

Improving Data Capacity for American Indian/Alaska Native (AIAN) Populations in Federal Health Surveys

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Acronyms & Definitions

American Indian/ Alaska Native (AIAN)
American Indian/ Alaska Native, Single Race, Hispanic or Latino/a (1R AIAN H)
American Indian/ Alaska Native, Single Race, not Hispanic or Latino/a (1R AIAN NH)
American Indian/ Alaska Native, Two or more Races (2+R AIAN)
American Indian/ Alaska Native, All AIAN (All AIAN)
American Community Survey (ACS)
Behavioral Risk Factor Surveillance System (BRFSS)
California Health Interview Survey (CHIS)
Data Access Center (DAC)
Medicare Current Beneficiary Survey (MCBS)
National Health Interview Survey (NHIS)
National Health & Nutrition Examination Survey (NHANES)
National Survey of Children's Health (NSCH)
National Survey of Drug Use and Health (NSDUH)
Population Assessment of Tobacco and Health (PATH)
Public Use File (PUF)
Research Data Center (RDC)

Collection: The process of gathering and measuring information on variables of interest, that enables one to answer stated research questions, test hypotheses, and evaluate outcomes.

Classification: After information from a survey has been collected, the process of coding and grouping data into different categories based on survey production decisions on deemed common characteristics of the group or common characteristics of the data.

Tabulation: A process of summarizing data and presenting it in a compact form for analyses and reporting.

Weighting: Weighting is used to adjust the estimates of a survey sample to bring them more in line with the characteristics of a population.

Executive Summary

National health surveillance instruments are intended to monitor important health issues and health status of all populations in the United States. Several population subgroups present with disparities in health conditions and health care. To effectively create programs and policies to address these issues requires accurate identification of key population subgroups. Among the subgroups with the highest rates of poor health outcomes is the American Indian/Alaska Native (AIAN) population, which is also at significant risk of misidentification in national surveillance instruments.

Selection of data sets for study inclusion was based on significant use of data sets in the literature, collection of AIAN designation, and availability of key health indicators. Thus, the Behavior Risk Factor Surveillance System (BRFSS), the National Health Interview Survey (NHIS), the National Survey of Children's Health (NSCH), the National Health and Nutrition Examination Survey (NHANES), the National Survey of Drug Use and Health (NSDUH), Population Assessment of Tobacco and Health (PATH), and the Medicare Current Beneficiary Survey (MCBS) were selected. Additionally, the research team reviewed the California Health Interview Survey (CHIS), due to its inclusion of a large AIAN population.

This report shares methodological challenges in identifying and quantifying health and social determinants of health of the diverse populations of AIAN across the US. There is variation in classification, coding, tabulation, and reporting practices among national surveys. We provide an assessment of how methodological decisions about racial classification and, in select data sets, how weighting affect population estimates of leading health indicators among AIANs, including specific examples of prevalence estimates using existing and revised weights.

Key Findings

Our initial analyses using the original weights constructed by survey administrators demonstrated that there are significant differences across AIAN groups and among the AIAN population as a whole. Moreover, the size of the AIAN population, as well as the distribution of AIAN groups within that population differed substantially across surveys. Many of the surveys do not explicitly account for AIANs in the weighting process. Moreover, most include the Latino/a population as a single homogeneous group during weighting. To demonstrate that these weighting decisions

affect our understanding of the AIAN population we introduced revised weighting targets (dimensions) that explicitly account for these factors. The results of the reweighting should be seen as a “proof of concept” demonstration that accounting for the AIAN population directly in the weighting process can improve our understanding of health-related disparities faced by this population.

Authors' Main Message

This report demonstrates that classification and weighting decisions affect the measurement of the population characteristics and health outcomes for the AIAN population. We share observations that can inform data production and processing efforts in major health surveys to advance the insights on the AIAN population. Increasing data capacity for the AIAN population will improve the knowledge about the health of specific subgroups within the AIAN population, and better guide allocation of public health resources.

Acknowledgments and List of ERG Members

Special thanks to the members of the External Review Group (ERG). The talented membership represents federal and non-federal organizations and agencies with interest and expertise in survey weighting methodology, race classification of the American Indian/Alaska Native population, health behaviors and outcomes, and federal databases. The ERG served as an external advisory body and provided valuable consultation on the proposed analytical methods and feedback on findings. Members of the ERG evaluated the feasibility, validity, and reliability of the proposed research and provided constructive feedback for the research team on presentation and messaging of the results. We greatly appreciate their contribution to this effort.

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Introduction

American Indians and Alaska Natives (AIAN) have been shown to have poorer physical and mental health outcomes than other racial and ethnic groups in the U.S.^{1,2} However, there are methodological challenges in identifying and quantifying the health of the diverse populations of AIAN across the United States.^{1,3,4} Misclassification of race appears to be a major contributing factor as information on race and ethnicity in population health datasets are not systematically or accurately collected.^{1-3,5} Variations in approaches to the classification of race and ethnicity in federal and state health statistics could have substantial implications for measuring health status, access and healthcare quality, and health equity. More than any other racial group, AIAN face the risk of imprecise survey estimates owing to survey leaders' decisions in classification, tabulation, and weighting.

The cost of imprecision in health estimates for the AIAN racial/ethnic group could levy serious repercussions on public health planning and policy formulation. Further, with increasing recognition of the social determinants of health, misclassification may blunt opportunities for wider allocation of non-health social protection resources that could impact AIAN health. We provide an assessment of how methodological decisions about racial classification and weighting affect population estimates of leading health indicators among AIANs. This work allows us to develop guidelines that can advance data collection and dissemination efforts in the future, improve knowledge about the health of populations, and inform allocation of public health resources.

Purpose

In this assessment of the AIAN racial/ethnic data capacity of major health surveys, we review challenges for classification, tabulation, and weighting, then demonstrate the implications of current practice and make observations to improve practice. To understand challenges in weighting, we assess how post-weight stratification decisions affect population-based estimates of the AIAN population by constructing new post stratification weights that standardize the size and composition of the AIAN population using different AIAN classification systems. We apply these weights to illustrate how the classification of AIAN affects the distributions of leading health indicators of health status, health behaviors, utilization and access to healthcare, thus demonstrating the implications of current practice and testing alternate observations to improve practice.

Our research questions:

1. *What are the current approaches used to classify race and ethnicity of AIANs in population based surveys? What is the distribution of AIAN (AIAN race in combination with other race(s), Latino/a AIAN, only AIAN, and All AIAN) within selected population-based state/national surveys?*
 2. *What post weight stratification adjustments are necessary for classification of AIANs, in particular when looking at AIAN race in combination with other races, Latino/a AIAN, only AIAN, and All AIAN groupings? And how do the post weight stratification adjustments affect results?*
 3. *How does the distribution of the leading health indicators of health status, health behaviors, utilization and access to healthcare change when classification is revised? How can variations in weighting AIAN data affect the rates and counts of important indicators of health status, health behaviors, utilization, and access to healthcare for the AIAN population?*
-

ERG Selection and Role

With the U.S. Department of Health and Human Services Office of the Assistant Secretary for Planning and Evaluation (ASPE), we convened a national External Review Group (ERG). The ERG served as an advisory body for this research project and provided consultation on the proposed analytical methods. Members were recognized experts among researchers, academics, and health system practitioners in areas of AIAN health research, health disparities, and population survey methodology. After being vetted by ASPE project leaders, they were invited to consult on design, data review, and policy impacts of findings. We conducted three meetings via online webinar with ASPE personnel and the ERG to solicit feedback: 1) proposed analytical methods, 2) preliminary findings and presentation, and 3) final report and discussion of findings. Members of the ERG and the ASPE project team evaluated the feasibility, validity, and reliability of the research and provided constructive feedback for the research team.

Population-Based Health Surveys and Health Indicators

Our data selection process first encompassed a scan of the literature on the usage of candidate population-based state/national health surveys on studies examining AIAN health. Second, we evaluated which datasets collected *and* coded race/ethnicity variables such that we could evaluate the distribution of four sub-populations of AIANs within the selected surveys: AIAN race in combination with other race(s) (2+R AIAN), Latino/Hispanic AIAN (1R AIAN H), only AIAN (1R AIAN NH), and All AIAN. After consultation with ASPE, we added the criterion that study

findings encompass a broad representation of AIAN population health and health needs across the age spectrum. In addition to the selected health surveys, we use the American Community Survey (ACS) to supply the population totals needed to generate alternative weights.

The purpose of the literature scan was to determine the level of representation of national datasets examining AIAN in the published literature. We then produced a usage heat map of the population-based state/national population surveys that have been used in AIAN health studies. A PubMed search for papers with any mention of American Indian or Alaska Native was conducted for studies published between 2007 and 2017. This search yielded 2,233 studies.

Among the 2,233 studies, we then examined any mentions of population-based surveys in the study abstract or as keywords associated with the article. We found the most commonly cited data source was Behavior Risk Factor Surveillance System (BRFSS), used in 48 studies, followed by National Health Interview Survey (NHIS), California Health Interview Survey (CHIS), NSCH, and National Health and Nutrition Examination Survey (NHANES) (Table 1.). These surveys are random samples of individuals from households. We excluded surveys with sampling frames based on facilities such as doctor's offices, hospitals and schools. Exhibit 1 displays strong use of BRFSS and the NHIS, with a preponderance of use of CHIS, NHANES, and NSCH). There is limited use of the National Survey on Drug Use and Health (NSDUH), but the content of this survey was deemed important by ASPE and UCLA to include for consideration. Similarly, even though to date, there is no use of the Population Assessment of Tobacco and Health (PATH) and the Medicare Current Beneficiary Survey (MCBS), we included these surveys to broaden the scope and age targets of the set of surveys examined. For this project, examining a mix of low-, medium-, and high-usage datasets provides insight on improving the value of surveys for the AIAN population. With consultation with the ERG, following seven surveys were chosen for this study and results of analyses conducted for this study are shown for these surveys: BRFSS, NHIS, CHIS, NHANES, NSDUH, PATH and MCBS.

Table 1. Heat map of number of AIAN papers using population-based health surveys

Survey	2007-2009	2010-2012	2013-2015	2016-2017
PATH Population Assessment of Tobacco and Health	0	0	0	0
MCBS Medicare Current Beneficiary Survey	0	0	0	0
NSDUH National Survey of Drug Use and Health	2	1	0	1
NSCH National Survey of Children’s Health	1	6	0	0
NHANES National Health & Nutrition Examination Survey	4	1	1	1
CHIS California Health Interview Survey	3	5	4	0
NHIS National Health Interview Survey	8	8	3	1
BRFSS Behavioral Risk Factor Surveillance System	13	22	10	3

We summarized the types of health outcomes and health indicators for the set of relevant studies obtained from PubMed ([Appendix A](#)). With input from the ERG, we narrowed down the list of health indicators of health status (e.g. having been diagnosed with diabetes), health behaviors (e.g. smoking), utilization (e.g. visited doctor for substance abuse counseling), and access to healthcare (e.g. uninsurance). Priority indicators were those that have relevance to the issues most salient to AIAN health. Then, we finalized the set of key indicators by survey with consultation from ASPE and the ERG. Criteria to select indicators per survey were 1) unique contribution of measure—for example food insecurity measured in NHANES, NHIS and CHIS is not available in other surveys, 2) inclusion of 1-2 measures that are common across health surveys, for example self-rated health, 3) selection of measures that are known to impact AIAN health based on the literature review and ERG feedback, 4) repeated use of the measure across survey years to ensure consistency of survey measures when pooling data across survey years. The health indicator variables selected in this process are shown in Table 2.

Table 2. Health indicator variables by survey chosen for analysis after ERG review

Population	Child- ren	Teens to Young Adults	Teen and Adults	Adults, Teens, Children	Adults, Teens, Children	Adults	Adults	Age>65 & Medi- care covera ge
Surveys	NSCH	PATH	NSDUH	CHIS	NHIS	BRFSS	NHANES	MCBS
Access to medical home or usual source of care (All age groups)	X			X	X	X	X	X
Alcohol use (Teen)		X	X	X	X	X	X	X
Annual physician visit (Child, Teen)	X	X	X	X	X	X	X	X
Asthma (Child)	X	X	X	X	X	X	X	X
Cancer screening (Adult, Older Adult)						X		X
Care for depression (Teen, Adult)	X		X		X	X		
Chronic disease management and utilization (Teen, Adult, Older Adult)		X		X	X	X		X
Emergency room visits (All age groups)		X	X	X	X	X		X
Fruit and vegetable consumption (Child, Adult, Older Adult)						X		
Food insecurity (Child, Adult, Older Adult)				X	X		X	
Heart disease (Older Adult)		X	X	X	X	X	X	X
Hypertension (Teen, Adult)		X	X	X	X	X	X	X
Insurance status (All ages)	X	X	X	X	X	X	X	X
Mental health (Teen, Adult)	X	X		X	X	X	X	X
Mental health care (Child, Adult)	X			X	X	X	X	X
Overweight/Obesity (Teen, Adult)	X	X	X	X	X	X	X	X
Physical activity/inactivity (All ages)	X	X		X	X	X	X	X
Pre-diabetes/Diabetes (Teen, Adult, Older Adult)	X	X	X	X	X	X	X	X
Psychological distress (Older Adult)	X	X		X	X	X	X	

Population	Child- ren	Teens to Young Adults	Teen and Adults	Adults, Teens, Children	Adults, Teens, Children	Adults	Adults	Age>65 & Medi- care covera ge
Surveys	NSCH	PATH	NSDUH	CHIS	NHIS	BRFSS	NHANES	MCBS
Self-rated health (Teen, Adult, Older Adult)	X	X	X	X	X	X	X	X
Socioeconomic health (i.e. income, education) (All ages)	X	X	X	X	X	X	X	X
Unmet medical needs due to cost (All ages)	X		X	X	X	X	X	X

Current Status of Collection, Classification, and Tabulation of AIAN Race and Ethnicity in Population-based Surveys

For each survey chosen for this study, we next review current practices for the collection, classification, and tabulation of AIAN race. The relevant survey questions on AIAN race and Latino/a ethnicity are presented in

Appendix B. Survey Questionnaires We also discuss the measures of race/ethnicity that are available to researchers in the public-use and restricted data files for each survey to assess the accessibility of information about AIANs to users. This accessibility affects the degree to which data users can examine disparities among the AIAN population and other racial/ethnic groups, as well as disparities within the AIAN population. We note where it is possible to identify all AIANs, as well as each of the three AIAN subgroups: 1R AIAN NH, 1R AIAN H, and 2+R AIAN.

For BRFSS, NHIS, and CHIS, we present a comparison of the current weighting approaches and provide an evaluation of the impact of an alternative weighting approach on selected estimates. The discussion includes identifying which surveys include the AIAN population in the weighting process, and, if so, how the AIAN population information was used. We also compare the sources of population totals used for creating weights.

1.1.1. BRFSS

BRFSS is a population-based survey that is representative of the adult non-institutional population of the U.S., including all 50 states, the District of Columbia, and the territories of Puerto Rico, Guam, and the Virgin Islands.^{42,43} For this project, we included only data from the fifty U.S. states and the District of Columbia. All data collected in BRFSS is from a self-reported telephone interview administered by each state. The sample size for each of the five years of data evaluated for this project can be found in Table 3

Table 3. 2011-2015 BRFSS Sample Size, Adults Ages 18 and Over, U.S. States and DC

	Sample Size	Weighted Population
2011	497,967	235,054,000
2012	467,333	240,131,000
2013	483,865	243,095,000
2014	456,158	245,561,000
2015	434,382	248,437,000

Race and ethnicity information is collected in a two-question sequence. Like other federal surveys, Latino/a ethnicity information is collected in a separate question that precedes the

question that collects race information. However, within BRFSS, both the Latino/a ethnicity and the race response options include a number of ethnic subgroup options that allow those who are Latino/a, Pacific Islander, and/or Asian to provide greater detail on their ethnic background.

If the respondent reports more than one race, s/he is asked which one of the reported races s/he most identifies. BRFSS does not collect information about tribal affiliation or about whether the respondent is a member of a state- or federally recognized tribe.

These race and ethnicity responses are coded into a variety of summary measures that can be accessed by researchers who are interested in AIAN populations. To code race measures, BRFSS collapses each of the ethnic subgroup mentions into larger racial categories. The six broad race categories are: white, black or African American, American Indian or Alaska Native (AIAN), Native Hawaiian or Pacific Islander, Asian, and other race. In the pre-2013 public use files, it is possible to identify all four AIAN groups, because detailed race variables that provide information on all of the races reported by the respondent are available. In addition to these detailed measures, information on Latino/a ethnic background is provided in a separate variable. These measures are used together to code additional measures of race/ethnicity. The data contain a recoded race measure that collapses those who report multiple races into a single category; it is coded as white only, black only, Asian only, Native Hawaiian or Pacific Islander, AIAN only, other race only, or multiracial. In addition to this measure, the data contain a similar measure that combines all Latino/a respondents into a single category. None of these measures are imputed when data are missing. Beginning with 2013 BRFSS, only the recoded race only and race/ethnicity measures are included in the public use file. It is no longer possible to identify 2+R AIAN respondents in the public use data. Because of this, analysis of the 2013-2015 BRFSS data was conducted in the federal statistical research data center.

The public-use data file also includes a small number of race/ethnicity variables that have information imputed for respondents who did not provide race or ethnicity information during the interview. These measures were imputed for use in the weighting process. The most detailed of these measures combines Latino/a ethnicity information with race reports to create a six-category race/ethnicity measure with the following categories: non-Latino/a white, non-Latino/a black, non-Latino/a Asian, non-Latino/a AIAN, Latino/a, and non-Latino/a other race. The non-Latino/a other race category includes those who are Native Hawaiian or Pacific Islander, two or more races, and reported their race as "other". Beginning with 2015 BRFSS, this detailed imputed

measure of race/ethnicity is no longer included in the public use file. This means that after 2014 it is not possible for researchers to identify respondents who were imputed as 1R AIAN NH, using the public use data files.

1.1.2. CHIS

The California Health Interview Survey is the country's largest state-based population health survey.⁴⁴⁻⁴⁶ Conducted since 2001, the survey now employs continuous collection with a target of 40,000 households every 2-year cycle. Data are collected as part of a telephone interview. Data are collected from adults ages 18 and older, adolescents ages 12-17 and the most knowledgeable adult for children ages 0-11. Demographic information, including race/ethnicity are self-reported directly by adult and adolescent respondents and by the most knowledgeable adult (usually a parent) for children ages 0-11.

CHIS collects information on race/ethnicity using several questions. These questions are included at the end of this document. Latino/a origin is reported in one question with follow-up questions to report specific ancestry groups for respondents who indicate they are Latino/a (e.g., Mexican, Salvadoran, Cuban, etc.). Race is reported in response to a separate question with the following response categories (respondents select all that apply): Native Hawaiian, Other Pacific Islander, American Indian, Alaska Native, Asian, black/African American, White, or other. Ethnicity among those who report Asian or Pacific Islander race is collected in follow-up questions.

Respondents who report they are AIAN are asked to report their tribal heritage and whether they are enrolled in a federally- or state-recognized tribe. In addition, among all CHIS respondents who report more than one race, or who report a single-race and Latino/a ethnicity, the survey asks the respondent whether they identify with one race/ethnicity in particular and, if yes, there is a follow-up question asking with which race/ethnicity they most identify.

Responses to these questions are coded into a variety of summary measures available in the public use file (PUF). To code race measures, CHIS combines responses into six broad race categories representing single race as well as a category for those who mention more than one race: white, black or African American, American Indian or Alaska Native (AIAN), Native Hawaiian or Pacific Islander, Asian, other race, and two or more races. This race variable is independent of Latino/a ethnicity. An additional race/ethnicity variable combines Latino/a

ethnicity with race by coding all respondents who report Latino/a ethnicity as Latino/a. Another race variable categorizes respondents based on single race, and for those who report more than one race, the race with which they most identify. The PUF file also includes separate variables indicating whether respondents reported being a particular race, including AIAN race, as well as Latino/a ethnicity. CHIS restricted access data files provide even more detailed race ethnicity variables.

Table 4. 2011-2014 CHIS Sample Size, All Ages

	Sample Size	Population
2011-2012	53,068	36,931,000
2013-2014	48,005	37,582,000
Pooled	101,073	37,257,000

1.1.3. MCBS

Medicare Current Beneficiary Survey (MCBS) data are collected in person from Medicare beneficiaries age 65 and over as well as Medicare beneficiaries under age 65 with a disability.^{47,48} Respondents for the MCBS are sampled from the Medicare administrative enrollment data. The sample is designed to be representative of the Medicare population as a whole and by the following age groups: under 45, 45 to 64, 65 to 69, 70 to 74, 75 to 79, 80 to 84, and 85 and over. Demographic information, including race/ethnicity is self-reported directly by respondents.

MCBS collects information on race/ethnicity using several questions. These questions are included at the end of this document. Latino/a origin is reported in one question with follow-up questions to report specific ancestry groups (e.g., Mexican, Puerto Rican, Cuban, etc.). Race is reported in response to a separate question with the following response categories (respondents select all that apply): American Indian, Alaska Native, Asian, black or African American, Native Hawaiian or Other Pacific Islander, white, or some other race. Respondents can choose as many as apply. There are no questions on the MCBS survey about tribal affiliation or enrollment. Some AIAN respondents also report being one or more additional race groups and some AIAN respondents report also being Latino/a. Responses to these questions are used to create a number of race/ethnicity variables available to researchers and analysts in public use and restricted access

data files. The combinations of responses to these variables impact how AIAN participants are coded in race variables available to researchers and analysts.

In MCBS public use files, AIAN participants are not identifiable. The only race variable available in the public use file is one that combines Latino/a ethnicity and race responses into one variable with the following mutually exclusive categories: Non-Latino/a white, Non-Latino/a black, Latino/a, and other. AIAN participants who report Latino/a ethnicity are coded into the “Latino/a” category. Other AIAN participants are coded into the “Other” category. In addition, prior to the 2013 survey MCBS data were not released as public use files.

MCBS restricted access data files provide more detailed race ethnicity variables. AIAN participants are identified in the following two types of variables: (1) A variable capturing whether participants reported being AIAN in which any respondent who mentions being AIAN is coded as yes and (2) A variable that identifies participants who report a single race without considering Hispanic/Latino ethnicity. AIAN participants who report only AIAN race are coded into the “American Indian, Alaska Native” category, and AIAN participants who report AIAN in addition to other race categories are coded into the “more than one race” category. In addition, there is a variable that identified whether participants are of Latino or Hispanic ethnicity.

Because MCBS is an overlapping panel survey, consecutive survey waves could not simply be combined to conduct pooled analyses. Our approach to conducting pooled MCBS analyses is described in detail in the “Research Questions” section and the resulting sample size and population data are shown in Table 13 and Table 14.

1.1.4. NHANES

NHANES is a nationally representative in-person interview of residents of a cross-section of U.S. residents.^{49,50} The interview includes both an in-person interview and a physical examination. The sample size for the 2011-2014 waves can be found in Table 5.

Table 5. 2011-2014 NHANES Sample Size, All Ages

	Sample Size	Population
2011-2012	9,756	306,591,000
2013-2014	10,175	311,204,000
Pooled	19,931	308,897,000

NHANES race and ethnicity data is collected as part of an in-person interview. The interviewer collects information to fill out a household roster at the door that includes basic demographic information about everyone living in the selected household. Some limited information about race and ethnicity is collected for sampling purposes as part of this process. One person is randomly selected as the respondent. If the selected respondent is unable to respond for themselves, a proxy respondent may provide information about the selected respondent. When the selected respondent is a child, a parent is present for the interview and may respond on the child's behalf.

Race and ethnicity information is collected in a two-question sequence. Like other federal surveys, Latino/a ethnicity information is collected in a separate question that precedes the question that collects race information. Respondents are provided with a card that lists possible response options. If a respondent reports that the selected participant is Latino/a, Asian, or "other" race they are asked a follow-up question to ascertain subgroup ancestry.

NHANES does not ask the respondents who report more than one race with which race they most identify. This survey does not collect information on tribal affiliation or whether the respondent is a member of a state- or federally-recognized tribe.

It is not possible to identify AIANs using the public use data. The public use files contain two measures of race and ethnicity. In each of these measures, respondents who reported being of Latino/a ethnicity are coded into one of two ethnicity categories: Mexican American and Other Latino/a. Missing data for all racial/ethnic measures is imputed. No race only measures are available in the public use file. The most detailed racial/ethnic measure has six categories: Mexican American, Other Latino/a, non-Latino/a white only, non-Latino/a black only, non-Latino/a Asian, and non-Latino/a other race. The less-detailed measure collapsed non-Latino/a Asian respondents into the non-Latino/a other race category.

The restricted files contain more detailed racial/ethnic information, including the ability to identify the specific race reports of those who reported more than one race. This information is contained in a series of indicator variables that are coded as 1 if the respondent was reported to be that race and 2 otherwise. The restricted data file includes indicators for white, black or African American, Asian, American Indian or Alaska Native, Pacific Islander or Native Hawaiian, Mexican American, other Latino/a, and other race. Because it is only possible to identify AIANs using the restricted data files, all analyses were performed in the federal statistical RDC using the restricted data.

1.1.5. NHIS

NHIS is the largest in-person health survey conducted in the United States.^{51,52} It is a cross-sectional survey designed to be representative of the non-institutional population of the U.S. As part of the interview, basic demographic information is collected about every household member. Within each household, one adult and, if available, one child are randomly selected for a more detailed health interview.

The sample size for household members, sample adults, and sample children in the 2013 NHIS can be found in Table 6. The weights for these three populations were generated by NHIS using separate weighting procedures.

Table 6. 2013 NHIS Sample Size, All Ages

	Persons in Households		Sample Adults		Sample Children	
	Sample Size	Population	Sample Size	Population	Sample Size	Population
2013	104,204	310,874,000	34,557	237,394,000	12,860	73,486,000

NHIS data is collected as part of an in-person interview. The interviewer collects information to fill out a household roster that includes basic demographic information about each person living in the selected household. When possible, this information is collected as a self-report, directly from each household member; however, when a household member is not present at the interview or is unable to provide a self-response, that information is collected from a proxy respondent

living in the household. For this reason, the NHIS race/ethnicity data is a combination of self-reported and proxy-reported information.

Race and ethnicity information is collected in a two-question sequence. Like other federal surveys, Latino/a ethnicity information is collected in a separate question that precedes the question that collects race information. Respondents are provided with a card that lists possible response options. If a respondent reports that an individual is Latino/a, they are asked to provide their subgroup ancestry. The race question's response options include a number of ethnic subgroup options that allow those who identify as Pacific Islander and/or Asian to provide greater detail on their racial background.

If a respondent reports more than one race for an individual in the household, NHIS follows up to ask: "Which one of these groups, that is [Read Groups] would you say BEST represents [your/ALIAS's] race?" This race is considered the individual's primary race. Because this question is asked about all household members and may not be answered by the individual in question, this question may not capture the individual's preferred race.

NHIS data is collected as part of an in-person interview. The interviewer collects information to fill out a household roster that includes basic demographic information about each person living in the selected household. When possible, this information is collected as a self-report, directly from each household member; however, when a household member is not present at the interview or is unable to provide a self-response, that information is collected from a proxy respondent living in the household. For this reason, the NHIS race/ethnicity data is a combination of self-reported and proxy-reported information.

Race and ethnicity information is collected in a two-question sequence. Like other federal surveys, Latino/a ethnicity information is collected in a separate question that precedes the question that collects race information. Respondents are provided with a card that lists possible response options. If a respondent reports that an individual is Latino/a, they are asked to provide their subgroup ancestry. The race question's response options include a number of ethnic subgroup options that allow those who identify as Pacific Islander and/or Asian to provide greater detail on their racial background.

If a respondent reports more than one race for an individual in the household, NHIS follows up to ask: “Which one of these groups, that is [Read Groups] would you say BEST represents [your/ALIAS's] race?” This race is considered the individual’s primary race. Because this question is asked about all household members and may not be answered by the individual in question, this question may not capture the individual’s preferred race.

NHIS does not collect information on tribal affiliation or whether the respondent is a member of a state- or federally-recognized tribe.

The public use files contain several measures of race and ethnicity, none of which allow researchers to identify 2+R AIAN respondents. In each of these measures, all respondents who reported more than one race were collapsed into a single multiracial category. Respondents who reported that their race did not fall into one of the five recognized race categories (white, African American, Asian, Native Hawaiian or Pacific Islander, or American Indian or Alaska Native) were recoded or imputed into one of these five categories. Missing data for all racial/ethnic measures was imputed.

The most detailed race only measure was coded as white only, black/African American only, AIAN only, Asian only, “unreleasable race” group, and multiple race. The “unreleasable race” category appears to predominantly be those who fall in the Native Hawaiian and Pacific Islander racial category. In addition to this race measure, the data includes both an indicator and a detailed measure of Latino/a ethnicity. The detailed measure provides information on Latino/a ethnic subgroup. The race only and Latino/a indicator can be combined to identify the 1R AIAN NH and 1R AIAN H subgroups in the public use file.

The restricted files contain more detailed racial/ethnic information, including the ability to identify the specific race reports of those who reported more than one race. This information is contained in a series of indicator variables that are coded as 1 if the respondent was reported to be that race and 2 otherwise. The restricted data file includes indicators for white, black or African American, Asian, American Indian or Alaska Native, and Pacific Islander or Native Hawaiian. Because 2+R AIAN respondents can only be identified in the restricted access data files, analyses of NHIS were conducted in the federal statistical research data center.

1.1.6. NSCH

NSCH is a cross-sectional telephone survey of households with at least one resident child aged 0 to 17 years at the time of the interview.^{53,54} The respondent of the survey is the parent/guardian who has knowledge regarding the health and health care of the children in the household. The NSCH uses a complex sample design, with stratification by state and sample type (landline or cell phone) and with clustering of children within households. In 2011-2012, 95,677 child-level interviews were collected. The sample size for our selected groups are presented in Table 7.

Table 7. 2011-12 NSCH Sample Size, 0-17 year olds

	Sample Size	Population
2011/12	95,677	73,717,000

Race and ethnicity information is collected in a two-question sequence. Latino/a ethnicity information is collected first and then race information is collected. Unlike NHIS, if a respondent reports that an individual is Latino/a, there is no follow-up question to ascertain subgroup ancestry. American Indian/Native American and Alaska Native are coded separately and if a respondent marks any of these two as their child's race, the interviewer asks about receiving services from the Indian Health Service.

NSCH does not ask about tribal affiliation or whether the individual is part of a state- or federally-recognized tribe. NSCH also does not include a question asking those who report two or more races with which race the individual "most identifies."

The public use files contain measures of race and ethnicity. The Latino/a ethnicity variable has 2 categories, yes (Latino/a origin) or no (not Latino/a origin). The primary race measure (RACER) is a 3 category variable coded as white only, black only, Other. The public use dataset also contains the following variables: RACE_HI, which is race classification used for Hawaii (white only, black only, Asian only, NH/PI only, Other), RACEASIA is race classification with Asian specification that is available for only select states that have a sufficient Asian population (white only, black only, Asian only, Other), and RACEAIAN is the race classification with American Indian/Alaska Native specification that is available for select states with a sufficient AIAN population (white only, black only, AIAN only, Other). The states for which single-race AIAN

information is available are Alaska, Arizona, Montana, New Mexico, North Dakota, Oklahoma, and South Dakota. In these states, the size of the single-race AIAN population exceeds 5% of all children, allowing this information to be released without significantly increasing disclosure risk. Because it is the only race/ethnicity measure that applies to all states, RACER is the only race variable in the public use dataset that can be used for national estimates, but there was sufficient information in the public use files to conduct our analysis.

1.1.7. NSDUH

NSDUH is an in-person national health survey that covers the civilian, noninstitutionalized population age 12 and over. Field interviewers use handheld computers to record responses, and the computer uses a preprogrammed algorithm to select zero to two eligible individuals for the complete interview. The sample size for our selected groups are below.^{55,56}

Table 8. 2014 NSDUH Sample Size, All Ages

	Sample Adults		Sample Children (12-17)	
	Sample Size	Population	Sample Size	Population
2014	41,671	240,248,000	13,600	24,875,000

NSDUH conducts in-person interviews to collect its data. Surveyors attempt to conduct the interview with each sampled person in the household after screening the first person. Sampled persons give their race/ethnicity information in several questions. Latino/a origin is reported in one question with a follow-up question to report specific ancestry groups (e.g., Mexican, Puerto Rican, Cuban, etc.). The follow-up question and the race question are asked verbally, while the respondent is given showcards listing the possible answer choices.

Race is reported in response to the next question with the following response categories (respondents select all that apply): American Indian or Alaska Native, Asian, black or African American, Native Hawaiian, Guamanian or Chamorro, Samoan, Other Pacific Islander, white, or some other race. Thus, some AIAN respondents will also report being one more additional race groups and some AIAN respondents will report also being Latino/a.

Responses to these questions are used to create a number of race/ethnicity variables available to researchers and analysts in public use and restricted access data files. NSDUH does not contain a “most identify” type question. The combinations of responses to these variables impact how AIAN participants are coded in race variables available to researchers and analysts.

NSDUH offers researchers the opportunity to analyze AIAN data through its Public File and Restricted Data. The Public File is limited to one variable that identifies the 1R AIAN NH subgroup. The Restricted Data contains more race/ethnicity variables that are needed to create our project’s 4 AIAN subgroups. This includes: (1) a Latino/a indicator, (2) an All AIAN indicator, and (3) a 15-level race variable.

Tribal affiliation and state/national tribe recognition are not asked in NSDUH. Respondents who report ‘Other’ in the race question have their race value imputed to one of the following 15 race categories in NSDUH’s restricted race variable: white, black/African American, Native American or Alaska Native, Native Hawaiian, Other Pacific Islander, Native Hawaiian and Other Pacific Islander, Chinese, Filipino, Japanese, Asian Indian, Korean, Vietnamese, Other Asian, Asian Multiple Categories, and More than one Race. Imputation results stem from either the questionnaire response to the race/ethnicity questions, logically assigned data, Census data from country of origin, or replacement with appropriate response codes.

1.1.8. PATH

PATH samples their respondent pool from the civilian, non-institutionalized population age 12 and older. The survey uses a longitudinal structure, so our research team used Wave 1 data (conducted from September 2013-December 2014). Selected households complete an adult screener, and up to one adult and one child are chosen for the interviews. Children age 9 to 11 are invited to complete a youth interview upon turning 12 years old in a future wave. Every adult respondent is asked to provide a biospecimen for testing. Sample sizes for the Wave 1 population are below.

Table 9. 2013-2014 PATH Wave 1 Sample Size, All Ages

	Sample Adults		Sample Children (12-17)	
	Sample Size	Population	Sample Size	Population
2013-2014	32,320	236,692,000	13,651	24,852,000

PATH is a longitudinal cohort study that collects data in multiple waves. Selected households begin interviewing with an adult household member and are screened for the populations of interest: adults, children age 12-17, and children age 9-11. After completion of the interview, the surveyor collects a biospecimen from consenting interviewees. PATH captures race/ethnicity similarly to other health surveys. Latino/a is asked first, allowing respondents to select their specific Latino/a ethnic group. Immediately after, respondents select their race(s) from 14 potential categories. Thus, some AIAN respondents will also report being one more additional race groups and some AIAN respondents will report also being Latino/a. PATH does not ask a race ‘most identify’ type question.

In PATH public use files, AIAN participants are not identifiable. The only race variables available are a Latino/a indicator and three-level race variable. The three-level variable’s categories are white only, black only, and Other. To analyze the AIAN population, access to the restricted use file was granted through the University of Michigan’s Virtual Data Enclave (VDE).

PATH confidential data contains more detailed race/ethnicity variables for analysis. AIAN participants are identified in: (1) an All AIAN variable, and (2) a seven-level race variable that parses out non-Latino/a AIANs. Those who report 1R AIAN NH in addition to other race categories are coded to the “more than one race” category.

Tribal affiliation and AIAN state/federal tribe recognition are not asked in PATH. Respondents who report ‘Other’ in the race question have their race value assigned to one of the following seven categories in NSDUH’s restricted race/ethnicity variable: white, Non-Latino/a; black or African American, Non-Latino/a; American Indian or Alaska Native, Non-Latino/a; Asian, Non-Latino/a; Native Hawaiian or Other Pacific Islander, Non-Latino/a; More than one race, Non-Latino/a; Latino/a. Results stem from logically derived assessments. Respondents who report “Don’t Know” or “Refused” answers have missing values for this variable.

Methods

1.1.1. Overview of Analysis Plan

The goal of the analysis is to demonstrate that AIAN classification and weighting decisions affect the measurement of the population characteristics and health outcomes for this population. To do this, we examine 1) the population size and distribution of the AIAN population and the three AIAN subgroups within each survey; 2) the distribution of social determinants of health and health outcomes within these four AIAN groups within each survey; 3) the way in which each survey incorporates the AIAN population in their weighting methodology; and 4) how the distributions of the social determinants of health and health outcomes for the four AIAN groups change when the survey weighting process is standardized to include AIAN subgroups based on population distributions from a common source.

All surveys rely on external population totals for weighting, but surveys often draw this information from different sources. Though we attempted to compare them across surveys, the sources of these population totals were not always easily identified in survey documentation. Differences across surveys in the sources of the population distributions and totals used in their weighting process can introduce variation across surveys in the size and characteristics of the AIAN population, as well as the distribution of AIAN subgroups within the larger AIAN population. Even when the same sources are used, survey administrators must decide how racial/ethnic groups will be classified during the weighting process. Due to the small size of the AIAN population, this group is often collapsed into a residual “other” category during the weighting process. When this happens, the size of this population is not explicitly controlled or standardized in the survey’s data. When survey administrators have included AIANs as a separate racial/ethnic group in the weighting process, generally only the 1R AIAN NH population has been included. This means that the population size of 1R AIAN H and 2+R AIAN are not standardized. When health outcomes vary across AIAN subgroups, differential representation of these groups within the AIAN population across surveys can lead to very different estimates of health disparities between AIANs and other racial/ethnic groups.

To assess the impact of the use of different population totals and distributions across surveys, we reweighted three of the data sets, recalculating original race/ethnicity-based weighting dimensions and introducing new weighting dimensions that adjust the surveys’ racial/ethnic distributions to match a single, standardized source. For this task we used the public-use

American Community Survey (ACS) as our standard source for racial/ethnic population distributions.

The ACS is a large, annual, nationally representative survey of approximately one percent of all households in the United States. The large sample size and national coverage of the survey provides us with the greatest flexibility for identifying the appropriate population and defining new, detailed weighting dimensions for each survey. The ACS may not adequately represent the true counts of the AIAN population due to issues such as uneven coverage of AIAN tribal lands, question wording that appears to require AIAN respondents to provide the name of a recognized tribe, and classification of Latino AIANs. Despite these concerns, we relied on the ACS distribution across the different racial classification to operationalize a revised weighting approach that accounts for more granular AIAN population total targets. The ACS was selected for this purpose because it facilitated the specification of the four AIAN classification subgroups specified in this study and informed the revised, more granular population race/ethnicity distributions and population totals needed for the reweighting process. Though the ACS provided new, standardized population targets for this study, the limitations of this data should be kept in mind and the revised estimates should not be interpreted as a more “accurate” representation of the AIAN population.

1.1.2. Sample selection

Several surveys included data for areas outside of the 50 U.S. states and the District of Columbia (D.C.). For example, BRFSS has included survey data from Puerto Rico and other U.S. territories, while MCBS includes Medicare recipients living in Puerto Rico. Data in the ACS is restricted to the 50 U.S. states and D.C. Therefore, each dataset is restricted to this population to facilitate the construction of new weighting dimensions based on the population distributions within the ACS.

We made two further inclusion restrictions for MCBS and BRFSS. Most access-related measures in MCBS are restricted to a subsample of respondents who are continuously enrolled in Medicare for the full year. For this reason, our MCBS sample was restricted to this population. BRFSS includes a core survey that is conducted in all states and D.C., as well as optional survey modules that states can choose to include in their interviews. To ensure that our data is nationally

representative, BRFSS analyses were restricted to measures that collected as part of the core survey interview.

1.1.3. Imputation

The percentage of respondents who were missing information differed substantially across measures and data sets. For most measures, the number of cases that were missing information was very small; however, for a small number of sensitive measures such as income, the percentage of respondents who were missing data could reach as high as one-quarter or more. Though each survey imputes missing information for measures that are used for constructing survey weights, only one of the eight surveys, CHIS, imputes missing values for all survey measures that are missing information. Two surveys, NHIS and NSCH, multiply-impute income information for all respondents, but do not impute values for most other measures. In both of these surveys, the income data is imputed five times.

Missing data for all measures used was multiply-imputed for all surveys, excluding CHIS, using weighted soft boundary hot deck procedures. Outcome measures with missing values were grouped together by topic and simultaneously imputed five times to preserve the skip patterns and correlation relationships between these measures. Under soft boundary hot deck imputation, cases that were missing information (“recipients”) were assigned values from another record with complete information on those measures (“donors”) who were similar in terms of gender, age, and state or geographic region. These characteristics were chosen because these measures had complete information for all respondents in each survey.

There were exceptions to this rule. Most of the surveys imputed race/ethnicity information so that this information could be used as part of the weighting process. However, the race/ethnicity variables that were imputed often were not imputed with a sufficient level of detail for our analyses. For this reason, we imputed more detailed race, ethnicity, and AIAN group information for cases that were missing this information. In addition to the gender, age, and geographic information, we used the less-detailed imputed race/ethnicity measures as predictors in order to ensure that the newly assigned values were consistent with the original race/ethnicity measures that were imputed by each survey’s administrators. One final exception was NHANES, for which no subnational measures were approved for use in this project; thus, for this survey, only age and gender were used to impute missing values.

1.1.4. Analysis

The population sizes and percentage distributions for each of the four AIAN groups were calculated using one-way weighted frequency tables that adjust the variance estimates to account for the design of each survey. The demographic and health-related measures were analyzed using two-way weighted frequency tables that cross these measures by AIAN group. The eight surveys each required the use of complex survey analysis procedures to analyze the data. The analyses were conducted in SAS and Stata, using PROC SURVEYFREQ and svy procedures, respectively. MCBS data was analyzed using replicate weights, while the remaining surveys were analyzed using the Taylor Series linearization. Using Taylor series simplified the reweighting process, because it did not require constructing new replicate weights.

Final analyses were conducted on each of the five multiply-imputed datasets, and then the results from the five analyses were combined using built-in multiple imputation analysis procedures in SAS and Stata designed to construct corrected estimates and standard errors. The same analyses were conducted after revised weights were constructed for three of these datasets.

The current re-weighting approaches used by select survey projects are outlined here, with demonstrations of weighted and reweighted data where feasible.

Our initial analyses using the original weights constructed by survey administrators demonstrated that there are significant differences in health-related outcomes across AIAN groups and among the AIAN population as a whole. Additionally, the size of the AIAN population, as well as the distribution of AIAN groups within that population, differed substantially across surveys.

Many of these surveys do not explicitly account for AIANs in the weighting process. Moreover, most include Latinos as a single group during weighting. To demonstrate that these weighting decisions affect our understanding of the AIAN population we introduced revised weighting targets (dimensions) that explicitly account for these factors. The new weighting dimensions explicitly take into account the size of the overall AIAN population and the distribution of the three AIAN subgroups (1R AIAN NH, 1R AIAN H, and 2+R AIAN) within it. In addition, to account for the fact that controlling for the 1R AIAN H population can change the racial distribution within the Latino ethnic group, we included a race only dimension that standardizes

the overall racial distribution of the population. Data were raked to match the weighting dimensions identified for each survey.

Adding revised weighting dimensions to the survey could affect the distribution of other characteristics that were controlled for in the original weighting process. For this reason, attempts were made to preserve the weighting targets that were originally used to weight each data set, to the greatest degree possible. We did this by creating targets for those dimensions from the existing distributions in the data. Only weighting dimensions that involved race or race/ethnicity were changed to match the ACS race, race/ethnicity, and AIAN group distributions. When possible, information for the dimensions used to weight the original data sets was drawn from publicly available survey documentation. For surveys for which this information was not publicly available, we contacted the survey to request this information.

In some cases, it was not possible to include all of the original weighting dimensions in the re-weighting process. For example, in some states, BRFSS includes sub-state regional distributions in the raking process. The data sets did not provide sufficient information defining each region to allow us to collapse regions together when sample sizes within the region were too small. For this reason, we excluded all dimensions that were based on sub-state regions. Therefore, the reweighted results should be seen as a “proof of concept” demonstration that accounting for the AIAN population directly in the weighting process can improve our understanding of health-related disparities this population faces. To this point, due to sample size, difficulty, or data access limitations we restricted the reweighting process to three of the eight surveys: CHIS, BRFSS, and NHIS.

1.1.5. Creation of New Population Targets

As noted, the new race, race/ethnicity, and AIAN population targets were generated using data from the American Community Survey (ACS). To construct new targets for each survey, we followed these steps. First, the ACS data was restricted to respondents who met the criteria for inclusion in the health survey. For example, BRFSS is restricted to individuals who do not live in group quarters; therefore, the ACS sample for BRFSS was restricted to those who did not live in group quarters. Using this sample, we then constructed new sample target distributions by generating population frequency tables showing the distribution of race/ethnicity, race only, and AIAN groups.

If the original survey weighting dimensions crossed race/ethnicity with another characteristic such as gender and/or age, simply using the distribution of race/ethnicity from the ACS data would lead to inconsistencies across weighting dimensions or change the distribution of that characteristic in the original data. For example, suppose a survey included one weighting dimension that was based on the distribution of race/ethnicity alone, one based on gender alone, and another based on the distribution of race/ethnicity by gender. If we were to calculate the distribution of race/ethnicity alone from the ACS as well as race/ethnicity by gender from the ACS, this would lead to inconsistencies across the revised weighting dimensions. This is because the gender distribution in the ACS is not the same as the gender distribution in the original health survey data. This is important because if these dimensions are not internally consistent, the raking process will not statistically converge on a final weight.

If the targets for the dimension that crosses gender by race/ethnicity were directly calculated from the ACS data, the gender distribution for this dimension would no longer match the original gender distribution within the health survey data. One alternative would be to calculate the gender distribution within the original health survey data and the distribution of race/ethnicity within each gender in the ACS, and apply this race/ethnicity within gender distribution from the ACS to the gender distribution from the health survey to create gender-adjusted race/ethnicity distributions. However, if this is done while the dimension that is based on race/ethnicity alone is directly calculated from the ACS (without adjusting for the health survey's gender distribution) the distribution of race/ethnicity in the race/ethnicity alone dimension will not match the total percentage within each racial/ethnic category from summing men and women the race/ethnicity by gender dimension. This is because the underlying gender distributions between the two surveys differ; therefore, summing the gender-adjusted race/ethnicity distributions will not be the same as the overall ACS race/ethnicity distribution. In order to ensure that these revised weighting distributions are consistent with each other, as well as with the original distributions of these non-race/ethnicity measures, the race/ethnicity only target must be created by first generating the health survey gender-adjusted race/ethnicity distribution from the ACS, and then summing the gender categories for each racial/ethnic group. This method maintains the original gender distribution while creating consistent racial/ethnic and gender by racial/ethnic distributions using the ACS.

In general, this is the strategy that we followed when constructing new racial/ethnic and AIAN measures. We first identified all of the original weighting dimensions that were constructed using

race/ethnicity and race/ethnicity by other characteristics in the original weighting dimensions. We then crossed these non-race/ethnicity-based characteristics by each other in the original health survey to get their distribution within the original data, and then created detailed multi-way frequency tables that crossed these characteristics by each other and generated the racial/ethnic composition within each category in the ACS. The ACS racial/ethnic distributions were applied to the population within each category from the health survey. These results were then aggregated up to create the revised weighting dimensions. This process ensured that the new racial/ethnic dimensions were consistent with the original distributions of non-racial/ethnic measures, as well as across multiple dimensions that use race/ethnicity.

After constructing these categories, we examined the sample size within both the ACS and BRFSS. If a particular category had fewer than 30 respondents in that category, we collapsed that category into another related category. In this way, we improved the probability that the raking process would converge to a new final weight, as well as the quality of the estimates for the racial/ethnic distributions in the ACS.

Research Questions

Research Question #1 What are the current approaches used to code race and ethnicity of AIANs in population-based surveys? What is the distribution of AIAN (AIAN race in combination with other race(s), Latino/a AIAN, only AIAN and All AIAN) within selected population-based state/national surveys?

BRFSS

Within BRFSS, the 1R AIAN NH and 1R AIAN H populations were identified by crossing the group of respondents who reported their only race as AIAN by the Latino/a indicator measure. The 2+R AIAN population was identified by selecting all respondents who reported more than one race and included AIAN as one the races with which they identified.

Though we conducted the analyses on five years of BRFSS data, the results are substantively similar across years. To simplify the presentation of the analysis, we present only the results from 2013 BRFSS in this report. In 2013 BRFSS, All AIANs comprise 2.7% of the U.S. population. 1R AIAN NH compose the largest proportion of AIAN; they make up 1.1% of the total population, and 38.5% of the All AIAN population. The remaining AIAN are nearly evenly split between 1R AIAN H (0.83% of the U.S. population) and 2+R AIAN (0.85% of the U.S. population).

Table 10. Estimated Population Counts and Percent Distribution of Total Population for Four AIAN Tabulation Groups

AIAN Tabulation	Estimated Population Count	%
All AIAN	6,663,000	2.7
1R AIAN NH	2,568,000	1.1
1R AIAN H	2,029,000	0.83
2+R AIAN	2,066,000	0.85

Source: 2013 BRFSS

CHIS

To identify the 1R AIAN NH and 1R AIAN H categories, we crossed the single-race indicator variable (which identifies single-race groups along with a category for respondents who reported more than one race without considering Latino/a ethnicity) with the Latino/a indicator variable. The 2+R AIAN population was identified by respondents who are coded as “more than one race” in the single-race indicator variable and also are coded as “Yes” for the AIAN dichotomous indicator. Finally, the AIAN indicator variable identified all respondents who reported All AIAN (the last tabulation group).

The estimated population counts and distribution among adults and children using the original CHIS weights for the four AIAN tabulation groups constructed are shown in the table below.

Table 11. Estimated Population Counts and Percent Distribution of Total Population for Four AIAN Tabulation Groups

AIAN Tabulation	Estimated Population Count	%
Adults		
All AIAN	805,000	2.86
1R AIAN NH	126,000	0.45
1R AIAN H	352,000	1.25
2+R AIAN	328,000	1.16
Children and Adolescents		
All AIAN	317,000	3.49
1R AIAN NH	34,000	0.37
1R AIAN H	154,000	1.70
2+R AIAN	129,000	1.42

Source: 2011-14 California Health Interview Survey

MCBS

Using the Latino/a indicator variable, the AIAN indicator variable, and the race only variable available in the restricted MCBS data, we identified four American Indian/Alaska Native (AIAN)

tabulation groups: 1R AIAN NH, 1R AIAN H, 2+R AIAN, and All AIAN. The last category is a combination of the previous three categories.

To identify the 1R AIAN NH and 1R AIAN H categories, we crossed the main race variable (which identifies single-race groups along with a category for respondents who reported more than one race without considering Latino/a ethnicity) with the Latino/a indicator variable. The 2+R AIAN population was identified by respondents who are coded as “more than one race” in the main race variable and also are coded as “Yes” for the AIAN dichotomous indicator. Finally, the AIAN indicator variable identified all respondents who reported All AIAN (the last tabulation group).

The estimated population counts and distribution using the original MCBS weights⁴⁸ for the four AIAN tabulation groups constructed are shown in the table below.

Table 12. Estimated Population Counts and Weighted Percent Distribution of Total Population for Four AIAN Tabulation Groups

AIAN Tabulation	Estimated Population Count	%
All AIAN	1,482,000	3.21
1R AIAN NH	441,000	0.96
1R AIAN H	60,000	0.13
2+R AIAN	981,000	2.13

Source: Pooled data from 2010-2013, 2015 MCBS

Data from MCBS were selected from the 2010-2013 and 2015 waves, because no MCBS data was released for 2014. The AIAN sample in a single calendar year of MCBS data is too small to produce reliable estimates on its own for the four AIAN groups; therefore, data across years had to be pooled to achieve a sufficient sample size for the AIAN population. However, unlike the other seven data sets, two consecutive waves of the survey could not be combined to essentially double the sample, because MCBS is an overlapping panel survey. Though a new sample of respondents is drawn each year, these respondents are subsequently re-interviewed across four consecutive years. This means that each calendar year of data includes a mix of newly selected respondents and respondents who were interviewed in the previous year. This overlapping sample

makes pooling data across years more complicated than other surveys in which respondents are only interviewed once.

The analysis dataset we constructed draws observations from each of the five datasets in a way that prevents any one panel member from being included in the final analysis dataset more than once. Specifically, all available observations are drawn from the 2010 dataset. These respondents were originally drawn as part of the 2007, 2008, 2009, and 2010 sample panels. This base sample is then supplemented with respondents drawn from the newest panel in each of the 2011-2013 datasets and the 2014 and 2015 panels in the 2015 data set. This means that the analysis dataset draws data from the first year the respondent was included in MCBS for the 2010-2013 and 2015 panels, and re-interview data for 2007-2009 and 2014 panel respondents.

This method of selecting respondents has important ramifications for the representativeness of the final analyses. The 2007-2010 panel weights are constructed to be representative of the 2010 Medicare beneficiary population when the four panels are analyzed together. The remaining panels are subsets of the full Medicare population. Though these subsequent panels are randomly sampled, when weighted as part of the annual dataset, their weights must account for not only their own random sampling and any non-response bias from data collection, but also any bias in the attrition rates from continuing panels that are included in each annual dataset. For this reason, the new panels cannot be assumed to be representative of all Medicare beneficiaries in the year from which their data are drawn.

Table 13 shows the proportion of the sample in each year of data that is drawn for the final MCBS analysis. If there was no sample attrition over time, roughly one-quarter of the sample in each year would be new and each new panel could be selected from the data and treated as a new random sample; however, due to loss to follow-up, the sample size from the previous panels dwindles over time. This means that the new panel will make up more than one-quarter of the total sample size within each annual data set. The respondents that were drawn from previous years' panels become less representative of the overall Medicare population over time. Because of this, new panel respondents who are most like those who were lost to follow-up (e.g., those with higher mortality rates or who refused to be re-interviewed) will be weighted more heavily than those who are retained in the interviewed sample over time. This means that after weights are applied, the new panel of respondents no longer represents a new random sample of all Medicare beneficiaries when weighted.

Table 13. Weighted distribution of MCBS respondents by sample cohort and survey year

Data File										
	2010		2011		2012		2013		2015	
Panel	Pop (‘000)	%	Pop (‘000)	%	Pop (‘000)	%	Pop (‘000)	%	Pop (‘000)	%
2007	7,893*	17.9*								
2008	7,137*	16.2*	6,442	14.2						
2009	10,921*	24.8*	8,594	19.0	7,567	16.1				
2010	18,105*	41.1*	11,654	25.8	9,031	19.3	8,316	17.0		
2011			18,514*	41.0*	11,825	25.2	9,553	19.5		
2012					18,446*	39.4*	12,168	24.9	7,855	15.2
2013							18,841*	38.5*	8,652	16.7
2014									15,917*	30.8*
2015									19,304*	37.3*
Total	44,056		45,205		46,869		48,878		51,728	

Values in Red or marked with an asterisk (*) indicate observations included in the ASPE analysis dataset.

To examine how this sample attrition affects the representativeness of the final sample used in our analyses, we compared the weighted characteristics of the respondents selected from the 2011-2013 and 2015 waves of data to the weighted characteristics of all respondents in each of those years. The results of those analyses (not shown) indicated that the newly selected respondents were, on average, younger than the sample as a whole. Because the new sample is younger, it is also somewhat better-educated and less non-Latino/a white than Medicare beneficiaries overall. Other than these small differences, the selected sample was largely similar to the overall population of Medicare beneficiaries over this period. Though it would be possible to re-weight the final sample to match the age distribution for the full sample of Medicare beneficiaries, this could have unintended effects on other measures. For this reason, we decided not to adjust the age distribution; therefore, these differences should be kept in mind when examining the results presented in this report.

Table 14. Distribution of respondents in final MCBS sample by sample cohort and wave of data

Observations/Population by Panel					Observations/Population by Dataset				
Panel	N	%	Population	%	Dataset	N	%	Population	%
2007	2,965	7.6	7,893,000	5.8					
2008	2,723	7.0	7,137,000	5.3					
2009	3,740	9.6	10,921,000	8.1					
2010	5,334	13.8	18,105,000	13.4	2010	14,762	38.1	44,056,000	32.6
2011	5,428	14.0	18,514,000	13.7	2011	5,428	14.0	18,514,000	13.7
2012	5,154	13.3	18,446,000	13.7	2012	5,154	13.3	18,446,000	13.7
2013	5,123	13.2	18,841,000	13.9	2013	5,123	13.2	18,841,000	13.9
2014	4,186	10.8	15,917,000	11.8					
2015	4,133	10.7	19,304,000	14.3	2015	8,319	21.4	35,221,000	26.1
Total	38,786	100.0	135,078,000	100.0	Total	38,786	100.0	135,078,000	100.0

An additional concern for pooling this data was how to weight each cohort of new respondents when their data are combined in the pooled sample. The unweighted and weighted distribution of respondents from each cohort by cohort and wave of survey can be seen in Table 13. Due to sample attrition over time, the respondents drawn from the 2007-2009 and 2014 panels make up a smaller proportion of the analytic sample than those drawn from the 2010-2013 and 2015 panels. This means that if each panel is treated equally in the weighting adjustment, the 2010-2013 and 2015 panels will have greater influence on the results. Additionally, the method used to weight each sample will affect how the final estimates can be interpreted. The 2007-2010 cohorts were weighted together to produce a sample that is representative of Medicare beneficiaries. Setting aside the effects of sample attrition on the weighting process, even if the 2011-2013 and 2014-2015 cohorts were representative of all Medicare beneficiaries, the weighted population size for these cohorts is far below the population size of Medicare beneficiaries in each year. Without being adjusted to account for this, it will be hard to assess how each year of data is represented within the final dataset, and therefore how to interpret the time period that the final analytic dataset represents.

To create estimates that are broadly interpretable as representing Medicare beneficiaries in the 2010-2015 period, we decided to inflate the weights of the new sample selected from each calendar year of data to the total population of Medicare beneficiaries from that year. We then weighted each sample based on the number of cohorts drawn from each calendar year. The final analytic sample includes data from nine cohort panels of respondents. The final weights for respondents that were drawn from the 2010 data were multiplied by 4/9; the final weights for respondents drawn from the 2011-2013 panels were each multiplied by 1/9; and the final weights for respondents drawn from the 2015 MCBS data, which included the 2014 and 2015 panels were multiplied by 2/9. This method leaves us with a final population that is a weighted average of the 2010-2015 Medicare beneficiaries.

NHANES

In NHANES, the AIAN groups were identified using the set of indicators for each race in combination with the Latino/a indicator. All AIAN respondents were identified using the AIAN indicator measure provided by NHANES. AIAN respondents who identified with only one race were coded as either 1R AIAN NH or 1R AIAN H depending on their reported Latino/a status. All AIAN respondents who also reported identifying with another race were coded as 2+R AIAN.

The sample size of AIAN subgroups in each of the two-year data sets was too small for analysis. For this reason, the 2011-2012 and 2013-2014 data sets were pooled for all analyses. Each data set was equally weighted. In the pooled 2011-2014 NHANES, All AIAN comprised 1.7% of the total U.S. population. Most of the AIAN respondents in NHANES were 2+R AIAN; this group made up 1.0% of the population and 62.2% of All AIANS. In contrast, only 0.11% of the U.S. population (6.6% of All AIANS) was 1R AIAN H.

Table 15. Estimated Population Counts and Percent Distribution of Total Population for Four AIAN Tabulation Groups

AIAN Tabulation	Estimated Population Count	%
All AIAN	3,680,000	1.7
1R AIAN NH	1,628,000	0.53
1R AIAN H	212,000	0.07
2+R AIAN	5,520,000	1.1

Source: 2011-2014 pooled NHANES

NHIS

The NHIS restricted use data file provides indicators for each racial category. These measures can be used to identify those who are 1R AIAN or 2+R AIAN. They can be combined with the Latino/a ethnicity indicator to identify those who are Latino/a AIAN.

The analyses on NHIS data were conducted for all single-year data files for 2010-2015. NHIS contains a small number of health-related measures that are available for all persons in a household, a larger number of detailed measures that are only available for the sample child, and a more extensive set of measures that are only available for the sample adult. We analyzed each of these sets of measures separately. The findings were substantively similar across survey years and sample groups. To simplify the presentation of results, we chose to present only the 2013 NHIS results for sample adults in this report.

Among U.S. adults in 2013, 1.8% identify as AIAN. Slightly more than half of these (52.8%), or 0.9% of U.S. adults identify as 2+R AIAN. A much smaller percentage are 1R AIAN H; 0.3% of the U.S. population and 16.9% of All AIAN identify as 1R AIAN H.

Table 16. Estimated Population Counts and Percent Distribution of Total Population for Four AIAN Tabulation Groups, Sample Adults

AIAN Tabulation	Estimated Population Count	%
All AIAN	4,176,000	1.8
1R AIAN NH	1,264,000	0.57
1R AIAN H	706,000	0.32
2+R AIAN	2,206,000	0.90

Source: NHIS 2013

NSCH

The NSCH restricted use data file provides indicators for each racial category. These measures can be used to identify those who are 1R AIAN or 2+R AIAN. They can also be combined with the Latino/a ethnicity indicator to distinguish between those who are 1R AIAN NH and those who are 1R AIAN H.

In the 2011-2012 NSCH, 3.2% of children are identified as AIAN. More than half of these children (63.2%) are 2+R AIAN, which means that 2+R AIAN children comprise 1.9% of the population under age 18. 1R AIAN H make up the smallest proportion of AIAN; only 18.9% of All AIAN, 0.55% of the child population, are 1R AIAN H.

Table 17. Estimated Population Counts and Percent Distribution of Total Population for Four AIAN Tabulation Groups, Children Under Age 18

AIAN Tabulation	Estimated Population Count	%
All AIAN	2,155,000	3.2
1R AIAN NH	596,000	0.81
1R AIAN H	407,000	0.55
2+R AIAN	1,361,000	1.9

Source: NSCH 2011-12

NSDUH

From the Latino/a indicator variable, main race variable, and AIAN indicator variable, we identified four American Indian/Alaska Native (AIAN) subgroups: single-race Latino/a AIAN-only, single-race non-Latino/a AIAN-only, race in combination with other race(s) AIAN, and any-mention AIAN.

To identify Latino/a status within the AIAN group, we identified it by crossing the main race variable with the Latino/a indicator variable (IRHOIND). The AIAN race in combination with other race(s) population was identified by crossing respondents who answer “more than one race” in the main race variable and are coded as “Yes” for the AIAN dichotomous indicator. Finally, the AIAN indicator variable identified all respondents who reported All AIAN (the last tabulation group).

Table 18. Estimated Population Counts and Percent Distribution of Total Population for Four AIAN Tabulation Groups

AIAN Tabulation	Estimated Population Count	%
All AIAN	6,304,000	2.4
1R AIAN NH	1,442,000	0.5
1R AIAN H	1,664,000	0.6
2+R AIAN	3,198,000	1.2

Source: NSDUH 2014

PATH

Two AIAN subgroups were created from existing PATH variables: single-race 1R AIAN NH and any-mention AIAN. Since PATH does not provide a variable that identifies Latino/a AIANs, we created a Census-format race variable to be used when creating the two other AIAN subgroups (single-race 1R AIAN H and race in combination with other race(s) AIAN). All four subgroups had incomplete data and underwent statistical imputation. Four predictor variables were used to generate the final race datasets: gender, age, geographical region, and race (Census definition).

These predictor variables were chosen in accordance with our imputation strategy from other surveys we imputed.

Table 19. Estimated Population Counts and Percent Distribution of Total Population for Four AIAN Tabulation Groups

AIAN Tabulation	Estimated Population Count	%
All AIAN	6,756,000	2.6
1R AIAN NH	871,000	0.3
1R AIAN H	1,852,000	0.7
2+R AIAN	4,034,000	1.5

Source: PATH Wave 1 2013-2014

Research Question #2: What post weight stratification adjustments are necessary for classification of AIANs, in particular when looking at AIAN race in combination, Latino/a AIAN, only AIAN and All AIAN groupings? And how do the post weight stratification adjustments affect results?

BRFSS

The BRFSS weighting process includes the imputed measure of race/ethnicity created by BRFSS that is described in the previous section on current approaches. This measure contains a separate category for 1R AIAN NH but collapses all Latino/a AIANs into the Latino/a category and non-Latino/x 2+R AIAN respondents into the two or more races category. This means that these latter two AIAN groups are not explicitly controlled for in the weighting process. As a consequence, neither the overall size of the total AIAN population nor the distribution of the three AIAN subgroups within that population are standardized during weighting.

The original weights constructed by BRFSS administrators include a large number of weighting dimensions. The demographic characteristics used in this weighting process can be found in Table 20. This table does not include the sub-state geographic identifiers used for weighting by BRFSS. BRFSS is weighted for each state and the state-based results are then combined into a single data set that represents the United States as a whole.

During the BRFSS weighting process, the race/ethnicity measure was included in three of the state-based and the sub-state region-based weighting dimensions. The first is the distribution of race/ethnicity within state (region), the second is the distribution of race/ethnicity by sex within state (region), and the third is the distribution of race/ethnicity by age within state (region). Though BRFSS creates these dimensions using the imputed race/ethnicity measure, some states or regions do not contain a sufficient number of respondents within each racial/ethnic group, especially when these measures are also stratified by sex or age category. When this occurs, BRFSS collapses racial/ethnic categories together within each state or region. Because the number of AIAN respondents in many states is small, the 1R AIAN NH category is often combined with other racial/ethnic groups during the weighting process.

The collapsing of racial/ethnic categories within some states means that though the imputed race/ethnicity measure explicitly measures the 1R AIAN NH group, in practice, within most states the size of this population is not directly controlled for. Because of this, the total size of this population is also not controlled at the national level. To simplify our re-weighting process, we recoded the race/ethnicity measure used by BRFSS to weight the data into the largest number of categories that could be used in every state. The weighting dimensions that were based on the original dimensions used by BRFSS and revised weighting dimensions are listed in Table 21. Because the original BRFSS weighting process used a more detailed state-specific racial/ethnic measure than was used in our process, we added an additional detailed national racial/ethnic dimension to our weighting process for BRFSS. This dimension crosses a more detailed race/ethnicity measure by age and gender. This dimension is applied nationally because some states do not have a sufficient number of respondents within all of the gender by age by race/ethnicity categories.

The revised weighting process introduced by our research team adds three new national dimensions to the weighting process in total. These new dimensions allow us to control the racial/ethnic composition and size of the AIAN subgroup populations in greater detail. The three new dimensions are:

1. The BRFSS imputed race/ethnicity measure by sex and a six-category age measure
2. A new, four-category race only measure (white, black, Asian, other) by sex and six-category age

3. AIAN group (1R AIAN NH, 1R AIAN H, 2+R AIAN, and not AIAN) by sex and six-category age

We believe that this method of introducing national-level dimensions could allow surveys that have state-based data to add more detailed racial/ethnic target information at the national level in order to improve national estimates for smaller racial/ethnic populations, even when small sample sizes preclude doing so sub-nationally. It improves the comparability of estimates across surveys by fixing the size of the 2+R AIAN population within the two or more races group, as well as the size of the 1R AIAN H group within the Latino/a respondent population. This process reduces compositional differences within the all AIAN group that may affect the measurement of health-related estimates.

Table 20. Measures Used to Construct Weighting Dimensions for BRFSS

Measure	Coding 1	Coding 2	Coding 3
State	51 Categories		
	50 States		
	District of Columbia		
Gender	2 Categories		
	Male		
	Female		
Age	7 Categories	6 Categories	3 Categories
	18-24 years	18-24 years	18-39 years
	25-34 years	25-34 years	40-64 years
	35-44 years	35-44 years	65+ years
	45-54 years	45-54 years	
	55-64 years	55-64 years	
	65-74 years	65+ years	
	75+ years		
Race/Ethnicity	5 Categories	3 Categories	2 Categories
	Latino	Latino	NL white only
	NL white	NL white	Latino/non-white
	NL black	NL other/multiple	
	NL Asian		
	NL other/multiple		
AIAN¹ Group	4 Categories		
	1R AIAN NH		

Measure	Coding 1	Coding 2	Coding 3
	1R AIAN H		
	2+R AIAN		
	Not AIAN		
Race Only	4 Categories		
	White only		
	Black only		
	Asian only		
	Other race/Multiple		
Education	5 Categories		
	Less than 9 th grade		
	9-11 grades		
	High school		
	Some college/tech		
	College degree		
Marital Status	6 Categories		
	Married		
	Separated		
	Divorced		
	Widowed		
	Never Married		
	Cohabiting		
Home Ownership	3 Categories		
	Owns home		
	Rents home		
	Other arrangement		
Phone Type	3 Categories		
	Landline only		
	Cell phone only		
	Landline + Cell		

¹ AIAN = American Indian/Alaska Native

Table 21. Original and Revised BRFSS Weighting Dimensions with Source of Population Distribution

Original Weighting			Revised Weighting		
	Dimension	Source		Dimension	Source
1	State (51) X	BRFSS	N1	Gender (2) X	BRFSS
	Age (7) X	BRFSS		Age (6) X	BRFSS
	Gender (2)	BRFSS		Race/Ethnicity (5)	ACS
2	State (51) X	BRFSS	N2	Gender (2) X	BRFSS
	Race/Ethnicity (3)	ACS		Race only (4)	ACS
3	State (51) X	BRFSS	N3	Gender (2) X	BRFSS
	Education (5)	BRFSS		Age (6) X	BRFSS
4	State (51) X	BRFSS		AIAN Group (4)	ACS
	Marital Status (6)	BRFSS			
5	State (51) X	BRFSS			
	Home Ownership (3)	BRFSS			
6	State (51) X	BRFSS			
	Gender (2)	BRFSS			
	Race/Ethnicity (2)	ACS			
7	State (51) X	BRFSS			
	Age (3) X	BRFSS			
	Race/Ethnicity (2)	ACS			
8	State (51) X	BRFSS			
	Phone Type (3)	BRFSS			

The race/ethnicity distributions used in the original BRFSS population targets are drawn from Claritas population data. Claritas data is based on U.S. Census data and is adjusted based on population projections and other data sources using proprietary methods. When the ACS race, race/ethnicity, and AIAN group distributions are added as weighting dimensions, the overall AIAN population size is reduced by nearly half (Table 22). In the 2012 BRFSS data, the All AIAN population drops from 6.7 million (2.7%) to 3.6 million (1.5%). The largest percentage reduction is in the size of the 1R AIAN H population, which is reduced by more than 80%. The smallest percent reduction is in the size of the 2+R AIAN population, which is 12.7% smaller after reweighting.

Table 22. 2013 BRFSS AIAN Distribution under Original and Revised Weights

	Original Weight		Revised Weight		Change		
	Pop.	%	Pop.	%	Pop.	%	PP
All AIAN	6,663,000	2.70	3,619,000	1.50	-3,045,000	-45.7	-1.30
1R AIAN NH	2,568,000	1.10	1,491,000	0.61	-1,077,000	-41.9	-0.44
1R AIAN H	2,029,000	0.83	323,000	0.13	-1,705,000	-84.1	-0.70
2+R AIAN	2,066,000	0.85	1,804,000	0.74	-263,000	-12.7	-0.11

Source: BRFSS 2013 Adult age 18+
PP = percentage point

CHIS

The original weights in CHIS are produced by controlling for 12 dimensions listed in Appendix C. Methodology used for re-weighting CHIS 2011-2012 and 2013-2014 data: these dimensions differ at which geographic levels they are controlled for. The revised weights use the original weights in CHIS public use files (RAKEDW0) as the basis. Because the public use files do not include geographic or sample design information, all dimensions used in the revised weighting are constructed at the state level.

In the revised weighting, original weighting dimensions 3, 5, 6, 7, 9 and 11 are retained (Table 23) Although not explicitly controlled for, dimensions 1, 2 and 12 are essentially reduced versions of dimension 3; dimension 8 replicates dimension 6 and dimension 11 does so for dimension 10. Dimension 4 cannot be accommodated as it requires detailed geographic information. Therefore, the loss of information is rather minimal in the revised weighting, except for geographies. The new element in the revised weighting is a dimension that separates out AIAN as follows: 1R AIAN H; 1R AIAN NH; 2+R AIAN; and not AIAN, and further combines with age. It should be noted that, if used at all, AIAN is typically controlled as a single category in weighting and rarely separated out as done in our revised weighting approach.

Table 23. Summary of CHIS Reweighting Dimensions

Reweighting Dimensions Name	Dimensions Description	Relationship to CHIS Standard Weighting	Used in Reweighting
NEWDIM1	Age	Similar to Dimension2	No
NEWDIM2	Age x Sex	Similar to Dimension3	Yes
NEWDIM3	Age x Race/ethnicity	Similar to Dimension5	Yes
NEWDIM4	Age x Race/ethnicity x Gender	Similar to Dimension6	Yes
NEWDIM5	Age x Asian Ethnicity	Similar to Dimension7	Yes
NEWDIM6	Age x Education	Similar to Dimension9	Yes
NEWDIM7	Home ownership x Age x Counts of adults/Education	Similar to Dimension11	Yes
NEWDIM8	Age x Race	Specific to this project	No
NEWDIM9	Age x AIAN type	Specific to this project	Yes

Unlike the original weighting, source data for the population totals in the revision was the American Community Survey (ACS) single-year Public Use Microdata Sample (PUMS) for California, specifically obtained from IPUMS USA (<https://usa.ipums.org/usa/>). Using the ACS data, the population total count for each dimension (e.g., the count of adults ages 18 or older who are Latino/a and single-race AIAN) was calculated for each year and combined for 2011 & 2012 and 2013 & 2014 through respective averages. Because the total population size is not consistent between the CHIS standard weights and the ACS (e.g., 36,931,023 based on the CHIS 2011-2012 vs. 36,871,518 based on the ACS 2011 vs. 37,225,859 based on the ACS 2012), the totals for new dimensions were scaled to match the CHIS population size.

CHIS revised weights were calculated through rake function in R survey package⁵⁹ separately for CHIS 2011-2012 and 2013-2014. Once reweighting was completed, the original weight (RAKEDW0) and the revised weight were compared with respect to the interquartile range and design effect due to weighting, *deft*,⁶⁰ as shown in Table 23. This was done to determine whether reweighting produced extreme weights (i.e., decreased estimate efficiency), which further led to trimming considerations. The range of revised weights was similar to that of original weights. The increases in *deft* was negligible. For more detail in our approach, please see Appendix C. Methodology used for re-weighting CHIS 2011-2012 and 2013-2014 data.

Table 23. Comparison of Original Weights and New Revised Weights – California Health Interview Survey

	CHIS 2011-2012		CHIS 2013-2014	
	Original Weight	Revised Weight	Original Weight	Revised Weight
Minimum	0.908	0.875	1.706	1.308
1 st Quartile	154.037	152.363	88.024	86.288
Median	348.284	344.892	212.340	209.113
3 rd Quartile	799.030	796.102	628.493	625.500
Maximum	22325.081	15819.787	21132.221	24365.687
Deft	3.120	3.154	5.105	5.238

The impact of alternative weights depends on both how the alternative weighting dimensions differ from the original weighting dimensions and the source for the distributions of race groups used in the alternative weights. In CHIS, the original weighting dimensions involving race include a category for 1R AIAN NH. The dimensions used to develop the alternative weights also included a category for 1R AIAN NH but then added dimensions representing all four AIAN tabulation groups examined in this project. The original control totals in CHIS were preserved in the reweighting process, but the American Community Survey (ACS) was used to develop the race distributions for the alternative weighting dimensions. The race distributions in ACS differ from the race distributions in the original weighting dimensions in CHIS, such that the estimated population counts for AIAN groups were all smaller when the alternative weights were applied to CHIS relative to the original weights. This was true for both adults and children.

Among both adults and children, the estimated population counts and proportions for each of the AIAN tabulation groups were higher when using original weights than when using the revised weights (Table 24). This was true across all of the classification groups. Among adults, the largest differences in population counts and percent distributions for the AIAN tabulation groups were observed in the All AIAN category. This is not surprising as this category is a combination of the other three AIAN classifications.

Among the three AIAN classifications that comprise the All AIAN group, the largest differences were observed in the 1R AIAN H group. This is likely because the distributions derived from ACS data included proportionally more people with Latino/a ethnicity and fewer with AIAN race. The smallest differences in population counts and proportions were observed in the 1R AIAN NH

category. This is likely because CHIS included a category for 1R AIAN NH in the raking dimensions used in the original weights. Among children, the patterns for the largest differences between original and revised weights was similar to the adults, with the largest differences observed in the All AIAN group followed by the 1R AIAN H group. However, among children, the smallest difference was observed in the 2+R AIAN group, although there were also small differences in the 1R AIAN NH group.

Table 24. 2011-2014 CHIS AIAN Distribution under Original and Revised Weights

	Original Weight		Revised Weight		Difference (Revised- Original)		
	Pop.	%	Pop.	%	Pop.	%	PP
Adults							
All AIAN	805,000	2.86	478,000	1.70	-327,000	-40.6	-1.16
1R AIAN NH	126,000	0.45	104,000	0.37	-22,000	-17.8	-0.08
1R AIAN H	352,000	1.25	99,000	0.35	-253,000	-72.0	-0.9
2+R AIAN	328,000	1.16	275,000	0.98	-53,000	-15.5	-0.18
Children							
All AIAN	317,000	3.49	196,000	2.14	-121,000	-38.7	-1.35
1R AIAN NH	154,000	1.70	37,000	0.41	-117,000	-75.9	-1.29
1R AIAN H	34,000	0.37	30,000	0.33	-4,000	-10.8	-0.04
2+R AIAN	129,000	1.42	128,000	1.40	-1,000	-1.4	-0.02

Source: CHIS 2011-14
PP = percentage point

MCBS

MCBS was not reweighted due to the partially longitudinal nature of the survey. The MCBS uses a rotating panel sample design in which each panel is followed for four years. Every year, one panel is retired and a new panel is introduced to replace it. The dimensions used to weight MCBS data account for limited racial/ethnic information. This is likely due to the small number of people reporting races other than non-Latino/a whites among Medicare beneficiaries. According to the 2013 MCBS public use data file codebook, 74% of the Medicare beneficiary population was non-Latino/a white. MCBS uses four dimensions in the raking process, one of which includes race: Age group (5 level) x Sex (2 level) x Race (2 level). The two race groups included in this

raking dimension are white vs. not white. Thus, the weighting of MCBS data does not explicitly include any AIAN category.

NHANES

The NHANES sampling methodology incorporates an oversample of Latino/a persons, non-Latino/a black persons, non-Latino/a and non-black Asian persons, low-income non-Latino/a white persons and persons of “other” race, and non-Latino/a white persons and persons of “other” race who are ages 80 and over. These categories were included as part of the weighting adjustment and stratified to match the one-year American Community Survey population totals for 2011 (NHANES 2011-12) or 2013 (NHANES 2013-14).

The race/ethnicity measure that is used to stratify the weights of the NHANES data does not explicitly include an AIAN category. 1R AIAN NH respondents are collapsed together with non-Latino/a Native Hawaiians and Pacific Islanders, and non-Latino/a multiracial individuals, while Latino/a AIANs are contained within the Latino/a category. This means that the data do not standardize the size of the AIAN population or the distribution of different AIAN groups within this population.

We did not reweight NHANES for this project due to the small sample size of AIANs in the pooled NHANES 2011-2014.

NHIS

The weighting procedure used by NHIS incorporates race/ethnicity in two steps, both of which rely on a four-category measure of race/ethnicity that is coded as Latino/a, non-Latino/a black or African American, non-Latino/a Asian, and non-Latino/a other race. In the first stage adjustment, these racial/ethnic categories are considered within Census region and by CBSA status. In the post-stratification adjustment step, they are crossed with gender and age.

The four-category measure that is used to stratify the weights of the NHIS data does not explicitly include an AIAN category. 1R AIAN NH respondents are collapsed together with non-Latino/a whites, non-Latino/a Native Hawaiians and Pacific Islanders, and non-Latino/a individuals of two

or more races, while Latino/a AIANs are coded in the Latino/a category. This means that the data do not standardize the size of the AIAN population or the distribution of different AIAN groups within this population.

The revised weighting dimensions that are added as part of this project introduce two new dimensions to the post-stratification adjustment process. The first is a measure of race only by age; the second is AIAN group by sex with separate distributions for adults and children. By including these new dimensions, the weighting process adjusts the size of the AIAN population, as well as the distribution of AIAN groups within it to match their distributions within the U.S. population.

The effect of this reweighting process can be seen in Table 25, which show the distribution of AIAN groups in each wave of NHIS using the original and revised weights for all persons in the household, sample adults, and sample children respectively. The original population targets used by NHIS for post-stratification weighting adjustment are produced by the U.S. Census Bureau and are similar to those used to weight the Current Population Survey in order to ensure comparability across the surveys. The base for the 2013 NHIS targets is the 2010 Census.

After re-weighting, the overall size of the AIAN population is reduced across the three samples. The largest percentage change is in the size of the 1R AIAN H population, which is reduced by at least 54%. In contrast, the size of the 1R AIAN NH population is larger after reweighting.

Table 25. 2013 NHIS AIAN Distribution under Original and Revised Weights

	Original Weight		Revised Weight		Difference (Revised- Original)		
	Pop.	%	Pop.	%	Pop.	%	PP
All Persons in Households							
All AIAN	5,569,000	1.8	4,910,000	1.6	-659,000	-11.8	-0.21
1R AIAN NH	1,783,000	0.57	1,895,000	0.61	112,000	6.3	0.04
1R AIAN H	997,000	0.32	458,000	0.15	-538,000	-54.0	-0.17
2+R AIAN	2,790,000	0.90	2,557,000	0.82	-232,000	-8.3	-0.07
Adults							
All AIAN	4,176,000	1.8	3,442,000	1.5	-734,000	-17.6	-0.31
1R AIAN NH	1,264,000	0.53	1,374,000	0.58	111,000	8.8	0.05
1R AIAN H	707,000	0.30	321,000	0.14	-386,000	-54.6	-0.16

	Original Weight		Revised Weight		Difference (Revised- Original)		
	Pop.	%	Pop.	%	Pop.	%	PP
2+R AIAN	2,206,000	0.93	1,747,000	0.74	-459,000	-20.8	-0.19
Children							
All AIAN	1,641,000	2.2	1,480,000	2.0	-161,000	-9.8	-0.22
1R AIAN H	327,000	0.45	137,000	0.19	-191,000	-58.2	-0.26
1R AIAN NH	476,000	0.65	526,000	0.72	50,000	10.4	0.07
2+R AIAN	837,000	1.1	817,000	1.1	-20,000	-2.4	-0.03

Source: 2013 NHIS
PP = percentage point

NSCH

In the NSCH weighting process, demographic control totals were obtained from the public-use 2011 American Community Survey (ACS) data. Raking adjustments within each state and D.C. were made using a number of categories, one of which included the number of households with children in four nonoverlapping race and ethnicity categories: Hispanic; non-Hispanic Asian, Native Hawaiian, or Pacific Islander; non-Hispanic AIAN; and non-Hispanic any other race, which includes white, African American, and those who report two or more races. When the sample size for a specific racial/ethnic group within a state is too small, that group is collapsed into the non-Hispanic any other race category.

To assess the quality of the post-stratification adjustment, NSCH 2011-2012 used benchmark estimates from the 2011 American Community Survey (ACS), 2011 National Health Interview Survey (NHIS), and 2011 Medical Expenditure Panel Survey (MEPS), each of which included in-person interviewing and resulted in a higher response rate than NSCH. Comparisons of the NSCH estimate and the benchmark estimates from the external sources were made for the following variables: age category of the child, sex, race and ethnicity, number of children in household, household income, highest education of adults in the household, housing tenure, family type, insurance coverage, health status of child, special health needs of child, asthma, and source of care. After post-stratification adjustment, the final weights produce NSCH estimates that are consistent with the benchmark estimates for all of the demographic and socioeconomic variables used in raking the NSCH weights.— However, the NSCH estimates are significantly different from the benchmark estimates for the percentage of children who are AIAN, the percentage with

insurance coverage, health status, the percentage with special health care needs, and the percentage with a usual place for health care. These comparisons suggest that though the single-race non-Hispanic AIAN population is explicitly adjusted in the weighting process, this is not sufficient for addressing the bias introduced through differential nonresponse and the data collection process due to the need to collapse this racial/ethnic category within many states with small numbers of AIAN respondents. NSCH was not re-weighted due to the small sample size of the AIAN population in the survey.

NSDUH

NSDUH used race/ethnicity data in both its nonresponse adjustment and post-stratification weighting. Latino/a status and race were crossed within the nine-level Census regions of the country. Individual state sample sizes determined whether the race variable included three levels or five. Only the five-level race indicator incorporated the American Indian/Alaska Native population. This means that certain states with higher AIAN populations have data that calibrates the size of the AIAN population and the spread of the AIAN subgroups

Typically, the weight adjustment included using age, gender, race, Latino/a status, and Relation to Householder. For poststratification, NSDUH used State, Age, Race, Gender, Latino/a status, and Quarter. Population estimates were given from the Population Estimates Branch of the U.S. Census Bureau on special request. These estimates were based on monthly state-level figures. Access to NSDUH was provided through the Substance Abuse and Mental Health Services Agency (SAMSHA), which was only able to grant a limited number of data runs; thus, NSDUH was not chosen for reweighting.

PATH

PATH weights used race/ethnicity data in two steps to generate its adult and youth weights. However, the American Indian/Alaska Native population was not used. Combinations included Asian, black, and Latino/a races, so the AIAN data is not standardized. First, a nonresponse adjustment used 2010 Census and 5-year ACS (2009-2013) data to form its weighting classes. Second, demographic population totals were based from the 2013 ACS Public Use Microdata Sample (PUMS). Raking was performed using census region, age, race/ethnicity, sex, and educational attainment. Extreme values resulted from the raking, so a trimming step was added to bring the extreme weights within an acceptable range. After trimming, the weighted totals did not

match the ACS control totals, so the last two steps were repeated until the weighted totals were within the defined range. This methodology was not chosen for reweighting due to its longitudinal survey design.

Research Question #3: How does the distribution of the leading health indicators of health status, health behaviors, utilization and access to healthcare change when classification is revised? How can variations in weighting AIAN data affect the rates and counts of important indicators of health status, health behaviors, utilization, and access to healthcare for the AIAN population?

BRFSS

In 2013 BRFSS, 1R AIAN H are more likely to differ from 1R AIAN NH respondents than 2+R AIAN. Respondents who are 1R AIAN H are younger than other AIANs, while respondents who are 2+R AIAN are older. 1R AIAN H are more likely to have never married or be currently cohabiting than other AIANs. They have less education, have lower income, and are less likely to own their home, though they are more likely to be employed than other AIANs. Respondents who are 2+R AIAN have more education and higher income than other AIANs. Nearly all (87.0%) 1R AIAN H live in metro areas, while two-thirds (66.6%) of 1R AIAN NH do.

Table 26. Social Determinants of Health for each AIAN Group, Weighted using Original BRFSS 2013 Sampling Weight

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Age								
18-29 Years	1,814	647	713	454	27.2	25.2	35.1	22.0
30-39 Years	1,148	388	405	356	17.2	15.1	20.0	17.2
40-49 Years	1,128	461	348	320	16.9	17.9	17.2	15.5
50-64 Years	1,718	695	423	600	25.8	27.0	20.9	29.1
65 and Over	854	378	139	337	12.8	14.7	6.9	16.3
Marital Status								

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Married	2,649	1,005	751	893	39.8	39.1	37.0	43.2
Previously Married	1,578	672	358	548	23.7	26.2	17.7	26.5
Never Married	1,999	734	753	512	30.0	28.6	37.1	24.8
Cohabiting	437	157	166	114	6.6	6.1	8.2	5.5
Employment Status								
Employed	3,457	1,230	1,198	1,029	51.9	47.9	59.1	49.8
Unemployed	772	352	220	200	11.6	13.7	10.8	9.7
Not in the Labor Force	2,434	986	611	837	36.5	38.4	30.1	40.5
Education								
Less than High School	1,747	594	793	360	26.2	23.1	39.1	17.4
High School	1,988	822	614	553	29.8	32.0	30.3	26.8
Attended College	2,071	810	476	784	31.1	31.6	23.5	37.9
College/Technical Degree	856	342	145	369	12.9	13.3	7.2	17.9
Income								
Less than \$15,000	1,599	606	555	437	24.0	23.6	27.4	21.2
\$15K-\$25K	1,649	670	568	410	24.7	26.1	28.0	19.8
\$25K-\$35K	828	327	258	244	12.4	12.7	12.7	11.8
\$35K-\$50K	817	321	203	293	12.3	12.5	10.0	14.2
\$50K-\$75K	709	254	185	270	10.6	9.9	9.1	13.1
\$75,000 or More	1,061	389	260	412	15.9	15.2	12.8	19.9
Owns Home	3,580	1,553	838	1,189	53.7	60.5	41.3	57.5
Metro Area	5,038	1,709	1,764	1,565	75.6	66.6	87.0	75.7

Source: BRFSS 2013 Adult age 18+

When the four AIAN groups are compared to each other using 2013 BRFSS, the largest differences across groups were generally among the healthcare access and utilization measures. For most measures, the group that fared poorly relative to other AIAN groups were those who were 1R AIAN H. These AIANs were nearly two times more likely to be uninsured, seventeen percentage points less likely to have a personal doctor, and nearly nine percentage points less likely to have had a routine check-up in the past year. In contrast, there were much smaller

differences between AIAN groups on health status measures and health behaviors, with the smallest occurring for BMI group. The two exceptions were that 1R AIAN H were less likely than other AIANs to report having a depressive disorder or to have high blood pressure.

Table 27. Health Indicators by AIAN Group, Weighted using Original BRFSS Sampling Weight

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Health Status								
Fair or poor health	1,790	638	600	553	26.9	24.8	29.6	26.8
Diabetes	919	378	258	283	13.8	14.7	12.7	13.7
High blood pressure	2,179	860	533	786	32.7	33.5	26.3	38.0
Angina/Coro nary heart disease	309	112	65	132	4.6	4.4	3.2	6.4
Heart attack	404	174	70	161	6.1	6.8	3.4	7.8
Depressive disorder	1,616	601	339	676	24.2	23.4	16.7	32.7
Frequent mental distress	1,261	474	357	430	18.9	18.5	17.6	20.8
BMI Group								
Normal/Und erweight	2,165	836	641	688	32.5	32.5	31.6	33.3
Overweight	2,230	855	687	687	33.5	33.3	33.9	33.2
Obese	2,269	877	701	692	34.1	34.1	34.5	33.5
Health Behaviors								
Physical Activity								
Meets aerobic guideline only	2,008	771	567	670	30.1	30.0	28.0	32.4
Meets strength guideline only	741	277	239	224	11.1	10.8	11.8	10.9
Meets aerobic + strength	1,401	547	406	448	21.0	21.3	20.0	21.7

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Does not meet guidelines	2,513	972	816	724	37.7	37.9	40.2	35.1
5+ servings of fruits/vegetables	1,349	439	471	439	20.2	17.1	23.2	21.2
Healthcare Access/Utilization								
Uninsured	1,655	513	749	393	24.8	20.0	36.9	19.0
Has personal doctor	4,401	1,743	1,143	1,515	66.1	67.9	56.3	73.3
Routine check-up past year	4,196	1,699	1,170	1,327	63.0	66.2	57.7	64.2
Did not get care due to cost	1,662	589	579	494	24.9	22.9	28.5	23.9

Source: BRFSS 2013 Adult age 18+

Reweighting somewhat reduces the differences in the social determinants of health across the three AIAN groups. The biggest changes were among the 2+R AIAN respondents, though the 1R AIAN H respondents remained younger, less affluent, and more likely to be never married or cohabiting than other AIAN respondents, while 2+R AIAN remained better education and more affluent.

Table 28. Social Determinants of Health for each AIAN Group, Weighted using Revised BRFSS Sampling Weight

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Age								
18-29 Years	978	399	104	475	27.0	26.7	32.1	26.4
30-39 Years	637	235	65	337	17.6	15.8	20.1	18.7
40-49 Years	619	264	60	295	17.1	17.7	18.6	16.3
50-64 Years	933	395	71	467	25.8	26.5	22.0	25.9
65 and Over	451	199	23	229	12.5	13.3	7.2	12.7

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Marital Status								
Married	1,427	566	121	740	39.4	38.0	37.5	41.0
Previously Married	898	384	62	452	24.8	25.7	19.1	25.1
Never Married	1,060	446	115	499	29.3	29.9	35.4	27.7
Cohabiting	234	95	26	113	6.5	6.4	8.1	6.3
Employment Status								
Employed	1,831	715	187	929	50.6	47.9	57.8	51.5
Unemployed	418	210	35	174	11.5	14.1	10.7	9.6
Not in the Labor Force	1,370	567	102	701	37.8	38.0	31.5	38.8
Education								
Less than High School	801	347	129	325	22.1	23.3	39.8	18.0
High School	1,056	483	97	477	29.2	32.4	30.0	26.4
Attended College	1,227	470	74	684	33.9	31.5	22.9	37.9
College/Technical Degree	534	192	24	319	14.8	12.9	7.3	17.7
Income								
Less than \$15,000	862	358	95	410	23.8	24.0	29.2	22.7
\$15K-\$25K	835	396	88	351	23.1	26.5	27.1	19.5
\$25K-\$35K	432	191	39	202	11.9	12.8	12.1	11.2
\$35K-\$50K	478	187	32	258	13.2	12.5	10.0	14.3
\$50K-\$75K	404	145	29	230	11.2	9.7	9.0	12.8
\$75K or More	608	215	41	352	16.8	14.4	12.6	19.5
Owns Home	2,016	893	132	991	55.7	59.9	41.0	54.9
Metro Area	2,628	963	286	1,378	72.6	64.6	88.4	76.4

Source: BRFSS 2013 Adult age 18+

Table 29. Differences between Estimates Using Original and Revised Weights, Social Determinants of Health by AIAN Group, BRFSS 2013

Population (in 1,000s)				
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Age				
18-29 Years	-836	-248	-609	21
30-39 Years	-511	-153	-340	-19
40-49 Years	-509	-197	-288	-25
50-64 Years	-785	-300	-352	-133
65 and Over	-403	-179	-116	-108
Marital Status				
Married	-1,222	-439	-630	-153
Previously Married	-680	-288	-296	-96
Never Married	-939	-288	-638	-13
Cohabiting	-203	-62	-140	-1
Employment Status				
Employed	-1,626	-515	-1,011	-100
Unemployed	-354	-142	-185	-26
Not in the Labor Force	-1,064	-419	-509	-136
Education				
Less than High School	-946	-247	-664	-35
High School	-932	-339	-517	-76
Attended College	-844	-340	-402	-100
College/Technical Degree	-322	-150	-121	-50
Income				
Less than \$15,000	-737	-248	-460	-27
\$15K-\$25K	-814	-274	-480	-59
\$25K-\$35K	-396	-136	-219	-42
\$35K-\$50K	-339	-134	-171	-35
\$50K-\$75K	-305	-109	-156	-40
\$75,000 or More	-453	-174	-219	-60
Owns Home	-1,564	-660	-706	-198
Metro Area	-2,410	-746	-1,478	-187

Source: BRFSS 2013 Adult age 18+

Table 30. Differences between Estimates Using Original and Revised Weights, Social Determinants of Health by AIAN Group, BRFSS 2013

Percent				
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Age				
18-29 Years	-0.2	1.5	-3.1	4.4
30-39 Years	0.4	0.7	0.2	1.5
40-49 Years	0.2	-0.2	1.4	0.9
50-64 Years	0.0	-0.6	1.1	-3.1
65 and Over	-0.3	-1.4	0.4	-3.6
Marital Status				
Married	-0.3	-1.2	0.5	-2.2
Previously Married	1.1	-0.4	1.4	-1.4
Never Married	-0.7	1.3	-1.7	2.9
Cohabiting	-0.1	0.3	-0.1	0.8
Employment Status				
Employed	-1.3	0.0	-1.2	1.7
Unemployed	0.0	0.4	-0.2	-0.1
Not in the Labor Force	1.3	-0.4	1.4	-1.7
Education				
Less than High School	-4.1	0.1	0.7	0.6
High School	-0.6	0.4	-0.3	-0.3
Attended College	2.8	-0.1	-0.5	0.0
College/Technical Degree	1.9	-0.4	0.1	-0.2
Income				
Less than \$15,000	-0.2	0.4	1.8	1.6
\$15K-\$25K	-1.7	0.4	-0.9	-0.4
\$25K-\$35K	-0.5	0.1	-0.6	-0.6
\$35K-\$50K	0.9	0.0	0.0	0.2
\$50K-\$75K	0.5	-0.2	-0.1	-0.3
\$75,000 or More	0.9	-0.8	-0.2	-0.4
Owns Home	2.0	-0.6	-0.3	-2.6
Metro Area	-3.0	-2.0	1.5	0.7

Source: BRFSS 2013 Adult age 18+

Reweightings also had minimal impact on the set of health indicators and didn't change the overall conclusions regarding which health indicators showed the largest differences across the three AIAN groups. In general, reweighting reduced differences across AIAN groups on measures that

exhibited the largest differences across groups using the original weights, and increased differences for indicators that had smaller differences.

The largest shifts for All AIAN were in the percentage who had a depressive disorder (increased 3.4 percentage points), were uninsured (decreased 3.4 percentage points), and had a personal doctor (increased 2.4 percentage points). These changes were larger than the changes experienced by any of the three AIAN subgroups, indicating that some of the change for All AIAN was due to change in the relative distribution of the three groups within All AIAN. 1R AIAN H and 2+R AIAN experienced larger differences in health outcomes after reweighting than 1R AIAN NH. This is most likely because the original BRFSS weighting process included 1R AIAN NH in the states with the largest AIAN populations. Among 1R AIAN H, the largest differences were a decrease in physical activity, an increase in obesity (1.5 percentage points), and an increase in the percentage who have a personal doctor (1.4 percentage points). Among 2+R AIAN, the largest changes were in a decrease in the percentage who had a routine check-up in the past year (2.2 percentage points), an increase in the percentage normal or underweight (2.1 percentage points), and a decrease in the percentage who have a personal doctor (2.2 percentage points).

Table 31. 2013 Health Indicators by AIAN Group, Weighted using Revised BRFSS Sampling Weight

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Health Status								
Fair or poor health	925	365	99	460	25.6	24.5	30.7	25.5
Diabetes	486	216	44	226	13.4	14.5	13.7	12.5
High blood pressure	1,206	486	88	632	33.3	32.6	27.1	35.0
Angina/Coronary heart disease	179	62	10	107	4.9	4.2	3.2	5.9
Heart attack	232	96	11	125	6.4	6.5	3.5	6.9
Depressive disorder	1,001	352	58	591	27.7	23.6	17.8	32.8
Frequent mental distress	722	274	59	389	20.0	18.4	18.2	21.6
BMI Group								
Normal/Underweight	1,224	486	100	638	33.8	32.6	30.9	35.4

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Overweight	1,186	493	107	587	32.8	33.0	33.1	32.5
Obese	1,208	513	117	579	33.4	34.4	36.0	32.1
Health Behaviors								
Physical Activity								
Meets aerobic guideline only	1,122	447	93	582	31.0	30.0	28.8	32.2
Meets strength guideline only	412	158	35	220	11.4	10.6	10.7	12.2
Meets aerobic + strength	769	319	60	390	21.2	21.4	18.6	21.6
Does not meet guidelines	1,316	567	136	613	36.4	38.0	41.9	34.0
5+ servings of fruits/vegetables	715	256	79	379	19.8	17.2	24.5	21.0
Healthcare Access/Utilization								
Uninsured	775	294	116	365	21.4	19.7	35.9	20.3
Has personal doctor	2,479	999	187	1,293	68.5	67.0	57.7	71.7
Routine check-up past year	2,290	982	189	1,119	63.3	65.9	58.5	62.0
Did not get care due to cost	869	343	93	434	24.0	23.0	28.7	24.1

Source: BRFSS 2013 Adult age 18+

Table 32. Differences in Estimated Population Counts for Health Indicators Between Original Weights and Revised Weights, by AIAN Group, BRFSS 2013

	Population (in 1,000s)			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Health Status				
Fair or poor health	-865	-273	-501	-93
Diabetes	-433	-162	-214	-57
High blood pressure				

	Population (in 1,000s)			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Angina/Coronary heart disease	-130	-50	-55	-25
Heart attack	-172	-78	-59	-36
Depressive disorder	-615	-249	-281	-85
Frequent mental distress	-539	-200	-298	-41
BMI Group				
Normal/Underweight	-941	-350	-541	-50
Overweight	-1,044	-362	-580	-100
Obese	-1,061	-364	-584	-113
Health Behaviors				
Physical Activity				
Meets aerobic guideline only	-886	-324	-474	-88
Meets strength guideline only	-329	-119	-204	-4
Meets aerobic + strength	-632	-228	-346	-58
Does not meet guidelines	-1,197	-405	-680	-111
5+ servings of fruits/vegetables	-634	-183	-392	-60
Healthcare Access/Utilization				
Uninsured	-880	-219	-633	-28
Has personal doctor	-1,922	-744	-956	-222
Routine check-up past year	-1,906	-717	-981	-208
Did not get care due to cost	-793	-246	-486	-60
Fair or poor health	-865	-273	-501	-93

Source: BRFSS 2012 Adults age 18+

Table 33. Differences in Estimated Prevalence for Health Indicators Between Original Weights and Revised Weights, by AIAN Group, BRFSS 2013

	Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Health Status				
Fair or poor health	-1.3	-0.4	1.2	-1.2
Diabetes	-0.4	-0.3	1.0	-1.2
High blood pressure				
Angina/Coronary heart disease	0.3	-0.2	0.0	-0.5
Heart attack	0.4	-0.3	0.0	-0.9
Depressive disorder	3.4	0.2	1.1	0.1
Frequent mental distress	1.0	-0.1	0.6	0.7
BMI Group				
Normal/Underweight	1.3	0.0	-0.7	2.1
Overweight	-0.7	-0.3	-0.8	-0.7
Obese	-0.7	0.2	1.5	-1.4
Health Behaviors				
Physical Activity				
Meets aerobic guideline only	0.9	-0.1	0.8	-0.2
Meets strength guideline only	0.3	-0.2	-1.1	1.3
Meets aerobic + strength	0.2	0.1	-1.4	-0.1
Does not meet guidelines	-1.3	0.2	1.7	-1.1
5+ servings of fruits/vegetables	-0.5	0.1	1.3	-0.2
Healthcare Access/Utilization				
Uninsured	-3.4	-0.3	-1.0	1.2
Has personal doctor	2.4	-0.9	1.4	-1.6
Routine check-up past year	0.3	-0.3	0.8	-2.2
Did not get care due to cost	-0.9	0.0	0.1	0.2
Fair or poor health	-1.3	-0.4	1.2	-1.2

Source: BRFSS 2012 Adults age 18+

CHIS

Table 34. Social Determinants of Health for CHIS 2011-14 by AIAN Group, Original Weights

	Population (in '000s)				Percent			
	All	1R	1R	2+R	All	1R	1R	2+R
	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN
		NH	H		NH	H		
Adults ages 18+								
HS Grad or Less	383	63	214	106	47.5	50.0	60.8	32.3
Urban	680	91	317	272	84.4	72.2	90.2	82.9
Own	381	76	123	182	47.4	60.9	35.0	55.4
Rent/other	424	49	229	146	52.6	39.1	65.0	44.6
Below Poverty	206	32	121	54	25.6	25.2	34.3	16.5
Children and Adolescents Ages 0-17								
HS Grad or Less	144	8	90	46	45.4	22.8	58.2	36.1
Urban	273	23	143	107	86.2	67.3	92.9	83.2
Own	113	16	55	41	35.6	46.8	35.9	32.2
Rent/other	204	18	99	87	64.4	53.2	64.1	67.8
Below Poverty	109	7	58	44	34.4	20.8	37.6	34.0

Source: CHIS 2011-2014

Table 35. Social Determinants of Health for CHIS 2011-184 by AIAN Group, Revised weights

	Population (in '000s)				Percent			
	All	1R	1R	2+R	All	1R	1R	2+R
	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN
		NH	H		NH	H		
Adults ages 18+								
HS Grad or Less	200	53	61	87	41.8	50.6	61.1	31.6
Urban	392	75	89	227	81.9	72.2	90.2	82.6
Own	249	64	35	151	52.2	61.3	35.0	54.9
Rent/other	228	40	64	124	47.8	38.7	65.0	45.1
Below Poverty	106	26	34	46	22.1	25.0	34.4	16.6
Children and Adolescents Ages 0-17								
HS Grad or Less	76	7	22	47	38.8	23.5	59.0	36.5
Urban	160	20	35	105	81.5	66.6	93.0	81.7
Own	67	14	14	40	34.4	47.5	36.3	30.8

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Rent/other	128	16	24	89	65.6	52.5	63.7	69.2
Below Poverty	63	6	14	42	32.0	20.7	38.7	32.7

Source: CHIS 2011-2014

Table 36. Health Indicators for 2011-14 CHIS by AIAN Group, Original Weights

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Adults								
Health Status								
Fair/Poor Health Status	216	35	111	70	26.8	27.6	31.7	21.2
Heart Disease	64	16	16	32	7.9	12.9	4.5	9.7
Hypertension	260	53	102	105	32.3	42.3	29.0	32.0
Diabetes	73	14	35	24	9.1	11.0	9.9	7.4
Type 2 Diabetes	63	11	29	23	7.8	9.1	8.1	6.9
Obesity	255	48	120	88	31.7	37.7	34.1	26.7
Overweight	299	44	155	101	37.1	34.7	44.0	30.8
Ever Diagnosed with Asthma	199	39	60	100	24.7	30.6	17.0	30.6
Current Asthma	121	25	31	65	15.1	20.2	8.9	19.8
Psychological Distress Past Year	104	21	37	46	12.9	16.8	10.5	14.0
Psychological Distress Past Month	54	11	22	21	6.7	8.5	6.2	6.5
Health Behaviors								
Currently Smokes	155	39	41	76	19.3	30.6	11.5	23.3
No Binge Drinking Past Year	542	85	226	231	67.3	67.1	64.3	70.6
Healthcare Access/Utilization								

	Population (in '000s)				Percent			
	All	1R	1R	2+R	All AIAN	1R	1R	2+R
	AIAN	AIAN	AIAN	AIAN		AIAN	AIAN	AIAN
		NH	H		NH	H		
Currently Uninsured	154	16	95	43	19.2	12.3	27.1	13.3
Has Usual Source of Care	641	115	248	278	79.6	91.5	70.5	84.9
Doctor Visit Past Year	623	107	239	278	77.4	84.8	67.9	84.9
ER Visit Past Year	225	44	81	101	28.0	34.6	23.0	30.7
Children and Adolescents								
Health Status								
Fair/Poor Health Status	20	1	16	3	6.3	1.9	10.4	2.6
Ever Diagnosed with Asthma	56	4	21	30	17.5	12.5	13.5	23.7
Current Asthma	39	4	12	23	12.3	11.7	7.6	18.2
Health Behaviors								
5 or More Servings Fruit/Vegetables	82	31	23	38	30.4	30.5	37.3	28.4
Meets Physical Activity Guidelines	48	25	14	18	21.5	30.8	28.1	14.9
Healthcare Access/Utilization								
Insured	308	33	148	127	97.2	97.1	95.8	98.9
Has Usual Source of Care	293	32	138	123	92.4	93.9	89.3	95.8
ER Visit Past Year	68	6	27	35	21.6	18.9	17.8	26.8
Doctor Visit Past Year	285	31	133	121	90.0	91.6	86.0	94.4

Source: CHIS 2011-2014

Physical activity guidelines for children and adolescents = at least 60 minutes of PA daily

Table 37. Health Indicators for 2011-14 CHIS by AIAN Group, Revised weights

	Population (in '000)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Adults								
Health Status								
Fair/Poor Health Status	119	29	31	59	24.9	27.6	31.7	21.4
Heart Disease	46	13	4	28	9.6	13.0	4.5	10.1
Hypertension	163	44	29	90	34.1	42.3	29.0	32.8
Diabetes	42	12	10	21	8.9	11.3	9.9	7.6
Type 2 Diabetes	37	10	8	20	7.8	9.2	8.2	7.1
Obesity	146	39	34	73	30.6	37.7	34.2	26.6
Overweight	161	36	43	82	33.8	34.5	43.8	29.9
Ever Diagnosed with Asthma	133	32	17	84	27.7	30.9	17.0	30.4
Current Asthma	84	21	9	54	17.6	20.4	8.9	19.7
Psychological Distress Past Year	67	17	10	39	13.9	16.5	10.5	14.2
Psychological Distress Past Month	33	9	6	18	6.9	8.4	6.2	6.7
Health Behaviors								
Currently Smokes	109	32	12	66	22.9	30.6	11.6	24.0
No Binge Drinking Past Year	328	70	64	194	68.6	67.4	64.2	70.7
Healthcare Access/Utilization								
Currently Uninsured	77	13	27	38	16.2	12.5	27.2	13.7
Has Usual Source of Care	397	95	70	233	83.2	91.3	70.5	84.6
Doctor Visit Past Year	388	88		233	81.3	84.8	67.8	84.8
ER Visit Past Year	143	36	23	84	29.9	34.7	22.9	30.7
Children and Adolescents								
Health Status								

	Population (in '000)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Fair/Poor Health Status	7	1	4	3	3.7	2.1	9.9	2.3
Ever Diagnosed with Asthma	36	4	5	27	18.4	11.7	13.3	21.4
Current Asthma	28	3	3	22	14.2	10.9	7.7	16.8
Health Behaviors								
5 or More Servings Fruit/Vegetables	53	11	9	33	32.2	37.6	28.5	31.9
Meets Physical Activity Guidelines	33	5	4	24	25.8	22.9	14.4	30.7
Healthcare Access/Utilization								
Insured	192	29	36	127	97.9	97.4	95.4	98.7
Has Usual Source of Care	185	29	34	123	94.5	94.7	89.9	95.8
ER Visit Past Year	46	5	7	34	23.5	18.0	18.1	26.4
Doctor Visit Past Year	181	28	32	121	92.2	91.5	86.1	94.1

Source: CHIS 2011-14

Table 38. Differences in Estimated Population Counts for Health Indicators Between Original Weights and Revised Weights, by AIAN Group, CHIS 2011-14

Revised weighted estimates - Original weighted estimates				
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Adults				
Health Status				
Fair/Poor Health Status	96,631	6,040	79,982	10,608
Heart Disease	17,853	2,744	11,314	3,795
Hypertension	96,765	8,965	73,166	14,633
Diabetes	30,508	2,157	24,948	3,403

Revised weighted estimates - Original weighted estimates				
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Type 2 Diabetes	25,522	1,872	20,549	3,102
Obesity	108,697	8,356	85,991	14,350
Overweight	137,399	7,696	111,226	18,477
Lifetime Asthma	66,030	6,408	43,045	16,576
Current Asthma	37,223	4,208	22,401	10,614
Psychological distress in past year	37,690	4,092	26,660	6,938
Psychological distress in past month	20,616	1,958	15,639	3,020
Health Behaviors				
Currently Smokes	45,874	6,724	29,081	10,069
No Binge Drinking Past Year	213,630	14,340	162,362	36,927
Healthcare Access/Utilization				
Currently Uninsured	76,822	2,596	68,419	5,808
Has Usual Source of Care (other than ER)	243,523	20,002	177,929	45,593
Doctor Visit Past Year	234,774	18,343	171,527	44,903
ER Visit Past Year	81,995	7,515	58,080	16,399
Children				
Health Status				
Excellent, Very Good, or Good Health	108,000	3,000	104,000	0
Ever Diagnosed with Asthma	20,000	0	16,000	3,000
Currently Has Asthma	11,000	1,000	9,000	1,000
Health Behaviors				
5 or More Servings of Fruit and Vegetables Daily	29,000	1,000	29,000	-2,000
Meets Physical Activity Guidelines	15,000	1,000	14,000	1,000

Revised weighted estimates - Original weighted estimates				
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Healthcare				
Access/Utilization				
Currently Insured	116,000	4,000	112	0
Has Usual Source of Care (other than ER)	108,000	3,000	104,000	0
Doctor Visit in Past Year	104,000	3,000	101,000	0
ER Visit in Past Year	22,000	1,000	20,000	1,000

Source: CHIS 2011-14

In general, the estimated population counts for health indicators were higher when using original weights than when using the revised weights. Among adults, the differences in population counts for health indicators were largest in the All AIAN category. This is not surprising as this category is a combination of the other three AIAN classifications. When looking among the three AIAN classifications that comprise the All AIAN group, the largest differences were observed in the 1R AIAN H group. This is likely because the distributions derived from ACS data included proportionally more people with Latino/a ethnicity and fewer with AIAN race. The smallest differences in population counts across health indicators were observed in the non-Latino/a single-race AIAN category. This is likely because CHIS included a category for non-Latino/a single-race AIAN in the raking dimensions used in the original weights.

Similar to adults, among children the largest differences in population counts for health indicators were observed in the All AIAN category, followed by the 1R AIAN H group. However, the pattern for the smallest differences in population counts among children differed from that among adults. Among children, the smallest differences were observed most often in the 2+R AIAN group, followed by the most identified with AIAN and 1R AIAN NH groups.

However, prevalence of health indicators was similar when using original weights and revised weights and this was true for both adults and children. Among children, the largest difference in prevalence estimates between original weights and revised weights was for the percentage meeting physical activity guidelines where the estimate for most identified with AIAN was 6 percentage points lower when using original weights (28% vs. 34%). The estimate for All AIAN

was also 5 percentage points lower when using original weights (21% vs. 26%). There was also a difference of 5 percentage points on servings of fruits and vegetables for the most identified group (37% using original weights and 42% using revised weights). The smallest differences in prevalence of indicators between using original and revised weights were observed on rates of current insurance. No group changed more than 1 percentage point in proportion currently insured between estimates produced using original and revised weights. This may be related to the very low variation in rates of current insurance among children, ranging from 95% to 99%.

Among adults, no difference exceeded 5 percentage points. The largest difference in prevalence estimates between original weights and revised weights was for the current smoking rate. The estimate for All AIAN was 4 percentage points lower when using the original weights (19% vs. 23%). The smallest differences in prevalence of indicators between using original and revised weights were observed on prevalence of type 2 diabetes and psychological distress in the past month. This is likely because these indicators both have very low prevalence and minimal variability across AIAN groups. However, there were also minimal differences observed in prevalence of obesity which had considerably higher rates and more variability across AIAN groups; the prevalence ranged from 27% among 2+R AIAN to 38% among Latino/a AIAN. No group changed more than 1 percentage point in obesity prevalence between estimates produced using original and revised weights.

Among adults, the larger differences between prevalence estimates using original and revised weights tended to be observed on indicators of access and health behaviors whereas the smaller differences tended to be observed on health status indicators. Among children, the larger differences between prevalence estimates using original and revised weights tended to occur on health behavior indicators and the smaller differences tended to be on access indicators. Among both adults and children, the majority of the larger differences between prevalence estimates using original and revised weights occurred in the All AIAN group. However, among children the two largest differences between prevalence estimates using original and revised weights occurred in the most identified as AIAN group.

Table 39. Differences in Prevalence of Health Indicators for Health Indicators Between Original Weights and Revised Weights, by AIAN Group, CHIS 2011-14

	Revised weighted estimates - Original weighted estimates				
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN
Adults					
Health Status					
Fair/Poor Health Status	-2	0	0	0	-2
Heart Disease	2	0	1	0	2
Hypertension	2	0	0	1	2
Diabetes	0	0	0	1	0
Type 2 Diabetes	0	0	0	0	0
Obesity	-1	0	0	0	-1
Overweight	-3	-1	0	-1	-3
Lifetime Asthma	3	0	0	-1	3
Current Asthma	3	0	0	0	3
Psychological distress in past year	1	-1	0	0	1
Psychological distress in past month	0	0	0	0	0
Health Behaviors					
Currently Smokes	4	0	0	1	4
No Binge Drinking Past Year	2	0	0	0	2
Healthcare Access/Utilization					
Currently Uninsured	-3	0	0	1	-3
Has Usual Source of Care (other than ER)	3	0	1	0	3
Doctor Visit Past Year	4	0	0	0	4
ER Visit Past Year	2	0	0	0	2
	0	0	0	0	0
Children and Adolescents	0	0	0	0	0
Health Status					
Ever Diagnosed with Asthma	0	-1	0	-3	0
Currently Has Asthma	2	-1	0	-1	2
Health Behaviors					
5 or More Servings of Fruit and Vegetables Daily	2	0	0	1	2
Meets Physical Activity Guidelines	5	1	-1	0	5

	Revised weighted estimates - Original weighted estimates				
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN
Healthcare Access/Utilization					
Currently Insured	1	0	-1	0	1
Has Usual Source of Care (other than ER)	2	1	1	0	2
Doctor Visit in Past Year	2	0	0	0	2
ER Visit in Past Year	1	-1	0	-1	1
Excellent, Very Good, or Good Health	2	0	0	1	2

We focus the discussion on prevalence estimates using original weights, but patterns were similar using revised weights. The prevalence of health indicators varied across the four AIAN tabulation groups. Among children, differences across the four AIAN tabulation groups ranged from 16 percentage points for proportion meeting physical activity guidelines to 3 percentage points for rates of current insurance. The largest difference across AIAN tabulation groups was on the proportion meeting physical activity guidelines. The estimated percent meeting PA guidelines varied by 16 percentage points between 2+R AIAN and 1R AIAN H single race (31% and 15%, respectively). There was also a large difference in asthma prevalence which was 12 percentage points higher among 2+R AIAN than most identified as AIAN (24% and 12%, respectively). The smallest difference across AIAN tabulation groups was observed in rates of current insurance which ranged from 96% among the Latino/a single-race AIAN group to 99% among the 2+R AIAN group. There were also relatively small differences in having a doctor visit in the past year which ranged from 86% among the Latino/a single-race AIAN group to 94% among the 2+R AIAN group; and in having a usual source of care which ranged from 89% among the Latino/a single-race AIAN group to 97% among the most identified as AIAN group.

Among adults, the largest difference across AIAN tabulation groups was on the proportion with a usual source of care (USOC). The percent with a USOC was 21 percentage points higher among 1R AIAN NH single race than 1R AIAN H single race (91% and 70%, respectively). There was also a large difference on the prevalence of current smoking with rates among 1R AIAN NH single race 19 percentage points higher than rates among 1R AIAN H single race (31% and 12%, respectively). The smallest differences across AIAN tabulation groups was observed on rates of type 2 diabetes and psychological distress in the past month. Rates of type 2 diabetes ranged from

7% among 2+R AIAN to 9% among Latino/a single-race AIAN, and psychological distress in the past month ranged from 6% among Latino/a single-race AIAN to 8% among non-Latino/a single-race AIAN.

Among children, the largest differences across the AIAN tabulation groups were observed on health behavior and health status indicators (meeting PA guidelines, asthma prevalence) and the smallest differences across tabulation groups were observed on access to care indicators (insurance status, usual source of care, doctor visits). In contrast, among adults the largest differences across the AIAN tabulation groups were observed primarily on access to care indicators (usual source of care, doctor visits) and the smallest differences across tabulation groups were observed on health status indicators (diabetes and psychological distress).

Among children, the Latino/a single-race AIAN tabulation group had a preponderance of rates indicating poorer health status and healthcare access across tabulation groups (e.g., lowest proportion meeting PA guidelines). However, for several indicators, the AIAN in combination group had rates that indicated poorer health (e.g., highest rate of ever diagnosed with asthma).

Among adults, across tabulation groups, the majority of rates indicating lower levels of health status and access to care were observed in the Non-Latino/a single-race AIAN group (e.g., the lowest rate of having a doctor visit in the past year). However, for several indicators the Latino/a single-race AIAN group posted the rates of the least favorable health status or access to care (e.g. the lowest rate of having a usual source of care). Interestingly, the Latino/a single-race AIAN group had the highest number of most favorable rates on health indicators (e.g., the lowest rate of current smoking). For several indicators the most favorable rate was observed among the AIAN in combination group (e.g., the lowest obesity rate).

Differences across AIAN tabulation groups on health indicators using the revised weights followed the same pattern as those using the original weights among adults. However, among children there were some different patterns using the revised weights. When using the revised weights, the two largest differences across tabulation groups occurred on health behavior indicators and the smallest differences across groups occurred on access indicators.

MCBS

MCBS was not reweighted (explained in previous section). However, we can discuss the impact of different ways of classifying AIAN participants on rates for key health indicators. The prevalence of health indicators varied across the four AIAN tabulation groups (Table 40). Differences across the four AIAN tabulation groups ranged from 4 percentage points for “ever diagnosed with mental disorder” to 24 percentage points for “ever diagnosed with diabetes” (Table 40). Among MCBS respondents, the largest difference across AIAN tabulation groups was on diabetes which varied by 24 percentage points between 1R AIAN NH vs. 1R AIAN H (34% and 58%, respectively). There were also large differences in current smoking rates and having a usual source of care; both had 15 percentage point differences between 1R AIAN NH vs. 1R AIAN H (30% vs. 15% for current smoking and 96% vs. 81% for usual source of care). 1R AIAN H were worse off in terms of diabetes and usual source of care (higher rates of diabetes and lower rates of having a USOC), but 1R AIAN NH had higher rates of current smoking. The smallest difference across AIAN tabulation groups was observed in percent ever diagnosed with mental disorder which ranged from 9% among 1R AIAN NH to 13% among both 2+R AIAN and All AIAN. There was also a relatively small difference in the prevalence of overweight, which ranged from 29% among both 1R AIAN NH and 1R AIAN H to 34% among 2+R AIAN.

The majority of the prevalence rates for indicators indicating lower health status and access across tabulation groups were observed in 1R AIAN H group (e.g., highest prevalence of diabetes and lowest rate of having a usual source of care). However, many of the measures indicating higher health status and access were also observed among 1R AIAN H (e.g., lowest smoking rate). The 1R AIAN H group and the 1R AIAN NH group had equal numbers of the rates indicating higher levels of health status and access.

Table 40. Health Indicators for 2010-2013, 2015 MCBS by AIAN Group

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Health Status								
Fair or Poor Health	561	205	26	330	37.8	46.4	42.5	33.7

	Population (in '000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Ever Diagnosed with Asthma, Emphysema, COPD	431	125	13	293	29.1	28.4	22.1	29.8
Ever Diagnosed with Diabetes	561	151	35	375	37.9	34.3	57.7	38.3
Overweight	484	129	17	337	32.6	29.3	28.8	34.4
Obese	612	197	29	385	41.3	44.8	48.6	39.3
Ever Diagnosed with Depression	566	161	29	376	38.2	36.5	48.5	38.3
Ever Diagnosed with Mental Disorder	186	49	6	131	12.5	11.1	9.2	13.4
Health Behaviors								
Current Smoker	367	133	9	225	24.8	30.1	15.4	22.9
Healthcare Access/Utilization								
Has Usual Source of Care (other than ER)	1,386	425	49	912	93.5	96.4	80.8	93.0

Source: 2010-2013, 2015 MCBS

NHANES

The sample of AIANs in NHANES is much smaller than that from the other surveys we analyzed, so many of the estimates are based on a small number of respondents and are less reliable. This is particularly true for the 1R AIAN H group, for which most estimates were unreliable due to small sample sizes, though it was also true for the 1R AIAN NH, because two-thirds of the AIAN population in NHANES were 2+R AIAN. The 1R AIAN H population in NHANES has less education, is more likely to live in poverty, and has lower food security than other AIAN respondents though each of these estimates was statistically unstable due to the small number of 1R AIAN H respondents in the pooled data. Despite this, these respondents are more likely to be married or cohabiting than other AIAN respondents.

Table 41. Social Determinants of Health for Pooled NHANES 2011-2014 Data

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Gender								
Male	2,693	849	163	1,681	51.6	52.2	47.2	51.8
Female	2,523	779	183	1,562	48.4	47.8	52.8	48.2
Age								
Under age 18	1,170	225	73	872	22.4	13.8	21.0	26.9
Ages 18-39 years	1,671	472	203	995	32.0	29.0	58.7	30.7
Ages 40 and over	2,376	931	70	1,375	45.5	57.2	20.3	42.4
Marital Status (Among Ages 20+)								
Married or Cohabiting	2,105	843	81	1,182	55.1	63.5	23.3	52.7
Never or Previously Married	1,719	485	172	1,062	44.9	36.5	62.1	47.3
Income as a Percent of FPL								
Under 100% FPL	1,538	556	140	842	29.5	34.2	40.3	26.0
100%-199% FPL	1,603	457	81	1,065	30.7	28.1	23.3	32.9
200% FPL or More	2,076	615	125	1,335	39.8	37.8	36.4	41.2
Education (among Ages 20+)								
High School Degree or Less	1,437	720	156	560	37.6	54.3	61.8	25.0
More than High School	2,388	607	96	1,684	62.4	45.7	38.2	75.0
Food Security								
Fully Food Secure	2,688	782	161	1,744	51.5	48.0	46.6	53.8
Marginal-Very Low Security	2,529	846	185	1,498	48.5	52.0	53.4	46.2
Low-Very Low Security	1,767	631	108	1,028	33.9	38.8	31.1	31.7

Source: 2011-2014 NHANES

Rare conditions were difficult to measure within some of the AIAN groups because the sample size was too small to provide reliable estimates, particularly among 1R AIAN H where the small numbers of respondents with these conditions often prevented the release of these estimates from the RDC. Despite this, differences across AIAN groups were generally larger for healthcare access and utilization measures and smallest for health status measures.

Table 42. Health Indicators for 2011-2014 NHANES by AIAN Group

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Health Status								
Fair/Poor Health	1,217	400	81	736	23.3	24.6	23.4	22.7
Major Depression	851	307	--	511	21.0	21.9	--	21.5
Diabetes	654	365	--	240	12.7	22.7	--	7.5
Asthma (Ever Diagnosed)	1,065	144	63	858	20.6	9.0	18.1	26.7
Congestive Heart Failure	--	--	0	--	--	--	0.0	--
Coronary Heart Disease	124	--	--	--	3.2	--	--	--
Hypertension	1,522	629	--	837	36.5	44.0	--	34.0
BMI								
Underweight/Normal	1,792	562	80	1,151	35.4	35.8	23.0	36.5
Overweight	1,406	291	111	1,004	27.5	18.5	32.2	31.5
Obese	1,883	718	155	1,010	36.9	45.7	44.8	31.6
Health Behaviors								
Binge Drinking Past Year	1,544	693	141	710	38.2	49.4	51.6	29.9
Physical Activity								
Moderate/Vigorous: Work	2,759	795	181	1,783	62.3	54.3	63.1	66.6
Moderate/Vigorous: Recreation	2,564	568	180	1,815	57.9	38.8	62.9	67.8
Moderate/Vigorous: Any	3,485	966	--	2,278	78.7	66.0	--	85.0
Healthcare Access/Utilization								
Has Usual Source of Care	4,296	1,436	231	2,629	82.3	88.2	66.6	81.1
Insured	3,936	1,166	268	2,503	75.5	71.6	77.4	77.2

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Visited Doctor Past Year	4,496	--	294	2,612	86.2	--	84.8	80.6
Saw Mental Health Professional	579	--	--	441	11.7	--	--	14.4

Source: 2011-2014 NHANES

'--' indicates estimate was suppressed due to data disclosure concerns

NHIS

Table 43. Social Determinants of Health for Sample Adults in 2013 NHIS by AIAN Group, Original Weights

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Age								
18-29 Years	1,145,000	352,000	205,000	587,000	27.4	27.9	29.0	26.6
30-39 Years	703,000	193,000	197,000	314,000	16.8	15.2	27.9	14.2
40-49 Years	793,000	234,000	147,000	412,000	19.0	18.5	20.9	18.7
50-64 Years	985,000	289,000	114,000	581,000	23.6	22.9	16.2	26.3
65 and Over	550,000	196,000	43,000	311,000	13.2	15.5	6.1	14.1
Gender								
Male	2,018,000	518,000	386,000	1,114,000	48.3	41.0	54.7	50.5
Female	2,158,000	746,000	320,000	1,092,000	51.7	59.0	45.3	49.5
Urban	3,031,000	662,000	653,000	1,716,000	72.6	52.4	92.4	77.8
Education								
Less than High School	834,000	167,000	248,000	419,000	20.0	13.2	35.1	19.0
High School	1,305,000	389,000	235,000	680,000	31.2	30.8	33.3	30.8
Attended College	1,261,000	479,000	148,000	633,000	30.2	37.9	21.0	28.7
College Degree	532,000	181,000	55,000	296,000	12.7	14.4	7.7	13.4
Graduate Degree	245,000	47,000	20,000	178,000	5.9	3.7	2.9	8.1
Own Home	2,010,000	722,000	264,000	1,024,000	48.1	57.2	37.3	46.4
Family Type								
One Adult, No Children	843,000	233,000	93,000	517,000	20.2	18.5	13.1	23.4

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Two+ Adults, No Children	1,484,000	423,000	230,000	831,000	35.5	33.5	32.5	37.7
One Adult, One+ Children	213,000	58,000	37,000	117,000	5.1	4.6	5.2	5.3
Two+ Adults, One+ Children	1,637,000	549,000	347,000	741,000	39.2	43.4	49.1	33.6
Marital Status								
Currently Married	1,663,000	522,000	273,000	868,000	39.8	41.3	38.6	39.4
Previously Married	895,000	255,000	94,000	545,000	21.4	20.2	13.4	24.7
Never Married	1,085,000	279,000	232,000	574,000	26.0	22.1	32.8	26.0
Cohabiting	533,000	207,000	108,000	218,000	12.8	16.4	15.3	9.9
Employment Status								
Employed	2,066,000	576,000	419,000	1,070,000	49.5	45.6	59.3	48.5
Unemployed	485,000	75,000	102,000	308,000	11.6	6.0	14.5	13.9
Not in the Labor Force	1,625,000	612,000	185,000	828,000	38.9	48.4	26.2	37.5
Food Security								
Food Secure	3,229,000	993,000	542,000	1,695,000	77.3	78.6	76.7	76.8
Low Security	651,000	222,000	123,000	306,000	15.6	17.5	17.4	13.9
Very Low Security	297,000	49,000	42,000	205,000	7.1	3.9	6.0	9.3

Source: 2013 NHIS

1R AIAN H adults are younger, less educated, and less likely to own their own home, even though they are more likely to be employed than other AIAN respondents. Nearly all (92.4%) of this group live in urban areas, compared to three-quarters (77.8%) of those who are 2+R AIAN and just over half (52.4%) of 1R AIAN NH respondents. Those who are 2+R AIAN are more than twice as likely as 1R AIAN NH to have very low food security (9.3% vs. 3.9%).

Table 44. Health Indicators for Sampled Adults in 2013 NHIS by AIAN Group, Original Weights

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIA N	1R AIA N NH	1R AIAN H	2+R AIAN
Health Status								
Fair or Poor Health	740,000	196,000	116,000	427,000	17.7	15.5	16.4	19.4
Asthma								
Ever Diagnosed	750,000	171,000	99,000	481,000	18.0	13.5	14.0	21.8
Current Asthma	385,000	94,000	56,000	235,000	9.2	7.4	7.9	10.7
Asthma Attack (Ever	244,000	51,000	43,000	149,000	33.5	30.0	44.0	32.6
Angina	75,000	15,000	5,000	55,000	1.8	1.2	0.78	2.5
Coronary Heart	162,000	56,000	15,000	91,000	3.9	4.4	2.1	4.1
Diabetes	576,000	216,000	69,000	291,000	13.8	17.1	9.8	13.2
Pre-diabetes	727,000	278,000	94,000	356,000	17.4	22.0	13.2	16.1
BMI Group								
Normal/Underweight	1,223,000	290,000	196,000	737,000	29.3	23.0	27.7	33.4
Overweight	1,260,000	321,000	250,000	689,000	30.2	25.4	35.3	31.2
Obese	1,693,000	652,000	261,000	780,000	40.5	51.6	37.0	35.3
Health Behaviors								
Alcohol Consumption								
Never Drank Alcohol	948,000	336,000	149,000	463,000	22.7	26.6	21.1	21.0
Formerly Drank	866,000	382,000	121,000	363,000	20.7	30.2	17.1	16.5
Current Drinker	2,362,000	546,000	436,000	1,380,000	56.6	43.2	61.8	62.5
Moderate or Heavy	773,000	182,000	137,000	455,000	18.5	14.4	19.4	20.6
Heavy Drinker	274,000	84,000	75,000	115,000	6.6	6.6	10.6	5.2
Physical Activity								
Meets aerobic	1,233,000	339,000	223,000	671,000	29.5	26.8	31.5	30.4
Meets strength	156,000	33,000	31,000	92,000	3.7	2.6	4.3	4.2
Meets aerobic and	786,000	242,000	93,000	452,000	18.8	19.1	13.1	20.5
Does not meet	2,001,000	649,000	360,000	991,000	47.9	51.4	51.0	44.9
Healthcare								
Access/Utilization								
Has usual source of	3,350,000	1,113,000	436,000	1,801,000	80.2	88.1	61.8	81.6
USOC changed past	278,000	45,000	35,000	198,000	6.6	3.5	5.0	9.0
USOC changed due to	103,000	14,000	16,000	73,000	2.5	1.1	2.3	3.3
Visited doctor past								
General doctor	2,652,000	913,000	349,000	1,391,000	63.5	72.3	49.4	63.0
Any doctor	3,053,000	989,000	398,000	1,667,000	73.1	78.3	56.3	75.5
Mental health	393,000	89,000	50,000	254,000	9.4	7.0	7.0	11.5
Visited ER in past year	1,208,000	390,000	147,000	671,000	28.9	30.9	20.8	30.4
Health Insurance								

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIA N	1R AIA N NH	1R AIAN H	2+R AIAN
Uninsured	1,142,000	304,000	337,000	502,000	27.3	24.0	47.7	22.7
Medicaid	529,000	254,000	53,000	222,000	12.7	20.1	7.5	10.1
Private Insurance	1,439,000	416,000	198,000	825,000	34.5	32.9	28.0	37.4
Delayed medical care due to cost	610,000	108,000	137,000	365,000	14.6	8.5	19.4	16.5
Forgone care due to cost	479,000	119,000	81,000	279,000	11.5	9.4	11.4	12.6
Couldn't afford needed care	1,049,000	212,000	158,000	679,000	25.1	16.7	22.4	30.8
Couldn't afford Rx	575,000	103,000	107,000	365,000	13.8	8.2	15.1	16.5
Delayed Rx to save money	472,000	78,000	61,000	333,000	11.3	6.2	8.6	15.1
Changed Rx to save money	1,052,000	205,000	99,000	748,000	25.2	16.2	14.0	33.9
Difficulty paying medical bills	740,000	196,000	116,000	427,000	17.7	15.5	16.4	19.4

Source: 2013 NHIS

When the set of health indicators are compared across the three AIAN groups, the differences are smallest for the prevalence of the health status measures and largest for the healthcare access and utilization measures.

Among health status measures, the differences across the AIAN groups are larger among more common conditions such as pre-diabetes and smaller for less common conditions such as angina. For example, when compared by BMI group, 52% of 1R AIAN NH are obese, compared to about 36% of other AIANs, but when prevalence of coronary heart disease is compared, only 2.1% of 1R AIAN H respondents have this condition, compared to 4.4% of 1R AIAN NH respondents.

The largest differences in health behaviors were in alcohol consumption status. Only 43% of 1R AIAN NH respondents were current drinkers, compared to about 62% of 1R AIAN H and respondents who are 2+R AIAN. The differences across AIAN groups in meeting physical activity guidelines were much smaller.

In contrast, most of the healthcare access and utilization measures showed large differences across the three AIAN groups. In general, 1R AIAN H fared worse than other AIANs in terms of healthcare access. Their uninsured rate was twice as high as that for other AIANs and only 56% had visited a doctor in the past year, compared to more than three-quarters of other AIANs. However, those who were 2+R AIAN fared worse than other AIANs on cost-related healthcare access measures. They were more likely to say they couldn't afford needed medical care, and that they had delayed or changed a prescription in the past year.

Reweighting alters the distributions of the social determinants of health within the AIAN population, but not substantially. After reweighting, all three AIAN subgroups were older, more likely to be currently or previously married, and less likely to be in the labor force. The differences across AIAN groups were smaller, but were not substantively affected.

Table 45. Social Determinants of Health for Sampled Adults in 2013 NHIS by AIAN Group, Revised weights

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Age								
18-29 Years	714,000	283,000	80,000	351,000	20.7	20.6	24.8	20.1
30-39 Years	549,000	214,000	86,000	248,000	15.9	15.6	26.9	14.2
40-49 Years	715,000	280,000	74,000	362,000	20.8	20.3	23.1	20.7
50-64 Years	894,000	337,000	58,000	499,000	26.0	24.5	18.2	28.5
65 and Over	570,000	260,000	23,000	288,000	16.6	18.9	7.0	16.5
Gender								
Male	1,629,000	631,000	169,000	829,000	47.3	45.9	52.6	47.5
Female	1,814,000	743,000	152,000	918,000	52.7	54.1	47.4	52.5
Urban	2,373,000	719,000	298,000	1,356,000	68.9	52.3	92.8	77.6
Education								
Less than High School	611,000	176,000	113,000	322,000	17.8	12.8	35.3	18.4
High School	1,067,000	427,000	105,000	536,000	31.0	31.0	32.7	30.7
Attended College	1,081,000	513,000	68,000	500,000	31.4	37.3	21.3	28.6
College Degree	463,000	199,000	24,000	239,000	13.4	14.5	7.6	13.7
Graduate Degree	220,000	59,000	10,000	151,000	6.4	4.3	3.1	8.7

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Own Home	1,760,000	798,000	124,000	839,000	51.1	58.1	38.6	48.0
Family Type								
One Adult, No Children	764,000	290,000	43,000	430,000	22.2	21.1	13.6	24.6
Two+ Adults, No Children	1,252,000	490,000	106,000	656,000	36.4	35.7	33.0	37.5
One Adult, One+ Children	166,000	55,000	17,000	95,000	4.8	4.0	5.2	5.4
Two+ Adults, One+ Children	1,261,000	539,000	155,000	567,000	36.6	39.2	48.2	32.4
Marital Status								
Currently Married	1,420,000	573,000	127,000	719,000	41.2	41.7	39.6	41.2
Previously Married	831,000	310,000	47,000	474,000	24.1	22.5	14.7	27.1
Never Married	772,000	287,000	96,000	389,000	22.4	20.9	29.9	22.3
Cohabiting	420,000	204,000	50,000	165,000	12.2	14.9	15.7	9.5
Employment Status								
Employed	1,630,000	614,000	186,000	831,000	47.3	44.7	57.8	47.5
Unemployed	347,000	80,000	45,000	222,000	10.1	5.8	13.9	12.7
Not in the Labor Force	1,466,000	681,000	91,000	694,000	42.6	49.5	28.2	39.7
Food Security								
Food Secure	2,676,000	1,077,000	247,000	1,352,000	77.7	78.3	76.9	77.4
Low Security	533,000	238,000	53,000	242,000	15.5	17.4	16.6	13.8
Very Low Security	233,000	59,000	21,000	153,000	6.8	4.3	6.5	8.8

Source: 2013 NHIS

Table 46. Difference between Estimates of Social Determinants of Health Using Original and Revised Weights, 2013 NHIS Sample Adults

	Population (in 1,000s)				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Age								
18-29 Years	-431	-69	-125	-236	-6.7	-7.3	-4.2	-6.5
30-39 Years	-154	21	-111	-66	-0.9	0.4	-1.0	0.0
40-49 Years	-78	46	-73	-50	1.8	1.8	2.3	2.0

	Population (in 1,000s)				Percent			
50-64 Years	-91	48	-56	-82	2.4	1.7	2.0	2.2
65 and Over	20	64	-20	-23	3.4	3.4	0.9	2.4
Gender								
Male	-389	113	-217	-285	-1.0	4.9	-2.1	-3.0
Female	-344	-3	-168	-174	1.0	-4.9	2.1	3.0
Urban	-658	57	-355	-360	-3.6	-0.1	0.4	-0.2
Education								
Less than High School	-223	9	-135	-97	-2.2	-0.4	0.2	-0.6
High School	-238	38	-130	-144	-0.2	0.2	-0.6	-0.2
Attended College	-180	34	-80	-133	1.2	-0.6	0.3	-0.1
College Degree	-69	18	-31	-57	0.7	0.2	-0.1	0.3
Graduate Degree	-25	12	-10	-27	0.5	0.6	0.2	0.6
Own Home	-250	76	-140	-185	3.0	0.9	1.2	1.6
Family Type								
One Adult, No Children	-79	57	-50	-87	2.0	2.7	0.4	1.2
Two+ Adults, No Children	-232	67	-124	-175	0.8	2.2	0.5	-0.1
One Adult, One+ Children	-47	-3	-20	-22	-0.3	-0.7	0.0	0.1
Two+ Adults, One+ Children	-376	-10	-192	-174	-2.6	-4.2	-0.9	-1.2
Marital Status								
Currently Married	-243	51	-146	-149	1.4	0.4	1.1	1.8
Previously Married	-64	55	-47	-71	2.7	2.4	1.3	2.4
Never Married	-313	8	-136	-185	-3.6	-1.2	-2.9	-3.8
Cohabiting	-113	-3	-58	-53	-0.6	-1.5	0.5	-0.4
Employment Status								
Employed	-436	38	-233	-239	-2.1	-0.9	-1.5	-1.0
Unemployed	-138	5	-57	-86	-1.5	-0.2	-0.5	-1.2
Not in the Labor Force	-159	69	-94	-134	3.7	1.1	2.0	2.2
Food Security								
Food Secure	-553	84	-295	-343	0.4	-0.2	0.3	0.6
Low Security	-118	16	-70	-64	-0.1	-0.2	-0.8	0.0
Very Low Security	-64	10	-21	-52	-0.3	0.4	0.5	-0.5

Source: 2013 NHIS

The reweighted estimates are very similar to those using the original weights. Most estimates change by less than one percentage point, though a small number change by three percentage points or more. All of these measures were healthcare access and utilization measures. They included: has a usual source of care, visited a general doctor in the past year, visited any doctor in the past year, and currently uninsured. The AIAN group whose estimates were most affected by

the reweighting process varied across measures. In general, the differences across AIAN groups were similar both before and after reweighting.

Table 47. Health Indicators for Sampled Adults in 2013 NHIS by AIAN Group, Revised weights

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Health Status								
Fair or Poor Health	658,000	229,000	58,000	371,000	19.1	16.7	18.0	21.2
Asthma								
Ever Diagnosed	616,000	194,000	49,000	374,000	17.9	14.1	15.2	21.4
Current Asthma	323,000	101,000	27,000	195,000	9.4	7.3	8.4	11.2
Asthma Attack (Ever Asthma)	205,000	57,000	21,000	127,000	33.9	29.3	43.7	35.1
Angina	73,000	21,000	3,000	49,000	2.1	1.6	0.90	2.8
Coronary Heart Disease	167,000	77,000	7,000	83,000	4.9	5.6	2.3	4.7
Diabetes	547,000	254,000	36,000	257,000	15.9	18.5	11.2	14.7
Pre-diabetes	681,000	322,000	48,000	311,000	19.8	23.4	15.1	17.8
BMI Group								
Normal/Underweight	957,000	308,000	85,000	565,000	27.8	22.4	26.5	32.3
Overweight	1,025,000	352,000	118,000	555,000	29.8	25.6	36.8	31.7
Obese	1,460,000	715,000	118,000	628,000	42.4	52.0	36.7	35.9
Health Behaviors								
Alcohol Consumption								
Never Drank Alcohol	778,000	353,000	68,000	357,000	22.6	25.7	21.1	20.4
Formerly Drank Alcohol	791,000	421,000	57,000	313,000	23.0	30.7	17.8	17.9
Current Drinker	1,873,000	599,000	196,000	1,078,000	54.4	43.6	61.0	61.7
Moderate or Heavy Drinker	612,000	211,000	62,000	339,000	17.8	15.4	19.3	19.4
Heavy Drinker	214,000	93,000	32,000	89,000	6.2	6.8	9.9	5.1
Physical Activity								
Meets aerobic guidelines only	986,000	355,000	101,000	530,000	28.6	25.8	31.6	30.3
Meets strength guidelines only	125,000	35,000	14,000	77,000	3.6	2.5	4.2	4.4
Meets aerobic and strength	622,000	251,000	44,000	327,000	18.1	18.3	13.7	18.7
Does not meet guidelines	1,710,000	734,000	162,000	814,000	49.7	53.4	50.6	46.6
Healthcare Access/Utilization								

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Has usual source of care (USOC)	2,879,000	1,210,000	205,000	1,464,000	83.6	88.0	63.9	83.8
USOC changed past year	225,000	56,000	16,000	153,000	6.5	4.1	5.1	8.7
USOC changed due to insurance	77,000	17,000	8,000	52,000	2.2	1.2	2.4	3.0
Visited doctor past year								
General doctor	2,322,000	1,006,000	167,000	1,149,000	67.4	73.2	51.9	65.7
Any doctor	2,626,000	1,075,000	189,000	1,362,000	76.3	78.2	58.9	78.0
Mental health professional	317,000	94,000	23,000	200,000	9.2	6.9	7.0	11.4
Visited ER in past year	990,000	398,000	68,000	523,000	28.8	29.0	21.1	30.0
Health Insurance								
Uninsured	826,000	316,000	148,000	362,000	24.0	23.0	46.1	20.7
Medicaid	442,000	246,000	25,000	171,000	12.8	17.9	7.7	9.8
Private Insurance	1,192,000	461,000	92,000	638,000	34.6	33.6	28.8	36.5
Delayed medical care due to cost	468,000	116,000	61,000	291,000	13.6	8.5	18.9	16.7
Forgone care due to cost	390,000	128,000	39,000	222,000	11.3	9.3	12.1	12.7
Couldn't afford needed care	843,000	229,000	74,000	540,000	24.5	16.6	23.2	30.9
Couldn't afford Rx	447,000	110,000	49,000	288,000	13.0	8.0	15.3	16.5
Delayed Rx to save money	362,000	77,000	28,000	257,000	10.5	5.6	8.8	14.7
Changed Rx to save money	872,000	228,000	47,000	597,000	25.3	16.6	14.6	34.2
Difficulty paying medical bills	882,000	302,000	83,000	497,000	25.6	22.0	26.0	28.4

Table 48. Difference between Estimates of Key Health Indicators Using Original and Revised Weights, 2013 NHIS Sample Adults

	Population (in 1,000s)				Percent			
	All	1R	1R	2+R	All	1R	1R	2+R
	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN
	NH	H			NH	H		
Health Status								
Fair or Poor Health	-82	33	-58	-56	1.4	1.1	1.6	1.9
Asthma								
Ever Diagnosed	-134	23	-50	-107	-0.1	0.6	1.3	-0.4
Current Asthma	-62	7	-29	-40	0.2	-0.1	0.5	0.5
Asthma Attack (Ever Asthma)	-39	6	-22	-22	0.4	-0.7	-0.3	2.5
Angina	-2	6	-2	-6	0.3	0.4	0.12	0.3
Coronary Heart Disease	5	21	-8	-8	1.0	1.2	0.2	0.6
Diabetes	-29	38	-33	-34	2.1	1.4	1.4	1.5
Pre-diabetes	-46	44	-46	-45	2.4	1.4	1.8	1.7
BMI								
Normal/Underweight	-266	18	-111	-172	-1.5	-0.6	-1.2	-1.1
Overweight	-235	31	-132	-134	-0.4	0.2	1.5	0.5
Obese	-233	63	-143	-152	1.9	0.4	-0.2	0.6
Health Behaviors								
Alcohol Consumption								
Never Drank Alcohol	-170	17	-81	-106	-0.1	-0.9	0.0	-0.6
Formerly Drank Alcohol	-75	39	-64	-50	2.2	0.4	0.7	1.4
Current Drinker	-489	53	-240	-302	-2.1	0.4	-0.8	-0.9
Moderate or Heavy Drinker	-161	29	-75	-116	-0.7	1.0	0.0	-1.2
Heavy Drinker	-60	9	-43	-26	-0.3	0.1	-0.7	-0.1
Physical Activity								
Meets aerobic guidelines only	-247	16	-122	-141	-0.9	-1.0	0.0	-0.1
Meets strength guidelines only	-31	2	-17	-15	-0.1	-0.1	-0.1	0.2
Meets aerobic and strength	-164	9	-49	-125	-0.8	-0.9	0.5	-1.8
Does not meet guidelines	-291	85	-198	-177	1.8	2.0	-0.4	1.7
Healthcare								
Access/Utilization								
Has usual source of care (USOC)	-471	97	-231	-337	3.4	-0.1	2.1	2.2
USOC changed past year	-53	11	-19	-45	-0.1	0.6	0.1	-0.2

	Population (in 1,000s)				Percent			
	All	1R	1R	2+R	All	1R	1R	2+R
	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN	AIAN
	NH	H		NH	H			
USOC changed due to insurance	-26	3	-8	-21	-0.2	0.1	0.1	-0.3
Visited doctor past year								
General doctor	-330	93	-182	-242	3.9	1.0	2.6	2.7
Any doctor	-427	86	-209	-305	3.2	-0.1	2.6	2.4
Mental health professional	-76	5	-27	-54	-0.2	-0.2	0.0	-0.1
Visited ER in past year	-218	8	-79	-148	-0.2	-1.9	0.4	-0.5
Health Insurance								
Uninsured	-316	12	-189	-140	-3.4	-1.0	-1.5	-2.1
Medicaid	-87	-8	-28	-51	0.2	-2.2	0.2	-0.3
Private Insurance	-247	45	-106	-187	0.2	0.7	0.8	-0.9
Delayed medical care due to cost	-142	8	-76	-74	-1.0	-0.1	-0.5	0.1
Forgone care due to cost	-89	9	-42	-57	-0.1	-0.1	0.7	0.1
Couldn't afford needed care	-206	17	-84	-139	-0.6	-0.1	0.8	0.1
Couldn't afford Rx	-128	7	-58	-77	-0.8	-0.2	0.2	-0.1
Delayed Rx to save money	-110	-1	-33	-76	-0.8	-0.6	0.2	-0.4
Changed Rx to save money	-180	23	-52	-151	0.1	0.3	0.6	0.3
Difficulty paying medical bills	-218	25	-98	-145	-0.7	0.1	0.3	-0.6

Source: 2013 NHIS

NSCH

NSCH was not reweighted. For the original weights, the impact of different ways of classifying AIAN participants on rates for key health, healthcare access, and demographic indicators are shown below. The prevalence of health indicators varied across the four AIAN tabulation groups. Among respondents, the largest difference across AIAN tabulation groups was for the demographic and healthcare access variables (as opposed to the health status and behaviors indicators). For example, for education, less than high school varied by 26 percentage points between 1R AIAN NH vs. 1R AIAN H (11% and 36%, respectively) and for Medicaid the difference between 2+R AIAN vs. 1R AIAN H was 19 percentage points (53% and 36%, respectively). Among the health indicators examined, the variable physically active had the

largest variability across the categories. Among 1R AIAN NH, percent physically active was 63% vs. 48% for 2+R AIAN.

Table 49. Health and health-related indicators for sampled children (0-17yrs) in 2011-2012 NSCH by AIAN Group

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Social Determinants of Health								
Age								
<6 yrs	865,000	212,000	150,000	502,000	36.6	35.6	36.8	36.9
6-11 yrs	854,000	207,000	146,000	501,000	36.1	34.8	35.8	36.8
12-17 yrs	645,000	176,000	111,000	358,000	27.3	29.5	27.4	26.3
Sex								
Male	1,128,000	283,000	221,000	624,000	47.7	47.5	54.2	45.9
Female	1,236,000	313,000	187,000	737,000	52.3	52.5	45.8	54.1
MSA								
MSA	1,701,000	334,000	313,000	1,055,000	84.4	70.8	85.9	89.4
Non-MSA	314,000	137,000	51,000	125,000	15.6	29.2	14.1	10.6
Homeownership								
Owns Home	1,067,000	314,000	146,000	607,000	45.1	52.7	35.9	44.6
Rents	1,297,000	282,000	261,000	755,000	54.9	47.3	64.1	55.4
Education								
<HS	529,000	67,000	150,000	313,000	22.4	11.2	36.8	23.0
HS	569,000	142,000	86,000	341,000	24.1	23.8	21.1	25.1
>HS	1,266,000	387,000	171,000	708,000	53.6	65.0	42.1	52.0
Health Status								
Asthma	445,000	89,000	73,000	282,000	18.8	14.9	18.0	20.7
Diabetes	3,000	2,000	*	*	0.1	0.4	0.1	0.0
Fair or Poor Health	71,000	9,000	18,000	44,000	3.0	1.6	4.4	3.2
Depression (2-17yrs)	87,000	30,000	8,000	48,000	4.2	5.7	2.3	4.1
Anxiety (2-17yrs)	95,000	38,000	10,000	47,000	4.6	7.2	2.7	4.0
Health Behaviors								
Physically Active (6-17yrs)	790,000	244,000	132,000	414,000	52.7	63.5	51.4	48.3
Healthcare Access/Utilization								
Uninsured	167,000	38,000	21,000	108,000	7.1	6.4	5.2	7.9

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Medicaid	1,273,000	316,000	280,000	677,000	53.8	53.0	68.7	49.8
Trouble paying	236,000	59,000	56,000	122,000	11.0	9.9	13.6	9.0
Usual source of care	253,000	65,000	58,000	129,000	10.7	11.0	14.4	9.5

Source: National Survey of Children’s Health (NSCH) 2011-2017, 0-17yrs

Note: Cells containing “*” were suppressed given small sample size.

NSDUH

NSDUH was not reweighted. However, we observed the impact of different ways of classifying AIAN participants on rates for key health indicators. The prevalence of health indicators varied across the four AIAN tabulation groups (see Table 50 below). There were large differences in insurance status and mental health (ever had depression); insurance status had 18 percentage point differences between 1R AIAN H single race vs. 1R AIAN NH (73% vs. 91%), and mental health had 12 percentage points differences between 1R AIAN H vs. race in combination with other race(s) AIAN. Latino/a single-race AIANs were worse off in terms of insurance status, but Non-Latino/a AIANs had higher rates of alcohol abuse or dependence in the past year and higher tobacco use in the past year.

Table 50. Health and health-related indicators for sampled adults and teens (12+yrs) in 2014 NSDUH by AIAN Group

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Social Determinants of Health								
Metro area	5,127,000	792,000	1,579,000	2,756,000	81.3	54.9	94.9	86.2
Lives in American Indian area	888,000	739,000	20,000	129,000	14.1	51.2	1.2	4.0

	Population				Percent			
	All AIAN	IR AIAN NH	IR AIAN H	2+R AIAN	All AIAN	IR AIAN NH	IR AIAN H	2+R AIAN
Age								
12-17	775,000	166,000	226,000	383,000	12.3	11.5	13.6	12.0
18-25	889,000	203,000	310,000	377,000	14.1	14.1	18.6	11.8
26-34	938,000	196,000	337,000	404,000	14.9	13.6	20.2	12.6
35-49	1,453,000	363,000	426,000	664,000	23.1	25.2	25.6	20.8
50-64	1,363,000	336,000	253,000	774,000	21.6	23.3	15.2	24.2
65 or older	886,000	177,000	112,000	596,000	14.1	12.3	6.8	18.6
Health Status								
Fair or poor health	1,362,000	377,000	305,000	680,000	21.6	26.3	18.3	21.3
Heart disease	327,000	45,000	26,000	256,000	5.3	3.2	1.6	8.1
Diabetes	715,000	212,000	120,000	383,000	11.6	15.1	7.5	12.1
Anxiety	648,000	171,000	80,000	398,000	10.5	12.1	5.0	12.6
Depression	785,000	155,000	91,000	540,000	12.7	11.0	5.6	17.0
High blood pressure	1,419,000	340,000	185,000	894,000	22.9	24.1	11.5	28.2
Psychological distress past month	478,000	109,000	71,000	297,000	8.6	8.6	5.0	10.6
Psychological distress past year	837,000	176,000	132,000	529,000	15.1	13.8	9.2	18.8
Asthma past year	438,000	85,000	92,000	261,000	7.1	6.0	5.7	8.3
Ever had asthma	878,000	205,000	153,000	519,000	14.2	14.5	9.5	16.4
Health Behaviors								
BMI								
Normal/ Under-weight	2,017,000	390,000	563,000	1,063,000	33.6	28.3	36.5	34.5
Over-weight	1,792,000	356,000	505,000	932,000	29.8	25.8	32.7	30.2
Obese	2,201,000	633,000	476,000	1,091,000	36.6	45.9	30.9	35.4
Ever used vicodin, lortab, or lorcet	506,000	116,000	89,000	300,000	8.0	8.0	5.4	9.4

	Population				Percent			
	All AIAN	IR AIAN NH	IR AIAN H	2+R AIAN	All AIAN	IR AIAN NH	IR AIAN H	2+R AIAN
Ever used pain reliever	918,000	253,000	179,000	485,000	14.6	17.6	10.8	15.2
Used pain reliever past year	291,000	81,000	73,000	138,000	4.6	5.6	4.4	4.3
Ever used pain reliever nonmedically	918,000	253,000	179,000	485,000	14.6	17.6	10.8	15.3
Pain reliever dependency	39,000	*	*	25,000	0.62	0.64	0.32	0.78
Ever used cigarettes	3,885,000	947,000	808,000	2,129,000	61.6	65.7	48.6	66.6
Used cigarettes past year	1,798,000	544,000	340,000	915,000	28.5	37.7	20.4	28.6
Nicotine dependency	520,000	142,000	35,000	342,000	8.2	9.9	2.1	10.7
Ever used tobacco	4,155,000	1,031,000	862,000	2,262,000	65.9	71.5	51.8	70.7
Used tobacco past year	2,133,000	616,000	398,000	1,118,000	33.8	42.7	23.9	35.0
Ever used alcohol	4,951,000	1,131,000	1,186,000	2,633,000	21.5	21.6	28.7	17.7
Used alcohol past year	3,818,000	789,000	959,000	2,070,000	39.4	45.3	42.3	35.3
Alcohol abuse or dependency	596,000	211,000	143,000	243,000	9.5	14.6	8.6	7.6
Ever used heroin	122,000	45,000	15,000	63,000	1.9	3.1	0.91	2.0
Used heroin past year	31,000	18,000	*	*	0.49	1.2	0.3	0.3
Ever used marijuana	2,899,000	777,000	501,000	1,621,000	46.0	53.9	30.1	50.7
Marijuana dependency	86,000	19,000	15,000	52,000	1.4	1.3	0.9	1.6

	Population				Percent			
	All AIAN	IR AIAN NH	IR AIAN H	2+R AIAN	All AIAN	IR AIAN NH	IR AIAN H	2+R AIAN
Healthcare Access/ Utilization								
Has health insurance	5,221,000	1,301,000	1,203,000	2,717,000	83.4	90.7	72.9	85.6
Emergency room visit in past year	2,273,000	563,000	489,000	1,220,000	37.3	41.2	30.7	38.9
Received drug or alcohol treatment	544,000	195,000	72,000	276,000	8.6	13.5	4.3	8.6
Received inpatient mental health treatment	68,000	17,000	17,000	34,000	1.2	1.3	1.2	1.2
Received outpatient mental health treatment	392,000	83,000	50,000	260,000	7.1	6.5	3.5	9.3
Received prescription medicine for MH	630,000	162,000	73,000	396,000	11.4	12.7	5.1	14.1
Received any MH treatment in past year	738,000	178,000	99,000	461,000	13.4	14.1	7.0	16.4
Perceived need/no treatment	180,000	31,000	19,000	130,000	3.3	2.5	1.3	4.6
No perceived need/no treatment	4,568,000	1,051,000	1,300,000	2,217,000	83.3	83.4	91.7	78.9
Perceived need/got treatment	170,000	32,000	26,000	111,000	3.1	2.6	1.8	4.0

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
No perceived need/got treatment	568,000	146,000	72,000	350,000	10.3	11.5	5.1	12.5

Source: NSDUH 2014 Adult & Teen age 12+

Note: Cells containing “*” were suppressed given small sample size.

PATH

PATH was not reweighted (explained in previous section). However, we can discuss the impact of different ways of classifying AIAN participants on rates for key health indicators. The prevalence of health indicators varied across the four AIAN tabulation groups (see Table 51 below). There were large differences in education rates (up to high school degree) and ever drinking alcohol; education had 17 percentage point differences between 1R AIAN H single race vs. race in combination with other race(s) AIAN (63% vs. 46%), and alcohol had 22 percentage points differences between 1R AIAN NH vs. race in combination with other race(s) AIAN. Latino/a single-race AIANs were worse off in terms of education, but Non-Latino/a AIANs had higher rates of hypertension and lower health status.

Table 51. Health and health-related indicators for sampled adults and teens (age 12+yrs) in 2013-2014 PATH by AIAN Group

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIA N	1R AIAN NH	1R AIAN H	2+R AIA N
Social Determinants of Health								
Age								
12-17	883,000	89,000	247,000	548,000	13.1	10.2	13.3	13.6
18-24	1,000,000	75,000	330,000	595,000	14.8	8.7	17.8	14.8
25-29	543,000	61,000	209,000	274,000	8.0	7.0	11.3	6.8

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIA N	1R AIAN NH	1R AIAN H	2+R AIA N
30-39	1,244,000	158,000	466,000	620,000	18.4	18.1	25.2	15.4
40-49	1,037,000	157,000	265,000	615,000	15.3	18.0	14.3	15.2
50-64	1,367,000	211,000	200,000	956,000	20.2	24.2	10.8	23.7
65 or older	683,000	121,000	136,000	426,000	10.1	13.9	7.4	10.6
Health Status								
Fair or poor health	1,356,000	240,000	378,000	738,000	20.1	27.5	20.4	18.3
Asthma	1,285,000	125,000	273,000	887,000	19.0	14.4	14.7	22.0
Hypertension	1,484,000	228,000	224,000	1,033,000	22.0	26.2	12.1	25.6
Diabetes	1,029,000	173,000	169,000	687,000	15.2	19.9	9.1	17.0
Health Behaviors								
Ever tried alcohol	5,089,000	641,000	1,145,000	3,304,000	42.1	27.2	32.5	48.8
Binge drink in past year	2,185,000	241,000	555,000	1,389,000	79.3	73.0	82.7	79.3
Ever tried marijuana	2,910,000	357,000	688,000	1,864,000	43.1	41.0	37.1	46.2
Ever used painkiller not prescribed	1,243,000	168,000	276,000	799,000	18.4	19.3	14.9	19.8
Healthcare Access/ Utilization								
Emergency room visit in past year	2,090,000	275,000	437,000	1,377,000	31.0	31.7	23.6	34.2

Source: PATH 2013-2014 (Wave 1) Adults and Teens age 12+

Table 52. Health and health-related indicators for sampled adults (age 18+ yrs) in 2013-2014
PATH by AIAN Group

	Population				Percent			
	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN	All AIAN	1R AIAN NH	1R AIAN H	2+R AIAN
Social Determinants of Health								
HS Degree or Less	3,058,000	435,000	1,008,000	1,615,000	52.1	55.7	62.8	46.3
Health Status								
Heart disease	543,000	64,000	63,000	416,000	9.2	8.2	3.9	11.9
Self-rated quality of life								
Excellent	885,000	170,000	255,000	460,000	15.1	21.7	15.9	13.2
Very good	2,261,000	293,000	568,000	1,401,000	38.5	37.4	35.3	40.2
Good	1,807,000	202,000	460,000	1,145,000	30.8	25.9	28.6	32.9
Fair	820,000	92,000	319,000	408,000	14.0	11.8	19.9	11.7
Poor	100,000	25,000	4,000	72,000	1.7	3.2	0.2	2.1
Mental health rating								
Excellent	1,093,000	184,000	238,000	671,000	18.6	23.5	14.8	19.3
Very good	1,707,000	192,000	447,000	1,068,000	29.1	24.6	27.8	30.6
Good	1,878,000	270,000	533,000	1,074,000	32.0	34.6	33.2	30.8
Fair	937,000	96,000	347,000	494,000	15.9	12.3	21.6	14.2
Poor	259,000	40,000	41,000	179,000	4.4	5.1	2.6	5.1
Health Behaviors								
Current smoker	1,460,000	228,000	251,000	980,000	24.9	29.2	15.7	28.1
Healthcare Access/Utilization								
Saw medical doctor in past 12 months	4,413,000	577,000	1,042,000	2,795,000	75.1	73.8	64.9	80.2
Currently insured	4,572,000	680,000	1,020,000	2,872,000	77.9	86.9	63.5	82.4

Source: PATH 2013-2014 (Wave 1) Adults age 18+

Observations

BRFSS

Prior to 2013, researchers had access to detailed racial/ethnic information in the BRFSS public use file; however, beginning with the 2013 wave of the survey, this information can only be accessed in the restricted use data. This means that from 2013 onward, researchers who would like to identify those who reported as 2+R AIAN would have to access BRFSS data through an RDC, either through one of the federal Census RDCs, the CDC, or through NCHS. Beginning with the 2015 wave, the imputed race/ethnicity measure that is used in the weighting process is not included in the public use files. This means that most of the race only and race/ethnicity measures are missing information for some respondents, which could make reproducing CDC-created race-specific estimates for even the 1R AIAN NH population difficult to accomplish using the public use file.

The BRFSS results show there are compositional differences in the social determinants of health between the three AIAN groups, as well as differences in health status and healthcare access and utilization. In BRFSS, 1R AIAN H respondents differ more from 1R AIAN NH and 2+R AIAN than the latter two groups do from each other. Though 2+R AIAN resembled 1R AIAN NH on most health status measures, they fared worse than this group on a number of healthcare access measures. This means that the standard method of grouping Latino AIANs in a single category with other Latinos and 2+R AIANs with those who report two or more races rather than with other AIANs hides the relative disadvantage that these groups face and provides an incomplete understanding of the diversity within the AIAN population.

Using the original weights, BRFSS estimates a much larger AIAN population in the U.S. than the ACS shows. This is true about both the percentage of the population that is AIAN and the total population size. These differences could arise from a number of sources, including differences in survey methodology and data collection practices, question wording, race classification practices, and weighting methodology. The BRFSS weighting process includes a dimension that simultaneously adjusts age, gender, and race/ethnicity. Though the reweighting process preserved the original BRFSS age and gender distributions, after reweighting the age distribution of the AIAN population is older, suggesting that the original weighting process, which collapsed AIANs with other racial-ethnic groups in states with small AIAN populations, did not fully adjust the age

distribution within the AIAN population. Despite this, explicitly adjusting for the three AIAN subgroups had only small effects on estimates for this population.

CHIS

The CHIS public use files allow users to identify those who are AIAN only (both Latino/a and non-Latino/a), as well as those who are AIAN in combination with another race and those who report All AIAN. For respondents who report AIAN in combination with another race, the public use file allows users to identify those who most identify as being AIAN. Among respondents who report being AIAN, CHIS also collects information about tribal heritage and whether they are enrolled in a federally- or state-recognized tribe. However, this information is not available in the public use file. Users interested in accessing this information must use the restricted data.

MCBS

The sample size of AIANs in a given year of MCBS is very small. In fact, the sample sizes of most race groups other than non-Latino/a white and Latino/a in MCBS are relatively small; therefore MCBS does not release any measures that allow identification of AIANs in the public use files. In addition, prior to 2013, public use files were not available. Users interested in the health and healthcare utilization of AIAN Medicare beneficiaries must access the restricted data. In addition, because of the small sample size of AIAN, users need to pool multiple years of MCBS data to generate stable estimates for this population. As noted in the section discussing weighting, pooling of MCBS data is complicated due to the overlapping panel design. Furthermore, the weights for each panel need to be adjusted when pooling to ensure that the weighted estimates remain representative of the Medicare beneficiary population. Taken together, these factors limit the utility of MCBS for examining health indicators for the elder AIAN population.

NSDUH

Researchers interested in using NSDUH for analyzing the specific AIAN subgroups require access to the confidential dataset. The public file offers only one AIAN subgroup used in our project analysis: Non-Latino/a AIAN. NSDUH offers wide-ranging variables in illicit drug use

and treatment that is seldom offered in other surveys at such detail. Researchers investigating these sensitive topics should be mindful that many of the largest percentage spreads occur between the Non-Latino/a and Latino/a subgroups. At the time of analyses, NSDUH was only accessible through indirect access via the Substance Abuse and Mental Health Services Administration (SAMHSA). Estimates underwent a disclosure review that suppressed all unweighted frequencies and weighted estimates with low cell counts. This potentially limits analyses involving pain reliever use and heroin use due to small sample sizes. However, starting in October 2018, SAMHSA partnered with the National Center for Health Statistics (NCHS) to host NSDUH data in its secure Research Data Centers (RDCs). Researchers opting for this method should inquire with NCHS about exact disclosure rules and limitations.

NHANES

The sample size of AIANs within NHANES is very small; therefore, NHANES does not release any measures that would allow identification of AIANs in the public use files. Users interested in using the NHANES detailed health-related measures, including its rich physical exam data, to examine health within the AIAN population can only access information about AIANs within the restricted data sets. A further limitation is that the sample size for the AIAN population in NHANES is much smaller than the other federal health surveys we evaluated and is more heavily weighted toward those who are 2+R AIAN than the AIAN population in other surveys. This significantly reduces users' ability to examine disparities within the AIAN population and between the AIAN population and other racial/ethnic groups using the rich information and detailed measures that are only available in NHANES data. Moreover, the high percentage of those who are 2+R AIAN who differ in terms of health status, health behaviors, and healthcare access and utilization could affect the representativeness of NHANES estimates for AIANs, as well as their comparability with estimates from other federal health surveys.

NHIS

The public use files allow users to identify those who are AIAN only (both Latino and non-Latino) but prevent them from identifying those who are 2+R AIAN. Though NHIS upcodes or imputes values for respondents who report "other race", it is possible to identify these respondents in the public use file using a measure that flags whether that upcoding or imputation

was performed, allowing users to determine whether they would prefer to keep these cases as “other race” or upcode them into other race categories. However, any user who would like to identify all AIAN respondents or all AIANs who reported as 2+R AIAN would be required to access the restricted use files in the RDC.

One significant limitation of NHIS is that race/ethnicity information for persons living in the household may be provided by a proxy respondent. It is not always possible to determine whether each race/ethnicity report is a self-report or a proxy-report.

As was the case in each of the other surveys, there were notable differences across the three AIAN groups in their health status, health behaviors, and healthcare access and utilization, as well as the distribution of social determinants of health. In general, 1R AIAN H were younger, more socioeconomic disadvantaged, and more likely to be employed. They were more likely to face difficulties with healthcare access. 2+R AIAN respondents were more likely to report cost-related difficulties accessing care. Taken together, these findings suggest that when researchers limit their analyses to 1R AIAN NH the result is an incomplete understanding of the challenges AIANs face in accessing and using health care services.

The original NHIS weighting process does not directly control the size or distribution of the AIAN population. Despite this, the NHIS estimate of the size of the 1R AIAN NH population is similar to that in the ACS, though there are larger differences in the sizes of the 1R AIAN H and 2+R AIAN populations. Reweighting adjusts the composition of the social determinants of health within the AIAN population, slightly shifting the age distribution, marital status, family type, and labor force participation of AIAN adults, though the weighting dimensions only include CBSA status, Census region, age, gender, and race/ethnicity. These changes in composition also have small effects on measures of health status, health behaviors, and healthcare access and utilization. Though these changes did not affect the substantive differences across AIAN groups, they could affect the size of health disparities between AIANs and other racial/ethnic groups.

NSCH

The 2011/12 NSCH public use file provided by the National Center for Health Statistics has some race/ethnicity variables that allow analysis of AIAN. The main race/ethnicity variable in the

public use file upcodes the detailed responses to questions on race/ethnicity asked during the phone interview into a four category variable: “Hispanic”, “white, non-Hispanic”, “black, non-Hispanic”, and “Multi-racial/Other, non-Hispanic.” Race classification of the target child with American Indian/Alaska Native specification for select states (white only, black only, AIAN only, Other) can be requested in the public use dataset; however, the fact that this measure can only be applied to a small number of state limits its utility for researchers interested in national AIAN estimates or within states with smaller AIAN populations.

PATH

PATH required an additional programming step to identify the four AIAN subgroups. As previously mentioned, our research team created an intermediate Census-format race variable to be used for creating our 1R AIAN H and 2+R AIAN subgroups. The data also contains missing values for respondents who answer “Don’t Know” or “Refused”. Therefore, researchers who are averse to using incomplete data or are unfamiliar with imputation methods may opt to use other available survey data. PATH data was accessed through the Inter-university Consortium for Political and Social Research’s (ICPSR) Virtual Data Enclave (VDE) and was subject to their disclosure policies.

Appendix A. List of papers obtained in literature search, by survey and year

Author	Year	Title	Journal
<u>PATH</u>			
None			
<u>MCBS</u>			
None			
<u>MEPS</u>			
		The complementarity and substitution between unconventional and mainstream medicine among racial and ethnic groups in the United States	Health Serv Res
Tom Xu, K. and Farrell, T. W.	2007		
Johnson, P. J., Blewett, L. A., Call, K. T. and Davern, M.	2010	American Indian/Alaska Native uninsurance disparities: a comparison of 3 surveys	Am J Public Health
<u>HRS</u>			
		Social engagement and physical and cognitive health among American Indian participants in the health and retirement study	J Cross Cult Gerontol
Nelson, L. A., Noonan, C. J., Goldberg, J. and Buchwald, D. S.	2013		
		Prostate Cancer Screening Among American Indians and Alaska Natives: The Health and Retirement Survey, 1996-2008	Prev Chronic Dis
Goins, R. T., Schure, M. B., Noonan, C. and Buchwald, D.	2015		
<u>NSFG</u>			
		The challenge of fetal mortality	NCHS Data Brief
Maccorman, M. F. and Kirmeyer, S.	2009		
		Reproductive health and sexual violence among urban American Indian and Alaska Native young women: select findings from the National Survey of Family Growth (2002)	Matern Child Health J
Rutman, S., Taulii, M., Ned, D. and Tetrick, C.	2012		
		Vital signs: births to teens aged 15-17 years-United States, 1991-2012	MMWR Morb Mortal Wkly Rep
Cox, S., Pazol, K., Warner, L., Romero, L., Spitz, A., Gavin, L. and Barfield, W.	2014		
<u>NSDUH</u>			
		Adult tobacco use among racial and ethnic groups living in the United States, 2002-2005	Prev Chronic Dis
Caraballo, R. S., Yee, S. L., Gfroerer, J. and Mirza, S. A.	2008		

Author	Year	Title	Journal
Blazer, D. G. and Wu, L. T.	2009	Nonprescription use of pain relievers by middle-aged and elderly community-living adults: National Survey on Drug Use and Health	J Am Geriatr Soc
Cummings, J. R., Wen, H. and Druss, B. G.	2011	Racial/ethnic differences in treatment for substance use disorders among U.S. adolescents	J Am Acad Child Adolesc Psychiatry
Cunningham, J. K., Solomon, T. A. and Muramoto, M. L.	2016	Alcohol use among Native Americans compared to whites: Examining the veracity of the 'Native American elevated alcohol consumption' belief	Drug Alcohol Depend

NSCH

Probst, J. C., Wang, J. Y., Martin, A. B., Moore, C. G., Paul, B. M. and Samuels, M. E.	2008	Potentially violent disagreements and parenting stress among American Indian/Alaska Native families: analysis across seven states	Matern Child Health J
Singh, G. K., Siahpush, M. and Kogan, M. D.	2010	Disparities in children's exposure to environmental tobacco smoke in the United States, 2007	Pediatrics
Singh, G. K., Siahpush, M. and Kogan, M. D.	2010	Rising social inequalities in US childhood obesity, 2003-2007	Ann Epidemiol
Barradas, D. T., Kroelinger, C. D. and Kogan, M. D.	2012	Medical home access among American Indian and Alaska Native children in 7 states: National Survey of Children's Health	Matern Child Health J
Lau, M., Lin, H. and Flores, G.	2012	Factors associated with human papillomavirus vaccine-series initiation and healthcare provider recommendation in US adolescent females: 2007 National Survey of Children's Health	Vaccine
Lau, M., Lin, H. and Flores, G.	2012	Racial/ethnic disparities in health and health care among U.S. adolescents	Health Serv Res
Ness, M., Barradas, D. T., Irving, J. and Manning, S. E.	2012	Correlates of overweight and obesity among American Indian/Alaska Native and Non-Hispanic white children and adolescents: National Survey of Children's Health, 2007	Matern Child Health J

NHANES

Author	Year	Title	Journal
Bray, G., Gregg, E., Haffner, S., Pi-Sunyer, X. F., Wagenknecht, L. E., Walkup, M. and Wing, R.	2006	Baseline characteristics of the randomised cohort from the Look AHEAD (Action for Health in Diabetes) study	Diab Vasc Dis Res
Boyer, B. B., Mohatt, G. V., Plaetke, R., Herron, J., Stanhope, K. L., Stephensen, C. and Havel, P. J.	2007	Metabolic syndrome in Yup'ik Eskimos: the Center for Alaska Native Health Research (CANHR) Study	Obesity (Silver Spring)
Mohatt, G. V., Plaetke, R., Klejka, J., Luick, B., Lardon, C., Bersamin, A., Hopkins, S., Dondanville, M., Herron, J. and Boyer, B.	2007	The Center for Alaska Native Health Research Study: a community-based participatory research study of obesity and chronic disease-related protective and risk factors	Int J Circumpolar Health
Schumacher, C., Ferucci, E. D., Lanier, A. P., Slaterry, M. L., Schraer, C. D., Raymer, T. W., Dillard, D., Murtaugh, M. A. and Tom-Orme, L.	2008	Metabolic syndrome: prevalence among American Indian and Alaska native people living in the southwestern United States and in Alaska	Metab Syndr Relat Disord
Redwood, D. G., Lanier, A. P., Johnston, J. M., Asay, E. D. and Slaterry, M. L.	2010	Chronic disease risk factors among Alaska Native and American Indian people, Alaska, 2004-2006	Prev Chronic Dis
Batliner, T., Wilson, A. R., Tiwari, T., Glueck, D., Henderson, W., Thomas, J., Braun, P., Cudeii, D., Quissell, D. and Albino, J.	2014	Oral health status in Navajo Nation Head Start children	J Public Health Dent
Tanamas, S. K., Hanson, R. L., Nelson, R. G. and Knowler, W. C.	2017	Effect of different methods of accounting for antihypertensive treatment when assessing the relationship between diabetes or obesity and systolic blood pressure	J Diabetes Complications
<u>CHIS</u>			
Ahn, M. K., Juon, H. S. and Gittelsohn, J.	2008	Association of race/ethnicity, socioeconomic status, acculturation, and environmental factors with risk of overweight among adolescents in California, 2003	Prev Chronic Dis
Crawley, L. M., Ahn, D. K. and Winkleby, M. A.	2008	Perceived medical discrimination and cancer screening behaviors of racial and ethnic minority adults	Cancer Epidemiol Biomarkers Prev
Lopez, E. D., Khoury, A. J., Dailey, A. B., Hall, A. G. and Chisholm, L. R.	2009	Screening mammography: a cross-sectional study to compare characteristics of women aged 40 and older from the deep South who are current, overdue, and never screeners	Womens Health Issues

Author	Year	Title	Journal
Eberth, J. M., Huber, J. C., Jr. and Rene, A.	2010	Breast cancer screening practices and correlates among American Indian and Alaska native women in California, 2003	Womens Health Issues
Bryant, A. N. and Kim, G.	2012	Racial/ethnic differences in prevalence and correlates of binge drinking among older adults	Aging Ment Health
Kim, G., Bryant, A. N. and Parmelee, P.	2012	Racial/ethnic differences in serious psychological distress among older adults in California	Int J Geriatr Psychiatry
Kim, G., Ford, K. L., Chiriboga, D. A. and Sorkin, D. H.	2012	Racial and ethnic disparities in healthcare use, delayed care, and management of diabetes mellitus in older adults in California	J Am Geriatr Soc
Peart, T. and Crawford, P. B.	2012	Trends in nutrition and exercise counseling among adolescents in the health care environment	J Environ Public Health
Babey, S. H., Hastert, T. A. and Wolstein, J.	2013	Adolescent sedentary behaviors: correlates differ for television viewing and computer use	J Adolesc Health
Nguyen, A. B., Moser, R. and Chou, W. Y.	2014	Race and health profiles in the United States: an examination of the social gradient through the 2009 CHIS adult survey	Public Health
Chikani, V., Brophy, M., Vossbrink, A., Hussaini, K., Salvino, C., Skubic, J. and Martinez, R.	2015	Association of insurance status with health outcomes following traumatic injury: statewide multicenter analysis	West J Emerg Med
Ejebe, I. H., Jacobs, E. A. and Wisk, L. E.	2015	Persistent differences in asthma self-efficacy by race, ethnicity, and income in adults with asthma	J Asthma
<u>NHIS</u>			
Barnes, P. M., Adams, P. F. and Powell-Griner, E.	2008	Health characteristics of the Asian adult population: United States, 2004-2006	Adv Data
Barnes, P. M., Bloom, B. and Nahin, R. L.	2008	Complementary and alternative medicine use among adults and children: United States, 2007	Natl Health Stat Report
Brim, S. N., Rudd, R. A., Funk, R. H. and Callahan, D. B.	2008	Asthma prevalence among US children in underrepresented minority populations: American Indian/Alaska Native, Chinese, Filipino, and Asian Indian	Pediatrics

Author	Year	Title	Journal
Elliott, M. N., Finch, B. K., Klein, D., Ma, S., Do, D. P., Beckett, M. K., Orr, N. and Lurie, N.	2008	Sample designs for measuring the health of small racial/ethnic subgroups	Stat Med
Marks, S. M., Deluca, N. and Walton, W.	2008	Knowledge, attitudes and risk perceptions about tuberculosis: US National Health Interview Survey	Int J Tuberc Lung Dis
Pleis, J. R. and Barnes, P. M.	2008	A comparison of respiratory conditions between multiple race adults and their single race counterparts: an analysis based on American Indian/Alaska Native and white adults	Ethn Health
Sabatino, S. A., Coates, R. J., Uhler, R. J., Breen, N., Tangka, F. and Shaw, K. M.	2008	Disparities in mammography use among US women aged 40-64 years, by race, ethnicity, income, and health insurance status, 1993 and 2005	Med Care
Harper, S., Lynch, J., Meersman, S. C., Breen, N., Davis, W. W. and Reichman, M. C.	2009	Trends in area-socioeconomic and race-ethnic disparities in breast cancer incidence, stage at diagnosis, screening, mortality, and survival among women ages 50 years and over (1987-2005)	Cancer Epidemiol Biomarkers Prev
Barnes, P. M., Adams, P. F. and Powell-Griner, E.	2010	Health characteristics of the American Indian or Alaska Native adult population: United States, 2004-2008	Natl Health Stat Report
Bolen, J., Schieb, L., Hootman, J. M., Helmick, C. G., Theis, K., Murphy, L. B. and Langmaid, G.	2010	Differences in the prevalence and severity of arthritis among racial/ethnic groups in the United States, National Health Interview Survey, 2002, 2003, and 2006	Prev Chronic Dis
Johnson, P. J., Blewett, L. A., Call, K. T. and Davern, M.	2010	American Indian/Alaska Native uninsurance disparities: a comparison of 3 surveys	Am J Public Health
Johnson, P. J., Carlson, K. F. and Hearst, M. O.	2010	Healthcare disparities for American Indian veterans in the United States: a population-based study	Med Care
Tangka, F. K., O'Hara, B., Gardner, J. G., Turner, J., Royalty, J., Shaw, K., Sabatino, S., Hall, I. J. and Coates, R. J.	2010	Meeting the cervical cancer screening needs of underserved women: the National Breast and Cervical Cancer Early Detection Program, 2004-2006	Cancer Causes Control
Law, H. Z., Oraka, E. and Mannino, D. M.	2011	The role of income in reducing racial and ethnic disparities in emergency room and urgent care center visits for asthma-United States, 2001-2009	J Asthma

Author	Year	Title	Journal
Orell, L. J., Ferucci, E. D., Lanier, A. P. and Etzel, R. A.	2011	Self-reported asthma among American Indian and Alaska Native people in Alaska	J Health Care Poor Underserved
Singh, G. K., Siahpush, M., Hiatt, R. A. and Timsina, L. R.	2011	Dramatic increases in obesity and overweight prevalence and body mass index among ethnic-immigrant and social class groups in the United States, 1976-2008	J Community Health
Oraka, E., Iqbal, S., Flanders, W. D., Brinker, K. and Garbe, P.	2013	Racial and ethnic disparities in current asthma and emergency department visits: findings from the National Health Interview Survey, 2001-2010	J Asthma
Jamal, A., Agaku, I. T., O'Connor, E., King, B. A., Kenemer, J. B. and Neff, L.	2014	Current cigarette smoking among adults-- United States, 2005-2013	MMWR Morb Mortal Wkly Rep
Jamal, A., Homa, D. M., O'Connor, E., Babb, S. D., Caraballo, R. S., Singh, T., Hu, S. S. and King, B. A.	2015	Current cigarette smoking among adults - United States, 2005-2014	MMWR Morb Mortal Wkly Rep
Bullock, A., Burrows, N. R., Narva, A. S., Sheff, K., Hora, I., Lekachvili, A., Cain, H. and Espey, D.	2017	Vital Signs: Decrease in Incidence of Diabetes-Related End-Stage Renal Disease among American Indians/Alaska Natives - United States, 1996-2013	MMWR Morb Mortal Wkly Rep
<u>NHIS</u>			
Barnes, P. M., Adams, P. F. and Powell-Griner, E.	2008	Health characteristics of the Asian adult population: United States, 2004-2006	Adv Data
Barnes, P. M., Bloom, B. and Nahin, R. L.	2008	Complementary and alternative medicine use among adults and children: United States, 2007	Natl Health Stat Report
Brim, S. N., Rudd, R. A., Funk, R. H. and Callahan, D. B.	2008	Asthma prevalence among US children in underrepresented minority populations: American Indian/Alaska Native, Chinese, Filipino, and Asian Indian	Pediatrics
Elliott, M. N., Finch, B. K., Klein, D., Ma, S., Do, D. P., Beckett, M. K., Orr, N. and Lurie, N.	2008	Sample designs for measuring the health of small racial/ethnic subgroups	Stat Med
Marks, S. M., Deluca, N. and Walton, W.	2008	Knowledge, attitudes and risk perceptions about tuberculosis: US National Health Interview Survey	Int J Tuberc Lung Dis

Author	Year	Title	Journal
Pleis, J. R. and Barnes, P. M.	2008	A comparison of respiratory conditions between multiple race adults and their single race counterparts: an analysis based on American Indian/Alaska Native and white adults	Ethn Health
Sabatino, S. A., Coates, R. J., Uhler, R. J., Breen, N., Tangka, F. and Shaw, K. M.	2008	Disparities in mammography use among US women aged 40-64 years, by race, ethnicity, income, and health insurance status, 1993 and 2005	Med Care
Harper, S., Lynch, J., Meersman, S. C., Breen, N., Davis, W. W. and Reichman, M. C.	2009	Trends in area-socioeconomic and race-ethnic disparities in breast cancer incidence, stage at diagnosis, screening, mortality, and survival among women ages 50 years and over (1987-2005)	Cancer Epidemiol Biomarkers Prev
Barnes, P. M., Adams, P. F. and Powell-Griner, E.	2010	Health characteristics of the American Indian or Alaska Native adult population: United States, 2004-2008	Natl Health Stat Report
Bolen, J., Schieb, L., Hootman, J. M., Helmick, C. G., Theis, K., Murphy, L. B. and Langmaid, G.	2010	Differences in the prevalence and severity of arthritis among racial/ethnic groups in the United States, National Health Interview Survey, 2002, 2003, and 2006	Prev Chronic Dis
Johnson, P. J., Blewett, L. A., Call, K. T. and Davern, M.	2010	American Indian/Alaska Native uninsurance disparities: a comparison of 3 surveys	Am J Public Health
Johnson, P. J., Carlson, K. F. and Hearst, M. O.	2010	Healthcare disparities for American Indian veterans in the United States: a population-based study	Med Care
Tangka, F. K., O'Hara, B., Gardner, J. G., Turner, J., Royalty, J., Shaw, K., Sabatino, S., Hall, I. J. and Coates, R. J.	2010	Meeting the cervical cancer screening needs of underserved women: the National Breast and Cervical Cancer Early Detection Program, 2004-2006	Cancer Causes Control
Law, H. Z., Oraka, E. and Mannino, D. M.	2011	The role of income in reducing racial and ethnic disparities in emergency room and urgent care center visits for asthma-United States, 2001-2009	J Asthma J Health Care
Orell, L. J., Ferucci, E. D., Lanier, A. P. and Etzel, R. A.	2011	Self-reported asthma among American Indian and Alaska Native people in Alaska	Poor Underserved

Author	Year	Title	Journal
Singh, G. K., Siahpush, M., Hiatt, R. A. and Timsina, L. R.	2011	Dramatic increases in obesity and overweight prevalence and body mass index among ethnic-immigrant and social class groups in the United States, 1976-2008	J Community Health
Oraka, E., Iqbal, S., Flanders, W. D., Brinker, K. and Garbe, P.	2013	Racial and ethnic disparities in current asthma and emergency department visits: findings from the National Health Interview Survey, 2001-2010	J Asthma
Jamal, A., Agaku, I. T., O'Connor, E., King, B. A., Kenemer, J. B. and Neff, L.	2014	Current cigarette smoking among adults-- United States, 2005-2013	MMWR Morb Mortal Wkly Rep
Jamal, A., Homa, D. M., O'Connor, E., Babb, S. D., Caraballo, R. S., Singh, T., Hu, S. S. and King, B. A.	2015	Current cigarette smoking among adults - United States, 2005-2014	MMWR Morb Mortal Wkly Rep
Bullock, A., Burrows, N. R., Narva, A. S., Sheff, K., Hora, I., Lekiachvili, A., Cain, H. and Espey, D.	2017	Vital Signs: Decrease in Incidence of Diabetes-Related End-Stage Renal Disease among American Indians/Alaska Natives - United States, 1996-2013	MMWR Morb Mortal Wkly Rep
<u>BRFSS</u>			
Centers for Disease Control and Prevention	2007	Prevalence of stroke--United States, 2005	MMWR Morb Mortal Wkly Rep
Tann, S. S., Yabiku, S. T., Okamoto, S. K. and Yanow, J.	2007	triADD: the risk for alcohol abuse, depression, and diabetes multimorbidity in the American Indian and Alaska Native populations	Am Indian Alsk Native Ment Health Res
Centers for Disease Control and Prevention	2008	Racial/ethnic disparities in self-rated health status among adults with and without disabilities--United States, 2004-2006	MMWR Morb Mortal Wkly Rep
Balluz, L. S., Okoro, C. A. and Mokdad, A.	2008	Association between selected unhealthy lifestyle factors, body mass index, and chronic health conditions among individuals 50 years of age or older, by race/ethnicity	Ethn Dis
Chowdhury, P. P., Balluz, L. and Strine, T. W.	2008	Health-related quality of life among minority populations in the United States, BRFSS 2001-2002	Ethn Dis

Author	Year	Title	Journal
Jones, C. P., Truman, B. I., Elam-Evans, L. D., Jones, C. A., Jones, C. Y., Jiles, R., Rumisha, S. F. and Perry, G. S.	2008	Using "socially assigned race" to probe white advantages in health status	Ethn Dis
Li, C., Ford, E. S., Strine, T. W. and Mokdad, A. H.	2008	Prevalence of depression among U.S. adults with diabetes: findings from the 2006 behavioral risk factor surveillance system	Diabetes Care
Lindley, M. C., Groom, A. V., Wortley, P. M. and Euler, G. L.	2008	Status of influenza and pneumococcal vaccination among older American Indians and Alaska Natives	Am J Public Health
Loveland, K. M., Kessler, A. C., Helgeson, S. D. and Harwell, T. S.	2008	Is there a disparity in the prevalence of asthma between American Indian and white adults?	J Asthma
McGuire, L. C., Okoro, C. A., Goins, R. T. and Anderson, L. A.	2008	Characteristics of American Indian and Alaska native adult caregivers, Behavioral Risk Factor Surveillance System, 2000	Ethn Dis
Zhao, G., Ford, E. S. and Mokdad, A. H.	2008	Racial/ethnic variation in hypertension-related lifestyle behaviours among US women with self-reported hypertension	J Hum Hypertens
Lee, S., Satter, D. E. and Ponce, N. A.	2009	Effect of race and ethnicity classification on survey estimates: Anomaly of the weighted totals of American Indians and Alaska Natives	Am Indian Alsk Native Ment Health Res
Roberts, H., Jiles, R., Mokdad, A., Beckles, G. and Rios-Burrows, N.	2009	Trend analysis of diagnosed diabetes prevalence among American Indian/Alaska native young adults--United States, 1994-2007	Ethn Dis
Centers for Disease Control and Prevention	2010	Vital signs: breast cancer screening among women aged 50-74 years - United States, 2008	MMWR Morb Mortal Wkly Rep
Dent, C. W., Maher, J. E., Pizacani, B. A., Dowler, D. W., Rohde, K. and Peterson, E.	2010	Secondhand smoke exposure in Alaskan households with children	Rural Remote Health
Jernigan, V. B., Duran, B., Ahn, D. and Winkleby, M.	2010	Changing patterns in health behaviors and risk factors related to cardiovascular disease among American Indians and Alaska Natives	Am J Public Health
Liao, Y., Tucker, P., Siegel, P., Liburd, L. and Giles, W. H.	2010	Decreasing disparity in cholesterol screening in minority communities--findings from the racial and ethnic approaches to community health 2010	J Epidemiol Community Health

Author	Year	Title	Journal
Poltavski, D., Holm, J., Vogeltanz-Holm, N. and McDonald, L.	2010	Assessing health-related quality of life in Northern Plains American Indians: prominence of physical activity as a health behavior	Am Indian Alsk Native Ment Health Res
Tangka, F. K., O'Hara, B., Gardner, J. G., Turner, J., Royalty, J., Shaw, K., Sabatino, S., Hall, I. J. and Coates, R. J.	2010	Meeting the cervical cancer screening needs of underserved women: the National Breast and Cervical Cancer Early Detection Program, 2004-2006	Cancer Causes Control
Amparo, P., Farr, S. L. and Dietz, P. M.	2011	Chronic disease risk factors among American Indian/Alaska Native women of reproductive age	Prev Chronic Dis
Bratter, J. L. and Gorman, B. K.	2011	Does multiracial matter? A study of racial disparities in self-rated health	Demography Prog
Brega, A. G., Noe, T., Loudhawk-Hedgepeth, C., Jim, D. M., Morse, B., Moore, K. and Manson, S. M.	2011	Cardiovascular knowledge among urban American Indians and Alaska Natives: first steps in addressing cardiovascular health	Community Health Partnersh
Dee, D. L., Bensyl, D. M., Gindler, J., Truman, B. I., Allen, B. G., D'Mello, T., Perez, A., Kamimoto, L., Biggerstaff, M., Blanton, L., Fowlkes, A., Glover, M. J., Swerdlow, D. L. and Finelli, L.	2011	Racial and ethnic disparities in hospitalizations and deaths associated with 2009 pandemic Influenza A (H1N1) virus infections in the United States	Ann Epidemiol
Liao, Y., Bang, D., Cosgrove, S., Dulin, R., Harris, Z., Taylor, A., White, S., Yatabe, G., Liburd, L. and Giles, W.	2011	Surveillance of health status in minority communities - Racial and Ethnic Approaches to Community Health Across the U.S. (REACH U.S.) Risk Factor Survey, United States, 2009	MMWR Surveill Summ
Lieb, S., Fallon, S. J., Friedman, S. R., Thompson, D. R., Gates, G. J., Liberti, T. M. and Malow, R. M.	2011	Statewide estimation of racial/ethnic populations of men who have sex with men in the U.S	Public Health Rep
Watanabe-Galloway, S., Flom, N., Xu, L., Duran, T., Frerichs, L., Kennedy, F., Smith, C. B. and Jaiyeola, A. O.	2011	Cancer-related disparities and opportunities for intervention in Northern Plains American Indian communities	Public Health Rep
Wong, C. A., Jim, M. A., King, J., Tom-Orme, L., Henderson, J. A., Saraiya, M., Richardson, L. C., Layne, L., Suryaprasad, A. and Espey, D. K.	2011	Impact of hysterectomy and bilateral oophorectomy prevalence on rates of cervical, uterine, and ovarian cancer among American Indian and Alaska Native women, 1999-2004	Cancer Causes Control

Author	Year	Title	Journal
Centers for Disease Control and Prevention	2012	Prevalence of stroke--United States, 2006-2010	MMWR Morb Mortal Wkly Rep
Biggerstaff, M., Jhung, M., Kamimoto, L., Balluz, L. and Finelli, L.	2012	Self-reported influenza-like illness and receipt of influenza antiviral drugs during the 2009 pandemic, United States, 2009-2010	Am J Public Health
Denny, C. H., Floyd, R. L., Green, P. P. and Hayes, D. K.	2012	Racial and ethnic disparities in preconception risk factors and preconception care	J Womens Health (Larchmt)
Luncheon, C. and Zack, M.	2012	Health-related quality of life among US veterans and civilians by race and ethnicity	Prev Chronic Dis
Miller, J. W., King, J. B., Joseph, D. A. and Richardson, L. C.	2012	Breast cancer screening among adult women--Behavioral Risk Factor Surveillance System, United States, 2010	MMWR Suppl
Mushtaq, N., Williams, M. B. and Beebe, L. A.	2012	Concurrent use of cigarettes and smokeless tobacco among US males and females	J Environ Public Health
Nuno, T., Gerald, J. K., Harris, R., Martinez, M. E., Estrada, A. and Garcia, F.	2012	Comparison of breast and cervical cancer screening utilization among rural and urban Hispanic and American Indian women in the Southwestern United States	Cancer Causes Control
Wolfe, B., Jakubowski, J., Haveman, R. and Courey, M.	2012	The income and health effects of tribal casino gaming on American Indians	Demography
Cole, A. M., Jackson, J. E. and Doescher, M.	2013	Colorectal cancer screening disparities for rural minorities in the United States	J Prim Care Community Health
Dilley, J. A., Peterson, E., Bobo, M., Pickle, K. E. and Rohde, K.	2013	Tobacco use prevalence--disentangling associations between Alaska Native race, low socio-economic status and rural disparities	Int J Circumpolar Health
Dilley, J. A., Peterson, E., Hiratsuka, V. Y. and Rohde, K.	2013	Discovering unique tobacco use patterns among Alaska Native people	Int J Circumpolar Health
Rohde, K., Boles, M., Bushore, C. J., Pizacani, B. A., Maher, J. E. and Peterson, E.	2013	Smoking-related knowledge, attitudes, and behaviors among Alaska Native people: a population-based study	Int J Circumpolar Health
Benard, V. B., Thomas, C. C., King, J., Massetti, G. M., Doria-Rose, V. P. and Saraiya, M.	2014	Vital signs: cervical cancer incidence, mortality, and screening - United States, 2007-2012	MMWR Morb Mortal Wkly Rep

Author	Year	Title	Journal
Hutchinson, R. N. and Shin, S.	2014	Systematic review of health disparities for cardiovascular diseases and associated factors among American Indian and Alaska Native populations	PLoS One
Johnson, P. J., Ghildayal, N., Rockwood, T. and Everson-Rose, S. A.	2014	Differences in diabetes self-care activities by race/ethnicity and insulin use	Diabetes Educ
Johnson-Jennings, M. D., Tarraf, W., Xavier Hill, K. and Gonzalez, H. M.	2014	United States colorectal cancer screening practices among American Indians/Alaska Natives, blacks, and non-Hispanic whites in the new millennium (2001 to 2010)	Cancer
Liss, D. T. and Baker, D. W.	2014	Understanding current racial/ethnic disparities in colorectal cancer screening in the United States: the contribution of socioeconomic status and access to care	Am J Prev Med
Ford, C. L., Godette, D. C., Mulatu, M. S. and Gaines, T. L.	2015	Recent HIV Testing Prevalence, Determinants, and Disparities Among U.S. Older Adult Respondents to the Behavioral Risk Factor Surveillance System	Sex Transm Dis
Cunningham, J. K., Solomon, T. A. and Muramoto, M. L.	2016	Alcohol use among Native Americans compared to whites: Examining the veracity of the 'Native American elevated alcohol consumption' belief	Drug Alcohol Depend
Liu, Y., Wheaton, A. G., Chapman, D. P., Cunningham, T. J., Lu, H. and Croft, J. B.	2016	Prevalence of Healthy Sleep Duration among Adults--United States, 2014	MMWR Morb Mortal Wkly Rep
Dwojak, S. and Bhattacharyya, N.	2017	Racial disparities in preventable risk factors for head and neck cancer	Laryngoscope

Appendix B. Survey Questionnaires

BRFSS

Q1. Are you Hispanic, Latino/a, or Spanish origin?

Mexican, Mexican American, Chicano/a

Puerto Rican

Cuban

Another Hispanic, Latino/a, or Spanish origin

(Do not read) No

Q2. Which one or more of the following would you say is your race?

White

Black or African American

American Indian or Alaska Native

Pacific Islander

Native Hawaiian

Guamanian or Chamorro

Samoan

Other Pacific Islander

Asian

Asian Indian

Chinese

Filipino

Japanese

Korean

Vietnamese

Other Asian

(Do not read) Other

CHIS

Q1. Are you Latino or Hispanic?

Yes/No

Q2. [You said you are Latino or Hispanic. Also,] please tell me which one or more of the following you would use to describe yourself. Would you describe yourself as Native Hawaiian, Other Pacific Islander, American Indian, Alaska Native, Asian, Black, African American, or White?

White/ Black or African American / Asian

American Indian or Alaska Native

Native Hawaiian/ Other Pacific Islander

Other (Specify: _____)

Q3. You said, American Indian or Alaska Native, and what is your tribal heritage? If you have more than one tribe, tell me all of them.

Apache

Blackfoot/Blackfeet

Cherokee

Choctaw

Mexican American Indian

Navajo

Pomo

Pueblo

Sioux

Yaqui

Other Tribe (Specify: _____)

Q4. Are you an enrolled member in a federally or state recognized tribe?

Yes/ No

Q5. Which tribe are you enrolled in?

Apache

Mescalero Apache, NM

Apache (not specified) / Other Apache (Specify _____)

Blackfoot/Blackfeet

Cherokee: Western Cherokee

Cherokee (not specified)

Other Cherokee (Specify _____)

Choctaw: Choctaw Oklahoma

Choctaw (not specified)

Other Choctaw (Specify _____)

Navajo, Navajo (not specified)

Pomo: Hopland Band, Hopland Rancheria

Sherwood Valley Rancheria

Pomo (not specified)

Other Pomo (Specify _____)

Pueblo: HOPI

Ysleta Del Sur Pueblo of Texas

Pueblo (not specified)

Other Pueblo (Specify _____)

Sioux: Oglala/Pine Ridge Sioux

Sioux (not specified)

Other Sioux (Specify _____)

Yaqui/ Pascua Yaqui Tribe of Arizona

Yaqui (not specified)/ Other Yaqui (Specify _____)

Other Tribe (Specify: _____)

Q6. You said that you are: [Insert Multiple Responses from Race questions]

Q7. Do you identify with any one race in particular?

Yes/No

Q8. Which do you most identify with?

MCBS

Q1. [Are you/Is (SP)] of Hispanic, (Latino/Latina), or Spanish origin?

YES

NO

Don't Know

Refused

Q2. Looking at this card, [are you/is SP] Mexican, Mexican American, or (Chicano/Chicana), Puerto Rican, Cuban, or of another Hispanic, (Latino/Latina) or Spanish origin?

CHECK ALL THAT APPLY.

MEXICAN/MEXICAN AMERICAN/CHICANO(A)

PUERTO RICAN

CUBAN

OTHER HISPANIC, LATINO(A), OR SPANISH ORIGIN

Don't Know

Refused

Q3. Looking at this card, what is [your/(SP's)] race? [EXPLAIN IF NECESSARY: For this survey, Hispanic origins are not races.]

CHECK ALL THAT APPLY.

AMERICAN INDIAN OR ALASKA NATIVE

ASIAN

BLACK OR AFRICAN AMERICAN

NATIVE HAWAIIAN OR OTHER PACIFIC ISLANDER

WHITE

SOME OTHER RACE

Don't Know

Refused

NHANES

Q1. [Do you/Does SP] consider [yourself/himself/herself] to be Hispanic or Latino?

Yes

No

Q1a. [If Q1=Yes] Where [do your/do his/do her] ancestors come from?

Q2. Please look at the categories on this card. What race or races [do you/does SP] consider [yourself/himself/herself] to be? Please select one or more.

American Indian or Alaska Native

Asian

Black or African American

Native Hawaiian or Pacific Islander

White

Other

NHIS

Q1. [Do you/does ALIAS] consider [yourself/himself/herself] to be Hispanic or Latino?
Yes/ No

Q1a. [If Q1=Yes] Where did [your/ALIAS's] ancestors come from?

Q2. What race or races [do you/does ALIAS] consider [yourself/himself/herself] to be? Please select 1 or more of these categories:

White
Black/African American
Indian (American)
Alaska Native
Native Hawaiian
Guamanian or Chamorro
Samoan
Other Pacific Islander
Asian Indian
Chinese
Filipino
Japanese
Korean
Vietnamese
Other Asian
Some other race

NSCH

Q1. Is [selected child] of Hispanic, Latino, or Spanish origin?

Yes
No
Don't know
Refused

(Hispanic or Latino includes Mexican, Mexican-American, Central American, South American or Puerto Rican, Cuban, or other Spanish-Caribbean)

Q2. Please choose one or more of the following categories to describe [selected child]'s race. Mark all that apply

White/Caucasian
Black/African-American
American Indian/Native American
Alaska Native
Asian
Native Hawaiian
Pacific Islander
Other
Don't know
Refused

NSDUH

Q1. Are you of Hispanic, Latino, or Spanish origin or descent?

Yes

No

Q2. Which of these groups describes you? Just give me the number or numbers from the card.

White

Black Or African American

American Indian or Alaska Native (American Indian includes North American, Central American, and South American Indians)

Native Hawaiian

Guamanian or Chamorro

Samoan

Other Pacific Islander

Asian (Including: Asian Indian, Chinese, Filipino, Japanese, Korean, and Vietnamese)

Other (Specify)

PATH

Q1. Are you Hispanic, [Latino I Latina I Latino or Latina], or of Spanish origin? Choose all that apply.

No, not of Hispanic, [Latino I Latina I Latino or Latina], or Spanish origin

Yes, Mexican, Mexican American, [Chicano I Chicana I Chicano or Chicana]

Yes, Puerto Rican

Yes, Cuban

Yes, Another Hispanic, [Latino I Latina I Latino or Latina], or Spanish origin

Q2. What is your race? Choose all that apply.

White

Black or African American

American Indian or Alaska Native

Asian Indian

Chinese

Filipino

Japanese

Korean

Vietnamese

Other Asian

Native Hawaiian

Guamanian or Chamorro

Samoan

Other Pacific Islander

Appendix C. Methodology used for re-weighting CHIS 2011-2012 and 2013-2014 data

1.1.6. Raking dimensions

Based on recommendations detailed in “Memo_CHIS Reweighting (11.21.2018).docx”, there were a total of 9 dimensions initially considered for reweighting. Detailed categories within each dimension are as follows:

NEWDIM1: Ag

- 1 = "AGES 0-5"
- 2 = "AGES 6-11"
- 3 = "AGES 12-17"
- 4 = "AGES 18-24"
- 5 = "AGES 25-29"
- 6 = "AGES 30-39"
- 7 = "AGES 40-49"
- 8 = "AGES 50-64"
- 9 = "AGES 65+"

NEWDIM2: Age x Sex

- 11 = "0-3: MEN"
- 21 = "4-7: MEN"
- 31 = "8-11: MEN"
- 41 = "12-14: MEN"
- 51 = "15-17: MEN"
- 61 = "18-24: MEN"
- 71 = "25-30: MEN"
- 81 = "31-37: MEN"
- 91 = "38-45: MEN"
- 101 = "46-53: MEN"
- 111 = "54-64: MEN"
- 121 = "65-77: MEN"
- 131 = "78+: MEN"

12 = "0-3: WOMEN"
22 = "4-7: WOMEN"
32 = "8-11: WOMEN"
42 = "12-14: WOMEN"
52 = "15-17: WOMEN"
62 = "18-24: WOMEN"
72 = "25-30: WOMEN"
82 = "31-37: WOMEN"
92 = "38-45: WOMEN"
102 = "46-53: WOMEN"
112 = "54-64: WOMEN"
122 = "65-77: WOMEN"
132 = "78+: WOMEN";

NEWDIM3 Age x Race/ethnicity

1 = "0-11"
2 = "12-17"
10 = "18+: LATINO"
20 = "18+: WHITE"
30 = "18+: AFRICAN AMERICAN"
40 = "18+: AIAN"
50 = "18+: ASIAN"
60 = "18+: NHOPI"
70 = "18+: OTHER/MULTIPLE"

NEWDIM4: Age x Race/ethnicity x Gender

111 = "0-17: LATINO MEN"
211 = "0-17: WHITE MEN"
311 = "0-17: BLACK MEN"
511 = "0-17: ASIAN MEN"
711 = "0-17: 2+ RACES MEN"
121 = "0-17: LATINO WOMEN"
221 = "0-17: WHITE WOMEN"
321 = "0-17: BLACK WOMEN"
521 = "0-17: ASIAN WOMEN"
721 = "0-17: 2+ RACES WOMEN"
112 = "18+: LATINO MEN"

212 = "18+: WHITE MEN"
312 = "18+: BLACK MEN"
512 = "18+: ASIAN MEN"
712 = "18+: 2+ RACES MEN"
122 = "18+: LATINO WOMEN"
222 = "18+: WHITE WOMEN"
322 = "18+: BLACK WOMEN"
522 = "18+: ASIAN WOMEN"
722 = "18+: 2+ RACES WOMEN"
9410 = "ALL AGES: AIAN MEN"
9420 = "ALL AGES: AIAN WOMEN"
9600 = "ALL AGES: NHOPI"

NEWDIM5: Age x Asian Ethnicity

11 = "0-17: CHINESE ONLY"
21 = "0-17: KOREAN ONLY"
31 = "0-17: FILIPINO ONLY"
41 = "0-17: VIETNAMESE ONLY"
51 = "0-17: JAPANESE ONLY"
61 = "0-17: OTHER/NON-ASIAN"
12 = "18+: CHINESE ONLY"
22 = "18+: KOREAN ONLY"
32 = "18+: FILIPINO ONLY"
42 = "18+: VIETNAMESE ONLY"
52 = "18+: JAPANESE ONLY"
62 = "18+: OTHER/NON-ASIAN"

NEWDIM6: Age x Education

0 = "0-17"
1 = "18+: <HS"
2 = "18+: HS"
3 = "18+: >HS"

NEWDIM7: Home ownership x Age x Counts of adults/Education

1 = "OWN: 0-17: 1 ADULT"
2 = "OWN: 0-17: 2+ ADULTS"
3 = "OWN: 18-30: <=HS"

- 4 = "OWN: 18-30: >HS"
- 5 = "OWN: 31-64: <=HS"
- 6 = "OWN: 31-64: >HS"
- 7 = "OWN: 65+: <=HS"
- 8 = "OWN: 65+: >HS"
- 11 = "RENT: 0-17: 1 ADULT"
- 12 = "RENT: 0-17: 2+ ADULTS"
- 13 = "RENT: 18-34: <=HS"
- 14 = "RENT: 18-34: >HS"
- 15 = "RENT: 35+: <=HS: 1 ADULT"
- 16 = "RENT: 35+: >HS: 1 ADULT"
- 17 = "RENT: 35+: <=HS: 2+ ADULTS"
- 18 = "RENT: 35+: >HS: 2+ ADULTS"

NEWDIM8: Age x Race

- 11 = "0-11: WHITE"
- 12 = "0-11: BLACK"
- 13 = "0-11: AIAN"
- 14 = "0-11: ASIAN"
- 15 = "0-11: NHOPI/OTHER"
- 16 = "0-11: 2+ RACES"
- 21 = "12-17: WHITE"
- 22 = "12-17: BLACK"
- 23 = "12-17: AIAN"
- 24 = "12-17: ASIAN"
- 25 = "12-17: NHOPI/OTHER"
- 26 = "12-17: 2+ RACES"
- 31 = "18+: WHITE"
- 32 = "18+: BLACK"
- 33 = "18+: AIAN"
- 34 = "18+: ASIAN"
- 35 = "18+: NHOPI"
- 36 = "18+: OTHER"
- 37 = "18+: 2+ RACES"

NEWDIM9: Age x AIAN Type

- 13 = "0-11: AIAN IN COMB"

- 14 = "0-11: NOT AIAN"
- 23 = "12-17: AIAN IN COMB"
- 24 = "12-17: NOT AIAN"
- 31 = "18+: LATINO SINGLE RACE AIAN"
- 32 = "18+: NONLATINO SINGLE RACE AIAN"
- 33 = "18+: AIAN IN COMB"
- 34 = "18+: NOT AIAN"
- 901 = "0-17: LATINO SINGLE RACE AIAN"
- 902 = "0-17: NONLATINO SINGLE RACE AIAN"

The summary of these reweighting dimensions is provided in Table A.C.1, and a comparison of original and revised weighting dimensions are in Table A.C.2 While NEWDIM1 through NEWDIM7 are replicates of CHIS standard raking dimensions, NEWDIM8 and NEWDIM9 were considered specifically for this project. Among these dimensions, NEWDIM1 and NEWDIM8 were excluded in reweighting. These excluded dimensions added complexity to raking, making standard raking procedure in R unworkable. At the same time, they are similar to other dimensions controlled. In particular, NEWDIM2 (Age x Sex) is a more detailed version of NEWDIM1 (Age); and NEWDIM4 (Age x Race/ethnicity) is similar to NEWDIM8 (Age x Race). Hence, while NEWDIM1 and NEWDIM8 were not explicitly controlled for in this reweighting, the loss of information is rather minimal as similar information was used in reweighting.

Table A.C.1. Summary of CHIS Reweighting Dimensions

Reweighting Dimensions Name	Dimensions Description	Relationship to CHIS Standard Weighting	Used in Reweighting
NEWDIM1	Age	Similar to Dimension2	No
NEWDIM2	Age x Sex	Similar to Dimension3	Yes
NEWDIM3	Age x Race/ethnicity	Similar to Dimension5	Yes
NEWDIM4	Age x Race/ethnicity x Gender	Similar to Dimension6	Yes

Reweighting Dimensions Name	Dimensions Description	Relationship to CHIS Standard Weighting	Used in Reweighting
NEWDIM5	Age x Asian Ethnicity	Similar to Dimension7	Yes
NEWDIM6	Age x Education	Similar to Dimension9	Yes
NEWDIM7	Home ownership x Age x Counts of adults/Education	Similar to Dimension11	Yes
NEWDIM8	Age x Race	Specific to this project	No
NEWDIM9	Age x AIAN type	Specific to this project	Yes

Table A.C.2 Comparison of Original and Revised weighting Dimensions – California Health Interview Survey 2011-2012 and 2013-2014

Dimension	Level	Description	Original		Revised	
			Categories	Categories	Categories	Categories
1	Region (R) (collapsed where necessary)	Age groups (3) x Sex (2)	11R 12R 21R 22R 31R 32R	Under 12 yrs, male Under 12 yrs, female 12 to 17 yrs, male 12 to 17 yrs, female 18+ yrs, male 18+ yrs, female	N/A	
2	Region (R) (collapsed where necessary)	Age groups (9)	R1 R2 R3 R4 R5 R6 R7 R8 R9	Under 6 yrs 6 to 11 yrs 12 to 17 yrs 18 to 24 yrs 25 to 29 yrs 30 to 39 yrs 40 to 49 yrs 50 to 64 yrs 65+ yrs	N/A	
3	State	Age groups (13) x Sex (2)	11 12 21 22 31 32 41 42 51 52 61 62 71 72 81 82 91 92 101 102 111 112	Under 4 yrs, male Under 4 yrs, female 4 to 7 yrs, male 4 to 7 yrs, female 8 to 11 yrs, male 8 to 11 yrs, female 12 to 14 yrs, male 12 to 14 yrs, female 15 to 17 yrs, male 15 to 17 yrs, female 18 to 24 yrs, male 18 to 24 yrs, female 25 to 30 yrs, male 25 to 30 yrs, female 31 to 37 yrs, male 31 to 37 yrs, female 38 to 45 yrs, male 38 to 45 yrs, female 46 to 53 yrs, male 46 to 53 yrs, female 54 to 64 yrs, male 54 to 64 yrs, female	11 21 31 41 51 61 71 81 91 101 111 121 131 12 22 32 42 52 62 72 82 92 102 112	0-3 YRS: MEN 4-7 YRS: MEN 8-11 YRS: MEN 12-14 YRS: MEN 15-17 YRS: MEN 18-24 YRS: MEN 25-30 YRS: MEN 31-37 YRS: MEN 38-45 YRS: MEN 46-53 YRS: MEN 54-64 YRS: MEN 65-77 YRS: MEN 78+ YRS: MEN 0-3 YRS: WOMEN 4-7 YRS: WOMEN 8-11 YRS: WOMEN 12-14 YRS: WOMEN 15-17 YRS: WOMEN 18-24 YRS: WOMEN

		Original			Revised	
Dimension	Level	Description	Categories		Categories	
			121	65 to 77 yrs, male	72	25-30 YRS:
			122	65 to 77 yrs, female		WOMEN
			131	78+ yrs, male	82	31-37 YRS:
			132	78+ yrs, female		WOMEN
					92	38-45 YRS:
						WOMEN
					102	46-53 YRS:
						WOMEN
					112	54-64 YRS:
						WOMEN
					122	65-77 YRS:
						WOMEN
					132	78+ YRS: WOMEN
4	SPAs in Los Angeles Co., HRs in San Diego Co., Rural counties and Remainder of CA	SPAs (8), HRs (6), Remainder of CA (1)	0	Remainder of CA		N/A
			11	SPA 1 – Antelope Valley		
			12	SPA 2 – San Fernando		
			13	SPA 3 – San Gabriel		
			14	SPA 4 – Metro		
			15	SPA 5 – West		
			16	SPA 6 – South		
			17	SPA 7 – East		
			18	SPA 8 – South Bay		
			21	HR 1 – North Coastal		
			22	HR 2 – North Central		
			23	HR 3 – Central		
			24	HR 4 – South		
			25	HR 5 – East		
			26	HR 6 – North Inland		
			432	Siskiyou County		
			441	Tuolumne County		
			442	Calaveras County		
5	Region (R) (collapsed where necessary)	Race/ethnicity (7)	1	Under 12 yrs old (whole state)	1	0-11 YRS
			2	12 to 17 yrs old (whole state)	2	12-17 YRS
			1R	Latino 18+ yrs	10	18+ YRS: LATINO
			2R	Non-Latino White 18+ yrs	20	18+ YRS: WHITE
			3R	Non-Latino African American 18+ yrs	30	18+ YRS: AFRICAN AMERICAN
			4R	Non-Latino American Indian 18+ yrs	40	18+ YRS: AIAN
			5R	Non-Latino Asian 18+ yrs	50	18+ YRS: ASIAN
			6R	Non-Latino Native Hawaiian 18+ yrs	60	18+ YRS: NHOPI
			7R	Non-Latino Two or more races 18+ yrs	70	18+ YRS: OTHER/MULTIPLE
6	State	Race/ethnicity (7) x Age groups (2) x Gender (2) (collapsed where necessary)	111	Latino, Male, <18 yrs	111	0-17 YRS: LATINO MEN
			112	Latino, Male, 18+ yrs	211	0-17 YRS: WHITE MEN
			121	Latino, Female, <18 yrs	311	0-17 YRS: BLACK MEN
			122	Latino, Female, 18+ yrs	511	0-17 YRS: ASIAN MEN
			211	Non-Latino White, Male, <18 yrs	711	0-17 YRS: 2+ RACES MEN
			212	Non-Latino White, Male, 18+ yrs	121	0-17 YRS: LATINO WOMEN
			221	Non-Latino White, Female, <18 yrs		
			222	Non-Latino White, Female, 18+ yrs		
			311	Non-Latino African		

		Original		Revised
Dimension	Level	Description	Categories	Categories
			312 American, Male, <18 yrs Non-Latino African	221 0-17 YRS: WHITE WOMEN
			321 American, Male, 18+ yrs Non-Latino African	321 0-17 YRS: BLACK WOMEN
			322 American, Female, <18 yrs Non-Latino African	521 0-17 YRS: ASIA WOMEN
			411 American, Female, 18+ yrs Non-Latino American	721 0-17 YRS: 2+ RACES WOMEN
			412 Indian, Male, <18 yrs Non-Latino American	112 18+ YRS: LATINO MEN
			421 Indian, Male, 18+ yrs Non-Latino American	212 18+ YRS: WHITE MEN
			422 Indian, Female, <18 yrs Non-Latino American	312 18+ YRS: BLACK MEN
			511 Indian, Female, 18+ yrs Non-Latino Asian, Male, <18 yrs	512 18+ YRS: ASIAN MEN 712 18+ YRS: 2+ RACES MEN
			512 Non-Latino Asian, Male, 18+ yrs	122 18+ YRS: LATINO WOMEN
			521 Non-Latino Asian, Female, <18 yrs	222 18+ YRS: WHITE WOMEN
			522 Non-Latino Asian, Female, 18+ yrs	322 18+ YRS: BLACK WOMEN
			611 Non-Latino Native Hawaiian, Male, <18 yrs	522 18+ YRS: ASIAN WOMEN
			612 Non-Latino Native Hawaiian, Male, 18+ yrs	722 18+ YRS: 2+ RACES WOMEN
			621 Non-Latino Native Hawaiian, Female, <18 yrs	9410 ALL AGES: AIAN MEN 9420 ALL AGES: AIAN
			622 Non-Latino Native Hawaiian, Female, 18+ yrs	WOMEN
			711 Non-Latino Two or more races, Male, <18 yrs	9600 ALL AGES: NHOPI
			712 Non-Latino Two or more races, Male, 18+ yrs	
			721 Non-Latino Two or more races, Female, <18 yrs	
			722 Non-Latino Two or more races, Female, 18+ yrs	
7	State	Asian groups (5) x Age groups (2)	11 Non-Latino Chinese only, <18 yrs	11 0-17: CHINESE ONLY 21 0-17: KOREAN ONLY
			12 Non-Latino Chinese only, 18+ yrs	31 0-17: FILIPINO ONLY 41 0-17: VIETNAMESE ONLY
			21 Non-Latino Korean only, <18 yrs	51 0-17: JAPANESE ONLY
			22 Non-Latino Korean only, 18+ yrs	61 0-17: OTHER/NON- ASIAN
			31 Non-Latino Filipino only, <18 yrs	12 18+: CHINESE ONLY 22 18+: KOREAN ONLY
			32 Non-Latino Filipino only, 18+ yrs	32 18+: FILIPINO ONLY 42 18+: VIETNAMESE ONLY
			41 Non-Latino Vietnamese only, <18 yrs	52 18+: JAPANESE ONLY
			42 Non-Latino Vietnamese only, 18+ yrs	62 18+: OTHER/NON- ASIAN
			51 Other or non-Asian only, <18 yrs	
			52 Other or non-Asian only, 18+ yrs	

		Original			Revised
Dimension	Level	Description	Categories		Categories
			61	Non-Latino Japanese only, <18 yrs	
			62	Non-Latino Japanese only, 18+ yrs	
8	Stratum (S) (collapsed where necessary)	Race/ethnicity (3) x Age groups (2)	S11 S12 S21 S22 S31 S32	Latino, <18 yrs Latino, 18+ yrs Non-Latino White, <18 yrs Non-Latino White, 18+ yrs Non-Latino Non-White, <18 yrs Non-Latino Non-White, 18+ yrs	N/A
9	Region (R) (collapsed where necessary)	Education (4)	R1 R2 R3 R4	Age <18 yrs 18+ yrs, Less than High School 18+ yrs, High School grad or GED recipient 18+ yrs, At least some college	0 0-17 YRS 1 18+ YRS: <HS 2 18+ YRS: HS 3 18+ YRS: >HS
10	Region (R) (collapsed where necessary)	Person type (3) x # Adults in HH (3)	11R 12R 13R 21R 22R 23R 31R 32R	Adult, 0 or 1 adult Adult, 2 adults Adult, 3 or more adults Child, 0 or 1 adult Child, 2 adults Child, 3 or more adults Teen, 0 or 1 adult Teen, 2 adults Teen, 3 or more adults	N/A
11	Region (collapsed where necessary)	Non-telephone dimension	Categories combining household tenure, age, educational attainment, and number of adults in the household		1 OWN: 0-17 YRS: 1 ADULT 2 OWN: 0-17 YRS: 2+ ADULTS 3 OWN: 18-30 YRS: <=HS 4 OWN: 18-30 YRS: >HS 5 OWN: 31-64 YRS: <=HS 6 OWN: 31-64 YRS: >HS 7 OWN: 65+ YRS: <=HS 8 OWN: 65+ YRS: >HS 11 RENT: 0-17 YRS: 1 ADULT 12 RENT: 0-17 YRS: 2+ADULTS 13 RENT: 18-34 YRS: <=HS 14 RENT: 18-34 YRS: >HS 15 RENT: 35+ YRS: <=HS: 1 ADULT 16 RENT: 35+ YRS: >HS: 1 ADULT 17 RENT: 35+ YRS: <=HS: 2+ ADULTS 18 RENT: 35+ YRS: >HS: 2+ ADULTS
12	Region (7) x Stratum (S)	Person type (3)	RSS2 RSS3	Child Teen Adult	N/A
NEW					13 0-11 YRS: AIAN IN COMBINATION

Dimension	Original			Revised
	Level	Description	Categories	Categories
				14 0-11 YRS: NOT AIAN
				23 12-17 YRS: AIAN IN COMBINATION
				24 12-17 YRS: NOT AIAN
				31 18+ YRS: LATINO SINGLE RACE AIAN
				32 18+ YRS: NON-LATINO SINGLE RACE AIAN
				33 18+ YRS: AIAN IN COMBINATION
				34 18+ YRS: NOT AIAN
				901 0-17 YRS: LATINO SINGLE RACE AIAN
				902 0-17 YRS: NON-LATINO SINGLE RACE AIAN

1.1.7. Source of Population Totals

The source of the control totals for all dimensions was the single-year American Community Survey (ACS) public use microdata sample for California, specifically obtained from IPUMS USA (<https://usa.ipums.org/usa/>). Using the ACS data, the population total count for each dimension (e.g., the count of adults ages 18 or older who are Latino and single-race AIAN) was calculated for each year and combined for 2011 & 2012 and 2013 & 2014 through respective averages. Because the total population size is not consistent between the CHIS standard weights and the ACS (e.g., 36,931,023 based on the CHIS 2011-2012 vs. 36,871,518 based on the ACS 2011 vs. 37,225,859 based on the ACS 2012), the totals for new dimensions were scaled to match the CHIS population size.

1.1.8. Raking Procedure

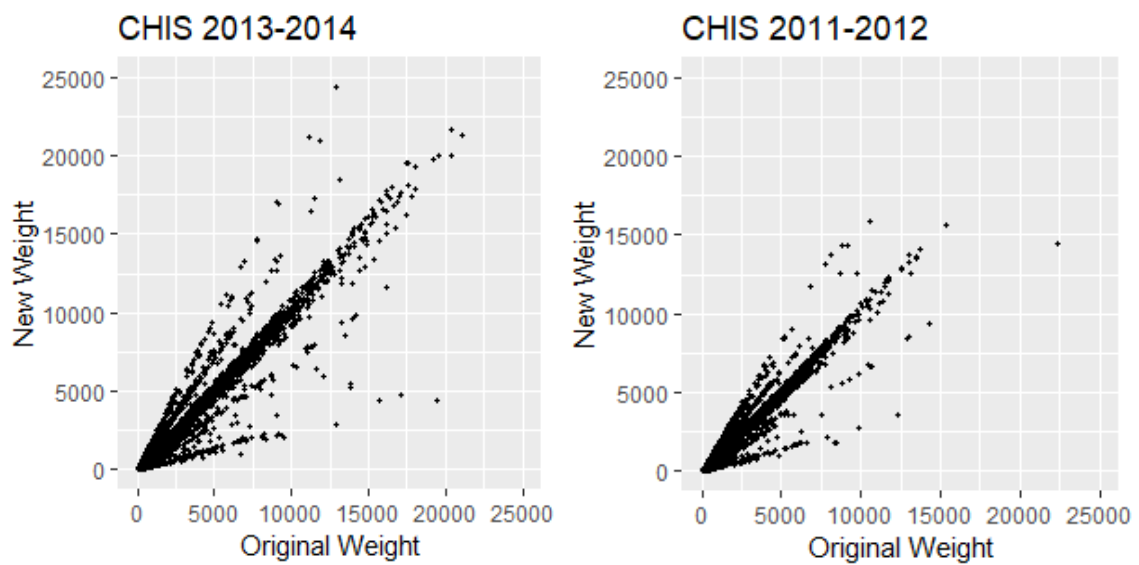
CHIS reweighting was done using rake function in R survey package (Lumley, 2018) separately for CHIS 2011-2012 and 2013-2014. The exact code is available in the files, “CHIS Reweighting 2011 2012 (12.7.2018).R” and “CHIS Reweighting 2013 2014 (11.27.2018).R”. Once reweighting was completed, the original weight (RAKEDW0) and the revised weight were compared with respect the interquartile and design effect due to weighting, *deft*, (Kish, 1992) as

shown in Table A.C.3. This was done to and to determine whether reweighting produced extreme weights (i.e., decreased estimate efficiency), which further led to trimming considerations. As shown in Table A.C.3. the range of revised weights was similar to that of original weights. The increases in *deft* was negligible. Also seen in Figure A.C.1, the relationship between the two weights at the individual level is on the 45-degree line. Therefore, no trimming was applied to the revised weights.

Table A.C.3. Comparison of Original Weights and Revised weights

	CHIS 2011-2012		CHIS 2013-2014	
	Original Weight	Revised weight	Original Weight	Revised weight
Minimum	0.908	0.875	1.706	1.308
1 st Quartile	154.037	152.363	88.024	86.288
Median	348.284	344.892	212.340	209.113
3rd Quartile	799.030	796.102	628.493	625.500
Maximum	22325.081	15819.787	21132.221	24365.687
Deft	3.120	3.154	5.105	5.238

Figure A.C.1. Scatterplots of Original Weights and Revised Weights



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