

Persistent Mortality Patterns in Appalachia

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ABSTRACT

Overall Appalachian mortality rates for many cancer and other diseases do not exceed national levels. However, in our previous research, we have observed that some counties appear to rank poorly on a national scale for many cancers. These counties are often rural, with small populations, so they are obscured in the calculation of regional mortality rates. The purpose of this analysis was to try to identify counties and clusters of counties with persistently poor mortality rates across several diseases as an important way to explore patterns of health disparity within Appalachia.

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DATA

The primary data source for this analysis was the smoothed mortality data set for Appalachia generated by Dr. Joel Halverson at West Virginia University as part of an Appalachian Regional Commission funded exploration into Appalachian Health disparities. This data set uses a statistical smoothing algorithm to generate more mortality rates at the county level. Data used included county level mortality rates for all cancers, heart disease, diabetes, stroke, COPD, lung cancer, and colorectal cancer.

Additional data sources included the Appalachian Regional Commission's distressed county categorizations for 2003, and 1993 Beale codes. These were used to compare county level patterns of economic distress and rurality with disease mortality patterns.

MORTALITY RANKINGS, ECONOMIC DISTRESS, AND RURALITY

Approach

In order to begin to assess patterns in mortality, counties were divided up into quartile ranks based on mortality rates by disease. Counties in the best quartile of mortality rates were assigned a score of 1, counties in the middle two quartiles were scored 2 or 3, and counties in the worst quartile were assigned a score of 4.

Once quartile scores had been assigned by disease, we looked at average quartile ranking across several diseases. An average ranking would be a 2.5. A score lower than 2.5 indicates a better quartile ranking than average, and a score higher than 2.5 indicates a worse quartile ranking than average.

In addition to assessing overall mortality, quartile rankings were determined for two age bands as well – premature mortality (ages 35-64), and 65+ mortality for each disease. It was determined that mortality patterns were quite different for these two age bands, so all findings in this report are given for both age ranges separately.

This analysis was repeated using deciles, to see if a more fine grained ranking approach gave better results. However, the quartile analysis seems to produce the most evident and easy to interpret patterns, so that is what was used for the remainder of this report.

Findings

Mortality Rankings and Economic Distress

There are 406 Appalachian counties. In 2003, the Appalachian Regional Commission designated 117 of these counties as distressed, based on multiple indicators of severe economic disparity. Table 1 shows average disease

mortality quartile rank for the distressed counties compared to the non-distressed counties.

Table 1: Disease Mortality Quartile Rankings by Economic Distress

Average Quartile Rank	Non-Distressed	Distressed
All Cancer 35-64	2.8	1.8
All Cancer 65+	2.4	2.8
Heart Disease 35-64	2.8	1.9
Heart Disease 65+	2.5	2.6
Diabetes 35-64	2.3	2.9
Diabetes 65+	2.3	3.1
Lung Cancer 35-64	2.8	1.8
Lung Cancer 65+	2.6	2.4
Colorectal Cancer 35-64	2.3	2.9
Colorectal Cancer 65+	2.2	3.2
Stroke 35-64	2.9	1.6
Stroke 65+	2.8	1.9
COPD 35-64	2.9	1.6
COPD 65+	2.7	2.1

This table reveals several interesting findings. Remember that an average quartile rank would be 2.5 – a score higher than 2.5 indicates worse than average mortality for a given disease.

Some disease mortality tends to be worse in distressed counties, and some is better. Diabetes and colorectal cancer mortality are worse in distressed counties, for all ages. Stroke and COPD are worse in non-distressed counties for all ages.

There are also some important differences based on age – premature mortality and 65+ mortality are not always related to economic distress in the same ways. All cancer, heart disease, and lung cancer are worse in non-distressed counties for ages 35-64, but there is relatively little disparity between distressed and non-distressed counties for those ages 65+.

Mortality Rankings and Rurality

1993 Beale codes were used to place Appalachian counties into three groups, 1-3 (most urban), 4-6, and 7-9 (most rural). Table 2 shows average disease mortality quartile rank for these three groupings of counties.

Table 2: Disease Mortality Quartile Rankings by Rurality

Average Quartile Rank ▼	1-3	4-6	7-9
All Cancer 35-64	2.6	2.7	2.3
All Cancer 65+	2.6	2.4	2.5
Heart Disease 35-64	2.6	2.5	2.4
Heart Disease 65+	2.5	2.4	2.6
Diabetes 35-64	2.3	2.6	2.6
Diabetes 65+	2.4	2.6	2.6
Lung Cancer 35-64	2.6	2.7	2.2
Lung Cancer 65+	2.6	2.6	2.3
Colorectal Cancer 35-64	2.3	2.5	2.8
Colorectal Cancer 65+	2.4	2.5	2.6
Stroke 35-64	2.7	2.5	2.3
Stroke 65+	2.7	2.5	2.3
COPD 35-64	2.8	2.6	2.2
COPD 65+	2.7	2.6	2.3

Unlike the data we saw with comparisons of economically distressed and non-distressed counties, there are no clear or strong patterns in mortality rankings based on urban-rural county classification.

AGE RELATED MORTALITY BURDEN – WITHIN COUNTY DIFFERENCES

Approach

Since it was clear from the economic distress findings that mortality for 35-64 year olds and 65+ do not always track together, that raised the question – are there patterns in how mortality rates for younger and older populations compare within a county?

An average quartile rank across all seven diseases considered in this analysis was determined for each county for 35-64 year olds, and for 65+. Counties were recategorized into five groups, based on the differential between the two average quartile ranks:

- “Old Much Worse” – average rank is 25%+ worse for older population
- “Old Worse” – rank is 5-24% worse for older population
- “Same” – ranks are within 5%
- “Young Worse” – rank is 5-24% worse for younger population
- “Young Much Worse” – rank is 25%+ worse for younger population

Findings

Age Related Mortality Burden by State

Table 3 shows the percent of Appalachian counties in each state that fall into each of the 5 age related mortality comparison categories detailed above.

Table 3: Young vs. Older Mortality Burden Within Counties by State

State	Old Much Worse	Old Worse	Same	Young Worse	Young Much Worse
Alabama	8%	19%	0%	27%	46%
Georgia	27%	3%	3%	35%	32%
Kentucky	2%	80%	0%	18%	0%
Maryland	33%	0%	0%	67%	0%
Mississippi	0%	55%	0%	0%	45%
New York	7%	57%	36%	0%	0%
North Carolina	21%	10%	3%	41%	24%
Ohio	17%	41%	17%	24%	0%
Pennsylvania	10%	19%	46%	25%	0%
South Carolina	33%	0%	0%	0%	67%
Tennessee	6%	18%	8%	40%	28%
Virginia	4%	30%	9%	13%	43%
West Virginia	31%	22%	15%	33%	0%
Grand Total	14%	30%	12%	26%	18%

This table shows that not all states share the mortality burden equally over older and younger populations. In Kentucky, New York, and Ohio, the burden falls unequally on older populations. This means that for any given county in the Appalachian part of these three states, people over 65 fare worse compared to their peers in the rest of Appalachian than do people under 65. The county as a whole may have very high or very low mortality, but whatever level of mortality exists; it disproportionately affects people over 65.

By contrast, in Alabama, Georgia, North Carolina, and Tennessee, the mortality burden falls unequally on people under 65. Appalachian counties in these states are likely to have a strong premature mortality disparity.

Other states either show less clear-cut patterns or have very few Appalachian counties.

Age Related Mortality Burden by Economic Distress

Table 4 shows the distribution of Appalachian distressed and non-distressed counties into each of the five age related mortality comparison categories.

Table 4: Young vs. Older Mortality Burden Within Counties by Economic Status

Economic Status	Old Much Worse	Old Worse	Same	Young Worse	Young Much Worse
Distressed	21%	78%	0%	0%	1%
Non-Distressed	10%	10%	17%	37%	25%
Grand Total	14%	30%	12%	26%	18%

This table shows that in distressed counties, the older population almost universally bears an unequal burden of mortality compared to younger people in the same county. In non-distressed counties, the younger population tends to show disproportionate mortality.

Age Related Mortality Burden by Rurality

Table 5 shows the distribution of Appalachian counties based on rurality into each of the five age related mortality comparison categories.

Table 5: Young vs. Older Mortality Burden within Counties by Urban-Rural Coding

1993 Beale Codes ▼	Old Much Worse	Old Worse	Same	Young Worse	Young Much Worse
1-3	21%	12%	14%	35%	18%
4-6	12%	26%	19%	25%	19%
7-9	8%	51%	5%	19%	17%
Grand Total	14%	30%	12%	26%	18%

This table shows that in more rural counties, the older population tends to bear an unequal burden of mortality compared with younger people in that county. In more urban counties, the younger population tends to show disproportionate mortality.

CONCLUSION

This analysis did not find clear patterns of counties that are persistently poor for mortality across all diseases. This is perhaps not surprising, considering that the relationship of many diseases to poverty and rurality is quite different.

However, there were clear patterns observed for economic distress and the average mortality ranking of Appalachian counties. It also clearly emerged that age is a driving factor in mortality patterns, and looking at mortality across all ages combined obscures some important differences in health disparity patterns. There were also some interesting patterns in how the mortality burden is distributed between younger and older populations within a county.

These findings may be very helpful in targeting interventions and further research to specific populations in Appalachia, as we continue to try to improve health disparity outcomes in this region.