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ARC Appalachian Regional Commission

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Appalachian Diseases of Despair

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The Walsh Center for Rural Health Analysis
NORC at the University of Chicago
4350 East West Highway, Suite 800
Bethesda, MD 20814
http://walshcenter.norc.org

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ETSU Center for Rural Health Research
PO Box 70623
Johnson City, TN 37614
http://www.etsu.edu/cph/rural-health-research

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Introduction

The Appalachian Region (the Region), as defined by the Appalachian Regional Commission's (ARC) authorizing legislation, is a 205,000 square-mile region that spans the Appalachian Mountains from southern New York to northern Mississippi. It includes all of West Virginia and parts of 12 other states: Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia. The Region is comprised of 423 counties and eight independent cities in 13 states, and has a population of 26 million people.[1]

Compared to the rest of the nation, the Appalachian Region faces a greater number of disparities related to educational attainment, employment, income, and certain health outcomes. Appalachia's household income is 82 percent of the U.S. average, and 15 percent of Appalachians live below the poverty line.[2] Certain Appalachian subregions experience greater disparities than others; for example, household income and bachelor's-degree attainment are lowest in Central Appalachia.[4,3] Prior research by NORC at the University at Chicago (NORC) revealed higher-than-average mortality rates in the Region, particularly in its more remote areas.[4,5]

In 2008, NORC and Eastern Tennessee State University (ETSU) conducted a study—"An Analysis of Mental Health Services and Substance Abuse Disparities and Access to Treatment Services in the Appalachian Region"—on behalf of ARC, which found that treatment admission rates for primary abuse of opiates and synthetics were higher in Appalachia than the rest of the nation, and were growing at a faster pace.[6]

In 2017, ARC commissioned NORC to investigate "diseases of despair" in Appalachia. At the time, health economists Anne Case and Angus Deaton had begun to research increasing morbidity and mortality from three main causes: alcohol, prescription- and illegal-drug overdose; suicide; and alcoholic liver disease/cirrhosis of the liver. These have been referred to as "deaths of despair," or "diseases of despair."[7]

The resulting 2017 Appalachian Diseases of Despair study was based on 2015 mortality data. In those days, the United States was seeing a dramatic rise in overdose deaths from synthetic opioids, particularly those involving illicitly manufactured fentanyl.[8] In 2020, NORC and ETSU updated the Diseases of Despair report to include data through 2018.[9] In 2022, ARC commissioned NORC and ETSU to determine changes between 2018 and 2020. This latest update will begin to show the impact of the COVID-19 pandemic on diseases of despair mortality in Appalachia.

Methods

This report presents 2020 mortality data from the Multiple Cause of Death database, which provides the underlying cause of death—as well as up to 20 additional multiple causes—as reported on an individual's death certificate by a physician, coroner, and/or medical examiner.[10] These data are publicly available through the Centers for Disease Control and Prevention's (CDC) Wide-ranging Online Data for Epidemiologic Research (CDC WONDER). CDC WONDER provides access to data from CDC's National Center for Health Statistics National Vital Statistics System,[11] which collects and presents U.S. resident data for the aggregate of 50 states, New York City, and the District of Columbia, as well as for each individual state. Deaths are coded to the International Classification of Disease Tenth Revision (ICD-10) codes.

For this report, we included the ICD-10 codes referenced by Case and Deaton, reflecting underlying cause of death from each of the three diseases of despair: alcohol, prescription-drug, and illegal-drug overdose; suicide; and alcoholic liver disease/cirrhosis of the liver.[7] To determine the percentage of alcohol, prescription-drug, and illegal-drug overdose deaths attributed to opioids, we used the multiple cause-of-death ICD-10 codes that specify the type of drug causing the overdose.[12] Appendix A provides the underlying cause-of-death ICD-10 codes used to identify the disease of despair, and the multiple cause-of-death ICD-10 codes that identify overdoses caused by opioids.

Analyses use age-adjusted mortality rates, and focus on the population ages 15–64. However, select analyses report mortality rates by age group (10-year increments between ages 15–64). If the Appalachian counties in a specific state had fewer than 20 deaths, the state-specific mortality rate for that disease of despair is considered unreliable. The few instances of unreliable data are noted in the findings. This study aimed to detect differences in the mortality rates from diseases of despair between Appalachia and the non-Appalachian U.S., in addition to differences by age and gender. Statistical significance was assessed at the 0.05 level using two-sided significance tests (*z*-tests).

Appalachian rates were further analyzed by subregion, county economic status, and levels of rurality. Appalachian subregions represent contiguous geographies of relatively homogeneous characteristics (topography, demographics, economics, and transportation), and include the following (per Exhibit 1):

- Northern
- North Central
- Central
- South Central
- Southern Appalachia

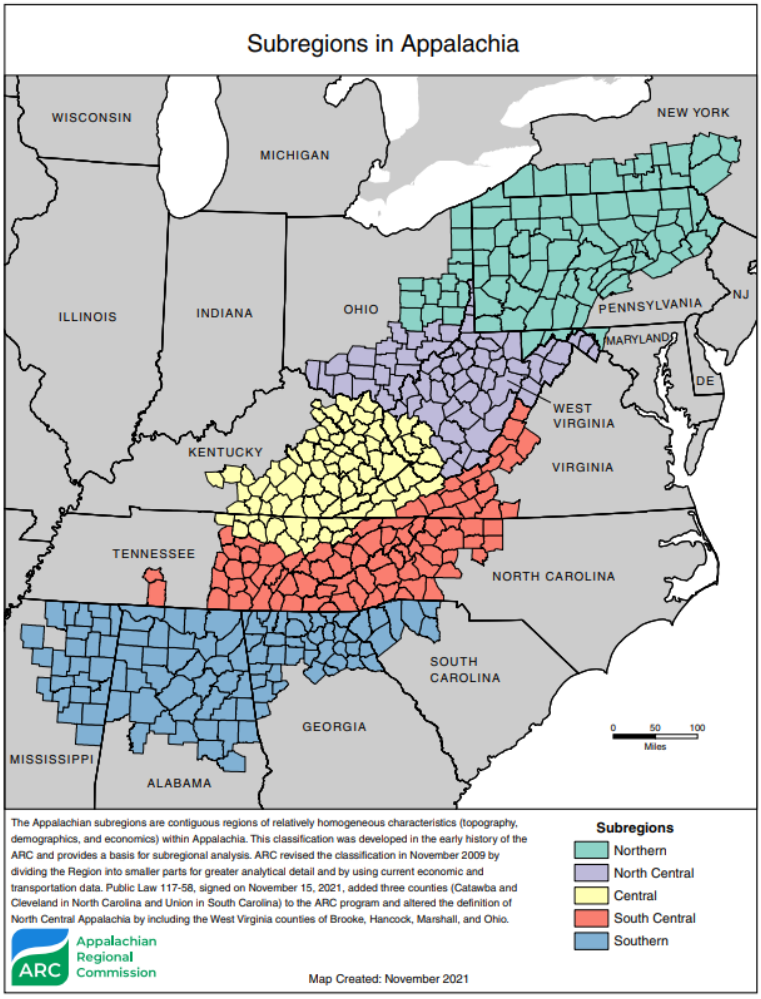
ARC's economic classifications rely on an index of three economic indicators (three-year unemployment rate, per capita market income, and poverty rate). Counties are then designated based

on the index as distressed, at-risk, transitional, competitive, or attainment.[13] For these analyses, counties were classified as distressed or non-distressed.

For rurality, we used ARC designations of “metropolitan counties” (counties that include large metropolitan centers of one million or more people, and those with metropolitan centers of less than one million residents), and “nonmetropolitan counties” (including nonmetro counties adjacent to large metropolitan areas [metros], those adjacent to small metros, and rural counties). These designations are based on a simplification of the U.S. Department of Agriculture’s Economic Research Services 2013 Urban Influence Codes.[14]

Lastly, for the purposes of this report all deaths are per 100,000 people.

Exhibit 1. Appalachian subregions



Findings

Overall Mortality

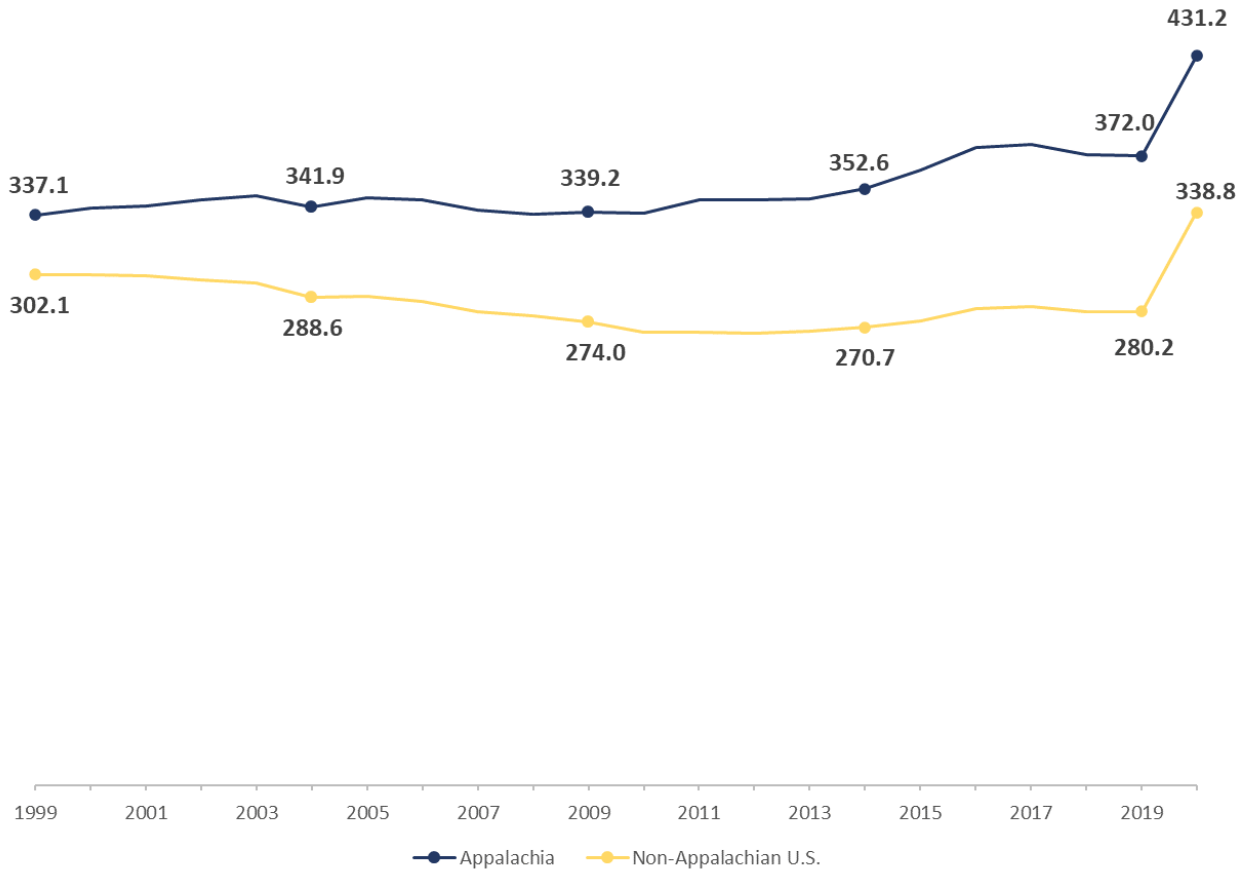
The all-cause mortality rate (overall mortality) among individuals ages 15–64 in the non-Appalachian U.S. steadily declined between 1999 and 2010—by 11 percent—before increasing between 2012 and 2017 (see Exhibit 2). By contrast, in that same time period, the overall mortality rate in the Appalachian Region *increased* by 0.4 percent, resulting in a growing divide between the Region and the rest of the nation.

From 2012–2017, the all-cause mortality rate increased by 9 percent in the Appalachian Region and 6 percent in the non-Appalachian U.S. This rise both inside and outside Appalachia coincides with a surge in U.S. opioid-overdose deaths.

Between 2017 and 2018, both the Appalachian Region and the non-Appalachian U.S. saw the first decline in the all-cause mortality rate since 2011 to 2012. The all-cause mortality rate in the Appalachian Region declined from 378.8 deaths per 100,000, in 2017, to 372.6 deaths per 100,000 in 2018 (a 1.6 percent decrease). By comparison, the non-Appalachian U.S. saw a decline from 282.8 deaths per 100,000, in 2017, to 280.3 deaths per 100,000 in 2018 (a 0.9 percent decrease). These declines were likely driven by fewer drug-overdose deaths during this period.

However, between 2019 and 2020, both the Appalachian Region and the non-Appalachian U.S. saw a dramatic increase in all-cause mortality, primarily due to the COVID-19 pandemic. In the Appalachian Region, the all-cause mortality rate increased from 372.0 deaths per 100,000, in 2019, to 431.2 deaths per 100,000 in 2020 (a 16 percent increase). In the non-Appalachian U.S., the all-cause mortality rate increased from 280.2 deaths per 100,000, in 2019, to 338.8 deaths per 100,000 in 2020 (a 21 percent increase).

Exhibit 2. All-cause annual mortality rates, ages 15–64, by region (1999–2020)‡*



‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.

* For all years, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.

Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Diseases of Despair: Comparisons Between Appalachia & the Non-Appalachian United States

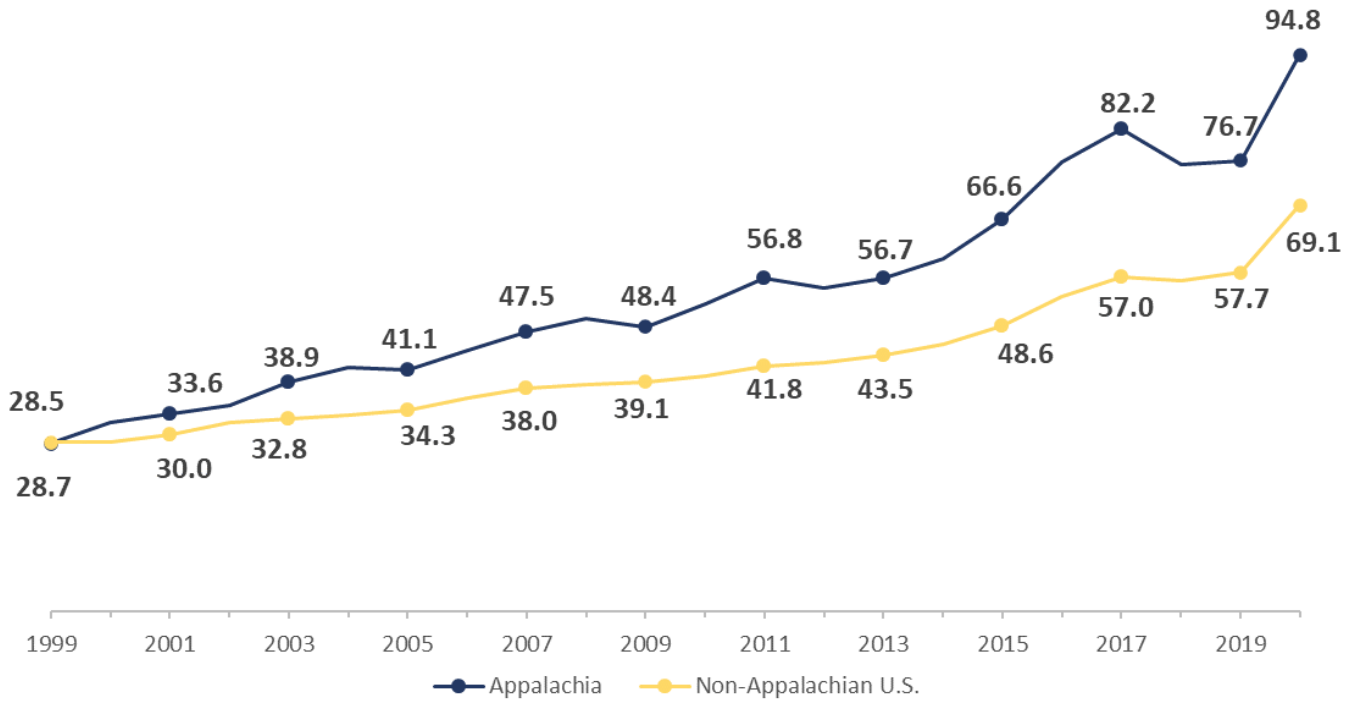
Exhibit 3 compares the burden from diseases of despair between the Appalachian Region and the non-Appalachian U.S., from 1999 to 2020. The gap between the Appalachian Region and the rest of the nation continued to grow between 1999 and 2017. In 1999, the diseases of despair mortality rate was not statistically different between the Appalachian Region and the non-Appalachian U.S.

This changed significantly by 2009, when the mortality rate in the Appalachian Region was 24 percent higher than the non-Appalachian U.S. By 2015, that difference had grown to 37 percent. The disparity between the Appalachian Region and the non-Appalachian U.S. reached its widest gap in 2017, when the diseases of despair mortality rate was 44 percent higher in Appalachia than outside of it.

In 2018, the gap began to narrow anew, although the diseases of despair mortality rate was still 35 percent higher in the Appalachian Region than in non-Appalachia. The mortality rate among individuals ages 15–64 was 76.1 per 100,000 in Appalachia (a decline of 7 percent from 2017), compared to 56.2 deaths per 100,000 in the non-Appalachian U.S.

The gap between Appalachia and non-Appalachia continued to compress in 2019, although the diseases of despair mortality rate was still 33 percent higher in Appalachia. However, that trend reversed by 2020. Between 2019 and 2020, deaths linked to diseases of despair increased dramatically in both Appalachia and the rest of the country. In the Appalachian Region, the diseases of despair mortality rate increased by 24 percent from 2019 to 2020 (leaping from 76.7 deaths to 94.8 deaths, per 100,000). In the non-Appalachian U.S., the rate increased by 20 percent over the same time period (from 57.7 deaths to 69.1 deaths, per 100,000). As a result, in 2020, the diseases of despair mortality rate was 37 percent higher in the Appalachian Region than in the non-Appalachian U.S.

Exhibit 3. Diseases of despair annual mortality rates, ages 15–64, by region (1999–2020)‡*

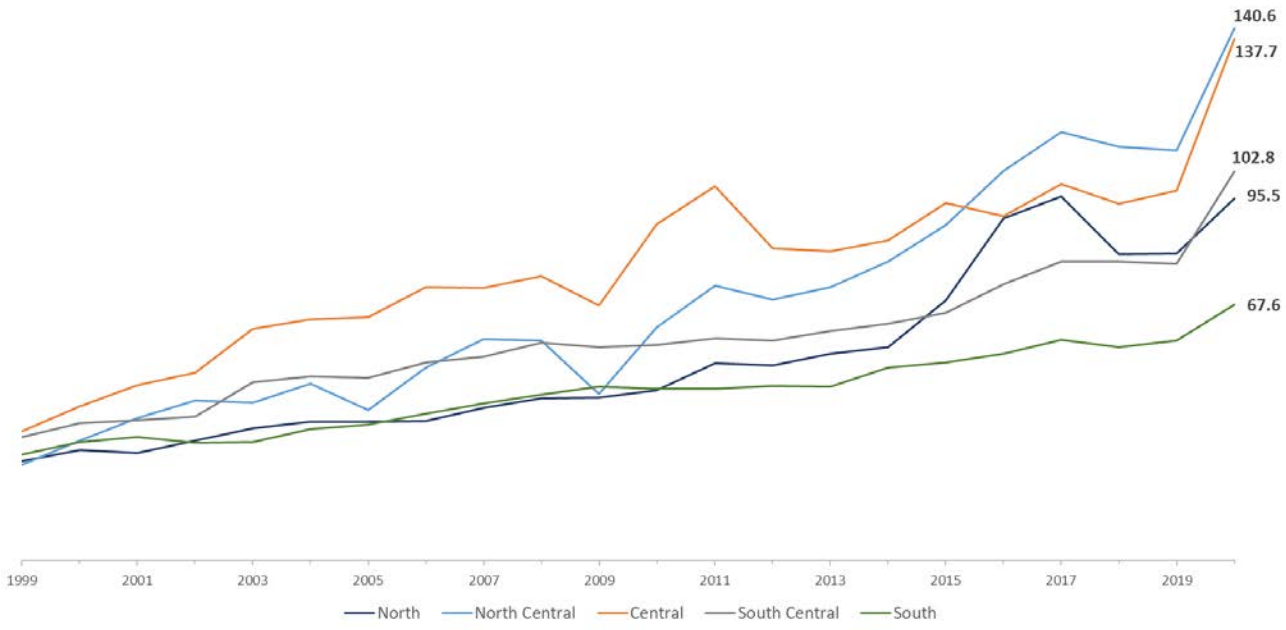


‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
* In all years except 1999, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

A look at Appalachia's subregions reveals that all five experienced an increase in diseases of despair mortality, from 2019–2020. Central Appalachia experienced the largest increase (41 percent), while Southern Appalachia had the smallest (16 percent). In 2020, the diseases of despair mortality rate was 140.6 deaths per 100,000 in North Central Appalachia, and 137.7 deaths per 100,000 in Central Appalachia, over two times greater than the rate in Southern Appalachia.

Exhibit 4 compares diseases of despair mortality rate trends from 1999 to 2020, for all five subregions.

Exhibit 4. Diseases of despair annual mortality rates, ages 15–64, by Appalachian subregion (1999–2020)[‡]

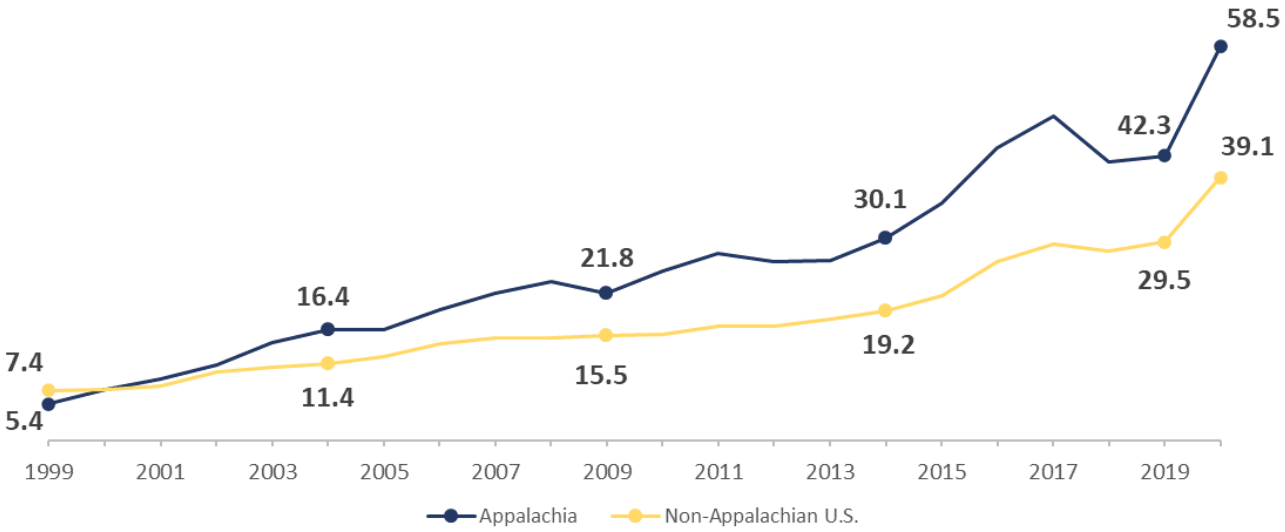


[‡] Rates are presented as deaths per 100,000 population, and are age-adjusted.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Between 2019 and 2020, both the Appalachian Region and the non-Appalachian U.S. marked a previously unseen number of deaths related to overdose, with both reaching their highest overdose mortality rates to date, in 2020. The overdose mortality rate increased by 38 percent in the Appalachian Region (from 42.3 to 58.5 deaths, per 100,000) and by 33 percent in the non-Appalachian U.S. (from 29.5 to 39.1 deaths, per 100,000), between 2019 and 2020.

Below, Exhibit 5 shows the trend in overdose mortality rates from 1999 to 2020. In 1999, while the overdose mortality rate was low in the Appalachian Region and non-Appalachian areas, it was slightly higher outside of the Region. In 2018, both Appalachia and non-Appalachia experienced declines in the overdose mortality rate of 14 and 4 percent, respectively.

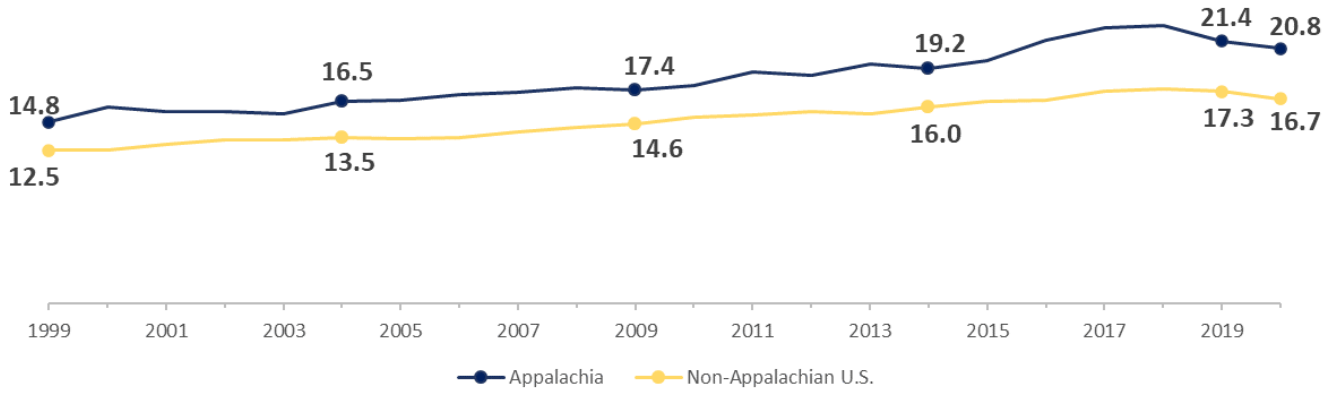
Exhibit 5. Overdose annual mortality rates, ages 15–64, by region (1999–2020)‡*



‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
* In all years except 2000, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Exhibit 6 shows the trends in suicide mortality rates both inside and outside of Appalachia, between 1999 and 2020. Every year in this timeframe showed a statistically higher suicide mortality rate in the Appalachian Region than in the non-Appalachian U.S. The suicide mortality rate in the Appalachian Region rose 53 percent between 1999 and 2018, while increasing 40 percent in the non-Appalachian U.S. Between 2018 and 2020, both the Appalachian Region and the non-Appalachian U.S. saw drops in the suicide mortality rate.

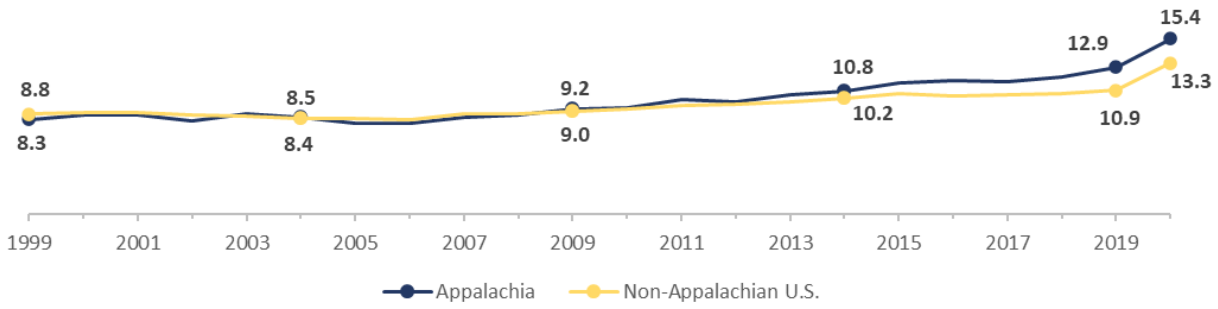
Exhibit 6. Suicide annual mortality rates, ages 15–64, by region (1999–2020)‡*



‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
* In all years, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

As shown in Exhibit 7, the liver disease mortality rate has remained relatively stable, with minimal difference between the Appalachian Region and the non-Appalachian U.S., between 1999 and 2015. That said, between 2019 and 2020, both the Appalachian Region and the non-Appalachian U.S. saw an increase in the number of deaths attributable to liver disease. The liver disease mortality rate increased by 19 percent in the Appalachian Region (from 12.9 deaths to 15.4 deaths, per 100,000) and by 22 percent in the non-Appalachian U.S. (from 10.9 deaths to 13.3 deaths, per 100,000) in 2020.

Exhibit 7. Liver disease annual mortality rates, ages 15–64, by region (1999–2020)‡*

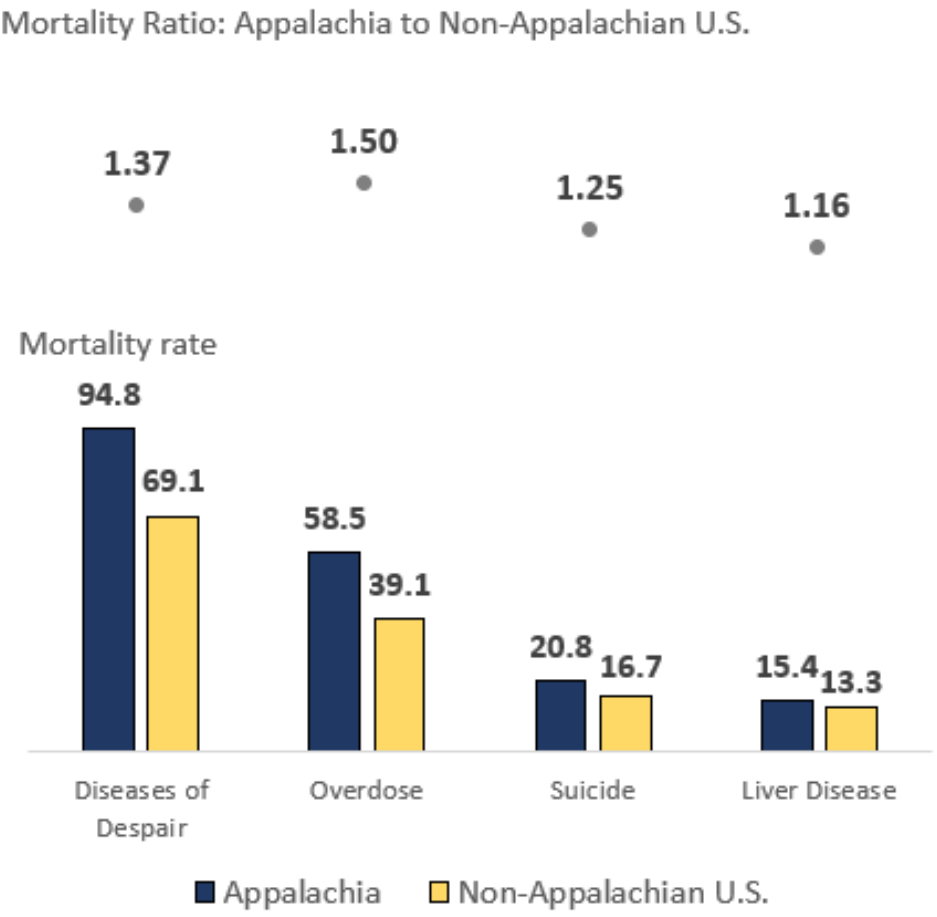


‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
* In 1999, 2002, 2005, 2011, and 2013–2018, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Exhibit 8 compares the burden from each disease of despair between the Appalachian Region and the non-Appalachian U.S., in 2020. Among Appalachians ages 15–64, there were 9,157 deaths due to overdose, 3,399 attributed to suicide, and 3,019 ascribed to alcoholic liver disease/cirrhosis. Of the three diseases of despair, overdose is the greatest and the most notable marker of the overall burden in Appalachia, and the divide between Appalachia and non-Appalachia; it was 50 percent higher in the Region than the rest of the nation. Specifically, there were 58.5 deaths per 100,000 in the Appalachian Region compared to 39.1 deaths per 100,000 in the non-Appalachian U.S.

In addition, we found that the suicide rate was 25 percent higher—and the liver disease mortality rate was 16 percent higher—in Appalachia than the non-Appalachian U.S. All differences between the Appalachian Region and the non-Appalachian U.S. were statistically significant.

Exhibit 8. Diseases of despair mortality rates, ages 15–64, by disease and region (2020)‡*

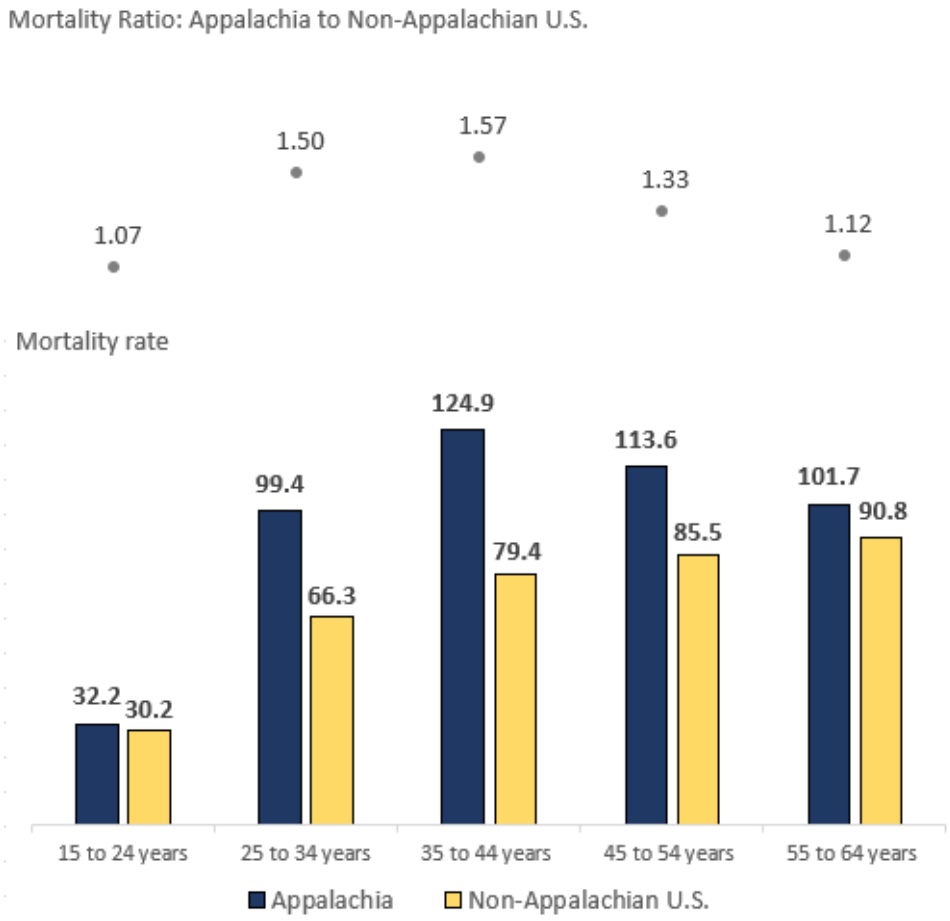


‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
* For all diseases, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Diseases of despair mortality rates also differ by age group, as shown in Exhibit 9. The Appalachian Region experienced higher rates of mortality than the non-Appalachian U.S. for all 10-year age ranges between 15 and 64. The mortality rate for the 25–34 age group was 50 percent higher in Appalachia than in the non-Appalachian U.S., and the mortality rate for those ages 35–44 was 57 percent higher in Appalachia than the non-Appalachian U.S.

When combining several age ranges, to consider individuals ages 25–54, the diseases of despair mortality rate was 47 percent higher in the Appalachian Region (113.4 deaths per 100,000) than in the non-Appalachian U.S. (77.2 deaths per 100,000). The 25–54 age range is important, as those individuals are considered to be in their prime working and child-rearing years, creating implications for both economic development and children's health and well-being. For all age groups, the difference between the mortality rate in the Appalachian Region and the non-Appalachian U.S. was statistically significant.

Exhibit 9. Diseases of despair mortality rates, ages 15–64, by age and region (2020)‡*

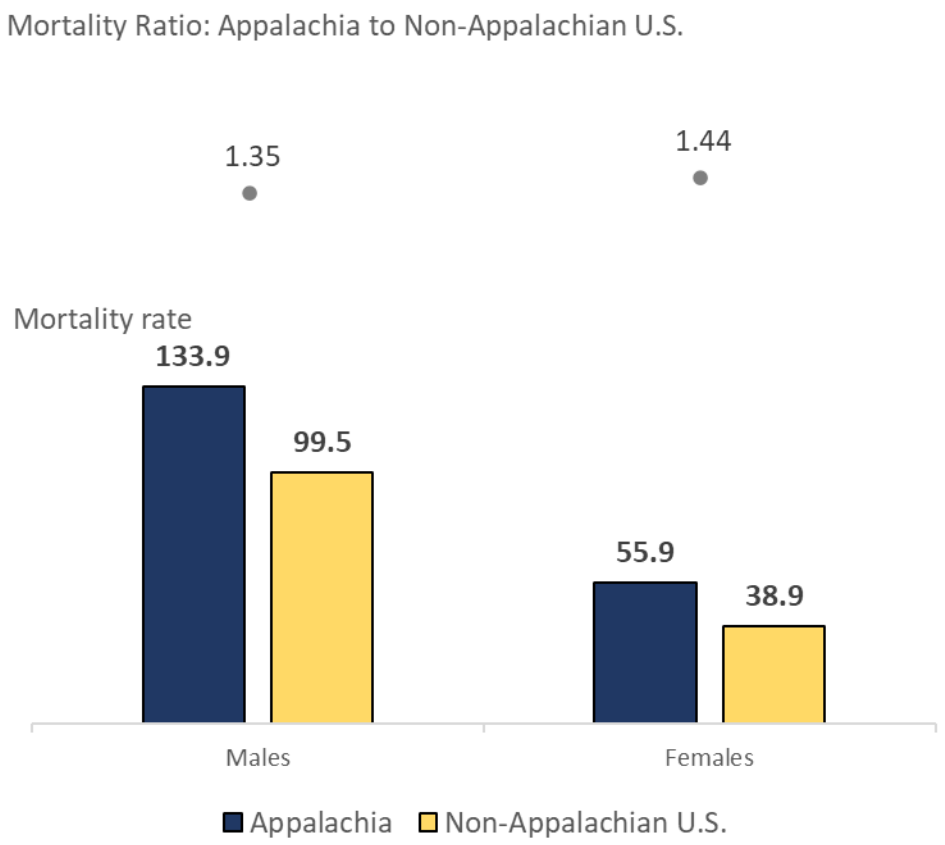


‡ Rates are presented as deaths per 100,000 population, and are crude mortality rates for each age group.
* For all age groups, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

In 2020, the burden of mortality attributed to diseases of despair was higher for males than females, as shown in Exhibit 10. In Appalachia, the diseases of despair mortality rate for men ages 15–64 was more than twice that of women in the same age range (133.9 deaths per 100,000, compared to 55.9 deaths per 100,000).

However, the disparity between the Appalachian Region and non-Appalachian U.S. was greater for females. Specifically, the diseases of despair mortality rate was 44 percent higher for females in the Appalachian Region than females in the non-Appalachian U.S. The rate was also 35 percent higher for males in the Appalachian Region than males in the non-Appalachian U.S.

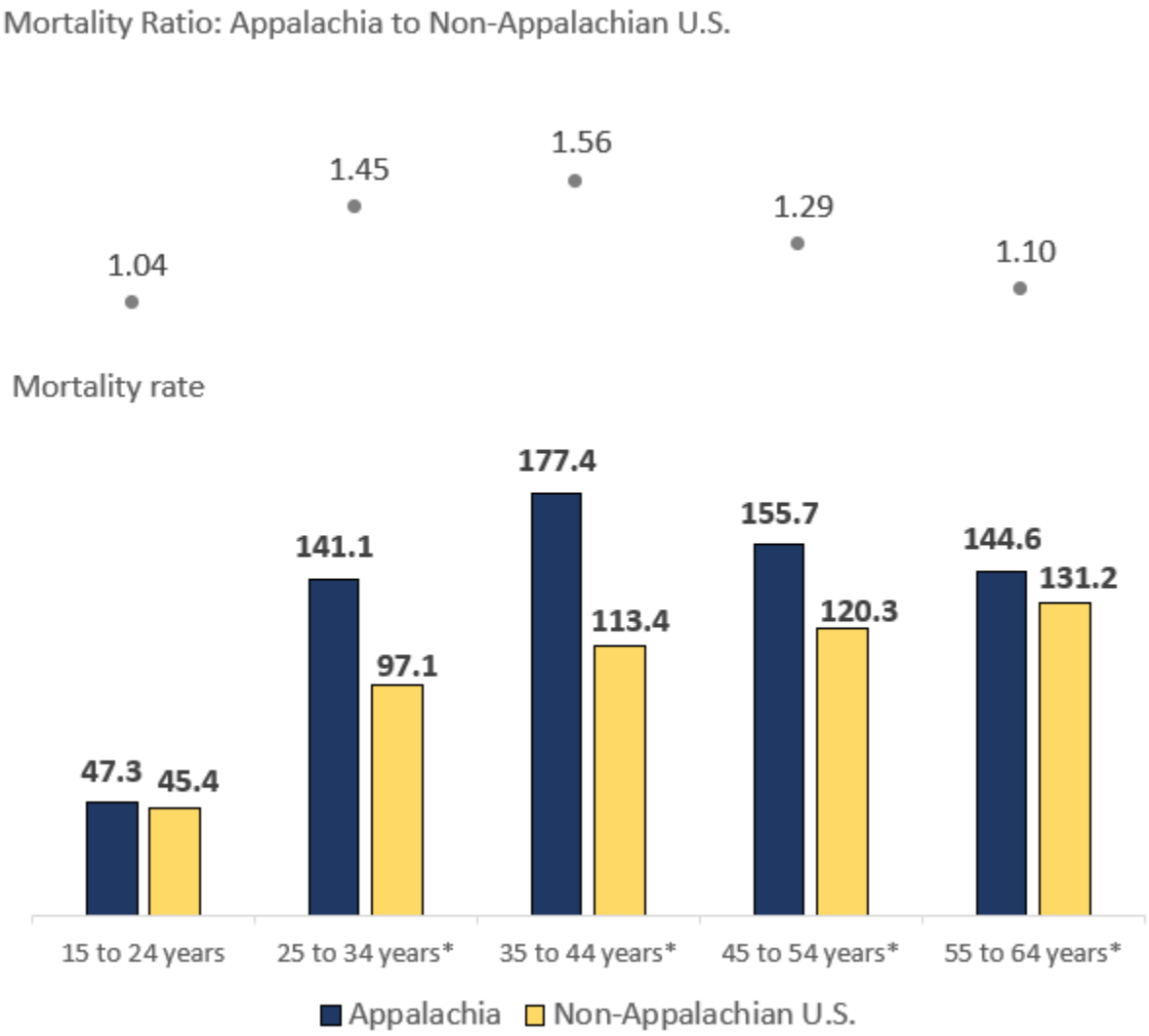
Exhibit 10. Diseases of despair mortality rates, ages 15–64, by gender and region (2020)‡*



‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
* For both genders, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html

Exhibit 11 shows diseases of despair mortality for males, by 10-year age groups. Among men 35–44 years old, the diseases of despair mortality rate was 177.4 deaths per 100,000 in the Appalachian Region, which was 56 percent higher than the rate in the non-Appalachian U.S. (113.4 deaths per 100,000). With the exception of men ages 15–24, the difference between the mortality rate in the Appalachian Region and the non-Appalachian U.S. was statistically significant.

Exhibit 11. Diseases of despair mortality rates for males, ages 15–64, by age and region (2020)‡*



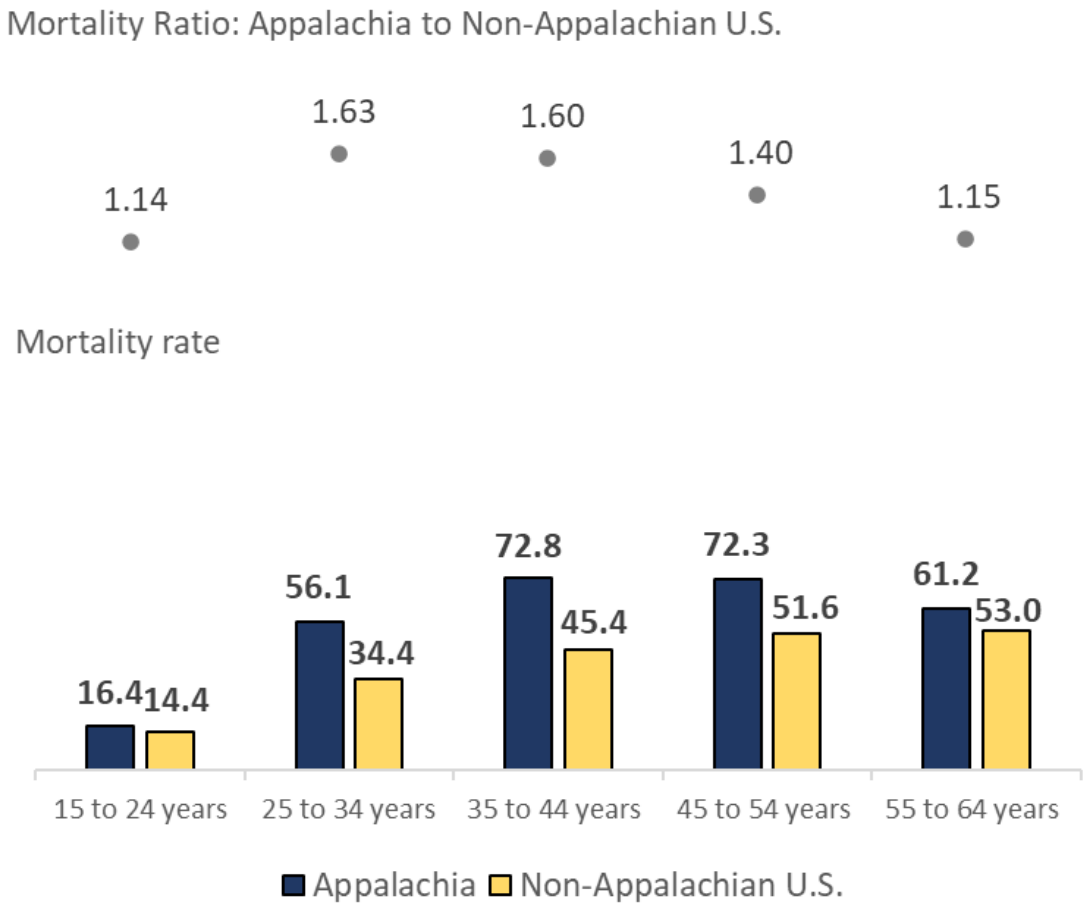
‡ Rates are presented as deaths per 100,000 population, and are crude mortality rates for each age group.

* For all age groups, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.

Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

While—for the combined diseases of despair mortality rate—the overall burden was lower among females than males, the gap between Appalachian and non-Appalachian women was wider (see Exhibit 12). Specifically, the mortality rate was 63 percent higher for women ages 25–34 in Appalachia, and 60 percent higher for women ages 35–44, compared to the non-Appalachian U.S. For females of all ages, the difference between the mortality rate in the Appalachian Region and the non-Appalachian U.S. was statistically significant.

Exhibit 12. Diseases of despair mortality rates for females, ages 15–64, by age and region (2020)‡*



‡ Rates are presented as deaths per 100,000 population, and are crude mortality rates for each age group.
* For all age groups, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Diseases of Despair: Within-State Comparisons (Appalachia vs. Non-Appalachia)

States in the Appalachian Region experienced differences in diseases of despair mortality rates between the Appalachian and non-Appalachian parts of the state. Exhibit 13 shows the percentage difference between the mortality rates from diseases of despair in the Appalachian portion of each state, compared to the non-Appalachian portion.

Among these, Maryland exhibited the greatest disparity, with the diseases of despair mortality rate registering 65 percent higher in the Appalachian part of the state than in the non-Appalachian area. Virginia closely followed its neighbor, with an Appalachian mortality rate that was 63 percent higher than that of its non-Appalachian portion. In New York, North Carolina, Ohio, and Alabama, the diseases of despair mortality rate in the Appalachian portion of each state was at least 20 percent higher than in the non-Appalachian portion.

Mississippi and South Carolina were the only states in which non-Appalachian counties had a higher mortality rate from diseases of despair than their Appalachian counterparts. In all states where the diseases of despair mortality rate was higher in the Appalachian portion of the state, this difference was statistically significant.

In the charts that follow, West Virginia does not exhibit a percentage difference because the entire state is located in the Appalachian Region.

Exhibit 13. Diseases of despair mortality rates, comparing Appalachian and non-Appalachian portions of states, ages 15–64, by disease and state (2020)‡

	Diseases of Despair–Total		
	Appalachia (App)	Non-Appalachia (Non-App)	% Difference
Maryland	135.3*	82.2	65%
Virginia	102.3*	62.8	63%
New York	73.8*	53.8	37%
North Carolina	89.9*	71.2	26%
Ohio	119.4*	95.1	26%
Alabama	73.9*	61.6	20%
Kentucky	126.9*	107.9	18%
Pennsylvania	93.4*	80.0	17%
Tennessee	115.3*	98.8	17%
Georgia	56.3	54.1	4%
South Carolina	86.1	88.8	-3%
Mississippi	58.5	65.4	-11%
West Virginia	160.7	N/A	N/A

‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.

* The Appalachian rate is significantly different than the non-Appalachian rate for the same disease, $p \leq 0.05$.

Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Exhibit 14. Individual diseases of despair mortality rates, comparing Appalachian and non-Appalachian portions of states, ages 15–64, by disease and state (2020)[‡]

	Overdose		Suicide		Alcoholic Liver Disease/Cirrhosis	
	App	Non-App	App	Non-App	App	Non-App
Alabama	36.6*	25.8	20.7	19.4	16.6	16.3
Georgia	28.4*	24.5	16.6	17.4	11.3	12.3
Kentucky	82.5*	68.5	22.2	22.8	22.1*	16.7
Maryland	109.2*	62.7	14.2	10.9	11.9	8.6
Mississippi	17.5*	33.7	20.8	16.7	20.2*	15.0
New York	45.0*	35.9	17.9*	9.8	10.9*	8.1
North Carolina	50.5*	43.7	21.6*	15.7	17.8*	11.9
Ohio	85.7*	65.9	19.9*	17	13.8	12.2
Pennsylvania	63.1*	59	18.4*	14	11.9*	6.9
South Carolina	47.5	52.1	23.6	20.4	15.0	16.2
Tennessee	69.3*	65.1	25.2*	19.4	20.8*	14.4
Virginia	45.4*	37.6	31.9*	15.3	25.0*	9.9
West Virginia	119.6	N/A	25.2	N/A	15.9	N/A

[‡] Rates are presented as deaths per 100,000 population, and are age-adjusted.

* The Appalachian rate is significantly different than the non-Appalachian rate for the same disease, $p \leq 0.05$.

Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

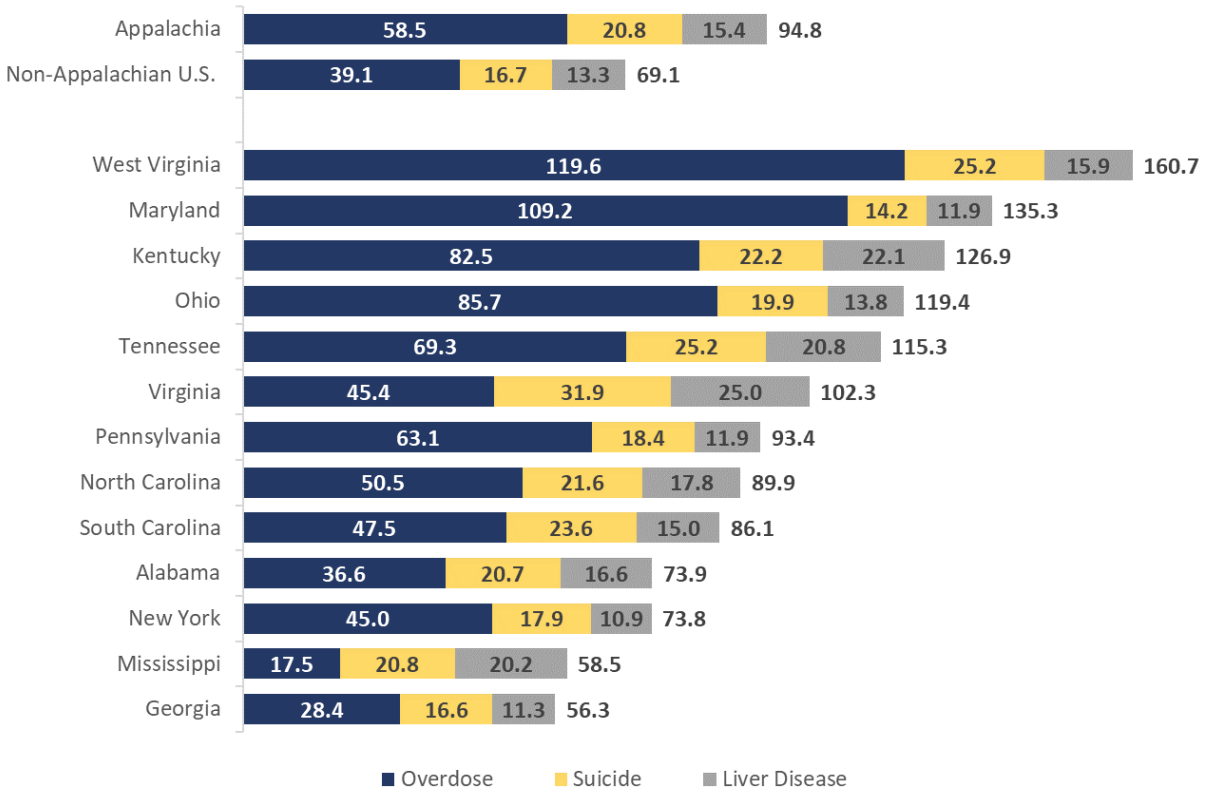
Diseases of Despair: Disparities Within Appalachia

There are areas within the Appalachian Region where the burden of diseases of despair is most concentrated. The following findings describe the disparities within the Appalachian Region by state, subregion, county economic status, and rurality.

Exhibit 15 shows the mortality rate for each individual disease of despair for the Appalachian portions of each state. For all diseases of despair combined, West Virginia and Appalachian Maryland had the highest mortality rate of all Appalachian states at 160.7 and 135.3 deaths, per 100,000, respectively. In West Virginia—and the Appalachian portions of Kentucky, Maryland, Ohio, and Pennsylvania—at least 65 percent of diseases of despair deaths were due to overdose.

On the opposite end of the spectrum, Georgia and Mississippi not only had the lowest combined mortality rates from diseases of despair in their Appalachian portions, they were the only states with rates lower than the overall non-Appalachian U.S. rate.

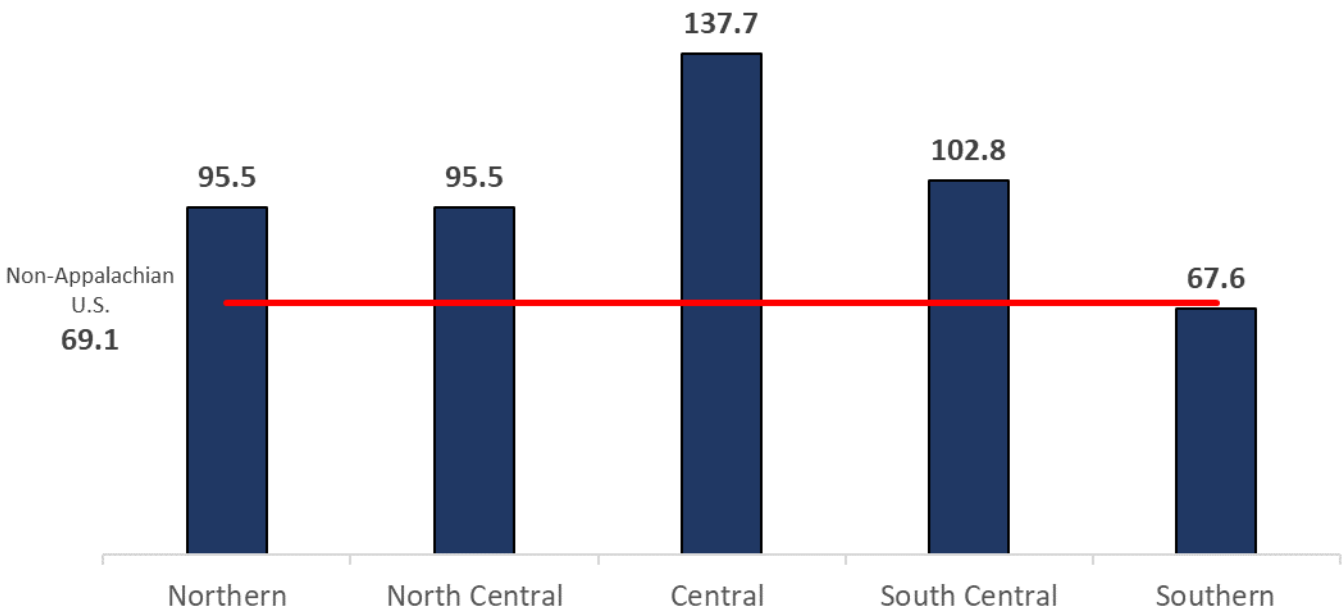
Exhibit 15. Diseases of despair mortality rates, ages 15–64, by state^ and disease (2020)‡



^ For states within Appalachia, only the mortality rate for the Appalachian counties is shown.
‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

In 2020, the greatest burden of diseases of despair within Appalachia was concentrated in Central Appalachia, which had a mortality rate of 137.7 deaths per 100,000. Per Exhibit 16, which shows the mortality rates for Appalachian subregions, Northern, North Central, and South Central Appalachia all had diseases of despair mortality rates between 95 and 105 deaths, per 100,000. Southern Appalachia had the lowest mortality rate for diseases of despair, with 67.6 deaths per 100,000, which was less than the rate in the non-Appalachian U.S. (69.1 deaths per 100,000).

Exhibit 16. Diseases of despair mortality rates, ages 15–64, by subregion (2020)‡

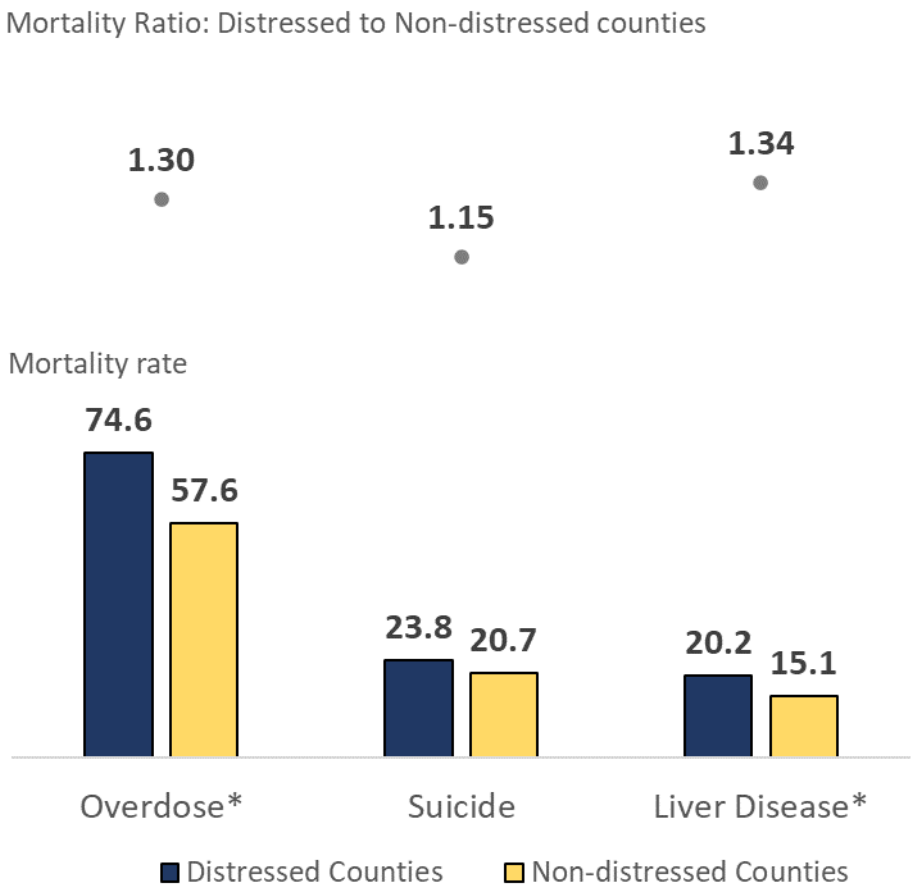


‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Exhibit 17 shows the mortality rate for each individual disease of despair, comparing distressed and non-distressed counties. While overdose deaths were the most common among the three diseases of despair, alcoholic liver disease/cirrhosis was where distressed and non-distressed counties differed the most; distressed counties exhibited a 34 percent higher rate than their counterparts.

In addition, the mortality rate for overdose and suicide was 30 percent higher and 15 percent higher, respectively, in distressed counties than in non-distressed ones. The difference between distressed and non-distressed counties was statistically significant for both overdose and liver disease.

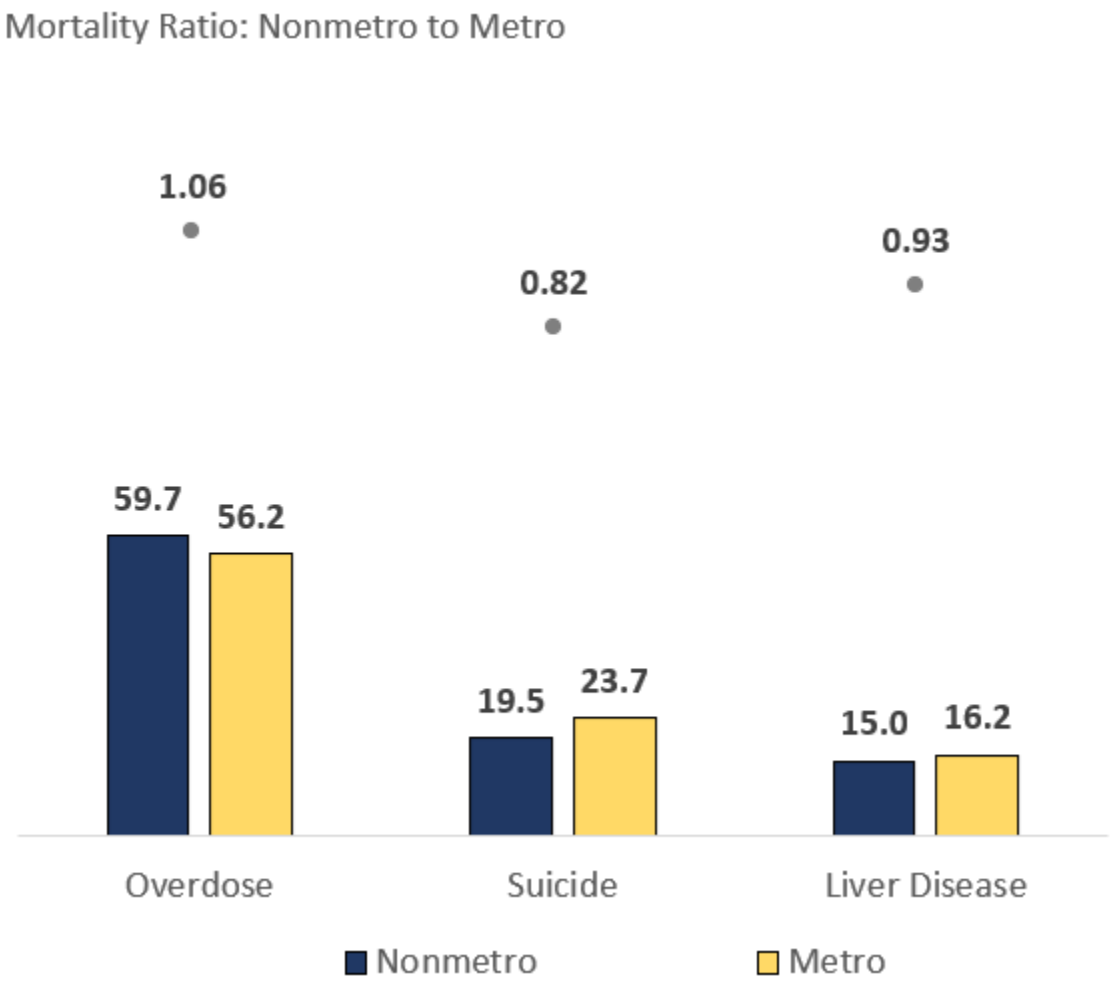
Exhibit 17. Diseases of despair mortality rates, ages 15–64, by disease and county economic status (2020)‡



‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
* The rate for distressed counties is significantly different from the rate for non-distressed counties, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Findings also varied based on rurality, as shown in Exhibit 18. In nonmetro counties, the suicide rate was 18 percent lower than in metro counties, and the alcoholic liver disease/cirrhosis mortality rate was 7 percent lower. Meanwhile, the overdose rate in nonmetro counties was 6 percent higher than in metro counties. The differences between metro and nonmetro counties were statistically significant for each of the three causes of death.

Exhibit 18. Diseases of despair mortality rates, ages 15–64, by disease and rurality (2020)‡*



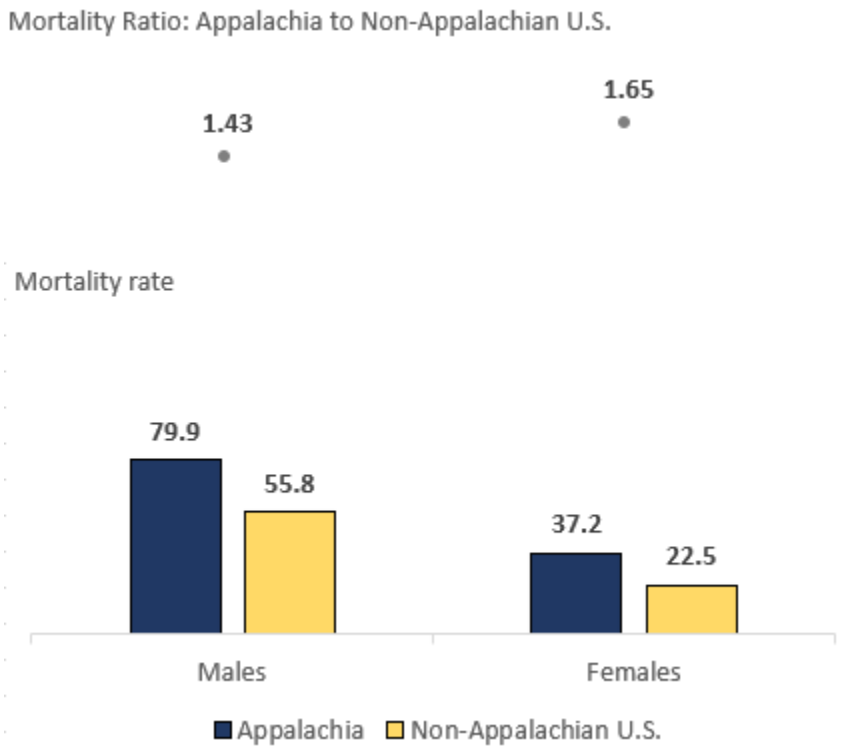
‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
* For all diseases, the rate for nonmetro counties is significantly different from the rate for metro counties, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

A Closer Look at Overdose Deaths

The remaining findings focus solely on deaths due to alcohol, prescription-drug, and illegal-drug overdose (overdose deaths). Among individuals ages 25–54—traditionally considered to be in their prime working and child-rearing years—the overdose mortality rate was 61 percent higher in the Appalachian Region (75.6 deaths per 100,000) than in the non-Appalachian U.S. (47.1 deaths per 100,000). In the Appalachian Region, the overdose mortality rate for individuals ages 25–54 increased by 42 percent from 2018 to 2020.

Exhibit 19 shows the differences in overdose mortality between the Appalachian Region and non-Appalachian U.S. for males and females. While the burden associated with overdose mortality is higher among men (79.9 deaths per 100,000 in Appalachia, compared to 55.8 deaths per 100,000 outside of it), the disparity is greater for women in the Region. Specifically, while the overdose mortality rate in the Appalachian Region among males is 43 percent higher than in the non-Appalachian U.S., the rate is 65 percent higher for Appalachian females compared to non-Appalachian females.

Exhibit 19. Overdose mortality rates, ages 15–64, by gender and region (2020)‡*

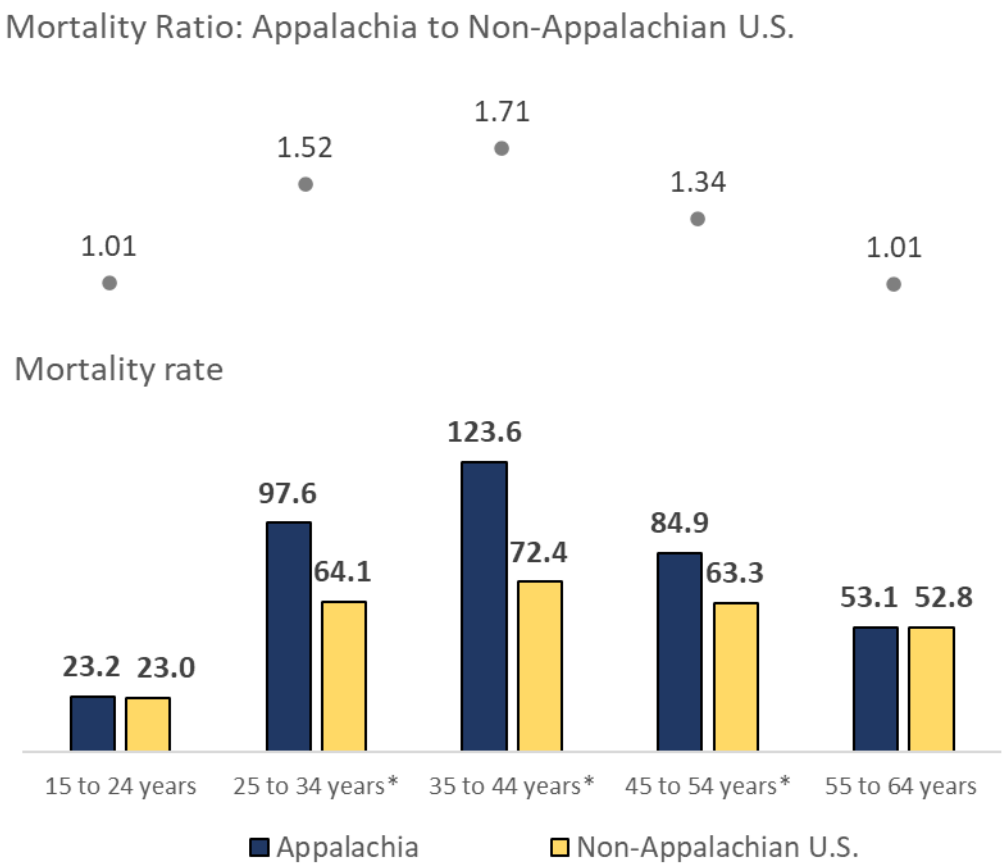


‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
* For both genders, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Men in Appalachia who were ages 25–44 experienced notable disparities compared to non-Appalachian males, as shown in Exhibit 20. In Appalachia, the overdose mortality rate was 71 and 52 percent higher among men ages 35-44 and 25-34, respectively, compared to non-Appalachian males. The Region's burden was also highest for these two age groups, at 123.6 deaths and 97.6 deaths, per 100,000, respectively.

For Appalachian males 25–54, the overdose mortality rate (103.4 deaths per 100,000) was 54 percent higher than the overdose mortality rate for men outside of the Region (67.0 deaths per 100,000). For all male age groups, the overdose mortality rate in the Appalachian Region was higher than the non-Appalachian U.S. rate, and the difference was statistically significant.

Exhibit 20. Overdose mortality rates for males, ages 15–64, by age group and region (2020)‡

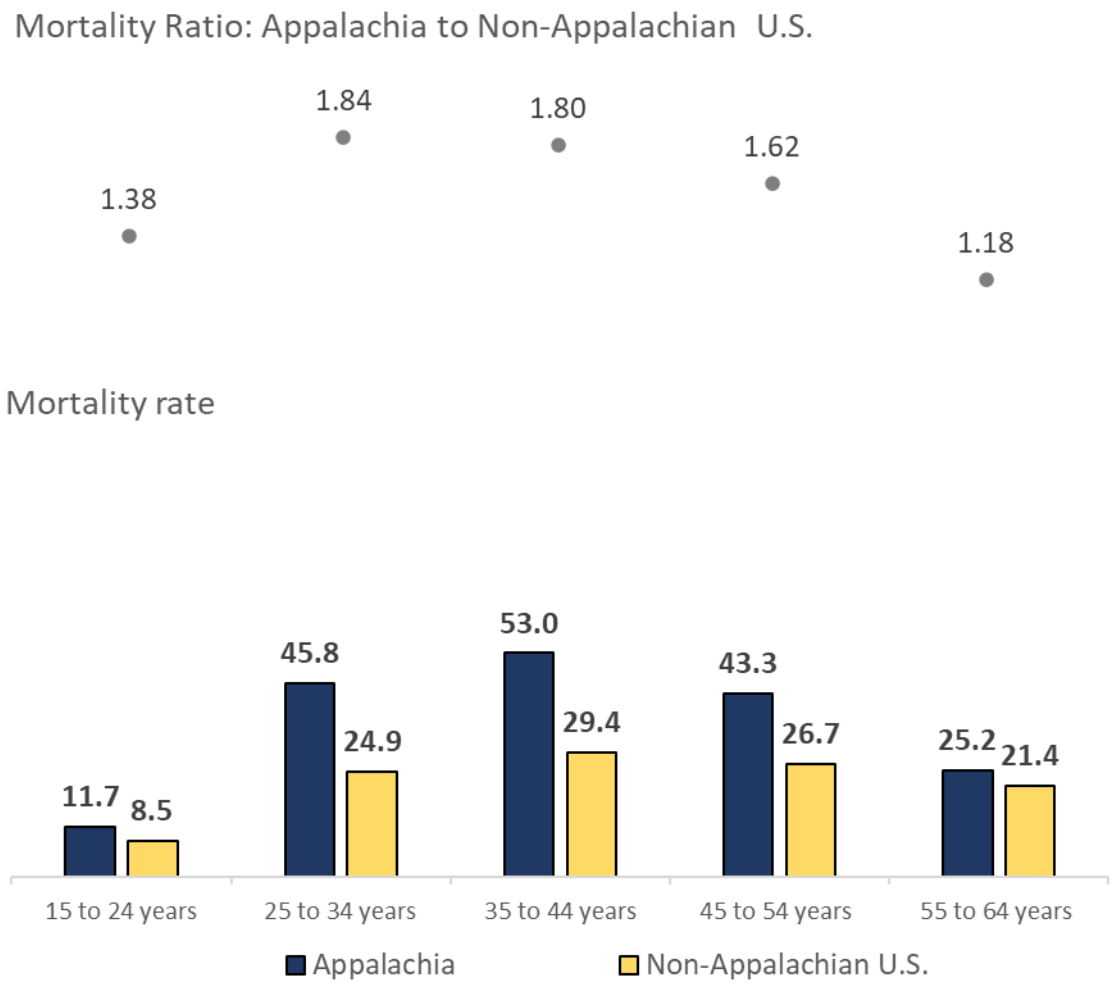


‡ Rates are presented as deaths per 100,000 population, and are crude mortality rates for each age group.
* The Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

While the overall overdose mortality burden was lower among females than males, the disparity between females in Appalachia and women outside of it was even greater than the disparity among men, as shown in Exhibit 21.

In the 25–34 age group, the overdose mortality rate for Appalachian females was 84 percent higher than that of females in the non-Appalachian U.S. Among 35- to 44-year-olds, the Appalachian rate was 80 percent higher overall, with the highest overdose mortality rate being among females in that age range (53.0 deaths per 100,000). For females ages 25–54, the overdose mortality rate was 75 percent higher in the Appalachian Region (47.7 deaths per 100,000) than in the non-Appalachian U.S. (27.2 deaths per 100,000). For all female age groups, the overdose mortality rate in the Appalachian Region was higher than the non-Appalachian U.S. rate, and the difference was statistically significant.

Exhibit 21. Overdose mortality rates for females, ages 15–64, by age group and region (2020)‡*



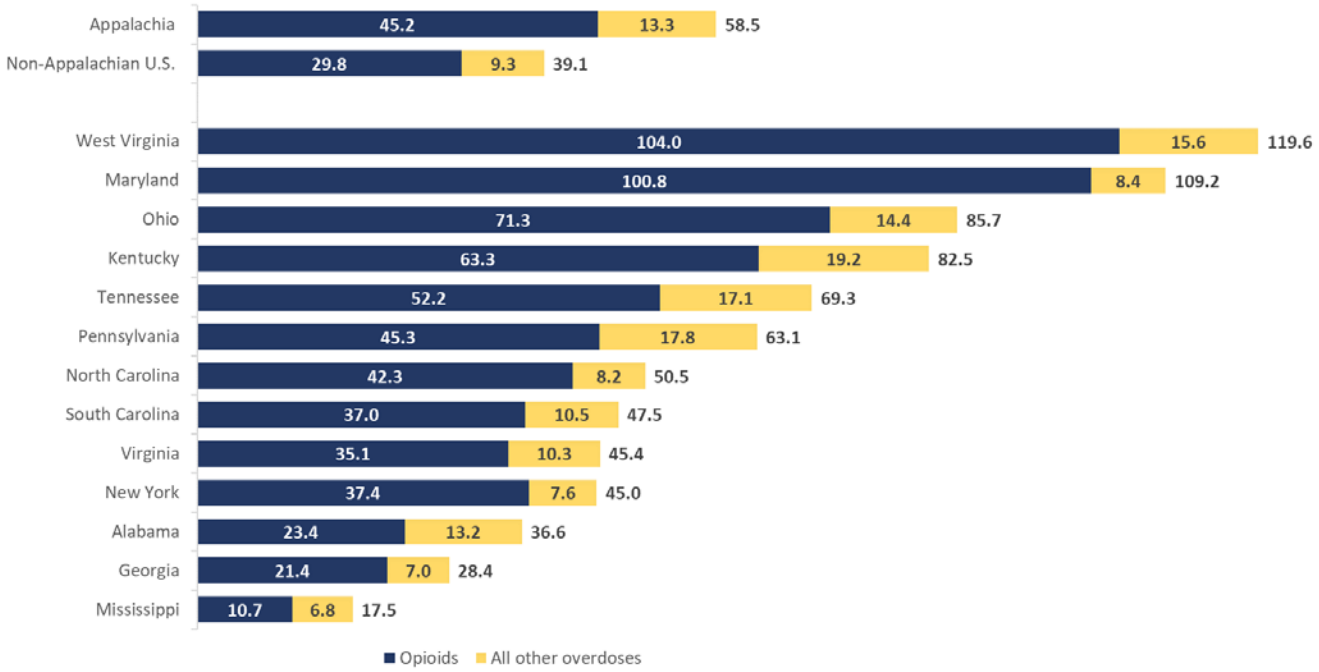
‡Rates are presented as deaths per 100,000 population, and are crude mortality rates for each age group.
* For all age groups, the Appalachian rate is significantly different from the non-Appalachian U.S. rate, $p \leq 0.05$.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Exhibit 22 shows the total overdose mortality rates plus the opioid-related overdose rates in the Appalachian portions of each state. In 2020, 7,011 of the 9,157 overdose deaths (77 percent) in the Appalachian Region were attributed to opioids.

The states with the highest opioid-related overdose mortality rates within their Appalachian counties were West Virginia (104.0 deaths per 100,000), Maryland (100.8 deaths per 100,000), Ohio (71.3 deaths per 100,000), and Kentucky (63.3 deaths per 100,000). While the states with the highest percentages of overdose deaths attributed to opioids within their Appalachian portions were Maryland (92 percent), West Virginia (87 percent), North Carolina (84 percent), Ohio (83 percent), and New York (83 percent).

Opioid-related overdose mortality rates were lowest in the Appalachian parts of Mississippi (10.7 deaths per 100,000), Georgia (21.4 deaths per 100,000), and Alabama (23.4 deaths per 100,000).

Exhibit 22. Overdose mortality rates, ages 15–64, by state^ and type of overdose (2020)‡



^ For states within Appalachia, only the mortality rates for the Appalachian counties are shown.
‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
† Due to a small number of deaths, the opioid mortality rate is unreliable and not age-adjusted.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Exhibit 23 shows the percentages of overdose deaths attributed to opioids in each state, as well as the opioid-related overdose mortality rate. The opioid-related mortality rate was 45.2 deaths per 100,000 in the Appalachian Region, which was 49 percent higher than the non-Appalachian U.S. rate of 29.8 deaths per 100,000.

Exhibit 23. Overdose and opioid-related overdose mortality rates, age 15–64, by state^ (2020)‡

	Overdose	Opioid-related Overdose	Opioid-related (%)
Alabama	36.6	23.4*	64%
Georgia	28.4*	21.4*	75%
Kentucky	82.5*	63.3*	77%
Maryland	109.2*	100.8*	92%
Mississippi†	17.5*	10.7*	61%
New York	45.0*	37.4	83%
North Carolina	50.5*	42.3*	84%
Ohio	85.7*	71.3*	83%
Pennsylvania	63.1*	45.3*	72%
South Carolina	47.5*	37.0*	78%
Tennessee	69.3*	52.2*	75%
Virginia	45.4	35.1	77%
West Virginia	119.6*	104.0*	87%
Appalachia	58.2*	45.2*	78%
Non-Appalachian U.S.	39.1	29.8	76%

^ For states within Appalachia, only the mortality rate for the Appalachian counties is shown.
‡ Rates are presented as deaths per 100,000 population, and are age-adjusted.
* Rate is significantly different than the non-Appalachian U.S. rate, $p \leq 0.05$.
† Due to a small number of deaths, the opioid mortality rate is unreliable and not age-adjusted.
Source: Mortality Rates and Standard Errors provided by the Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed at http://wonder.cdc.gov/mcd-icd10.html.

Discussion

This report provides an update on trends in diseases of despair mortality in the Appalachian Region. Diseases of despair mortality had begun to decline between 2017 and 2018, but dramatically surged in 2020, likely due to the COVID-19 pandemic. Between 2019 and 2020, the diseases of despair mortality rate increased by 24 percent in the Appalachian Region and 20 percent in the non-Appalachian U.S. In 2020, the overall diseases of despair mortality rate was 37 percent higher in the Appalachian Region than in the non-Appalachian U.S.

When it came to the individual diseases of despair mortality rates, the Region's overdose rate was 50 percent higher, the suicide rate was 25 percent higher, and the liver disease/cirrhosis rate was 16 percent higher than in the non-Appalachian U.S. More detailed analyses of opioid-related overdose deaths showed that in 2020, opioids caused 77 percent of overdose deaths in Appalachia (7,011 total deaths).

Compared to the rest of the nation, the Appalachian Region experienced higher rates of mortality from diseases of despair for all 10-year age ranges between ages 15 and 64. The most notable disparities existed for the 35–44 group, individuals in their prime working and child-rearing years. More specifically, this age bracket experienced mortality rates that were 57 percent higher in Appalachia. These findings have significant implications, particularly in terms of economic development and children's health and well-being.

Within Appalachia, all subregions saw a notable increase in diseases of despair mortality between 2019 and 2020. In 2020, North Central and Central Appalachia had the highest and second highest diseases of despair mortality rates of 140.6 deaths and 137.7 deaths, per 100,000, respectively. Between 2019 and 2020, Central Appalachia saw a 41 percent increase in diseases of despair mortality, and South Central and North Central Appalachia both saw increases of at least 30 percent.

Additionally, economically distressed counties had higher mortality rates for all three causes of death: overdose, suicide, and liver disease/cirrhosis. For overdose mortality, the disparity between distressed and non-distressed counties declined from 34 percent higher to 18 percent higher in the distressed counties, between 2015 and 2018. However, by 2020, this disparity had risen to 30 percent higher in distressed counties. For liver disease/cirrhosis, the mortality rate for distressed counties was 34 percent higher (20.2 deaths per 100,000) than non-distressed counties (15.1 deaths per 100,000) in 2020.

Findings varied by rurality, depending on the specific disease of despair. In 2020, nonmetro counties had an overdose mortality rate that was 6 percent higher than metro counties. By contrast, metro counties had a suicide rate that was 18 percent higher than nonmetro counties, and a liver disease mortality rate that was 7 percent higher than nonmetro counties.

In sum, diseases of despair mortality rates—particularly overdose and liver disease/cirrhosis rates—increased dramatically between 2019 and 2020. These data provide a first look at the devastating impact of the COVID-19 pandemic *beyond* the deaths directly attributable to COVID-19. Like the rest of the United States, the Appalachian Region experienced economic and other challenges as a result of the pandemic—including the increased isolation of its populace, and limitations on access to in-person treatment and recovery support—but shouldered a greater burden when it came to diseases of despair.

It will be important to continue to monitor these trends, and to determine which strategies led to the 2018 declines in deaths attributable to diseases of despair, so that these approaches can be enhanced to address rising mortality rates across Appalachia.

Appendix A: ICD-10 Codes

Exhibit 24. Underlying cause of death–ICD-10 codes for diseases of despair

Diseases of Despair	ICD-10 Code	Underlying Cause of Death
Alcoholic poisoning and overdoses of prescription and illegal drugs (Overdose)	X40-45	Accidental poisoning by and exposure to: nonopioid analgesics, antipyretics, and antirheumatics; antiepileptic, sedative-hypnotic, antiparkinsonism, and psychotropic drugs; narcotics and psychodysleptics [hallucinogens]; other drugs acting on the autonomic nervous system; other and unspecified drugs, medicaments, and biological substances; and alcohol
	Y10-15	Poisoning by and exposure to the following (undetermined intent): nonopioid analgesics, antipyretics and antirheumatics, undetermined intent; antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs; narcotics and psychodysleptics [hallucinogens]; other drugs acting on the autonomic nervous system; other and unspecified drugs, medicaments and biological substances; and alcohol
	Y45	Analgesics, antipyretics, and anti-inflammatory drugs
	Y47	Sedatives, hypnotics, and antianxiety drugs
	Y49	Psychotropic drugs, not elsewhere classified
Suicide	X60-84	Intentional self-harm
	Y87.0	Sequelae of intentional self-harm
Alcoholic liver disease/cirrhosis	K70	Alcoholic liver disease
	K73	Chronic hepatitis, not elsewhere classified
	K74	Fibrosis and cirrhosis of liver

Exhibit 25. Multiple causes of death–ICD-10 codes for opioid-related overdose

Disease of Despair	ICD-10 Code	Multiple Causes of Death
Alcoholic poisoning and overdoses of prescription and illegal drugs (Overdose)	T40.0	Opium
	T40.1	Heroin
	T40.2	Other opioids
	T40.3	Methadone
	T40.4	Other synthetic narcotics
	T40.6	Other, and unspecified, narcotics

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