

Issue Brief: Disparities in Premature Death Amenable to Health Care, 2011 to 2015

The Roles of Geography, Poverty, and Race and Ethnicity

MAY | 2019

Key Findings

- Higher rates of early death from conditions that are amenable to health care treatment and potentially avoidable were found in areas with high poverty in Minnesota.
- Racially or ethnically diverse areas with high poverty had particularly high rates of early death for stroke and complications from common surgical procedures.
- In addition to the personal and psychological impact of early deaths for families and communities, premature death represents lost future earnings of approximately \$73.2 million per year in diverse, high-poverty areas of the state.

Background

While Minnesota ranks first overall in the United States in low rates of deaths that are preventable with access to health care, where you live in the state can affect how long you live, leading to large variation.¹ This is especially true in areas characterized by high levels of poverty or racial and ethnic diversity.^{2,3} In this issue brief, the Health Economics Program of the Minnesota Department of Health (MDH) analyzes differences in the rates and causes of early death across Minnesota by poverty, racial and ethnic diversity of the population, and the combination of these factors. By identifying areas where disparities are greatest, public health officials, communities, and policy makers can determine where to best target initiatives to reduce these disparities.

Methods

Our work in this issue brief was inspired by other research that found a link between poverty, race and ethnicity, receiving needed care, and shorter life spans. One local study found census tracts in Minnesota have life expectancies that can vary by up to 27 years.⁴ National research showed low-income Americans died much sooner than their more affluent neighbors,⁵ and there are racial disparities in mortality due to chronic heart disease, cancer, diabetes, and infant mortality.⁶

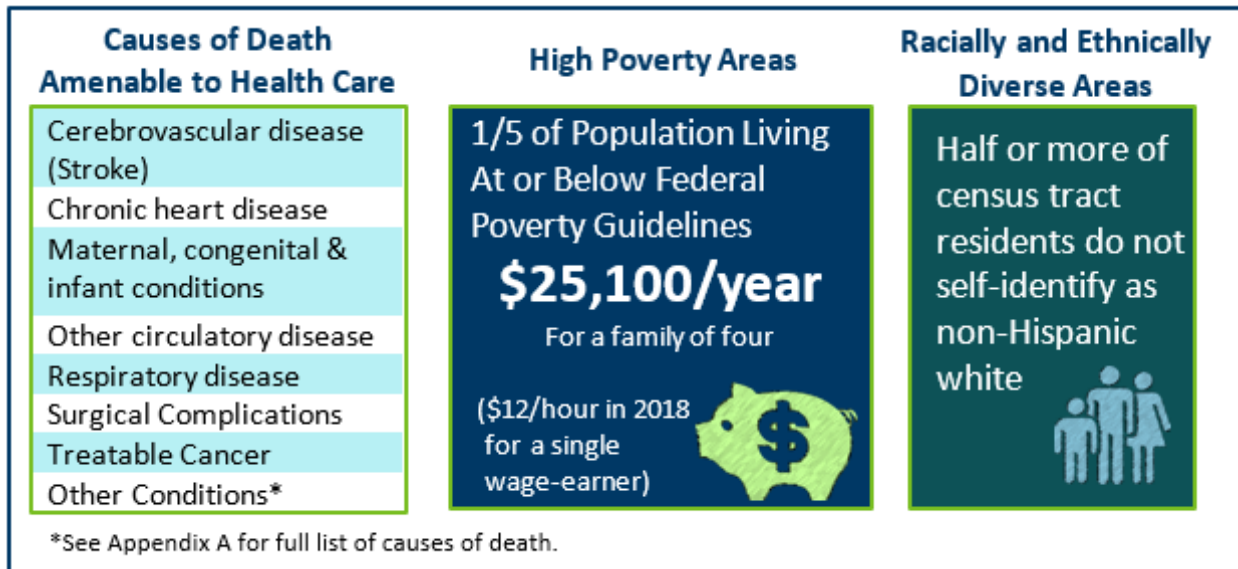
This work used two primary data sources: Minnesota death records, and population level estimates from the American Community Survey (ACS). Deaths were mapped to census tracts using address information on the death record, and demographics of census tracts were drawn from the American Community Survey (see Figure 1). The cause of death, and age of decedent (usually under age 75), were used to identify “health care amenable mortality,” or deaths that

were most likely preventable if the person had access to timely and effective health care.⁷ The causes of death considered include chronic heart disease,⁸ complications from surgical procedures, stroke, and other conditions identified in Appendix A.

We calculated population rates for each geography after adjusting for differences in age and sex.⁹ Finally, we compare adjusted rates of premature death across two categories:

- High poverty areas of the state; and
- High poverty areas also characterized by greater racial and ethnic diversity;¹⁰ (Figure 1).

Figure 1. Definitions

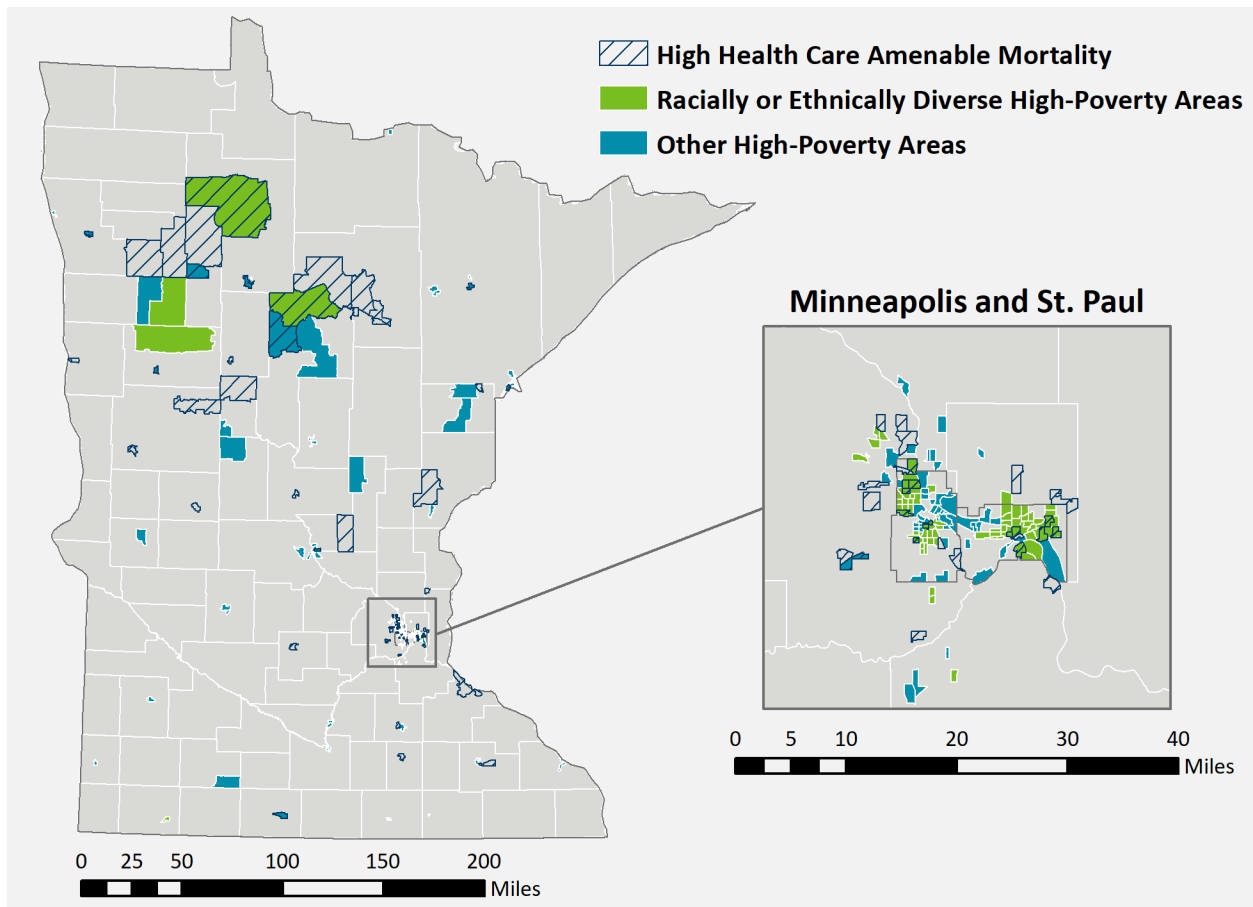


Volume and Geographic Distribution of Health Care Amenable Mortality

Our analysis identified that nearly one in five deaths for Minnesota residents under age 75 were potentially avoidable with health care treatment (14,027 out of 76,907) from 2011 through 2015. In examining the geographic distribution of health care amenable mortality, we found substantial overlap with the extent of poverty and presence of racial and ethnic diversity. As shown in Figure 2, census tracts with higher rates of health care amenable mortality often correspond with areas that were high poverty (blue) or were high-poverty areas with greater racial and ethnic diversity (green).¹¹ In all, 43 percent of the population with high mortality rates amenable to health care live in areas with high poverty, even though these areas only represent 14 percent of the state population under age 75.

Similar to the state as a whole, the majority of Minnesota’s population (54.5 percent) living in areas with elevated health care amenable mortality were within 20 miles of the cities of Minneapolis and St. Paul. Outside of the metro area, more than half the population in isolated rural areas with high mortality lived in areas that included American Indian reservations.

Figure 2. High Health Care Amenable Mortality and Poverty in Minnesota



Note: Rates of mortality amenable to health care (premature death) were adjusted by age and sex. Census tracts with a higher number of actual deaths amenable to health care than the expected number based on the population are considered high mortality. Expected numbers are derived from the statewide rate of mortality amenable to health care. The map only shows census tracts with high amenable mortality rates, 20 or more amenable mortality events, and the rates are considered stable.

Source: MDH, Health Economics Program analysis of the Minnesota Mortality Registry and the US Census Bureau's American Community Survey 2011-2015.

These overall findings are consistent with the *Minnesota Statewide Health Assessment* that points to structural barriers faced across generations by Minnesotans living in poverty, communities of color, and American Indians, that keep many communities from being healthy.¹² American Indians, in particular, face considerable hurdles to health including limitations around how and where they can access health care, higher rates of homelessness, earnings of about half the median income of white Minnesotans, and a disproportionate involvement with the criminal justice system.¹³

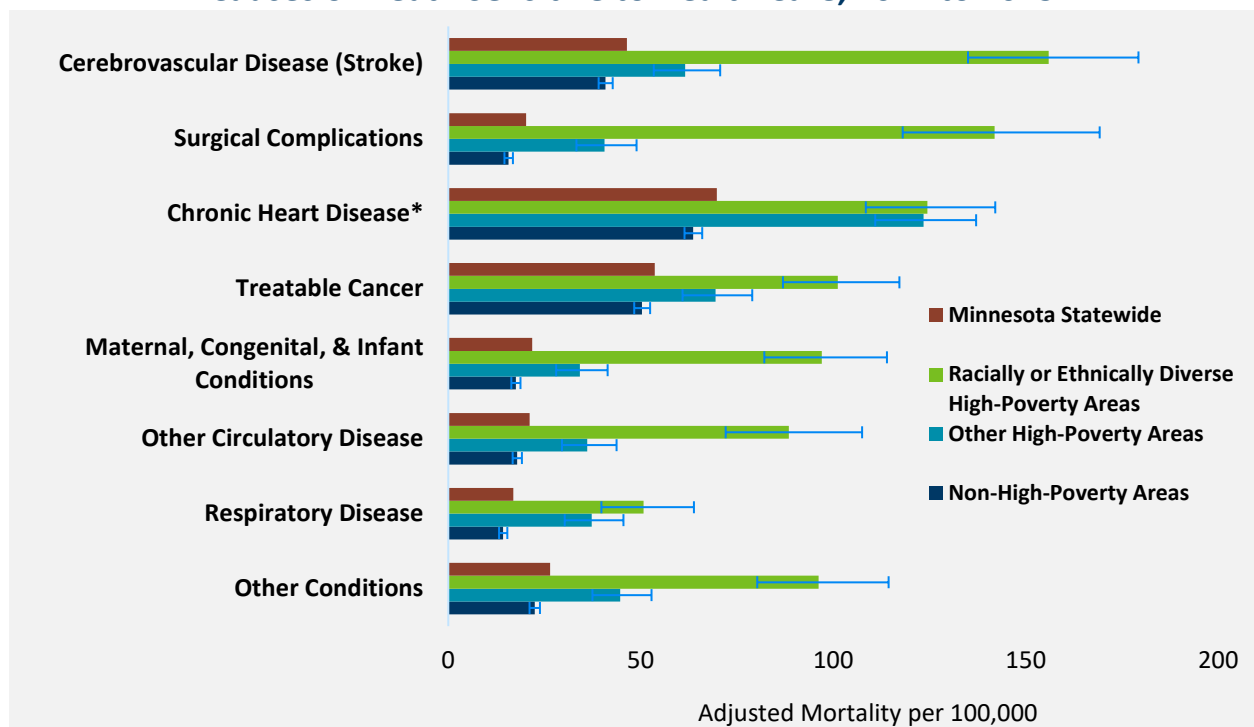
Distribution of the Causes of Health Care Amenable Deaths

While areas with the highest rates of early death largely overlapped with areas of high poverty (and diversity), the causes of early death differ across categories (Figure 3). Among deaths amenable to health care, chronic heart disease was the leading cause of death in high poverty areas, followed closely by treatable cancer and stroke. Health care amenable mortality rates for surgical conditions, heart disease, maternal and infant conditions (conditions related to

pregnancy, birth and birth defects), and respiratory disease in these high-poverty areas were nearly double the statewide average.

Areas with high poverty that were also racially and ethnically diverse experienced the highest rates of health care amenable mortality for stroke and complications from surgical conditions, with rates nearly four times higher than the statewide rate and more than twice as high as other areas with high poverty. Also of note, rates for maternal, congenital, and infant conditions, and other circulatory diseases were also more than two times higher than in high-poverty areas that were not as diverse. High-poverty areas, regardless of racial and ethnic diversity, had similar adjusted death rates for chronic heart disease and respiratory disease.¹⁴

Figure 3. Mortality Rates per 100,000 for Causes of Death Sensitive to Health Care, 2011 to 2015



**Only 50 percent of deaths for chronic heart disease are included as evidence indicates 40 to 50 percent of heart disease mortality is sensitive to health care treatment.*

Source: MDH, Health Economics Program analysis of the Minnesota Mortality Registry and the US Census Bureau's American Community Survey 2011-2015. Rates were adjusted by age and gender with the statewide rate as the standard rate.

Consequences of Premature Death

Losing loved ones imposes an immense psychological toll on the immediate family, friends, and community of those who die—particularly when the death is unexpected. Much of this burden can result in unquantifiable consequences, including the loss of emotional support, family integrity, and personal or community history.¹⁵ In addition to loss of social support for friends and family, premature death also leads to loss of income due to fewer years worked, which economists call productivity loss.¹⁶ This analysis looks at the average age of death for individuals who died before reaching 75 years of age for mortality amenable to health care.

As shown in Table 1, people living in racially or ethnically diverse, high-poverty areas, on average, died seven years earlier (at age 50) than their counterparts in areas that were not characterized by higher poverty and greater diversity (age 57). The gap was three years for people who lived in lower-diversity high poverty areas (age 54). Using standard (although likely imperfect) economic assumptions about the cost per year of life lost (\$50,000),¹⁷ we estimate an overall productivity loss in areas of high poverty of \$114.8 million per year between 2011 and 2015, with nearly two-thirds (\$73.2 million) of this loss focused in areas that also had high diversity.¹⁸

Table 1. Average Age at Death and Productivity Loss, 2011 to 2015

	Average Age of Death Under Age 75	Annual Productivity Loss ^a
Racially or Ethnically Diverse High-Poverty Areas	50	-\$73.2 million
Other High-Poverty Areas	54	-\$41.6 million

** This is the difference between the years of potential life lost and the expected number of years based on the age-specific death rates of the entire Minnesota population multiplied by \$50,000. It also includes an annual discount of 3%.*

Source: MDH, Health Economics Program analysis of the Minnesota Mortality Registry and the American Community Survey, 2011 to 2015.

Conclusion

The concept of premature death is not new, but the magnitude of it reported in this issue brief serves as an important reminder about the relevance of access to timely, high-quality health care services as well as the social determinants of health. As with other forms of health disparities, access to health care is not the only factor leading to premature death. Other research points to the built environment (air quality, housing, healthy food systems), socioeconomic status, as well as discrimination, racism and stress as being important determinants of lower life expectancy.^{19, 20}

What is new in this analysis is that we identify the disproportionate impact of health care amenable deaths on high-poverty communities and, in particular, high-poverty communities that are also characterized by a greater degree of racial and ethnic diversity in a state that does comparably well in terms of residents living long and healthier lives.²¹

Our findings about high-poverty communities with greater diversity, particularly concerning the evidence on productivity losses, are one example of the impact of generational structural barriers to health and financial well-being illustrated in the recent *Minnesota Statewide Health Assessment*.²² The financial losses, along with the psychological burdens experienced by communities who are dealing with early loss, only add to the evidence developed by groups such as the National Equity Atlas, which highlights the existence and type of systemic barriers experienced by specific disadvantaged communities.²³ The findings in this brief also provide additional context for new tools such as the Opportunity Atlas, which allows individuals to explore the neighborhoods (and factors) that offer children the best chance for social mobility.²⁴ For example, recent research on the latter resource shows that children have a

better chance at moving out of poverty if they live where there are higher incomes, less racial segregation, and more two-parent families.^{25,26}

The reasons underlying the observed patterns of premature deaths are complex. While this study was not designed to identify them, we know a good deal from the literature. Some of the factors affecting the trends in Minnesota and nationwide relate to access to care, whether influenced by the complexity of the system, its failure to align to patients' needs and expectations, or the cost of care.²⁷ Other factors relate to systemic barriers, including structural racism, that have grown historically and affect Minnesotans' equal chances for achieving best possible health as noted nearly five years ago in the MDH report *Advancing Health Equity in Minnesota*.²⁸ The literal life-and-death implications of this brief bring renewed urgency to the ongoing work of fulfilling the recommendations in the *Advancing Health Equity* report, which are still relevant today.

Appendix A: Causes of Death Sensitive to Health Care

<i>Cause of Death Considered Sensitive to Health Care</i>	<i>Age</i>	<i>International Classification of Diseases 10th Revision</i>
Cerebrovascular disease (Stroke)	0-74	I60-I69
Chronic heart disease	0-74	I20-I25
Maternal, congenital and perinatal conditions		
Maternal death	0-74	O00-99
Congenital cardiovascular anomalies	0-74	Q20-8
Perinatal deaths, all causes, excluding stillbirths	0-74	P00-P96,A33
Other circulatory conditions		
Chronic rheumatic heart disease	0-74	I05-9
Hypertensive disease	0-74	I10-I13,I15
Respiratory disease		
All respiratory diseases (excl. pneumonia, influenza)	1-14	J00-J09,J20-J99
Influenza	0-74	J10-J11
Pneumonia	0-74	J12-J18
Surgical conditions		
Peptic ulcer	0-74	K25-K27
Appendicitis	0-74	K35-K38
Abdominal hernia	0-74	K40-K46
Cholelithiasis and cholecystitis	0-74	K80-K81
Nephritis and nephrosis	0-74	N00-N07,N17-N09, N25-N27
Benign prostatic hyperplasia	0-74	N40
Treatable Cancer		
Malignant neoplasm of colon and rectum	0-74	C18-C21
Malignant neoplasm of skin	0-74	C44
Malignant neoplasm of breast	0-74	C50
Malignant neoplasm of cervix uteri	0-74	C53
Malignant neoplasm of cervix uteri or body of uterus	0-44	C54, C55
Malignant neoplasm of testis	0-74	C62
Hodgkin's disease	0-74	C81
Leukemia	0-44	C91-C95
Other Conditions		
Diabetes	0-49	E10-E14
Diseases of the thyroid	0-74	E00-E07
Epilepsy	0-74	G40-1
Intestinal infections	0-14	A00-A09
Measles	1-14	B05
Misadventures to patients	0-74	Y60-Y69,Y83-Y84
Diphtheria, tetanus, septicemia, or poliomyelitis	0-74	A36,A35,A80
Tuberculosis	0-74	A15-A19,B90
Whooping cough	0-14	A37

Source: Adapted from Nolte, E., & McKee, M. (2004). *Does Health Care Save Lives? Avoidable Mortality Revisited* (p. 66). London: The Nuffield Trust

Endnotes

¹ The Commonwealth Fund. Health System Data Center: Healthy Lives: Mortality Amenable to Health Care, Deaths per 100,000 population, 2013-2014. Retrieved October 6, 2017 from <http://datacenter.commonwealthfund.org>.

² A large share (20 percent or greater) have income that is below the federal poverty guidelines. See: Kneebone, Elizabeth, and N. Holmes (2016, April). Concentrated Poverty in the Wake of the Great Recession. Brookings. Retrieved October 6, 2017 from: <https://www.brookings.edu/research/us-concentrated-poverty-in-the-wake-of-the-great-recession>.

³ Defined as Census tracts with populations where the majority of the population do not self-identify as non-Hispanic white and a large share (20 percent or greater) have income that is below the federal poverty guidelines.

⁴ National Center for Health Statistics. U.S. Small-Area Life Expectancy Estimates Project (USALEEP): Life Expectancy Estimates File for Minnesota, 2010-2015]. National Center for Health Statistics. 2018. Available from: [https://www.cdc.gov/nchs/nvss/usaleep/usaleep.html\(https://www.cdc.gov/nchs/nvss/usaleep/usaleep.html\)](https://www.cdc.gov/nchs/nvss/usaleep/usaleep.html(https://www.cdc.gov/nchs/nvss/usaleep/usaleep.html)).

⁵ Chetty, R., Stepner, M., Abraham, S., Lin, S., Scuderi, B., Turner, N., & Cutler, D et al. (2016). The Association between Income and Life Expectancy in the United States, 2001-2014. *JAMA*, 315(16), 1750-1766.

⁶ Kochanek, K. D., Arias, E., & Anderson, R. N. (2013). How Did Cause of Death Contribute to Racial Differences in Life Expectancy in the United States in 2010? National Centers for Health Statistics Data Brief No. 125.

⁷ Nolte, E., & McKee, M. (2004). *Does Health Care Save Lives? Avoidable Mortality Revisited* (p. 66). London: The Nuffield Trust. For a comprehensive list, see Appendix A.

⁸ We are only considering half of chronic heart disease mortality to be sensitive to health care. See Nolte, E., & McKee, C. M. (2012). In amenable mortality—deaths avoidable through health care—progress in the US lags that of three European countries. *Health Affairs*, 31(9), 2114-2122.

⁹ Adjustments match census tract populations with statewide age and gender distributions with the state rates as the reference rate. For more information on the indirect adjustment of rates, see Lilienfeld, D. and Stolley, P. (1994). *Foundations of Epidemiology* (3rd Ed.) Oxford University Press.

¹⁰ Census tracts with high rates of poverty had at least 20 percent of the population within household incomes below 100 percent of the Federal Poverty Guidelines (FPG). Census tracts that were both high poverty and diverse also had at least 20 percent of the population within household incomes below 100 percent FPG, and at least 50 percent of the population was not white non-Hispanic.

¹¹ Rates of mortality amenable to health care (premature death) have been adjusted by age and sex; if actual number of deaths amenable to health care is higher than the expected number, based on the population of the census tract, the tract is considered high mortality. Expected numbers are derived from the statewide rate of mortality amenable to health care.

¹² MDH, Center for Public Health Practice Minnesota Statewide Health Assessment. Retrieved October 23, 2018 from <http://www.health.state.mn.us/statewidehealthassessment>.

¹³ Kaul, G. (2018, October 10). Across a range of measures, Minnesota's American Indians fare worse than other groups. So why isn't it talked about more? Retrieved October 23, 2018 from <https://www.minnpost.com/politics-policy/2018/10/across-a-range-of-measures-minnesotas-american-indians-fare-worse-than-other-groups-so-why-isnt-it-talked-about-more/>

¹⁴ Pollution can exacerbate respiratory diseases such as asthma, and census tracts with high poverty rates are often located near major roads and other air pollutants, which may partially help to explain this issue. See Lindgren, P., Johnson, J., Williams, A., Yawn, B., & Pratt, G. C. (2016). Asthma Exacerbations and Traffic: Examining Relationships Using Link-based Traffic Metrics and a Comprehensive Patient Database. *Environmental Health*, 15(1), 102.

¹⁵ Kozhimannil, K. B. (2018). Reversing The Rise In Maternal Mortality. *Health Affairs*, 37(11), 1901-1904.

¹⁶ We calculate difference of prime working years (ages 15 through 69) between the actual and expected age-specific rates based on the Minnesota population in five year segments.

¹⁷ Neumann, P. J., Cohen, J. T., & Weinstein, M. C. (2014). Updating Cost-Effectiveness—the Curious Resilience of the \$50,000-per-QALY Threshold. *New England Journal of Medicine*, 371(9), 796-797. This figure is also slightly below the average annual wage in Minnesota for the most recent year of \$52,730 in 2017. Retrieved November 21, 2018 from https://www.bls.gov/oes/current/oes_mn.htm#00-0000.

¹⁸ Since there is uncertainty about death in the distant future, the years of potential life lost includes an annual discount of 3% as recommended by Corso PA, Haddix AC. Discount Rate and Time effects. In: Haddix AC, Teutsch SM, Corso PS, eds. *Prevention Effectiveness: A Guide to Decision Analysis and Economic Evaluation*, 2nd Ed. New York, NY: Oxford University Press; 2003: pg. 23; 92–102. The discount method used is described by Simple Interactive Statistical Analysis, Calculating the Discounted and Mortality Adjusting Years of Potential Life Lost. Retrieved October 6, 2017 from <http://www.quantitativeskills.com/sisa/papers/paper6.htm>.

¹⁹ Russell, L. M. (2011). Reducing disparities in life expectancy: What factors matter. *The Institute of Medicine*, 1, 116.

²⁰ Woolf, S. H. (2015). How are income and wealth linked to health and longevity? Retrieved December 13, 2018 from https://www.urban.org/research/publication/how-are-income-and-wealth-linked-health-and-longevity/view/full_report

²¹ Murray, C. J., Mokdad, A. H., Ballestros, K., Echko, M., Glenn, S., Olsen, H. E., ... & Ferrari, A. J. (2018). The state of US health, 1990-2016: Burden of diseases, injuries, and risk factors among US states. *JAMA-Journal of the American Medical Association*, 319(14), 1444-1472.

²² MDH, Center for Public Health Practice Minnesota Statewide Health Assessment. Retrieved September 18, 2018 from <http://www.health.state.mn.us/statewidehealthassessment>.

²³ National Equity Atlas webpage. Retrieved October 8, 2018 from <http://nationalequityatlas.org/>.

²⁴ The Opportunity Atlas webpage. Retrieved October 8, 2018 from <https://www.opportunityatlas.org/>.

²⁵ Chetty, R., & Hendren, N. (2018). The impacts of neighborhoods on intergenerational mobility II: County-level estimates. *The Quarterly Journal of Economics*, 133(3), 1163-1228.

²⁶ Chetty, R., Friedman, J. N., Hendren, N., Jones, M. R., & Porter, S. R. (2018). *The Opportunity Atlas: Mapping the Childhood Roots of Social Mobility* (No. w25147). National Bureau of Economic Research.

²⁷ MDH, Health Economics Program analysis of the 2015 Minnesota Health Access Survey.

²⁸ MDH, Advancing Health Equity in Minnesota. Retrieved November 21, 2018 from http://www.health.state.mn.us/divs/che/reports/ahe_leg_report_020114.pdf

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