



THE HUMAN COST of Mountaintop Removal Coal Mining

MAPPING THE SCIENCE BEHIND HEALTH AND
ECONOMIC WOES OF CENTRAL APPALACHIA





“The scientific evidence of the severe environmental and human impacts from mountaintop removal is strong and irrefutable.”

Margaret Palmer of the University of Maryland Center for Environmental Science

Since 2007, peer-reviewed studies by researchers from more than a dozen universities have concluded that mountaintop removal coal mining contributes to significantly higher rates of birth defects, cancer, cardiovascular and respiratory diseases among individuals living in the region where it occurs.

Mountaintop removal uses explosives to blast through hundreds of feet of rock, exposing coal seams and leaving nearby communities vulnerable to coal dust and air pollution that contains arsenic, cadmium and other carcinogens. The remaining rock and dirt are pushed into adjacent valleys, burying headwater streams and polluting waterways.

Exposure to coal-related pollution is significantly higher in communities near mountaintop removal mines than in communities where only underground mining occurs. The areas of Central Appalachia with the most mountaintop removal mining — southern West Virginia, eastern Kentucky and Tennessee, and southwestern Virginia — face the highest risk and are the focus of this report.

The studies included in this report use data from the Center for Disease Control, the U.S. Geological Survey and other institutions and government agencies to determine the impacts of mountaintop removal on the health and well-being of the communities where it occurs. Among the gravest findings are that as many as 60,000 additional cases of cancer in Central Appalachia are directly linked to mountaintop removal, and more than 700 additional deaths from heart disease occur every year due to the practice.

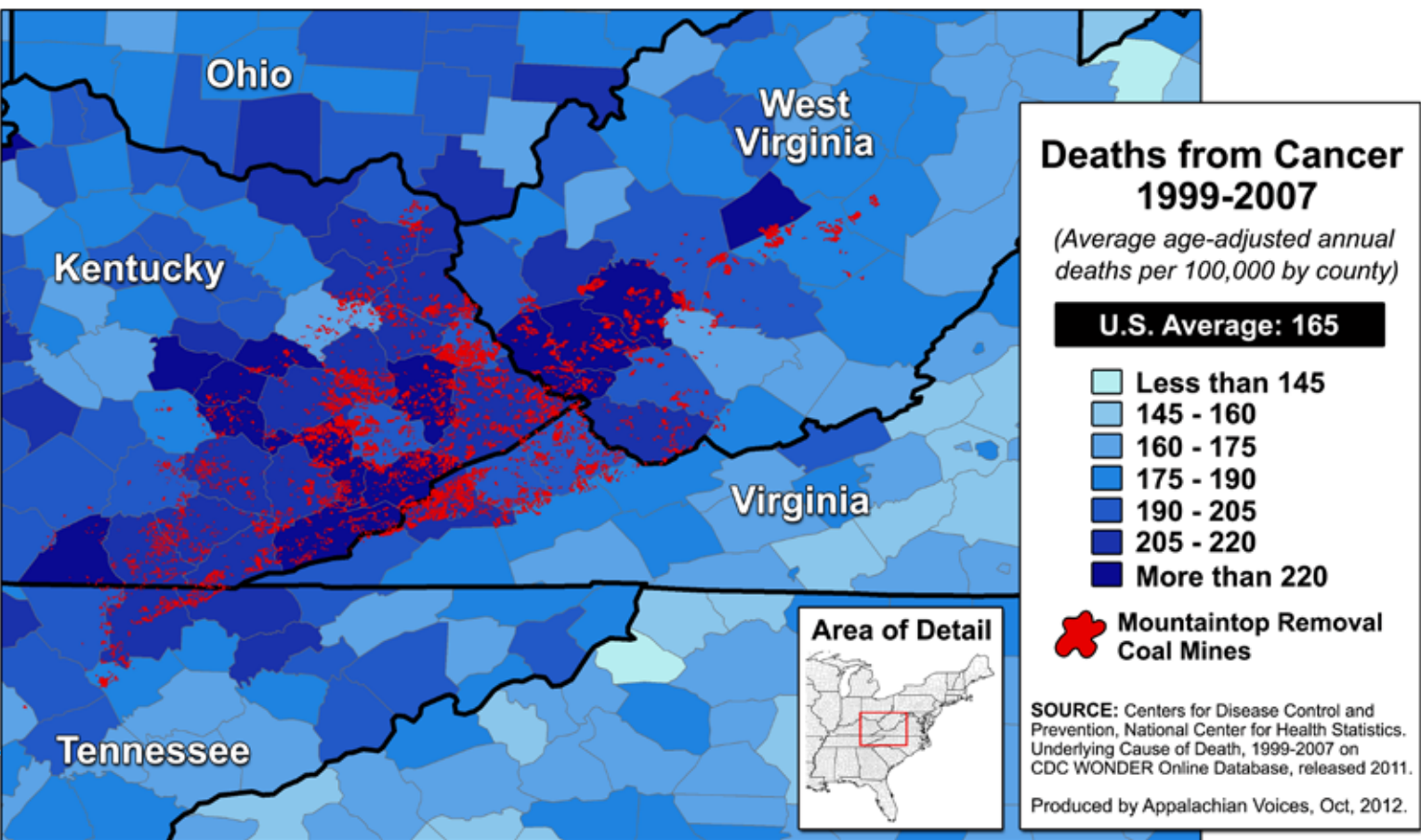
According to the United Health Foundation, in 2011 Kentucky and West Virginia ranked first and second, respectively, in the nation for the most deaths from cancer. Both are consistently among the 10 states with the highest rates of respiratory diseases, heart attacks, preventable hospital visits and premature deaths. In Gallup's annual poll, West Virginia and Kentucky ranked last and second-to-last in overall well-being for four consecutive years. The two states have the most mountaintop removal coal mining and are also among the most polluted in the nation.

Despite these findings, little has been done to protect Appalachian communities from the impacts of mountaintop removal. Based on the broad concurrence of scientific findings in these studies, it's evident that the trending health and socioeconomic inequalities in Central Appalachia cannot fully be addressed so long as mountaintop removal coal mining continues.

Stricter permitting and regulation of mountaintop removal are unlikely to reverse the risks to human health. As thirteen top scientists wrote in a paper published by the nation's premier scientific journal, *Science*:

“Clearly, current attempts to regulate [mountaintop removal mining] practices are inadequate. Mining permits are being issued despite the preponderance of scientific evidence that impacts are pervasive and irreversible and that mitigation cannot compensate for the losses.”

Additional resources and interactive maps can be found at iLoveMountains.org/the-human-cost.



High Incidences of Cancer

Compared to the national average, the toll that cancer inflicts on the communities of Appalachia where mountaintop removal coal mining occurs is staggering. Cancer is a leading cause of death nationwide, and areas with the most mountaintop removal lead the nation in deaths from cancer.

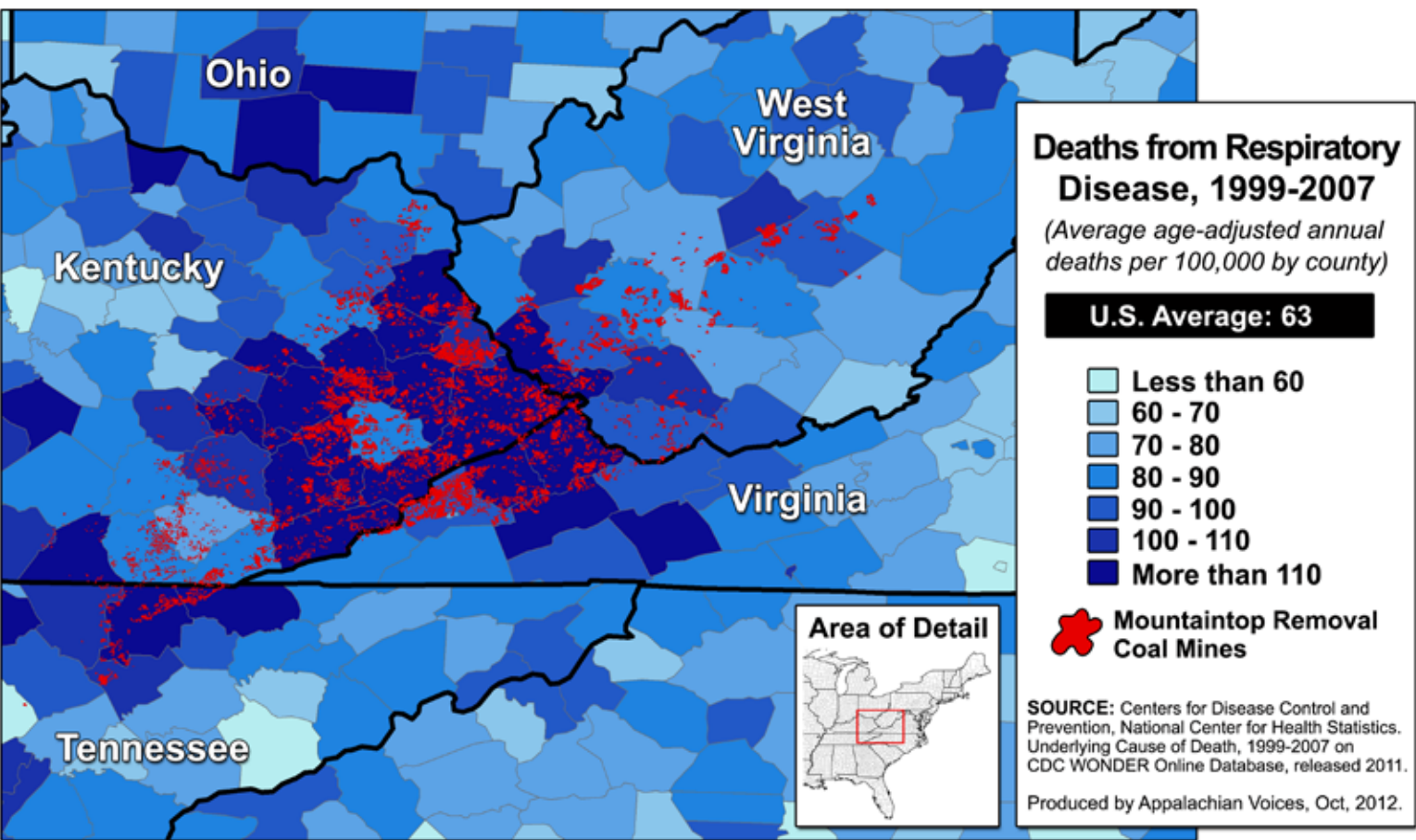
In 2011, a peer-reviewed study found that self-reported cancer rates in counties where mountaintop removal occurs are nearly double the rates in nearby counties with no mountaintop removal. The study concludes that among the 1.2 million Americans living in counties where mountaintop removal occurs, as many as 60,000 additional cases of cancer are linked to the practice ^[1].

In 2010, researchers used a geographical information system (GIS) analysis to determine how cancer mortalities in West Virginia relate to proximity to coal-mining activities including mines, coal slurry disposal sites and processing plants. If only socioeconomic factors contribute to the health disparities in Appalachia, the research posits, there should be little to no increase in cancer rates and mortalities in communities with greater exposure to coal-mining activities. The data revealed, however, that proximity to coal-mining activity, and mountaintop removal in particular, significantly increases health risks ^[2].

The study categorized six counties in West Virginia — Wayne, Lincoln, Mingo, Logan, Boone and Wyoming — as having high clusters of cancer. These counties are the largest producers of mountaintop removal coal and therefore face the greatest risk of health impacts.

KEY FINDINGS

- West Virginia and Kentucky lead the nation in deaths from cancer.
- Greater exposure to pollution from coal-mining activity increases the risk for cancer and other fatal diseases.
- As many as 60,000 cases of cancer in Appalachia are directly linked to mountaintop removal.



Lung Cancer and Respiratory Diseases

After accounting for smoking, industry emissions and other environmental factors, incidences of lung cancer and other respiratory diseases in coal-mining counties of Appalachia remain disproportionately higher than other parts of the region and the national average. Moreover, greater exposure to pollution in communities near mountaintop removal mines has been linked to higher risks of lung cancer and other respiratory diseases.

A national county-level analysis published in the international journal *Lung Cancer* expanded on previous

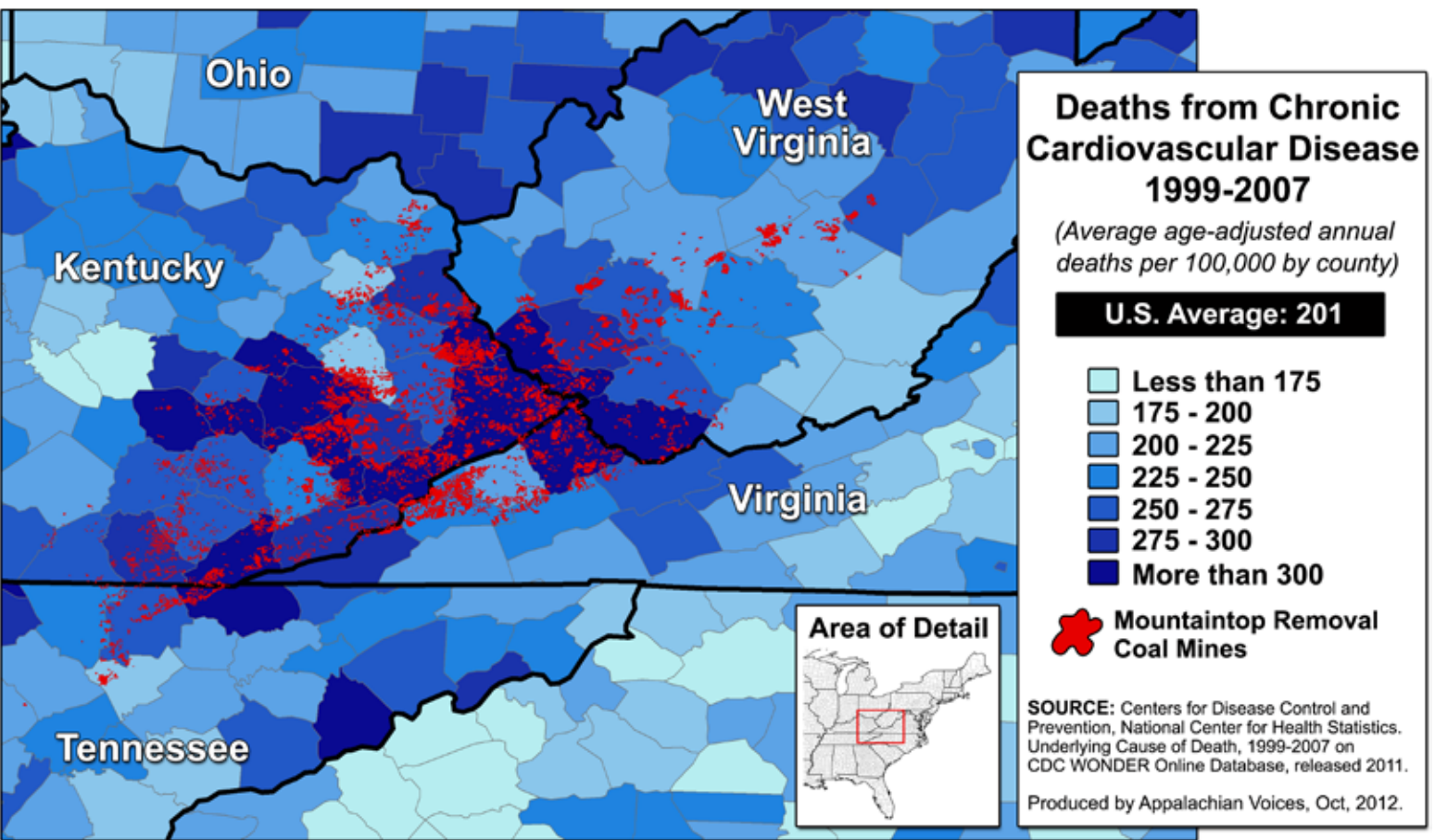
research that found higher incidences of lung cancer in Appalachia compared to the rest of the country. Incidences of lung cancer mortalities were especially high in areas with mountaintop removal^[3].

Using data from the Center for Disease Control and coal production data from the Energy Information Administration, the analysis found that the most heavily mined areas of Appalachia were associated with higher incidences of lung cancer. Occupational hazards were considered but cannot explain the high rates of disease in the overall population. Likewise, pollution in the mostly rural areas cannot be attributed to the environmental risks of more urban areas. Higher rates of cancer were also found in the non-smoking portion of the population in Appalachian coal-mining communities.

Due to lower population density and populations that live further from mines, coal-mining regions outside of Appalachia were not found to have significantly higher rates of respiratory diseases and lung cancer.

KEY FINDINGS

- West Virginia and Kentucky lead the nation in lung cancer mortalities.
- Living in heavily mined areas increases the risk of lung cancer and respiratory disease.
- Levels of exposure to contaminants are the highest in areas with the most mountaintop removal.



Cardiovascular Disease and Heart Attacks

Each year, nearly 25 percent of all deaths in America are the result of heart disease. Almost one million Americans suffer a heart attack annually. Poor diets, lack of exercise and smoking are all contributing factors, but risk-adjusted research has found that communities where mountaintop removal occurs have significantly above-average mortality rates from heart attacks and chronic cardiovascular disease.

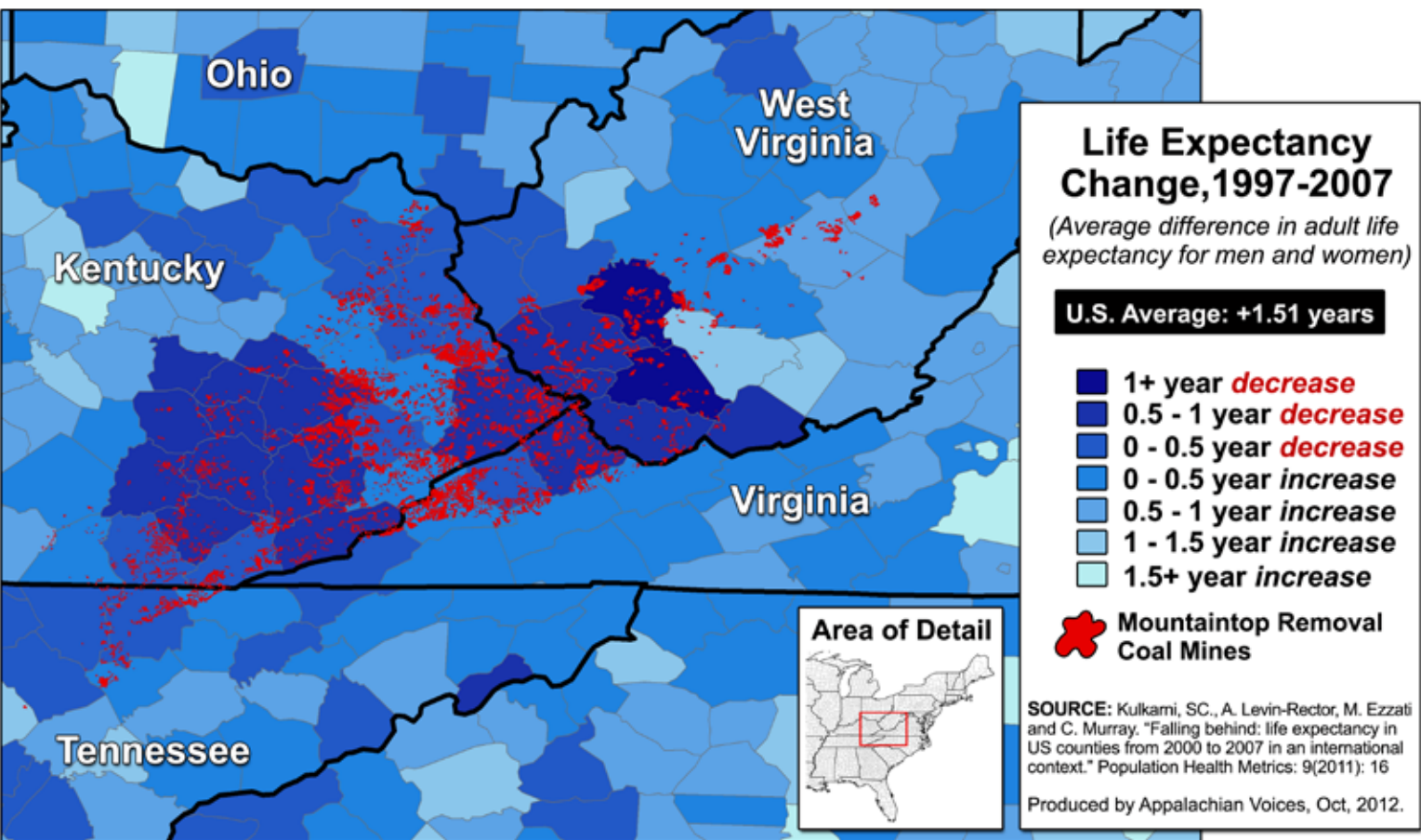
A 2011 study investigating chronic cardiovascular disease mortality in areas with mountaintop removal found that, even after adjusting for poverty and other socioeconomic risks, mortality rates remained significantly elevated in areas with mountaintop removal compared to other counties in Appalachia ^[4].

Using county-level data, the study found that incidences of heart disease increase with the amount of coal production. Researchers estimate that coal-mining activities contribute to an additional 1,072 annual deaths from the forms of chronic cardiovascular diseases included in the study, with as many as 703 occurring in areas with mountaintop removal.

Exposure to air pollution is a global risk factor for cardiovascular disease and heart attacks. Over time, the inhalation of particulate matter, or dust, released into the air by mountaintop removal can lead to the formation of plaque and inflammation, and can increase the risk of high blood pressure, atherosclerosis and heart attacks. These risks are more severe in populations with high rates of diabetes, obesity and tobacco use ^[5].

KEY FINDINGS

- Heart disease is a leading cause of death in Appalachian coal-mining communities.
- Areas with mountaintop removal have significantly higher mortality rates from heart disease than other parts of Appalachia with similar levels of poor health, smoking and poverty.
- More than 700 additional deaths from heart disease occur annually in areas with mountaintop removal compared to areas of Appalachia without mining.



Shortened Lives and Preventable Deaths

Partially due to the health risks associated with mountaintop removal, coal-mining communities in Appalachia have the lowest life expectancy and highest number of preventable deaths in the nation.

Of the 3,147 counties in the United States, the two largest coal producing counties in Kentucky, Perry and Pike, were among the bottom ten for trends in life expectancy between 1997 and 2007, according to a 2011 study published in *Population Health Metrics*. Counties in coal-

producing southern West Virginia, including McDowell, Logan and Mingo, also ranked among the lowest one percent in the nation for life expectancy, while surrounding counties are all in the bottom 10 percent ^[6].

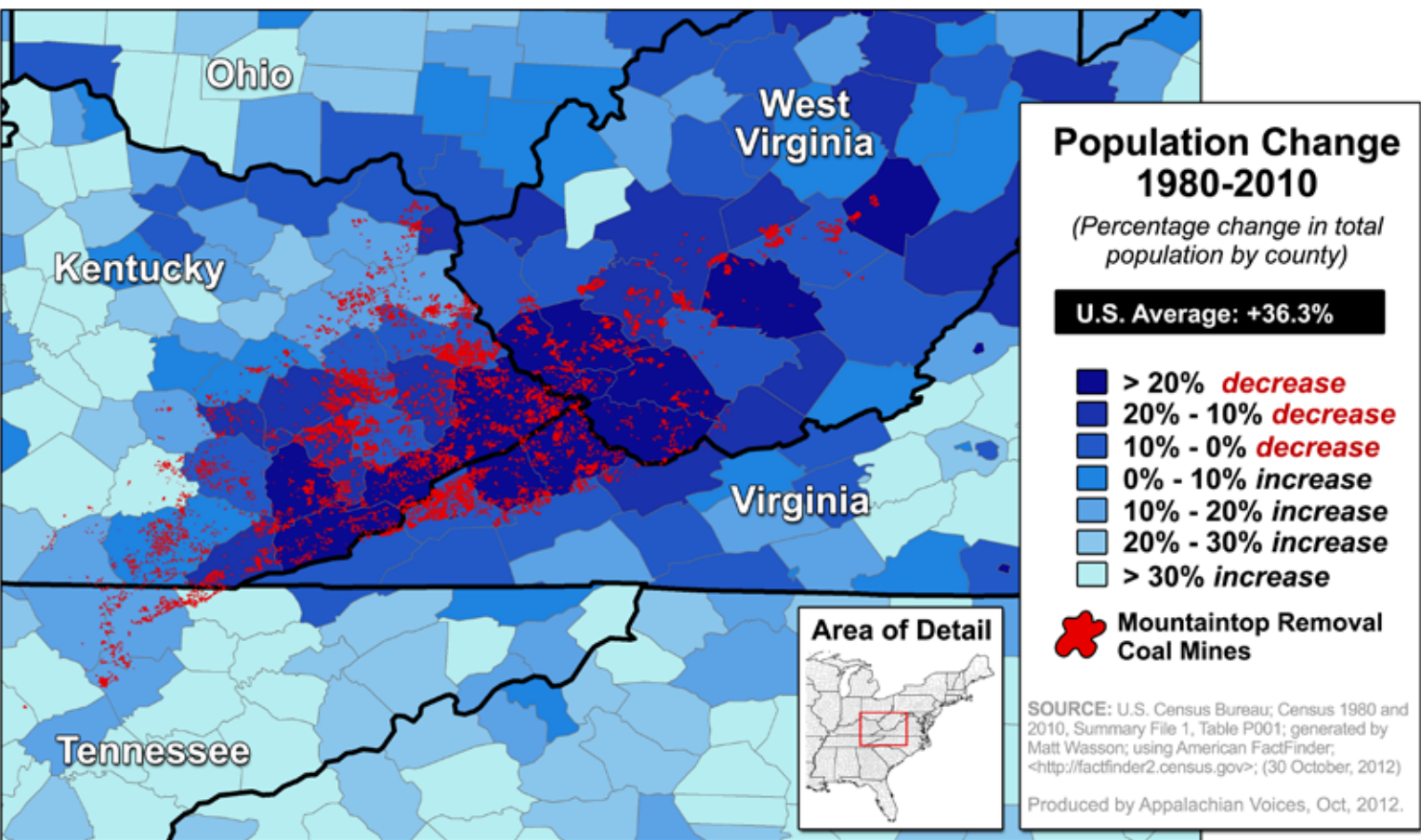
While nationwide life expectancy increased by one-and-a-half-years over the decade, average life expectancy in counties where mountaintop removal occurs has generally decreased.

Areas with mountaintop removal also have significantly higher mortality rates than other areas in Central Appalachia, according to multiple studies conducted by researchers at West Virginia University. In 2011, a study of more than 400 Appalachian and non-Appalachian counties found that mortality rates were the highest in areas with mountaintop removal in the years from 2000 to 2007.

The states where the most mountaintop removal occurs consistently rank in the bottom 10 for premature deaths and preventable hospitalizations. Adding to the severe health risks of mountaintop removal, coal-mining communities face higher than average total poverty and child poverty rates.

KEY FINDINGS

- Overall mortality rates are significantly higher in areas with mountaintop removal.
- Average life expectancy has decreased in across the area where mountaintop removal occurs.
- Kentucky and West Virginia rank 49th and 50th in preventable hospitalizations.



Population Change and Socioeconomic Struggles

Strong correlations exist between poor health in Appalachia, overall well-being and decreasing population in coal-mining communities. After 30 years of surface mining in Central Appalachia, the region has consistently lost population.

While the average population of counties in the United States increased by 36.3 percent between 1980 and 2010, more than half of the counties in the affected region lost population, including McDowell County in West Virginia, which lost 56 percent of its population, falling from 49,747 to 22,113 ^[7].

For the past several years, West Virginia and Kentucky have ranked last and second to last on Gallup's well-being index for factors such as work environment and life evaluation.

Out of the 435 congressional districts in the United States, the two regions where the impacts of mountaintop removal are the most pervasive — Kentucky's 5th district and West Virginia's 3rd district — rank among the lowest in life expectancy, physical and emotional health, and overall well-being.

Congressional districts where mountaintop removal occurs in eastern Tennessee and southwestern Virginia also rank in the bottom 10 districts for life evaluation, physical and emotional health.

KEY FINDINGS

- Of the 49 counties with mountaintop removal mining, 36 lost population between 1980 and 2010.
- 10 mountaintop removal counties saw a 20 percent or greater decrease in population over that 30 year period.
- Counties with mountaintop removal lost nearly 200,000 people — more than 10 percent of total population.



CITATIONS

CANCER

1. Hendryx, M., L. Wolfe, J. Luo, and B. Webb. (2011) "Self-Reported Cancer Rates in Two Rural Areas of West Virginia with and Without Mountaintop Coal Mining." *Journal of Community Health*.
2. Hendryx, M., E. Fedorko, and A. Anesetti-Rotherme. (2010) "A Geographical Information System-Based Analysis of Cancer Mortality and Population Exposure to Coal Mining Activities in West Virginia." *Geospatial Health* 4(2), 2010

LUNG CANCER AND RESPIRATORY DISEASES

3. Hendryx, M., K. O'Donnell and K. Horn. (2008) "Lung cancer mortality is elevated in coal-mining areas of Appalachia". *Lung Cancer*. 62 : 1-7.

CARDIOVASCULAR DISEASE

4. Hendryx, M., and L. Esch. (2011) "Chronic Cardiovascular Disease Mortality in Mountaintop Mining Areas of Central Appalachian States." *Journal of Rural Health*.
5. Hendryx, M. and K. Zullig. (2009) "Higher Coronary Heart Disease and Heart Attack Morbidity in Appalachian Coal Mining Regions." *Preventive Medicine*.

LIFE EXPECTANCY

6. Kulkarni, SC., A. Levin-Rector, M. Ezzati and C. Murray. "Falling behind: life expectancy in US counties from 2000 to 2007 in an international context". *Population Health Metrics*. 9(2011): 16

POPULATION CHANGE

7. Zullig, KJ and M. Hendryx. "Health-Related Quality of Life Among Central Appalachian Residents in Mountaintop Mining Counties". *American Journal of Public Health*. 101, 5 (2011): 848-53.

OTHER SOURCES: U.S. Center for Disease Control, West Virginians for Affordable Healthcare, United Health Foundation, Gallup-Healthways Well-being Index

COVER IMAGE CREDITS

Top row, l-r: Kenny Stroud and his son Chase from Mingo County, W.Va., observe brown water running from the tap in their bathroom sink, photo by Vivian Stockman and Ohio Valley Environmental Coalition Jane Branham of Pound, Va., photo courtesy of Jane Branham The Urias family, Pike County, Ky., photo by Mary Jo Shafer / Institute for Rural Journalism and Community Issues Mary Love from eastern Kentucky, photo by Jamie Goodman Ed Wiley of Rock Creek, W.Va., holds a photo of his granddaughter, Kayla who became ill while attending a school adjacent to a mountaintop removal coal mine, photo by Mark Schmerling.

Center image: Residents of Lincoln County, W.Va., survey the site of a former family orchard at the Hobet 21 mountaintop removal coal mine, photo by Dana Kuhline.

Bottom row, l-r: Maria Lambert from Prenter, W.Va., examines with jars of dirty water drawn from her kitchen sink, photo by Paul Corbit Brown Teri Blanton and her grandson Timothy from eastern Kentucky, photo by Kentuckians for the Commonwealth Residents of Wise County, Va., deliver a Mile Long Petition asking the state's governor to ban of mountaintop removal coal mining, photo by Matt Wasson Ann League from Campbell County, Tenn., photo by Jamie Goodman.