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CONTRIBUTORS TO WISCONSIN'S PERSISTENT BLACK-WHITE
GAP IN LIFE EXPECTANCY

by

Max T. Roberts

A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Sociology

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2017

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ABSTRACT

Contributors to Wisconsin's Persistent Black-White
Gap in Life Expectancy

by

Max T. Roberts, Master of Science

Utah State University 2017

Major Professor: Dr. Eric N. Reither
Department: Sociology

While the national black-white gap in life expectancy has improved over the last several decades, blacks have consistently experienced shorter life expectancies than their white counterparts. As of 2009, Wisconsin had the widest gap in life expectancy between black and white males of all 50 states, and between 2000 and 2010 the gap increased for black and white females. This study aims to identify the age- and cause-specific contributors to the life expectancy gap both within and between groups. Using 1999-2001 and 2009-2011 multiple cause of death data files provided by the National Center for Health Statistics, this study employs demographic techniques to decompose the black-white gap in life expectancy by selected causes of death in Wisconsin from 2000 to 2010. Findings show that heart disease and malignant neoplasms contribute most to the persistent gap both within and between all groups, particularly between the ages of 50 and 74. Perinatal conditions early in life were found to be top contributors to the black-white gap among females, along with diabetes after the age of 30. Homicide among males frequently ranked near heart disease and malignant neoplasms as a top contributor

to the black-white gap, contributing most between the ages of 15 and 29. These findings provide evidence for public health policy to target primary causes and the life stages at which they contribute most to the life expectancy gap.

(63 pages)

PUBLIC ABSTRACT

Contributors to Wisconsin's Persistent Black-White
Gap in Life Expectancy

Max T. Roberts

For decades, blacks have faced shorter life expectancy than their white counterparts. This persistent disparity has led to a gap in life expectancy between the two groups. Nationally, this gap has decreased over the last 40 years. However, this is not the case at the state-level as some states have experienced little or no improvement in the life expectancy gap. Such is the case in Wisconsin, where the life expectancy gap is the largest in the nation for males, and the gap actually has grown for females over the last two decades. This study seeks to examine this persistent gap in Wisconsin by looking at different causes of death and the ages when they contribute most to the gap. Additionally, this study will examine how the contribution of certain causes of death have changed over time, both between blacks and whites, and also within each group. Using 1999-2001 and 2009-2011 data from the National Center for Health Statistics, this study found that heart disease and malignant neoplasms (cancer) contributed most to the life expectancy gap between blacks and whites and also over time within each group. For females, diabetes and perinatal conditions were found to be top contributors to the black-white gap. Diabetes contributed most after the age of 50. For males, homicide was found to be a top contributor to the black-white gap, particularly among youth aged 15 to 29. Homicide among males frequently ranked near heart disease and malignant neoplasms as a leading

contributor to the gap. These findings tell us that by reducing death rates from these causes at particular moments in the life course, the life expectancy gap between blacks and whites can be reduced. This study provides important evidence that health policy makers can use to address racial disparities in life expectancy.

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CHAPTER I

INTRODUCTION

In the United States, the overall black-white gap in life expectancy has been shrinking for decades; from 7.6 years in 1970, to 5.7 years in 2000, down to 3.6 years in 2013 (Kochanek, Arias, & Anderson, 2015; Firebaugh, Acciai, Noah, Prather, & Nau, 2014; Harper, MacLehose, & Kaufman, 2014; Kochanek, Arias, & Anderson, 2013). The consistent improvement in the black-white gap is attributable to non-Hispanic blacks experiencing greater increases in life expectancy from birth than their white counterparts (Kochanek, Arias, & Bastian, 2016). However, it is important to note that life expectancy has risen substantially among men and women from both racial groups since the 1970s (Levine, Foster, R. Fullilove, M. Fullilove, Briggs, Hull, Husaini, & Hennekens, 2001). While the national black-white gap in life expectancy has narrowed over time, blacks have nevertheless consistently maintained life expectancies that are lower than their white counterparts (Harper et al., 2014).

Despite encouraging national trends, substantial variability persists across states with respect to black-white disparities in life expectancy (Firebaugh et al., 2014; Harper et al., 2014). For example, a study by Harper et al. (2014) found that as of 2009 the black-white gap in life expectancy had narrowed to an all-time low of 3.0 years or less among non-Hispanic men and women in Nevada, New Mexico and Oregon. Conversely, black-white life expectancy disparities tended to stagnate at a relatively high level in Midwestern states between 1990 and 2009 and, in the case of Wisconsin, they actually increased for women. In fact, in Wisconsin the black-white gap in life expectancy among

non-Hispanic men reached 8.2 years in 2009—the widest gap for either men or women in any of the 50 states (Harper et al., 2014).

In the following sections, I address this concerning finding by analyzing age- and cause-specific contributions to the life expectancy gap between non-Hispanic black and white populations in Wisconsin. Through an investigation of leading causes of death and the life stages at which these causes exert the most influence, I aim to explain why Wisconsin has experienced unfavorable improvement in the black-white gap in life expectancy.

State Variation in Black-White Life Expectancy Disparities

From 1999 to 2011, the national black-white gap in life expectancy improved for males by nearly two years, while females experienced an improvement of 1.7 years (Kochanek, Murphy & Xu, 2015; Hoyert, Arias, Smith, Murphy & Kochanek, 2001). Prior research documents that state level differences in the gap can contribute to the overall national gap (Bharmal et al., 2012). These state level gaps can vary and result from a multitude of factors relating to lower than average life expectancies among whites, or higher than average life expectancies among blacks.

Relatively small racial disparities in life expectancy can occur in states with below national average life expectancy among whites, and above average life expectancy among blacks. Such was the case in a study by Bharmal, Tseng, Kaplan, & Wong (2012) in 2004 for males in Kentucky (black-white gap of 4.37 years), and West Virginia (black-white gap of 4.42 years). Similar circumstances were found to affect the black-white gap

for women in New Mexico and New York, where black females experienced life expectancies substantially greater than the national average, resulting in a black-white gap of less than four years.

In contrast, states with the largest racial disparities in life expectancy can be a result of whites with higher than average life expectancy and blacks with lower than average life expectancy. This was the case for men in New Jersey and Wisconsin, where the black-white gap was greater than eight years, and for women in Illinois and Wisconsin, where the gap was greater than six years (Bharmal et al., 2012). The growing disparity in Wisconsin can be linked to these circumstances, if these patterns have persisted over time. If blacks in Wisconsin are facing poor improvement in their life expectancy relative to national trends, and whites are continuing to improve at a steady rate, it can be expected that the life expectancy gap will continue to grow. What factors then could be acting against the black population to hinder their increasing life expectancy? It is best to next look at the causes of death, which directly contribute to life expectancy in these populations.

Contribution of Cause of Death to Black-White Life Expectancy Disparity

The role of cause of death, or the incidence component of life expectancy, can contribute to the changing black-white disparities observed across states (Acciai et al., 2015; Kochanek et al., 2015; Firebaugh et al., 2014; Kochanek et al., 2013; Harper et al., 2007). Consequently, it is important to explore the major causes of death in Wisconsin. Causes of death vary by gender and race—and also across periods of observation. This

means that particular causes of death may affect the black-white gap differently over time for men and women.

Heart disease and cancer have consistently been the leading causes of death across gender and race groups (Kochanek et al., 2013). Heart disease alone accounts for more than 25% of all mortality in the U.S. (Firebaugh et al., 2014). Therefore, substantial changes in death rates from these conditions can heavily influence life expectancy among all these groups. Non-Hispanic whites experienced a gain of 1.93 years of life expectancy from 2000-2014 due to relatively large decreases in rates among these causes of death (Kochanek, et al. 2016). At the same time, increased rates of suicide, accidents, liver disease, and hypertension can act to reduce or even reverse gains in life expectancy (Kochanek et al., 2016).

Heart disease, malignant neoplasms, cerebrovascular disease, and accidents are consistently leading causes of death among both blacks and whites. However, other causes of death have a tendency to rank among the leading causes of death for some groups but not others (Kochanek et al., 2015). For example, in 2014 homicide ranked as the fifth leading cause of death among black males nationwide, but did not even register in the top ten leading causes among white males (Heron, 2016). Furthermore, whereas homicide accounts for .87 of the 4.70-year difference in life expectancy between black and white males, it has a negligible impact on the gap between black and white females (Kochanek et al., 2013). This phenomenon exists at the state-level within Wisconsin, where homicide is the fourth leading cause of death among black males, yet does not rank in the top ten among white males (Wisconsin Department of Health Services, 2010).

Relatively high rates of homicide mortality among black males reduces their life expectancy, which can work to increase the gap with their white counterparts. Similarly, whites may experience relatively high rates of certain causes of death, leading to a shrinking black-white disparity. Such a cause of death could include suicide, which ranked as the seventh leading cause of death among white males, but tenth for black males in Wisconsin in 2009. Meanwhile, some age-specific causes of death can work to maintain the black-white life expectancy gap, such as high rates of infant mortality among blacks. The Wisconsin Department of Health Services recognizes the disproportionate infant mortality among blacks as another concern within the state. In 2010, black infant mortality accounted for 24% of all infant mortality in the state, when they accounted for only 10% of all live births (Wisconsin Department of Health Services, 2012). These large disparities in infant mortality have brought Wisconsin's overall rank based on African American infant mortality down to among the worst in the nation.

Age-Specific Mortality Risk and Black-White Life Expectancy Disparities

Variation in life expectancy across time has been found to be directly related to changes in age-specific mortality rates and age-specific cause of death rates (Kochanek, et al., 2016). Causes of death vary substantially across the life course, with those ages 65+ most affected by chronic conditions including cardiovascular disease, malignant neoplasms, and hypertension. At earlier ages, preventable causes of death such as accidents make important contributions to life expectancy (Firebaugh et al., 2014; World Health Organization, 2002). Changes in life expectancy are affected by age-specific death

rates, thus the age component becomes an important factor when trying to explain variation in the black-white gap in life expectancy (Kochanek et al., 2016; Firebaugh et al., 2014). Homicide, for example, is a cause of death that disproportionately affects those at younger ages (Firebaugh et al., 2014).

In a state like Wisconsin that has relatively high rates of homicide among young black males, higher mortality rates at young ages removes years of potential life lived by these individuals, thus decreasing the overall life expectancy for that group. While blacks tend to experience relatively high mortality rates at young ages, whites experience unusually high mortality at other life stages. Case and Deaton (2015) recently found that middle-aged non-Hispanic whites have experienced an increase in all-cause mortality in the U.S., which is unique among developed countries. This increase has been explained by increased death rates due to drug and alcohol poisoning, suicide, and chronic liver diseases. As mentioned in the previous section, this age-specific increase in mortality among whites can work to reduce the black-white gap in life expectancy.

Why do Blacks have Unfavorable Health Outcomes?

Much of the health disparities observed between black and white populations are related to a myriad of social and economic factors including educational attainment, income, and socioeconomic status. Blacks have been persistently marginalized in the US, deprived of resources and left with a sense of disempowerment and loss of control (Marmot, 2015). Poor social conditions lie at the root of black health disparities and must be addressed in order to improve health among blacks.

The social characteristics hypothesis suggests that when relevant demographic, social, familial, and economic characteristics are accounted for, mortality differences across race groups will cease to exist (Rogers, 1992). For example, marriage promotes social integration and healthful behavior, and those married often experience lower levels of mortality than those who are not (Mergenhagen, Lee, and Gove, 1985). However, blacks are less likely than their white counterparts to marry, thus contributing to their disadvantage, which may in turn affect the black-white gap in mortality and health outcomes (Bennett, Bloom, & Craig, 1989). Additionally, factors such as increased income can result in access to high-quality health care, diets, and housing, all of which can translate into positive health outcomes and decreases in mortality (Rogers, 1992).

Research has suggested that poverty, race, and place are among factors that influence premature mortality among youth and young adults (Geronimus, Bound, Waidmann, Colen, & Steffick, 2001). For example, residing in an area that is considered unsafe due to high levels of crime can have an immediate impact on the risk of homicide or accidents. Being trapped in poverty subjects individuals and families to poor housing options that can also produce high levels of stress in their lives. So does it not make the most sense for blacks to move out of these bad neighborhoods? Yes, but the ability to make such a decision relies on the circumstances of the individual and without control of their situation, they are incapable of taking responsibility (Marmot, 2015)

Moreover, without sufficient financial resources, these individuals may be unable to secure access to proper health care that could help combat resulting negative health outcomes. These unfavorable living conditions contribute to what Geronimus (2006) calls

the weathering hypothesis, which postulates that blacks suffer premature health deterioration resulting from persistent social and economic adversity and political marginalization. These acute and chronic stressors thus have serious effects on one's health.

Educational attainment can influence many social and health disparities for black populations. During the 1980's and 1990's, improvements in life expectancy occurred almost exclusively for those who had high levels of education (Meara, Richards, & Cutler, 2008). Low levels of education inhibit opportunities for social capital accumulation and health improvement. Conversely, high levels of education are associated with good-paying jobs and mobility into better neighborhoods, which increase social capital. Due to all the social, financial, and health benefits that come with higher education, highly educated Americans, on average, live longer lives than Americans with lower levels of educational attainment (Sasson, 2016).

Research shows that relatively poor health among blacks is almost entirely rooted in socioeconomic inequality. However, it is important to note that linking theoretical perspectives to persistent black-white disparities in life expectancy in Wisconsin is beyond the scope of this thesis. Without socioeconomic and sociodemographic data to pair with existing mortality data, I can only speculate about explanations for poor health outcomes.

Research Aims

To date there have been insufficient state-specific analyses of black-white gaps in life expectancy, particularly among those states experiencing the widest racial disparities. A rare phenomenon is underway in Wisconsin, one in which the large black-white gap in life expectancy has persisted and even increased. Contrary to the encouraging national improvement in the gap, blacks in Wisconsin are at a great health disadvantage relative to their white counterparts. The large mortality disparity between blacks and whites is a public health concern that requires prompt action in order to reverse the current disparity in Wisconsin.

To the best of my knowledge, this study is the first to examine age- and cause-specific contributions to a state-specific black-white life expectancy gap. The first research aim of this study is to determine exactly how many years of additional life could be lived if particular causes of death were eliminated. The second aim is to apply demographic techniques to examine how different causes of death have contributed to the black-white life expectancy gap in Wisconsin from 1999-2001 to 2009-2011. Third, this study carefully examines the life stages most affected by these disparities, as this will have important implications for targeted public health responses. Lastly, this study examines how each cause of death has contributed to changes in life expectancy within each group across time. By addressing the impact that selected causes of death have and the ages at which they are most likely to occur, this study seeks to identify those groups that are most at risk of death with hopes of informing policy that can be implemented to change the current black-white health disparity patterns taking place in Wisconsin.

CHAPTER II

METHODS

Data

For this study, I draw data from the multiple cause of death mortality – all county micro data files for 1999-2001 and 2009-2011(hereafter 2000 to 2010) as provided by the National Center for Health Statistics (NCHS). These data have been compiled through the Vital Statistics Cooperative Program and collected from the 50 vital statistics jurisdictions (NCHS, 1999-2001 & 2009-2011). The multiple cause of death mortality files are county-level national mortality data based on death certificates for U.S. residents. The NCHS aggregates mortality files by race, ethnicity, age, sex, and cause of death. All causes of death are classified in accordance with the International Classification of Disease (ICD), 10th revision for both 2000 and 2010 (NCHS, 2010). NCHS data also include U.S. Census Bureau population estimates by sex, age, ethnicity and race, which I utilize to generate life tables for my analyses.

I pooled six years of data together (1999-2001 and 2009-2011) to form two aggregate cross-sections of time, T_1 -2000 and T_2 -2010, in order to capture sufficient mortality counts for each cause of death selected for my analyses. I have chosen these two periods for two reasons: First, due to the availability of data from the NCHS, and second, to compare and contrast the change in the black-white gap between these two periods. This particular data granted to me by the NCHS are restricted access, and therefore are not subject to censoring or suppression of mortality counts ranging from 1-9 cases, as are the conditions for public access data. In accordance with the NCHS terms

and conditions of restricted data use, I acted appropriately throughout the study to guarantee confidentiality of all cases. The Institutional Review Board at Utah State University exempted this study from oversight as it uses secondary data analysis and does not involve human subjects.

Measures

I include measures of year, race, ethnicity and age of decedents and living persons in Wisconsin to evaluate the impact different causes of death have on the black-white life expectancy gap. I have included 13 causes of death in my analyses: heart disease, malignant neoplasms, chronic lower respiratory disease, cerebrovascular disease, accidents, diabetes, flu/pneumonia, hypertension, chronic liver disease, perinatal conditions, suicide, homicide, HIV, and a remaining other-causes-of-death category. These causes of death were selected from the ICD-10 113 Selected Causes of Death list adapted for use by the Division of Vital Statistics (DVS). These causes of death are coded via the 113 recode as follows: heart disease (55-68), malignant neoplasms (20-44), chronic lower respiratory disease (83-86), cerebrovascular disease (70), accidents (113-123), diabetes (46), flu/pneumonia (77-78), hypertension (69), chronic liver disease (94-95), perinatal conditions (108), suicide (125-126), homicide (128-129), and HIV (16). My category for all other causes of death include all remaining causes of death among the 113 recode list (50 causes of death). I have carefully selected these 13 causes of death as they relate to both national leading causes of death (LCOD, 2014) and as causes of death identified as having the largest effect on the black-white gap (Kochanek et al., 2013).

Within the state of Wisconsin, I restrict my analyses to non-Hispanic populations, as Hispanics are distinct from non-Hispanic blacks and whites in terms of social and economic factors and subsequent health outcomes (Firebaugh et al., 2014; Morales, Lara, Kington, Valdez, & Escarce, 2002). Ethnicity is reported separately on the death certificate of the deceased in accordance with standards of the Office of Management and Budget. Ethnicity of the decedent is reported by the funeral director as provided by an informant or, in the event an informant is unavailable, on the basis of observation (NCHS, 2010). My analysis will focus on four groups: non-Hispanic black males, non-Hispanic black females, non-Hispanic white males, and non-Hispanic white females (hereafter, black males, black females, white males, and white females). I have included all ages in the analysis with age categories created for less than one year, and one to four years of age. I generate five-year age categories for all remaining ages from five to 84, with a remaining open-ended age category for 85+. This system of age categorization is standard in the construction of period life tables, and appears in all ensuing tables.

Analyses

Using Microsoft Excel, I apply demographic techniques to generate master period life tables, multiple decrement life tables, associated single decrement life tables, and age and cause decomposition tables for black and white males and females in Wisconsin for T_1 , and T_2 . In constructing the master period life tables, I employ graduation techniques to generate average person-years lived between ages x and $x+n$ for all decedents (${}_n a_x$). I use master period life tables to show what would happen if hypothetical birth cohorts of

100,000 individuals were subjected for their entire lifespan to the mortality conditions of T_1 and T_2 (Preston, Heuveline, & Guillot, 2001).

The master period life tables identify and provide life expectancy at birth (e_0) for blacks and whites for both periods. I will use the resulting e_0 of each group, along with l_x , ${}_n p_x$, ${}_n q_x$, and ${}_n a_x$ values to construct succeeding tables. I then use multiple decrement life tables to explain the percentage of the hypothetical cohort that dies from each cause of death under U.S. age- and cause-specific death rates of T_1 and T_2 . Additionally, the multiple decrement life tables aid in the construction of associated single decrement life tables, allowing me to identify the proportion of death in each age interval resulting from cause i (R^{-i}).

The associated single decrement life tables identify variation in life expectancy when accounting for the removal of each potential cause of death. By employing this method, I am able to address the question of how long blacks and whites could expect to live if the risk of each respective cause of death were removed. Lastly, I use age and cause decomposition tables to identify the contribution from each cause of death (i) to the black-white gap for each age category (x to $x+n$) (${}_n \Delta^i_x$). These decomposition tables allow me to identify the contribution each cause of death has made to the black-white gap in life expectancy. I also use decomposition tables to identify which causes of death are primarily responsible for changing life expectancies within each race-sex group between 2000 and 2010.

CHAPTER III

RESULTS

Between 2000 and 2010, I found that black and white males in Wisconsin experienced a small improvement in the life expectancy gap. The gap decreased by 0.9 years over this 10-year span. Females however, did not improve at all. In fact, the life expectancy gap between non-Hispanic black and white females increased by 0.24 years between 2000 and 2010, an astounding retrogression relative to progress made nationwide (see Tables 1 and 2).

Table 1

Life Expectancy at Birth by Gender, Race, Ethnicity, and Period in the US (in Years)

Period	Males			Females		
	non-Hisp. Black	non-Hisp. White	Gap	non-Hisp. Black	non-Hisp. White	Gap
1999-2001	68.13	74.87	6.75	75.11	80.01	4.90
2009-2011	71.82	76.55	4.73	78.11	81.31	3.20

Table 2

Life Expectancy at Birth by Gender, Race, Ethnicity, and Period in Wisconsin (in Years)

Period	Males			Females		
	non-Hisp. Black	non-Hisp. White	Gap	non-Hisp. Black	non-Hisp. White	Gap
1999-2001	68.00	75.73	7.73	75.20	80.90	5.70
2009-2011	70.96	77.79	6.83	76.57	82.51	5.94

Table 3 satisfies my first research aim, providing the hypothetical life expectancy at birth for each group in Wisconsin at each period, after removing selected causes of death. These figures show how long each group could expect to live if a particular cause of death were eliminated. The selected causes include leading causes of death, such as heart disease, malignant neoplasms, and cerebrovascular disease, as well as causes previous literature has identified as contributing most to the black-white life expectancy gap, such as homicide, HIV, and perinatal conditions (Kochanek et al., 2013). Across both periods (2000 and 2010), the removal of heart disease, malignant neoplasms, cerebrovascular disease, and respiratory disease contribute to the largest increase in life expectancy as these are all leading causes of death among black and white males and females.

Removal of other causes of death, such as homicide among black males, could also lead to relatively large gains in life expectancy. Eliminating homicide among black males would have contributed to an increase in life expectancy of 1.38 years in 2000 and 0.99 years in 2010. Among white males, removal of suicide as a mortality risk would have increased life expectancy by 0.48 years in 2000 and 0.56 years in 2010. Among black females, removal of perinatal conditions would have resulted in an increase in life expectancy of 0.54 years in 2000 and 0.50 years in 2010. White females would benefit from the removal of diabetes as a mortality risk, which would result in an increase in life expectancy of 0.36 years in 2000 and 0.19 years in 2010. These differences across groups provide useful clues about the most important contributors to the black-white gap in life expectancy.

Table 3

Life Expectancy at Birth when Selected Cause of Death is Removed by Period, Gender and Race in Wisconsin (in Years)

<u>Cause of Death</u>	Wisconsin							
	<u>1999-2001</u>				<u>2009-2011</u>			
	<u>Males</u>		<u>Females</u>		<u>Males</u>		<u>Females</u>	
	<u>Black</u>	<u>White</u>	<u>Black</u>	<u>White</u>	<u>Black</u>	<u>White</u>	<u>Black</u>	<u>White</u>
<i>Life Expectancy at birth for all causes of death</i>	68.00	75.73	75.20	80.90	70.96	77.79	76.57	82.51
Heart Disease	71.30	78.63	78.11	82.79	74.12	79.96	79.09	83.78
Malignant Neoplasms	71.91	78.79	78.33	83.99	74.65	80.77	79.74	85.36
Cerebrovascular Disease	68.77	76.20	76.00	81.52	71.57	78.10	77.18	82.85
Respiratory Disease	68.41	76.17	75.61	81.46	71.36	78.23	76.93	82.99
Accidents	68.99	76.80	75.68	81.53	72.10	78.94	77.27	83.10
Diabetes	68.43	76.00	75.87	81.26	71.37	78.03	77.04	82.70
Flu/Pneumonia	68.17	75.88	75.41	81.14	71.11	77.91	76.73	82.63
Suicide	68.28	76.21	75.27	81.13	71.24	78.35	76.67	82.68
Liver Disease	68.20	75.89	75.24	81.11	71.12	77.98	76.69	82.62
Hypertension	68.09	75.76	75.32	81.04	71.07	77.84	76.73	82.55
Homicide	69.38	75.80	75.51	81.05	71.95	77.84	76.75	82.54
Perinatal Conditions	68.63	75.96	75.74	81.22	70.96	78.00	77.07	82.67
HIV	68.32	75.73	75.30	81.01	71.08	77.80	76.64	82.51
All other causes	70.90	77.53	78.29	82.74	73.93	79.84	79.77	84.47

Between Group Age- and Cause-Specific Decompositions

The next step is to decompose black-white gaps in life expectancy by age and cause of death. The following four figures satisfy my second and third research aims,

identifying how selected causes of death have contributed to the black-white gap, and the life stages most affected by these causes.

Figure 1 presents the leading contributors to the black-white gap across the life course for males in 2000. For purposes of simplicity in Figure 1 and following figures, I captured the top five contributing causes of death to the overall gap. (The complete decomposition tables with all causes of death are presented at the end of this paper in a separate Appendix). For males in 2000, those causes of death included heart disease, malignant neoplasms, cerebrovascular disease, homicide, and perinatal conditions. I included all other remaining causes of death for comparative purposes.

Figure 1 shows spikes in perinatal conditions, homicide, heart disease, and malignant neoplasms at different stages of the life course, when these causes of death contribute most to the black-white gap in life expectancy. Heart disease, malignant neoplasms, and homicide contribute most to the overall gap, accounting for 1.11, 1.58, and 1.49 years of the 7.73-year gap, respectively. Looking closer at age-specific contributions, malignant neoplasms contributes the most at ages 55-59 (0.24 years) and 60-64 (0.36 years). Similarly, heart disease contributes most to the gap at the ages of 50-54 (0.24 years) and 60-64 (0.29 years). Lastly, homicide makes the greatest contribution to the gap at the ages of 15-19 (0.33 years), 20-24 (0.44 years), and 25-30 (0.21 years). It is clear that homicide contributes to this gap primarily at younger ages, as the line peaks at 0.44 years for the 20-24 age group.

At the end of the graph (ages 85+) there is a crossover of malignant neoplasms and heart disease, indicating increased mortality rates among white males for these

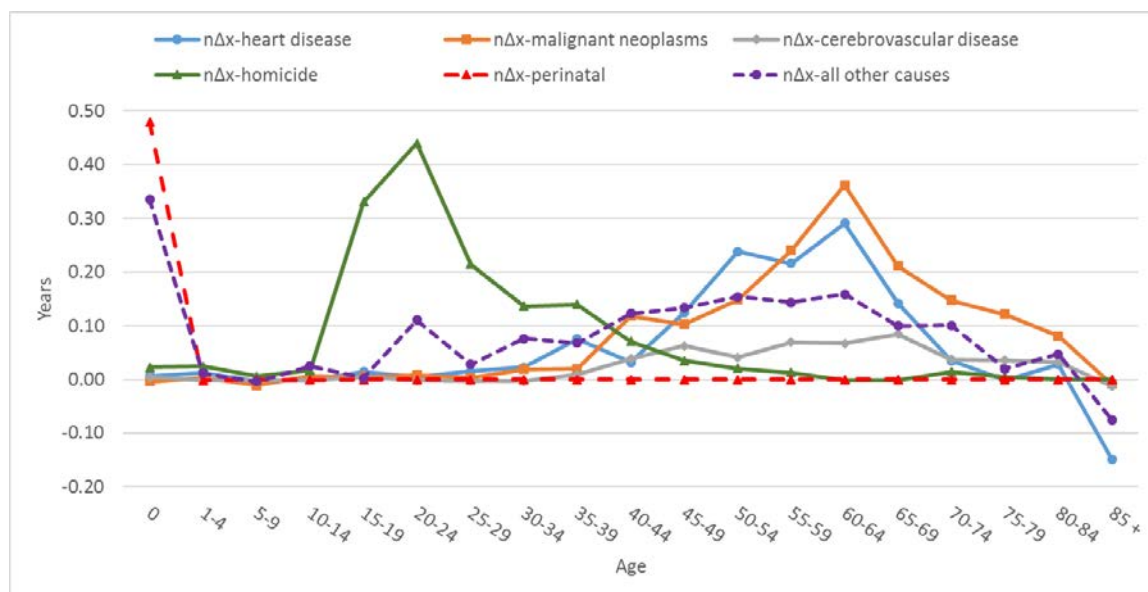


Figure 1. Age and Cause Decomposition of e_0 Differences between non-Hispanic Black and White Males in Wisconsin (2000)

conditions, which prevents the overall gap in life expectancy from becoming even larger. These crossovers represent comparative advantages for black males, which work to slightly reduce the overall size of the life expectancy gap. This phenomenon is consistent with literature citing the black-white mortality “crossover”, in which blacks at ages beyond 80 are more likely to have greater life expectancies than their white counterparts (Fenelon, 2013; Masters, 2012).

Figure 2 presents the leading contributors to the black-white gap across the life course for males in 2010. The five leading contributors to the gap remain heart disease, malignant neoplasms, cerebrovascular disease, homicide, and perinatal conditions. Similar to Figure 1, there are spikes among perinatal conditions, homicide, heart disease, and malignant neoplasms at particular ages. Heart disease, malignant neoplasms, and homicide remain the largest contributors to the overall gap for males in 2010, accounting

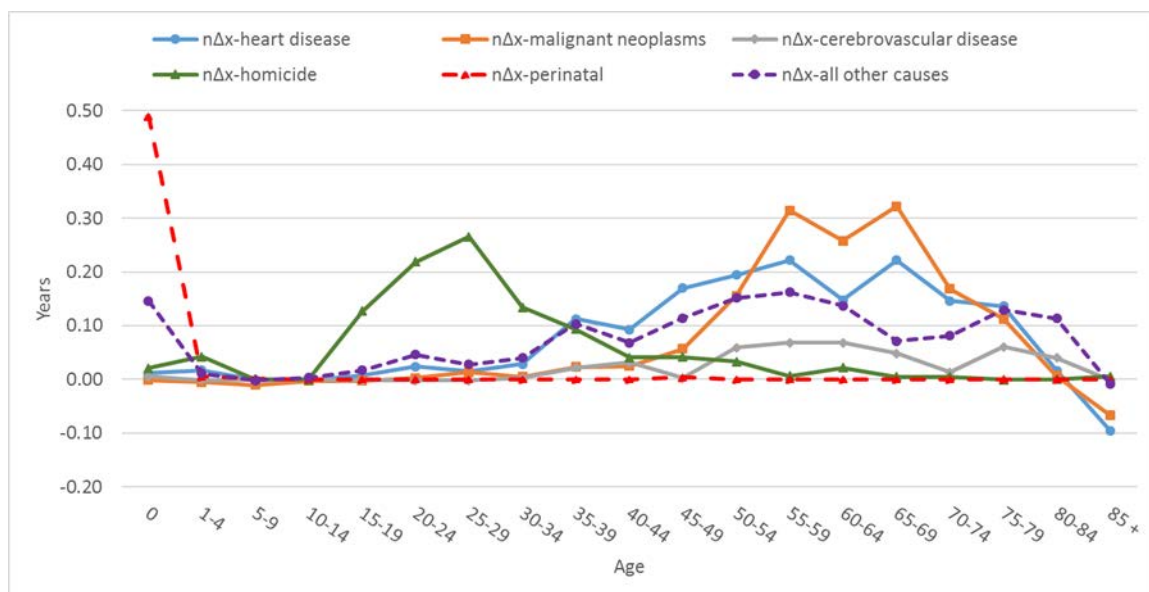


Figure 2. Age and Cause Decomposition of e_0 Differences between non-Hispanic Black and White Males in Wisconsin (2010)

for 1.47, 1.37, and 1.06 years of the 6.83-year gap, respectively. Age-specific contributions reveal that heart disease contributes the most to the black-white gap at ages 55-59 (0.22 years) and 65-69 (0.22 years). Malignant neoplasms contribute the most to the gap at the ages of 55-59 (0.31 years), 60-64 (0.26 years) and 65-69 (0.32 years). Lastly, homicide makes a strong contribution to the gap at the ages of 20-24 (0.27 years) and 25-30 (0.27 years).

Comparing the two periods, homicide and malignant neoplasms contribute less to the gap in 2010 than in 2000, but the contribution of heart disease increases over this time span. What is particularly notable between the two periods is the increased contribution of suicide among white males. Increased rates of suicide among white males act as an advantage for black males, accounting for -.12 years of the gap in 2000 and -.21 years of the gap in 2010. Overall, elevated suicide rates among white males between ages 25-64 act to narrow the gap. Comparing Figure 1 to Figure 2 reveals that there is also a decrease

in the peak for homicide between the ages of 15-24, which contributed to the reduced black-white gap in life expectancy over these two periods. Again, at ages 80+, there is a crossover where increased mortality among whites prevents the gap from increasing further. Specifically, heart disease and malignant neoplasms at 80+ affect white males at a higher rate than their black counterparts.

Figure 3 presents the leading contributors to the black-white gap across the life course for females in 2000. Heart disease, malignant neoplasms, cerebrovascular disease, diabetes, and perinatal conditions are the five leading contributors to the gap for this group. There are notable spikes in perinatal conditions, heart disease, and malignant neoplasms, indicating ages where these causes contribute most to the black-white gap in life expectancy. Heart disease and malignant neoplasms contribute most, accounting for 1.34 and 0.75 years of the 5.80-year gap, respectively.

Heart disease does not become a meaningful contributor to the gap until ages 35-39, and then takes a short dip before rising incrementally up to ages 60-64, contributing most at the age groups 60-64 (0.25 years) and 65-69 (0.22 years). Malignant neoplasms reach their peak at the age of 65-69; contributing most to the gap at ages 65-69 (0.18 years). In addition, diabetes is a major contributor to the gap (0.58 years), showing a rising contribution to the gap at age 50 and above. Similar to males, females ages 80+ experience an improvement in the gap due to relatively high rates of heart disease mortality among elderly white females. Similar to the crossover phenomenon for heart disease in Figure 1 and Figure 2, white females experience much higher rates of heart

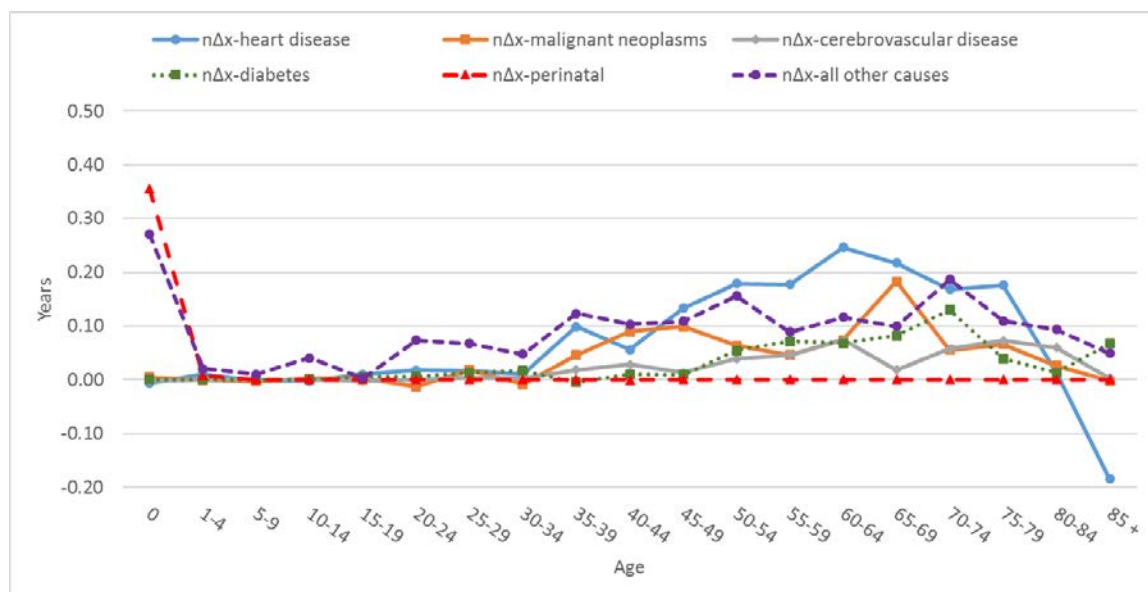


Figure 3. Age and Cause Decomposition of e_0 Differences between non-Hispanic Black and White Females in Wisconsin (2000)

disease mortality at ages 85+, which helps to reduce the overall size of the gap in life expectancy.

Figure 4 presents the leading contributors to the black-white gap across the life course for females in 2010, which again include heart disease, malignant neoplasms, cerebrovascular disease, diabetes, and perinatal conditions. There are still spikes that contribute substantially to black-white life expectancy disparities for perinatal conditions, heart disease, and malignant neoplasms. Heart disease and malignant neoplasms remain the largest contributors, accounting for 1.44 and 1.03 years of the overall 5.94-year gap, respectively. The contribution of heart disease mortality rises between the ages of 45-64, then proceeds to drop before rising again at ages 70-74 where it contributes most to the gap, accounting for 0.31 years. Malignant neoplasms contribute most to the gap at the ages of 55-59 (0.19 years) and 60-64 (0.20 years). Diabetes mortality remains the third

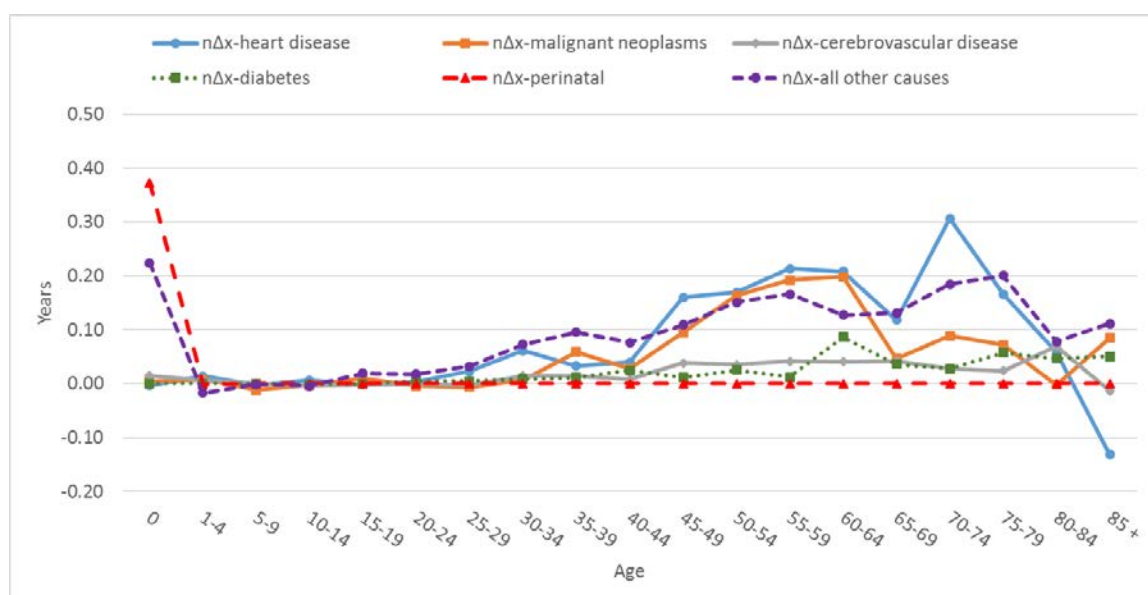


Figure 4. Age and Cause Decomposition of e_0 Differences between non-Hispanic Black and White Females in Wisconsin (2010)

largest contributor to the gap (0.41 years), followed closely by perinatal conditions (0.37 years) and cerebrovascular disease (0.36 years).

White females experience high rates of heart disease mortality at ages 80+, just as black females experience a rise of malignant neoplasm mortality at the same age group. This essentially results in the two causes canceling out their effects on the gap at this life stage, contrary to mortality outcomes observed in Figures 1-3.

Within Group Age- and Cause-Specific Decompositions

The following step, and final research aim, decomposes gaps in life expectancy by age and cause of death within each group. Figure 5 presents the five leading contributors to improved life expectancy for black males across the two periods. The leading contributors include heart disease, malignant neoplasms, cerebrovascular disease,

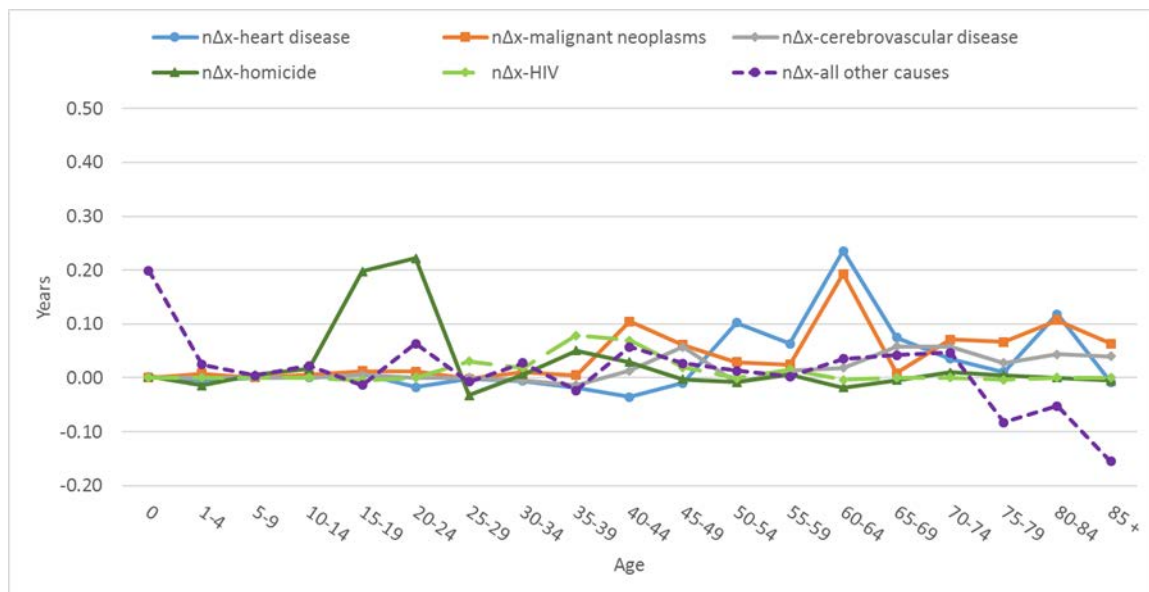


Figure 5. Age and Cause Decomposition of e_0 Differences within non-Hispanic Black Males in Wisconsin from T_1 (2000) to T_2 (2010)

homicide, and HIV. From 2000 to 2010, improvements in malignant neoplasm and heart disease mortality contributed most to rising life expectancy among black males, accounting for 0.78 and 0.55 years of the 2.96-year improvement, respectively. Homicide mortality follows closely, contributing 0.47 years to the 2.96-year improvement.

Heart disease dips at ages 40-44, representing a slight loss in life expectancy, but improvements occur at ages 50-54 and again at ages 60-64, which accounted for the greatest gain of 0.24 years. Malignant neoplasms contributed to gains in life expectancy at ages 40-44, 60-64, and 80-84, with 60-64 accounting for the greatest gain of 0.19 years. Homicide accounts for an increase in life expectancy at ages 15-24, but dips suddenly at ages 25-29, representing a slight loss of life expectancy at that life stage across the two periods. Overall, reductions in homicide led to important gains in life expectancy, and most of those improvements occurred between the ages of 15-19 (0.20 years), and 20-24 (0.22 years). Accidents were the only cause of death among black

males that yielded an overall slight deterioration in life expectancy over this period, accounting for a loss of 0.06 years.

Figure 6 presents the leading contributors to changing life expectancy for white males across the two periods. For purposes of simplicity, I include only the three leading contributors to life expectancy improvements, which are heart disease, malignant neoplasms and cerebrovascular disease. For white males, heart disease and malignant neoplasms contributed most to increasing life expectancy across the two periods, accounting for 1.11 and 0.51 years of the 2.05-year improvement, respectively. Cerebrovascular disease is the next most important contributor, accounting for 0.29 years of improvement.

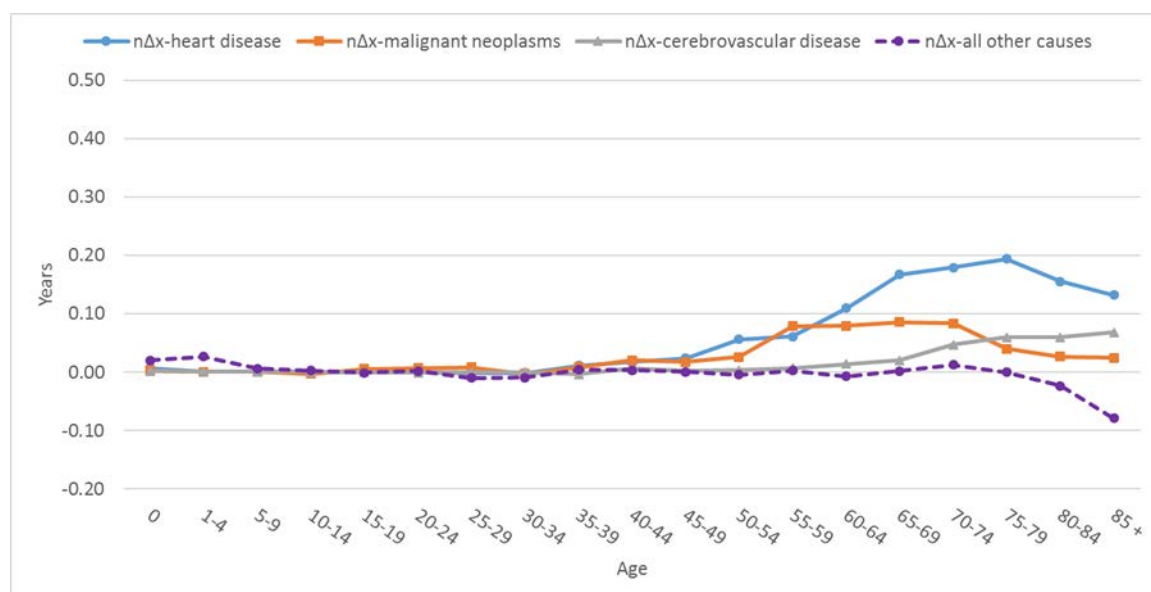


Figure 6. Age and Cause Decomposition of e_0 Differences within non-Hispanic White Males in Wisconsin from T_1 (2000) to T_2 (2010)

Heart disease makes the greatest contribution to life expectancy improvement at ages 65-69 (0.17 years), 70-74 (0.18 years) and 75-79 (0.19 years). Increases in life expectancy attributable to lower rates of cancer mortality occur between ages 55-74 over the two periods; these gains then begin to taper off into late life stages. Malignant neoplasms contribute most to life expectancy gains at ages 60-64 (0.08 years), 65-69 (0.09 years), and 70-74 (0.08 years). Increases in suicide mortality subtract 0.06 years of life expectancy over the two periods, followed by minimal losses from hypertension at 0.02 years, and liver disease at 0.01 years.

Figure 7 presents the leading contributors to changing life expectancy for black females across the two periods. Heart disease, cerebrovascular disease, accidents, and diabetes are the top four contributors to changing life expectancy across the two periods. From 2000 to 2010, heart disease made the greatest contribution to changing life expectancy, accounting for 0.67 years of the 1.37-year improvement. Cerebrovascular disease is the following contributor, accounting for 0.38-year improvement in life expectancy across the two periods.

Heart disease contributed to a slight loss in life expectancy at ages 30-34 before improving at ages 35-39 and then stagnating until ages 60-64 where further improvements occurred. Heart disease made the greatest contribution at the ages 65-69 (0.18 years) and 75-79 (0.13 years). Cerebrovascular disease makes almost no contribution to rising life expectancy among black females, until improvements occur at ages 60-64 and again at 70-74. Accidents between the ages of 45-64 contribute to a loss of life expectancy across the two periods. Moreover, only accidents and liver disease

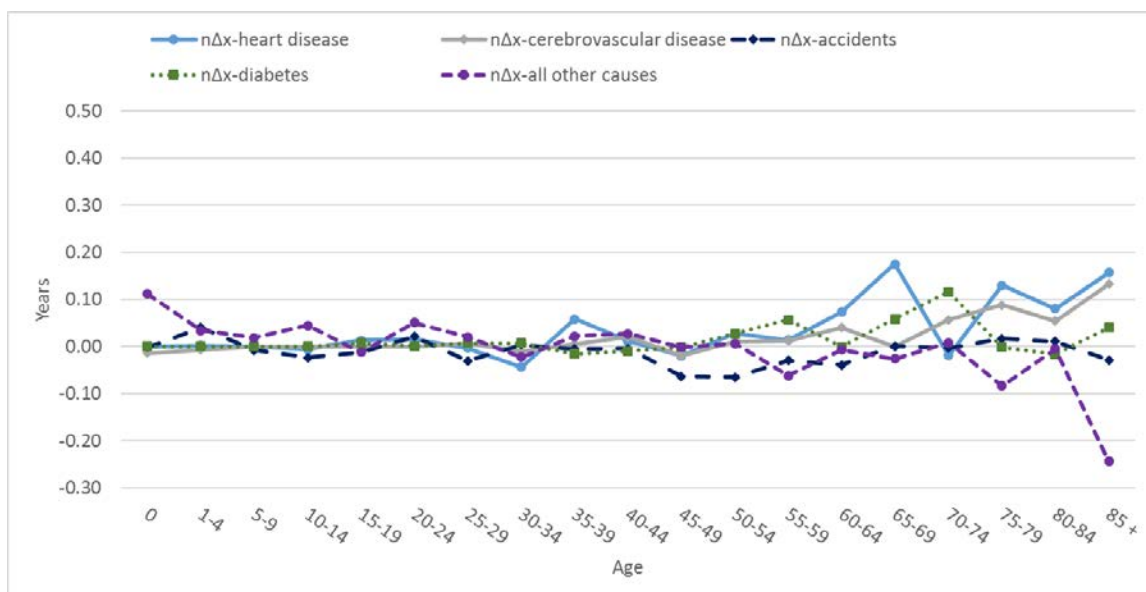


Figure 7. Age and Cause Decomposition of e_0 Differences within non-Hispanic Black Females in Wisconsin from T_1 (2000) to T_2 (2010)

resulted in a loss of life expectancy for black females over this timeframe. Accidents accounted for a loss of 0.22 years, while liver disease accounted for a loss of only 0.08 years.

Figure 8 presents the leading contributors to changing life expectancy for white females across the two periods. For reasons of simplicity, I capture only the three leading contributors to these changes, namely heart disease, malignant neoplasms, and cerebrovascular disease. Heart disease contributed most to gains in life expectancy, accounting for 0.96 years of the 1.51-year improvement across the two periods. Malignant neoplasms and cerebrovascular disease made similar contributions, accounting for 0.37 and 0.38 years of the improvement, respectively.

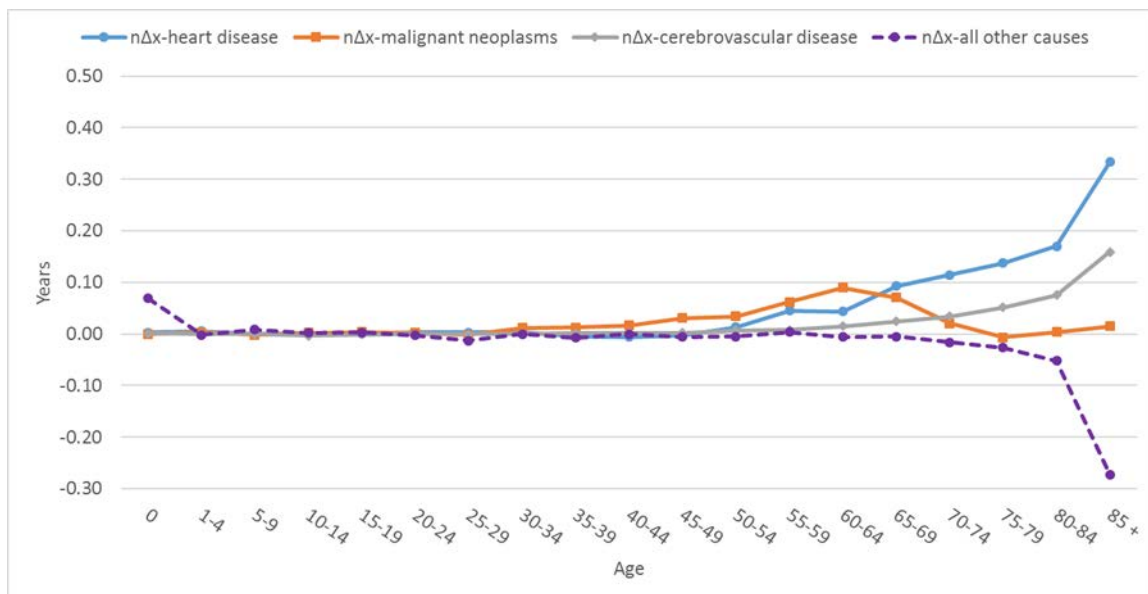


Figure 8. Age and Cause Decomposition of e_0 Differences within non-Hispanic White Females in Wisconsin from T_1 (2000) to T_2 (2010)

Heart disease made notable contributions to life expectancy gains at ages 70-74 (0.11 years), 75-79 (0.14 years), 80-84 (0.17 years), and a relatively substantial contribution at ages 85+ (0.33 years). Malignant neoplasms contributed to gains at ages 55-59 (0.06 years), 60-64 (0.09 years), and 65-69 (0.07 years) followed by a slight dip before rising again at ages 80-84. Cerebrovascular disease shows a steady contribution to life expectancy improvement between ages 60-84, followed by its peak at ages 85+ (0.16 years). The dip in all other causes of death category at the end of the life course indicates that there is another cause, or causes, not captured among leading contributors producing a loss of life expectancy at ages 85+ across the two periods. Accidents and suicide are two causes with an overall contribution resulting in decreases in life expectancy, accounting for a loss of 0.06 years and 0.05 years, respectively.

CHAPTER IV

DISCUSSION

As this study has shown, heart disease and malignant neoplasms make the largest contributions to the life expectancy gap, both between and within groups, particularly in mid to late life. Among females, diabetes proved to be a leading contributor to the black-white gap as well, contributing most after the age of 50. Moreover, mortality conditions at young ages have implications for overall life expectancy. For example, perinatal conditions among blacks were consistent contributors to the black-white gap, particularly among females. Similarly, homicide among black males, particularly youths, made substantial contributions to the gap and consistently ranked near heart disease and malignant neoplasms as a leading contributor to racial disparities.

Policy Implications

Health policy in Wisconsin should make it a priority to address heart disease and malignant neoplasms among blacks and whites, particularly between the ages of 50-74. Blacks and whites alike in the state would benefit immensely from reductions in mortality rates from these contributors. By successfully reducing these mortality rates all groups would experience substantial gains in life expectancy and, in improving conditions for blacks, the gap would narrow. Prompt action is also needed by policy makers in Wisconsin to address the contributions of perinatal conditions and diabetes among females and homicide among males to the life expectancy gap. Mortality reduction among these three causes could substantially alleviate the stagnating life

expectancy gap. However, the solution to decreasing mortality rates from these causes among blacks may not be a simple one.

As postulated by the weathering and social characteristics hypotheses, poor health outcomes among blacks are attributable to marginalization in society and unfavorable social conditions. The solution may not be to simply provide health insurance to more people. After all, since 2009 Wisconsin has boasted health insurance coverage for its residents well above the national average, reaching a historic high of 94.3% in 2015 (Jones & McKown, 2016). Of those insured, whites have the greatest percentage covered (93.1%), while 87.6% of blacks are insured (U.S. Census, 2011-2015). These small disparities in health insurance coverage are unlikely to explain large gaps in life expectancy, especially considering that other states have smaller black-white gaps with greater health insurance inequalities. Therefore, improving the health and life expectancy of Wisconsin's black population will likely require improving social and economic conditions. As of 2010, 36.3% of blacks in Wisconsin lived below the poverty level, compared to only 9.7% of whites (U.S. Census, 2008-2010). It would seem that health policy would be most efficient if paired with policies targeting issues of poverty.

As Marmot (2015) describes, it is not enough to inform a person about healthful behaviors if s/he lacks the resources or ability to follow best practices. For example, receiving educational materials about a healthful diet is useless if an individual does not have the money to purchase or transportation to access healthful foods. Similarly, knowing that consistent sleep patterns promote better health does not help if one works a sporadic schedule, or lives in a restless neighborhood. Diabetes and obesity are much

more prevalent among the poor (Marmot, 2015), which as we can see in Wisconsin, are disproportionately black.

Likewise, homicide can result from issues related to poverty. As of 2015, Wisconsin's crude death rate for homicide among blacks ranked 3rd in the nation (33.0 per 100,000). Whites in Wisconsin only had a crude homicide death rate of 1.7 per 100,000. When accounting for firearm-related homicide, Wisconsin still ranked 3rd in the nation for blacks (28.4 per 100,000) while whites had a crude death rate of 1.0 per 100,000 (NCHS, 2015). Between 2000 and 2010, Wisconsin was among 12 other states in the nation considered to have the least restrictive firearm purchase and possession laws (Vittes, Vernick & Webster, 2012). In attempting to reduce the risk of homicide among black youths, policymakers could implement more restrictive firearm possession and ownership laws in an effort to minimize deadly weapons on the streets. Research has shown that laws including retention of sales records, firearm identification, universal background checks for all firearms, law enforcement involvement in obtaining permits, and background checks for the purchase of ammunition have all been associated with reduced firearm mortality (Kalesan, Mobily, Keiser, Fagan & Galea, 2016). Because black male adolescents are at particularly high risk of homicide, afterschool programs and other extracurricular and community programs could be funded to help strengthen community solidarity and keep youths from having too much free time to roam the streets.

However, homicide may still persist without policies focused on alleviating poverty in Wisconsin. Both diabetes among females and homicide among males stem

from much deeper issues for blacks in Wisconsin. Marginalization and poverty have stricken blacks in Wisconsin, resulting in poor health outcomes and ultimately perpetuating the life expectancy gap with their white counterparts. In order to resolve these issues, policy should focus on reducing poverty. Better quality public schools, anti-discrimination laws, and more government assistance can work to address issues related to poverty among blacks in Wisconsin.

Limitations and Future Research

Wisconsin is home to a predominately-white population, with a relatively small percentage of blacks in the state. The vast majority of the black population resides in Milwaukee County (~70% as of 2015) (U.S. Census, 2015). The current study focuses on the state-level, which while useful in explaining patterns across the state for these groups, may overlook important differences at the county-level. County-level analysis may exhibit a clearer picture of the racial disparities within clustered populations. Future research would benefit from replicating this study within Milwaukee County alone where the black population is prominent. Average life expectancy at the county-level may vary from state-level averages, thus the black-white life expectancy gap may be larger or smaller within Milwaukee County.

This study also does not have socioeconomic data available to pair with mortality files. Consequently, I am unable to test associations between mortality outcomes and socioeconomic determinants. Future research would benefit from exploring these associations to determine the extent to which social conditions affect life expectancy

disparities in Wisconsin. Despite these limitations, this study remains valuable as it has identified the major contributors to the black-white life expectancy gap in Wisconsin and the life stages at which they carry the most impact—analyses that have otherwise not been executed at the state level.

CHAPTER V

CONCLUSION

Existing literature and my investigation both show that a myriad of factors contribute to life expectancy gaps between groups. Wisconsin is a unique state where the black-white gap in life expectancy has stagnated and, in some cases, grown over the last three decades. By decomposing this overall gap into different causes of death, this study has contributed to existing research by identifying the contribution of specific causes across the life course to the black-white life expectancy gap. Differences across time are also introduced in this study, identifying how these contributors have changed over the two periods. Lastly, cause and age decomposition within groups reveals which causes of death have contributed most to rising life expectancies for each group, identifying the interplay between changing life expectancy and the changing black-white gap.

This study is the first of its kind to analyze the age- and cause-specific contributions to the black-white gap in a state that has experienced large and persistent differences in life expectancy. I have identified key contributors including heart disease, malignant neoplasms, homicide, perinatal conditions and diabetes to Wisconsin's persistent black-white life expectancy gap. In addition, I have shown which life stages contribute most to the gap. This study brings focus to those causes and the life stages where they contribute most to the black-white gap in life expectancy. The results of this study provide strong evidence to aid in public health objectives and promote greater health equality between black and white populations and work to reduce the life expectancy gap in Wisconsin.

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APPENDICES

Master Life Tables and Selected Cause of Death Decomposition Tables for
Non-Hispanic Blacks and Whites in Wisconsin for 2000 and 2010

Appendix Exhibit 1. Master Life Table of non-Hispanic Black Males - Wisconsin (2000)

age	n	nNx	nDx	nmx	nax	nqx	npx	lx	ndx	nLx	Tx	ex
0	1	10131	187	0.01846	0.095	0.01815	0.98185	100000	1815	98356	6799588	68.00
1-4	4	40246	24	0.00060	1.599	0.00238	0.99762	98185	234	392177	6701231	68.25
5-9	5	55737	17	0.00031	2.496	0.00152	0.99848	97951	149	489379	6309055	64.41
10-14	5	52911	25	0.00047	3.169	0.00236	0.99764	97801	231	488584	5819675	59.51
15-19	5	46338	85	0.00183	2.776	0.00913	0.99087	97571	891	485871	5331091	54.64
20-24	5	36032	106	0.00294	2.503	0.01460	0.98540	96679	1412	479872	4845220	50.12
25-29	5	34224	66	0.00193	2.435	0.00959	0.99041	95268	914	473993	4365348	45.82
30-34	5	32926	79	0.00240	2.665	0.01193	0.98807	94354	1126	469139	3891355	41.24
35-39	5	32471	127	0.00391	2.664	0.01938	0.98062	93228	1807	461919	3422216	36.71
40-44	5	30465	172	0.00565	2.635	0.02786	0.97214	91421	2547	451083	2960297	32.38
45-49	5	25116	199	0.00792	2.659	0.03889	0.96111	88875	3457	436281	2509214	28.23
50-54	5	19020	238	0.01251	2.638	0.06077	0.93923	85418	5191	414830	2072934	24.27
55-59	5	12195	219	0.01796	2.636	0.08613	0.91387	80227	6910	384795	1658104	20.67
60-64	5	7760	219	0.02822	2.586	0.13211	0.86789	73317	9686	343203	1273308	17.37
65-69	5	7272	272	0.03740	2.533	0.17122	0.82878	63631	10895	291278	930105	14.62
70-74	5	5764	279	0.04840	2.519	0.21607	0.78393	52736	11395	235412	638827	12.11
75-79	5	3411	230	0.06743	2.532	0.28904	0.71096	41341	11949	177210	403415	9.76
80-84	5	1609	186	0.11560	2.568	0.45116	0.54884	29392	13260	114710	226205	7.70
85+	∞	1016	147	0.14469	6.912		1	0	16132	16132	111495	6.91

Appendix Exhibit 2. Master Life Table of non-Hispanic White Males - Wisconsin (2000)

age	n	nNx	nDx	nmx	nax	nqx	npx	lx	ndx	nLx	Tx	ex
0	1	81072	518	0.00639	0.062	0.00635	0.99365	100000	635	99404	7573150	75.73
1-4	4	331903	112	0.00034	1.633	0.00135	0.99865	99365	134	397142	7473745	75.22
5-9	5	468608	87	0.00019	2.403	0.00093	0.99907	99231	92	495915	7076603	71.31
10-14	5	515671	95	0.00018	3.218	0.00092	0.99908	99139	91	495531	6580688	66.38
15-19	5	527528	434	0.00082	2.763	0.00411	0.99589	99047	407	494328	6085157	61.44
20-24	5	454344	558	0.00123	2.525	0.00612	0.99388	98641	604	491710	5590829	56.68
25-29	5	417495	410	0.00098	2.456	0.00490	0.99510	98037	480	488963	5099120	52.01
30-34	5	485783	502	0.00103	2.606	0.00515	0.99485	97557	503	486580	4610156	47.26
35-39	5	578760	882	0.00152	2.647	0.00759	0.99241	97054	737	483536	4123576	42.49
40-44	5	603855	1289	0.00213	2.667	0.01062	0.98938	96317	1023	479199	3640041	37.79
45-49	5	554033	1824	0.00329	2.676	0.01634	0.98366	95294	1557	472853	3160842	33.17
50-54	5	472719	2390	0.00506	2.692	0.02499	0.97501	93737	2342	463282	2687989	28.68
55-59	5	351279	2916	0.00830	2.681	0.04072	0.95928	91395	3722	448345	2224707	24.34
60-64	5	283273	3718	0.01313	2.677	0.06368	0.93632	87673	5583	425396	1776362	20.26
65-69	5	244129	5295	0.02169	2.659	0.10321	0.89679	82090	8472	390614	1350966	16.46
70-74	5	225849	8014	0.03548	2.617	0.16359	0.83641	73618	12043	339389	960352	13.05
75-79	5	177166	9949	0.05616	2.573	0.24710	0.75290	61575	15215	270942	620963	10.08
80-84	5	114533	10474	0.09145	2.669	0.37689	0.62311	46360	17473	191063	350021	7.55
85+	∞	80312	14595	0.18173	5.503	1	0	28887	28887	158957	158957	5.50

Appendix Exhibit 3. Master Life Table of non-Hispanic Black Females - Wisconsin (2000)

age	n	nNx	nDx	nmx	nax	nqx	npx	lx	ndx	nLx	Tx	ex
0	1	9856	144	0.01461	0.094	0.01442	0.98558	100000	1442	98693	7519663	75.20
1-4	4	38639	26	0.00067	1.500	0.00269	0.99731	98558	265	393570	7420970	75.30
5-9	5	54381	12	0.00022	2.288	0.00110	0.99890	98293	108	491172	7027400	71.49
10-14	5	50746	16	0.00032	2.596	0.00158	0.99842	98185	155	490552	6536228	66.57
15-19	5	43695	16	0.00037	2.854	0.00183	0.99817	98030	179	489766	6045675	61.67
20-24	5	38239	36	0.00094	2.625	0.00470	0.99530	97851	460	488163	5555909	56.78
25-29	5	37402	35	0.00094	2.524	0.00467	0.99533	97391	455	485830	5067747	52.03
30-34	5	35931	38	0.00106	2.809	0.00528	0.99472	96937	511	483563	4581916	47.27
35-39	5	37116	94	0.00253	2.665	0.01259	0.98741	96425	1214	479292	4098354	42.50
40-44	5	34619	108	0.00312	2.629	0.01548	0.98452	95211	1474	472561	3619062	38.01
45-49	5	28778	132	0.00459	2.656	0.02269	0.97731	93737	2127	463700	3146500	33.57
50-54	5	21737	148	0.00681	2.618	0.03350	0.96650	91610	3069	450740	2682800	29.28
55-59	5	15038	134	0.00891	2.664	0.04365	0.95635	88541	3864	433678	2232060	25.21
60-64	5	12045	180	0.01494	2.655	0.07219	0.92781	84677	6113	409047	1798382	21.24
65-69	5	9984	225	0.02254	2.620	0.10695	0.89305	78564	8402	372827	1389335	17.68
70-74	5	7808	264	0.03381	2.597	0.15635	0.84365	70162	10970	324447	1016508	14.49
75-79	5	5245	269	0.05129	2.544	0.22775	0.77225	59192	13481	262852	692061	11.69
80-84	5	2975	211	0.07092	2.780	0.30638	0.69362	45711	14005	197463	429209	9.39
85+	∞	3026	414	0.13681	7.309	1	0	31706	31706	231746	231746	7.31

Appendix Exhibit 4. Master Life Table of non-Hispanic White Females - Wisconsin (2000)

age	n	nNx	nDx	nmx	nax	nqx	npx	lx	ndx	nLx	Tx	ex
0	1	76602	431	0.00563	0.069	0.00560	0.99440	100000	560	99479	8090295	80.90
1-4	4	316668	84	0.00027	1.513	0.00106	0.99894	99440	105	397499	7990816	80.36
5-9	5	444408	56	0.00013	2.541	0.00063	0.99937	99335	63	496520	7593317	76.44
10-14	5	488721	74	0.00015	2.500	0.00076	0.99924	99272	75	496174	7096797	71.49
15-19	5	506647	181	0.00036	2.499	0.00178	0.99822	99197	177	495543	6600623	66.54
20-24	5	440618	156	0.00035	2.499	0.00177	0.99823	99020	175	494663	6105080	61.65
25-29	5	406168	163	0.00040	2.499	0.00200	0.99800	98845	198	493729	5610418	56.76
30-34	5	477174	268	0.00056	2.499	0.00280	0.99720	98647	277	492542	5116688	51.87
35-39	5	576286	456	0.00079	2.498	0.00395	0.99605	98370	388	490879	4624146	47.01
40-44	5	595640	747	0.00125	2.497	0.00625	0.99375	97982	612	488376	4133267	42.18
45-49	5	542239	1028	0.00190	2.496	0.00943	0.99057	97369	919	484546	3644891	37.43
50-54	5	465285	1385	0.00298	2.493	0.01477	0.98523	96451	1425	478682	3160344	32.77
55-59	5	359301	1858	0.00517	2.489	0.02552	0.97448	95026	2425	469038	2681663	28.22
60-64	5	297375	2468	0.00830	2.482	0.04065	0.95935	92600	3764	453524	2212624	23.89
65-69	5	271773	3702	0.01362	2.471	0.06584	0.93416	88836	5849	429390	1759101	19.80
70-74	5	271172	5802	0.02140	2.455	0.10145	0.89855	82987	8419	393507	1329711	16.02
75-79	5	247176	8303	0.03359	2.428	0.15460	0.84540	74568	11528	343186	936204	12.56
80-84	5	194787	11495	0.05901	2.481	0.25687	0.74313	63040	16193	274402	593018	9.41
85+	∞	200665	29504	0.14703	6.801	1	0	46847	46847	318616	318616	6.80

Appendix Exhibit 5. Master Life Table of non-Hispanic Black Males - Wisconsin (2010)

age	n	nNx	nDx	nmx	nax	nqx	npx	lx	ndx	nLx	Tx	ex
0	1	11255	177	0.01573	0.087	0.01550	0.98450	100000	1550	98585	7095764	70.96
1-4	4	46237	27	0.00058	1.607	0.00233	0.99767	98450	230	393249	6997179	71.07
5-9	5	220649	8	0.00004	1.667	0.00018	0.99982	98220	18	491041	6603930	67.24
10-14	5	55758	18	0.00032	3.157	0.00161	0.99839	98202	158	490719	6112889	62.25
15-19	5	58580	62	0.00106	2.823	0.00528	0.99472	98044	518	489092	5622170	57.34
20-24	5	47923	95	0.00198	2.604	0.00986	0.99014	97526	962	485326	5133078	52.63
25-29	5	41359	86	0.00208	2.512	0.01034	0.98966	96564	999	480335	4647753	48.13
30-34	5	37764	81	0.00214	2.613	0.01067	0.98933	95565	1020	475393	4167417	43.61
35-39	5	35929	119	0.00331	2.592	0.01643	0.98357	94546	1553	468988	3692025	39.05
40-44	5	34565	128	0.00370	2.666	0.01836	0.98164	92992	1707	460977	3223037	34.66
45-49	5	33161	215	0.00648	2.720	0.03195	0.96805	91285	2916	449778	2762060	30.26
50-54	5	31114	346	0.01112	2.667	0.05420	0.94580	88369	4789	430671	2312282	26.17
55-59	5	23621	397	0.01681	2.578	0.08075	0.91925	83580	6749	401556	1881611	22.51
60-64	5	16945	339	0.02001	2.583	0.09542	0.90458	76831	7331	366437	1480055	19.26
65-69	5	9777	292	0.02987	2.573	0.13924	0.86076	69500	9677	324009	1113618	16.02
70-74	5	6945	272	0.03916	2.579	0.17887	0.82113	59823	10700	273211	789609	13.20
75-79	5	4547	295	0.06488	2.538	0.27972	0.72028	49123	13740	211789	516398	10.51
80-84	5	2763	251	0.09084	2.633	0.37382	0.62618	35382	13227	145598	304609	8.61
85+	∞	1744	243	0.13933	7.177	1	0	22156	22156	159011	159011	7.18

Appendix Exhibit 6. Master Life Table of non-Hispanic White Males - Wisconsin (2010)

age	n	nNx	nDx	nmx	nax	nqx	npx	lx	ndx	nLx	Tx	ex
0	1	77373	454	0.00587	0.061	0.00584	0.99416	100000	584	99452	7778516	77.79
1-4	4	318943	69	0.00022	1.634	0.00086	0.99914	99416	86	397462	7679065	77.24
5-9	5	421764	50	0.00012	2.453	0.00059	0.99941	99330	59	496502	7281602	73.31
10-14	5	444217	65	0.00015	3.183	0.00073	0.99927	99272	73	496226	6785100	68.35
15-19	5	482105	289	0.00060	2.834	0.00299	0.99701	99199	297	495352	6288874	63.40
20-24	5	467462	520	0.00111	2.594	0.00555	0.99445	98902	549	493190	5793522	58.58
25-29	5	447062	497	0.00111	2.528	0.00554	0.99446	98353	545	490419	5300332	53.89
30-34	5	427647	545	0.00127	2.549	0.00635	0.99365	97808	621	487518	4809912	49.18
35-39	5	423461	605	0.00143	2.594	0.00712	0.99288	97187	692	484270	4322394	44.48
40-44	5	491205	955	0.00194	2.678	0.00968	0.99032	96495	934	480307	3838124	39.78
45-49	5	576830	1812	0.00314	2.676	0.01559	0.98441	95561	1490	474343	3357817	35.14
50-54	5	591239	2783	0.00471	2.668	0.02328	0.97672	94071	2190	465248	2883474	30.65
55-59	5	533078	3839	0.00720	2.658	0.03541	0.96459	91881	3254	451786	2418226	26.32
60-64	5	437209	4709	0.01077	2.660	0.05253	0.94747	88628	4656	432243	1966440	22.19
65-69	5	308637	5213	0.01689	2.654	0.08123	0.91877	83972	6821	403857	1534197	18.27
70-74	5	230441	6155	0.02671	2.640	0.12563	0.87437	77151	9692	362878	1130340	14.65
75-79	5	178272	7775	0.04361	2.615	0.19752	0.80248	67458	13325	305519	767462	11.38
80-84	5	137794	10100	0.07330	2.790	0.31539	0.68461	54134	17073	232931	461943	8.53
85+	∞	109839	17775	0.16183	6.179	1	0	37061	37061	229012	229012	6.18

Appendix Exhibit 7. Master Life Table of non-Hispanic Black Females - Wisconsin (2010)

age	n	nNx	nDx	nmx	nax	nqx	npx	lx	ndx	nLx	Tx	ex
0	1	11121	136	0.01223	0.087	0.01209	0.98791	100000	1209	98896	7656537	76.57
1-4	4	45546	16	0.00035	1.503	0.00140	0.99860	98791	139	394816	7557641	76.50
5-9	5	52562	5	0.00010	2.415	0.00048	0.99952	98652	47	493138	7162825	72.61
10-14	5	53627	13	0.00024	2.793	0.00121	0.99879	98605	119	492761	6669687	67.64
15-19	5	54997	24	0.00044	2.576	0.00218	0.99782	98486	215	491907	6176925	62.72
20-24	5	47207	19	0.00040	2.788	0.00201	0.99799	98271	198	490917	5685018	57.85
25-29	5	43124	43	0.00100	2.699	0.00497	0.99503	98073	488	489244	5194101	52.96
30-34	5	39581	54	0.00136	2.653	0.00680	0.99320	97585	664	486370	4704857	48.21
35-39	5	37530	76	0.00203	2.612	0.01008	0.98992	96922	977	482277	4218487	43.52
40-44	5	35340	88	0.00249	2.730	0.01238	0.98762	95945	1188	477030	3736210	38.94
45-49	5	35638	174	0.00488	2.695	0.02414	0.97586	94757	2287	468515	3259180	34.39
50-54	5	33409	245	0.00733	2.638	0.03604	0.96396	92470	3333	454477	2790665	30.18
55-59	5	27119	280	0.01032	2.620	0.05039	0.94961	89137	4491	434998	2336188	26.21
60-64	5	19368	281	0.01451	2.556	0.07006	0.92994	84646	5930	408733	1901190	22.46
65-69	5	12804	205	0.01601	2.647	0.07715	0.92285	78716	6073	379291	1492457	18.96
70-74	5	9751	294	0.03015	2.627	0.14069	0.85931	72643	10220	338966	1113166	15.32
75-79	5	7167	313	0.04367	2.558	0.19732	0.80268	62423	12317	282041	774200	12.40
80-84	5	4727	292	0.06177	2.867	0.27291	0.72709	50106	13674	221366	492160	9.82
85+	∞	4051	545	0.13453	7.433	1	0	36431	36431	270794	270794	7.43

Appendix Exhibit 8. Master Life Table of non-Hispanic White Females - Wisconsin (2010)

age	n	nNx	nDx	nmx	nax	nqx	npx	lx	ndx	nLx	Tx	ex
0	1	73285	307	0.00419	0.065	0.00417	0.99583	100000	417	99610	8250399	82.50
1-4	4	301711	60	0.00020	1.516	0.00080	0.99920	99583	79	398134	8150789	81.85
5-9	5	401482	29	0.00007	2.381	0.00036	0.99964	99504	36	497424	7752655	77.91
10-14	5	423634	50	0.00012	2.882	0.00059	0.99941	99468	59	497214	7255231	72.94
15-19	5	460293	133	0.00029	2.664	0.00144	0.99856	99409	144	496709	6758017	67.98
20-24	5	453305	157	0.00035	2.608	0.00173	0.99827	99265	172	495916	6261308	63.08
25-29	5	433478	204	0.00047	2.589	0.00235	0.99765	99094	233	494907	5765391	58.18
30-34	5	413311	227	0.00055	2.643	0.00274	0.99726	98861	271	493665	5270485	53.31
35-39	5	414793	353	0.00085	2.683	0.00425	0.99575	98590	419	491978	4776820	48.45
40-44	5	487964	637	0.00131	2.668	0.00651	0.99349	98171	639	489365	4284842	43.65
45-49	5	577519	1110	0.00192	2.665	0.00957	0.99043	97532	933	485482	3795478	38.92
50-54	5	588926	1694	0.00288	2.666	0.01429	0.98571	96599	1380	479774	3309995	34.27
55-59	5	529174	2284	0.00432	2.677	0.02137	0.97863	95219	2035	471369	2830221	29.72
60-64	5	441226	2992	0.00678	2.682	0.03338	0.96662	93184	3111	458712	2358852	25.31
65-69	5	329314	3561	0.01081	2.692	0.05275	0.94725	90074	4751	439405	1900140	21.10
70-74	5	260495	4776	0.01833	2.664	0.08791	0.91209	85322	7500	409094	1460735	17.12
75-79	5	223989	6564	0.02931	2.657	0.13711	0.86289	77822	10670	364105	1051641	13.51
80-84	5	199778	10147	0.05079	3.050	0.23107	0.76893	67152	15517	305502	687536	10.24
85+	∞	236205	31925	0.13516	7.399	1	0	51635	51635	382034	382034	7.40

Appendix Exhibit 9. Contribution of selected causes of death mortality differences in life expectancies between non-Hispanic

Black Males and non-Hispanic White Males by age in Wisconsin (2000)

Age	nΔx-all	nΔx-heart disease	nΔx- malignant neoplasms	nΔx- cerebrovascular disease	nΔx- respiratory disease	nΔx- accidents	nΔx-diabetes	nΔx-flu/pnu	nΔx-suicide	nΔx-liver disease	nΔx- hypertension	nΔx- homicide	nΔx-perinatal	nΔx-HIV	nΔx-all other causes
0	0.90	0.01	0.00	0.00	0.01	0.03	0.00	0.01	0.00	0.00	0.00	0.02	0.48	0.00	0.34
1-4	0.07	0.01	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.01
5-9	0.04	0.00	-0.01	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
10-14	0.09	0.00	0.01	0.00	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.03
15-19	0.29	0.01	0.01	0.00	0.01	-0.08	0.01	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00
20-24	0.45	0.01	0.01	0.00	0.00	-0.10	0.00	0.00	-0.01	0.00	0.00	0.44	0.00	0.00	0.11
25-29	0.22	0.02	0.00	0.00	0.00	-0.04	0.00	0.00	-0.03	0.01	0.00	0.21	0.00	0.03	0.03
30-34	0.29	0.02	0.02	0.00	0.01	0.00	0.00	0.00	-0.01	0.00	0.01	0.14	0.00	0.03	0.08
35-39	0.44	0.08	0.02	0.01	0.01	0.04	0.01	0.00	-0.03	0.01	0.00	0.14	0.00	0.09	0.07
40-44	0.56	0.03	0.12	0.04	0.01	0.05	0.01	0.01	-0.01	0.01	0.00	0.07	0.00	0.10	0.12
45-49	0.62	0.12	0.10	0.06	0.01	0.05	0.03	0.01	0.00	0.04	0.01	0.03	0.00	0.03	0.13
50-54	0.82	0.24	0.15	0.04	0.01	0.08	0.04	0.01	-0.01	0.04	0.00	0.02	0.00	0.03	0.15
55-59	0.83	0.22	0.24	0.07	0.01	0.03	0.05	0.00	-0.01	0.01	0.01	0.01	0.00	0.03	0.14
60-64	0.95	0.29	0.36	0.07	0.02	0.00	0.05	0.02	0.00	-0.02	0.01	0.00	0.00	0.00	0.16
65-69	0.68	0.14	0.21	0.08	0.06	0.01	0.06	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.10
70-74	0.36	0.04	0.15	0.04	0.01	0.00	0.01	0.00	0.00	-0.01	0.01	0.01	0.00	0.00	0.10
75-79	0.18	0.00	0.12	0.04	-0.01	-0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02
80-84	0.18	0.03	0.08	0.03	-0.02	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.05
85+	-0.23	-0.15	-0.01	-0.01	0.01	-0.02	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	-0.08
Total	7.74	1.11	1.58	0.46	0.14	0.12	0.29	0.09	-0.12	0.10	0.11	1.49	0.48	0.35	1.56

Appendix Exhibit 10. Contribution of selected causes of death mortality differences in life expectancies between non-Hispanic Black Males and non-Hispanic White Males by age in Wisconsin (2010)

Age	nΔx-all	nΔx-heart disease	nΔx-malignant neoplasms	nΔx-cerebrovascular disease	nΔx-respiratory disease	nΔx-accidents	nΔx-diabetes	nΔx-flu/pnu	nΔx-suicide	nΔx-liver disease	nΔx-hypertension	nΔx-homicide	nΔx-perinatal	nΔx-HIV	nΔx-all other causes
0	0.76	0.01	0.00	0.01	0.01	0.07	0.01	-0.01	0.00	0.00	0.00	0.02	0.49	0.00	0.15
1-4	0.11	0.02	0.00	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.04	0.01	0.00	0.01
5-9	-0.03	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-14	0.06	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-19	0.14	0.01	0.00	0.00	0.01	-0.02	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.01	0.02
20-24	0.24	0.02	0.00	0.00	0.01	-0.07	0.01	0.00	0.01	0.00	0.00	0.22	0.00	0.00	0.05
25-29	0.24	0.01	0.01	0.00	0.00	-0.06	0.00	0.01	-0.02	0.00	0.00	0.27	0.00	0.00	0.03
30-34	0.19	0.03	0.00	0.00	0.00	-0.02	0.01	0.00	-0.03	0.00	0.01	0.13	0.00	0.01	0.04
35-39	0.37	0.11	0.02	0.02	0.01	0.04	0.01	0.00	-0.04	-0.01	0.00	0.09	0.00	0.02	0.10
40-44	0.30	0.09	0.02	0.03	0.01	0.02	0.02	0.01	-0.03	-0.01	0.00	0.04	0.00	0.02	0.07
45-49	0.49	0.17	0.06	0.00	0.02	0.07	0.02	0.00	-0.03	0.00	0.01	0.04	0.00	0.01	0.11
50-54	0.78	0.19	0.16	0.06	0.01	0.11	0.02	0.00	-0.01	0.01	0.02	0.03	0.00	0.04	0.15
55-59	0.93	0.22	0.31	0.07	0.02	0.06	0.02	0.02	-0.03	0.04	0.01	0.01	0.00	0.02	0.16
60-64	0.68	0.15	0.26	0.07	-0.01	0.01	0.05	0.01	-0.02	0.00	0.00	0.02	0.00	0.00	0.14
65-69	0.69	0.22	0.32	0.05	0.00	-0.01	0.05	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	0.07
70-74	0.44	0.15	0.17	0.01	-0.01	-0.01	0.02	0.02	-0.01	0.00	0.01	0.01	0.00	0.00	0.08
75-79	0.45	0.14	0.11	0.06	0.01	0.00	0.01	-0.01	-0.01	-0.01	0.01	0.00	0.00	0.00	0.13
80-84	0.20	0.02	0.01	0.04	0.01	-0.02	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.11
85 +	-0.22	-0.10	-0.07	0.00	-0.03	-0.03	0.01	-0.01	0.00	0.00	0.01	0.01	0.00	0.00	-0.01
Total	6.83	1.47	1.37	0.41	0.06	0.18	0.26	0.06	-0.21	0.02	0.10	1.06	0.50	0.13	1.41

Appendix Exhibit 11. Contribution of selected causes of death mortality differences in life expectancies between non-Hispanic

Black Females and non-Hispanic White Females by age in Wisconsin (2000)

Age	nΔx-all	nΔx-heart disease	nΔx- malignant neoplasms	nΔx- cerebrovascular disease	nΔx- respiratory disease	nΔx- accidents	nΔx-diabetes	nΔx-flu/pnu	nΔx-suicide	nΔx-liver disease	nΔx- hypertension	nΔx- homicide	nΔx-perinatal	nΔx-HIV	nΔx-all other causes
0	0.72	-0.01	0.00	0.00	0.01	0.03	0.00	0.04	0.00	0.00	0.00	0.02	0.35	0.00	0.27
1-4	0.13	0.01	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.02
5-9	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01
10-14	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.02	0.00	0.00	0.04
15-19	0.00	0.01	0.00	0.00	0.00	-0.04	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
20-24	0.17	0.02	-0.01	0.00	0.01	0.01	0.01	0.02	0.00	0.00	0.00	0.05	0.00	0.01	0.07
25-29	0.14	0.02	0.02	0.01	0.01	-0.02	0.01	0.01	-0.01	0.00	0.00	0.03	0.00	0.00	0.07
30-34	0.12	0.01	-0.01	0.00	0.01	0.01	0.02	0.01	-0.01	0.00	0.00	0.02	0.00	0.02	0.05
35-39	0.37	0.10	0.05	0.02	0.01	0.02	0.00	0.00	0.01	-0.01	0.00	0.02	0.00	0.02	0.12
40-44	0.35	0.06	0.09	0.03	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.10
45-49	0.44	0.13	0.10	0.01	0.02	-0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.03	0.11
50-54	0.53	0.18	0.06	0.04	0.01	0.01	0.05	0.00	-0.01	0.00	0.01	0.01	0.00	0.01	0.16
55-59	0.42	0.18	0.05	0.05	0.01	-0.01	0.07	-0.01	-0.01	-0.01	0.01	0.01	0.00	0.00	0.09
60-64	0.59	0.25	0.07	0.07	-0.01	0.01	0.07	0.00	-0.01	0.00	0.01	0.01	0.00	0.00	0.12
65-69	0.60	0.22	0.18	0.02	-0.01	-0.01	0.08	0.01	0.00	-0.01	0.03	0.01	0.00	0.00	0.10
70-74	0.58	0.17	0.06	0.06	0.00	-0.01	0.13	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.19
75-79	0.52	0.18	0.07	0.07	-0.01	0.00	0.04	0.04	0.00	-0.01	0.03	0.01	0.00	0.00	0.11
80-84	0.20	0.01	0.03	0.06	0.00	0.01	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.09
85+	-0.16	-0.18	0.00	0.00	-0.03	-0.06	0.07	-0.04	0.00	0.00	0.03	0.00	0.00	0.00	0.05
Total	5.80	1.34	0.75	0.44	0.05	-0.01	0.58	0.07	-0.04	-0.05	0.13	0.30	0.36	0.11	1.77

Appendix Exhibit 12. Contribution of selected causes of death mortality differences in life expectancies between non-Hispanic

Black Females and non-Hispanic White Females by age in Wisconsin (2010)

Age	nΔx-all	nΔx-heart disease	nΔx- malignant neoplasms	nΔx- cerebrovascular disease	nΔx- respiratory disease	nΔx- accidents	nΔx- diabetes	nΔx- flu/pnu	nΔx- suicide	nΔx- liver disease	nΔx- hypertension	nΔx- homicide	nΔx- perinatal	nΔx- HIV	nΔx-all other causes
0	0.66	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.37	0.00	0.22
1-4	0.05	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	-0.02
5-9	0.01	0.00	-0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10-14	0.04	0.01	0.00	0.00	0.00	0.04	0.00	0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00
15-19	0.05	0.00	0.01	0.00	0.01	-0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.02
20-24	0.02	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02
25-29	0.14	0.02	-0.01	0.00	0.01	0.01	0.01	0.00	0.03	0.01	0.01	0.03	0.00	0.01	0.03
30-34	0.20	0.06	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.07
35-39	0.26	0.03	0.06	0.01	0.00	0.02	0.01	0.01	-0.01	-0.01	0.00	0.02	0.00	0.02	0.10
40-44	0.23	0.04	0.03	0.01	0.01	0.00	0.02	0.01	-0.02	0.00	0.01	0.02	0.00	0.02	0.08
45-49	0.50	0.16	0.09	0.04	0.02	0.05	0.01	0.00	-0.01	0.01	0.01	0.01	0.00	0.01	0.11
50-54	0.65	0.17	0.16	0.04	0.01	0.07	0.03	0.01	-0.01	0.01	0.01	0.00	0.00	0.00	0.15
55-59	0.72	0.21	0.19	0.04	0.04	0.02	0.01	0.02	-0.01	0.01	0.01	0.01	0.00	0.01	0.17
60-64	0.73	0.21	0.20	0.04	-0.01	0.05	0.09	0.01	0.00	0.01	0.02	0.00	0.00	0.00	0.13
65-69	0.38	0.12	0.05	0.04	-0.02	-0.01	0.04	0.00	0.00	0.00	0.02	0.00	0.00	0.01	0.13
70-74	0.61	0.31	0.09	0.03	-0.01	-0.01	0.03	-0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.18
75-79	0.49	0.17	0.07	0.02	-0.01	-0.03	0.06	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.20
80-84	0.22	0.06	0.00	0.07	-0.05	-0.01	0.05	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.08
85 +	-0.01	-0.13	0.09	-0.01	-0.06	-0.06	0.05	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.11
Total	5.94	1.44	1.03	0.36	-0.06	0.17	0.41	0.06	-0.06	0.03	0.15	0.17	0.37	0.08	1.78

Appendix Exhibit 13. Contribution of selected causes of death mortality differences in life expectancies between non-Hispanic

Black Males in 2000 and non-Hispanic Black Males in 2010 by age in Wisconsin

Age	nΔx-all	nΔx-heart disease	nΔx- malignant neoplasms	nΔx- cerebrovascular disease	nΔx- respiratory disease	nΔx- accidents	nΔx- diabetes	nΔx- flu/pnu	nΔx- suicide	nΔx- liver disease	nΔx- hypertension	nΔx- homicide	nΔx- perinatal	nΔx- HIV	nΔx-all other causes
0	0.19	0.00	0.00	0.00	0.00	-0.04	-0.01	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.20
1-4	0.00	0.00	0.01	0.00	-0.01	0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.02
5-9	0.09	0.00	0.00	0.00	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
10-14	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.02
15-19	0.21	0.01	0.01	0.01	0.00	-0.01	0.01	0.00	0.01	0.00	0.00	0.20	0.00	0.00	-0.01
20-24	0.23	-0.02	0.01	0.00	-0.01	-0.02	-0.01	0.00	-0.02	0.00	0.00	0.22	0.00	0.00	0.06
25-29	-0.03	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.00	0.00	-0.03	0.00	0.03	-0.01
30-34	0.05	-0.01	0.01	-0.01	0.01	-0.01	-0.02	0.00	0.00	0.01	0.00	0.01	0.00	0.02	0.03
35-39	0.10	-0.02	0.00	-0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.00	0.05	0.00	0.08	-0.02
40-44	0.28	-0.04	0.10	0.01	0.00	0.02	-0.01	0.01	0.01	0.01	0.00	0.03	0.00	0.07	0.06
45-49	0.18	-0.01	0.06	0.06	-0.01	-0.02	0.01	0.01	0.01	0.03	0.00	0.00	0.00	0.02	0.03
50-54	0.14	0.10	0.03	-0.01	0.00	-0.03	0.03	0.01	-0.01	0.03	-0.01	-0.01	0.00	0.00	0.01
55-59	0.09	0.06	0.02	0.01	0.00	-0.03	0.03	-0.02	0.01	-0.03	0.00	0.01	0.00	0.02	0.00
60-64	0.50	0.24	0.19	0.02	0.03	-0.01	0.01	0.01	0.01	-0.02	0.01	-0.02	0.00	0.00	0.04
65-69	0.32	0.08	0.01	0.06	0.07	0.02	0.03	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.04
70-74	0.26	0.04	0.07	0.06	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05
75-79	0.04	0.01	0.07	0.03	-0.01	-0.01	0.03	0.01	0.00	0.01	0.00	0.01	0.00	0.00	-0.08
80-84	0.23	0.12	0.11	0.04	-0.02	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.05
85 +	0.04	-0.01	0.06	0.04	0.04	-0.01	0.02	0.05	0.00	0.00	0.02	0.00	0.00	0.00	-0.16
Total	2.96	0.55	0.78	0.31	0.14	-0.06	0.11	0.09	0.02	0.06	0.02	0.47	0.00	0.22	0.23

Appendix Exhibit 14. Contribution of selected causes of death mortality differences in life expectancies between non-Hispanic

White Males in 2000 and non-Hispanic White Males in 2010 by age in Wisconsin

Age	nΔx-all	nΔx-heart disease	nΔx- malignant neoplasms	nΔx- cerebrovascular disease	nΔx- respiratory disease	nΔx- accidents	nΔx-diabetes	nΔx-flu/pnu	nΔx-suicide	nΔx-liver disease	nΔx- hypertension	nΔx- homicide	nΔx-perinatal	nΔx-HIV	nΔx-all other causes
0	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02
1-4	0.04	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
5-9	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
10-14	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-19	0.07	0.00	0.01	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-24	0.03	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
25-29	-0.03	0.00	0.01	0.00	0.00	-0.03	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01
30-34	-0.06	0.00	0.00	0.00	0.00	-0.03	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01
35-39	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
40-44	0.03	0.02	0.02	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.02	0.02	0.02	0.00	0.00	-0.01	0.00	0.00	-0.02	0.00	0.00	0.00	0.00	0.00	0.00
50-54	0.05	0.06	0.03	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00
55-59	0.12	0.06	0.08	0.01	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00
60-64	0.20	0.11	0.08	0.01	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	-0.01
65-69	0.31	0.17	0.09	0.02	0.02	0.00	0.02	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
70-74	0.39	0.18	0.08	0.05	0.03	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01
75-79	0.34	0.19	0.04	0.06	0.02	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
80-84	0.26	0.16	0.03	0.06	0.02	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	-0.02
85+	0.20	0.13	0.02	0.07	0.01	-0.01	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	-0.08
Total	2.05	1.11	0.51	0.29	0.09	-0.01	0.07	0.08	-0.06	-0.01	-0.02	0.02	0.02	0.02	-0.05

Appendix Exhibit 15. Contribution of selected causes of death mortality differences in life expectancies between non-Hispanic Black Females in 2000 and non-Hispanic Black Females in 2010 by age in Wisconsin

Age	nΔx-all	nΔx-heart disease	nΔx-malignant neoplasms	nΔx-cerebrovascular disease	nΔx-respiratory disease	nΔx-accidents	nΔx-diabetes	nΔx-flu/pnu	nΔx-suicide	nΔx-liver disease	nΔx-hypertension	nΔx-homicide	nΔx-perinatal	nΔx-HIV	nΔx-all other causes
0	0.18	0.00	0.00	-0.01	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.03	0.00	0.11
1-4	0.09	0.00	-0.01	-0.01	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.03
5-9	0.04	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.02
10-14	0.02	-0.01	0.01	0.00	0.00	-0.02	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.04
15-19	-0.02	0.01	0.00	0.00	-0.01	-0.01	0.01	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	-0.01
20-24	0.15	0.02	-0.01	0.00	0.01	0.02	0.00	0.01	-0.01	0.00	0.00	0.05	0.00	0.01	0.05
25-29	-0.01	0.00	0.02	0.01	0.01	-0.03	0.01	0.00	-0.03	-0.01	-0.01	0.00	0.00	-0.01	0.02
30-34	-0.07	-0.04	0.00	-0.01	0.01	0.00	0.01	0.01	-0.02	0.00	-0.01	0.00	0.00	0.01	-0.02
35-39	0.10	0.06	0.00	0.01	0.01	0.00	-0.02	-0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.02
40-44	0.11	0.01	0.07	0.02	0.01	0.00	-0.01	0.00	0.01	-0.01	-0.01	0.00	0.00	0.00	0.03
45-49	-0.04	-0.02	0.03	-0.02	0.00	-0.06	0.00	0.01	0.01	-0.01	0.00	0.00	0.00	0.02	0.00
50-54	-0.07	0.03	-0.05	0.01	0.00	-0.06	0.03	-0.01	0.00	-0.01	0.00	0.01	0.00	0.01	0.01
55-59	-0.15	0.01	-0.08	0.01	-0.02	-0.03	0.06	-0.02	0.00	-0.02	0.00	0.00	0.00	-0.01	-0.06
60-64	0.03	0.07	-0.03	0.04	0.00	-0.04	0.00	-0.01	0.00	0.00	0.00	0.01	0.00	0.00	-0.01
65-69	0.42	0.18	0.19	0.00	0.01	0.00	0.06	0.01	0.00	0.00	0.01	0.00	0.00	0.00	-0.03
70-74	0.17	-0.02	-0.01	0.06	0.02	0.00	0.12	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.01
75-79	0.22	0.13	0.00	0.09	0.00	0.02	0.00	0.04	0.01	0.00	0.03	0.01	0.00	0.00	-0.08
80-84	0.16	0.08	0.03	0.05	0.03	0.01	-0.02	0.00	0.00	0.00	-0.03	0.00	0.00	0.00	-0.01
85 +	0.04	0.16	-0.06	0.13	0.00	-0.03	0.04	0.01	0.00	0.00	0.02	0.01	0.00	0.00	-0.24
Total	1.37	0.67	0.11	0.38	0.09	-0.22	0.28	0.08	-0.02	-0.08	-0.01	0.14	0.04	0.03	-0.12

Appendix Exhibit 16. Contribution of selected causes of death mortality differences in life expectancies between non-Hispanic

White Females in 2000 and non-Hispanic White Females in 2010 by age in Wisconsin

Age	nΔx-all	nΔx-heart disease	nΔx- malignant neoplasms	nΔx- cerebrovascular disease	nΔx- respiratory disease	nΔx- accidents	nΔx-diabetes	nΔx-flu/pnu	nΔx-suicide	nΔx-liver disease	nΔx- hypertension	nΔx- homicide	nΔx-perinatal	nΔx-HIV	nΔx-all other causes
0	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.07
1-4	0.02	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5-9	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
10-14	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-19	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20-24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.00	0.00	0.00
25-29	-0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
30-34	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
35-39	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
40-44	-0.01	-0.01	0.02	0.00	0.00	-0.01	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.03	0.00	0.00	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01
50-54	0.01	0.01	0.03	0.01	0.00	-0.02	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00
55-59	0.11	0.05	0.06	0.01	0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
60-64	0.16	0.04	0.09	0.01	0.00	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
65-69	0.23	0.09	0.07	0.02	0.01	0.00	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
70-74	0.19	0.11	0.02	0.03	0.01	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.02
75-79	0.18	0.14	-0.01	0.05	0.00	-0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.03
80-84	0.21	0.17	0.00	0.08	-0.01	-0.01	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	-0.05
85 +	0.28	0.33	0.01	0.16	-0.02	-0.02	0.01	0.07	0.00	0.00	-0.01	0.00	0.00	0.00	-0.27
Total	1.51	0.96	0.37	0.38	0.00	-0.06	0.10	0.10	-0.05	0.00	-0.01	0.01	0.05	0.00	-0.33