groups is not well developed. In the National Health Interview Survey (NHIS), survey respondents who report more than one race are asked to identify a primary race. This report compares selected health and demographic measures by the response to the primary race question and compares estimates for specific primary race groups to corresponding estimates for single race groups.

Methods. Using 1997–2003 NHIS data, several demographic and health measures were compared by reported primary race within the four largest multiple race groups. Then estimates by primary race for these four multiple race groups were compared to those for their single race counterparts.

Results. There were few statistically significant associations between reported primary race and health or demographic variables within the four multiple race groups. This lack of association may be due to the small number of multiple race respondents (which results in large standard errors) rather than similarity of point estimates among the subgroups. A greater number of differences between estimates for single race groups and for multiple race respondents who reported the same single race as their primary race were identified.

Conclusions. The apparent lack of association between primary race within a multiple race group and health outcomes suggests that tabulating multiple race responses by primary race is unnecessary for valid health estimates for multiple race groups, at least with available statistical power. However, differences between single race and primary race estimates within a multiple race group suggest that inferences for multiple race respondents using single race estimates may be imprecise for some outcomes.

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The National Health Interview Survey (NHIS) has allowed all survey respondents to report more than one race since 1982.[1] In a follow-up question, multiple race respondents are asked to choose the one race that best describes their race, referred herein as primary race. The primary race from this response was used for assigning multiple race NHIS respondents to one race under the 1977 Office of Management and Budget (OMB) Directive 15, the previous standard for reporting data by race and ethnicity within the federal statistical system.[2] This Directive, known as OMB-15, required that federal agencies tabulate data using four race groups: Aleut, Eskimo, or American Indian (which became American Indian or Alaska Native [AIAN]); Asian or Pacific Islander (API); black; and white. Statistics by Hispanic origin were to be tabulated separately.

OMB replaced OMB-15 with a new standard in 1997.[3] Among other modifications to OMB-15, the 1997 standard separated the API group into two groups (Asians; Native Hawaiian and Other Pacific Islanders [NHOPI]) and allowed respondents to choose more than one race when responding to queries on race within the federal statistical system. As a result, primary race is no longer needed to create single race variables for NHIS tabulations. However, primary race can be used to create single race distributions and variables for certain analytic and programmatic needs that require single race information. For example, primary race has been used to maintain trends in NHIS data that were begun prior to the implementation of the 1997 standard, as well as to create models for use in other data systems to bridge between OMB-15 and the 1997 standard.[4] Although NHIS public-use data files do not identify specific multiple race groups for confidentiality protection,[5] beginning with data from the 1999 NHIS, NCHS publications have presented race-specific health estimates for multiple race groups that meet statistical standards for reliability and confidentiality.[6–8] Primary race may, in addition, provide some insight into the health and demographic characteristics of multiple race groups, as well as into the persistent health disparities observed among race groups.[9–11]

The objective of this report is to examine possible associations between reported primary race and health outcomes among multiple race groups. Differences in health statistics by primary race within multiple race groups would indicate that the continued collection of information on primary race could provide important health information for this relatively unstudied population. Differences in health statistics between multiple race respondents assigned to primary race groups and their single race reporting counterparts could indicate that single race statistics for a particular group may not be relevant for the subgroup of multiple race individuals who identify with that group as their primary race.

This report also provides an overview of selected health characteristics of multiple race groups. To date, few data have been published on health outcomes and demographic characteristics for multiracial populations[12–20]; furthermore, data that have been reported often describe either a combined multiple race group[15,16] or interracial births,[17,18] which are both distinct from self-reported multiple race groups.[19,20]

First, selected demographic characteristics and health status variables of multiple race and single race groups were tabulated; the variables were further tabulated by primary race within multiple race groups. Then, the associations between the health estimates and primary race selection were examined for statistical significance. Differences between health estimates for primary race subgroups within multiple race groups and their corresponding single race groups were also tested. Although a handful of specific outcomes were examined, the goal is to report the findings in general terms; uncovering the various reasons why a particular health outcome differs for a particular group was beyond the scope of this analysis.

METHODS

The 1997–2003 NHIS were combined for this report.[21] NCHS in-house data files were used to access the multiple race detail. The NHIS is a nationally representative health survey that has been conducted annually since the 1950s. Though actual counts vary by year, approximately 40,000 households, resulting in about 100,000 individuals, are interviewed annually in the survey. All members of the household 18 years of age or older are invited to respond for themselves. For children and adult household members who are unavailable to respond, a household adult provides proxy responses; in some cases, 17-year-olds respond for themselves. To ease writing, all individuals included in the survey are referred to as respondents.

Since 1997, the NHIS has consisted of three core components which are similar each year, as well as additional topic-specific supplements that change each year. Data from the supplements may also appear on the three core files. We used data files with core components for this analysis: the person file[7] contains demographic and selected health information on all respondents, the sample adult file[8] contains additional health information for one sampled adult from each household, and the sample child file[22] contains

additional health information for one child sampled from each household. Using the six years of NHIS, we had 684,195 survey respondents; of these, 226,953 were included in the sample adult file and 92,573 in the sample child file. For some outcomes, respondents provided no information (Table 1). The percent of non-response is generally low but varies across outcomes and race. Because of the small number of multiple race respondents in the NHIS, estimates use all available respondents; as a result, different respondents may be used in each calculation. The imputed income files were used to calculate poverty status, given the high non-response for income in the NHIS.[23]

Race

Since 1976, the NHIS has allowed respondents to provide more than one race when responding to the race query; in 1982, proxy responses were allowed more than one race. Although the survey is administered through an interviewer, some visual aids are provided. For race, a card is handed to the respondent listing different race groups. The choices listed on the card have changed over time. Since 1978, however, the groups have been able to be combined according to the 1977 OMB Directive-15.[2] Currently, the card provided to the respondent lists 15 groups and the interviewer will record a response of "some other race" if a category other than one of the 15 is offered; the question asks: "What race do you consider yourself to be? Please choose one or more of these categories."

Table 1. Percent missing individual data elements, overall and for single and multiple race groups

	Single race groups	*Multiple race groups*
All		
Younger than 18 years of age	0	0
Poverty status[a]	<0.1	0.1
Hispanic origin	<0.1	<0.1
No health insurance	1.1	0.6
Fair or poor health status	0.5	0.3
Sample adult[b]		
No usual source of health care	0.6	0.5
Asthma	0.1	0.2
Overweight	4.1	3.0
Heart disease	0.2	0.2
Diabetes	1.1	2.0
Hypertension	0.2	0.3
Current smoker	1.0	0.4
Sample child[b]		
Asthma	0.2	0.2
No usual source of health care	0.2	0.1
ADD/ADHD/LD	0.3	0.1

[a] Poverty estimates presented in report were obtained using imputed income variables on NHIS files.[23]

[b] Variables defined in the text.

For this study, we restricted the analysis to those who reported one of the four single race groups used by OMB-15 (AIAN, API, black, and white) or one of the four largest multiple race combinations (AIAN/white, API/white, black/white, AIAN/black). Respondents who chose some other race in combination with a specific single or multiple race response were combined with the specific response; for example, AIAN/other was coded as AIAN and black/white/other was coded as black/white. Respondents with missing or imputed race, those who reported some other race and no specific race, and those with other multiple race combinations were excluded, leaving 646,509 total respondents, 218,085 sample adults, and 86,750 sample children. Of these, 7,894 total respondents, 2,002 sample adults, and 2,088 sample children reported more than one race. The group API was used, rather than Asian and NHOPI, in order to include all seven years of the survey. Beginning with the 1999 NHIS, Asians and NHOPI can be more easily disaggregated on the in-house data files; the advantage of additional years of data was deemed more important for this study than the more precise categorization.

Primary race

The interviewer asks respondents to the survey who choose two or more race groups a follow-up question, asking for a primary race: "Which one of these groups would you say BEST represents your race?" The choice of a particular race as well as non-response differed among the multiple race groups. All primary race responses other than one of the two component race groups, such as "multiracial," were combined into an Other category.

Demographic measures

Information on several demographic and health measures is available in the NHIS, either collected from all respondents and included in the person file, or obtained only for the sample adult or child. In selecting measures appropriate for this report, the small number of multiple race respondents was balanced with the underlying number of individuals included in the calculation.

Age is a major determinant of health status and is recorded for all survey respondents. Other reports have also described the younger age distribution of some multiple race groups.[1,12,24] Here, the percentage of the race group younger than 18 years of age is shown.

Although Hispanic origin is sometimes tabulated as

a separate race/ethnic category, information on Hispanic origin is obtained from a separate question on the NHIS and in other federal data collections. For this study, we tabulate Hispanic origin as a demographic factor. Differences among Hispanic subgroups have been documented for many health outcomes;[6] however, for both simplicity and statistical power, Hispanic subgroup detail is not given. Less than 1% of both single race and multiple race respondents were missing Hispanic origin.

As a general indicator of economic position, poverty status was categorized as above or below the federal poverty level. A large percentage of survey respondents (26% of single race and 16% of multiple race respondents) were missing information on income, hence poverty status is unknown; for this report, the multiply imputed income variables were used to estimate poverty status and its associated standard error.[23]

To define heath insurance coverage, all respondents who had private or public health insurance—including Medicaid, SCHIP, Medicare, and military coverage but not including Indian Health Service coverage—were considered insured; all others were considered uninsured.[6] Approximately 1% of single race and 0.6% of multiple race respondents were missing information about health insurance coverage. As insurance coverage options vary by age, age-adjusted estimates for insurance status are also presented.

Respondents are asked whether their health status is excellent, very good, good, fair, or poor. This response was categorized into fair or poor health status versus all others. Less than 0.5% of both single and multiple race respondents were missing information on health status. Estimates for health status were age-adjusted to facilitate comparisons between groups not attributed to differences in age.

For sampled adults, the NHIS collects information on several health outcomes. Usual source of health care was defined by whether there were one or more places where the respondent usually went when sick or in need of advice about health that was not a hospital emergency room.[6] Other health indicators obtained from the sample adults were whether or not the respondent had ever been told by a health professional that he or she had asthma, heart disease, hypertension, or diabetes. Overweight was defined using the body mass index (BMI) based on self-reported height and weight; a BMI of 25 or greater was considered overweight.[6] Smoking was defined as current smokers vs. never or former smokers. With the exception of overweight, approximately 1% or fewer sampled adults were missing information for these variables; approximately 4% of sampled adults were missing information on BMI. As health conditions vary by age, all estimates from the sample adult file were age-adjusted.

The sample child file was used to obtain information on usual source of health care, defined as for the sample adult. Asthma was defined as whether or not the child had ever been told by a health professional that he or she had asthma. Attention deficit disorder (ADD) or learning disabilities (LD) were defined by whether or not the child had been told by a professional that he or she had one or more of these conditions; attention deficit hyperactivity disorder (ADHD) was added to the ADD question after 1999. Because ADD and/or ADHD was ascertained for children ages two or older and LD for children ages three or older, the combined variable, ADD/ADHD/LD, was defined for children three years of age or older. Under 0.25% of sample children were missing information on any of these variables.

Analysis

We estimated standard errors and performed overall tests of associations using SUDAAN,[25,26] statistical software designed to incorporate the complex survey design of the National Health Interview Survey into its calculations;[21] SUDAAN was also used for adjusted estimates for the multiple imputation of poverty status.[23] We calculated relative standard errors (RSE), as the standard error divided by the estimate and multiplied by 100%. Current practice for data reporting from the NHIS is to identify estimates with RSEs greater than 30% as unreliable.[7,8] In another report, estimates with RSE greater than 20% are identified and those with RSE greater than 30% are suppressed.[6] As an exploratory study of small subgroups, estimates with RSEs up to 40% are shown here. Standard errors were not reported in the tables to ease presentation.

We used linear contrasts in SUDAAN to assess whether the specific primary race estimates within a multiple race category differed; for example, whether the responses for the API/white respondents who reported API as a primary race differed from the responses for the API/white respondents who reported white as a primary race. Estimates for multiple race respondents with primary race categorized Other were not compared. Additional contrasts were used to test whether primary race estimates differed from the corresponding single race estimates, such as whether the responses for the black/white respondents who reported black as a primary race differed from the responses for single race black respondents. Significant associations are indicated in the tables, however, only when each of the compared estimates have a RSE less than 40%. Neither overall chi-square tests among

primary race groups nor adjustments for multiple comparisons were done.

We used additional linear contrasts to evaluate differences in the estimates between the multiple race groups and their single race counterparts. These findings are not as directly related to the study questions as those assessing primary race, and are thus discussed in the text but not presented in the tables.

RESULTS

Differences between specific primary race groups within multiple race groups

Demographic and health characteristics were not widely associated with specific primary race responses within most multiple race groups, though there were exceptions (Table 2). These exceptions and patterns differed among multiple race groups and outcomes. For example, among the API/white group, more who reported white as a primary race were children than those who reported API; among the AIAN/white group, more who reported AIAN as primary race were children than who reported white (Table 2). Some differences by primary race may be attributed to the large number of children in multiple race groups; health insurance and health status estimates for the API/white and black/white groups, the multiple race groups with the highest percentages of children, changed markedly after age-adjustment, leading to some corresponding changes in inferences.

Of the variables reported for adults, few were significantly associated with primary race within a particular multiple race group; hypertension, for example, in the API/white was more common among those who reported API than among those who reported white as a primary race (Table 3). Estimates for

Table 2. Percentages of persons with selected demographic and health characteristics by race group and by primary race for multiple race groups

						Uninsured		*Fair or poor health status*	
Race	*Primary race*	*Sample size*	*Younger than 18 years of age*	*Hispanic origin*	*Below poverty*	*Unadjusted*	*Age-adjusted*	*Unadjusted*	*Age-adjusted*
Multiple race groups									
AIAN/black	All	668	27.3[a]	8.4	28.4	20.4[a]	19.4[a]	17.5	18.5
	Black	502	23.2[b]	5.5[b,c]	25.6	17.1	16.5	16.6[b]	16.8
	AIAN	91	38.6	[e]	44.2[c]	37.2[c]	36.8	20.6[c]	21.5[c]
	Other	75	43.5	27.9[c]	28.9[d]	23.8[d]	20.1[c]	20.0[c]	17.8[c]
AIAN/white	All	2,892	27.8[a]	10.0[a]	19.2	23.7[a]	23.0[a]	15.8	16.5[a]
	White	2,087	24.9	6.8[b]	17.5[b]	21.4[b]	21.1[b]	15.5[b]	15.5[b]
	AIAN	612	34.4	14.7	23.1	31.8	30.1	16.9[b]	19.6[b]
	Other	193	40.3	35.4	27.9[c]	23.8[c]	24.2	15.7[c]	19.7
API/white	All	2,054	57.7[a]	7.9	9.9	9.2[a]	9.9	3.8	8.9[a]
	White	832	62.2[b]	7.0[b]	8.8	7.5[b]	10.3	2.8[b,c]	8.0
	API	827	49.8[b]	9.4[b,c]	12.6[c]	12.7[b]	11.5[b]	5.2	9.0
	Other	395	64.0	7.1	7.0[c]	5.7[c]	8.8[c]	3.0[d]	7.8[d]
Black/white	All	2,280	74.9[a]	11.0	26.5	12.7	15.1[a]	5.7	15.9
	White	627	76.8[b]	12.6	29.0[b]	12.4	20.2[b]	6.3	16.0[b,c]
	Black	1,025	72.2[b]	8.6[b]	26.9	11.6[b]	12.1[b]	6.0[b]	15.4
	Other	628	77.3	13.5	23.5	14.7	14.0	4.7	18.0
Single race groups									
AIAN		4,588	33.2	15.3	28.1	35.6	33.3	12.3	15.7
API		22,754	25.5	1.7	14.4	16.9	16.0	6.1	7.7
Black		95,040	32.0	1.8	26.7	18.0	17.3	12.4	15.0
White		516,233	24.8	11.2	10.8	13.3	13.4	8.5	8.2

[a]Specific primary race estimates differ within multiple race group, $p<0.05$

[b]Differs from corresponding single race, $p<0.05$

[c]RSE>20%

[d]RSE>30%

[e]RSE>40%

RSE = relative standard error

Table 3. Age-adjusted percentages of adults with selected health outcomes by race group and by primary race for multiple race groups

Race	Primary race	Sample size	No usual source of health care	Asthma	Overweight	Heart disease	Diabetes	Hypertension	Current smoker
Multiple race groups									
AIAN/Black	All	262	14.5[a]	16.7	65.8	18.1	11.1[a]	35.2[a]	27.4
	Black	31	9.8[b,c]	15.8	66.9	18.1[b]	9.6	31.2	28.0
	AIAN	208	40.8[b,c]	[e]	60.3	29.3[c]	26.0[d]	58.1[b]	17.8[b,d]
	Other	23	20.7[d]	22.5[d]	66.8	[e]	[e]	40.4[c]	21.6[d]
AIAN/White	All	1,076	19.6	19.6	60.6	18.7	9.8	29.5	39.1
	White	807	18.4[b]	18.3[b]	59.6[b]	18.9[b]	9.7[b]	30.5[b]	38.2[b]
	AIAN	209	22.6	22.4[b]	67.0	20.8[b]	9.9[c]	26.0	40.8
	Other	60	27.2[c]	33.3[c]	42.3	[e]	[e]	25.9[c]	46.7
API/white	All	372	13.6	13.8	54.2	10.1	13.0	15.7[a]	23.8
	White	147	13.0	11.4	45.1	[e]	[e]	7.1[b,d]	20.4[b]
	API	179	15.0	17.2[b]	58.3[b]	13.3	14.2[b]	20.8	26.0
	Other	46	19.0[c]	11.2[d]	45.8	[e]	[e]	9.6[d]	38.4
Black/white	All	292	17.0	15.3	57.4	6.7[c]	8.5[d]	29.2	32.9
	White	71	20.8[c]	19.4[b,c]	47.0	11.0[d]	[e]	31.0[b]	37.7[b]
	Black	138	19.5	9.4[c]	62.9	[e]	[e]	28.9	38.0[b]
	Other	83	13.4[c]	18.8[c]	51.6	18.2	25.3	36.4	24.7
Single race groups									
AIAN		1,399	16.2	12.5	65.4	14.1	12.4	27.9	33.2
API		6,245	18.5	6.5	31.8	7.0	5.4	18.9	13.7
Black		31,206	16.2	10.3	65.9	10.3	9.5	32.6	22.8
White		177,233	14.9	9.8	55.0	11.2	5.2	21.6	23.9

[a]Specific primary race estimates differ within multiple race group, $p<0.05$.

[b]Differs from corresponding single race estimate.

[c]RSE>20%

[d]RSE>30%

[e]RSE>40%

RSE = relative standard error

diabetes, hypertension, and lack of usual source of health care were significantly higher among AIAN/black who reported AIAN as a primary race than among those who reported black; however, that the AIAN/black group is noticeably smaller than the others and differences between estimates for other groups are not as pronounced suggest that the AIAN/black findings warrant additional investigation. None of the outcomes reported for children were significantly associated with primary race for any of the multiple race groups (Table 4), though the estimates were not necessarily similar. Asthma, for example, was less commonly reported for the API/white and black/white children who reported white as a primary race than for those who reported API or black, but more common for the AIAN/white who reported white than for those who reported AIAN (Table 4). These weak findings indicate that knowledge of primary race may not improve our current ability to understand health outcomes for multiple race groups; on the other hand, the large differences among some estimates by primary race within the multiple race groups, despite low statistical power and large standard errors, suggest that this conclusion may change if the number of multiple race reporters increases.

Primary race compared to corresponding single race groups

A large number of primary race estimates differed substantially from the corresponding single race estimates, and many were statistically significant (Tables 2–4). This finding indicates that inferences for multiple race respondents based on their primary race, using the more commonly available single race statistics, may not always be relevant. As noted above, some of the differences may be due to differing age distributions; for the API/white and black/white groups, for example, unadjusted estimates of the percentage in

Table 4. Percentages of children with selected heath outcomes by race and by primary race for multiple race groups

Race	*Primary race*	*Sample size*	*Asthma*	*No usual source of health care*	*ADD/LD*
Multiple race groups					
AIAN/Black	All	108	20.1[b]	14.3[c]	14.2[b]
	Black	69	26.9[b]	18.7[c]	14.6[c]
	AIAN	21	[d]	[d]	[d]
	Other	18	[d]	[d]	[d]
AIAN/White	All	442	16.5	6.4[c]	13.8
	White	306	17.1[a]	4.7[c]	13.9
	AIAN	107	12.2[c]	[d]	[d]
	Other	29	[d]	[d]	[d]
API/white	All	634	14.8	4.7	6.5
	White	287	13.5	5.7[b]	5.8[a,c]
	API	217	17.0[b]	4.3[a,b]	7.8[a,b]
	Other	130	14.0[b]	[d]	6.0[c]
Black/white	All	904	17.4	6.4	15.3
	White	271	13.7	8.6[c]	17.3
	Black	378	19.4	4.3[a,b]	19.2
	Other	255	18.2	7.3[c]	14.9[b]
Single race groups					
AIAN		691	16.9	8.8	11.6
API		2,806	9.6	10.0	2.8
Black		14,524	15.7	7.6	10.7
White		66,641	11.2	5.6	10.9

[a]Differs by primary race within multiple race group, $p<0.05$.

[b]RSE>20%

[c]RSE>30%

[d]RSE>40%

ADD/LD = Attention Deficit Hyperactivity Disorder, Attention Deficit Disorder, and Learning Disability; ADHD was included in the survey question for ADD in 2000 and later years.

fair or poor health status differed from estimates for their single race counterparts, but the age-adjusted estimates did not. On the other hand, more than 40% of the age-adjusted estimates for health outcomes tabulated for adults (Table 3) and a handful of estimates tabulated for children (Table 4) differed from the corresponding single race estimates. Furthermore, visual inspection of the point estimates indicated that the estimates by primary race were not typically closer to those of the corresponding single race than that of the non-corresponding single race; that is, in the black/white group, for example, the estimate for percent below poverty among those who reported white as their primary race (29.0%) was closer to the corresponding estimate for the single race black group (26.7%) than the estimate for the single race white group (10.8%).

Although not the focus of this report, we examined whether estimates for multiple race groups differed from those of the component single race groups. Patterns and summaries of these comparisons are not readily apparent. In general, characteristics and health outcomes of multiple race groups differed from those of one or both of their single race counterparts, though these differences were not necessarily statistically significant (statistical testing results not shown).

DISCUSSION

This report presents an overview of demographic and health indicators by primary race within multiple race respondents in a large national survey. To date, no other source has provided a broad picture of health outcomes of the multiple race population in the United States, particularly with a detailed look at how these populations would have been classified using the OMB-15 based single race reporting system. However, even with seven years of NHIS data, the power to make definitive inferences for particular demographic and health outcomes within specific multiple race groups is minimal.

Despite the exploratory nature of this study, some conclusions can be drawn. First, there is insufficient evidence for considering primary race when making inferences for a particular multiple race group. This finding is consistent with earlier analyses of these data that modeled primary race as a function of demographic characteristics for the purpose of single race assignment.[4,27] In these bridging studies, few demographic variables were significant predictors of primary race and health variables were not considered. The present report extends the earlier research by examining health outcomes and consequences of tabulating multiple race data by primary race using several health and demographic variables, including those particular to children and adults.

Second, there was no evidence that estimates by primary race within a multiple race group are generally congruent with estimates for the corresponding single race groups, though this conclusion does not apply to all multiple race groups, primary race groups, or variables. As the number of multiple race respondents is generally small relative to the single race groups, the effect on single race estimates of health or demographic statistics is likely to be small. However, single race statistics may not be informative for multiple race groups.

In addition, the NHIS estimates continue to show that multiple race groups differ from their single race counterparts. For some groups, such as black/white and API/white, differences for some measures can be attributed to the relative youth of the group. As shown previously, reporting of child's race for children with different race parents is not consistent.[20] On the other hand, as multiple race groups that include AIAN, such as AIAN/white and AIAN/black, do not have a markedly younger age distribution, generalizations about the overall multiple race population are difficult; the findings that health outcomes differed among the multiple race groups also support this conclusion.

Only a partial health profile of multiple race reporters is available from these data. The choice of these measures was informed by the existing literature and the sample sizes. The NHIS has a relatively large number of multiple race respondents each year compared to other data collections and combined survey years can provide information about these groups. However, when stratified by primary race, many of the percentages for multiple race respondents reported here are unstable and the power to understand differences between groups is limited. In addition to our lack of statistical power, the ability to make inferences for multiple race groups in other settings might be weak. Individuals with parents of different race groups, for example, may or may not report themselves in a multiple race group;[19,20] inferences from studies of interracial births may not be applicable to multiple race groups. However, the unique characteristics of multiple race identification shown in this overview may lead to better indices for describing these groups. Among adolescents, for example, a study of suicide suggests that stress-related outcomes might be more common among multiple race students than single race students;[14] the students' identification with a single race group, the strength and mechanism of that identification, and how it would affect suicide and its potential mediator is unknown.

Primary race information for multiple race groups in the NHIS has been a valuable resource for understanding the implications of the OMB 1997 standard[27] and for creating bridging algorithms to create comparability between newer data with multiple race categories and data collected with only single race categories.[4,28] Furthermore, these data are invaluable for maintaining and understanding long-term trends. However, the implications of the findings from this study for the utility of this information for specifically describing the health of multiple race respondents are not clear; this may change if the number of multiple race respondents increases. The use of primary race in this study contributes to the growing literature on the heterogeneity of individuals within the broad race categories used in the United States. In the context of public health, this heterogeneity indicates that additional descriptors are needed to identify, and develop programs for, those at high risk for poor health.

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REFERENCES

1. Sondik EJ, Lucas JW, Madans JH, Smith SS. Race/ethnicity and the 2000 Census: implications for public health. Am J Public Health 2000;90:1709-13.
2. Office of Management and Budget (US). Race and ethnic standards for federal statistics and administrative reporting. Statistical Policy Directive 15, 1977 [cited 2005 Nov 22]. Available from: URL: http://www.whitehouse.gov/omb/inforeg/statpolicy/html#dr
3. Office of Management and Budget (US). Revisions to the standards for the classification of federal data on race and ethnicity [cited 2005 Aug 24]. Available from: URL: http://www.whitehouse.gov/omb/fedreg/1997standards.html
4. Parker JD, Schenker N, Ingram DD, Weed JA, Heck KE, Madans JH. Bridging between two standards for collecting information on race and ethnicity: an application to Census 2000 and vital rates. Public Health Rep 2004;119:192-205.
5. National Health Interview Survey Public Use Data Documentation [cited 2005 Aug 24]. Available from: URL: ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS
6. National Center for Health Statistics. Health, United States 2004

[cited 2005 Nov 18]. Available from: URL: http://www.cdc.gov/nchs/hus.htm
7. Schiller JS, Bernadel L. Summary health statistics for U.S. population: National Health Interview Survey 2002. Vital Health Stat 10 2004(220).
8. Lethbridge-Cejku M, Schiller JS, Bernadel L. Summary health statistics for U.S. adults: National Health Interview Survey 2002. National Center for Health Statistics. Vital Health Stat 10 2004(222).
9. Keppel KG, Pearcy JN, Wagener DK. Trends in racial and ethnic-specific rates for the health status indicators: United States, 1990–98. Healthy people 2000 statistical notes. 2002(23):1-16.
10. Levine RS, Foster JE, Fullilove RE, Fullilove MT, Briggs NC, Hull PC, et al. Black-white inequalities in mortality and life expectancy, 1993-1999: implications for healthy people 2010. Public Health Rep 2001;116:474-83.
11. Fiscella K, Franks P, Gold MR, Clancy CM. Inequality in quality: addressing socioeconomic, racial, and ethnic disparities in health care. JAMA 2000;283:2579-84.
12. Jones NA. We the people of more than one race in the United States.(CENSR-22). Suitland (MD): U.S. Census Bureau; 2005. (CENSR-22).
13. Heck K, Parker JD, McKendry CJ. Multiple race mortality data for California, 2000–2001. Pub Health Rep 2004;119:187-91.
14. Udry JR, Li RM, Hendrickson-Smith J. Health and behavior risks of adolescents with mixed-race identity. Am J Public Health 2003:93: 1865-70.
15. Valleroy LA, MacKellar DA, Karon JM, Rosen DH, McFarland W, Shehan DA, et al. HIV prevalence and associated risks in young men who have sex with men. Young Men's Survey Study Group. JAMA 2000;284:198-204.
16. Yu SM, Bellamy HA, Schwalberg RH, Drum MA. Factors associated with use of preventive dental and health services among U.S. adolescents. J Adolesc Health 2001;29:395-405.
17. Setia S, Villaveces A, Dhillon P, Mueller BA. Neonatal jaundice in Asian, white, and mixed-race infants. Arch Pediatr Adolesc Med 2002;156:276-9.
18. Yang J, Carmichael SL, Kaidarova Z, Shaw GM. Risks of selected congenital malformations among offspring of mixed race-ethnicity. Birth Defects Res Part A Clin Mol Teratol 2004;70:820-4.
19. Parker JD, Madans JH. The correspondence between interracial births and multiple race reporting. Am J Public Health 2002;92:1976-81.
20. Parker JD, Lucas JB. Multiple race reporting for children in a national health survey. Ethn Dis 2000;10:262-74.
21. Botman SL, Moore TF, Moriarty CL, Parsons VL. Design and estimation for the National Health Interview Survey, 1995–2004. Vital Health Stat; vol 2. Hyattsville, Maryland. National Center for Health Statistics. 2000.
22. Dey AN, Schiller JS, Tai DA. Summary health statistics for U.S. children: National Health Interview Survey, 2002. Vital Health Stat 10 2004(221):1-78.
23. Schenker N, Raghunathan TE, Chiu PL, Makuc DM, Zhang G, Cohen AJ. Multiple imputation of family income and personal earnings in the National Health Interview Survey: methods and examples [cited 2005 Aug 24]. National Center for Health Statistics May 2004. Available from: URL: http://www.cdc.gov/nchs/data/nhis/tecdoc.pdf
24. Jones NA, Smith AS. The two or more races population: 2000 [cited 2005 Aug 24]. Census 2000 Brief. U.S. Census Bureau, Washington D.C. November 2001. Available from: URL: http://www.census.gov/prod/2001pubs/c2kbr01-6.pdf
25. Research Triangle Institute (RTI). SUDAAN: Version 7. Research Triangle Park: RTI; 1996.
26. Shah BV, Barnwell BG, Gieler GS. SUDAAN user's manual, release 7.5. Research Triangle Park, NC: Research Triangle Institute, 1997.
27. Tabulation Working Group of the Interagency Committee for the Review of Standards on Race and Ethnicity. Office of Management and Budget. Provisional Guidance on the Implementation of the 1997 Standard for Federal Data on Race and Ethnicity (Appendix C) [cited 2005 Aug 24]. Available from: URL: http://www.whitehouse.gov/omb/inforeg/re_app-ctables.pdf
28. Schenker N, Parker J. From single race reporting to multiple race reporting: using imputation methods to bridge the transition. Stat Med 2003;22:1571-87.