

Down Comes the Mountain: Coal Mining and Health in Central Appalachia from 2000 to 2010

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Introduction

Appalachia has long been an unhealthy and economically poor region in the United States. Central Appalachia, i.e., eastern Kentucky and West Virginia, has higher rates of heart disease, cancer, particularly breast cancer, stroke, and chronic obstructive pulmonary disease (COPD) compared to the United States as a whole (Halverson, Ma , and Harner 2004). While previous research has focused on the lower socio-economic conditions of Appalachia, a growing body of literature is examining the relationship between coal mining and health (Hendryx 2013; Hendryx and Zulig 2011; Hendryx and Ahern 2009; Hendryx 2009). When socioeconomic status is controlled, health status remains significantly lower in coal-producing Appalachian counties compared to non-coal producing Appalachian counties (Hendryx and Ahern 2009; Hendryx 2013).

However, the previous studies examine one or two years at time, meaning there is a lack of analysis looking at this trend over time. Coal mining in Eastern Kentucky and West Virginia has steady been on the decline for the past decade (Estep and Cheves 2013). This paper seeks to examine the relationship between coal mining and health over time. I use the CDC's Behavioral Risk Factor Surveillance System survey for selected counties in Eastern Kentucky and West Virginia for each year between 2000 and 2010.

Data & Methods

The BRFSS is an annual survey of more than 350,000-500,000 adults aged 18 and older who are randomly selected in 50 (U.S.) states. Many states oversampled underrepresented populations, such as African Americans, poor people, and those who live in rural communities. Only respondent data from selected counties in Eastern Kentucky and West Virginia will be used for this analysis. All variables will be aggregated from individual to county level. These data contain variables measuring health status, health outcomes, socioeconomic and physiological measures. This paper will use the self-reported health as the key dependent measure, which will be averaged at the county level.

Covariate data along with the dependent measure (Self-reported health status) will be combined with U.S. Department of Energy's reported coal production measures on the county level. Coal data will be broken up into two different types of mining techniques. Traditional underground mining will be included in the model while Mountain Top Removal (MTR) coal mining will be also measured as a separate variable. MTR is a type of mining process that removes the tops of mountains to extract coal. This type of mining has been associated with significant health disparities (Hendryx 2013; Hendryx and Zulig 2011). Hendryx (2013) found that communities with MTR coal mining have significantly higher cancer, hypertension, COPD, more heart attacks, stroke and asthma than non-mining communities in Appalachia.

Many factors including personal, psychological, environmental, and social impact the health of individuals and whole communities that may not be observed in the available data. To address this potential unobserved heterogeneity, fixed effects regression models will be estimated. Fixed effects regression estimates the extent to which changes in coal production

within a given county affects changes in average health status within the same county. This regression technique allows for counties to be compared against themselves over time. In this sense, counties will control for other possible unobserved covariates by only measuring one county against itself. Successive waves of BRFSS data from 2000 to 2010 will be used in the fixed effects regression model.

Preliminary Analysis

An initial OLS linear regression of coal production on health status suggests a relationship between Mountain Top Removal coal production and health status. The initial analysis ran 2005 MTR coal production against 2010 health status. Suggesting that over a period of five years coal production impacted health status in selected counties in Central Appalachia. When covariates for socioeconomic factors and health behaviors are added the relationship remains statistically significant. This is consistent with what previous literature has found in regards to MTR significantly impacting health status in Appalachia (Hendryx 2013; Hendryx and Zulig 2011; Hendryx and Ahern 2009).

Mountain Top Removal coal production is a process of extracting coal that requires removing mountain tops to extract coal. The remaining rock and soil is then pushed into valleys and hollows where it overlays streams (i.e., valley fills) (Palmer, et al 2010; Hendryx 2011; Hendryx 2013). Nearly 4,000 kilometers of streams in central Appalachia have been covered with valley fills (Hendryx 2013). These sites are prone to flooding and have caused increased flooding in the region (Epstein, et al. 2011; Hendryx 2013). Rain pushes heavy metals (such as lead, mercury, zinc and arsenic) that are located in the valley fills to leak into streams and local water sources (Epstein, et al. 2011; Palmer, et al 2010). Exposures to contaminated water with

high levels of these heavy metals have been linked to adverse health outcomes such as cancers, cardiovascular disease and mental disorders (Hendryx 2009).

While this study is in the initial stages, the preliminary results show a possible relationship between coal mining and health status in Appalachia over time. However, this initial analysis is limited by the limited number of counties in the analysis (N=47). Missing data will be addressed by using a multiple imputation method. This will increase the number of counties in the full model.

This research is even more important now as policy makers, politicians and activists are seeking to make change in these communities. The approaches taken in this article to understand the relationship between coal mining and health is consistent with what previous researchers have done and hopes to add to the small, but growing body of literature addressing this topic.

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