health watch

Colorado's Population and Vital Statistics – Recent Innovations and Recommendations

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Introduction

Population figures for the State of Colorado and its subpopulations are used widely by many programs at the Colorado Department of Public Health and Environment (CDPHE), local public health agencies, nonprofit organizations, and university-based researchers and students. Within the public health arena, these uses include quantifying populations for use in such standard measures as mortality and fertility rates, life expectancy, and percentage of the population engaging in certain health and risk behaviors. Additionally, population figures are used to describe populations' demographic and socioeconomic characteristics for purposes of planning and providing health promotion and disease prevention services.

The conventional wisdom regarding population estimates is that there is a single set of population estimates released each year from a single source, and that these estimates are not subject to change or revision. This is not the case. Population estimates arise from multiple sources, are updated routinely, and are essentially educated estimates using the best information on hand (including counts of births and deaths, migration patterns, housing, employment, and school and Medicare enrollment) at the time the estimates are computed.

This report is intended to address the following topics related to different population estimates and their sources, namely:

- descriptions of available population estimates and the effect of differences between them on commonly used public health measures;

- emergence of multiple-race data in the 2000 U.S. Census and the 2003 revisions of the U.S. standard birth and death certificates; and

- recommended uses of different population estimates, projections, and surveys.

Sources of population estimates

The two sources of population figures used most widely at CDPHE are the United States Census Bureau and the Colorado State Demography Office at the Colorado Department of Local Affairs, Division of Local Government. The Census Bureau conducts the decennial (every ten years) census of the United States, which is an effort to count everyone living in the country, and is mandated by the United States Constitution.

The State Demography Office assists the U.S. Census Bureau with this project. Additionally, it utilizes estimates from the Bureau and other national, state, and county sources (including CDPHE birth and death statistics), along with significant local input, to prepare certified annual estimates of the total population for Colorado counties, municipalities, and special districts.

The Health Statistics Section at the Colorado Department of Public Health and Environment has traditionally used these certified estimates from the State Demography Office to compute rates commonly used in studying births and deaths among Colorado residents. These estimates allow for the computation of statewide rates of mortality (deaths) and natality (births) by age, race/ethnicity, and sex, and similar rates at the county level by age and sex.

Population figures from the United States Census Bureau, though not generally used for computing official rates for births, deaths, and other diseases by CDPHE, are used often in quantifying and characterizing statewide and substate populations. This may be done to identify:

- populations of lower socioeconomic status;
- populations with diminished access to health care; or
- subcounty populations for special health studies.

These data may not be available from the demography office.

A common characteristic of both census-based and State Demography Office-based population estimates is an annual effort to revise and update the estimates for current and prior years.

Population estimates by race and ethnicity

Population estimates at the state and county level by race and ethnicity continue to be an important tool in identifying disparities in health and disease. The identification of race and ethnicity has evolved, most recently from the identification of an individual as a single race/ethnicity to the capacity to collect multiple-race identification.

Prior to the 2000 U.S. census, respondents were instructed when completing the form to "Fill one circle for the race each person considers himself/herself to be," while given the following options: *White, Black, American Indian or Native Alaskan, and Asian or Pacific Islander*. Additionally, respondents were asked if they were of Spanish/Hispanic origin. Starting with the 2000 U.S. census, respondents were instructed to "Mark one or more races to indicate what this person considers himself/herself to be," while being provided the categories *White, Black, American Indian or Native Alaskan, Asian, and Native Hawaiian or Other Pacific Islander*. The Spanish/Hispanic origin component of the survey changed very little.

While being able to self-identify using one or more categories is a much more appropriate and accurate method of enumerating the racial/ethnic makeup of the U.S. population, it does create some unique challenges. Using this new scheme, there are potentially 31 race groups to account for depending on whether a respondent selects one, two, or up to all five race categories. Use of the Spanish/Hispanic origin data would double the number of possible racial/ethnic categories.

Additionally, multiple-race data is generally incompatible with event data (such as births, deaths, and disease incidence) col-

lected and summarized using the original single-race method. In order to facilitate coding of multiple-race/ethnicity population data and to promote consistency in their use, the National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention (CDC) developed a methodology in collaboration with the U.S. Census Bureau to bridge the multiple-race population counts from the 2000 U.S. census back to the original single-race categories collected previously. The products of this effort are bridged-race census and intercensal population estimates available through the NCHS, which can be used with those now compatible event data collected using single-race categories to compute appropriate health measures.

Vital statistics by race and ethnicity

In order to follow suit with these Federal requirements for multiple-race collection on the 2000 U.S. census, the 2003 revision of the U.S. standard certificates of live birth and death incorporated this same multiple-race collection methodology. This triggers a new set of challenges: Implementation of the 2003 revision of the U.S. standard birth and death certificates across the states has been staggered. This creates a situation where some states are reporting births and deaths to the NCHS collected using multiple-race categories, while others are reporting single-race data. Additionally, some states have implemented one of these revised certificates, but not yet the other. In order to accommodate both systems of data collection, and to continue to be able to compute national birth and death rates by race/ethnicity, the NCHS applies this multiple-race bridging methodology to births and deaths as well as populations.

Traditionally, Colorado has collected single-race birth and death data, and has utilized statewide single-race population estimates provided by the Colorado State Demography Office for computation of common vital statistics measures by age, race/ethnicity, and sex. Beginning with 2007 live births, Colorado implemented the 2003 revised U.S. certificate of live birth, while implementation of the revised death certificate

ought to occur in the next few years. This creates a challenge in that Colorado now faces the incompatibility of event and population data that was noted previously at the national level.

Fortunately, the NCHS, following their processing of Colorado birth data, which includes applying the multiple-race bridging algorithm, returns the bridged, single-race codes to the Office of the State Registrar of Vital Statistics. This allows for the continued utilization of population estimates from the Colorado State Demography Office and the computation of the standard and routine birth statistics for the various racial/ethnic populations in this state. It is anticipated that the same process will take place with the multiple-race data collected following the implementation of the revised death certificate.
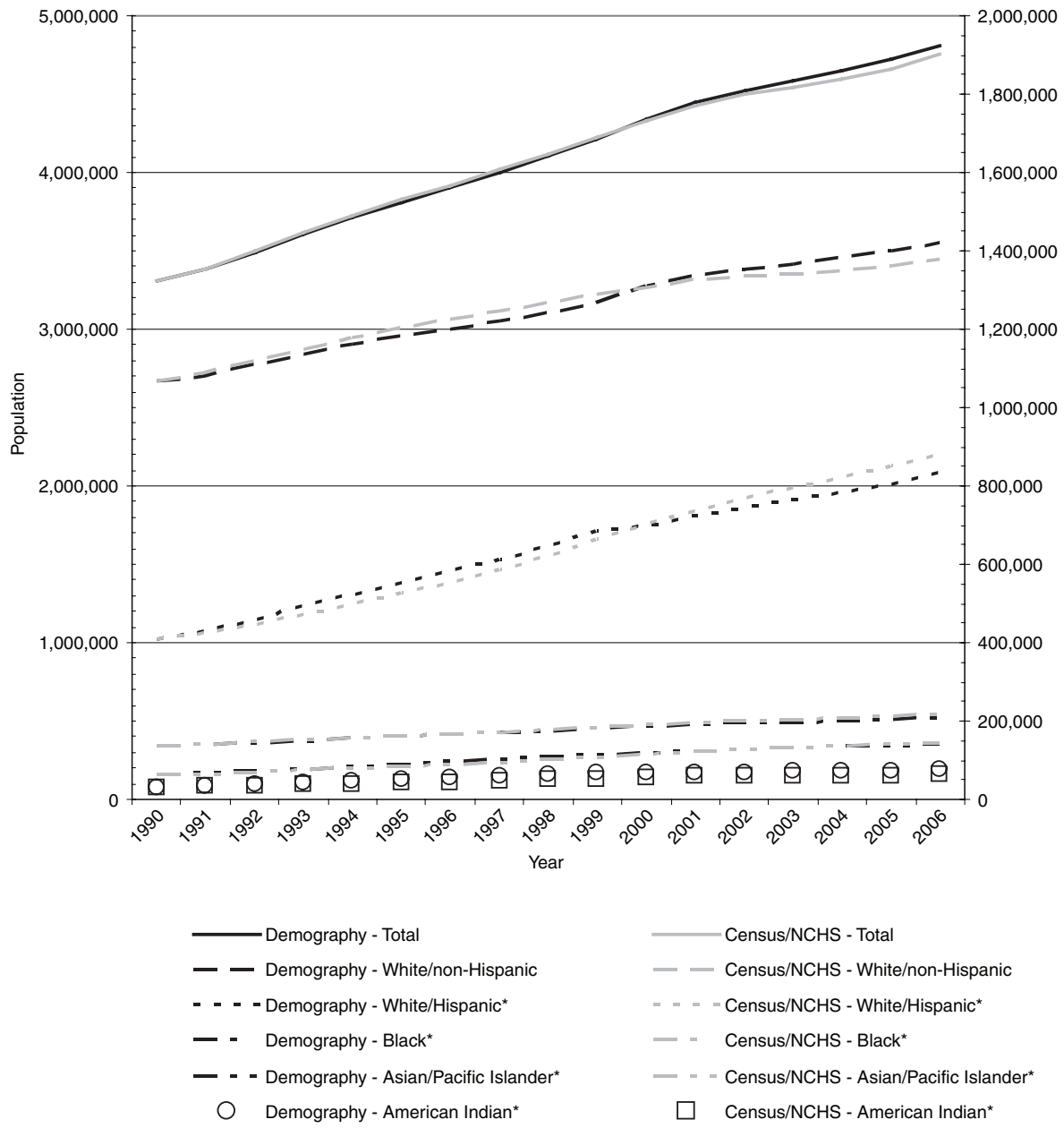
Differences in population estimates

Population estimates for Colorado differ between the demography-based and census-based estimates over time; however, the differences in the total population for the state are not large. In 2000, the demography-based population estimate was 0.26 percent greater than the census-based estimate, and was 1.24 percent greater in 2006. Such a growth over time in the difference is due in part to the increasing interval since the 2000 census, which serves as the baseline for these estimates, and different techniques for computing population estimates between these two agencies. There are larger differences between the demography-based, race/ethnicity-specific estimates and the census-based, NCHS-produced bridged-race estimates. Specifically, the demography-based estimate for the White/non-Hispanic population was 3.12 percent greater in 2006, while that for the White/Hispanic population was 5.38 percent less than the census-based estimate. The Black population estimate from the demography office was 4.67 percent lower than that from the census, and the Asian/Pacific Islander estimate was 2.42 percent lower. The largest difference appears with the American Indian/Native Alaskan estimate, which was 20.09 percent higher in the demography-based estimates than in the census-

based estimates (Figure 1).

Estimates between these two sources also vary by age group. For the 2006 population, the estimates differ relatively little in the youngest and oldest age groups; however, the demography-based estimate is 10.8 percent greater for 15-19 year-olds, 7.9 percent greater in 20-24 year-olds, and 18.6 percent less in 25-29 year-olds. The differences seen in this age band of 15-29 years, though large, mirror similar patterns reported by other states (Jones-Vessey KA). These differences persist in both the

Figure 1. Colorado populations by race/ethnicity: Colorado Demography Office vs. Census/NCHS bridged-race estimates, 2006

Demography - Total

Census/NCHS - Total

Demography - White/non-Hispanic

Census/NCHS - White/non-Hispanic

Demography - White/Hispanic*

Census/NCHS - White/Hispanic*

Demography - Black*

Census/NCHS - Black*

Demography - Asian/Pacific Islander*

Census/NCHS - Asian/Pacific Islander*

Demography - American Indian*

Census/NCHS - American Indian*

* Indicates population estimates counted using the right axis of the graph.

male and female population estimates (Figure 2).

Differences in population estimates between the Colorado State Demography Office and the U.S. Census Bureau arise in the county-specific populations for Colorado as well. Differences in the demography-based estimates for 2006 range from 6.3 percent lower than the census-based estimate for Saguache County to more than 13 percent greater for Bent and Crowley Counties (Figure 3).

Figure 2. Colorado populations by age group and sex: Colorado Demography Office vs. Census/NCHS estimates, 2006
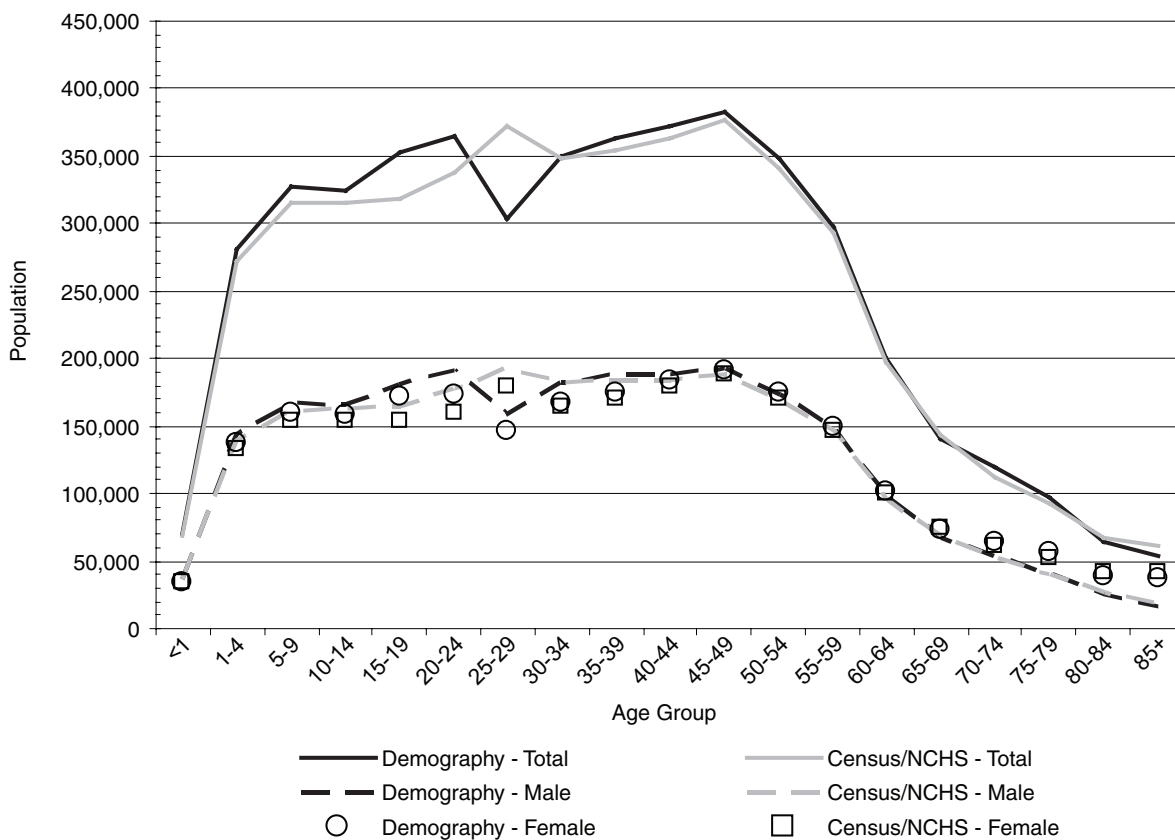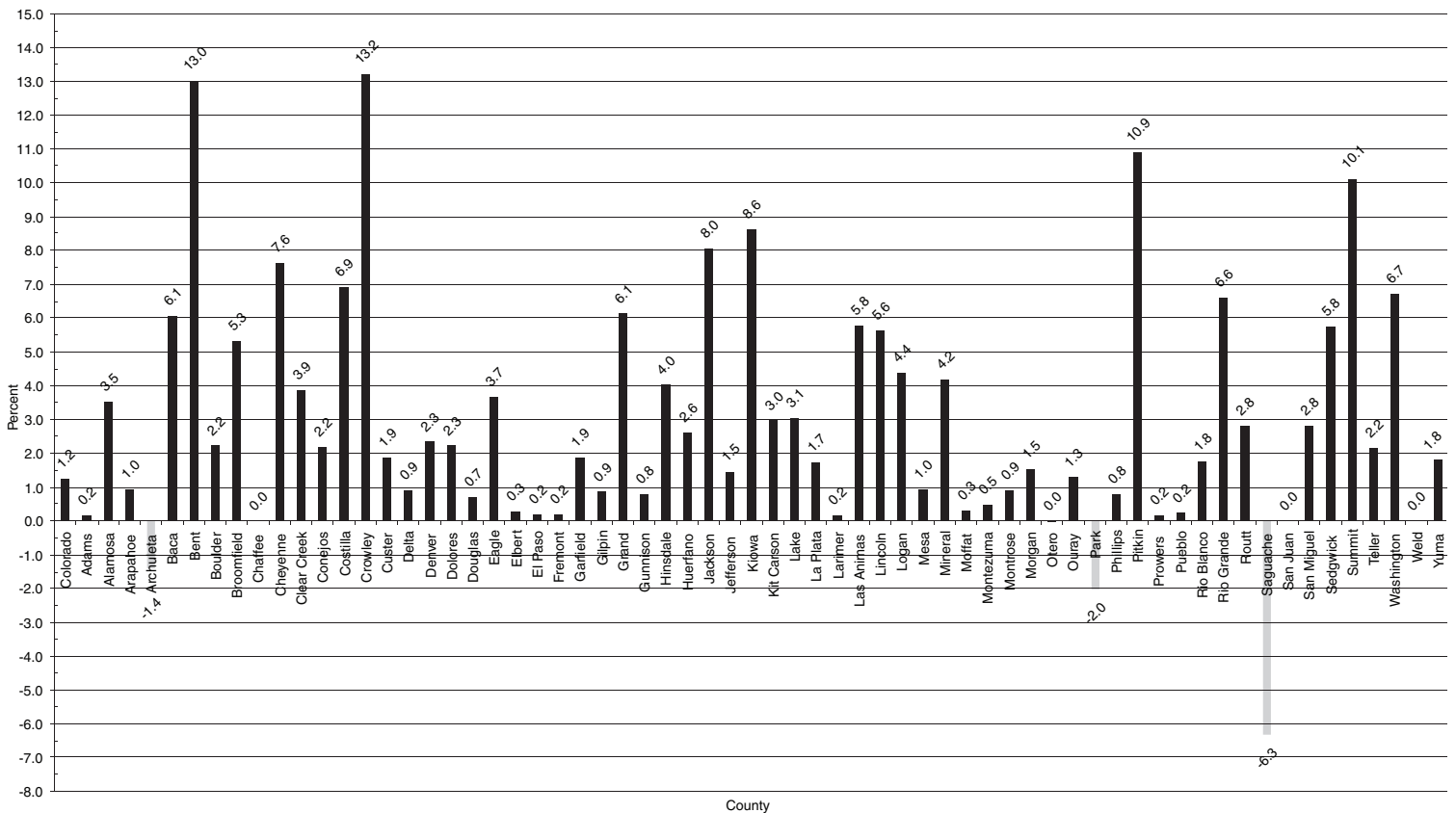
Figure 3. Percentage difference between Colorado county population estimates: Colorado Demography Office vs. Census/NCHS estimates, 2006

Differences in measures using different population estimates

Though the differences in population estimates are of interest, it is how these differences affect conclusions reached when analyzing public health measures that are of overriding concern. Certainly the differences in measures from demography-based estimates and those based on census estimates will be greatest for those categories in which the underlying differences in population estimates are greatest. This is seen in looking at general and teen fertility rates for Colorado in 2006 by race/ethnicity. Specifically, the overall general fertility rate based on demography estimates is only 0.7 percent lower than that based on census data; however, as with the population estimates themselves, the differences are greatest for the smaller populations of Black (5.7% greater), Asian/Pacific Islander (7.3% greater), and American Indian/Native Alaskan (10.3% lower) residents (Figure 4).

Among teen fertility rates (ages 15-19), the demography-based estimate is 10.6 percent lower than the census-based estimates, driven by the large difference in the 15-19 year-old population estimates noted previously. The largest differences among specific racial/ethnic categories are seen among White/non-Hispanic teens (for which the demography-based estimate is 12.3% lower), and Asian/Pacific Islander teens (10.8% lower) (Figure 4).

Age-adjusted mortality rates are also affected by these differences in population estimates across age and racial/ethnic groups. The demography-based all-cause age-adjusted mortality rate in 2006 for all racial/ethnic groups combined was 3.2 percent greater than the census-based rate. Again, larger differences were seen among specific racial/ethnic groups, including White/non-Hispanic (2.6% greater), White/Hispanic (18.2% greater), Black (2.8% lower), Asian/Pacific Islander (7.2%

Figure 4. General and teen fertility rates by race/ethnicity: Demography vs. Census/NCHS bridged-race estimates, 2006

Figure 5. Age-adjusted mortality rates by cause and race/ethnicity: Demography vs. Census/NCHS bridged-race estimates, 2006
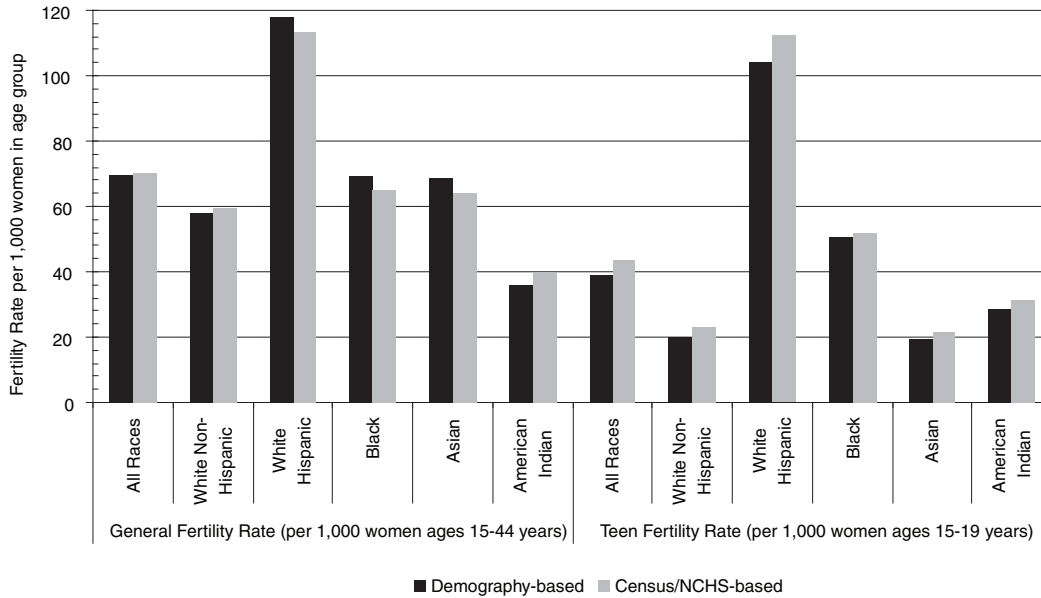
lower), and American Indian/Native Alaskan (25.7% lower). Similar differences were seen across the five leading causes of death in Colorado in 2006. The greatest differences are again seen among the White/Hispanic rates and the American Indian/Native Alaskan rates, which makes some sense given that the greatest differences between demography-based and census-based estimates appear for these two groups (Figure 5).
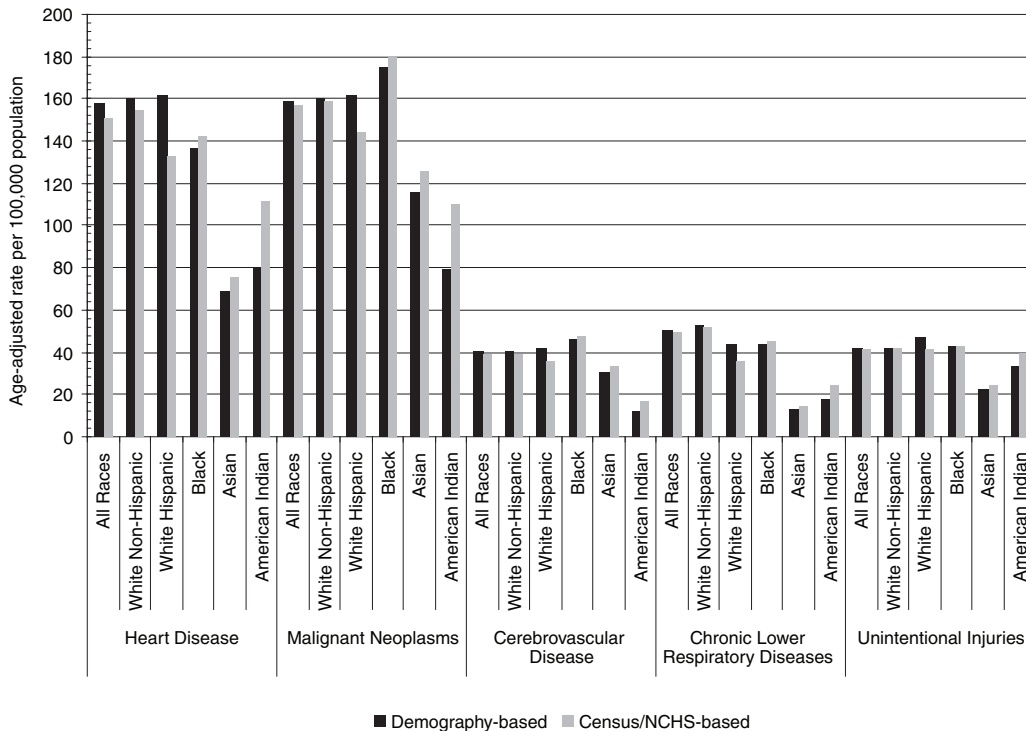
Current topics in population estimates

Both the U.S. Census Bureau and the Colorado State Demography Office produce population estimates as well as population projections. Additional population counts based on the U.S. Census Bureau's American Community Survey are being used progressively more as the data items and geographic resolution of the results continue to increase. Each of these three sets of population counts — estimates, projections, and survey-based — have strengths and limitations, depending upon the intended use.

Estimates versus projections

Population estimates use existing data for births, deaths, migration, and other components of population change to produce counts of population for the past. Population projections, however, use past estimates along with assumptions about future population change to provide a best guess of what the population counts in the future will be. Population estimates and projections for the same time period may not agree with each other for reasons including assumptions used in projections that did not hold out, improved data used when creating population estimates, and the two counts having been produced at different times. When obtaining population counts from either the U.S. Census Bureau or the Colorado State Demographer, it is generally noted whether the counts provided are estimates or projections. Population estimates are the preferred set of counts when attempting to enumerate the actual population by age, race, and sex, and when computing rates of events in a given population. However, projections are an excellent tool for planning for a changing population, as well as making educated guesses as to how much populations' health needs will be changing over time.

Survey-based population counts

The U.S. Census Bureau's American Community Survey is a nationwide survey of a small, rotating percentage of the population designed to collect information about the demographic, housing, social, and economic characteristics of the popula-

tion. It was designed, in part, to replace the long-form questionnaire traditionally provided to approximately 1 in 6 people during the decennial census, and to provide more timely population counts by these characteristics throughout the decade. Its primary stated purpose is to provide population counts used in planning and decision-making regarding policies, programs, and services for communities. It was not designed to produce official population counts to be used in computing various health measures. The American Community Survey data do not agree with the official population estimates at all geographic levels because of the weighting scheme applied to these sample survey data, and because the population at the time of a survey has likely changed (due to such factors as migration and aging) from the time period on which estimates are based. Consequently, official population estimates are suggested for use when computing health measures, particularly when stratified by age, race/ethnicity, and/or sex.

County population estimate by race/ethnicity

To date, Colorado has computed statewide rates of mortality and natality by age, race/ethnicity and sex, and county-level rates by age and sex only. Included in the bridged-race population estimates produced by the NCHS are county-level population estimates by age, sex and race/ethnicity, which will allow for the study of racial/ethnic populations at the county level for intercensal years. Coupled with historic census-based population estimates by race/ethnicity at the county level for 1990-1999 that were released in 2003, these higher resolution race/ethnicity-specific population estimates provide additional tools for measuring health and disease in Colorado's subpopulations. That said, because of the distribution of different racial/ethnic groups across Colorado's counties, specifically noting the small numbers of some groups in certain counties, it is unlikely at present that routine statistics will be produced at the county level by race/ethnicity. However, these estimates may prove valuable should there be specific local needs for such data, or special studies that warrant their use (Figure 6).

Figure 6. Colorado county populations by race/ethnicity: Census/NCHS bridged-race estimates, 2006
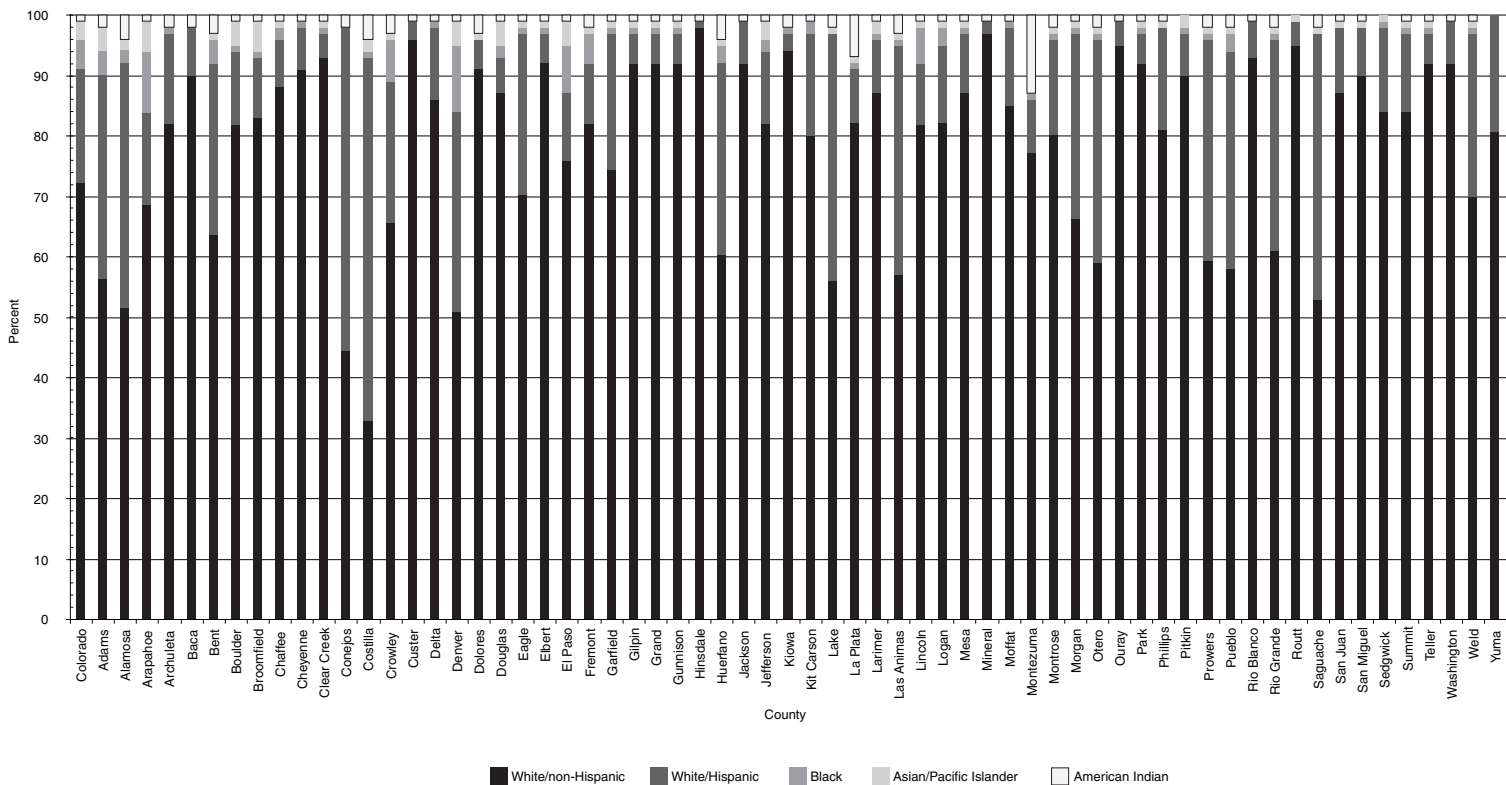
Conclusion

Population figures are produced by meticulous estimate and projection modeling methods. While providing an approximation of the population count, they are a useful and important tool in measuring and addressing public health concerns at the national, state, county, and community level. The Health Statistics Section at the Colorado Department of Public Health and Environment will continue to utilize the certified annual population estimates produced by the Colorado State Demography Office for computing standard health measures. However, the emergence of additional types of population data will facilitate assessments of health and disease in Colorado's populations that were previously not possible. The first step, however, is understanding the intended purposes and appropriate applications of these increasingly accessible population figures available to the public health community.

SOURCES OF DATA USED IN THIS REPORT

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