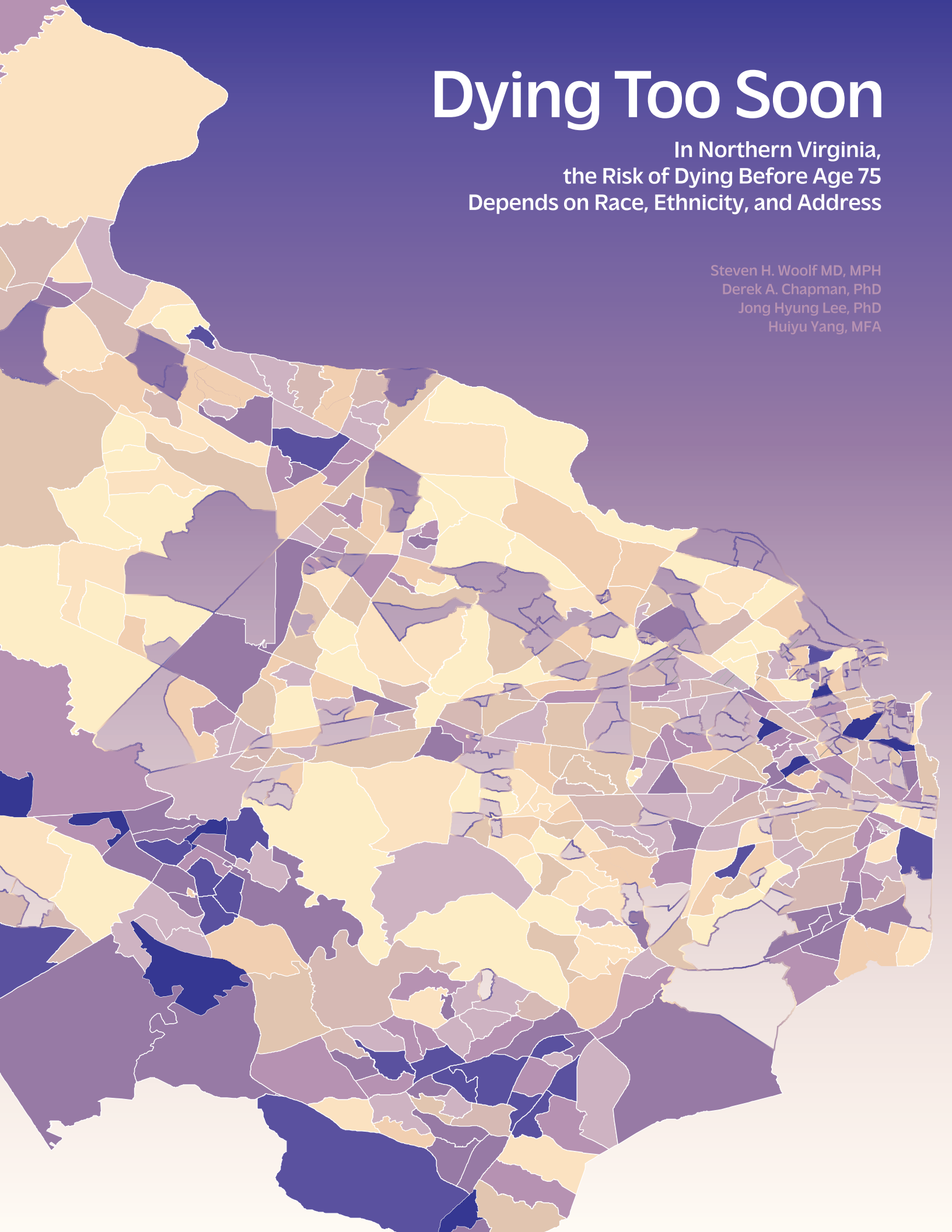# Dying Too Soon

In Northern Virginia, the Risk of Dying Before Age 75 Depends on Race, Ethnicity, and Address

Steven H. Woolf MD, MPH
Derek A. Chapman, PhD
Jong Hyung Lee, PhD
Huiyu Yang, MFA

Contents

The Virginia Commonwealth University Center on Society and Health produced this report for the Northern Virginia Health Foundation. The Center on Society and Health is an academic research center that studies the health implications of social factors—such as education, income, neighborhood and community environmental conditions, and public policy. Its mission is to answer relevant questions that can "move the needle" to improve the health of Americans, by presenting work in formats and venues that are useful to decision-makers and change agents.

The Center pursues these goals through collaboration with scholars in different disciplines at Virginia Commonwealth University and other institutions, and by nurturing partnerships with community, government, and private-sector stakeholders.

The Northern Virginia Health Foundation makes strategic grants to non-profit organizations that address the health care needs of residents of Northern Virginia, with particular emphasis on those who live in Arlington, Fairfax, Loudoun, and Prince William counties and the cities of Alexandria, Fairfax, Falls Church, Manassas, and Manassas Park. The Foundation focuses its grantmaking on those organizations that address the Foundation's priorities and promote its values.

INTRODUCTION

The Northern Virginia suburbs of Washington, DC are known for their high quality of life and excellent health outcomes. According to the 2022 County Health Rankings and Roadmaps,[1] the highest rankings in the Commonwealth of Virginia were given to Falls Church city (1st place), Arlington County (2nd place), Loudoun County (3rd place), Fairfax County (4th place), and Alexandria city (5th place).[a] The region is known for its high income, strong economy, highly educated population, and low poverty rates.

However, these broad generalizations mask stark disparities in health outcomes across the region. Life expectancy varies by 16 years across Northern Virginia's census tracts.[2] This report presents new data on how death rates vary across the region, examining rates for two recent time periods: the years preceding the COVID-19 pandemic (2015-2019) and the pandemic itself (2020-2021). Statistics are reported for counties, legislative districts, and census tracts and are compared across racial and ethnic populations, showing the heightened health risks faced by people of color. Finally, the report concludes with policy recommendations about strategy priorities to reduce health inequities.

BACKGROUND

A 2017 report[3] based on research by the Center on Society and Health at Virginia Commonwealth University, commissioned by the Northern Virginia Health Foundation, identified 15 "islands of disadvantage," neighborhoods in Northern Virginia with low life expectancy and adverse socio-economic and environmental conditions that affect health (*Figure 1*).[b]

The lower life expectancy and poorer health outcomes are less about health care, which affects only 10–20% of health outcomes, than the social and economic conditions that affect health (e.g. education, income, jobs, housing, transportation) and the additional barriers that low-income families face in accessing jobs, child care, and other essential services. A study commissioned by the Metropolitan Washington Council of Governments found that education and economic factors explained 60% of the variation in life expectancy across the region, with housing, transportation, and health care accounting for 16%, 10%, and 6%, respectively.[4]

People of color—especially Hispanic/Latino and non-Hispanic Black (African American) and Asian residents—are disproportionately represented in Northern Virginia's "islands of disadvantage." These racial and ethnic disparities reflect the long legacy of systemic racism in the United States. Our 2021 report[5] documented the 400-year history of Northern Virginia, beginning with the displacement of the indigenous population by British landowners who accumulated wealth by acquiring land and operating lucrative tobacco and wheat plantations that relied on workforces of enslaved Africans. The report details efforts after the Civil War and emancipation until the modern era to displace and segregate the Black population and restrict access to education, property ownership and wealth accumulation, jobs paying livable wages, and civil liberties.

---

a   Other jurisdictions examined in this report–Fairfax City, Manassas City, Manassas Park City, and Prince William County–ranked 13th, 31st, 45th, and 10th, respectively, out of 133 ranked jurisdictions in Virginia.

b   The 15 "islands of disadvantage" included census tracts in (1) Leesburg, (2) Sterling Park, (3) Herndon/Reston, (4) Centreville/Chantilly, (5) Fairs Oaks/Oakton, (6) Springfield/Annandale/Landmark, (7) Seven Corners/Bailey's Crossroads/Alexandria West, (8) Columbia Pike/Douglas Park, (9) Buckingham/Fort Myer, (10) Arlandria, (11) Old Town-Alexandria/Huntington, (12) Route 1 corridor/Fort Belvoir, (13) Bull Run/Manassas, (14) Dale City/Woodbridge, and (15) Dumfries.

Figure 1.
The 2017 study identified 15 "islands of disadvantage" across Northern Virginia
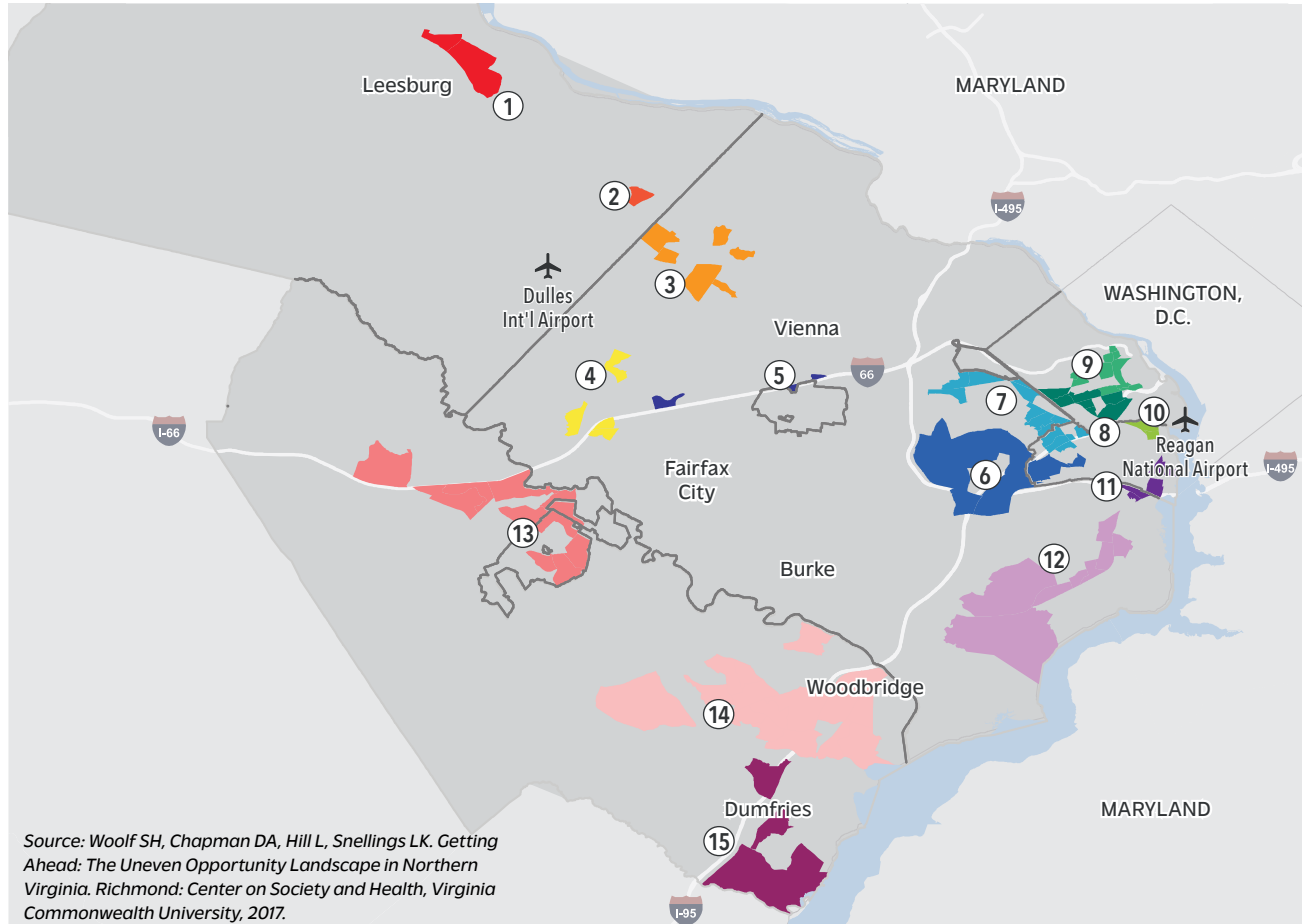
Source: Woolf SH, Chapman DA, Hill L, Snellings LK. Getting Ahead: The Uneven Opportunity Landscape in Northern Virginia. Richmond: Center on Society and Health, Virginia Commonwealth University, 2017.

		EDUCATION					ECONOMIC DISTRESS						HOUSING & HEALTH CARE	
		Pre-school enrollment <0.1% (15 tracts)	Teens out of school >20% (11 tracts)	High school or higher education <75% (18 tracts)	Bachelor's degree or higher <25% (26 tracts)	Households with limited English >20% (15 tracts)	Households with single parents >50% (5 tracts)	Un-employment rate >10% (18 tracts)	Median household income <$50,000 (12 tracts)	Poverty rate >15% (42 tracts)	Child poverty ≥33% (26 tracts)	Public assistance >15% (10 tracts)	Over-crowding >10% (23 tracts)	Uninsured rate >25% (45 tracts)
1	Leesburg			●	●	●			●				●	●
2	Sterling Park			●			●							●
3	Herndon / Reston	●		●		●		●		●	●		●	●
4	Centreville / Chantilly	●						●		●				●
5	Fair Oaks / Oakton					●				●	●			
6	Springfield / Annandale / Landmark	●	●	●	●	●	●	●		●	●	●	●	●
7	Seven Corners / Bailey's Crossroads / Alexandria West	●	●	●	●	●	●	●	●	●	●	●	●	●
8	Columbia Pike / Douglas Park	●	●	●			●	●	●	●	●	●		●
9	Buckingham / Fort Myer	●	●	●	●			●	●	●	●			●
10	Arlandria			●		●			●	●	●		●	
11	Old Town-Alexandria / Huntington	●								●	●			●
12	Route 1 corridor / Fort Belvoir	●		●	●	●		●	●	●			●	
13	Bull Run / Manassas			●	●	●				●	●	●	●	●
14	Dale City / Woodbridge	●	●	●	●	●		●		●	●	●	●	●
15	Dumfries	●			●		●	●	●	●	●	●		●

Dots indicate that the condition existed in at least one census tract in the cluster.

Many distressed areas of Northern Virginia can trace their origins to this history and to specific policies enacted by the General Assembly, local governments, and the private sector. Examples included restrictive covenants, inadequate funding for Black schools, and Jim Crow policies that blocked access to White businesses and venues. Over decades, these efforts segregated and isolated communities from economic opportunity and perpetuated a downward trajectory of neighborhood decline and multigenerational poverty. Today, the areas of Northern Virginia with the best health outcomes and most affluent families are often located on lands that benefited from segregated privilege and the accumulation and transfer of wealth across generations.

These circumstances help explain the large disparities in mortality (death) rates and health outcomes that exist across Northern Virginia, both by geography (e.g., county, census tract) and populations (e.g., race-ethnicity) and why people of color are disproportionately located in struggling neighborhoods. As occurred across the United States, these disparities became highly visible and were exacerbated by the COVID-19 pandemic. At-risk neighborhoods became "hot spots" for COVID-19, and populations of color who served as front-line workers and faced other risks experienced higher rates of viral exposure, infection, hospitalization, complications, and death. Low- and moderate-income families that were already struggling with the cost of living in Northern Virginia were devastated economically by lockdowns, job and wage losses, food and housing insecurity, and emotional stress.

This report takes a fresh look at current disparities in mortality rates across the region, with a focus on understanding the leading causes of death that drive these rates, how they vary by geography and population, and how these conditions were affected by the first two years of the COVID-19 pandemic (2020–2021). In brief, researchers at the Center on Society and Health at Virginia Commonwealth University obtained restricted death data from the Virginia Department of Health[c] and calculated death rates by location for the pre-pandemic years of 2015–2019 and for 2020–2021. Where possible, the data were stratified by race-ethnicity for the Hispanic and non-Hispanic Black, White, and Asian and Pacific Islander populations of Northern Virginia. (Further references in this report to Asian/Pacific Islander, Black, and White populations refer to those classified as non-Hispanic.) The jurisdictions examined included Alexandria City, Arlington County, Fairfax County (including the independent cities of Falls Church and Fairfax), Loudoun County, and Prince William County (including the cities of Manassas and Manassas Park). We obtained 2019 data on selected census indicators (e.g., demographic and economic indicators) for these jurisdictions.[d]

The report examines two important aspects of death rates in Northern Virginia. First, it focuses on *premature death*, defined as deaths before age 75. Second, it examines a special metric, called "avoidable causes of death," which the United States helped develop but is more widely used by international bodies (e.g., the World Health Organization) and other countries to track progress in addressing deaths that can be prevented or treated. For example, many cancers can be prevented through smoking cessation (primary prevention) or early detection through screening (secondary prevention). Deaths from chronic diseases like diabetes and heart disease can be avoided through treatments, such as medications to control blood sugar and hypertension.

Although most deaths occur at advanced ages, lost years of life are greater for deaths at younger ages; someone who dies at age 40 loses more years of life before age 75 (35 years) than someone who dies at age 70 (5 years). To quantify this, we calculated the total number of lost years of life that populations in Northern Virginia experienced because of deaths before age 75.[e] To adjust for differences in population size, we calculated the rate of lost years per 100,000 persons.

We calculated these rates for the entire Northern Virginia region, for the five jurisdictions listed above, and when possible,[f] for census tracts. We also calculated rates for clusters of adjacent census tracts falling within the boundaries of the 29 Virginia State House districts in Northern Virginia.[g] These include Districts 2, 10, 13, 31–53, 67, and 86–87.

In areas experiencing a greater risk of dying from avoidable causes of death, populations often have limited access to health care and struggle to obtain or afford preventive interventions like mammograms or medication for high blood pressure and cholesterol that can forestall or reduce complications of diseases. They are more likely to die from conditions that require rapid treatment, such as a heart attack or the onset of stroke; high-quality chronic care, such as for diabetes; or behavioral health services that can treat depression and prevent suicides or reduce fatalities from drug and alcohol addiction. This report goes beyond the measurement of traditional causes of death to compare avoidable causes across the region and how they changed during the COVID-19 pandemic. The aim of this analysis is to identify areas of opportunity to meaningfully improve health outcomes.

UNDERSTANDING DEATH RATES

We report absolute numbers of deaths but also death *rates*, defined as the number of deaths that occur each year per 100,000 persons in the population, which we adjust for age. Put simply, people facing higher premature death rates live with a *greater risk of dying* before age 75.

We often report rates per 100,000 even for places with fewer than 100,000 persons. This is much like the way we use percentages in daily life. A sales tax of 6% (in which a tax of six cents is applied per dollar in sales) is applied to all products, even if they cost less than one dollar.

If 5 deaths occur in census tract A, with a population of 1,000 people, the death rate experienced by that population is 5 per 1,000, which equals 500 per 100,000. If census tract B experiences 40 deaths but has a larger population (10,000 people), it experiences more deaths but a lower death rate (400 per 100,000). Using a common denominator allows us to recognize when places and populations in Northern Virginia face a *greater risk of dying* prematurely.

DISPARITIES IN MORTALITY
BEFORE THE COVID-19 PANDEMIC (2015–2019)

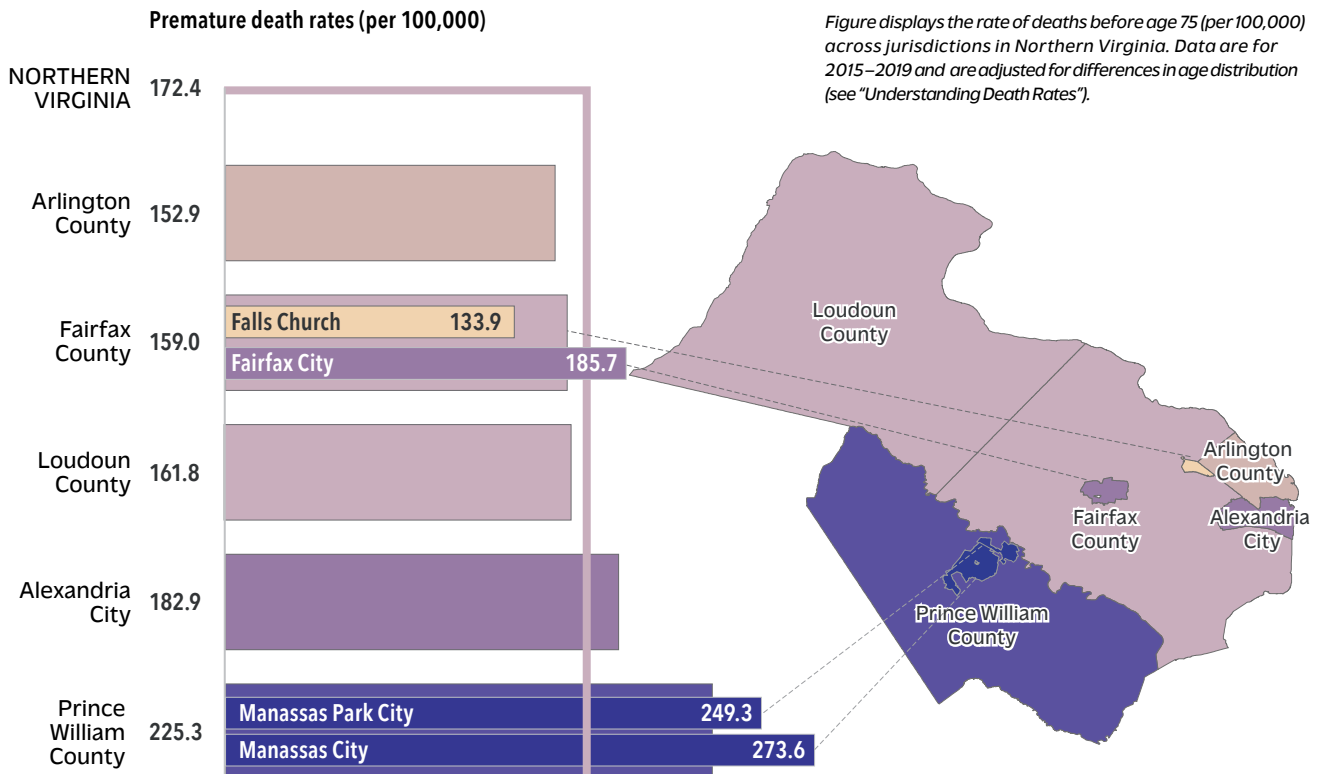## PREMATURE DEATH RATES VARIED
DRAMATICALLY ACROSS THE REGION

In the five years preceding the COVID-19 pandemic (2015–2019), there were 22,319 premature deaths (before age 75) in Northern Virginia, an age-adjusted rate of 162.0 deaths per 100,000 persons.[h] This rate—the likelihood that people living in Northern Virginia would die before age 75—was far below the statewide average for Virginia (308.9 per 100,000), signaling the good health that generally exists across the region. The rate varied even further across jurisdictions (*Figure 2*), with Prince William County experiencing the highest death rates.

Figure 3 plots premature death rates by State House districts and illustrates how death rates varied within counties. For example, although the overall premature death rate for Fairfax County was relatively low (159.0 per 100,000), the rate was 40% higher (222.5 per 100,000) in the Hybla Valley area of Fairfax County (represented by State House district 44). Even higher premature death rates were concentrated

---

h   These data refer to the rate of deaths before age 75. The appendix provides data (mortality rates) on deaths at all ages, along with deaths before age 75, for Northern Virginia and the five jurisdictions. These data are reported for all causes of death and the three leading causes of death, and they are broken out by race-ethnicity.

Figure 2.
The rate of premature deaths — the risk of dying before age 75 — was highest in Prince William County, 47% higher than in Arlington County, the county with the region's lowest rate.

Premature death rates (per 100,000)

NORTHERN VIRGINIA	172.4
Arlington County	152.9
Fairfax County	159.0
Falls Church	133.9
Fairfax City	185.7
Loudoun County	161.8
Alexandria City	182.9
Prince William County	225.3
Manassas Park City	249.3
Manassas City	273.6

Figure displays the rate of deaths before age 75 (per 100,000) across jurisdictions in Northern Virginia. Data are for 2015–2019 and are adjusted for differences in age distribution (see "Understanding Death Rates").

in areas of Manassas and the Woodbridge-Dumfries areas of Prince William County (corresponding with State House districts 2, 13, 50, and 52). Districts with low mortality rates were located in North Arlington, Great Falls, Vienna, and Oakton.

Death rates varied even more starkly by neighborhood. Premature death rates at the census tract level varied more than six-fold across Northern Virginia. For example, premature death rates were as low as 73.1 per 100,000 in census tract 4922.02, located in the South Run area of Fairfax County and 85.2 and 86.2 per 100,000 in tracts in Fair Oaks and Oakton (tracts 4612.02 and 4615.00, respectively) but as high as 573.3 per 100,000 in tract 9009.01 in the Dumfries areas of Prince William County.

These premature deaths claimed many years of life, but the total number of years of life lost varied from one census tract to another. For example, lost years of life (adjusted for population size) in tract 9007.01 in the Rippon community in Prince William County was three times higher than neighboring tract 9008.01. Put simply, the tragedy of people dying in the prime of their lives was far more common in tract 9008.01.

Figure 3.
Premature death rates in 2015–2019 varied by 124% across Virginia House Districts
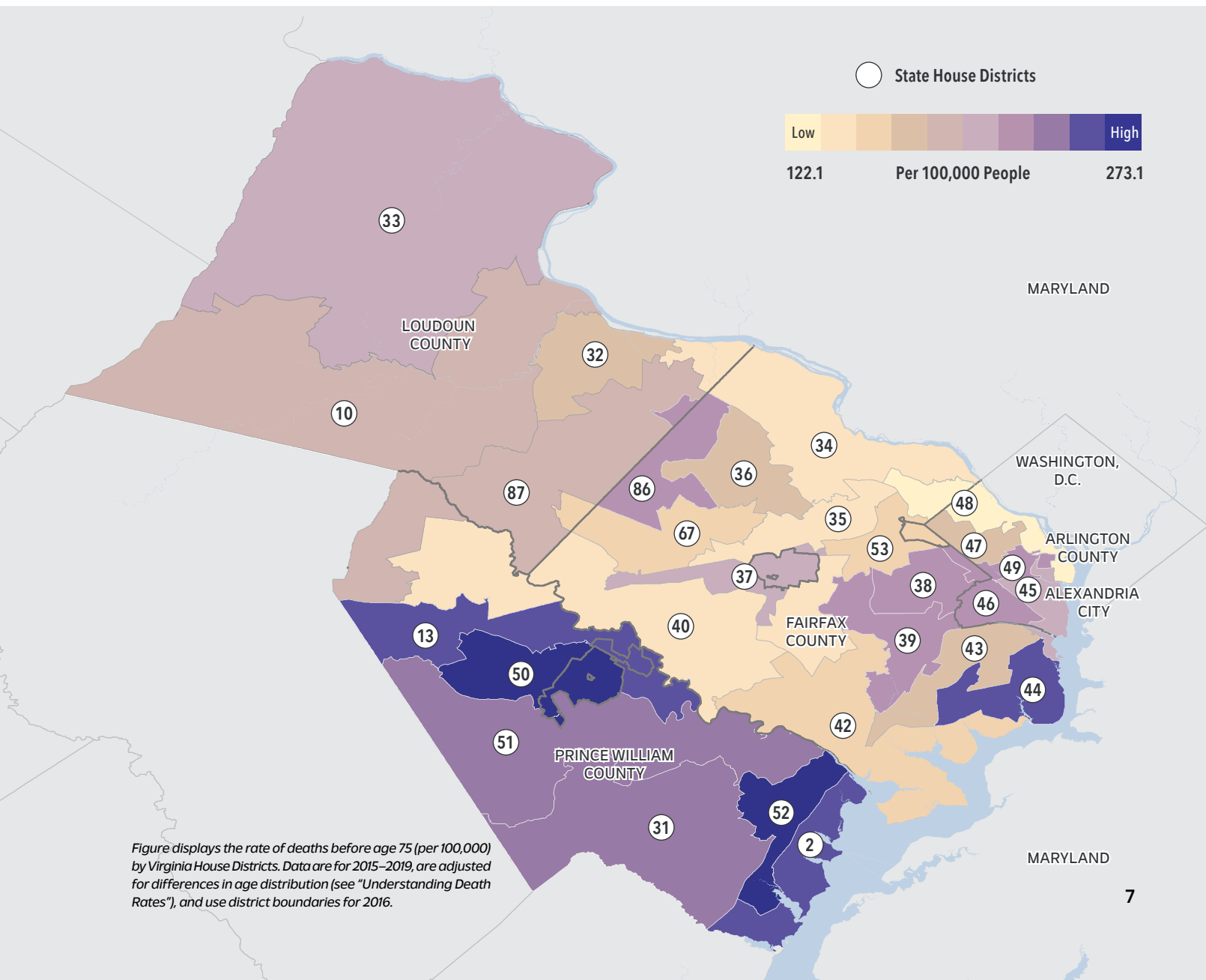

Figure displays the rate of deaths before age 75 (per 100,000) by Virginia House Districts. Data are for 2015–2019, are adjusted for differences in age distribution (see "Understanding Death Rates"), and use district boundaries for 2016.

Although Northern Virginia exhibits smaller racial-ethnic disparities than many other regions of the United States, stark disparities nonetheless persist in the region, with the Black population having the highest death rates (*Figure 4*). During 2015–2019, the Black population of Northern Virginia was 44% more likely to die before age 75 than their White counterparts, but this disparity varied by jurisdiction. It ranged from 9% in Prince William County to 28% in Loudoun County, 33% in Fairfax County, 116% in Arlington County, and 117% in Alexandria.. That is, Black residents in Alexandria and Arlington County were more than twice as likely to die before age 75 than White residents.

As occurs elsewhere in the United States, Hispanic and Asian/Pacific Islander populations had lower death rates than the White population. The rate of death before age 75 in the Black population of Alexandria (320.2 per 100,000) was more than triple the rate among Asian and Pacific Islander residents in Loudoun County (103.0 per 100,000).
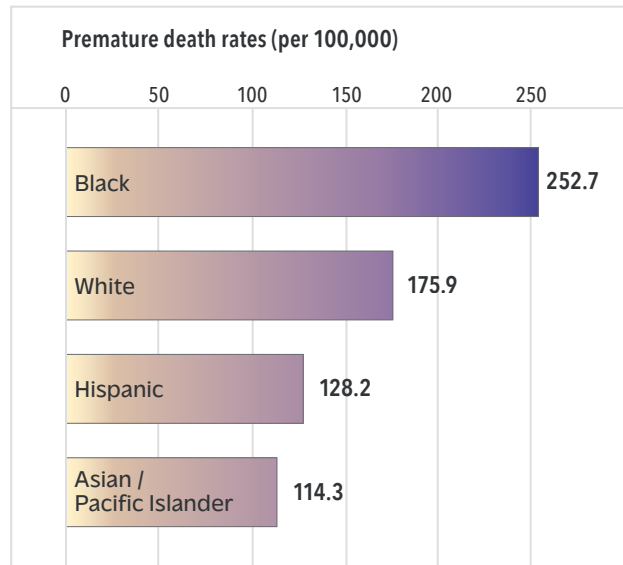
Premature death rates (per 100,000)

Black	252.7
White	175.9
Hispanic	128.2
Asian / Pacific Islander	114.3

Figure 4.

Black residents of Northern Virginia were more than twice as likely to die before age 75 than were Asian or Pacific Islander residents

Figure displays the rate of deaths before age 75 (per 100,000) in Northern Virginia by race and ethnicity. Data are for 2015–2019 and are adjusted for differences in age distribution (see "Understanding Death Rates"). Premature deaths are those before age 75. Black, White, and Asian/ Pacific Islander categories refer to individuals classified as non-Hispanic. Death counts were too low to calculate rates for American Indian/Alaska Native populations in Northern Virginia.

Figure 5.
Suicide was the third leading cause of premature death in Northern Virginia during 2015–2019

Cancer	7,051
Heart Disease	3,512
Suicide	997
Drug Overdoses	963
Stroke	799
Diabetes	747
Infant Deaths	586
Chronic Lower Respiratory Diseases	579
Car and Other Transport Accidents	438
Kidney Disease	394

The chart shows the number of deaths for the 10 leading causes of death in Northern Virginia, which claimed 16,066 lives in 2015–2019. A total of 22,319 deaths occurred when all causes of death are considered.
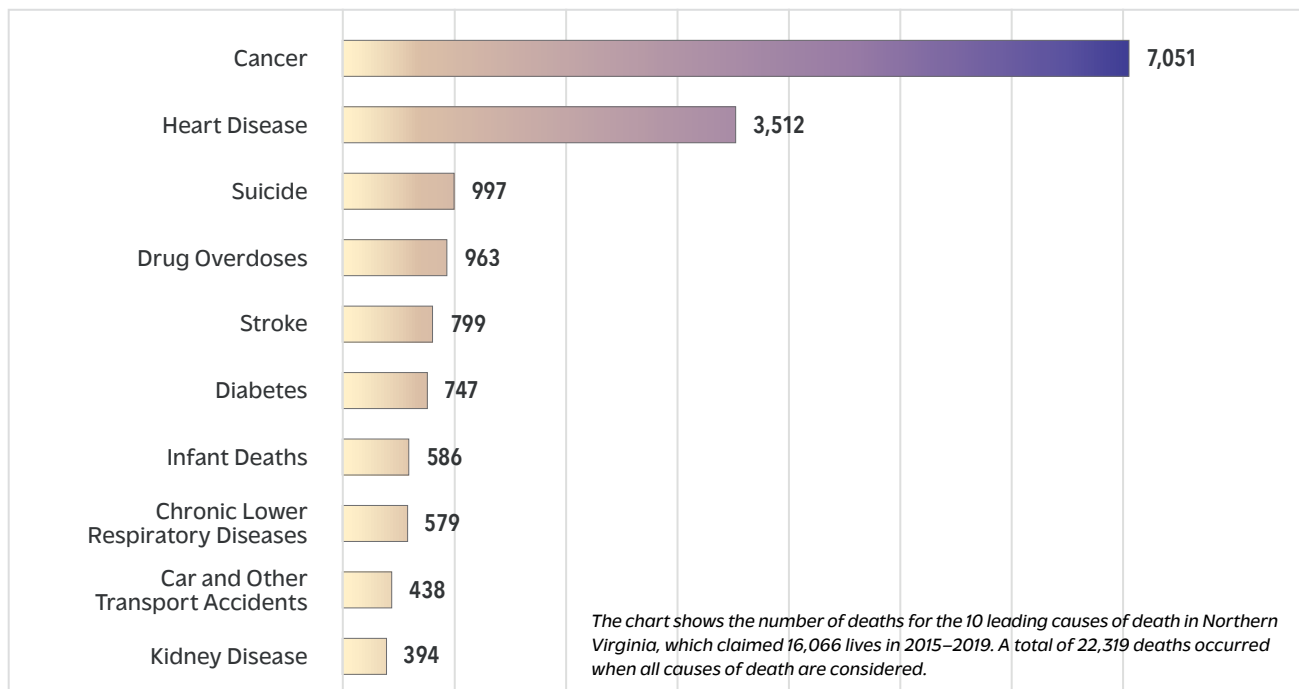
CHRONIC DISEASES AND INJURIES, MANY AVOIDABLE, DOMINATED THE LEADING CAUSES OF PREMATURE DEATH

The leading causes of premature deaths in Northern Virginia during 2015–2019 were cancer, heart disease, suicide, drug overdoses, cerebrovascular diseases (e.g., stroke), diabetes, infant deaths, chronic lower respiratory diseases, land transport (e.g., car) accidents, kidney disease,[i] and sepsis (*Figure 5*). This list differs from national trends in that suicide ranks higher in Northern Virginia, perhaps reflecting the intense lifestyle stresses in the region. Chronic lower respiratory disease is also a less common cause of death in Northern Virginia, perhaps because local smoking rates are below the national average.

Across racial and ethnic groups, cancer and heart disease were the two leading causes of premature death (before age 75), but disease threats otherwise differed (*Table 1*). For example, the third leading cause of premature deaths was strokes in the Asian population, infant deaths in the Hispanic population, diabetes in the Black population, and suicides in the White population. Car and other land transport accidents figured prominently in the Hispanic population, whereas chronic lower respiratory disease, influenza, and pneumonia were more prominent in the White population. Kidney disease was a leading cause of premature deaths only in Asian and Black populations. Infant deaths outnumbered suicides in the Black population, but the reverse occurred in the White population. Infant deaths are less common in the White population than among populations of color and are too infrequent to even rank among the top 10 leading causes of death. Drug overdoses ranked lower for the Asian population (10th) than in White (4th), Black (5th), and Hispanic (5th) populations.

i   Nephritis, nephrotic syndrome, nephrosis

Table 1.
The leading causes of premature death in Northern Virginia were not uniform across racial and ethnic groups

Asian*	Hispanic	Black*	White*
Cancer	Cancer	Cancer	Cancer
Heart Disease	Heart Disease	Heart Disease	Heart Disease
Stroke**	Infant Deaths	Diabetes	Suicides
Suicides	Car/Other Transport Accidents	Stroke**	Drug Overdoses****
Infant Deaths	Drug Overdoses****	Drug Overdoses****	Chronic Lower Respiratory Diseases
Diabetes	Stroke**	Infant Deaths	Stroke**
Kidney Disease***	Suicides	Kidney Disease***	Diabetes
Other Respiratory Disease	Diabetes	Chronic Lower Respiratory Diseases	Sepsis
Car/Other Transport Accidents	Homicide	Car/Other Transport Accidents	Influenza; Pneumonia
Drug Overdoses****	Other Respiratory Disease	Suicides	Car/Other Transport Accidents

*   Asian, Black, and White categories refer to people who were classified as non-Hispanic.
**   Includes strokes and other forms of cerebrovascular diseases.
***   Includes nephritis, nephrotic syndrome, and nephrosis.
**** Includes not only unintentional drug poisoning but also poisoning from alcohol, pesticides, and other noxious substances.

Table presents the ten leading causes of premature deaths (before age 75) in Northern Virginia during 2015-2019, by race and ethnicity.

Suicide was a more common cause of death in healthier neighbor-hoods, whereas stroke and diabetes predominated in less healthy areas.

Although cancer and heart disease were the first and second leading causes of premature death across the region, the third and fourth leading causes of death varied between census tracts with high and low overall death rates. For example, in tracts with lower overall death rates, suicide was the third leading cause of death. However, in census tracts with the highest death rates, drug overdoses, cerebrovascular disease (strokes), and diabetes ranked as the 3rd, 4th, and 5th leading causes of death, each claiming more lives than suicide, the 6th leading cause of death in these areas.

We found variation in leading causes of death across State House districts, especially when we studied districts with the highest and lowest premature death rates. For example, suicide was the third leading cause of death throughout Northern Virginia but not in District 52, the Woodbridge-Dumfries area of Prince William County (the county with the region's highest premature death rate). In that district, where 29% of the population is Black,[6] ten causes of death—cancer, heart disease, diabetes, infant deaths, drug overdoses, chronic lower respiratory disease, kidney disease, motor vehicle accidents, strokes, and homicides—each claimed more lives than suicide. In District 50, representing Manassas, motor vehicle fatalities ranked as the fourth leading cause of death, but they ranked 8th, 14th, and 18th, respectively, in Districts 52 (representing Woodbridge-Dumfries), 40 (representing Clifton), and 48 (representing North Arlington).

Variation occurred even within affluent areas. For example, infant death was the fifth leading cause of death in District 40, representing Clifton, but was the 14th leading cause of death in District 48, representing North Arlington.

In Northern Virginia, approximately two thirds of deaths before age 75 could have been avoided — through preventive interventions or better treatment.

Many premature deaths were avoidable, because they were amenable to preventive interventions or effective treatments. For example, deaths from cancers of the breast, cervix, and colon are considered avoidable because they can be prevented through screening (e.g., mammograms) or through effective treatments like chemotherapy, radiation, or surgery—but many people lack access to such care or get it too late. In Northern Virginia, the ten leading causes of avoidable (preventable and/or treatable) deaths were cancer, circulatory (e.g., heart) diseases, injuries (e.g., motor vehicle fatalities, drug overdoses, suicide, homicide),[j] alcohol and drugs, lung (respiratory) diseases, endocrine and metabolic diseases (e.g., diabetes), infectious diseases, kidney (genitourinary) diseases, complications of pregnancy and childbirth,[k] and digestive diseases. During 2015–2019, these 10 causes of avoidable deaths claimed 14,787 lives in Northern Virginia before age 75—nearly two thirds (66%) of all deaths before age 75 that occurred in those years.

---

j   Work-related injuries are included, but data are lacking to clarify how often they occurred.
k   Includes deaths during the perinatal period.

"ISLANDS OF DISADVANTAGE" PERSISTED

The primary reason for disparities in mortality rates in Northern Virginia is the existence of sharply divergent socioeconomic conditions.

Figure 6 shows variation at the census tract level. Census tracts with the highest premature death rates were clustered in Manassas and southern Prince William County; Leesburg and Sterling in Loudoun County; Annandale/ Springfield, Herndon/Centreville, Seven Corners/Bailey's Crossroads, and Route 1 areas of Fairfax County; the Shirley Highway (I-395) corridor; southern Arlington County; and downtown Alexandria. As we found in our 2017 report, these "islands of disadvantage" were often in close proximity to areas with the region's lowest death rates.

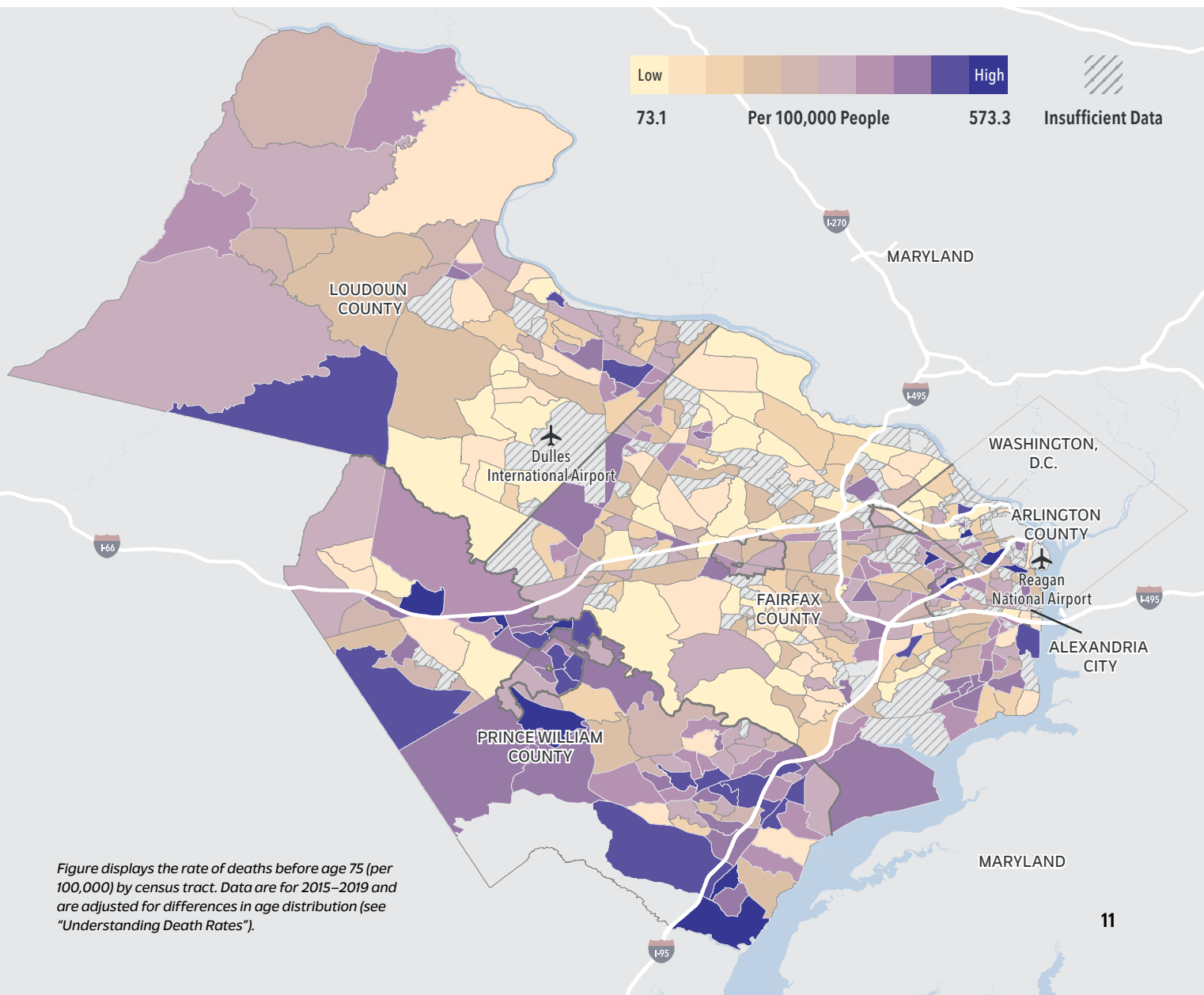Such health disparities are often mistakenly attributed to deficiencies in medical care. The primary reason for disparities in mortality rates in Northern Virginia is the existence of sharply divergent socioeconomic conditions. High death rates often exist in places with limited access to education, income, wealth, and employment and where residents face adverse environmental conditions that affect health, such as inadequate access to affordable housing, food, health care, and transportation.

Figure 6.
Premature death rates in 2015–2019 varied starkly by census tracts

Figure displays the rate of deaths before age 75 (per 100,000) by census tract. Data are for 2015–2019 and are adjusted for differences in age distribution (see "Understanding Death Rates").

In Northern Virginia, these conditions often exist across a street or highway from relatively affluent neighborhoods with lower death rates. For example, *Figure 7* contrasts two adjacent census tracts in the Buckingham and Bluemont areas of Arlington County, which exist on either side of North Henderson Road. In tract 1020.03 in Buckingham, the premature death rate in 2015–2019 (493.3 per 100,000) was 5.5 times that of tract 1013.00 in the adjacent Bluemont neighborhood (89.4 per 100,000). Tragically, deaths before age 75 in the Buckingham tract were more likely to occur at younger ages than in Bluemont, claiming more years of life. Adjusted for population, the rate (per 100,000) at which years of life were lost was four times that of Bluemont.

Conditions on either side of North Henderson Road are worlds apart. As of 2019, adults in the Bluemont tract were 51% more likely to hold a Bachelor's degree than those in Buckingham, and median household income ($199,113) was five times as high. In contrast, the poverty rate in the Buckingham tract was seven times higher than in Bluemont, rental properties were almost four times as likely to have substandard conditions, and the share of the population without health insurance was 70 times higher than in Bluemont (*Figure 7*). People of color disproportionately experience these adverse socioeconomic and environmental conditions. For example, 52% of the population in the Buckingham tract were people of color (e.g., Hispanic, Black, Asian), compared to 27% in the Bluemont tract.

These patterns are not unique to Bluemont and Buckingham. They recur throughout Northern Virginia. For example, a stream, Bull Run, separates census tracts 9019 in the Yorkshire area of Manassas and tract 4925 in Clifton, but the premature death rate in the Yorkshire tract was triple that of Clifton in 2015–2019. On average, deaths in the Yorkshire tract were more premature—occurred at younger ages—than in Clifton: the rate of lost years of life (per 100,000) was more than three times higher in Yorkshire than in Clifton. Two-thirds (67%) of Yorkshire residents were Hispanic, Black, or Asian, a share almost eight times larger than in Clifton, and 40% were foreign-born. In the Clifton tract, 86% of the population was White, and median household income and the percentage of adults with Bachelor's degree was 2.5 times that in Yorkshire.

HOW MORTALITY CHANGED DURING THE COVID-19 PANDEMIC

People living in Prince William County were 77% more likely to die from COVID-19 than residents of Fairfax County.

In 2020–2021, Northern Virginia experienced 2,331 deaths from COVID-19—including 946 deaths before age 75—making COVID-19 the third leading cause of premature death after cancer (2,883 deaths) and heart disease (1,551 deaths) during those years.[l] The number of COVID-19 deaths varied across Northern Virg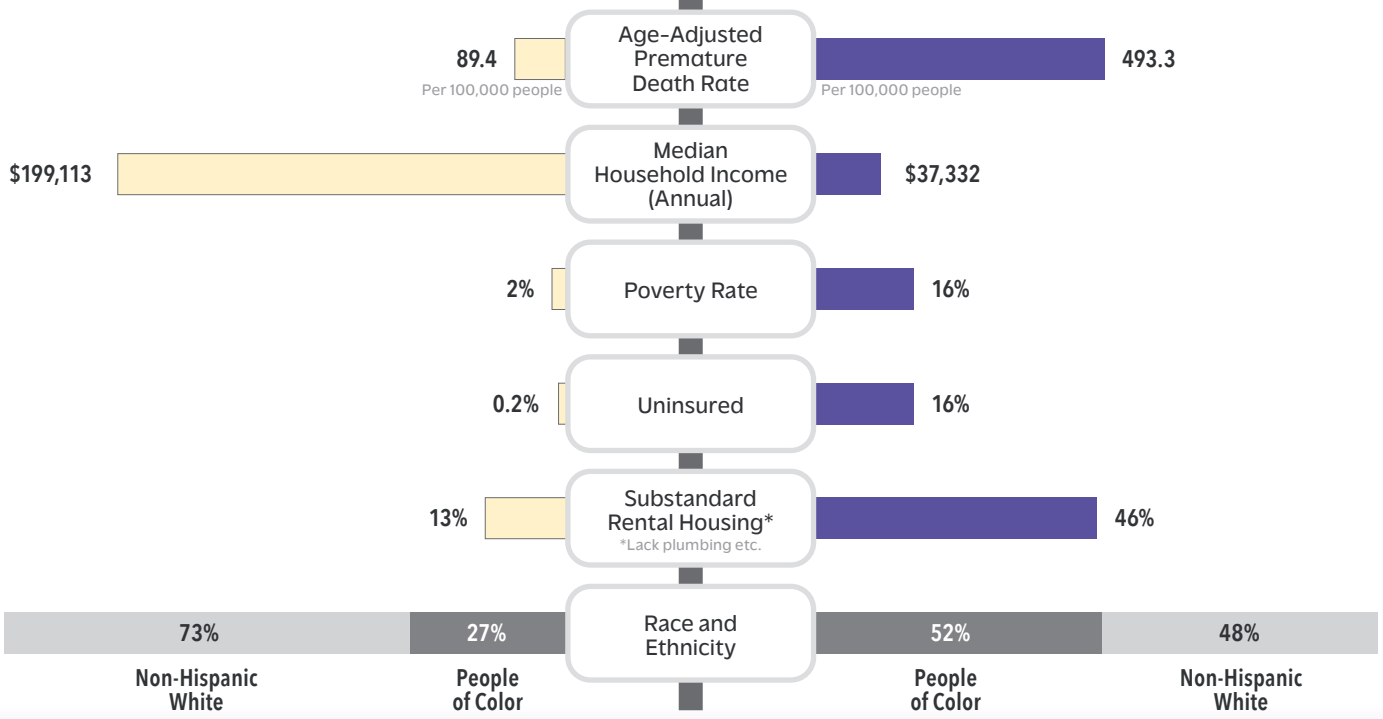inia. Although most of Northern Virginia's COVID-19 deaths occurred in the region's most populated jurisdiction, Fairfax County, the *rate* of deaths from COVID-19—the probability of dying, adjusted for population size and age—was highest in Prince William County, followed by Arlington County, Alexandria, Loudoun County, and Fairfax County (see Appendix). Put simply, people living in Prince William County were 77% more likely to die from COVID-19 than residents of neighboring Fairfax County.

The same islands of disadvantage that existed in 2015–2019, where many Hispanic, Black, and other high-risk residents lived, became "hot spots" during the COVID-19 pandemic. For example, the six House

---

l   Probably due to masking and other measures to prevent viral transmission, deaths from influenza and pneumonia were less common in Northern Virginia during 2020–2021

Figure 7.

Premature mortality rates in Bluemont and Buckingham (Arlington County) varied more than five-fold, poverty rates more than seven-fold

Figure contrasts conditions in two census tracts in Arlington, Virginia: tract 1013.00 in the Bluemont area and tract 1020.03 in Buckingham, where people of color were disproportionately affected. Premature death rates refer to deaths before age 75 (per 100,000 persons), adjusted for differences in age distribution (see "Understanding Death Rates"); other census tract characteristics are obtained from the 2019 American Community Survey, which averaged results for 2015-2019.

Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS User Community

	Age-Adjusted Premature Death Rate	
89.4 Per 100,000 people		493.3 Per 100,000 people
$199,113	Median Household Income (Annual)	$37,332
2%	Poverty Rate	16%
0.2%	Uninsured	16%
13%	Substandard Rental Housing* *Lack plumbing etc.	46%

Race and Ethnicity			
73% Non-Hispanic White	27% People of Color	52% People of Color	48% Non-Hispanic White

districts representing Prince William County (districts 2, 13, 31, and 50-52) ranked among the 10 districts with the region's highest premature deaths rates in 2015-2019 and those with the highest COVID-19 mortality rates in 2020-2021.

> **The "islands of disadvantage" in Northern Virginia were hot spots for COVID-19 — and will remain more vulnerable to future health threats.**

Conversely, eight of the 10 districts with the lowest death rates in 2015–2019 were also among the 10 districts with the lowest COVID-19 death rates. During 2020 and 2021, as COVID-19 claimed lives, premature death rates increased across the region. However, the top 10% of census tracts based on median household income—the wealthiest areas of Northern Virginia—experienced no increase in death rates.

Leading causes of death shifted during the pandemic, especially in certain areas of Northern Virginia (*Figure 8*). Comparing rates in 2020–2021 with those in 2015–2019, premature deaths in Northern Virginia increased for alcoholic liver disease (by 48%) and other forms of chronic liver disease (by 24%), drug overdoses (by 41%), diabetes (by 19%), heart disease (by 10%), and stroke (by 10%), likely due to disruptions in access to health care services. The pandemic also brought a decrease in rates of premature deaths from other causes, such as infant deaths and deaths from falls, sepsis, Alzheimer's disease, and influenza and pneumonia, which decreased by 25%, 22%, 21%, 18%, and 16%, respectively.[m]

As occurred throughout the United States, death rates from COVID-19 in Northern Virginia were higher in Hispanic and Black populations (99.3 and 66.1 per 100,000, respectively) than in the Asian and White populations (40.4 and 36.6 per 100,000, respectively). The high death rate made COVID-19 the leading cause of premature death in the Hispanic population of Northern Virginia.

However, COVID-19 risks were determined not only by racial-ethnic background but also by the circumstances in which people lived and worked. As shown in the Appendix, COVID-19 death rates across Northern Virginia varied as much as two-fold within the same racial-ethnic group, depending on where they lived. And across racial-ethnic groups, COVID-19 death rates varied almost six-fold across the region—from as high as 164.5 per 100,000 in the Hispanic population of Prince William County to 28.5 per 100,000 in the White population of Alexandria.

m   The decrease in influenza and pneumonia deaths has intuitive explanations, such as the increase in masking and social distancing. However, further research is needed to fully explain the decline in infant deaths and deaths from falls, sepsis, and Alzheimer's disease.

Figure 8.
Premature death rates for alcoholic liver disease, drug overdoses and other poisonings, and diabetes increased significantly in Northern Virginia during the COVID-19 pandemic

Figure displays the relative increase in premature death rates between 2015–2019 and 2020–2021 for alcoholic liver disease (e.g., cirrhosis), accidental drug overdoses and other forms of poisoning, and diabetes. Death rates also increased by 24% for other forms of liver disease, by 12% for a mixed category of respiratory diseases, and by 10% for heart disease and stroke.

Alcoholic Liver Disease
48% Increase

Drug Overdoses and Other Poisoning
41% Increase

Diabetes
19% Increase
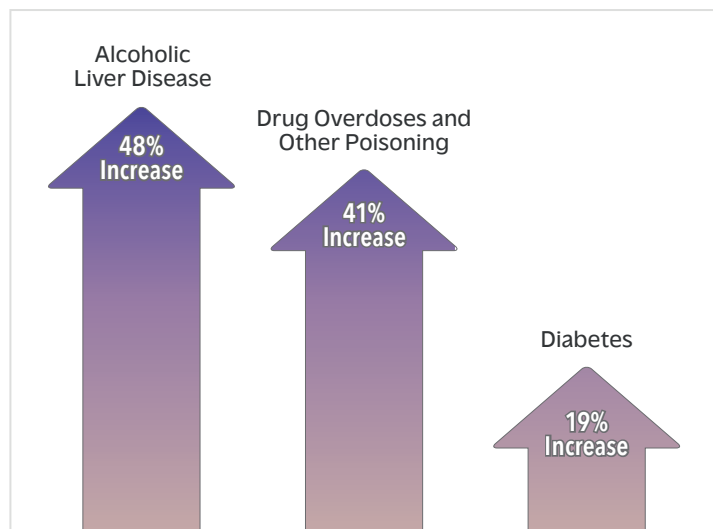
POLICY PRIORITIES TO IMPROVE HEALTH EQUITY
IN NORTHERN VIRGINIA

The data presented here show that health inequities persist in Northern Virginia, disproportionately impacting residents of color and neighborhoods with greater vulnerabilities. The "islands of disadvantage" identified in our 2017 report continued to experience higher death rates in 2015–2019 than did more advantaged areas of Northern Virginia, reflecting the adverse socioeconomic and environmental conditions that exist in those neighborhoods and their effects on health.

Residents of some hot spots in Northern Virginia face living conditions associated with developing nations. In 18 census tracts in Northern Virginia, death rates in 2015–2019 were as high as those experienced in Western and Central Africa and in Balkan, Caucuses, and Central Asian countries.[7] In eight census tracts (located in Bailey's Crossroads and Seven Corners, Arlandria and West Alexandria, Dumfries, Mount Vernon, and Oakton), poverty rates exceeded 20%, higher than poverty rates in countries like Estonia, Lithuania, Peru, Tajikistan, and Uganda.[8]

The places and populations in Northern Virginia that experienced higher death rates in 2015–2019 and adverse living conditions were especially vulnerable during the COVID-19 pandemic. Residents of these neighborhoods, which averaged lower socioeconomic status long before COVID-19 arrived, were at greater risk of exposure at work and home and faced greater consequences from lost jobs and income, food and housing insecurity, and other economic pressures. And these marginalized communities face greater challenges in recovering from the pandemic. Unhealthy coping behaviors (e.g., substance abuse) have increased in Northern Virginia. Our data show that alcohol abuse became a leading cause of death in Northern Virginia's Hispanic population, which faced heightened risk of death from COVID-19 and high poverty rates.

We showed that two-thirds of deaths in Northern Virginia were avoidable—i.e., they could have potentially been averted through prevention and/or treatment. The primary prevention of disease and injury deaths could be improved by local efforts to reduce risk factors like tobacco use and obesity and to discourage unsafe driving, drug use, and gun ownership. Prevention can be enhanced by interventions available in clinical settings, such as immunizations, smoking cessation aids, and the early detection of cancer and other conditions through screening. And for those with existing diseases, high-quality care—delivered when and how it is needed—is essential to reduce complications but is not available to everyone, even those with health insurance. Leading causes of death ranging from cancer to strokes could be prevented by expanding access to effective preventive services such as screening tests, medication to control high blood pressure and cholesterol levels, smoking cessation services, and more.

However, many residents lack access to health care providers and to high-quality care. In Northern Virginia in 2015–2019, the percent of the population that lacked health insurance exceeded 20% in 39 census tracts, and the insured population is often enrolled in plans that limit access to providers and apply formidable copayments to health care services and prescription drugs. Patients with limited incomes could benefit from economic support for health insurance premiums, copayments, and deductibles that often make those services unaffordable.

The COVID-19 pandemic underscored the importance of state and local public health departments, which have been chronically underfunded and lack the personnel and budgets to properly protect the public. Maintaining robust city and county health departments in Northern Virginia is vital both to manage chronic diseases and to deal with future threats.

Causes of death related to mental health (e.g., suicide) and substance abuse (e.g., drug overdoses) are of growing importance across the United States, and are particularly important in Northern Virginia, where suicide and drug overdoses ranked as the third and fourth leading causes of premature deaths in 2015–2019. These deaths emphasize the need to address the region's dwindling supply of mental health professionals—with many retiring while others are overbooked and unable to take new clients—and to make access to counseling and substance abuse services occur more quickly and more equitably to reach underserved populations. Access to such services is inequitable in Northern Virginia, where marginalized populations are more likely to lack insurance for behavioral health services, to live in areas with a shortage of providers, and to forego counseling because they cannot afford the out-of-pocket costs.

Racial and ethnic health disparities persist in Northern Virginia. Our data show that the Black population in Northern Virginia is 44% more likely to die before age 75 than their White counterparts, and the risk is greater for those living in marginalized neighborhoods. These disparities reflect the continuing challenges of systemic racism, discrimination against immigrant populations, and other structural obstacles to better health.

Data like ours, which help identify the precise census tracts with the greatest threats to health and wellbeing, are important to policymakers, service providers, and philanthropy. They can help target investments in high-risk neighborhoods and help prioritize efforts to improve social and economic conditions. These include efforts to offer more affordable housing, improve access to health care, and make public transportation (e.g., bus and Metrorail service) more affordable and accessible. Investments in these areas are also important to enhance preparedness and resilience to face continuing threats from infectious diseases (COVID-19 and future pandemics) and from climate change.

Environmental injustice in Northern Virginia heightens the exposure of low-income areas and communities of color to pollution and other environmental hazards and their vulnerability to severe weather events, such as extreme heat or cold and flooding. They are less able to cope with disruptions in infrastructure caused by severe storms such as the loss of electricity, water, and other services during storms; are more likely to require sheltering services; and have less of an economic cushion to repair storm damage to their homes.

RECOMMENDATIONS

ALERT THE PUBLIC

Our first recommendation to policymakers is to make the public aware of health inequities and the magnitude of excess deaths that occur in the region. Residents and policymakers in Northern Virginia may not realize that adverse living conditions and poor health outcomes exist in Northern Virginia, the magnitude of the disparities, and their disproportionate impact on people of color.

PRIORITIZE THE SOCIAL DETERMINANTS OF HEALTH

Social determinants of health are the major driver of these health disparities and social determinants should drive the policy response. In particular, the most effective policies to address these inequities are investments education, income and wealth-building, and access to affordable food, housing, health care, transportation, and child care. Investments in the built environment are necessary to improve access

to green space (e.g., parks, playgrounds), sidewalks, bicycle paths, and other infrastructure to promote physical activity.

PRIORITIZE THE "ISLANDS OF DISADVANTAGE"

Efforts should be targeted to marginalized neighborhoods that our reports have identified. These areas require investments that promote jobs, economic development, and infrastructure (e.g., food security, affordable housing, rapid transit, broadband). Such efforts should be designed with an equity lens to ensure access for all residents and to prevent unintended consequences like gentrification and displacement of local residents.

IMPROVE HEALTH CARE ACCESS AND QUALITY

The finding that two out of three premature deaths in Northern Virginia are avoidable through prevention or treatment suggests that the community could save many lives by reducing the prevalence of risk factors for disease and injury and improving social and economic conditions. Many deaths can be prevented by enhancing access to clinical preventive services and evidence-based treatments, but the quality of care may matter as much as access. Many patients fail to receive accurate and timely diagnoses, and care delivery is often poorly coordinated and inefficient.

These challenges are heightened in marginalized neighborhoods and populations. We recommend a targeted effort to avert avoidable deaths and disease by addressing (1) barriers to access, ranging from insurance and economic barriers (e.g., copayments) to provider shortages, particularly access to primary care, dental care, and mental health and substance abuse services, and (2) deficiencies in quality, with a special focus on eliminating implicit bias and discrimination from health care. Finally, health systems and providers can improve outcomes by helping to address the social needs faced by patients, such as food insecurity, unstable housing, and lack of transportation.

STRENGTHEN THE PUBLIC HEALTH INFRASTRUCTURE AND PREPAREDNESS

The need for greater investment in state and local public health departments was documented long before the COVID-19 pandemic, but that crisis underscored current deficiencies in the public health workforce, infrastructure, data systems, and public image. These deficiencies need attention not only to be prepared for pandemics and other crises but for ongoing, core responsibilities of these agencies to help prevent chronic diseases and protect public health and safety.

ADDRESS THE LEGACY OF SYSTEMIC RACISM

Efforts to address systemic racism should be prioritized in Northern Virginia, both in government and the private sector, from workplaces and schools to health care settings. We must acknowledge history and the role of past policies and their cumulative impact across generations in producing current inequities. And we must assess the role of current policies and structures that continue to limit access to opportunities and to expose people of color to disproportionate risks to health and safety.

APPENDIX

Appendix Table 1.
Average number of deaths per year for selected causes of death, by jurisdiction and racial-ethnic populations; 2015-2019 vs 2020-2021

Jurisdiction, by Race And Ethnicity	Average Number of Deaths Per Year at All Ages			Average Number of Premature Deaths Per Year (Before Age 75)				
	All Causes		COVID-19	2015–2019		2020–2021		
	2015–2019	2020–2021	2020–2021	All Causes	Leading Causes	All Causes	Leading Causes	
Northern Virginia	10,392	12,320	1,166	4,464	1,410 Cancer 702 Heart Disease 160 Stroke	5,172	1,442 Cancer 776 Heart Disease 175 Stroke	
Hispanic	678	1,129	252	429	111 Cancer 51 Heart Disease 19 Stroke	706	146 Cancer 59 Heart Disease 24 Stroke	
Non–Hispanic Asian or Pacific Islander	989	1,364	148	455	166 Cancer 63 Heart Disease 26 Stroke	580	185 Cancer 87 Heart Disease 30 Stroke	
Non–Hispanic Black	1,224	1,593	167	763	207 Cancer 144 Heart Disease 30 Stroke	999	247 Cancer 177 Heart Disease 41 Stroke	
Non–Hispanic White	7,394	8,076	581	2,753	907 Cancer 433 Heart Disease 81 Stroke	2,805	840 Cancer 440 Heart Disease 79 Stroke	
Alexandria	685	760	69	297	87 Cancer 51 Heart Disease 11 Stroke	354	82 Cancer 61 Heart Disease 14 Stroke	
Hispanic	43	60	11	28	<10 Cancer <10 Heart Disease <10 Stroke	39	<10 Cancer <10 Heart Disease <10 Stroke	
Non–Hispanic Asian or Pacific Islander	29	49	<10	12	<10 Cancer <10 Heart Disease <10 Stroke	22	<10 Cancer <10 Heart Disease <10 Stroke	
Non–Hispanic Black	169	207	23	103	27 Cancer 20 Heart Disease <10 Stroke	131	23 Cancer 24 Heart Disease <10 Stroke	
Non–Hispanic White	436	435	28	149	47 Cancer 24 Heart Disease <10 Stroke	156	43 Cancer 30 Heart Disease <10 Stroke	

Jurisdiction, by Race And Ethnicity	Average Number of Deaths Per Year at All Ages			Average Number of Premature Deaths Per Year (Before Age 75)			
	All Causes		COVID-19	2015–2019		2020–2021	
	2015–2019	2020–2021	2020–2021	All Causes	Leading Causes	All Causes	Leading Causes
Arlington County	860	996	109	342	102 Cancer 55 Heart Disease 12 Stroke	404	108 Cancer 66 Heart Disease 16 Stroke
Hispanic	64	100	21	35	10 Cancer <10 Heart Disease <10 Stroke	55	11 Cancer <10 Heart Disease <10 Stroke
Non–Hispanic Asian or Pacific Islander	64	88	15	25	<10 Cancer <10 Heart Disease <10 Stroke	35	<10 Cancer <10 Heart Disease <10 Stroke
Non–Hispanic Black	119	149	18	64	14 Cancer 15 Heart Disease <10 Stroke	92	23 Cancer 14 Heart Disease <10 Stroke
Non–Hispanic White	607	645	54	214	68 Cancer 32 Heart Disease <10 Stroke	214	65 Cancer 36 Heart Disease <10 Stroke
Fairfax County	5,282	6,040	530	2,094	700 Cancer 329 Heart Disease 78 Stroke	2,260	685 Cancer 333 Heart Disease 78 Stroke
Hispanic	327	511	99	199	51 Cancer 26 Heart Disease <10 Stroke	297	67 Cancer 25 Heart Disease 10 Stroke
Non–Hispanic Asian or Pacific Islander	636	864	88	282	107 Cancer 38 Heart Disease 18 Stroke	346	114 Cancer 51 Heart Disease 17 Stroke
Non–Hispanic Black	426	531	53	264	73 Cancer 50 Heart Disease 10 Stroke	327	92 Cancer 55 Heart Disease 11 Stroke
Non–Hispanic White	3,832	4,046	281	1,314	456 Cancer 211 Heart Disease 40 Stroke	1,247	400 Cancer 195 Heart Disease 40 Stroke

Jurisdiction, by Race And Ethnicity	Average Number of Deaths Per Year at All Ages			Average Number of Premature Deaths Per Year (Before Age 75)				
	All Causes		COVID-19	2015–2019			2020–2021	
	2015–2019	2020–2021	2020–2021	All Causes	Leading Causes		All Causes	Leading Causes
Loudoun County	1,390	1,706	141	587	194 Cancer 87 Heart Disease 18 Stroke		687	220 Cancer 98 Heart Disease 19 Stroke
Hispanic	72	114	23	46	13 Cancer <10 Heart Disease <10 Stroke		65	17 Cancer <10 Heart Disease <10 Stroke
Non–Hispanic Asian or Pacific Islander	129	162	19	65	22 Cancer 11 Heart Disease <10 Stroke		81	26 Cancer 11 Heart Disease <10 Stroke
Non–Hispanic Black	107	140	12	62	22 Cancer 12 Heart Disease <10 Stroke		71	28 Cancer 11 Heart Disease <10 Stroke
Non–Hispanic White	1,068	1,270	86	406	135 Cancer 60 Heart Disease <10 Stroke		460	146 Cancer 69 Heart Disease 10 Stroke
Prince William County	2,175	2,819	317	1,144	327 Cancer 180 Heart Disease 42 Stroke		1,469	347 Cancer 220 Heart Disease 49 Stroke
Hispanic	172	345	98	120	28 Cancer 14 Heart Disease <10 Stroke		250	44 Cancer 20 Heart Disease <10 Stroke
Non–Hispanic Asian or Pacific Islander	130	201	23	71	24 Cancer 10 Heart Disease <10 Stroke		96	28 Cancer 14 Heart Disease <10 Stroke
Non–Hispanic Black	404	566	62	270	70 Cancer 46 Heart Disease 10 Stroke		379	82 Cancer 74 Heart Disease 15 Stroke
Non–Hispanic White	1,451	1,681	133	670	201 Cancer 106 Heart Disease 23 Stroke		730	188 Cancer 110 Heart Disease 19 Stroke

Appendix Table 2.
Age-adjusted death rates (per 100,000) for selected causes of death, by jurisdiction and racial-ethnic populations; 2015-2019 vs 2020-2021

	Rate of Deaths at All Ages			Rate of Deaths Before Age 75 (Premature Deaths)							
	Deaths from All Causes		Deaths from COVID-19	All Causes		Cancer		Heart Disease		Stroke	
Jurisdiction	2015–2019	2020–2021	2020–2021	2015–2019	2020–2021	2015–2019	2020–2021	2015–2019	2020–2021	2015–2019	2020–2021
Northern Virginia	476.0	508.5	48.0	172.4	189.9	53.3	51.7	26.6	27.8	6.1	6.4
Hispanic	324.1	451.7	99.3	128.2	188.3	35.7	41.4	17.4	16.5	6.2	6.0
Non-Hispanic Asian or Pacific Islander	330.9	374.0	40.4	114.3	129.9	41.1	40.7	15.7	19.2	6.6	6.6
Non-Hispanic Black	561.4	620.8	66.1	252.7	259.9	68.7	73.0	47.3	51.7	10.4	11.9
Non-Hispanic White	500.9	511.8	36.6	175.9	177.2	55.1	50.5	26.4	26.8	5.1	4.7
Alexandria	489.7	498.6	45.3	182.9	208.6	53.1	47.8	31.1	35.3	6.3	8.1
Hispanic	343.8	415.7	79.4	141.9	175.8	43.1	*	*	*	*	*
Non-Hispanic Asian or Pacific Islander	318.0	448.4	37.3	118.2	204.9	*	*	*	*	*	*
Non-Hispanic Black	647.7	709.6	80.6	320.2	366.9	85.5	65.3	63.2	65.6	*	*
Non-Hispanic White	465.0	439.7	28.5	147.9	152.5	44.8	40.4	24.5	29.3	*	*

Jurisdiction	Rate of Deaths at All Ages			Rate of Deaths Before Age 75 (Premature Deaths)							
	Deaths from All Causes		Deaths from COVID-19	All Causes		Cancer		Heart Disease		Stroke	
	2015–2019	2020–2021	2020–2021	2015–2019	2020–2021	2015–2019	2020–2021	2015–2019	2020–2021	2015–2019	2020–2021
Arlington County	442.2	467.1	52.2	152.9	170.0	45.7	45.6	24.6	27.4	5.4	6.6
Hispanic	291.6	393.0	84.1	121.1	165.6	37.1	*	*	*	*	*
Non-Hispanic Asian or Pacific Islander	350.7	402.6	68.5	119.4	151.3	44.4	*	*	*	*	*
Non-Hispanic Black	644.6	699.8	84.7	303.2	395.1	68.5	100.5	74.9	59.4	*	*
Non-Hispanic White	455.1	455.7	38.1	140.5	134.4	43.9	40.3	21.1	22.6	3.3	*
Fairfax County	448.2	472.4	41.0	159.0	167.3	51.0	48.5	24.1	23.7	5.8	5.8
Hispanic	315.6	433.5	81.9	126.2	175.7	34.8	41.2	18.2	15.1	6.3	*
Non-Hispanic Asian or Pacific Islander	322.8	367.1	36.6	112.4	126.3	41.3	40.4	14.5	18.0	7.0	6.1
Non-Hispanic Black	494.4	522.8	50.9	221.0	249.5	60.8	69.7	41.8	41.1	8.8	*
Non-Hispanic White	477.5	480.8	32.6	165.8	157.6	53.6	47.1	24.8	23.5	4.7	4.8

	Rate of Deaths at All Ages			Rate of Deaths Before Age 75 (Premature Deaths)								
	Deaths from All Causes		Deaths from COVID-19	All Causes		Cancer		Heart Disease		Stroke	
Jurisdiction	2015–2019	2020–2021	2020–2021	2015–2019	2020–2021	2015–2019	2020–2021	2015–2019	2020–2021	2015–2019	2020–2021
Loudoun County	481.6	495.6	42.0	161.8	170.1	52.9	54.2	24.0	24.1	4.9	4.7
Hispanic	320.3	411.7	84.8	116.7	143.3	35.4	38.5	*	*	*	*
Non–Hispanic Asian or Pacific Islander	335.1	299.2	36.3	103.0	109.9	34.3	33.7	18.2	*	*	*
Non–Hispanic Black	516.3	591.0	52.5	221.7	216.3	78.4	82.9	40.0	*	*	*
Non–Hispanic White	512.7	527.0	36.3	173.8	182.5	55.6	56.5	24.8	26.6	3.8	*
Prince William County	574.8	653.8	72.4	225.3	270.4	63.9	62.6	35.1	39.7	8.3	8.7
Hispanic	368.5	562.8	164.5	139.2	242.2	35.7	46.7	19.7	21.3	*	*
Non–Hispanic Asian or Pacific Islander	385.4	481.9	55.2	142.1	165.4	48.2	47.9	20.1	23.4	*	*
Non–Hispanic Black	614.4	717.9	81.1	268.8	335.7	70.2	72.2	44.8	64.9	11.3	12.7
Non–Hispanic White	620.8	669.4	52.4	247.0	272.9	69.7	65.4	37.4	39.5	8.5	6.5

* Death counts were too low to provide accurate death rates.

REFERENCES

1 County Health Rankings and Roadmaps. https://www.countyhealthrankings.org/app/virginia/2022/rankings/outcomes/overall

2 Centers for Disease Control and Prevention. U.S. Small-area Life Expectancy Estimates Project. https://www.cdc.gov/nchs/nvss/usaleep/usaleep.html#data

3 Woolf SH, Chapman DA, Hill L, Snellings LK. *Getting Ahead: The Uneven Opportunity Landscape in Northern Virginia*. Richmond: Center on Society and Health, Virginia Commonwealth University, 2017.

4 Woolf S, Chapman D, Hill L, Schoomaker H, Wheeler D, Snellings L, Lee JH. *Uneven Opportunities: How Conditions for Wellness Vary Across the Metropolitan Washington Region*. Commissioned by Metropolitan Washington Council of Governments. Richmond: Center on Society and Health, Virginia Commonwealth University, 2018.

5 Woolf SH. *Deeply Rooted: History's Lessons for Equity in Northern Virginia*. Commissioned by Northern Virginia Health Foundation. Richmond: Center on Society and Health, Virginia Commonwealth University, 2021. https://historyfortomorrow.org/

6 Virginia House of Delegates District 52. https://ballotpedia.org/Virginia_House_of_Delegates_District_52

7 World Bank. Death rate (crude). https://data.worldbank.org/indicator/SP.DYN.CDRT.IN

8 World Bank. Poverty. https://data.worldbank.org/topic/poverty