Effects of Fluctuating Coal Production on Economic and Health Factors in Appalachian Southwest Virginia and Comparison Areas

Susan L. Meacham, PhD, RD
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Effects of Fluctuating Coal Production on Economic and Health Factors in Appalachian Southwest Virginia and Comparison Areas

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March 19, 2016
The MISSION of the Edward Via College of Osteopathic Medicine (VCOM) is to prepare globally-minded, community-focused physicians to meet the needs of rural and medically underserved populations and promote research to improve human health.

My MISSION with the ARIES project, as a health care worker, is to identify opportunities to improve the health and well-being of rural Virginian communities.
Central Appalachia has more than it’s share of economically distressed and at-risk counties.

Map created by the Appalachian Regional Commission, March 2015
Today’s Outline

Why have chronic disease rates persisted over time in Central Appalachia?

Introduction:
Literature data: Coal → Health → Environment → Economy

“Agency” data:
Appalachian Regional Commission (ARC) – county
Virginia Department of Health (VDH) – county
Robert Wood Johnson Foundation – County Health Rankings and Roadmaps
US – Bureau of Labor and Statistics – national

VCOM health study:
VDH Records, 1960-2012 - individual
VCOM Electronic Medical Records – individual, de-identified
VA health disparities areas

Note: 5-6 wealthiest counties in VA, and US, in Northern VA
(Forbes Magazine, 2015)

Southwest, Mt. Rogers, Southside and Eastern VA

(Virginia Rural Health Data Portal, 2012, discontinued)
Appalachian and Health Disparity Areas Across Southern VA

- Buchanan County – At-risk
- Dickenson County – At-risk
- Lee County - Distressed
- Russell County – At-risk
- Tazewell County - Transitional
- Wise County, Norton City – At-risk

No Coal Production (1 county)
Scott County – At-risk
Coal production by county in thousand short tons from 1990 to 2013 in the state of VA. Six southwest VA counties produced almost 100 percent of the state’s total coal production with the contribution from Scott County negligible declined by 36% from 1990 to 2013.
This study assessed health outcomes determined by:

- health behaviors (30%),
- clinical care (20%),
- **social and economic factors** (40%),
- physical environment (10%)
All cause age-adjusted mortality rates for males and females in SW and SS VA plotted for each decade, 1960-2012 (95% CI)(VCOM, VDH, UPITT).

What went ‘right’ in Southside VA counties?
All cancer and respiratory cancer mortality rates for males and females in SW and SS VA plotted for each decade, 1960-2012 (95% CI)(VCOM, VDH, UPITT).
All heart disease mortality improvements

In rates for males and females in SW, Mt Rogers and SS VA plotted by decade from 1980-2012 (95% CI)(VCOM, VDH, UPITT).

<table>
<thead>
<tr>
<th>% Improved</th>
<th>Southwest</th>
<th>Southside</th>
<th>Mt. Rogers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>31</td>
<td>39</td>
<td>50</td>
</tr>
<tr>
<td>Female</td>
<td>28</td>
<td>33</td>
<td>31</td>
</tr>
</tbody>
</table>

Overall, good news all!
Diabetes trends in US, VA and Appalachian VA

US Adults (%) Diagnosed Diabetes, 1980–2011, CDC (change,~4-8%)

Adult(%) Diagnosed Diabetes, 1994 – 2011, CDC(change,~4-8%)

Appalachian VA 13.9%

Non-Appalachian VA 7.4%

Alyson Snyder, OMSIII, VCOM  Summer Research Award, 2012; AOF Nominee
Diabetes age-adjusted mortality rates for males and females in SW and SS VA plotted for each decade, 1960-2012 (95% CI) (VCOM, VDH, UPITT).

Confusing, and upward trends not encouraging!
<table>
<thead>
<tr>
<th>Distressed SES Areas</th>
<th>Southwest (N=8)</th>
<th>Mount Rogers (N=12)</th>
<th>Southside (N=12)</th>
<th>Eastern VA (N=12)</th>
<th>VA Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality</td>
<td>13.0 ± 0.1</td>
<td>12.9 ± 0.1</td>
<td>12.5 ± 0.2</td>
<td>12.2 ± 0.2</td>
<td>12.7</td>
</tr>
<tr>
<td>Water Violations % pop</td>
<td>9.1 ± 11.4</td>
<td>1.9 ± 2.1</td>
<td>14.7 ± 7.7</td>
<td>353 ± 945</td>
<td>2</td>
</tr>
<tr>
<td>Poor Mental Health Days</td>
<td>5.5 ± 1.2</td>
<td>4.4 ± 1.1</td>
<td>3.7 ± 0.6</td>
<td>3.44 ± 1.1</td>
<td>3.1</td>
</tr>
<tr>
<td>Mental Health Provider Ratio</td>
<td>1600.5 ± 1194.6</td>
<td>8075.3 ± 14221</td>
<td>3835.8 ± 3462.8</td>
<td>4694 ± 6137</td>
<td>724</td>
</tr>
<tr>
<td>Motor Vehicle Crashes Deaths</td>
<td>23.7 ± 5.1</td>
<td>19.1 ± 3.9</td>
<td>23.9 ± 9.4</td>
<td>22 ± 5</td>
<td>11</td>
</tr>
<tr>
<td>Deaths Due to Injury</td>
<td>110.7 ± 6.9</td>
<td>91.3 ± 13.5</td>
<td>73.6 ± 11.6</td>
<td>77 ± 15</td>
<td>52</td>
</tr>
</tbody>
</table>

Note: incomplete data and large standard deviations (means ± SD)
Reminder: Why do these higher rates of chronic health conditions persist in coal-dependent counties in VA?

Confirm higher rates of chronic conditions in coal counties of WV and VA
Cancer rates not declining in medically underserved communities; not meeting measureable goals to improve cancer death rates in VA.
Heart diseases, strokes declined, like national trends, but still higher than comparison area averages
Obesity, diabetes, smoking, higher in coal counties – highest among women
Chronic kidney diseases higher in Southside VA – ethnicity factor
Deaths due to injuries and mental illnesses higher in SW VA, and again, in women
VCOM EMR Review - Recent Findings

Electronic medical records from 6 facilities in southern VA, total reviews 1770

Systematic randomization from 2012, systematic randomization from adult inpatient admissions

Today, 480 record reviews from 1 facility in SW VA

Year of Birth – 1914 – 1993, No data on 2%
Gender – Male 45%, Female- 53%, No data on 2%
Occupation - Disabled – 30% Retired – 29% Unknown/Missing – 31%

Coal miners – 29%,
all but one male,
almost all retired, disabled, unknown
VCOM EMR Review - Recent Findings

Lifestyle behaviors, 30% of National Health Model
Record data on:
Physical Activity - 85% of records no data
Prescription and Illicit Drug Abuse – little data
Alcohol Use – some data
Tobacco Use in 59% or records
    Reported as “PPD” packs per day,
    also cigarettes per day, cans per day-
    reporting up to 5 PPD for 5, 15, 20 yrs
Chews – 27 records (0.56%) as cans per day
Reports of “Quit” – 65 records (0.14%)
VCOM EMR Review - Recent Findings

Other Lifestyle Factors – Blood pressure, CWP, mental illness, etc….

Example for today: Diet - 1 record with “diet”

With 160 records indicating diabetes

Body Mass Index (BMI) – in 86% records –

Range in BMI - 8.03 to 74.46

BMI  less than 20 = underweight 12%

20-25  = normal – 23%

25-30  = overweight 20%

greater than 30 = obese 25%,

with over 40 = 10%

No data 16%
Economic Measures in Health Disparity Areas

**Coal production** - units of measure were in thousands of short tons, reported annually for years 1990 to 2013

(Energy Information Agency 2014; VA Center for Coal and Energy Research 2014)

**Poverty** - percent of the population for all persons with a status below the poverty threshold of a given family size; Single member US household poverty threshold - $6,652 in 1990; $11,888 in 2013

(Appalachian Regional Commission 2014)

**Children in poverty** - percent of individuals 0 to 17 years of age, reported annually 1993 to 2013 (except, 1994, 1996)

(US Census Bureau 2014)

**Unemployment** percentage data were recorded annually for years from 1990 to 2013 and included persons who had no employment but were available for work and persons laid off regardless of whether they were seeking employment.

(US Bureau Labor Statistics 2014)
Percentage of households below poverty thresholds in Scott county, in coal producing counties in southwest VA and the state of VA aggregated by decade, from 1990-2000, then reported at five year averages from 2005 to 2012 (Appalachian Regional Commission, 2015).

**Poverty** - differences existed between the coal producing counties, Scott County, and the state of VA when controlling for coal production ($p = 0.007$); no change in poverty rates over time.

Northern VA has 5-6 of wealthiest counties in US.
Children in poverty 1993 - 2013

Percentage of children in poverty in Scott county, coal counties in southwest VA, and the state of VA reported annually for years 1993, 1995, 1997 to 2013. Children in poverty increased significantly over time \((p < 0.001)\). Regionally, rates were unaltered between the coal producing counties, Scott County, and the state of VA \((p = 0.5)\).
Percent of persons unemployed in Scott county, in coal producing counties in southwest VA, Scott County, and the state of VA annually from 1990 to 2013. Unemployment changed over time, with a significant interaction between Scott county, coal counties, and VA ($p = 0.0001$). Recall a 36% decline in VA coal production, 1990-2013.
Chart 10. Civilian unemployment rate
Seasonally adjusted, 1990–2016

January 2016
4.9 percent

Note: Shaded areas represent recessions as determined by the National Bureau of Economic Research (NBER). Data online at http://data.bls.gov/timeseries/LNS14000000.

Chart 17. Unemployment rates for persons 25 years and older by educational attainment
Seasonally adjusted, 1992–2016

Note: Shaded areas represent recessions as determined by the National Bureau of Economic Research (NBER). Data online at http://data.bls.gov/timeseries/LNS140276598&series_id=LNS140276608&series_id=LNS140276898&series_id=LNS14027662.

VA Department of Health Data

Age-adjusted Cardiovascular Death Rate, By Region

VA Department of Health Data

Suicide Rates, By Region

Suicide Rates per 100,000 Residents

Many attempts being made to diversify economic opportunities in the region.

Over the past 20 years coal production declined, and, graphically, poverty rates have not reflected proportional assumed changes upward by county. Statistically significant differences persisted over time between study areas.

Unemployment trended downward from 1990 to 2008; suggested a lesser-than-expected direct influence of the coal mining industry on the economy of the region in recent years, possibly, a lag time effect and short-term capacity to adjust/diversify.

The nation-wide rise in unemployment was reflected in the region with the 2008 recession, yet recovery in SW VA has not mirrored US improvements, possibly lacking capacity to ‘rebound’ due to deep job cuts.
Discussion of Economic and Health Factors

VA state data by health district indicates that over the past 10 years stark disparities in health status continue, highest in distressed SES areas vs Northern VA.

Statewide,
- cardiovascular conditions – going down, good news
- cancer – going down in most areas, yes going up in SES
- suicide – all rising and/or not improving

Implications that economic factors having a substantial impact on mining region of Southwest VA, consequently on health, consistent with the national model (30-40%).

Other factors, such as loss of high paying jobs, loss of health insurance benefits for retirees, etc. impact community health care access, ‘eco-stress’, and are difficult to assess, yet likely impacting mental health as well as chronic disease.
National Health Study

County Health Rankings & Roadmaps
Building a Culture of Health, County by County
A Robert Wood Johnson Foundation program

This study assessed health outcomes determined by:

- health behaviors (30%),
- clinical care (20%),
- social and economic factors (40%),
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Conclusion
VCOM’s D.O. Alums Concentrate in Appalachia

N = 1,352 alumni 2007-2014
11% practice in rural areas
22% practice in Appalachia
37% practice in underserved areas

VCOM-VA-ARIES student involvement
5 Publications
> 50 Posters/Presentations
> 420 students/yr data in lectures

VCOM Hospital Residency Program
collaborating in training in research in rural hospitals
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