THINKING ABOUT RACE *and* ETHNICITY *in* POPULATION-BASED STUDIES *of Health*

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Introduction

In 1998, President Clinton took a bold step announcing a new initiative aimed at eliminating, by the year 2010, the health disparities long endured by racial and ethnic minority groups in the United States (USDHHS 2000). The president's initiative was driven by a number of factors; among them, several key indicators of the health status of Americans had repeatedly shown disadvantaged health status in racial and ethnic groups when compared to the rest of the population. For example, infant mortality, generally viewed as a problem for developing nations, is estimated as 2.5 times greater for African-Americans in the United States than it is for Whites (Satcher 1999). Despite the fact that the incidence of breast cancer is lower in African-American women than White women, African-American women are more likely to die from it (USDHHS 2000; Mays et al. 2000). Further, African-American men are twice as likely to die from prostate cancer than are White men. Overall, cancer mortality among African-Americans is 30% higher than among Whites (USDHHS 2000).

These health disparities are not limited to Black-White differences. The incidence of cervical cancer is five times greater among Vietnamese women in the United States than it is among White women (Nguyen et al. 2002). Rates of new cases of hepatitis and tuberculosis tend to be higher among Asian and Pacific Islanders living in the United States compared to Whites. Hispanic infants are 1.5 times more likely than White infants to die prematurely (Satcher 1999). The prevalence of dia-

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betes in Hispanics, Native Americans, and Alaska Natives is approximately double that seen in Whites (USDHHS 2000). Although Hispanics were only 11% of the population in the United States in 1996, they accounted for nearly 20% of all cases of tuberculosis; they were also twice as likely to die from diabetes and to have higher rates of high blood pressure and obesity than non-Hispanic Whites (USDHHS 2000). Extensive data collected over the last several decades repeatedly show lower life expectancy, higher mortality from cardiovascular disease, lower immunization rates, less access to health insurance coverage, and less intensive health care in some ethnic minority groups when compared to other Americans (National Center for Health Statistics 2000; Institute of Medicine 2002).

Each one of these findings comes from analyses of national population-based survey data such as the National Health Interview Survey. These nationally representative data provide measures of incidence and prevalence of disease, and access to and utilization of medical care, that tend to make the most impact in the federal health policy-setting agenda. We therefore focus our discussion on national, population-based surveys, with a few, though important, references to ongoing state efforts in measuring population-based health.

Considerations in Using Population-Based Samples to Assess Health Issues

Population-based data are used with some confidence in generating reliable estimates of health status, access, and health services utilization of individuals and households. But this degree of certainty is dependent upon researchers having confidence in their knowledge of the size and location of different source populations that comprise American racial/ethnic diversity. Researchers must also be assured that these source populations have been accurately captured and assessed in various data collection procedures.

In the field of public health, studies that use population-based samples are often viewed as a primary source for estimating the incidence and prevalence of health conditions (Rothman and Greenland 1998). Documenting facts about health in different populations also provides a mechanism to measure progress in eliminating health-related inequalities. Without population-based data sets, researchers would be hampered in understanding patterns of disease, including their severity or uniqueness in particular populations, and in determining a need for targeted public health interventions.

At the core of these studies are complicated concerns that intertwine across methodological, social, and public policy issues. Interpreting racial/ethnic data from population-based samples must be done wisely because these findings are used to establish guidelines, design treatments, develop screening criteria, and allocate resources. Population-based samples by the nature of their theoretical basis can falsely lure researchers to statements of certainty, causality, and generalizability about ethnic groups that may be overreaching; those reading and evaluating the results may also give greater weight to study conclusions because of the purported population-based design. Additionally, standard methods in population studies may bias respondent participation in ways that researchers are well aware, but may not fully appreciate. For example, it is widely known that successful recruitment of respondents may depend upon respondent characteristics that can be partially, but not perfectly, adjusted for in later statistical analyses, such as those who have a telephone, whose housing is conventional, whose language of communication is English, or whose jobs are stable.

Issues in Racial and Ethnic Categorizations

There are also other factors that may be well worth considering if the goal is to design and conduct research in a manner that facilitates a better understanding of the contributions of race and ethnicity to health status. The first underlying issue is developing a better understanding of why, how, or whether ethnic or racial categories function as risk indicators for health (Miettinen 1985). Researchers need to grapple with respondent categorizations that permit valid exploration of subgroups' racial and/or ethnic diversity. This is key in determining whether or not observed differences are universal to all ethnic groups, are linked only to specific ethnic subgroups, or are, in actuality, a function of other contextual variables such as neighborhood, social status, or some other explanatory factor (Sue 1999; Buka et al. 2003; Bond Huie, Hummer, and Rogers 2002; Diez-Roux et al. 1997; Anderson et al. 1997). For example, although the National Health Interview Survey (NHIS), an annual household-based survey that interviews respondents from about 45,000 households, has allowed participants to report more than one race since 1976, only recently (data years 1992 through 1996) has the NHIS included racial information by six Asian and three Native Hawaiian and other Pacific Islander groups in its public-use data files (Ponce 1992). Because of this, recent studies could use Asian or Native Hawaiian or other Pacific Islander (NHOPI) subpopulation ethnic group data to demonstrate differences in health status (Kuo 1998) and in patterns of breast cancer and cervical cancer screenings among Asian or NHOPI women (Kagawa-Singer and Pourat 2000). Prior to this study, the normative convention of merging the various Asian and Pacific Islander subgroups into a single category for analytic purposes had the effect of obscuring significant risk variation within this population, making invisible those subgroups at highest risk for late presentation of disease (Kagawa-Singer and Pourat 2000).

While advocating better ethnic or racial categorization as a research goal is relatively easy, doing so methodologically and interpretatively is not. Many have advocated for the use of a "multiple race" categorization in the collection of federal data. As a function of the revised federal race and ethnicity standards issued by the Office of Management and Budget (OMB), Census 2000 allowed respondents to indicate more than one category for their race (OMB 1997a; OMB 1997b; Jones and Smith 2001). But multiple categorization is not necessarily a simple task to accomplish, particularly for states like California or Hawaii that have some of the highest rates of ethnic intermarriage (Jiobu 1988; OMB 1997a; OMB 1997b).

The new federal standards, as currently constructed, allow an individual to check more than one category and direct the federal government in how to collect the data on race and ethnicity. The revised standards have five minimum categories for race:

White, Black/African-American, American Indian/Alaska Natives (AI/AN), Native Hawaiian or other Pacific Islander, and Asian. There are two categories on ethnicity, Hispanic/Latino or non-Latino. Finally, individuals wishing to indicate their mixed racial heritage can select more than one race group to describe themselves. One of the most significant changes was the separation of what was previously the Asian Pacific Islander category into Asian, Native Hawaiians, and other Pacific Islanders.

During the comment period before the directive was established, a number of criticisms emerged. In one instance, a Hawaiian congressional delegation requested the collapse of their racial designation into the American Indian/Alaska Native category. They perceived the AI/AN category as referring to "indigenous people" though this was not the interpretation of the federal government's interagency committee. The view by some ethnic groups of possessing indigenous status can be an important component of their ethnic identity, and these historical roots underscore the complexity of the construct. For example, there are Latino populations, particularly in the Southwest, who are descended from families that have lived in the United States for several generations, some before the establishment of a United States government presence. When asked, they will classify themselves as Native Americans—meaning that they have been in America since before the United States. This classification serves as a way of distinguishing their history from Latinos descended from more recent immigrants. Moreover, many Hispanics do have Indian blood, particularly in California (DiSogra et al. 2002) and so the Native American/American Indian identification reflects true heritage. Yet, we note that in each context, the underlying motivation for claiming the "Native American" identity is very different. Also, the term "native American," when heard in telephone surveys, may elicit affirmative responses among American-born interviewees.

In a nationally representative telephone sample (conducted by Louis Harris and Associates for the Commonwealth Fund on Minority Health (1994)), participants were asked to self-identify as African-American or Black, Hispanic or Latino, non-Hispanic White, Asian, or Native American (Hogue and Hargraves 2000). When data from respondents selecting the "native American" category were examined more closely, many were found to be Hispanic (Mays, Cochran and Sullivan 2000). Use of the census term "American Indian or Alaska Native" would lessen the ambiguity of whether they are Latinos who do have Indian blood, particularly in telephone surveys where there are no visual cues differentiating "Native American" from "native American." More importantly, collection of more detailed information on tribal membership, as is done in the California Health Interview Survey, provides confirmatory information on American Indian or Alaska Native heritage (Satter et al. 2002).

Bridging and Tabulation Methods

With the emergence of more complicated ethnic/racial classification schemes comes a growing body of research indicating differences in health status depending on how an individual's multiple race statuses are tabulated (Mays et al. 2003). Prior to the decennial census, studies were conducted to examine the outcome in coding the combinations of racial and ethnic categories proposed in Census 2000 (OMB 1994; OMB 1995; Baker et al. 1999; Lucas 1999; U.S. Dept. of Labor 1995). Parker (2000) describes three "bridging" approaches (drawn from the OMB)—that is, recategorizing multiple race persons back into a single race group for the purposes of maintaining trends in the data:

- *Deterministic whole assignment*, where multiple race respondents are coded into only one ethnic/racial category. This can be done in several ways including using a "Smallest Group" decision to first assign those reporting both White and any other category to the non-White category, then those reporting two or more non-White categories being assigned to the category with fewest respondents. Conversely, a "Largest Group" approach assigns respondents with two or more racial groups selected to simply the largest group of those selected.
- *Fractional allocation*, in which each multiple race respondent is partially allocated to the relevant groups. How this fraction is determined can vary.
- *Probabilistic allocation*, where a multiple race individual is randomly allocated to a particular group based on some likelihood function.

There are also other possible methods used by states that combine bridging and tabulation approaches. For example, the California Health Interview Survey (CHIS) and other population-based surveys ask for a "primary race identification" among multiracial respondents. This provides deterministic bridging information for those respondents who predominantly identify with one race (Mays et al. 2003). And, for those multiracial individuals not identifying with a single race, a multiple race category could still be tabulated, as it is done in one of the CHIS race tabulations (Ponce 2002). Racial and ethnic tabulation is further complicated with the consideration of treating "Latino/Hispanic origin" as an overlaying ethnicity or as a race. For example, California's Department of Finance tabulates Latino/Hispanic ethnicity as a mutually exclusive race/ethnic category from non-Latino Whites, non-Latino Asians, non-Latino Blacks, non-Latino American Indians, and non-Latino Native Hawaiians and other Pacific Islanders (Mays et al. 2003). The Latino/Hispanic consideration further expands the possibilities of racial and ethnic tabulations and consequent interpretation of health data.

Another approach departs from creating mutually exclusive categories. Baker and colleagues (1999) describe an "*all-inclusive assignment*" where as much information as possible is retained by using one of three codes (only one race classification indicated, one race plus others, or race not indicated) for each ethnic/racial classification for each respondent. With this approach, respondents can appear multiple times and the categories are not mutually exclusive. To illustrate, Baker et al. (1999) presented differences in health profiles using different coding strategies for the parents of respondents in the 1998 Hawaii Health Survey (HHS). This survey is modeled after the National Health Interview Survey, but is conducted as a household telephone survey. Hawaii is a remarkably diverse state with only 67% of the population reporting a single racial background (22% White, 18% Japanese, 13% Filipino, 4% Chinese, 3% Hawaiian, 2% Black). Using the OMB standards for tabulating multiple race data as a starting point, Baker et al. (1999) evaluated ethnic/racial patterns of different health outcomes as a function of two coding permutations (deterministic whole assignment and all-inclusive) with asthma as the health outcome of interest. The effects of these different approaches can be seen in Figures 1-3 using an example of asthma data from the HHS (Baker et al. 1999).

Differences in the racial profile of asthma vary as a function of different bridge method applications. In Figure 1, which shows estimates of asthma prevalence among Whites, the "All-Inclusive" method allocates to "White" anyone reporting any White racial heritage; asthma prevalence is estimated as 9%. In contrast, the "Full" approach includes only those with a single race listed (in this instance, White); by this method asthma prevalence is estimated as 6%. Among multi-race individuals who report being at least partially White (the "Part" classification), prevalence is estimated as 13%. Other race-coding methods generate different outcomes. For example, using a "Smallest Full" approach (those with multiple race backgrounds that include White are allocated fully to the least common race category) drops the prevalence to that of the "Full" classification because multi-race individuals are allocated elsewhere. In contrast, using a "Largest Full" race classification strategy (allocating those with multiple race background to the largest racial category) generates a middle estimate. The "Largest Full" race prevalence is identical to the "All Inclusive" prevalence because Whites are the most common race. In Figure 2, there is less variation in the prevalence of asthma for Hawaiians. But in the final figure (Figure 3) for the Filipino race, the estimated prevalences vary substantially depending on the assignment method employed. Similar variations occurred when prevalence of hypertension was selected as a second health outcome.

To some extent the diversity of Hawaii may seem to overstate the issue; however several states, such as California, Massachusetts, and New York will find themselves struggling with similar decisions (Mays et al. 2003). Findings from national data suggest that changes in health statistics are not limited to racially diverse local-

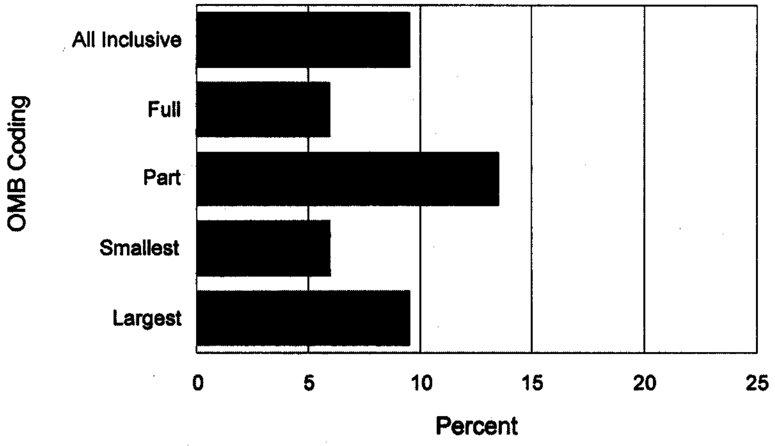

Figure 1. Asthma by OMB Coding—White Race, HHS 1998

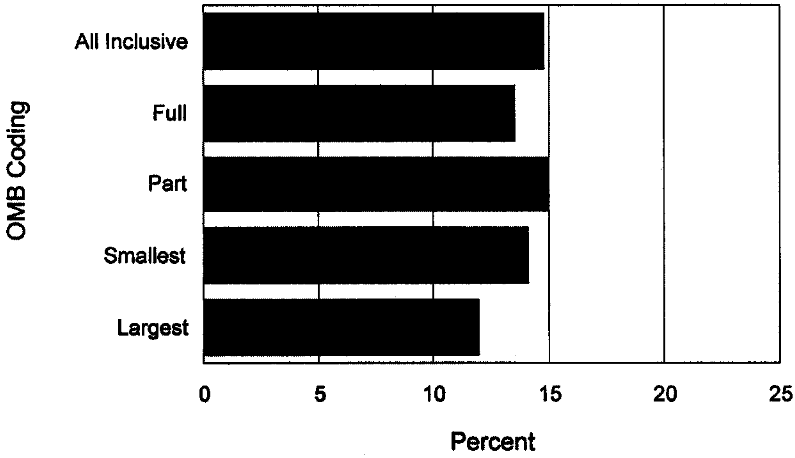

Figure 2. Asthma by OMB Coding—Hawaiian Race, HHS 1998

ities. Data from the 1997 National Health Interview Survey also demonstrate differences in health profiles between single and multiple race tabulations, with American Indian/Alaska Native and White biracial persons having higher smoking rates than either their single race White or single race American Indian/Alaska Native counterparts (Sondik et al. 2000).

Adequacy of Sampling Methods

An important focus of effort for methodologists conducting these surveys is the development of an accurate sampling frame. Some issues are fairly well appreciated, such as whether or not a household has a telephone, but others are more subtle such as fear and community distrust, particularly among ethnic minorities and immigrant

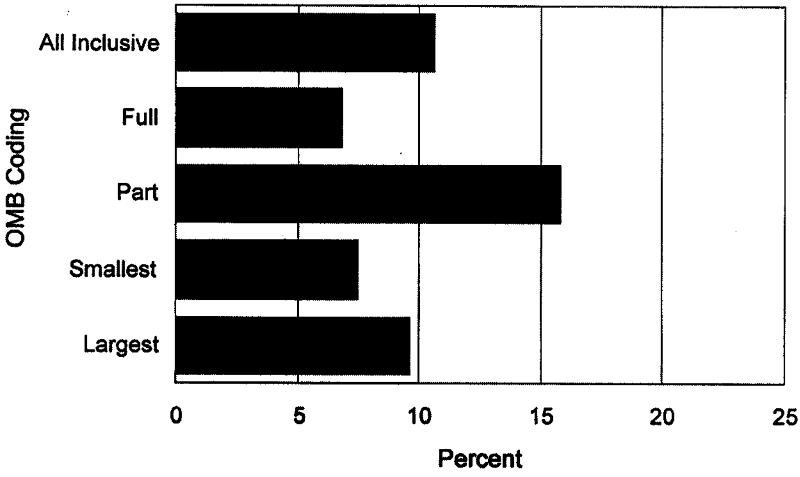

Figure 3. Asthma by OMB Coding—Filipino Race, HHS 1998

populations (Mays 2000). When sampling frames fail to capture the population without bias, then estimates are inaccurate; special efforts by state and local officials for resources, attention, and care of these populations will be necessary in order to advocate for federal funding, policies, and inclusion in the research agenda.

The increasing focus on better specification of health statistics among smaller subpopulations generates a need to consider oversampling strategies to achieve greater statistical power. This is not a new approach, but it does complicate estimation from population-based surveys; in some surveys, even with oversampling, the small numbers of minority participants raise a set of issues in the analyses and interpretation of the data on specific diseases. While multistage probability samples of households used in NCHS studies, such as the NHIS, result in nationally representative data, these samples, though large overall, will at times have insufficient numbers of cases for analyses about diseases that do not occur with high prevalence in a national population—AIDS is one example. Shapiro et al. (1999) estimates, hypothetically, that for a nationally representative survey interviewing approximately 100,000 individuals per year, researchers would need to screen about 1 million persons in an unstratified household sampling to identify 1,000 persons with AIDS. The actual number, though, is probably greater than this because individuals from stigmatized groups or engaging in stigmatized behaviors may for the sake of privacy not acknowledge their disease status during the interview (Shapiro et al. 1999). The ability to find individuals with relatively rare, specific diseases is probably more difficult when the actual number of cases (not the weighted values) are small, which is often the case with ethnic minorities or ethnic minority subgroups.

One major limitation of population-based data is that they are not currently designed to make estimates for small minority groups or to examine ethnic differences within the larger groups. However, these are not insurmountable problems. Sample sizes may be increased to include relevant numbers of particular subpopulations by: 1) collapsing subgroups into an aggregate category to increase sample size—although this may mask critical findings for certain subgroups; 2) combining years of data for analysis, which is something analysts often do—with the tradeoff being the loss of the ability to look at between-year data changes; and 3) oversampling populations—this will increase the costs of surveys and, depending on the method of oversampling, may raise methodological issues on whether and how it can be combined with the random sample, thus complicating the analysis of the data and interpretation of estimates. Despite these tradeoffs, increasing sample sizes to raise the statistical power of estimates for small subpopulation will continue to be important issues for population-based surveys, particularly in light of the call for greater specification of racial/ethnic subgroups.

Targeted surveys that focus specifically on racial/ethnic subgroups is another approach that might ensure that there are sufficient numbers of participants to produce more precise estimates of disease and other health-related information necessary for health planning and health services. For example, the Hispanic Health and Nutrition Examination Survey (Hispanic HANES) conducted by the National Center for Health Statistics used population-based methodology to reach ethnic subpopulations of Hispanics in the United States (USDHHS 1993). Targeted surveys of racial/ethnic groups are still subject to problems of nonresponse and selection bias. But there are some innovative methods for addressing these issues that are worth consideration: Oropesa and Landale (2001) used vital registration systems to design sampling frames in studying maternal-infant health issues in Latino subpopulations, which allowed for the study of nonresponse. In this case, drawing the sample frame from vital registration systems facilitated the identification of the sample along with information on those who chose not to respond.

Setting Health Policy and Health Prevention Agendas

Healthy People 2010 is the Surgeon General's blueprint for disease prevention and health promotion in the U.S. population and will be a principal mechanism for determining the extent to which the President's initiative to eliminate health disparities is accomplished. Achievement of goals established in the document is evaluated by use of quantitative data derived from population-based national health studies, especially those conducted by the National Center for Health Statistics and the Centers for Disease Control and Prevention (Percy and Keppel 2002). Healthy People 2010 contains very broad national health goals for the decade of 2000–2010. Ten leading health indicators will guide the set of targets for Healthy People 2010: physical activity, overweight and obesity, tobacco use, substance abuse, mental health, injury and violence, environmental quality, immunization, responsible sexual behavior, and access to health care. Two themes are dominant throughout: 1) increasing the quality and years of healthy life; and 2) the elimination of racial and ethnic disparities in health status (USDHHS 2000). Most states, governments, and even private funders will use the Healthy People 2010 targets as guidelines for resource allocations for research, prevention, and the setting of policy agendas.

The importance of population-based studies, particularly those under the purview of the federal government, to the prevention agenda of the Healthy People effort seems to have been underscored in recent years when the preparation for Healthy People 2010 was expanded to include more nongovernmental entities and more diverse academic disciplines in the process (USDHHS 2000). The reliance on aggregated population-based studies over convenience samples and clinical data to determine if health targets have been met has generated concerns about the adequacy of national population-based data sources for some minority groups. For example, Asian, Native Hawaiian, and other Pacific Islander community groups pointed to the need for subgroup data as a way of overcoming the phenomenon of obscuring the health status and health needs of subgroups within this community in the comment period for Healthy People 2010. Frontline clinicians and local health care providers complained that they sometimes found themselves faced with a greater occurrence than predicted of some diseases, making it difficult to plan adequately for needed health services. Healthy People 2010 can only be as accurate as the data systems that provide it with information.

Opportunities for measuring important differences across a variety of ethnic groups may be more feasible at the state level and less so at a national level. State-based surveys like the Hawaii Health Survey and the California Health Interview Survey are able to collect data and produce estimates of population characteristics at a more detailed level than is possible with national data (Brown 2001). These datasets impact state policies, but in order to advance the health of specific ethnic groups, they must also be considered as viable sources of population-based data to impact federal priority-setting processes, such as Healthy People 2010.

Census Data Issues

In past years, the census came under fire because of its estimated undercount of 4 million individuals in the 1990 data collection. Apart from its role in reapportionment and redistricting of congressional and state governmental representation, census data also provide the sampling frame of a large number of federally conducted surveys. In addition, census data are used in many studies to produce denominators for various rates and to develop poststratification weights (Botman et al. 2000). Census data also play a primary role in the determination of resource allocation for programs that are often central to the support of the physical, mental, and social health of Americans, particularly the most needy (GAO 1999). Population estimates as derived from census data serve as the primary source for funding allocations by federal, state, and local government, private foundations, and business. The data are central to almost all of the decisions made by federal, state, and local governments

Table 1: Large Formula Grants Programs by Use of Census Data

Formulas That Use Census Data	Estimated Obligations[1]	Percent of Total[2]
Medicaid	104.4	63%
Highway Planning and Construction	19.7	12%
Title 1 Grants to Local Education Agencies	7.5	5%
Foster Care	3.7	2%
Federal Mass Transit Grants	3.1	2%
Community Development Block Grants	3.0	2%
WIC (Food)	3.0	2%
Social Services Block Grant	2.4	1%
Rehabilitation Services: Basic Support	2.2	1%
Employment Training—Dislocated Workers	1.4	1%
Prevention Treatment of Substance Abuse	1.4	1%
HOME Investment Partnerships	1.3	1%
Community Development State Program	1.2	1%
Job Training Partnership Act, Title II-A	1.1	1%
Child Care Development Block Grant	1.0	1%
Vocational Education: Basic Grants	1.0	1%
Job Training Partnership Act, Title II-B	0.9	1%
Adoption Assistance	0.8	0%
Employment Services	0.8	0%
Goals 2000—State and Local Education	0.6	0%
Maternal Child Health Services	0.6	0%
Safe Drug-Free Schools/Communities	0.6	0%
Subtotal	161.6	97%

[1] In billions of dollars.

[2] Rounded to nearest whole number.

GAO, 1999.

in education, public health, transportation, agriculture, and housing. In Table 1, we show federal grant programs that rely on formulas derived from the use of census data (GAO 1999). Several of these programs, such as WIC, Medicaid, and substance abuse prevention programs, are safety-net programs to ensure the health and welfare of some of the neediest Americans. Inaccuracy of census figures can impair health care planning and services in populations that have few other resources.

According to a recent GAO report (1999), the 1990 Census undercount was greatest among African-Americans. Overall, the undercount was higher in large cities, greater for men in comparison to women, and for the young when compared to old (Levine 1991). Latino males, the homeless, and immigrants, particularly new immigrants, were also vulnerable to undercount (Levine 1991). These findings suggest that estimates for large urban areas with underclass populations, such as Texas, New York, Illinois, and California, may have less accuracy and may require researchers to take greater care when conducting analyses and interpreting findings. Bailar (1988), a previous Director of the Census Bureau, has commented that the undercount contributes to obscuring accuracy in our estimates of disease, poverty, unemployment, and crime because the prevalence estimates of these outcomes are benchmarked against the census data to give rate and risk estimates; an example she offers is that of the incidence of AIDS, which is estimated by dividing the number of reported cases by the total number of individuals in a specific population group. If the census substantially undercounts African-American males, their estimated AIDS incidence rate will appear higher than it is in reality.

Critical Data Collection Issues With Racial/Ethnic Minority Populations

In addition to the issues that we have already presented, researchers using population-based samples to assess health status and health behaviors of ethnic minority groups have a number of other concerns with which to contend. In doing so, they will ensure that they can fairly and accurately comment on the population and know how far to generalize their findings.

Male participation. Men's lower participation rate in surveys is a matter that troubles many researchers, but there is a unique set of issues that surrounds the availability and willingness of ethnic minority males to participate in studies (Cochran and Mays 1998). While much has been written about issues of distrust in research participation, there are a number of sampling issues that have unique manifestations in racial/ethnic populations (Mays 2000). Sex ratio imbalance constrains the number of men available for non-institutionalized samples, particularly when the sampling frame is based on households. Ethnic minority men, particularly young African-Americans and Hispanics, are more likely than White men to be in jail, prisons, or other types of incarceration facilities (Mays et al. 2003). Further, urban poor may be less likely to live at a permanent address and as a result may not be counted in household enumeration activities due to their sometimes tenuous residency within the unit. The men, and their health issues, may be underestimated unless there are special efforts to reach them. Adjusting survey weights for nonresponse bias may not solve the difficulty as male respondents who are successfully recruited may differ in important ways from those who are not recruited or choose not to participate.

Institutional vs. noninstitutional sampling frames. The majority of population-based studies are limited to noninstitutionalized populations (the census is an exception as it does count institutionalized persons). As of 2000, approximately 1 million African-Americans were in the prison system (Bonczar and Beck 1997; Palmer 1999). At the current rate of incarceration among African-American males, 1 in 4 (28.5%) is likely to be in prison or jail during his lifetime as compared to 1 in 23 for White males and 1 in 6 for Hispanic males. The likelihood that these men will go to either a state or federal prison varies as a function of age; it is estimated that by the age of 25 years, almost 16% of African-American males, 6% of Hispanics, and 2% of White males will have served some time in state or federal prisons (Bonczar and Beck 1997). Some ethnic minorities, particularly African-Americans and Hispanics, are also more likely to serve in the U.S. military and will be excluded from most sampling frames. Sampling from civilian and non-institutional group living environments, as is done in the National Household Survey on Drug Abuse, still does not capture the homeless or those in residential treatment facilities.

Failure to include respondents outside the normative non-institutionalized sampling frame. This failure has the consequence of differentially harming by race and ethnicity the accuracy of health estimates for some segments of the U.S. population. Because these estimates serve to determine both policy and funding decisions, those population groups that are not well identified may have underserved needs.

Importance of foreign birth and years in the U.S. Population-based health surveys have historically collected information on birth country and number of years of residence in the United States (Loue and Bunce 1999). Studies have indicated that there are different health outcomes for foreign vs. U.S. born subpopulations (Hummer et al. 1999; Singh and Yu 1996; Shiono et al. 1997; King et al. 1999). These may arise from differences in language, diet, habits, values, socioeconomic status, and customs. In addition, measures using the number of years in the United States have served as proxy measures of acculturation (Loue and Bunce 1999). Thus, surveys that collect more detailed information on the temporal nature of the immigrant experience address the heterogeneity of immigrants within racial groups. Studies that simply separate U.S. born from the foreign born may obscure important differences leading to overestimation of risk for one group and underestimation for the other, for example.

Immigration/citizenship status. While indicators of birth country and citizenship status are generally collected in population-based surveys, permanent residency status is often not. Questions on permanent residency status in health surveys can be analyzed to generate estimates of eligibility for particular public health programs such as Medicaid and the Children's Health Insurance Program. Understanding who is and who is not eligible for such services informs public health planners on the needed scope of programs for some uninsured immigrants who would otherwise be marginalized (Loue and Bunce 1999; Ponce et al. 2001). These questions may be considered intrusive to immigrants; a "no" response to a citizenship question may erroneously deem respondents as undocumented immigrants, when in fact these persons could also be legal U.S. entrants with special student or work visas, or could be in the process of permanent residency applications. Fears of deportation may lead to refusals to answer citizenship or birth country questions or discontinuation of survey participation, particularly if the survey is associated with the federal government. Although the questions are intended to track access to health services and health status among immigrants, their sensitive nature has resulted in their omission from many population-based health surveys.

Recent evidence suggests that the questions may be more successful in some state contexts. For example, the California Health Interview Survey, fielded statewide in California in 2001, included a question on whether an immigrant was a permanent resident with a "green card"; the question experienced a very low refusal rate (2%). This may be due in part to two key factors: 1) interviewers stated in the introduction that the research was conducted by a university, and not the government; and 2) the interviewers reiterated confidentiality of respondent identities and that the answers would not be reported to the Immigration and Naturalization Services (Ponce et al. 2003).

Language of interview. Traditionally, most population-based surveys have been conducted in English, and more recently in Spanish as well. Administering an English-only instrument systematically biases a survey's findings to more acculturated immigrant populations who are English proficient. Thus, for example, if a survey was not conducted in Asian languages, then breast cancer screening rates may be biased upward among Asian women, because those who have limited proficiency in English may experience more difficulty in accessing routine health care. Language access is emerging in health policy agendas, catalyzed by the federal government's Culturally and Linguistically Appropriate Services (CLAS) standards for health care, issued in 2000 (Ponce and Penserga 2002). But, when data are not collected from the broader population that includes linguistic minorities, then policies that address the need for language services become difficult, if not impossible, to formulate. Though cost considerations constrain widespread multiple language administration, the number of surveys doing so is growing. Reflecting the linguistic diversity of the population, county and statewide surveys in California, including for example the Los Angeles County Health Survey, the County of Alameda Uninsured Survey, and the California Health Interview Survey, are administered in English, Spanish, and several Asian languages (Ponce et al. 2001; Ponce et al. 2003).

Differential telephone coverage. Several periodic population-based surveys are conducted via telephone including the Behavioral Risk Factor Surveillance System (conducted by the CDC), the National Immunization Survey, and the State and Local Area Integrated Telephone Survey (SLAITS) (the latter two conducted by the National Center for Health Statistics). While ethnic and/or racial differences in telephone coverage are a well-known concern, surveys using telephone methodology have nonetheless proven to be an acceptable method for the collection of data (Weeks et al. 1983; Groves and Kahn, 1979; Yaffe et al. 1978; Hochstim 1967; Aneshensel et al. 1982). It is important to consider, when using data generated by telephone-survey methodology, the quality and nature of the respondents reached. While telephone coverage differences between the various ethnic/racial minority groups and Whites have decreased in recent years, there are still gaps (National Telecommunications and Information Administration 1999). The disparity is more a function of income, as higher income minority households are as likely as White households to have a phone. At the level of incomes of $15,000 and below, however, the disparities are the most pronounced, with only 72% of all American Indians/Eskimos/Aleuts having phones, followed by Blacks at 78%, Whites at 89% and Asian/Pacific Islanders at 91% (National Telecommunications and Information Administration 1999). Overall low-income, young, and specific ethnic groups are less likely than higher income, older Asian/Pacific Islanders to have phones (National Telecommunications and Information Administration 1999). The area with the fewest telephones per household lies in the reservations and trust lands of the Navajo (less than 25%) and Hopi (about 50%) in the American Southwest (American Editor 1998). The states categorized as low in telephone penetration are states with large minority populations (Texas, Illinois, Georgia, Louisiana, South Dakota, Mississippi, Oklahoma, Arkansas, and New Mexico; also Washington, D.C.).

Interviewee's perception of interviewer's race or ethnicity. Another issue to consider in telephone interviews that is often overlooked is the perceived race/ethnicity of the telephone interviewer as determined by vocal cues. Response patterns of ethnic minorities, particularly to sensitive questions involving racial attitudes or areas of racial concern, may be influenced by perceived match or mismatch with the interviewer (Wolford et al. 1995; Kohut 1998). Several studies have found a definite influence of interviewer race on the response of African-Americans to questions concerning racial integration, political attitudes, White hostility, alienation, and other race-related attitudes (Hyman et al. 1954; Schuman and Converse 1971; Campbell 1981; Anderson, Silver and Abramson 1988a,b; Schaeffer 1980; Wolford et al. 1995; Kohut 1998). Historically, surveys began to employ African-American interviewers in response to earlier findings of interviewer-generated effects in order to reduce this bias; however, as noted by Wolford et al. (1995), this practice has decreased in use over time. For example, the later waves of the National Survey of Black Americans and the National Black Election Telephone Panel Study did not use an all-Black interviewing staff as had been done earlier.

Interviewer effects can be quite robust and the direction of bias interjected difficult to predict. Wolford et al. (1995) examined whether race of interviewer might influence the response of African-American participants on race/ethnicity-related items using data from the 1993 National Black Politics Study, which used only Black interviewers, and the National Black Election Study 1984 pre- and postelection interviews. In both surveys, respondents were asked to guess the race of the interviewer, which they did correctly about three-quarters of the time. Wolford et al. (1995) found that when a Black respondent thought the interviewer was White there was a general deference to questions about Whites as well as a warmer attitude toward Whites and White public figures. For those who design population-based telephone surveys in which race/ethnicity related items are included, pretest work to determine the breadth and direction of the bias would be useful (Wolford et al. 1995). Potentially biasing effects can be estimated if a question related to the respondent's perception of the interviewer's race/ethnicity is included in the interview protocol. This seems particularly relevant in studies where researchers are investigating biobehavioral links between health status and social variables such as discrimination, racism, or perceived unfair treatment by Whites (Clark et al. 1999).

Similar issues arise in face-to-face interviews. Often, attempts are made to match the race of interviewer to the race of the household, with the perception that this will minimize any chance of bias as previously discussed. However, the issue of race of interviewers and interviewees is more complicated than it may appear. In a face-to-face interview study of HIV-related risk behaviors of African-American gay men who have sex with men, interviewees were given the choice of the race and sexual orientation of their interviewer. This was done on the basis of focus group results indicating that the men were more comfortable confiding sexual risk-taking behaviors to individuals who were not a part of the Black community and whom they were not likely to encounter in their social networks (Mays and Cochran 1998).

Cultural equivalence. Here in the United States, some researchers attribute health disparities findings across ethnic groups to differences in culturally mediated perceptions of the meaning of the questions that we ask in our studies (Johnson et al. 1996; Andersen, Mullner, and Cornelius 1987; Angel and Thoits 1987; Mays and Cochran 2000; Cochran and Mays 1998; Mays and Jackson 1991). Johnson and colleagues (1996) demonstrated this point in their study assessing differences in social cognition on a set of questions routinely used in health surveys such as the NHIS (global health ratings, disease labeling, health care access, physical activity, depressive symptoms, and nutrition). Using a study population of African-Americans, Mexican Americans, Puerto Ricans, and Whites, they found that even when controlling for variations in education levels there were differences in the perceived meaning of the questions among the various ethnic groups. Some questions even had different perceived meanings between Mexican American and Puerto Rican respondents, despite speaking a common language. For example, a Spanish language survey in Miami found that colloquial or slang terms for concepts differed depending on whether the interviewee was Puerto Rican, Dominican, Haitian, Central American, or a member of another Latino subpopulation.

International health studies recognize the problem of instrument equivalence across populations. Items are viewed as being of either "etic" (culturally general) or "emic" (culturally specific) in their content. Investigators using large-scale population-based data sets with a variety of ethnic group members may want to inquire about any pretest cognitive laboratory work that has been done to establish the "etic" qualities of the questions. Careful interpretation of study findings is also called for when some groups may not be measured as accurately as others.

It is useful to determine whether the issue in question is that of measuring the effects of culture on self-reports of health status or the validity of the questions. An example of this is the recent findings from the Commonwealth study that found that Asians rated their health lower than other ethnic groups (Betancourt, Green, and Carillo 2002). The result may be due to a cultural proscription against answering questions in a way that results in lower status or different interpretation of the given response categories ("excellent," "good," "fair," and "poor"). Each is an issue worthy of consideration in trying to accurately determine the health of racial/ethnic populations.

Aggregated Race Categories

Recognizing who is actually measured in a data set and who is not is tremendously important in interpreting the findings observed in any particular study. In those data sets where the race and ethnic identifier captures only large groups, such as Black/African-American, Hispanic/Latino, Asian/Pacific Islander, and American Indian/Native Alaskan, it may be prudent to consult medical geographers to understand the diversity of the racial/ethnic background of persons captured in the study (Allen and Turner 1988; Allen and Turner 1997). For example, although Southern California is traditionally seen as a gateway for the migration of individuals from Mexico and Central America, it is perhaps less well known that there is also substantial migration to this region from parts of Africa and the West Indies. The effect of this migration pattern on those classified as Black or African-American in the 1990 Census hints at the complicated nature of race and ethnicity in America. Three of the largest Black immigrant groups in Los Angeles are Jamaicans, Belizeans, and Nigerians (Allen and Turner 1997). The Belizian population in Los Angeles is ethnically varied: one subgroup, the Spanish Belizians, came from Belize's northwestern parts that bordered on Mexico and Guatemala; a second group, which is part Mayan Indian, is a mixed Black Caribbean/Indian population known as the Garifunas; and a third subgroup, which is actually the largest of the three, is composed of Creole Belizians. These subgroups can differ in their languages (English, Spanish, or Creole) as well as diet and nutritional habits. These differences might be important to health care planners and providers.

This diversity of people who might be coded with a single aggregated race category in research is not unique to California (Mays et. al 2003) and is a problem often voiced by other states. In southeastern Massachusetts, Cape Verdeans have long been identified as Black despite their heritage as Portuguese. Data from the 1980 Census, for example, indicated that the counties of Chesterfield, South Carolina, Riley, Kansas, and Sweetwater, Wyoming, had high percentages of individuals from East and West Africa.

The Challenges of Contextual Data

Another emerging trend is multilevel studies, where individual-level and group-level factors are simultaneously examined to determine social influences on health (Chen et al. 1998; Krieger et al. 2002; Acevedo-Garcia et al. 2003; Cain 2003; Darity 2003; McLaughlin and Stokes 2002). Including neighborhood characteristics in studies provides new opportunities for environmental epidemiologists to study associations between environmental exposures and the spatial distribution of disease (Massey and Denton 1990 and 1993; Massey, Gross, and Eggers 1991). This mapping of local social characteristics and environmental exposures to individual responses may afford a much better understanding of the health status of ethnic minorities (Baum and Posluszny 1999). Indeed, one of the advantages of multilevel studies is that social level environmental exposures can be directly studied. Ethnic minorities have a high likelihood of experiencing social stressors such as racism, discrimination, and prejudice (Clark et al. 1999; Broman 1996; Mays 1995; Mays and Cochran 1998; Mays, Coleman, and Jackson 1996; Lochner et al. 2001). Multilevel analysis may identify how those exposures work to create health disparities.

In multilevel studies, individual-level data are merged and analyzed with contextual or socioecological data depicting the individual's neighborhood or community, typically defined, because of convenience, by discrete spatial borders such as zip codes, county lines, or metropolitan statistical areas (Diez-Roux 2000). Two main sources of contextual variables in health research are census data and the Area Resource File (ARF). Census data have the advantage of providing socioeconomic characteristics, such as the percent of households living below the poverty level for areas as small as a block-level group, but contain little information on health care. The ARF contains more than 7000 variables with county-level information on health facilities, health professions, measures of resource scarcity, health status, economic activity, health training programs, and other socioeconomic and environmental characteristics. The basic file contains geographic codes and descriptors that enable it to be linked to many other files and to aggregate counties into various geographic groupings. While the ARF has been linked to national population-based surveys, its main disadvantage is that it contains no information for areas smaller than counties.

Newer techniques for capturing "community" and environmental issues focus on "ecologically meaningful" definitions of neighborhoods that may not spatially match census tracts or zip codes. Researchers and even health planners are constructing from individual-level surveys, group-level measures of social cohesion, trust and reciprocated exchange that impact health status (Earls and Buka 1997). A growing body of research has demonstrated that group-level measures of the degree of social cohesion in a neighborhood may be related to the promotion of healthy behaviors. This neighborhood-level effect may have a bigger impact in racial/ethnic minority populations. Indeed, Buka et al. (2003) have shown that the degree of a neighborhood's social cohesion significantly increased the odds of a higher birthweight among African-American babies, but not among White babies (Buka et al. 2003). Inclusion of contextual measures should be considered for population-based health surveys in that many of the "unmeasured" factors involved in ethnic and racial health disparities may arise from intrinsic social disparities across communities.

Summary

In this chapter we have focused on some of the challenges that researchers and policy makers face in the use of national population-based datasets when they seek to determine and monitor the health of racial and ethnic minority groups in the United States. These challenges include making decisions about the classification of race and ethnicity, developing sampling designs that address problems in participation by racial/ethnic minority males and creating survey instruments that capture the influences of immigrant status and language variations, collecting information from respondents in culturally competent context, and merging contextual data to population-based datasets. Despite the challenges that exist in using national population-based datasets, they nonetheless continue to be an important resource for health investigations of racial and ethnic minority groups. Our hope is that methodologies are developed that contribute to achieving the Healthy People 2010 goal of eliminating health disparities in racial/ethnic populations in the United States.

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