Published in final edited form as:

J Am Geriatr Soc. 2018 October ; 66(10): 1980–1986. doi:10.1111/jgs.15534.

Racial differences in cause-specific mortality among community-dwelling older black and white adults

Megan M. Marron, MS^a, Diane G. Ives, MPH^a, Robert M. Boudreau, PhD^a, Tamara B. Harris, MD^b, and Anne B. Newman, MD^{a,c}

^aDepartment of Epidemiology, University of Pittsburgh, Pittsburgh, PA

^bLaboratory of Epidemiology and Population Sciences, Intramural Research Program, National Institute on Aging, Bethesda, MD

^cDepartments of Medicine and Clinical and Translational Science, University of Pittsburgh, Pittsburgh, PA

Abstract

Background—U.S. black individuals die at higher rates than white individuals. To inform points of intervention to reduce excess mortality, we sought to understand which causes of death were higher among black versus white community-dwelling older adults and determine whether differences in baseline risk factors explained racial differences in mortality.

Design—Longitudinal cohort study.

Setting—Pittsburgh, Pennsylvania and Memphis, Tennessee.

Participants—The Health, Aging, and Body Composition study followed N=3075 black and white men and women aged 70–79 during recruitment (1997/98; 48% men, 42% black) for a median of 13 years.

Measurements—Cause of death was adjudicated by a committee of physicians and categorized as: cardiovascular disease, stroke, cancer, dementia, pulmonary, infection, kidney, or ‘other’

Address Correspondence to: Anne B. Newman, MD, MPH, Chair, Department of Epidemiology, Katherine M. Detre Endowed Chair of Population Health Sciences, Director, Center for Aging and Population Health, Professor of Epidemiology, Medicine, and Clinical and Translational Science, Graduate School of Public Health, University of Pittsburgh, 5126 Parran Hall, 130 DeSoto Street, Pittsburgh, PA 15261, Office (412) 624-3056; Fax (412) 624-3737, newmana@edc.pitt.edu.

This work was presented at the 21st International Association of Gerontology and Geriatrics (IAGG) World Congress of Gerontology & Geriatrics in San Francisco, CA on July 24, 2017.

Conflict of Interest

There are no conflicts of interest.

Author Contributions

Megan Marron completed the analysis and interpretation of the data, and wrote the manuscript. Diane Ives played an integral part in tracking down deaths in the Health ABC study and the necessary records to assign cause of death, as well as she edited the manuscript. Dr. Robert Boudreau helped with analysis and interpretation, and edited the manuscript. Dr. Tamara Harris contributed to the conception and design of the study, acquisition of cause of death data, and edited the manuscript. Dr. Anne Newman also contributed to the conception and design of the study, was part of the committee that adjudicated deaths, guided the aims of the manuscript, helped with interpretation of the data, and edited the manuscript. All authors approved the manuscript prior to submission.

Sponsor's Role

The funding agency did not have any role in the design and conduct of the Health ABC study, nor did they have any role in the analysis presented here.

causes. Using competing risks regression, we examined whether known risk factors at baseline (demographics, smoking, body mass index, chronic diseases, physical function, and cognition) could explain racial differences in cause-specific mortality risk.

Results—During follow-up, 1991 (65%) participants died. Black participants died at higher rates from cancer, kidney disease, stroke, and cardiovascular disease (hazard ratio (95% confidence interval): 1.36 (1.14, 1.63); 2.09 (1.16, 3.74); 1.31 (0.98, 1.76); 1.16 (0.98, 1.37), respectively). The racial difference in risks of dying from kidney disease, stroke, and cardiovascular disease was explained most by worse physical and cognitive performance at baseline among black participants. However, the racial difference in cancer mortality was not explained by differences in baseline risk factors. When examining types of cancer deaths, black participants died at higher rates from multiple myeloma, pancreatic cancer, and prostate cancer, which were also not explained by baseline risk factors.

Conclusion—Factors contributing to poorer physical and cognitive performance in similarly-aged black men and women could be targets to reduce excess mortality from cardiovascular disease, stroke, and kidney disease. More work is needed to identify factors contributing to cancer mortality disparities.

Keywords

cause-specific mortality; racial differences; African Americans

INTRODUCTION

In the U.S., black individuals have a higher mortality rate than white individuals.¹ At ages 70–79, black versus white older adults die at a 23% higher rate.^{1,2} The racial gap in life expectancy narrows with older age.³ However, even at age 70, black men and women live an average of 1.1 and 0.6 years less than white men and women, respectively. The racial difference in mortality may be due to known risk factors that are more prevalent among black individuals. For example, black Americans have a higher prevalence of diabetes,⁴ obesity,⁵ hypertension,⁶ and physical inactivity⁷ than white Americans, and black men have a higher prevalence of smoking than white men.⁸ To inform points of intervention to reduce excess mortality among black older adults, evidence is needed to clarify whether differences in known risk factors between black and white older adults can in fact account for racial disparities in mortality.

The Health, Aging and Body Composition (Health ABC) study followed a cohort of community-dwelling older black and white men and women. Such a cohort can further our understanding of potential reasons for racial differences in mortality due to its long-term follow-up, substantial proportion of black participants, and detailed baseline interview and examination. Thorpe et al. (2012) previously reported black older adults from the Health ABC study died at higher rates from coronary heart disease and cancer, of which differences in baseline risk factors could only explain the racial difference in risk of coronary heart disease mortality.⁹ A limitation of this report was that racial differences in mortality due to causes other than heart disease and cancer were not examined because of the limited number of deaths at the time of analysis. Thus, there remains a need to continue this work by

examining racial differences in multiple causes of death, in addition to heart disease and cancer, especially since U.S. black older adults die at a higher rate from almost all leading causes of death.^{1,2}

Currently, the Health ABC study has a 17.4 year maximum follow-up, where the number of adjudicated deaths has more than tripled since Thorpe et al. (2012). A longer follow-up and larger number of deaths allow for greater power to detect racial differences in mortality due to multiple causes, as well as for greater specificity for certain types of cancer deaths. Thus, we sought to examine whether racial differences in deaths due to cardiovascular disease, stroke, cancer, dementia, pulmonary diseases, infections, kidney disease, or 'other' causes exist among black versus white older adults from the Health ABC study, and to determine whether any racial differences in mortality due to specific causes could be explained by differences in measured baseline risk factors.

METHODS

The Health ABC study

The Health ABC study is a prospective cohort of N=3075 black and white men and women in Pittsburgh, Pennsylvania and Memphis, Tennessee, designed to characterize body composition, health, and incident functional limitation. White participants were recruited from a random sample of Medicare beneficiaries and all age-eligible black residents were recruited. Eligible participants were aged 70–79 during recruitment (1997/98) and self-reported no difficulty: walking ¼ mile, climbing 10 steps, or with basic activities of daily living. Those who had active cancer treatment in the past three years or were moving from the area within the next three years were ineligible.¹⁰ The protocol was approved by each field centers' Institutional Review Board and all participants provided written informed consent.

Potential confounders of the association between race and mortality

Sociodemographic factors, including date of birth, gender, race (self-reported as black or white), education, marital status, income, and health insurance, as well as smoking status and history or presence of chronic conditions were assessed by interview. History or presence of congestive heart failure, cerebrovascular disease, cancer, hypertension, and diabetes were based on self-report of a physician diagnosis. Hypertension and diabetes were confirmed by medication use. Cognitive performance was measured using the digit symbol substitution task.¹¹ Gait speed was the average speed over 20 meters.

Mortality

Participants were contacted every 6 months, with a median follow-up of 13.1 years. Deaths were identified by obituaries and proxy interviews. A committee of physicians reviewed all medical records, proxy interviews, and death certificates to assign underlying cause of death. For analyses, cause of death was categorized as:¹² cardiovascular disease, stroke, cancer, dementia, pulmonary disease, infection, kidney disease, or 'other'. Cardiovascular disease mortality included deaths from: atherosclerotic cardiovascular disease, non-cardiovascular atherosclerosis disease, and other non-stroke cardiovascular disease. Deaths categorized as

‘other’ included: liver failure, gastrointestinal disease, trauma, amyotrophic lateral sclerosis, Parkinson’s disease, epilepsy, metabolic disease, amyloidosis, hip fracture, failure to thrive, myelodysplastic syndrome, and other musculoskeletal diseases.

Statistical analysis

Mean (standard deviation) or frequency (percent) was used to describe differences by race and gender using Analysis of Variance and chi-square tests. The Kaplan Meier overall survival curve was illustrated by race and gender. Participants alive at the time of analysis were censored at their last interview date. Cause-specific mortality risk among black versus white participants was examined using Fine and Gray’s competing risks model to adjust for deaths from other causes.¹³ Causes of death with a racial difference in risk at a 0.10 significance level was illustrated by the cumulative incidence function and further examined to determine whether differences in baseline risk factors explained racial differences in risk. We examined whether a large number of baseline risk factors could further explain racial differences in cause-specific mortality, although further adjustment resulted in a similar amount of attenuation to what was presented here. For comparability, the risk factors presented are similar to previous work in the Cardiovascular Health Study.¹² For causes of death that had a significant racial difference in risk, we examined the estimated risk for black versus white participants while adjusting for age, gender, and study site (Model 1), education, body mass index, and smoking pack-years (Model 2), and chronic diseases, gait speed, or the digit symbol substitution task (Models 3a–3c). A fully adjusted model was also examined (Model 4). Percent attenuation quantified the extent to which baseline risk factors explained racial differences in cause-specific mortality.

Complete data was available on 2599 (85%) participants. Multiple imputation was applied to replace missing measurements using available information on age, gender, race, marital status, supplemental health insurance, income, pulmonary functioning, and physical and cognitive performance. The average of five imputed values replaced missing measurements for education (0.3%), smoking pack-years (1%), gait speed (13%), and digit symbol substitution task (1%). Consistent results were found using complete case analyses versus analyses with imputed values.

RESULTS

Participants were, on average, 74 years old, 48% were men, and 42% were black (Table 1). During follow-up, 1991 (65%) participants died. Black men, white men, black women, and white women had a median survival (95% confidence interval) of 10.6 (10.0, 11.5), 12.8 (12.4, 13.4), 13.4 (12.6, 14.6), and 15.3 (14.8, 16.2) years, respectively (Figure 1). Over half of the deaths were due to cardiovascular disease and cancer (Table 2). Few participants died from pulmonary diseases, infections, and kidney disease.

Black participants had higher risks of dying from cardiovascular disease, stroke, kidney disease, and cancer, while adjusting for age, gender, and site (Table 3). There were no differences in risk of dying from dementia (1.07 (0.85, 1.35); $p=.56$), pulmonary diseases (0.81 (0.51, 1.27); $p=.35$), infection (0.95 (0.60, 1.5); $p=.84$), or ‘other’ causes (0.92 (0.71, 1.2); $p=.51$) among black versus white participants, while adjusting for age, gender, and site.

When examining the cumulative incidence of deaths from cardiovascular disease, stroke, cancer, or kidney disease (Figure 2) it appeared there may be race-specific differences by gender, though there were no significant race-gender interactions ($p>.50$). Thus, black men and women versus white men and women were examined as black versus white participants in competing risks models, while adjusting for gender. Though not a focus here, women were at a higher risk of dying from dementia than men (1.61 (1.27, 2.03); $p<.001$), while adjusting for age, race, and site, which may be explained by the women living longer, on average. For example, a quarter of the dementia deaths occurred after age 90 (mean age at dementia death=87), where a larger proportion (57%) of participants who were still alive at age 90 and thus, still at risk for dying from dementia were women (Fisher's exact test $p=.003$).

Cardiovascular disease mortality

Table 3 displays how the black versus white hazard ratio with respect to a specific cause of death changes after adjusting for baseline risk factors. Black participants had a 16% higher risk of dying from cardiovascular disease than white participants, while adjusting for age, gender, and site (Model 1). Further adjusting for education, body mass index, and smoking pack-years attenuated the racial difference in cardiovascular disease mortality risk by 44% (Model 2). In the fully adjusted model, the higher risk of dying from cardiovascular disease among black participants was completely attenuated (Model 4).

Stroke mortality

Black participants had a 31% higher risk of dying from stroke than white participants, while adjusting for age, gender, and site (Model 1). Further adjusting for education, body mass index, and smoking pack-years strengthened the association between race and stroke mortality (Model 2). In the fully adjusted model, the racial difference in stroke mortality risk was attenuated by 81% (Model 4), where adjusting for the digit symbol substitution task explained the racial difference most prominently.

Kidney disease mortality

Black participants had over two times the risk of dying from kidney disease than white participants, while adjusting for age, gender, and site (Model 1). Further adjusting for education, body mass index, and smoking pack-years minimally attenuated the racial difference (Model 2). In the fully adjusted model, the higher kidney disease mortality risk among black participants was attenuated by 25% (Model 4), where adjusting for gait speed explained the racial difference most prominently.

Cancer mortality

Black participants had a 36% higher risk of dying from cancer than white participants, while adjusting for age, gender, and site (Model 1). Further adjusting for education, body mass index, and smoking pack-years strengthened the racial difference in cancer mortality (Model 2). Additionally adjusting for chronic conditions, the digit symbol substitution task, and gait speed also strengthened the association between race and cancer mortality (Model 4). Adding marital status, supplemental health insurance, and income $> \$50,000$ to the fully

adjusted model attenuated the higher cancer mortality risk among black participants by 23%; however, black participants still had a significantly higher cancer mortality risk (1.40 (1.11, 1.76); $P=.005$).

Specific type of cancer mortality

Among the 490 participants who died from cancer, most died from lung cancer (24%; Table S1–S2), followed by prostate cancer among men (16%) and breast cancer among women (12%). Despite the small numbers, black participants had 4.13 times the risk of dying from multiple myeloma (1.78, 9.61; $P=.001$) and an 82% higher risk of dying from pancreatic cancer (0.99, 3.35; $P=.06$) than white participants, while adjusting for age, gender, and site. Black men also had a 67% higher risk of dying from prostate cancer than white men (0.95, 2.97; $P=.08$), while adjusting for age and site. The racial differences in risk of dying from multiple myeloma, pancreatic cancer, and prostate cancer were also not explained by body mass index, smoking pack-years, education, chronic diseases, physical and cognitive performance, or markers of socioeconomic status.

DISCUSSION

Black participants in the Health ABC study had higher risks of dying from cancer, kidney disease, stroke, and cardiovascular disease when compared to white participants. The racial differences in mortality due to kidney disease, stroke, and cardiovascular disease were explained most by worse baseline physical and cognitive performance among black participants. However, the racial difference in cancer mortality was not explained by differences in measured baseline risk factors.

One potential explanation for why the racial difference in cancer mortality was not explained is that different types of cancers have different etiologies, making for a complicated outcome when all are grouped together. Despite small numbers, we addressed this by examining types of cancer deaths and found black participants had higher risks of dying from multiple myeloma and pancreatic cancer, and black men had a higher risk of dying from prostate cancer, all of which persisted after adjusting for baseline risk factors. This racial difference was also reflected in the U.S. population. The incidence and mortality rate of multiple myeloma are over 2 times as likely among black versus white Americans.¹⁴ Similarly, the incidence and mortality rate of pancreatic cancer are 24% higher in black versus white Americans¹⁴ and U.S. black versus white men have a 67% higher rate of incident prostate cancer and over two times the rate of dying from prostate cancer.¹⁵ Given that screening does not exist for multiple myeloma or pancreatic cancer, and that both the incidence and mortality rate for multiple myeloma, pancreatic cancer, and prostate cancer are higher among black versus white Americans, makes it unlikely that socioeconomic factors and health insurance explain these racial disparities. Instead, some have suggested biologic factors explaining these racial differences in types of cancer deaths.^{15–17}

Despite the higher rate of cancer mortality among black participants, white participants had a higher prevalence of cancer at baseline. History or presence of diseases was determined by self-report of a physician diagnosis, and an ineligibility criterion was active cancer treatment in the past three years. Thus, participants who self-reported a history of cancer would have

been in remission for at least three years. In the U.S., black individuals have the highest death rate and shortest survival for most cancers.¹⁸ Thus, the higher prevalence of cancer at baseline among white participants is likely due to survivor bias.

In this cohort, black men and women had worse average gait speed and digit symbol substitution task scores. The disadvantage in physical and cognitive performance explained racial differences in risk of dying from cardiovascular disease, stroke, and kidney disease most prominently. Performance measures, such as these, are well-established mortality risk factors among older adults.^{12,19,20} In fact, among 825 phenotypic and genetic measures in the Health ABC study, the digit symbol substitution task and physical performance measures were among the top 10 best mortality predictors.¹⁹ Examining an older adult's physical and cognitive performance is often the best measure of overall health, representing life-long impact of risk factors, such as severity and duration of diseases and interactions of multiple chronic conditions.²¹ However, physical and cognitive performances are only intermediate markers. Previous work in the Health ABC study found older age, black race, low education and literacy, current smoking, and not participating in moderate/vigorous exercise was associated with a higher odds of cognitive decline²², whereas risk factors of a faster decline in gait speed were being a women, black race, higher body mass index, limited knee strength, and low levels of physical activity.²³ Other work in Health ABC found indicators of socioeconomic status, such as literacy, education, income, and owning a house, partially attenuated the associations between black race and lower average baseline cognitive and physical performance^{24,25}. Thus, less lifetime learning, financial inadequacy, and unhealthy lifestyles may be underlying risk factors contributing to decline in physical and cognitive performance as pathways to higher mortality from cardiovascular disease, stroke, and kidney disease among black Health ABC participants. However, these previous analyses only partly explain higher risks of physical and cognitive functional impairment among blacks in this cohort.

Baseline risk factors that attenuated the racial difference in mortality risk differed by cause of death. For example, adjusting for education, body mass index, and smoking attenuated the racial difference in cardiovascular disease mortality by 50%, but explained minimal amounts of the racial difference in deaths from kidney disease, cancer, and stroke. Others have noted race-related mortality risk factors differing by cause of death.^{9,26} There also exist few common risk factors for all causes of death among older adults.¹² Thus, to understand racial disparities in mortality, analyses need to be focused on cause-specific mortality, especially since all-cause mortality is heavily weighted by cardiovascular disease.

Though, not a focus of this report, women only had a higher risk of dying from dementia, which is related in part to their older age at death than men. In contrast, there was no difference in dementia mortality by race. In the U.S. population, there is a higher prevalence of Alzheimer's disease among black Americans,²⁷ though they do not have a higher rate of dying from Alzheimer's disease than white Americans.²⁸ This is likely due to competing risks of death, such as from cardiovascular disease, which occur at younger average ages than dementia deaths. Consistent with this, black Health ABC participants died at a higher rate from cardiovascular disease, as well as died at a younger average age than white participants.

A limitation of this study was the small number of deaths due to pulmonary disease, infection, and types of cancer. With a larger number of deaths due to these causes, we may have identified more racial differences. Other limitations included lack of information on type of cancer deaths and early life exposures that may better explain mortality racial differences. Strengths of this study included the large number of black older adults allowing for an examination of black-white differences, the well-characterized cohort enabling assessment of how multiple baseline risk factors attenuate racial differences in mortality, and the adjudication and complete data on cause of death by a committee of physicians.

Though all Health ABC participants were recruited to be non-disabled, black participants still experienced a higher mortality rate. Gait speed and the digit symbol substitution task appeared to be meaningful markers of this health disparity. Factors contributing to worse physical and cognitive performance, such as an unhealthy lifestyle, financial inadequacy, and lower cognitive reserve, may be common targets for a multi-factorial intervention to reduce excess mortality due to cardiovascular disease, stroke, and kidney disease among older black men and women aged 70–79. The higher risk of cancer mortality experienced by black participants, on the other hand, was not explained by their relative disadvantage at baseline. Future work is needed to understand how to reduce disparities in cancer mortality, specifically from multiple myeloma, pancreatic cancer, and prostate cancer among black adults aged 70–79.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding sources: This work was supported by contracts N01-AG-6-2101; N01-AG-6-2103; N01-AG-6-2106; NIA grant R01-AG028050, and NINR grant R01-NR012459 from National Institute on Aging. This work was also supported in part by the Intramural Research Program of the NIH, National Institute on Aging. MMM is supported by the Epidemiology of Aging training grant at the University of Pittsburgh: T32-AG0001810 from National Institute on Aging.

References

1. Centers for Disease Control and Prevention/National Center for Health Statistics, National Vital Statistics System, Mortality. [Accessed June 21, 2017] LCWK1. Deaths, percent of total deaths, and death rates for the 15 leading causes of death in 5-year age groups, by race and sex: United States, 2014. 2014. https://www.cdc.gov/nchs/data/dvs/lcwk1_2014.pdf. Updated April 3, 2017
2. Centers for Disease Control and Prevention/National Center for Health Statistics. [Accessed June 21, 2017] Underlying Cause of Death 1999–2015 on CDC WONDER Online Database, released December, 2016. Data are from the Multiple Cause of Death Files, 1999–2015, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. <http://wonder.cdc.gov/ucd-icd10.html>
3. Kochanek KD, Murphy SL, Xu J. Deaths: Final Data for 2011. National Vital Statistics Reports: from the Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System. 2015; 63(3):1–120.
4. Centers for Disease Control Prevention, US Department of Health and Human Services. [Accessed June 21, 2017] National diabetes statistic report. 2014. <https://www.cdc.gov/diabetes/pdfs/data/2014-report-estimates-of-diabetes-and-its-burden-in-the-united-states.pdf>

5. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011–2012. *JAMA*. 2014; 311(8):806–814. [PubMed: 24570244]
6. Centers for Disease Control and Prevention. [Accessed September 14, 2017] High Blood Pressure Facts. <https://www.cdc.gov/bloodpressure/facts.htm>. Updated November 30, 2016
7. Centers for Disease Control and Prevention. [Accessed September 14, 2017] Facts about Physical Activity. <https://www.cdc.gov/physicalactivity/data/facts.htm>. Updated May 23, 2014
8. Jamal A, King BA, Neff LJ, Whitmill J, Babb SD, Graffunder CM. Current cigarette smoking among adults—United States, 2005–2015. *Morbidity and Mortality Weekly Report*, Centers for Disease Control and Prevention. 2016; 65(44):1205–1211.
9. Thorpe RJ Jr, Koster A, Bosma H, et al. Racial differences in mortality in older adults: factors beyond socioeconomic status. *Ann Behav Med*. 2012; 43(1):29–38. [PubMed: 22180315]
10. Newman AB, Haggerty CL, Goodpaster B, et al. Strength and Muscle Quality in a Well-Functioning Cohort of Older Adults: The Health, Aging and Body Composition Study. *J Am Geriatr Soc*. 2003; 51(3):323–330. [PubMed: 12588575]
11. Wechsler, D. WAIS-R manual: Wechsler adult intelligence scale-revised. Psychological Corporation; 1981.
12. Newman AB, Sachs MC, Arnold AM, et al. Total and cause-specific mortality in the cardiovascular health study. *J Gerontol A Biol Sci Med Sci*. 2009; 64(12):1251–1261. [PubMed: 19723772]
13. Fine JP, Gray RJ. A proportional hazards model for the subdistribution of a competing risk. *J Am Stat Assoc*. 1999; 94(446):496–509.
14. National Cancer Institute Surveillance Epidemiology and End Results Program. [Accessed October 23, 2017] SEER Cancer Statistics Review 1975–2014. https://seer.cancer.gov/csr/1975_2014/browse_csr.php. Updated April 2017
15. Greenberg AJ, Vachon CM, Rajkumar SV. Disparities in the prevalence, pathogenesis and progression of monoclonal gammopathy of undetermined significance and multiple myeloma between blacks and whites. *Leukemia*. 2012; 26(4):609–614. [PubMed: 22193966]
16. Khawja SN, Mohammed S, Silberfein EJ, Musher BL, Fisher WE, Van Buren G 2nd. Pancreatic cancer disparities in African Americans. *Pancreas*. 2015; 44(4):522–527. [PubMed: 25872128]
17. Bhardwaj A, Srivastava SK, Khan MA, et al. Racial disparities in prostate cancer: a molecular perspective. *Front Biosci (Landmark Ed)*. 2017; 22:772–782. [PubMed: 27814645]
18. American Cancer Society. [Accessed September 14, 2017] Cancer Facts & Figures for African Americans. 2016–2018. <https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/cancer-facts-and-figures-for-african-americans/cancer-facts-and-figures-for-african-americans-2016-2018.pdf>
19. Swindell WR, Cummings SR, Sanders JL, et al. Data mining identifies digit symbol substitution test score and serum cystatin C as dominant predictors of mortality in older men and women. *Rejuvenation Res*. 2012; 15(4):405–413. [PubMed: 22607624]
20. Yazdanyar A, Aziz MM, Enright PL, et al. Association Between 6-Minute Walk Test and All-Cause Mortality, Coronary Heart Disease–Specific Mortality, and Incident Coronary Heart Disease. *J Aging Health*. 2014; 26(4):583–599. [PubMed: 24695552]
21. Guralnik, JM, Patel, K, Ferrucci, L. Assessing functional status and disability in epidemiologic studies. In: Newman, AB, Cauley, JA, editors *The epidemiology of aging*. Springer; 2012. 91–117.
22. Yaffe K, Fiocco AJ, Lindquist K, et al. Predictors of maintaining cognitive function in older adults The Health ABC Study. *Neurology*. 2009; 72(23):2029–2035. [PubMed: 19506226]
23. White DK, Neogi T, Nevitt MC, et al. Trajectories of gait speed predict mortality in well-functioning older adults: the Health, Aging and Body Composition study. *J Gerontol A Biol Sci Med Sci*. 2012; 68(4):456–64. [PubMed: 23051974]
24. Mehta KM, Simonsick EM, Rooks R, et al. Health, Aging and Body Composition Study. Black and white differences in cognitive function test scores: what explains the difference? *J Am Geriatr Soc*. 2004; 52(12):2120–7. [PubMed: 15571554]
25. Thorpe RJ Jr, Koster A, Kritchevsky SB, et al. Health, Aging, and Body Composition Study. Race, socioeconomic resources, and late-life mobility and decline: findings from the Health, Aging, and Body Composition study. *J Gerontol A Biol Sci Med Sci*. 2011; 66(10):1114–23. [PubMed: 21743093]

26. Beydoun MA, Beydoun HA, Mode N, et al. Racial disparities in adult all-cause and cause-specific mortality among us adults: mediating and moderating factors. *BMC Public Health*. 2016; 16(1): 1113. [PubMed: 27770781]
27. Alzheimer's Association. 2016 Alzheimer's disease facts and figures. *Alzheimer's & Dementia*. 2016; 12(4):459–509.
28. Taylor CA, Greenlund SF, McGuire LC, Lu H, Croft JB. Deaths from Alzheimer's Disease—United States, 1999–2014. *MMWR Morbidity and mortality weekly report*. 2017; 66(20):521. [PubMed: 28542120]

Impact statement

We certify that this work is both novel and confirmatory. The novel aspect involves examining racial differences in eight different causes of death among a large well-characterized cohort of community-dwelling ambulatory older black and white men and women. The confirmatory aspect includes reporting that the higher cancer mortality risk among black older adults persisted after adjusting for differences in baseline risk factors, which was previously noted by Thorpe et al. (2012). Another novel aspect of this work is that we then examined racial differences in specific types of cancer deaths.

References

Thorpe RJ Jr, Koster A, Bosma H, et al. Racial differences in mortality in older adults: factors beyond socioeconomic status. *Ann Behav Med.* 2012; 43(1):29–38. [PubMed: 22180315]

Figure 1.

During follow-up 1991 (65%) participants died. Black men, white men, black women, and white women had a median survival (95% confidence interval) of 10.6 (10.0, 11.5), 12.8 (12.4, 13.4), 13.4 (12.6, 14.6), and 15.3 (14.8, 16.2) years, respectively. Black participants had a 34% higher risk of dying from any cause when compared to white participants, while adjusting for age, gender, and study site (95% confidence interval: 1.22, 1.46; $p < .001$).

Figure 2.

Black participants had a higher risk of dying from cardiovascular disease (hazard ratio (95% confidence interval)=1.16 (0.98, 1.37); $p=.09$), stroke (1.31 (0.98, 1.76); $p=.07$), kidney disease (2.09 (1.16, 3.74); $p=.01$), and cancer (1.36 (1.14, 1.63); $p<.001$) when compared to white participants, while adjusting for age, gender, and study site.

Table 1

Baseline characteristics of N=3075 Health ABC participants by race and gender

Mean (SD) or frequency (%)	Black men (n=552)	White men (n=939)	Black women (n=729)	White women (n=855)	P Value pairwise comparisons ^a
Age	74 (3)	74 (3)	73 (3)	74 (3)	<i>p</i> <.001 WM>BM, WW, BW
Pittsburgh study site	276 (50%)	463 (49%)	392 (54%)	396 (46%)	<i>p</i> =.03 BW>WW
Education:					<i>p</i> <.001
Less than high school	277 (50%)	132 (14%)	279 (39%)	87 (10%)	WW<WM<BW<BM
High school or equivalency	133 (24%)	245 (26%)	256 (35%)	366 (43%)	WW>BW>WM, BM
More than high school	141 (26%)	561 (60%)	189 (26%)	401 (47%)	WM>WW>BW, BM
Marital status:					<i>p</i> <.001
Married	339 (63%)	690 (79%)	168 (24%)	376 (49%)	WM>BM>WW>BW
Widowed	99 (18%)	96 (11%)	403 (58%)	292 (38%)	WM<BM<WW<BW
Divorced/separated/never married	101 (19%)	90 (10%)	126 (18%)	100 (13%)	WM, WW<BW, BM
Income > \$50,000	44 (9%)	260 (31%)	14 (2%)	139 (19%)	<i>p</i> <.001 WM>WW>BM>BW
Supplemental health insurance	334 (61%)	853 (91%)	483 (67%)	793 (93%)	<i>p</i> <.001 WW, WM>BW>BM
Smoking pack-years	23 (26)	28 (33)	12 (21)	13 (24)	<i>p</i> <.001 WM, BM>WW, BW
Body mass index, kg/m ²	27 (4)	27 (4)	30 (6)	26 (5)	<i>p</i> <.001 WW<WM, BM<BW
Gait speed, m/s	1.3 (0.2)	1.5 (0.2)	1.2 (0.2)	1.3 (0.2)	<i>p</i> <.001 WM>WW>BM>BW
Digit Symbol Substitution Task total	24 (14)	39 (12)	30 (14)	43 (12)	<i>p</i> <.001 WW>WM>BW>BM
Prevalent disease:					
Congestive heart failure	23 (4%)	38 (4%)	22 (3%)	12 (1%)	<i>p</i> =.004 WW<BW, WM, BM
Cerebrovascular disease	48 (9%)	70 (7%)	62 (9%)	67 (8%)	<i>p</i> =.80
Hypertension	306 (55%)	398 (42%)	481 (66%)	378 (44%)	<i>p</i> <.0001 WM, WW<BM<BW
Diabetes	120 (22%)	130 (14%)	154 (21%)	64 (7%)	<i>p</i> <.001 WW<WM<BW, BM

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Mean (SD) or frequency (%)	Black men (n=552)	White men (n=939)	Black women (n=729)	White women (n=855)	P Value pairwise comparisons ^a
Cancer	79 (14%)	252 (27%)	64 (9%)	189 (22%)	$P<.001$ WM>WW>BM>BW

^aWM=White men; BM=Black men; WW=White women; BW=Black women

Table 2

Frequency and rates of cause-specific mortality among N=3075 Health ABC participants by race and gender

Frequency (%) or Death rate (95% confidence interval)	Black men (n=552)	White men (n=939)	Black women (n=729)	White women (n=855)
All-cause mortality:	417 (76%)	647 (69%)	451 (62%)	476 (56%)
Deaths per 1000 person years	74.0 (67.2, 81.4)	59.2 (54.8, 63.9)	51.6 (47.1, 56.6)	42.6 (38.9, 46.6)
Cause of death:				
Cardiovascular disease:	120 (22%)	195 (21%)	123 (17%)	128 (15%)
Deaths per 1000 person years	21.3 (17.8, 25.5)	17.8 (15.5, 20.5)	14.1 (11.8, 16.8)	11.5 (9.63, 13.6)
Stroke:	35 (6%)	43 (5%)	51 (7%)	52 (6%)
Deaths per 1000 person years	6.21 (4.46, 8.6)	3.93 (2.92, 5.30)	5.84 (4.44, 7.68)	4.65 (3.54, 6.11)
Cancer:	126 (23%)	162 (17%)	104 (14%)	98 (11%)
Deaths per 1000 person years	22.4 (18.8, 26.6)	14.8 (12.7, 17.3)	11.9 (9.83, 14.4)	8.77 (7.19, 10.7)
Dementia:	38 (7%)	74 (8%)	89 (12%)	94 (11%)
Deaths per 1000 person years	6.74 (4.91, 9.27)	6.77 (5.39, 8.50)	10.2 (8.28, 12.5)	8.41 (6.87, 10.3)
Pulmonary:	13 (2%)	29 (3%)	16 (2%)	22 (3%)
Deaths per 1000 person years	2.31 (1.34, 3.97)	2.65 (1.84, 3.82)	1.83 (1.12, 2.99)	1.97 (1.30, 2.99)
Infection:	9 (2%)	25 (3%)	19 (3%)	18 (2%)
Deaths per 1000 person years	1.60 (0.83, 3.07)	2.29 (1.54, 3.38)	2.18 (1.39, 3.41)	1.61 (1.01, 2.56)
Kidney:	16 (3%)	14 (1%)	12 (2%)	6 (0.7%)
Deaths per 1000 person years	2.84 (1.74, 4.63)	1.28 (0.76, 2.16)	1.37 (0.78, 2.42)	0.54 (0.24, 1.19)
Other:	60 (11%)	105 (11%)	37 (5%)	58 (7%)
Deaths per 1000 person years	10.6 (8.27, 13.7)	9.60 (7.93, 11.6)	4.24 (3.07, 5.85)	5.19 (4.01, 6.71)

Table 3

Cause-specific mortality hazard ratio for N=3075 black versus white Health ABC participants while adjusting for baseline risk factors

Hazard ratio for black vs. white race (95% confidence interval), <i>p</i> -value	Cause-specific mortality			
	Cardiovascular disease	Stroke	Kidney disease	Cancer
Model 0: Unadjusted	1.09 (0.92, 1.29), <i>p</i> =.31	1.29 (0.96, 1.73), <i>p</i> =.09	1.99 (1.12, 3.53), <i>p</i> =.02	1.28 (1.08, 1.53), <i>p</i> =.006
Model 1: Adjusted for age, gender, and site	1.16 (0.98, 1.37), <i>p</i> =.09	1.31 (0.98, 1.76), <i>p</i> =.07	2.09 (1.16, 3.74), <i>p</i> =.01	1.36 (1.14, 1.63), <i>p</i> <.001
Model 2: model 1 + adjusted for education, body mass index, smoking pack-years	1.09 (0.91, 1.30), <i>p</i> =.37	1.42 (1.02, 1.96), <i>p</i> =.04	2.00 (1.00, 4.00), <i>p</i> =.05	1.37 (1.12, 1.68), <i>p</i> =.002
Model 3a: model 2 + adjusted for chronic diseases ^a	0.98 (0.81, 1.19), <i>p</i> =.86	1.27 (0.91, 1.77), <i>p</i> =.16	1.67 (0.85, 3.31), <i>p</i> =.14	1.49 (1.21, 1.84), <i>p</i> <.001
Percent attenuation ^b : model 3a vs. 2	100%	36%	33%	0%
Model 3b: model 2 + adjusted for gait speed	0.94 (0.78, 1.14), <i>p</i> =.55	1.35 (0.97, 1.88), <i>p</i> =.08	1.58 (0.78, 3.22), <i>p</i> =.20	1.34 (1.09, 1.65), <i>p</i> =.005
Percent attenuation ^b : model 3b vs. 2	100%	17%	42%	8%
Model 3c: model 2 + adjusted for digit symbol substitution task total	0.93 (0.75, 1.14), <i>p</i> =.47	1.20 (0.84, 1.72), <i>p</i> =.32	2.41 (1.13, 5.15), <i>p</i> =.02	1.43 (1.16, 1.77), <i>p</i> =.001
Percent attenuation ^b : model 3c vs. 2	100%	52%	0%	0%
Model 4: model 2 + adjusted for chronic diseases ^a , gait speed, digit symbol substitution task total	0.81 (0.65, 1.00), <i>p</i> =.05	1.08 (0.75, 1.55), <i>p</i> =.68	1.75 (0.83, 3.66), <i>p</i> =.14	1.52 (1.21, 1.89), <i>p</i> <.001
Percent attenuation ^b : model 4 vs. 2	100%	81%	25%	0%

^a Congestive heart failure, cerebrovascular disease, hypertension, cancer, and diabetes

$$^b \text{Percent attenuation} = \frac{\text{Hazard ratio}_{\text{simpler model}} - \text{Hazard ratio}_{\text{more complex model}}}{\text{Hazard ratio}_{\text{simpler model}} - 1} * 100$$