

Racial Disparities in Age-Specific Mortality Among Blacks or African Americans – Pennsylvania, 1999–2015

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Executive Summary

Since the 1980s, substantial progress has been made in improving residents' death rates in Pennsylvania, as well as in the United States. However, ongoing racial/ethnic, socioeconomic, geographic and other disparities in health still exist and need to be addressed. This health disparity report highlights some of the differences in the health behaviors and outcomes between two racial groups (black and white populations) in Pennsylvania. Understanding disparities in the selected leading causes of death across the life span and gaps in health behaviors can promote awareness of health inequities among the public and enhance targeting of appropriate interventions.

Some key findings of this report include:

- Disparities in death rates persisted among blacks compared with whites. Blacks had generally higher age-specific death rates for all-cause death than whites among young and middle-aged groups (18–34, 35–49 and 50–64 years) from 1999 to 2015.
- During 2011–2015, the age-adjusted risk of death associated with HIV disease and homicide was 10.5 times (RR=10.5, 95% CI: 9.27–11.9) and 10.6 times (RR=10.6, 95% CI: 9.86–11.4) higher among blacks than whites, respectively.
- Black-white differences in death rates for all-cause death declined over time. The percentage difference in all-cause death rates between blacks and whites reduced from 112.1% in 1999–2003 to 38.3% in 2011–2015 for the youngest adult age group (18–34 years); from 117.0% to 49.4% for the age group 35–49 years; from 96.8% to 64.5% for the age group 50–64 years; and from 6.4% to -1.6% for the oldest adult group (≥65 years).
- Gaps in the death rates between whites and blacks declined for most of the leading causes of death from 1999–2003 to 2011–2015. But black-white gaps widened for diseases of the heart, accidents and suicide death rates from 1999–2003 to 2011–2015. However, the level of the racial disparities in mortality rates varied by leading causes of deaths among different age groups.
- There were significant county-level geographic variations for all-cause age-adjusted death rates among both black and white Pennsylvanians. For blacks, all-cause age-adjusted death rates in Allegheny County, Beaver County and Philadelphia County were significantly higher than the statewide average. For whites, all-cause age-adjusted death rates in 35 counties were significantly higher than the statewide average, and most of these counties were clustered in the western and northeastern parts of the state.
- For blacks, 23 counties (ranged from 9% to 49%) had significantly higher all-cause age-adjusted death rates than whites' averages, and most of these counties were clustered in the southern part of the state.

- During 2011–2015, black adults (≥18 years) were 22% more likely to report being a current smoker (RR=1.22, 95% CI: 1.16–1.28) and 11% more likely to have no leisure-time physical activity (RR=1.11, 95% CI: 1.06–1.17) when compared to whites.
- Black adults had a significantly higher prevalence of obesity (35.7%) than whites (29.3%). Blacks are 16% (RR=1.16, 95% CI: 1.11–1.21) more likely to be obese than whites during 2011–2015.
- Black adults were 44% more likely to report not being able to see a doctor because of cost (RR=1.44, 95% CI: 1.36–1.53) and 15% less likely to have a personal doctor or health care provider (RR=0.85, 95% CI: 0.81–0.9) when compared to whites during 2011–2015.
- Black adults generally had higher prevalence of being diagnosed with chronic health conditions than whites, including 18% higher for asthma (RR=1.18, 95% CI: 1.12–1.25), 15% higher for high blood pressure (RR=1.15, 95% CI: 1.08–1.22), 19% for diabetes (RR=1.19, 95% CI: 1.13–1.26), and 24% for stroke (RR=1.24, 95% CI: 1.14–1.37).
- Black adults were 26% more likely to report having fair or poor health-related quality of life (RR=1.26, 95% CI: 1.20–1.32), 23% more likely to report mental distress (RR=1.23, 95% CI: 1.16–1.31), and 10% more likely to report physical distress (RR=1.1, 95% CI: 1.04–1.17) when compared to whites.

Introduction

Health inequities adversely affect groups of people who have systematically experienced greater obstacles to health based on their race or ethnicity; socioeconomic status; gender; age; mental health; cognitive, sensory or physical disability; sexual orientation or gender identity; occupation or geographic location; or other characteristics historically linked to discrimination or exclusion, which lead to health disparity [1]. Death rate (or mortality) is one of the most commonly used indicators of population health and is useful for examining health disparities in the United States. Death rates for leading causes of death reflect the impact of major illnesses or injuries on health and facilitate direct comparisons among different demographic groups, such as age, race or ethnicity across geographies and time. Comparisons of death rates are a convenient and intuitive measure for public awareness and policy makers to target appropriate interventions.

National- and state-level vital statistics data has been routinely collected and analyzed and has provided important information and assessment of current public health status. A vital statistic report recently released from the Pennsylvania Department of Health showed noteworthy improvement has been made in the death rate among Pennsylvania residents over the past several decades, in part attributed to advances in public health [2]; the all-cause death rate among all racial groups decreased from 11.0 deaths per 1,000 population in 1980 to 7.5 deaths per 1,000 population in 2014.

Moreover, the all-cause death rate for African-Americans (referred to as blacks in this report) decreased from 13.9 deaths per 1,000 population in 1980 to 9.1 deaths per 1,000 population in 2014, representing a sharper decline than among whites (10.8 deaths per 1,000 population in 1980 to 7.2 deaths per 1,000 population in 2014). However, death rates among Pennsylvania residents were consistently higher than the U.S. population over the same time period [2].

In addition, the latest analysis report from the Centers for Disease Control and Prevention (CDC) disclosed that the all-cause mortality estimated in 2015 relative to 1999 had declined 25% for blacks and 14% for whites, and the racial disparity gap in the all-cause death rate narrowed from 33% in 1999 to 16% in 2015. Despite the narrowing gap of racial disparities in death rates over time, disparities in mortality for the leading causes of deaths for blacks compared with whites remain significant and persistent across the life span. In 2015, blacks still had higher all-cause death rates than whites in each age group <65 years in the U.S. [3].

Besides racial disparities, previous research has highlighted large, long-standing, and increasing geographic inequalities in mortality among counties and even smaller areas, and geographic patterns varied substantially by cause of death [4–10]. This serves as a reminder that, just as the national average estimate masks state-level health disparities, state-level health indicator measures may hide important between- and/or within-county variations [11–12]. In the U.S., health systems in states and local communities such as counties are generally responsible for development and implementation of public policies to tackle important public health issues. Exploring racial disparities across geographical areas with different mortality patterns can inform us of the extent to which mortality reductions can be achieved more efficiently and specifically.

Racial disparities in health, especially for blacks compared with whites, can be influenced not only by health care utilization or adequate health insurance coverage but also by related health behaviors, modifiable risk factors like obesity, and preexisting health status, such as the prevalence of chronic diseases and health-related quality of life indicators [3]. In addition, socioeconomic status and the sociodemographic factors associated with residents living in different areas were significant predictors of geographic variations of significant racial disparities in mortality [13]. It is well-known that differences in social determinants and health behaviors, such as access to health care, chronic conditions and health-related quality of life might help explain racial disparities in the mortality rate [3, 14–16]. Similar indications were also documented in the Pennsylvania Health Disparities Report [17]. To our knowledge, comprehensive efforts have not yet been undertaken to examine black-white differences in the prevalence of health behavior characteristics by age group in Pennsylvania.

As racial or ethnic minority and elderly populations grow rapidly in Pennsylvania, it is essential that health disparity issues should be more explicitly investigated and addressed. Therefore, this report employed available vital statistics, census population and Behavioral Risk Factor Surveillance System (BRFSS) data:

1. to examine trends and patterns of the black-white disparities in mortality for all-cause and selected leading causes of death across the life span;
2. to illustrate the county-level geographic variations of all-cause mortality by race and the black-white disparities in mortality across counties; and
3. to assess the prevalence of possible contributors to racial disparities in mortality, such as related health behaviors, modifiable risk factors, health care utilization practices, health-related quality of life indicators, and chronic conditions for blacks compared with whites by age group.

Such information is important and could be useful for health policymakers and professionals to target appropriate intervention in the elimination of racial and geographic disparities in Pennsylvania residents' mortality as they design project and develop policies.

Methods

Mortality

Vital statistics data used for this analysis was obtained from Pennsylvania Death Certificates^S collected by the Pennsylvania Department of Health for years 1999–2015. All-cause death data and selected leading causes of death* data were downloaded and further grouped into an all-age group and four adult-age groups (18–34, 35–49, 50–64 and ≥65 years) by race (blacks and whites). Corresponding population data were ascertained from the U.S. Census Bureau. For more information on the population estimates, please see: <https://wonder.cdc.gov/wonder/help/ucd.html#Population Data>. Age-adjusted death rates (age-adjusted to the 2000 U.S. standard population) and age-specific death rates were calculated for blacks and whites of all ages and in each age group separately. Death rates were considered unreliable and would not be shown in results when the rate is calculated with a death counts of 20 or less.

Health-related Risk Behaviors

Self-reported information on health behaviors, health-related quality of life indicators, health care utilization practices and chronic diseases were obtained from the Pennsylvania Behavioral Risk Factor Surveillance System (BRFSS) for years 2011–2015. BRFSS is a cross-sectional survey that state health departments conduct over landline and cellular telephones using a standardized questionnaire to collect prevalence data among the adult U.S. population (aged ≥18 years) regarding their health-related risk behaviors, chronic health conditions and preventive health practices. For more information on the BRFSS, please see: <https://www.cdc.gov/brfss/index.html>. In this report, relevant health behavior data collected in Pennsylvania was downloaded and extracted, including the following risk factors: current cigarette smoking (having smoked at least 100 cigarettes in their lifetime and smoking daily or somedays), lack of leisure-time physical activity in the past 30 days, and binge drinking (five or more drinks for men, or four or more drinks for women on any occasion) in the past 30 days. Weight status indicators included having a normal body weight (body mass index of 18.5–24.9 kg/m²) and having obesity (body mass index ≥30 kg/m²) based on self-reported height and weight. Health care access and utilization indicators included having a personal doctor or health care provider, not being able to see a doctor in the past year because of cost, and taking medication to control high blood pressure among adults diagnosed with high blood pressure. Self-reported health-related quality of life indicators included fair or poor health status, frequent mental distress (≥14 days in past 30 days), and frequent physical distress (≥14 days in past 30 days). Chronic disease conditions included reporting ever being told by a doctor or other health professional that the respondent had asthma, chronic obstructive pulmonary disease (COPD), high blood pressure, high blood cholesterol, diabetes, coronary heart disease (including heart attack or angina), stroke or cancer (excluding skin cancer).

Analysis

To explore temporal trends of all-cause mortality, average age-specific death rates were calculated annually from 1999 to 2015. To examine cause-specific mortality differences

between the beginning of the study period and the end of the study period, percentage changes in 5-year-average age-specific death rates from 1999–2003 to 2011–2015 were also calculated by race. Since one-year accumulated death counts for some specific causes of death were too small to calculate stable annually average death rates by race and age group, we accumulated five-year death numbers and population counts for those analyses. Racial disparities were estimated by comparing percentage differences in death rates for all-cause and for selected leading causes of death between blacks and whites, as well as by estimating rate ratios for the period of 2011–2015. Z statistics and binomial logistic regression were performed to test statistical significance for percentage differences and rate ratios, respectively. To explore the geographic variation in mortality, standardized mortality ratios (SMRs) with 95% confidence intervals (CIs) for all-cause death were calculated by race for each county. Additionally, to explore the geographic variation of racial disparities in mortality, SMRs for blacks compared to whites were calculated and further visualized by mapping using ArcGIS 10.4.1 (ESRI, Redlands, CA). SAS survey procedures (SAS 9.4, SAS Institute, Cary NC) that account for the complex sampling design of BRFSS were used to calculate the prevalence rates and prevalence rate ratios. A *p* value of less than 0.05 was considered statistically significant for all analyses.

§ <https://www.phaim.health.pa.gov/EDD/>

* Leading causes of death are defined by *International Classification of Diseases, Tenth Revision* (ICD–10) codes for diseases that are reported as the underlying cause of death on the death certificate. For temporal trend analysis, six leading causes of death were selected on the basis of age- and race-specific death rates estimated in 1999–2015 (see FIGURE 2). For racial disparity analysis, the 17 leading causes of death for blacks of all ages in 2011–2015 were 1) diseases of heart (I00–I09, I11, I13, I20–I51); 2) malignant neoplasms (C00–C97); 3) cerebrovascular disease (I60–I69); 4) unintentional injuries (accidents) [V01–X59, Y85–Y86]; 5) diabetes mellitus (E10–E14); 6) chronic lower respiratory diseases (J40–J47); 7) assault (homicide) [U01–U02, X85–Y09, Y87.1]; 8) nephritis, nephrotic syndrome and nephrosis (N00–N07, N17–N19, N25–N27); 9) septicemia (A40–A41); 10) influenza and pneumonia (J09–J18); 11) Alzheimer's disease (G30); 12) essential hypertension and hypertensive renal disease (I10, I12, I15); 13) human immunodeficiency virus (HIV) disease (B20–B24); 14) chronic liver disease and cirrhosis (K70, K73–K74); 15) intentional self-harm (suicide) [U03, X60–X84, Y87.0]; 16) anemias (D50–D64); 17) pregnancy, childbirth and the puerperium (O00–O99).

Results

In Pennsylvania, during 1999–2015, blacks had generally higher age-specific death rates for all-cause death than whites among young and middle-aged groups (18–34, 35–49 and 50–64 years) for all years. However, age-specific death rates among blacks were not consistently higher than whites among adults aged ≥ 65 years from 2003 onward (see FIGURE 1). From 1999–2003 to 2011–2015, all-cause death rates in blacks and whites of all ages decreased 21.4% and 12.1%, respectively. For blacks, consistent decreasing trends in all-cause and age-specific death rates were found in each age group, with the greatest decline of 30.2% at ages 35–49 years. For whites, all-cause death rate was decreased in the two older adult groups (50–64 and ≥ 65 years) but increased in two younger adult groups (18–34 and 35–49 years). The greatest increase in white all-cause death rate (17.6%) was seen at ages 18–34 years.

Additionally, black-white disparities in the age-adjusted all-cause death rate significantly narrowed from 310.6 per 100,000 population in 1999–2003 to 165.1 per 100,000 population in 2011–2015, a decline of 36.2% and 21.9%, respectively (see TABLE 1). In addition to the disparities seen in the overall all-cause age-adjusted death rates among races, there were pronounced racial disparities in the age-specific death rates in 1999–2003 and 2011–2015, and blacks had higher age-specific death rates than whites in each age group except among age ≥ 65 years during 2011–2005. For adults aged ≥ 65 years, the age-specified death rate (4742.3 per 100,000 population) for blacks was 1.6% lower than whites (4821.1 per 100,000 population).

It is worth noting that the racial disparity gap in all-cause death rate was generally and significantly narrowed in each age group from 1999–2003 to 2011–2015. For example, for the youngest adult group (18–34 years), the percentage of mortality differences between blacks and whites reduced from 112.1% to 38.3%; for the 35–49 age group, from 117.0% to 49.4%; for the 50–64 age group, from 96.8% to 64.5%; and for the oldest adult group, from 6.4% to -1.6% (see TABLE 1).

Leading causes of death for blacks and whites were quite different in different age groups, especially in younger adults at ages 18–34 and 35–49 years. Among older adults at ages 50–64 and ≥ 65 years, malignant neoplasms, diseases of the heart and cerebrovascular diseases were the most common leading causes of death among both racial groups (see FIGURE 2). Age-adjusted death rates for most of the selected leading causes of death decreased among blacks and whites at all ages. In contrast, age-adjusted death rates for accidents increased 4.5% and 35.9% in blacks and whites, respectively, and for suicide increased 31.8% in whites from 1999–2003 to 2011–2015 (see TABLE 1).

Furthermore, the age-specific death rates of top three leading causes of death decreased in each age group for both racial populations over the study period. Exceptions include accidents among white for ages 18–34 (from 36.3 per 100,000 population in 1999 to 67.5 per 100,000 population in 2015) and ages 35–49 (from 32.7 per 100,000 population in 1999 to 63.4 per 100,000 population in 2015), and for suicide (from 13.4 per 100,000 population in 1999 to 16.9 per 100,000 population in 2015) in whites ages 18–34 (see FIGURE 2).

Black-white disparities were seen in death rates for most of the selected leading causes of death across the life spans. During 2011–2015, death rates among blacks for any selected leading causes of death were generally higher than whites. However, blacks had lower death rates for diseases of the heart at ages ≥ 65 years (-6.2%); chronic lower respiratory diseases at all ages (-13.7%) and at ages ≥ 65 years (-27.0%); accidents at all ages (-15.2%), at ages 18–34 (-49.6%), 35–49 (-12.8%), and ≥ 65 years (-31.1%); and suicide across the life span (see TABLE 1).

Although data showed a narrowing of the gap in racial disparities for age-adjusted mortality rates among most selected leading causes of death over time, racial gaps in age-adjusted mortality rates for diseases of the heart, accidents and suicide were widening during 1999–2015. Racial gaps in age-adjusted death rates at all ages for most of the selected leading causes of death reduced over time; however, the width of the gap varied by causes of death in different age groups. Moreover, racial gaps in age-specific mortality rates for some specific causes of death were not consistently declining in each age group even though gaps are narrowing in these specific causes of death in the all-age group. For example, for diabetes mellitus, the difference between black and white death rates decreased from 69.8% to 61.1% in the all-age group, but increased from 110% to 187.5% at ages 18–34 years. For homicide, black-white differences in death rates declined from 1052.0% to 937.5% in the all-age group, but increased from 733.3% to 853.3% at ages 18–34 years from 1999–2003 to 2011–2015 (see TABLE 1).

During 2011–2015, blacks had significantly higher death rates than whites for all-causes of death and for some selected leading causes of death, including diseases of the heart, chronic lower respiratory diseases, influenza and pneumonia, and anemias in each age group < 65 years, but there were lower death rates for these causes of death at ages ≥ 65 years.

For example, blacks had 2.15 times (95% CI: 1.83–2.52), 1.96 times (95% CI: 1.82–2.10), and 1.9 times (95% CI: 1.83–1.97) higher mortality rate ratios (RRs) for diseases of the heart (the first leading cause of death) compared with whites at ages 18–34, 35–49 and 50–64 years, respectively. For chronic lower respiratory diseases, blacks had a 27% (RR=0.73, 95% CI: 0.69–0.77) lower age-specific death rate compared with whites at ages ≥ 65 years but higher age-specific death rate at ages 18–34, 35–49 and 50–64 years. The pattern as mentioned above was also found for age-specific death rates due to influenza and pneumonia.

In contrast, for malignant neoplasms (the second leading cause of death), blacks had higher age-specific death rates than whites across all age groups > 34 years of age but had a lower age-specific death rate at ages 18–34 years. Across the life span, blacks had higher age-specific death rates than whites for cerebrovascular diseases (the third leading cause of death), diabetes mellitus, nephritis, nephrotic syndrome and nephrosis, septicemia, essential hypertension and hypertensive renal disease, and HIV disease. Among these specific causes of death, there was an extreme excess risk of HIV disease-related death among blacks at all ages (age-adjusted RR = 10.5, 95 % CI: 9.27–11.9) relative to whites. Additionally, blacks had a significantly lower age-specific death rate due to Alzheimer's disease at ages ≥ 65 years (RR=0.61, 95% CI: 0.57–0.66). Blacks also had lower suicide-related death rates across all age groups, that is 38% (RR= 0.62, 95% CI: 0.53–0.71), 62%

(RR= 0.38, 95% CI: 0.32–0.46), 68% (RR= 0.32, 95% CI: 0.26–0.39), and 68% (RR= 0.32, 95% CI: 0.23–0.44) lower suicide-related mortality risk among blacks at ages 18–34, 35–49, 50–64 and ≥65 years, respectively (see TABLE 2).

MAP 1 and MAP 2 show SMRs for all-cause death counts observed among black and white residents, respectively, relative to the number of deaths that would be expected based on corresponding age and race-specific death rates in Pennsylvania in each county during 2005–2014. There were notable geographic disparities for both black and white excess deaths across counties. For blacks, observed all-cause deaths were significantly higher than expected in three counties: Allegheny, Beaver and Philadelphia. About half of the counties (n=34) had significantly lower observed all-cause deaths among blacks than expected. For whites, observed all-cause deaths in excess of expectations were observed in more than half of the counties (n=35), and most of these counties were clustered in the western and northeastern parts of Pennsylvania.

In contrast, 18 counties that had significant lower SMRs for whites were mainly distributed in the southeastern part of Pennsylvania. It is worth noting that Beaver County and Philadelphia County had an excess number of all-cause deaths over expected for both black and white county residents, and this difference was statistically significant. Moreover, racial disparities in all-cause death numbers also varied by county. In 23 counties, the observed numbers of all-cause deaths among blacks ranged from 9 to 49%, significantly higher than the expected numbers estimated using corresponding death rates among whites; numbers were significantly lower in 12 counties in Pennsylvania. Most of the counties with significantly higher black-to-white SMRs were clustered in the southern regions of Pennsylvania (see MAP 3).

During 2011–2015, blacks were more likely to report being a current smoker and to have no leisure-time physical activity in each age group compared with whites. For example, blacks had higher prevalence of being a current smoker (26.8%) than do whites (19.7%) among all adults, a 22% higher risk (RR=1.22, 95% CI: 1.16–1.28). In contrast, blacks were less likely to report binge drinking on any occasion in the past 30 days at all ages combined and among adults at ages 18–34 and 35–49 years compared with whites. For weight status, blacks had a significantly higher prevalence of obesity (35.7%) than whites (29.3%), a 16% higher risk (RR=1.16, 95% CI: 1.11–1.21) for blacks relative to whites for obesity.

For health care utilization, blacks were less likely to have one or more personal doctors or health care providers and were more likely to report that they could not see a doctor in the past year because of cost in each age group. Additionally, blacks had a significantly higher prevalence of taking antihypertensive medication (44.5%) than do whites (20.8%), specifically at ages 18–34 years, a 75% higher risk (RR=1.75, 95% CI: 1.23–2.48) relative to whites. Across the life span, blacks were more likely to report worse health-related quality of life measures indicated as fair or poor health status, frequent mental distress, and frequent physical distress. The prevalence of being diagnosed with chronic conditions, including asthma, high blood pressure, diabetes and stroke was generally higher among blacks than whites at all ages and in each age group. It is worth noting that blacks had 66% (RR=1.66, 95% CI: 1.03–2.68), 62% (RR=1.62, 95% CI: 1.4–1.86) and 34% (RR=1.34, 95% CI: 1.15–1.57) higher risk of having a diagnosis of stroke relative to whites at ages 18–34, 50–64 and

≥65 years, respectively. In contrast, blacks at all ages were less likely to report high blood cholesterol and a cancer diagnosis compared with whites (see TABLE 3).

Discussion

In Pennsylvania, age-adjusted death rates for all-cause of death decreased by 249.4 deaths per 100,000 (21.4%) for blacks and 103.9 deaths per 100,000 (12.1%) for whites from 2011–2015 to 1999–2013. However, age-specific death rates for all-cause of death were increasing for white residents at ages 18–34 and 35–49 years by 17.6% and 1.4%, respectively. Excess burden in the all-cause death rate has persisted among blacks compared with whites in each age group except the oldest adult group (≥ 65 years), this excess persisting despite that the black-white differences in death rates were on the decrease over time. There were several black-white crossovers in death rates for all-cause of death among people aged ≥ 65 years, whereby blacks had slightly lower age-specific death rates than whites in 2004, 2007, 2008, 2011–2013 and 2015. The above-mentioned results are similar to findings reported in a recent CDC report [3]. Among various causes of death, diseases of the heart, malignant neoplasms and cerebrovascular diseases were leading causes of death for both black and white Pennsylvanians at all ages, especially at ages 50–64 and ≥ 65 years. Accidents, suicide, assault and HIV disease were the most common leading causes of death for both races at younger ages (18–34 and 35–49 years). Racial disparities in death rates were narrowing for most of the leading causes of death over time; however, gaps are widening for some specific leading causes of death, such as diseases of the heart, accidents and suicide. These findings are generally consistent with a previous health disparity report conducted by the Pennsylvania Department of Health [17].

In previous analyses of all-cause or cause-specific county-level death rates in the U.S., there were large rural-urban disparities or between-county differences, and geographic patterns varied substantially by cause of death [4–7]. Our findings are consistent, as significant county-level geographic variations that were seen for death rates among both black and white residents in Pennsylvania. For blacks, all-cause age-adjusted death rates in Allegheny County, Beaver County and Philadelphia County were significantly higher than the statewide average. For whites, all-cause age-adjusted death rates in 35 counties were significantly higher than the statewide average, and most of these counties were clustered in the western and northeastern parts of Pennsylvania.

Moreover, compared to the statewide average death rates, both Beaver County and Philadelphia County had significantly higher all-cause age-adjusted death rates for both blacks and whites. These findings indicate that local factors, probably a combination of socioeconomic, health behavioral and health care factors play an important role in inhibiting advances in disease or injury prevention and treatment for local residents.

Additionally, black-white differences in all-cause age-adjusted death rates also varied dramatically by county, consistent with findings of a previously published study that found geographic heterogeneity of racial disparities in stroke mortality across U.S. counties [18]. Most of the counties that had significantly higher all-cause age-adjusted death rates among black over white averages were clustered in the southern part of Pennsylvania; whereas counties that had significantly lower all-cause age-adjusted death rates among black over white averages were irregularly distributed in the state.

Our analysis and mapping results have helped to identify geographical regions or counties in Pennsylvania where black or white residents have higher death rates relative to corresponding state averages and have experienced vast black-white disparity in mortality. Our findings imply the need for advanced and refined policy and action for the prevention and control of major causes of death at the local-county level.

In Pennsylvania, black residents generally had a higher prevalence of some unhealthy behaviors, such as smoking and no leisure-time physical activity, possibly factors associated with blacks' higher risk of obesity compared with whites. In addition to having a lower prevalence of healthy behaviors and of maintaining healthy weight, blacks were more likely to report not being able to see a doctor because of cost and being less likely to have a personal doctor or health care provider.

Racial differences in certain health behaviors, as well as lower access to health care utilization, may contribute to more prevalent chronic conditions and lower health-related quality of life among blacks, especially in the oldest adult group (≥ 65 years). The above-mentioned findings from our analysis are principally similar to those reported in the CDC Morbidity and Mortality Weekly Report [3]. It has been well known that multiple unhealthy behaviors are strong predictors of mortality; however, the level of mortality risk varies across unique combinations of unhealthy behaviors [19–21]. Therefore, higher risks of unhealthy behaviors, obesity and limited access to health care for blacks may partly explain the racial and geographic disparities in mortality that were found in our report.

Strengths of this report stem from the application of analytic methods and geographic mapping to the state- and county-level vital statistics and BRFSS data, allowing us to improve on previous reports by using smaller geographic units and attaining greater precision in small-area death rates by race. In addition, this analysis is based on the latest available data; as such, concerns regarding the current or timely generalizability of the results are minimized.

However, this report is subject to several limitations. First, death certificate data used in analysis does not include death cases that occurred outside the state, although these deaths would be a very small percentage of the total. Second, the population counts are based on postcensal projections from the U.S. census bureau that may be subject to error. Third, there are issues of race classification on the death certificate compared to self-reports in the census that could affect our estimates of white and black mortality at the county level. Fourth, information about health-related risk behaviors characteristics from the BRFSS was self-reported and subject to recall and social desirability biases, although this may randomly occur in both racial groups and is unlikely to account for large disparities within the analyses. Fifth, the BRFSS reflects the household survey based on non-institutionalized populations that may result in selection bias.

Conclusions

In conclusion, there were large black-white disparities in death rates for all-cause and for most selected leading causes of death in each age group from 1999 through 2015, despite the impressive overall decline in all-cause mortality over the last 17 years. Our report also highlights the pervasiveness and magnitude of substantial county-level racial disparities in mortality across counties in the state. Additionally, inequalities in the prevalence of various health-related risk behavior characteristics remain quite remarkable among black and white residents.

Reductions in racial and geographical disparities in leading causes of mortality and reduction in relevant risk factors have been a focus of national organizations and initiatives [22]. Therefore, optimizing health for all Pennsylvania residents should address long-term health and behavioral inequalities among different races or ethnicities and geographic areas as an integral part of disease prevention and health promotion activities.

Our report indicates the need for targeted action and population-wide interventions to reduce cause-specific mortality and associated behavioral risks in more deprived areas of the state and among socially disadvantaged populations. Further research using more detailed and comprehensive data is essential to translate results into effective health and social policy interventions, as well as actions which could lead to progress toward health equity in Pennsylvania.

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Figures

FIGURE 1. Death Rates for All-cause Death among Blacks and Whites, by Age Group (Years) – Pennsylvania, 1999–2015

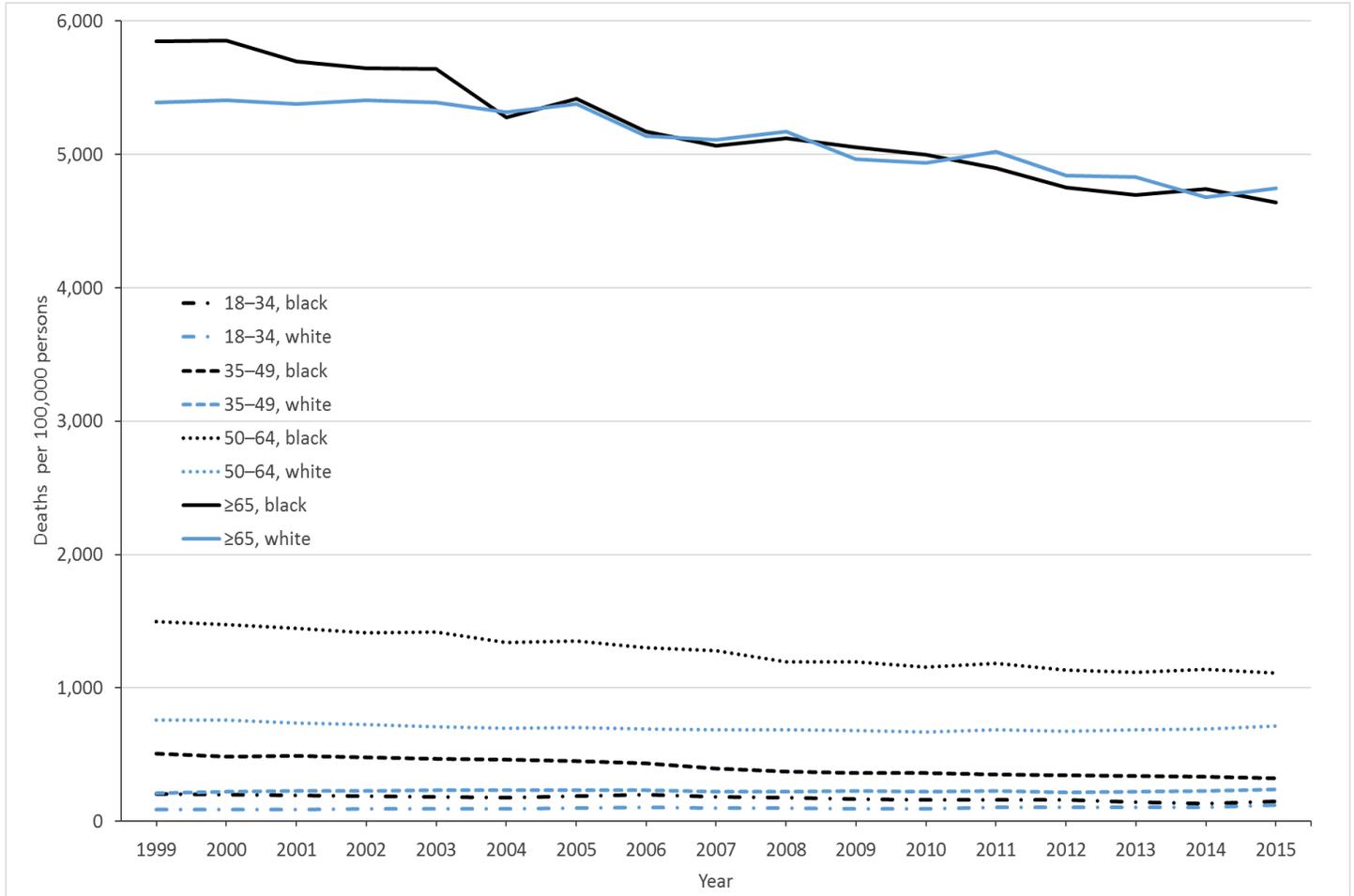
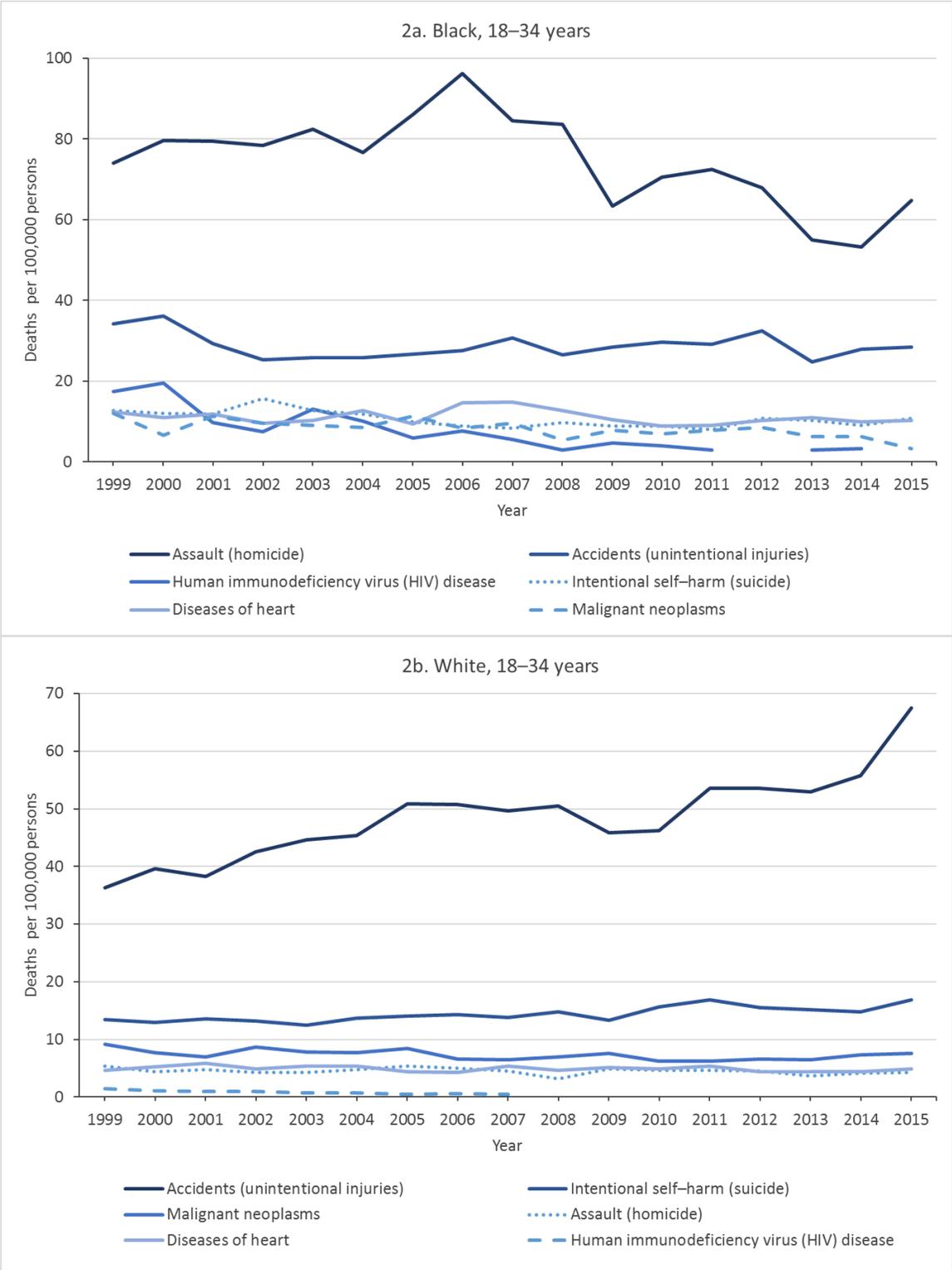
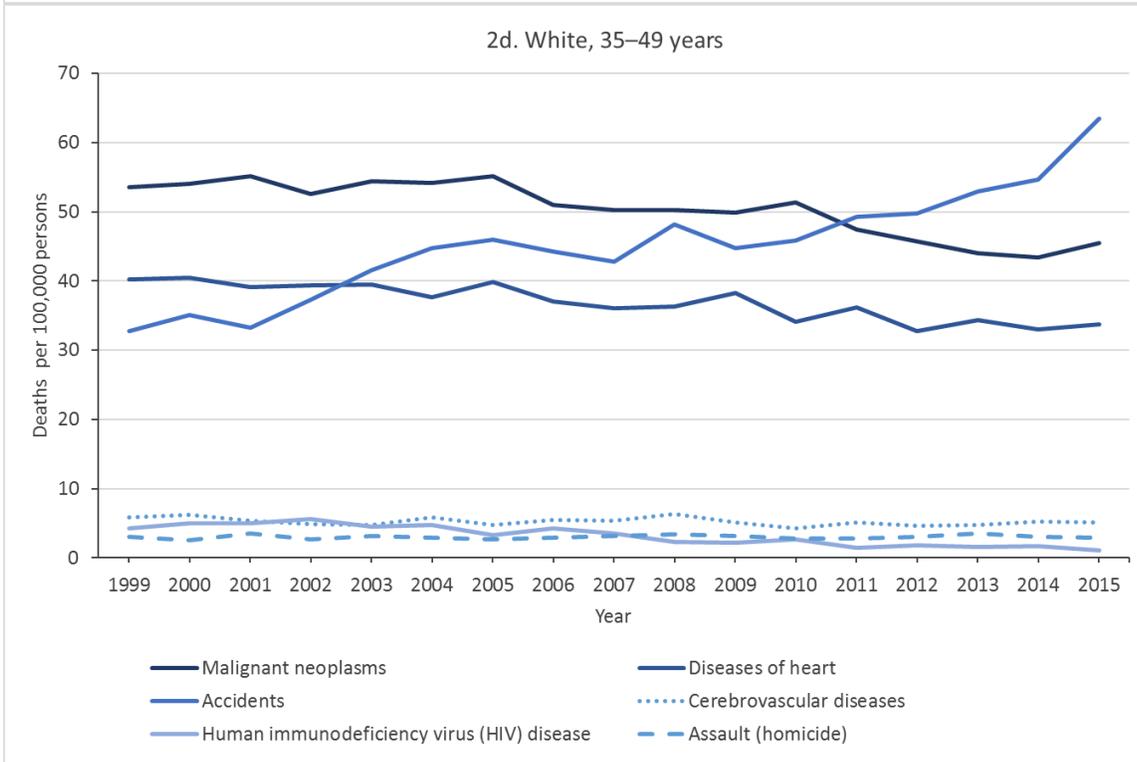
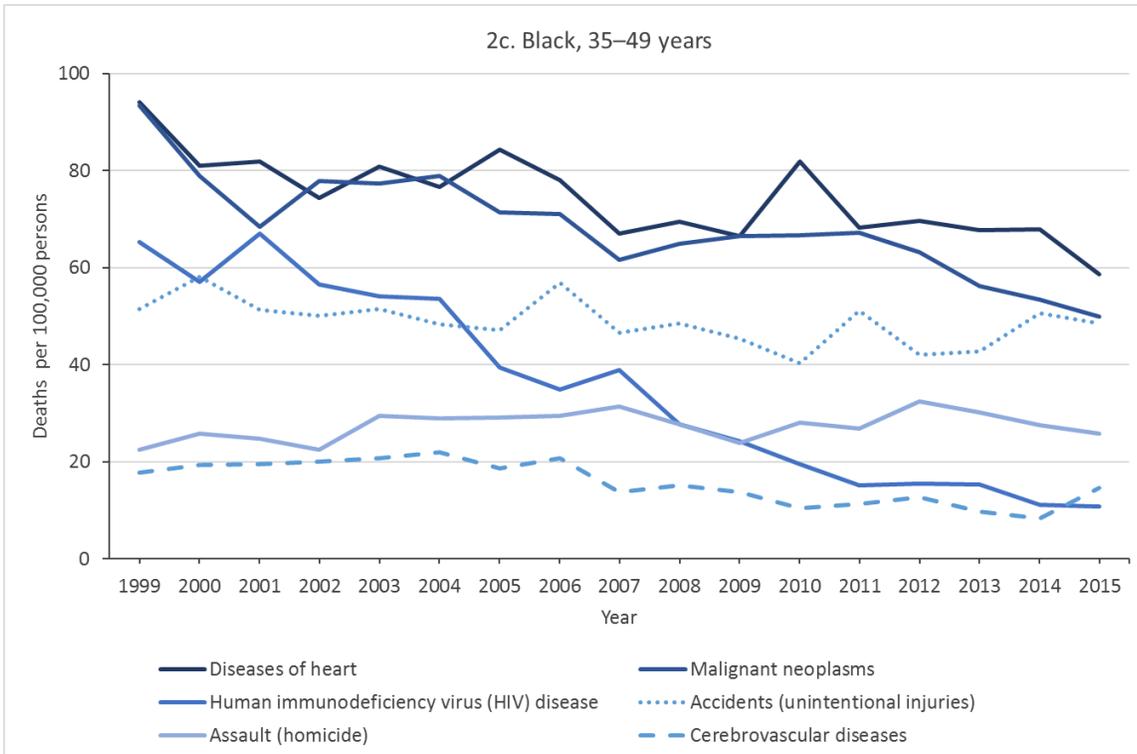
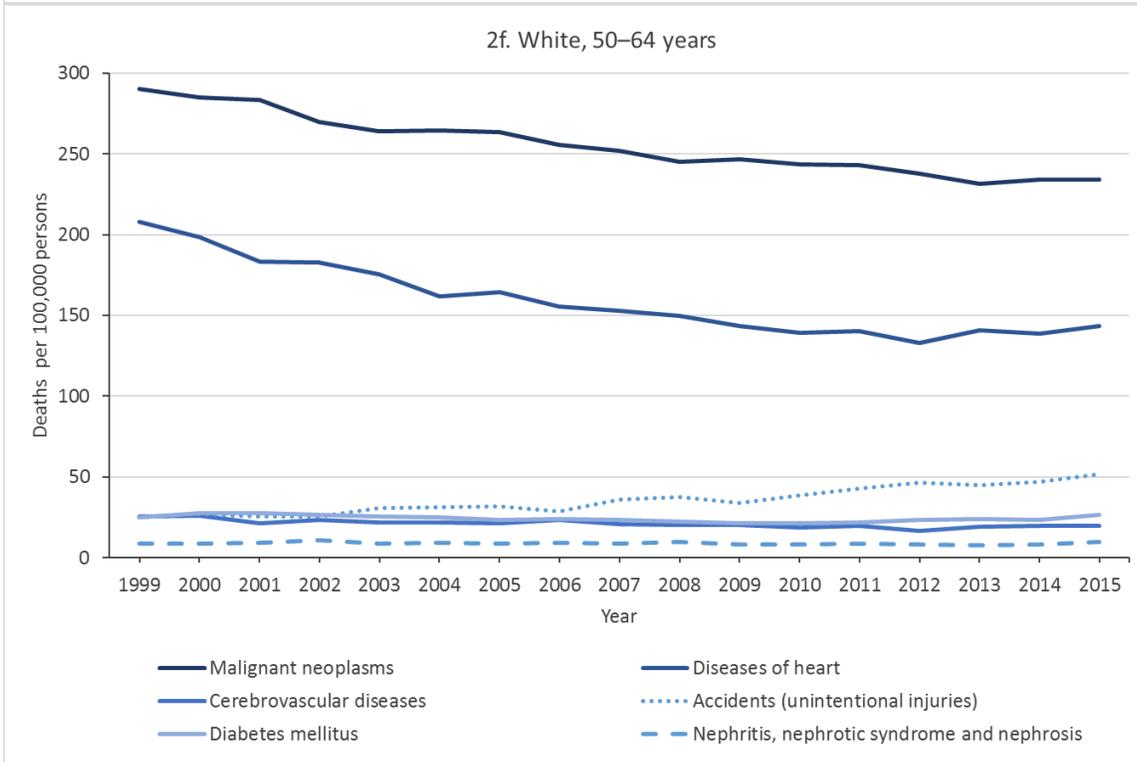
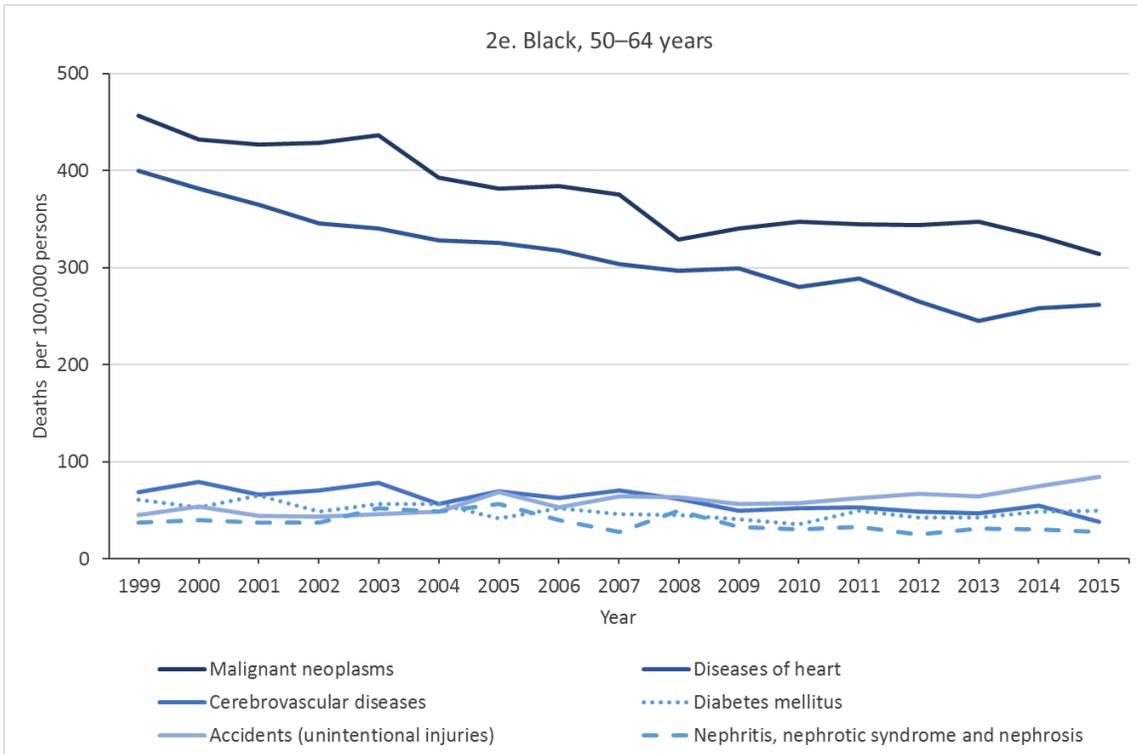
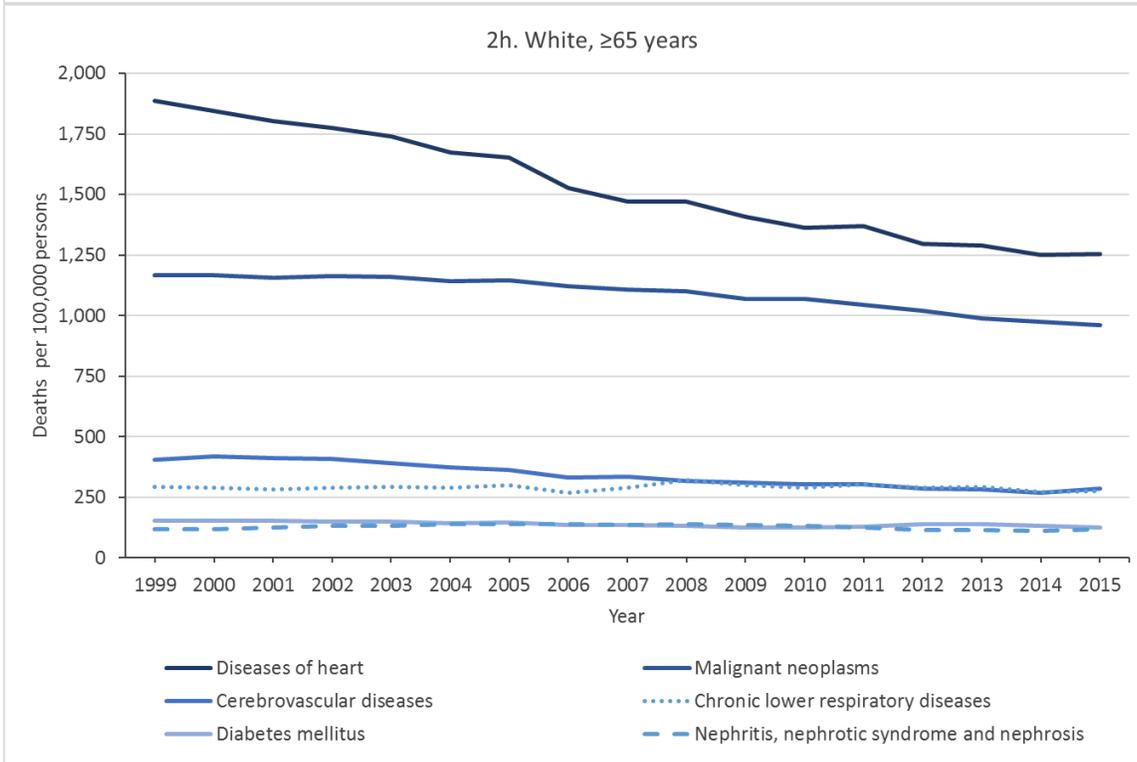
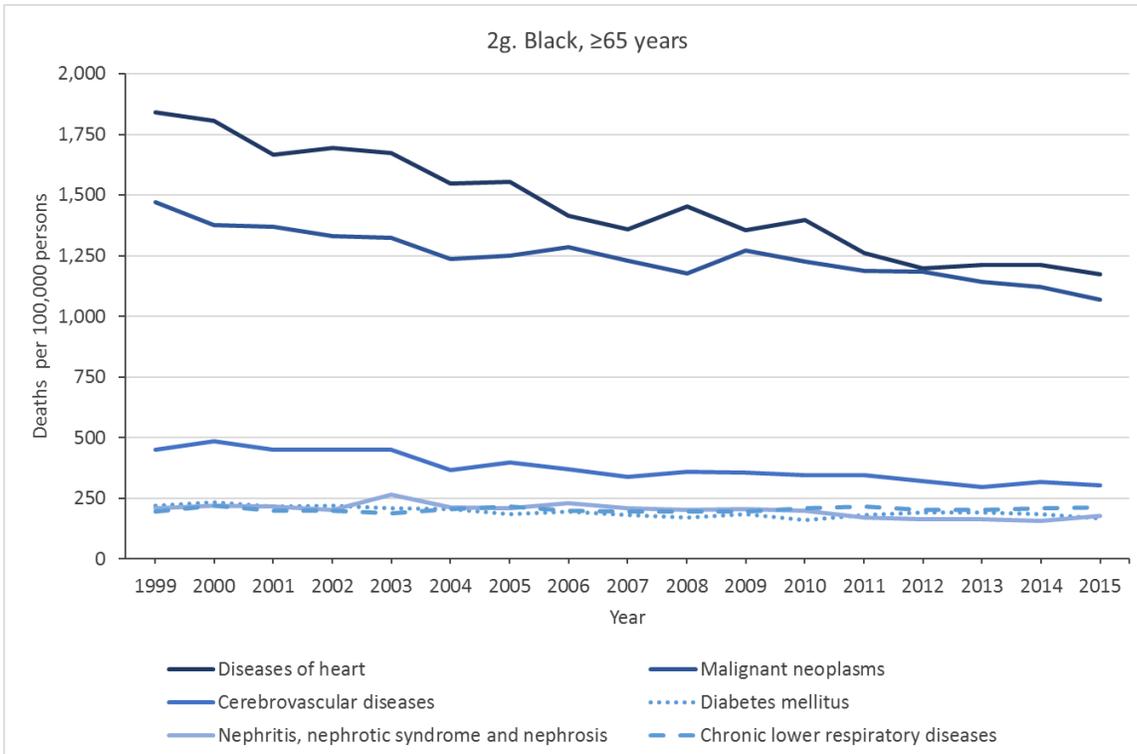


FIGURE 2. Death Rates for Selected Leading Causes of Death among Black and White Adults, by Age Group – Pennsylvania, 1999–2015









Tables

TABLE 1. Death Rates (per 100,000 Population) for All-cause and Selected Leading Causes of Death, Percentage Changes and Racial Disparity, by Age Group – Pennsylvania Death Certificate, 1999–2015

Cause of death by age group (years)	Black			White			Death rate disparity relative to white ^b	
	1999–2003 rate	2011–2015 rate	% change ^a	1999–2003 rate	2011–2015 rate	% change	1999–2003 (%)	2011–2015 (%)
All-cause								
All ages ^c	1168.1	918.7	-21.4*	857.5	753.6	-12.1*	36.2*	21.9*
18–34	193.9	148.7	-23.3*	91.4	107.5	17.6*	112.1*	38.3*
35–49	484.6	338.4	-30.2*	223.3	226.5	1.4	117.0*	49.4*
50–64	1449.2	1136.6	-21.6*	736.2	690.8	-6.2*	96.8*	64.5*
≥65	5736.6	4742.3	-17.3*	5393.8	4821.1	-10.6*	6.4*	-1.6*
Diseases of heart								
All ages	310.3	213.6	-31.2*	259.8	177.1	-31.8*	19.4*	20.6*
18–34	11.0	10.1	-8.2	5.2	4.7	-9.6	111.5*	114.9*
35–49	82.4	66.5	-19.3*	39.7	34.0	-14.4*	107.6*	95.6*
50–64	365.4	263.9	-27.8*	189.2	139.2	-26.4*	93.1*	89.6*
≥65	1735.4	1210.3	-30.3*	1810.4	1290.8	-28.7*	-4.1*	-6.2*
Malignant neoplasms								
All ages	264.8	211.9	-20.0*	200.8	170.1	-15.3*	31.9*	24.6*
18–34	9.7	6.4	-34.0*	8.0	6.8	-15.0*	21.3*	-5.9
35–49	79.1	58.0	-26.7*	53.9	45.2	-16.1*	46.8*	28.3*
50–64	436.0	336.3	-22.9*	278.2	236.2	-15.1*	56.7*	42.4*
≥65	1373.3	1139.3	-17.0*	1162.4	997.1	-14.2*	18.1*	14.3*
Chronic lower respiratory diseases								
All ages	34.5	33.9	-1.7	40.2	39.3	-2.2*	-14.2*	-13.7*
18–34	1.9	1.2	-36.8	0.6	0.5	-16.7	216.7*	140.0*
35–49	7.0	5.3	-24.3	2.4	2.7	12.5	191.7*	96.3*
50–64	39.4	34.4	-12.7	26.3	27.1	3.0	49.8*	26.9*
≥65	199.5	208.9	4.7	289.2	286.0	-1.1	-31.0*	-27.0*
Cerebrovascular diseases								
All ages	77.9	51.4	-34.0*	54.5	36.8	-32.5*	42.9*	39.7*
18–34	1.5	1.1	-26.7	1.0	0.7	-30.0*	50.0	57.1
35–49	19.5	11.4	-41.5*	5.4	4.9	-9.3	261.1*	132.7*
50–64	72.7	48.4	-33.4*	23.6	19.1	-19.1*	208.1*	153.4*
≥65	456.2	315.8	-30.8*	407.2	285.2	-30.0*	12.0*	10.7*
Accidents								
All ages	39.6	41.4	4.5*	35.9	48.8	35.9*	10.3*	-15.2*
18–34	30.1	28.5	-5.3	40.2	56.6	40.8*	-25.1*	-49.6*
35–49	52.6	47.0	-10.6*	36.0	53.9	49.7*	46.1*	-12.8*

50–64	46.8	70.9	51.5*	26.7	46.6	74.5*	75.3*	52.1*
≥65	79.5	82.6	3.9	94.0	119.8	27.4*	-15.4*	-31.1*
Diabetes mellitus								
All ages	41.1	34.0	-17.3*	24.2	21.1	-12.8*	69.8	61.1*
18–34	2.1	2.3	9.5	1.0	0.8	-20	110.0*	187.5*
35–49	14.7	12.1	-17.7	5.7	5.8	1.8	157.9*	108.6*
50–64	56.8	46.7	-17.8*	26.5	23.9	-9.8*	114.3*	95.4*
≥65	218.5	183.5	-16.0*	151.9	133.1	-12.4*	43.8*	37.9*
Septicemia								
All ages	40.0	21.7	-45.8*	15.4	12.5	-18.8*	159.7*	73.6
18–34	1.7	1.3	-23.5	0.7	0.6	-14.3	142.9*	116.7*
35–49	11.2	7.2	-35.7*	2.9	2.9	0	286.2*	148.3*
50–64	43.7	26.2	-40.0*	11.9	12.2	2.5	267.2*	114.8*
≥65	225.3	121.8	-45.9*	103.7	82.7	-20.3*	117.3*	47.3*
Suicide								
All ages	6.9	6.1	-11.6	11.0	14.5	31.8*	-37.3*	-57.9*
18–34	13.0	9.8	-24.6*	13.1	15.9	21.4*	-0.8	-38.4*
35–49	8.7	8.3	-4.6	16.7	21.6	29.3*	-47.9*	-61.6*
50–64	6.3	7.0	11.1	14.2	21.9	54.2*	-55.6*	-68.0*
≥65	4.9	5.0	2	11.9	15.7	31.9*	-58.8*	-68.2*
Homicide								
All ages	28.8	24.9	-13.5*	2.5	2.4	-4	1052.0*	937.5*
18–34	78.8	62.6	-20.6*	4.5	4.2	-6.7	1651.1*	1390.5*
35–49	25.0	28.6	14.4	3.0	3.0	0	733.3*	853.3*
50–64	12.4	10.0	-19.4	1.7	1.8	5.9	629.4*	455.6*
≥65	8.0	3.6	-55.0*	1.4	1.3	-7.1	471.4*	176.9*
HIV disease								
All ages	24.7	8.0	-67.6*	1.8	0.8	-55.6*	1272.2*	900.0*
18–34	13.4	2.4	-82.1*	1.0	0.2	-80.0*	1240.0*	1100.0*
35–49	60.0	13.6	-77.3*	4.9	1.5	-69.4*	1124.5*	806.7*
50–64	41.2	20.7	-49.8*	2.3	1.8	-21.7*	1691.3*	1050.0*
≥65	9.7	9.5	-2.1	0.4	0.6	50	2325.0*	1483.3*

^aChange (%) = (2011–2015 rate - 1999–2003 rate) × 100/1999–2003 rate.

^bDisparity (%) = (Black rate - white rate) × 100/white rate.

^c"All ages" category includes infants and children (<18 years). Death rates for all ages were age-standardized to the 2000 U.S. projected population.

*Z-statistic significance at p<0.05 for the death rate change from 1999–2003 to 2011–2015 or for the death rate difference between black and white populations.

TABLE 2. Comparison of Death Rates (Deaths per 100,000 Population) for All-cause and Selected Leading Causes of Death between Blacks and Whites, and Mortality Rate Ratios (RRs), by Age Group – Pennsylvania, 2011–2015

Cause of death	All ages ^a		18–34 years		35–49 years		50–64 years		≥65 years	
	Black	White	Black	White	Black	White	Black	White	Black	White
All-cause	918.7	753.6	148.7	107.5	338.4	226.5	1136.6	690.8	4742.3	4821.1
RR (95% CI)	1.23*	(1.22–1.24)	1.38*	(1.33–1.44)	1.49*	(1.45–1.54)	1.65*	(1.62–1.67)	0.98*	(0.97–0.99)
Diseases of heart	213.6	177.1	10.1	4.7	66.5	34	263.9	139.2	1210.3	1290.8
RR (95% CI)	1.23*	(1.21–1.26)	2.15*	(1.83–2.52)	1.96*	(1.82–2.10)	1.90*	(1.83–1.97)	0.94*	(0.92–0.96)
Malignant neoplasms	211.9	170.1	6.4	6.8	58	45.2	336.3	236.2	1139.3	997.1
RR (95% CI)	1.26*	(1.24–1.29)	0.94	(0.78–1.13)	1.28*	(1.19–1.38)	1.42*	(1.38–1.47)	1.14*	(1.12–1.17)
Cerebrovascular diseases	51.4	36.8	1.1	0.7	11.4	4.9	48.4	19.1	315.8	285.2
RR (95% CI)	1.43*	(1.38–1.48)	1.57	(0.98–2.52)	2.33*	(1.95–2.78)	2.53*	(2.32–2.77)	1.11*	(1.06–1.15)
Accidents	41.4	48.8	28.5	56.6	47	53.9	70.9	46.6	82.6	119.8
RR (95% CI)	0.86*	(0.83–0.90)	0.50*	(0.46–0.55)	0.87*	(0.81–0.94)	1.52*	(1.42–1.63)	0.69*	(0.64–0.75)
Diabetes mellitus	34	21.1	2.3	0.8	12.1	5.8	46.7	23.9	183.5	133.1
RR (95% CI)	1.64*	(1.57–1.72)	2.88*	(2.02–4.09)	2.09*	(1.76–2.47)	1.95*	(1.79–2.13)	1.38*	(1.30–1.46)
Chronic lower respiratory diseases	33.9	39.3	1.2	0.5	5.3	2.7	34.4	27.1	208.9	286
RR (95% CI)	0.87*	(0.85–0.93)	2.40*	(1.50–3.83)	1.96*	(1.52–2.53)	1.27*	(1.15–1.40)	0.73*	(0.69–0.77)
Assault (homicide)	24.9	2.4	62.6	4.2	28.6	3	10	1.8	3.6	1.3
RR (95% CI)	10.6*	(9.86–11.4)	14.9*	(13.43–16.54)	9.53*	(8.22–11.05)	5.56*	(4.46–6.92)	2.77*	(1.83–4.20)
Nephritis, nephrotic syndrome and nephrosis	27.8	15.2	0	0.2	6.2	1.9	29.3	8.6	167.1	116.5
RR (95% CI)	1.87*	(1.78–1.97)	–	–	3.26*	(2.54–4.20)	3.41*	(3.03–3.83)	1.43*	(1.35–1.52)
Septicemia	21.7	12.5	1.3	0.6	7.2	2.9	26.2	12.2	121.8	82.7
RR (95% CI)	1.77*	(1.67–1.87)	2.17*	(1.4–3.35)	2.48*	(1.99–3.10)	2.15*	(1.91–2.42)	1.47*	(1.38–1.58)
Influenza and pneumonia	14.4	15.2	1.3	0.8	3.5	2.2	13.8	8.3	84.9	116.6
RR (95% CI)	0.98	(0.92–1.05)	1.63*	(1.06–2.48)	1.59*	(1.17–2.16)	1.66*	(1.42–1.95)	0.73*	(0.67–0.79)
Alzheimer's disease	14.1	19.4	–	–	–	–	–	1.1	108	176.4
RR (95% CI)	0.73*	(0.68–0.78)	–	–	–	–	–	–	0.61*	(0.57–0.66)
Essential hypertension and hypertensive renal disease	11.1	5.8	–	–	2.9	0.9	13.3	4.7	65.1	43.4
RR (95% CI)	1.95*	(1.80–2.11)	–	–	3.22*	(2.24–4.64)	2.83*	(2.39–3.36)	1.50*	(1.37–1.65)
HIV disease	8	0.8	2.4	0.2	13.6	1.5	20.7	1.8	9.5	0.6
RR (95% CI)	10.5*	(9.27–11.9)	12*	(7.51–19.16)	9.07*	(7.35–11.19)	11.5*	(9.62–13.75)	15.83*	(11.15–22.48)

Chronic liver disease and cirrhosis	7.3	8.4	–	0.6	4.4	7.7	24.1	21.6	21.2	25.9
RR (95% CI)	0.88*	(0.80–0.96)	–		0.57*	(0.44–0.74)	1.12	(0.99–1.26)	0.82*	(0.70–0.96)
Suicide	6.1	14.5	9.8	15.9	8.3	21.6	7	21.9	5	15.7
RR (95% CI)	0.44*	(0.40–0.49)	0.62*	(0.53–0.71)	0.38*	(0.32–0.46)	0.32*	(0.26–0.39)	0.32*	(0.23–0.44)
Anemias	2.4	1.6	1.1	–	1.9	–	3	0.8	9.5	12.3
RR (95% CI)	1.55*	(1.31–1.83)	–		–		3.75*	(2.59–5.43)	0.77*	(0.61–0.98)
Pregnancy, childbirth and the puerperium	0.6	0.2	1.2	0.6	–	0.3	–	–	–	–
RR (95% CI)	3*	(2.11–4.27)	2*	(1.26–3.16)	–		–		–	

Abbreviation: CI = confidence interval

^a"All ages" category includes infants and children (<18 years). Death rates for all ages were age-standardized to the 2000 U.S. projected population.

* Statistical significance at alpha = 0.05, 95% CI did not include 1.

TABLE 3. Comparison of the Prevalence of Health-related Risk Behaviors between Blacks and Whites, and Prevalence Rate Ratios (RR), by Age Group – BRFSS, Pennsylvania, 2011–2015

	Adults ≥18 years		18–34 years		35–49 years		50–64 years		≥65 years	
	Black	White	Black	White	Black	White	Black	White	Black	White
Unweighted sample size	4817	511,588	977	7,311	1,081	9,660	1,519	16,542	1,240	18,075
Health behaviors: %										
Current smoker	26.77	19.71	25.96	25.40	28.70	24.69	32.57	19.72	16.45	8.35
RR (95% CI)	1.22*	(1.16–1.28)	1.01	(0.92–1.12)	1.11*	(1.01–1.22)	1.40*	(1.29–1.53)	1.47*	(1.30–1.66)
No leisure-time physical activity	28.89	24.73	21.89	16.52	26.81	22.38	30.65	26.88	45.59	33.69
RR (95% CI)	1.11*	(1.06–1.17)	1.19*	(1.07–1.33)	1.13*	(1.02–1.24)	1.10*	(1.01–1.19)	1.28*	(1.17–1.41)
Binge drinking	15.86	17.79	22.51	31.03	16.41	21.25	12.09	13.59	5.96	4.59
RR (95% CI)	0.93*	(0.88–0.99)	0.80*	(0.73–0.89)	0.85*	(0.76–0.96)	0.94	(0.82–1.06)	1.15	(0.94–1.39)
Weight status: %										
Normal weight	26.91	33.75	37.06	47.50	18.36	30.94	21.60	26.80	26.32	29.63
RR (95% CI)	0.85*	(0.81–0.90)	0.81*	(0.73–0.89)	0.71*	(0.64–0.79)	0.87*	(0.79–0.95)	0.92	(0.83–1.02)
Obesity	35.66	29.28	28.63	21.30	40.09	32.50	39.87	34.26	37.66	29.01
RR (95% CI)	1.16*	(1.11–1.21)	1.22*	(1.11–1.34)	1.18*	(1.08–1.29)	1.13*	(1.04–1.22)	1.22*	(1.11–1.33)
Health care utilization: %										
Has one personal doctor or health care provider	81.00	87.98	70.59	75.89	77.97	86.64	91.08	93.03	94.40	96.76
RR (95% CI)	0.76*	(0.72–0.81)	0.87*	(0.80–0.96)	0.74*	(0.66–0.82)	0.87*	(0.77–0.99)	0.75*	(0.57–0.99)
Could not see doctor in past year because of cost	19.51	10.46	22.45	14.61	23.37	13.44	18.56	10.12	7.87	3.29
RR (95% CI)	1.44*	(1.36–1.53)	1.30*	(1.17–1.44)	1.40*	(1.26–1.55)	1.42*	(1.29–1.57)	1.59*	(1.28–1.96)
Take antihypertensive medication	79.56	80.35	44.54	20.84	62.61	64.52	87.14	83.97	94.17	93.82
RR (95% CI)	0.98	(0.87–1.09)	1.75*	(1.23–2.48)	0.96	(0.78–1.18)	1.14	(0.90–1.44)	1.03	(0.79–1.35)
Health-related quality of life: %										
Fair or poor health status	22.98	15.83	12.25	7.94	20.01	13.24	33.32	18.67	36.85	23.85
RR (95% CI)	1.26*	(1.20–1.32)	1.27*	(1.11–1.46)	1.28*	(1.15–1.42)	1.48*	(1.36–1.60)	1.37*	(1.25–1.50)
Frequent mental distress	16.29	11.40	16.44	13.12	19.57	12.78	16.02	12.33	10.84	6.90
RR (95% CI)	1.23*	(1.16–1.31)	1.14*	(1.01–1.29)	1.29*	(1.15–1.44)	1.17*	(1.06–1.29)	1.28*	(1.10–1.50)
Frequent physical distress	14.32	12.11	7.46	5.96	13.17	11.03	20.82	15.80	22.13	15.75
RR (95% CI)	1.1*	(1.04–1.17)	1.13	(0.95–1.34)	1.11	(0.98–1.25)	1.18*	(1.08–1.30)	1.23*	(1.11–1.38)
Chronic conditions: %										
Asthma	17.82	13.47	22.71	17.40	16.80	13.75	15.87	12.32	11.10	10.15
RR (95% CI)	1.18*	(1.12–1.25)	1.18*	(1.06–1.31)	1.13*	(1.01–1.25)	1.16*	(1.05–1.28)	1.05	(0.93–1.19)

COPD	6.82	7.01	2.16	2.32	5.79	4.56	10.17	8.74	14.28	12.60
RR (95% CI)	0.99	(0.91–1.07)	0.96	(0.73–1.27)	1.13	(0.94–1.36)	1.09	(0.95–1.24)	1.07	(0.95–1.22)
High blood pressure	38.78	32.48	9.55	9.43	37.29	21.80	60.65	40.56	76.67	59.23
RR (95% CI)	1.15*	(1.08–1.22)	1.01	(0.84–1.21)	1.46*	(1.29–1.65)	1.50*	(1.35–1.68)	1.50*	(1.30–1.74)
High blood cholesterol	32.99	38.67	9.67	12.14	28.10	30.05	44.29	45.72	54.09	53.21
RR (95% CI)	0.88*	(0.83–0.94)	0.88	(0.68–1.14)	0.95	(0.82–1.10)	0.97	(0.87–1.09)	1.02	(0.90–1.16)
Diabetes	14.58	10.71	3.91	1.88	10.17	6.51	21.94	13.66	35.26	21.18
RR (95% CI)	1.19*	(1.13–1.26)	1.46*	(1.18–1.80)	1.28*	(1.11–1.47)	1.33*	(1.22–1.46)	1.42*	(1.30–1.56)
Coronary heart disease	4.45	5.15	0.60	0.53	1.66	1.50	7.52	5.64	13.27	13.47
RR (95% CI)	0.93	(0.84–1.02)	1.07	(0.68–1.68)	1.05	(0.80–1.39)	1.17	(0.98–1.38)	0.99	(0.87–1.13)
Stroke	4.7	3.06	0.95	0.35	2.23	1.61	7.77	3.13	12.73	7.49
RR (95% CI)	1.24*	(1.14–1.37)	1.66*	(1.03–2.68)	1.18	(0.93–1.19)	1.62*	(1.40–1.86)	1.34*	(1.15–1.57)
Cancer (excluding skin cancer)	5.69	7.65	1.07	1.45	3.17	4.17	7.06	8.02	18.50	17.63
RR (95% CI)	0.85*	(0.79–0.93)	0.86	(0.56–1.32)	0.87	(0.69–1.10)	0.93	(0.82–1.06)	1.03	(0.91–1.16)

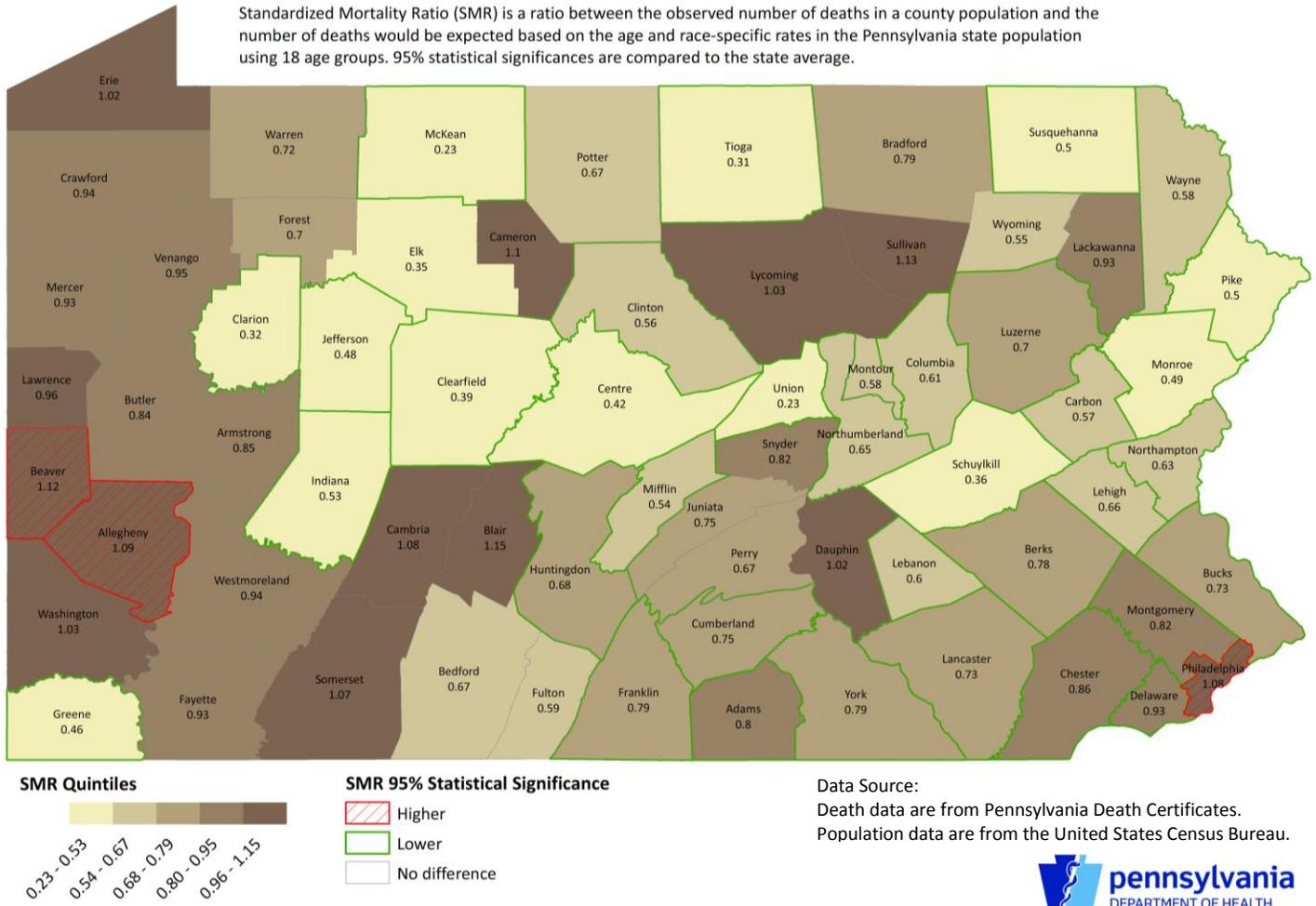
Abbreviation: CI = confidence interval.

*Statistical significance at alpha = 0.05, 95% CI did not include 1.

Maps

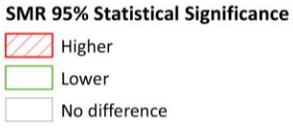
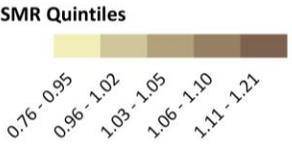
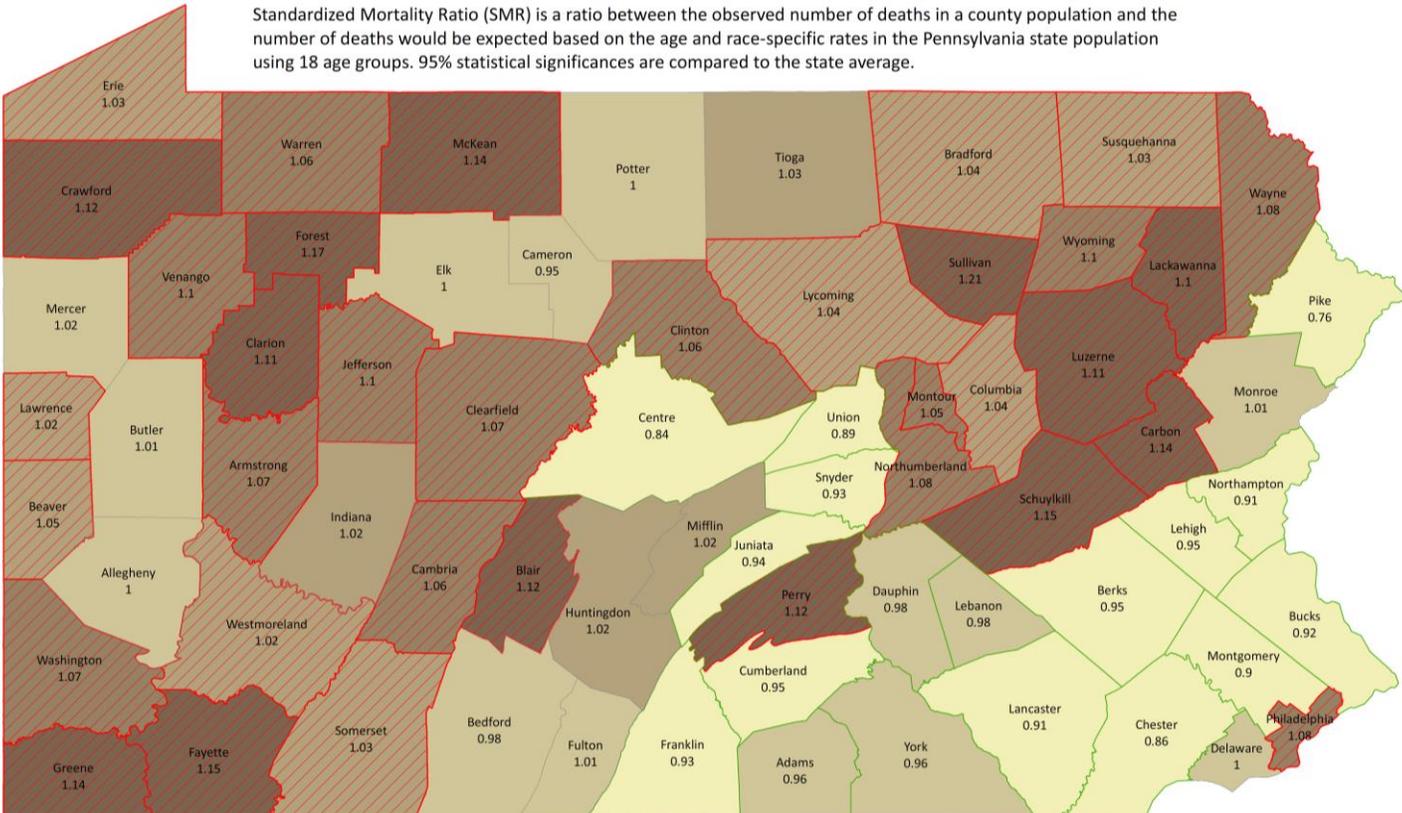
MAP 1. All-cause Death Standardized Mortality Ratio for Blacks by County, Pennsylvania Death Certificates, 2005–2014

Standardized Mortality Ratio (SMR) is a ratio between the observed number of deaths in a county population and the number of deaths would be expected based on the age and race-specific rates in the Pennsylvania state population using 18 age groups. 95% statistical significances are compared to the state average.



MAP 2. All-cause Death Standardized Mortality Ratio for Whites by County, Pennsylvania Death Certificates, 2005–2014

Standardized Mortality Ratio (SMR) is a ratio between the observed number of deaths in a county population and the number of deaths would be expected based on the age and race-specific rates in the Pennsylvania state population using 18 age groups. 95% statistical significances are compared to the state average.

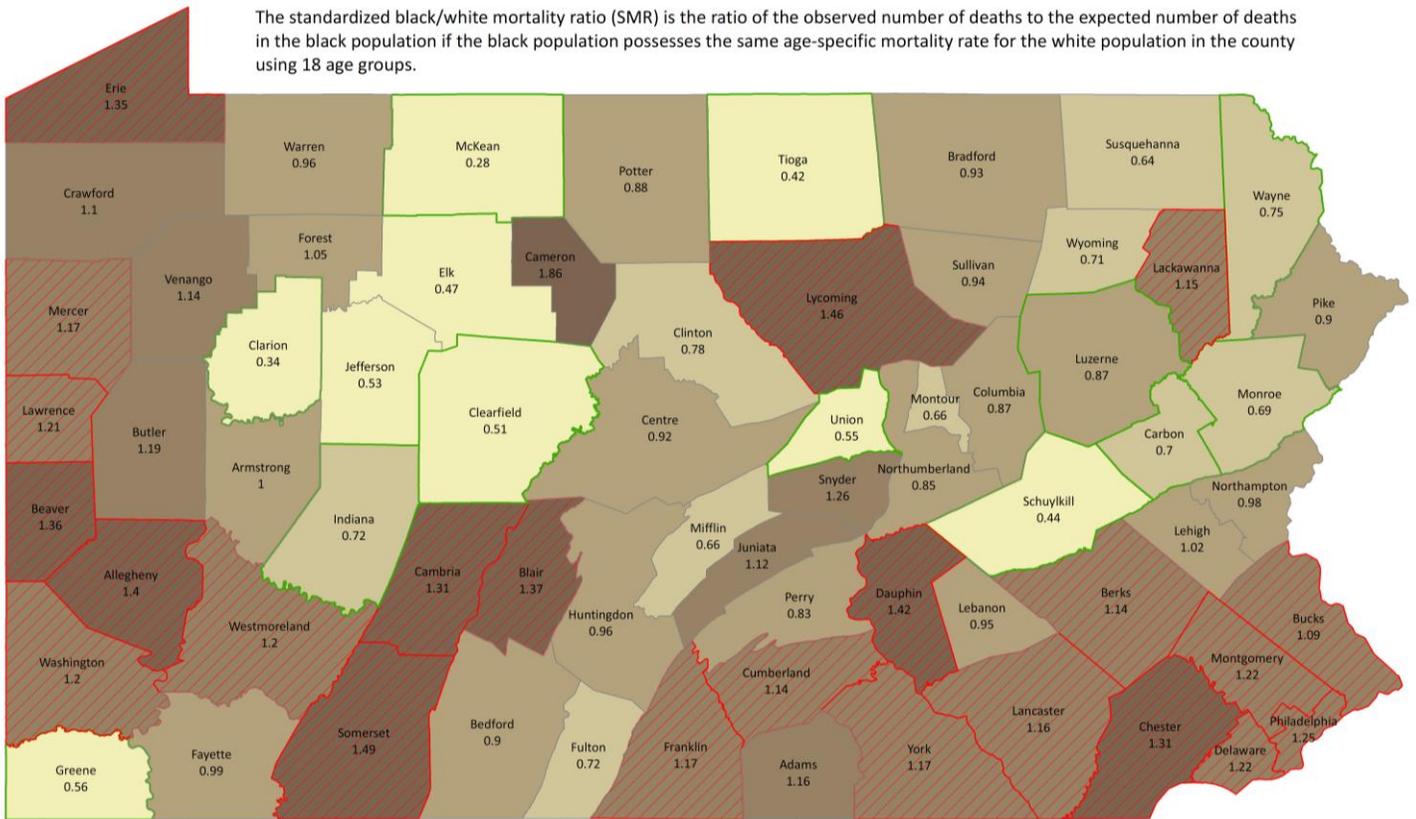


Data Source:
 Death data are from Pennsylvania Death Certificates.
 Population data are from the United States Census Bureau.

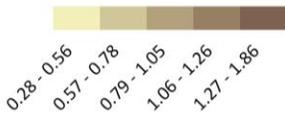


MAP 3. All-cause Death Standardized Mortality Ratio for Blacks Compared to Whites by County, Pennsylvania Death Certificates, 2005–2014

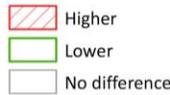
The standardized black/white mortality ratio (SMR) is the ratio of the observed number of deaths to the expected number of deaths in the black population if the black population possesses the same age-specific mortality rate for the white population in the county using 18 age groups.



SMR Quintiles



SMR 95% Statistical Significance



Data Source:

Death data are from Pennsylvania Death Certificates.
Population data are from the United States Census Bureau.

