2019

A Geographic Study of Lung and Bronchus Cancer Rates in Kentucky

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This is to certify that the doctoral study by

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Walden University
2019

Abstract

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CPH, Walden University, 2017

PBc, University of Cincinnati, 2016

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

The average age-adjusted incidence and mortality rates of lung and bronchus cancer is 55% and 56% higher in Kentucky than the national averages in the United States, respectively. Populations with low income and educational attainment, and those who live close to the mining regions across Kentucky are more affected by the high prevalence and resulting mortality rates of lung and bronchus cancer. This study was conducted because of the high incidence of lung and bronchus cancer and resulting mortality rates in the state of Kentucky that may not be caused solely by social and demographic factors. The theoretical foundation for this study was the social-ecological model (SEM). This quantitative cross-sectional study assessed whether the association between geographic factors and incidence, and mortality rate of lung and bronchus cancer is significant in Kentucky, controlling for social and demographic factors respectively. The sample size was $n = 960$. Bivariate analysis and ordinal regression were used to address the research questions. The outcome of the study revealed that populations that reside in rural zones are significantly ($p < .05$) more likely to be exposed to trace elements with less access to effective care, and higher mortality as compared to populations living in metropolitan and micropolitan zones. Healthy individuals promote healthy families, which in turn promote healthy communities. This could improve the local work force, investments, and development which could enhance self-esteem and social change in each county across Kentucky.

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Dedication

This dissertation is dedicated to my father, Njoh Gabriel, mother, Sophie Marie Mpondo, and ancestors for their support and unprecedented love throughout my life and putting in place strong foundation for my academic journey. My father did not live to see me get to this level in my academic endeavor which they truly predicted, but his spirit lived on with me in all that I do today and in the future through the blessing of God-Elohim.

Acknowledgments

I wish to express my appreciation to my former dissertation chair Dr. Amy Thompson and committee member Dr. Lee Caplan for their support at the beginning of my dissertation up to my prospectus approval and beyond. It was an important learning journey throughout this dissertation procedure, and I am thanking the new chair Dr. Sri Banerjee for allowing me to gain the required knowledge that I could never have had without his effort. My utmost thanks to my dissertation committee members, Dr. Vasileios Margaritis, and Dr. Patrick Tschida, for their remarks and positive feedbacks that have led to a successful completion of my dissertation. I would like to also, thank Dr. Tammy Root, and Dr. Nancy Rea for their dedicated attention to the accomplishment of my dissertation. Finally, I would also, like to thank Dr. Rao Marepalli for his unconditional support toward reaching this milestone.

To my sister, Mandjongui Njoh Nadege Suzanne, and my brothers Njoh Guillaume, Tankong Njoh Diallo, Alexandre Njoh Meko, Gabriel Njoh, and Landrian Njoh Mbella, I thank every single one of you for your comprehension of my tenacity and your support during those past years of my academic journey. I also want to thank every single friend who has been part of my life for their supports. Thus, I do have a great appreciation for your dedication of support during the challenging times during my study. I may have never reached this finish line without your understanding and ultimate support.

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Section 1: Foundation of the study and Literature Review

Introduction

Lung cancer is the major contributor to the high cancer incidence and mortality rates in Kentucky (North American Association of Central Cancer Registries [NAACCR], 2016). In the United States of America, lung cancer accounts for 14% of all new cancer cases and 18% of all cancer deaths, while the percentages in Kentucky are twice as high, being 28% and 36%, respectively (NAACCR, 2016). It is important to determine whether geographic factors were responsible for such high rates, in addition to social and demographic factors (American Cancer Society [ACS], 2018; Jay et al., 2011). According to Jay et al (2011) and NAACCR (2016), the results of my assessment may increase the awareness of populations living in each county across Kentucky of the potential risk factors and promote healthy environments and behavior of populations, thereby reducing the incidence and mortality rates caused by lung and bronchus cancer in the state of Kentucky.

Problem Statement

The National Cancer Institute (The National Cancer Institute [NCI], 2019a) reported that the average age-adjusted (to the standard population of the United States) incidence and mortality rates of lung and bronchus cancer are higher in Kentucky than the national average. According to the data of 2015, the average age-adjusted mortality rate (cases per 100,000 population per year) of lung and bronchus cancer is 93.5 in Kentucky compared to the age-adjusted national average mortality rate of 60.2 (NCI, 2019a; Centers for Disease Control and Prevention [CDC], 2019; NCI, 2019b). Furthermore, the average age-adjusted mortality rate (cases per 100,000 population per year) of lung and bronchus cancer is 67.7 in Kentucky compared to the national average, age-adjusted mortality rate of 43.4 (CDC, 2019; NCI, 2019a; NCI, 2019b). The National Cancer Institute (NCI, 2019a) Also, reported that the risk factors associated with the high incidence and resulting mortality of lung and bronchus cancer in Kentucky compared to the rest of the United States include tobacco, high-fat diet, and lack of exercise (CDC, 2019; NCI, 2019b; Office of Disease Prevention and Health Promotion [ODPHP], 2019).

The use of tobacco and the lack of proper diet and exercise are not the sole contributors to the high incidence and mortality rates of lung and bronchus cancer in the state of Kentucky (Kentucky Demographics, 2017; Jay, Huang, Rinehart, & Hopenhayn, 2011). Environmental exposures related to the coal-mining industry may contribute to the high mortality of lung cancer in southeastern Kentucky (Jay et al., 2011). The lack of evidence for this effect in western Kentucky and other regions of the rest of the United States could be due to regional differences in mining practices (Jay et al., 2011; GeoDa Center for Geographic Analysis and Computation, n. d.; Georgia et al., 2015). There is a need to examine the main effects of geographic factors (population size for each county, counties clustered by geographic regions, types, and areas) and the confounding effects of social elements (prevalence of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, and adult obesity) and demographic elements (median household income per county, education attainment in each county, gender, and age distribution), and the incidence and mortality rates of lung and bronchus cancer in Kentucky (American FactFinder, 2018; GeoDa Center for Geographic Analysis and Computation, n. d.).

It is well-known that lung cancer is related to smoking. Especially in the Appalachian area of the state of Kentucky there are higher rates of smoking (NAACCR, 2016). However, there are several recent studies that provided strong evidence that the high rates are not accounted for by smoking alone (NAACCR, 2016; American Cancer Society [ACS], 2018; Jay et al., 2011; the Community Research Collaborative Blog [CRCB], 2018).

The coal mining industry contributes to lung cancer risk in Appalachia, which is located in the southeastern portion of the state and has some of the highest lung cancer rates in the nation (Jay, Huang, Rinehart, & Hopenhayn, 2011). According to the NAACCR (2016) report, poverty and low educational attainment are Also, contributors to the high incidence and mortality rates of lung and bronchus cancer in Kentucky, especially in the Appalachian area of the state.

According to Gerstman (2015) and Xiaoping, Limin, and Li (2017), this study is needed because it assessed the relationship between geographic factors and the excessively high lung and bronchus cancer rates in Kentucky, while controlling for the effects of social and demographic factors. The research communities and the residents of Kentucky may support policies aimed at decreasing the incidence and mortality rates of lung and bronchus cancer according to NCI (2019a) illustration. Per Wagner (2016a) and

Gerstman (2015), this study is unique because multivariate analysis was used to assess the confounding nature of social, and demographic factors on the correlation between geographic factors, and lung and bronchus cancer rates.

The high prevalence of lung and bronchus cancer exists in the Appalachian region of Kentucky per NCI (2019a); NAACCR (2016) elaborations. According to the NAACCR (2016); Unrine et al (2019) illustrations, people living in the Appalachian area of Kentucky have elevated levels of arsenic, magnesium, mercury, selenium, and chromium, all of which are known lung cancer carcinogens. The excessively high lung cancer incidence and mortality rates may be due to higher rates of smoking in combination with exposure to these other carcinogens according to NAACCR (2016) denotation.

Education attainment and social economic status of populations have an impact on the variation observed in the incidence and mortality rates of lung and bronchus cancer, according to NCI (2019a); NAACCR (2016) elaborations. Lung, and bronchus cancer rates are higher in the less educated and more impoverished population of every state, including Kentucky per Islami et al (2015); NAACCR (2016) illustrations. There is an association between levels of trace elements such as arsenic, chromium, magnesium, mercury, and selenium, and lung and bronchus cancer in the environment of residence of some geographic regions in Kentucky (Rembert et al., 2017). In this study, per Rembert et al (2017); Jay, Huang, Rinehart, and Hopenhayn (2011), I examined these associations to determine if the differences between areas of Kentucky in lung and bronchial cancer rates are associated with geographic variation of counties in the state of Kentucky.

Purpose of the study

According to ACS (2018) and CRCB (2018), I conducted this study to examine high incidence and mortality rates of lung and bronchus cancer in the state of Kentucky that may not be caused solely by social and demographic factors. The high incidence and mortality rates may Also, be related to the change in geographic locations, which are counties clustered by geographic regions, types, and areas according to NCI (2018). To put this issue in context, if a person smokes, their risk of lung cancer is 11 to 14 times that of a non-smoker. However, if a person smokes and is Also, exposed to these carcinogens, their risk of lung cancer can be 300 times that of a non-smoker per NAACCR (2016) illustration.

Research Questions and Hypotheses

Research Questions

To examine effectively the influences of the confounding social and demographic elements on the correlation between geographic factors and the high mortality (most recent average age-adjusted new cases per 100,000 populations, 2011–2015) and mortality (most recent average age-adjusted deaths per 100,000 populations, 2011–2015) rates of lung and bronchus cancer in Kentucky, I formulated the following research questions:

Research Question 1 (RQ1): Is there a significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age?

Null hypothesis ($H_0$1): There is no significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age.

Alternative Hypothesis (H_a1): There is a significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age.

Research Question 2 (RQ2): Is there a significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age?

Null Hypothesis ($H_0$2): There is no significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age.

Alternative Hypothesis (H_a2): There is a significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age.

Theoretical Foundation for the Study

The theoretical framework for this study was the social, ecological system model (Hawkins, Cole, & Law, 2009). I used the theory at the individual, family, community, and societal levels to assess risk factors (for example an individual’s exposure to arsenic, chromium, magnesium, mercury, asbestos, and selenium from a nearby mining area) for lung and bronchus cancer in Kentucky according to Hawkins, Cole, and Law (2009) illustrations. I used this theory to determine the main geographic factors, by identifying regions with a high incidence and mortality rates of lung and bronchus cancer, such as the Appalachian region in Kentucky per Hawkins, Cole, and Law, (2009); NAACCR (2016) elaborations. Smoking undoubtedly contributes more than any other factor to the high rates of lung cancer found throughout the state. This contribution is especially true in Appalachian Kentucky, where smoking prevalence is higher and a larger percentage of people smoke more than a pack a day than in the rest of the state (Jay et al., 2011; Schoenberg, Huang, Seshadri, & Tucker, 2015). Women and men from Appalachian Kentucky smoke cigarettes at rates of 1.8 times and 1.6 times higher, respectively, than their national counterparts (Schoenberg et al., 2015). Besides the tobacco use, however, several occupational and/or environmental exposures might contribute to higher lung cancer rates (Rembert et al., 2017; NAACCR, 2016; ACS, 2018). For example, a large proportion of residents in the Appalachian region rely on private wells for drinking water, which might put them at risk of exposure to trace elements from natural or man-made sources (e.g., Arsenic, chromium, and nickel), which are known or suspected lung carcinogens (Jay et al., 2011; Rembert et al., 2017; NAACCR, 2016). Furthermore, workers in the extensive mining industry are likely exposed to coal and silica dusts, which have been linked to a variety of lung diseases in Kentucky (Jay et al., 2011). Radiation may have Also, contributed to lung cancer mortality in Kentucky (Jay et al., 2011).

I used the social, ecological system model to examine possible risk factors at the individual, family, and community levels that may have contributed to the high incidence and mortality rates of lung and bronchus cancer in Kentucky, according to Barry and Honoré (2009); Glanz, Rimer, and Viswanath (2015) notations. The theory focuses on both population-level and individual-level determinants of health and interventions where health was determined by influences at multiple levels, such as public policy, community, institutional, interpersonal, and intrapersonal factors (Glanz, Rimer, & Viswanath, 2015; Hawkins, Cole, & Law, 2009). The social, ecological model (SEM) considers the complex interplay between individual, family, community, and societal factors (Centers for Disease Control and Prevention [CDC], 2018). I used the SEM to understand the range of factors that put people at risk of exposures to environmental pollutants such as second-hand smoke, arsenic, chromium, magnesium, mercury, and selenium during windows of developmental vulnerability in their life in Kentucky according to CDC (2018) elaboration. I identified biological and personal history factors that increase the likelihood of being exposed to environmental pollutants in counties across Kentucky (CDC, 2018; NAACCR, 2016). I examined close relationships that may have increased exposures to environmental contaminants in geographic locations in Kentucky (CDC, 2018). I explored the settings, such as schools, workplaces, and neighborhoods, in which social relationships occur and seeks to identify the characteristics of these settings associated with becoming exposed to environmental pollutants in communities across Kentucky (CDC, 2018; NAACCR, 2016). Finally, I looked at the broader societal factors that help create a climate in which exposures to environmental contaminants are encouraged or inhibited in areas across Kentucky (CDC, 2018). Thus, population's exposure to environmental chemicals may lead to the high incidence and mortality rates of lung and bronchus cancer observed across regions of Kentucky (CDC, 2018; Suk et al., 2016)

According to Barry and Honoré (2009), based on the secondary data and existing information I applied the social and ecological theory to examine whether individuals were unable to seek for counseling to increase knowledge that addresses exposure to risk factors and their associations to lung and bronchial cancer. Per Hawkins, Cole, and Law (2009); Barry and Honoré (2009), I Also, applied the theory to assess whether the lack of families' activities that limit exposure to risk factors may have contributed to such elevated lung and bronchus cancer rates in Kentucky. Finally, per Glanz, Rimer, and Viswanath (2015), I applied the theory to examine if the lack of policies to protect communities from risk factors and enhance community-based participatory seminars and campaigns may have Also, contributed to such high incidence and mortality rates of lung and bronchus cancer in the state of Kentucky.

Nature of the study

According to GeoDa Center for Geographic Analysis and Computation (n.d.), this study was a quantitative, nonexperimental, cross-sectional study that I completed to determine and assess the social and demographic factors that may have had confounded the relationship between geographic factors and the high incidence and mortality rates in the state of Kentucky. Per Hawkins, Cole, and Law (2009), the aim of defining the confounding variables through the use of the SEM approach could perhaps help assess their influence on lung and bronchus cancer at the individual, family, community, and societal levels in every county across Kentucky efficiently. The populations of interest were those that live in the Appalachian areas and other areas with high incidence and mortality rates of lung and bronchus cancer among regions across Kentucky according to NAACCR (2016) illustration. According to the DataUSA (2018); Hawkins, Cole, and Law (2009), I provided health information that may benefit those communities and perhaps reduce the high incidence and mortality rates of lung and bronchus cancer in high risk areas across Kentucky.

According to Rothwell et al (2010); Suk et al (2016), I proposed the use of the SEM's constructs elaborated in the theoretical foundation section to organize Community-Based Participatory Activities (CBPA) where individuals and families living in communities across Kentucky were mobilized and advised on geographic variables, potential risk factors, and the adverse side effects of exposure to those environmental pollutants such as arsenic, chromium, magnesium, mercury, and selenium. According to the CDC (2018); The Office of Disease Prevention and Health Promotion (n.d.), policymakers may be able use the findings of the study to propose bi-weekly seminars through city council monthly meetings where individuals and families living in Kentucky were advised to identify biological and environmental risk factors, and personal history that may increase the likelihood of being exposed to environmental pollutants. Per the

Office of Disease Prevention and Health Promotion (n.d.); CDC (2018), during these meetings I assessed interpersonal interactions such as social professional meetings that may increase exposures to environmental chemicals at the individuals, and families' levels in communities across Kentucky. According to the CDC (2018) and the Office of Disease Prevention and Health Promotion (n.d.), community leaders, like city councilmen across Kentucky, may have an opportunity to establish guidelines in schools, workplaces, and neighborhoods in which social interaction occurs and look to identify the characteristics of these settings with respect to becoming exposed to environmental toxins. Per the CDC (2018), and the Office of Disease Prevention and Health Promotion (n.d.), I suggested to government personnel across Kentucky to make laws that look at the broad societal factors that assist in creating an atmosphere in which exposures to environmental pollutants are inhibited or encouraged. Finally, according to Rembert et al (2017); Hawkins, Cole, and Law (2009), the outcomes of the study may Also, increase awareness of the health benefits of not smoking, a healthy diet, exercising, and non-exposure to harmful trace elements such as arsenic, chromium, magnesium, mercury, and selenium from the geographic locations where populations reside in Kentucky.

Literature Review Strategy

I used the Walden University Library, Google Scholar, EBSCO, ProQuest, and Google to search for literatures necessary to support my thesis' topic. I used the Walden University Library and an EBSCO search for recent journals and articles to find related studies on lung and bronchus cancer and geography, spatial study, and SEM. I conducted similar searches using EBSCO again for geography, and lung and bronchus cancer in Kentucky, and geospatial study, geographic disparities and lung cancer. Furthermore, I used ProQuest to search for recent theses and dissertations from prior graduate students on lung and bronchus cancer, related risk factors, and vulnerable populations. I used Google and Google Scholar to search additional themes, including geospatial analysis, lung and bronchus cancer risk, and distance analysis.

According to Walden University Center for Research Quality (ND); Laureate Education (2008), the key terms I used to conduct the literature search included SEM, geospatial analysis, cancer risks, lung and bronchus cancer community-based response, spatial analysis, trace elements, Hawkins ecological system approach, education attainment and lung and bronchus cancer, multiple regression analysis, and geographic analysis and computation on Kentucky.

Background

According to the GeoDa Center for Geographic Analysis and Computation (N.d.), the development of state-of-the-art methods for geographic analysis; their implementation through open software tools; their application to policy-relevant research in the social sciences; and their dissemination through education support a growing community of over 270, 000 spatial analyst. According to the GeoDa Center for Geographic Analysis and Computation (N.d.), I included the examination of individual spatial behavior, the study’ principal investigator of urban sprawl and neighborhood dynamics, and the analysis of regional and international economic growth and convergence patterns.

The use of computational analysis of geographic information, social, and demographic data is an approach that can address my study topic adequately. For example, the School of Geographical Sciences and Urban Planning at Arizona State University is home to leading scholars in the areas of spatial and space-time data analysis, geographic information science, remote sensing, cyberinfrastructure, economic systems, transportation systems, and urban and regional science (GeoDa Center for Geographic Analysis and Computation, N.d.). Its faculty is unified by a common theme of computational spatial science and provides expertise in the development, implementation, and application of state-of-the-art methods of geospatial analysis to social, economic and environmental problems where the roles of place, space and interaction are central (GeoDa Center for Geographic Analysis and Computation, N.d.).

Radon is a leading cause of lung cancer. A recent study assessed the feasibility and success of radon tests to promote radon testing in rural and urban communities (Hahn, Rayens, Kercsmar, Robertson, & Adkins, 2014). During the prospective, quasi-experimental research of Radon study, the study' principal investigator tested a novel contest to raise radon awareness through paid media-recruited homeowners who received a free radon test kit and were eligible to win free home mitigation according to Hahn et al (2014) illustration. Urban homeowners with the five highest radon levels and rural participants with the three highest won free radon mitigation systems (Hahn et al., 2014).

Cross-sectional surveys were completed via internet or phone at enrollment. The study' principal investigator found that most returned radon test kits were 71% urban; 86% rural. Participation was more prevalent in the rural locations, most likely due to longer media recruitment (6 weeks vs. 11 days) and more money spent on media advertising ($1.86 vs. $0.21 per eligible household). The contest attracted 102 per 10, 000 households to test for radon in the rural area compared to 19 per 10, 000 households in urban counties (Hahn et al., 2014).

Therefore, communities exposed to Radon are subject to the high incidence rate and resulting mortality rate of lung and bronchus cancer. Thus, the promotion of health care access in those affected populations may reduce the high incidence rate and resulting mortality rate of lung and bronchus cancer in the state of Kentucky.

Access to cancer care can provide insight into disparities in lung cancer related mortality. During a recent study, the principal investigator examined recent trends in utilization of antineoplastic drugs, particularly the use of targeted therapies for treatment of cancer, by geographic region in Taiwan (northern, midwestern, southern, and eastern regions and the outer islands; Hsu, Chang, & Lu, 2017). This was a retrospective observational study of antineoplastic agents using 2009 – 2012 quarterly claims data from Taiwan's National Health Insurance Research Database (Hsu, Chang, & Lu, 2017). Yearly market shares from 2009 to 2012 such as the number of prescriptions for targeted therapies (TTs), number of prescriptions for all antineoplastic agents; the students' principal investigator estimated market share by prescription volume, and cost of TT by prescription volume and costs for targeted therapies among total antineoplastic agents by region (Hsu, Chang, & Lu, 2017). The study' principal investigator used multivariate regression and ANOVA to examine variations in utilization of targeted therapies between geographic regions and used ARIMA (Autoregressive integrated moving average) models to estimate longitudinal trends (Hsu, Chang, & Lu, 2017). Population-adjusted usage and costs of antineoplastic drugs (including targeted therapies) were highest in the southern region of Taiwan and lowest in the outer islands. The study' principal investigator found a 4-fold difference in the use of antineoplastic drugs and a 49-fold difference in the use of targeted therapies between regions when the outer islands were included (Hsu, Chang, & Lu, 2017). There were minimal differences in the use of antineoplastic drugs between the northern and eastern regions with about a 2-fold difference in the use of targeted therapies. Without considering the outer islands, the market share by prescription volume and costs of targeted therapies increased almost 2-food (1.84 to 1.90) and 1.5-fold (1.26 to 1.61), respectively between 2009 and 2012 (Hsu, Chang, & Lu, 2017). Furthermore, the region was not significantly associated with the use of antineoplastic agents or use of targeted therapies after adjusting for confounders (Hsu, Chang, & Lu, 2017). The region was associated with the costs of antineoplastic agents, but it was not associated with costs of targeted therapies after adjustment for confounders (Hsu, Chang, & Lu, 2017). The study' principal investigator found that the use of antineoplastic drugs overall and use of targeted therapies for treatment of cancer varied somewhat between regions in Taiwan; the use was notably lower in the outer islands (Hsu, Chang, & Lu, 2017). Strategies might be needed to ensure access to cancer care in each region as the economic burden of the cancer care increases due to growing use of targeted therapies (Hsu, Chang, & Lu, 2017).

The leading cause of cancer death in the United States of America varies substantially by the level of education at the national level, but this has not been previously analyzed by states (Islami et al., 2015). The examination of age-standardized lung cancer death rates by educational attainment and race/ethnicity in men and women (aged 25 to 64 years) was conducted in the United States of America in 2008 to 2010. The estimation of the proportion of potentially avoidable premature lung cancer deaths for each state was reduced to those achieved among more educated non-Hispanic whites in five states with lower lung cancer rates, using data on 134,869 lung cancer deaths (Islami et al., 2015). Age-standardized lung cancer mortality rates differed substantially by state and education level (Islami et al., 2015). Among non-Hispanic White men, for example, rates per 100,000 ranged from below six in more educated men (≥16 years of education) in Utah, Colorado, and Montana to >75 in less educated men (≤12 years of education) in Mississippi, Oklahoma, and Kentucky (Islami et al., 2015). An estimated 73 % of lung cancer deaths in the USA (32,700 deaths annually in 25 to 64 year–old individuals alone) was be prevented if appropriate policies that enhance education about lung cancer was be implemented in communities across those states (Islami et al., 2015). The outcome of the study' principal investigator gave a proportion of ≥85 % among men in Arkansas, Alabama, Kentucky, and Mississippi, and ≥80 % among women in West

Virginia and Kentucky. Most premature lung cancer deaths in the United States of America are potentially avoidable (Islami et al., 2015). The fact that most of these deaths can be attributed to smoking underscores the importance of increasing tobacco control measures in high-risk states and targeting tobacco control interventions in the less educated populations in all states (Islami et al., 2015).

The calculation of a spatial scans statistic, which is an estimation method to identify areas with lung cancer mortality rates that are higher than expected, after adjusting for age, gender, and smoking, was conducted by the study' principal investigator in 2011 (Jay, Huang, Rinehart, & Hopenhayn, 2011). The study' principal investigator examined geographic patterns of lung cancer mortality in Kentucky (Jay et al., 2011). The principal investigator of a recent research has suggested that the coal-mining industry contributes to lung cancer risk in Appalachia. The study' principal investigator focused on the southeastern portion of the state, which has some of the highest lung cancer rates in the nation (Jay et al., 2011). The Kentucky Cancer Registry supplied information on cases (1995 to 2007). The U.S. Census (2000) and several years of Behavioral Risk Factor Surveillance System data (1996 to 2006) provided county-level population and smoking data (Jay et al., 2011). The study' principal investigator compared the results with coal-mining data from the Mining Safety and Health Administration and public water utility data from the Kentucky Division of Water (Jay et al., 2011). Three clusters of counties with higher-than-expected rates were identified. Cluster 1 (relative risk [RR] = 1.21, $p<0.01$) included 12 counties in southeastern

Kentucky. Cluster 2 (RR=1.17, $p<0.01$) included three nearby counties in the same region (Jay et al., 2011). Several of the 15 counties in Cluster 3 (RR=1.04, $p=0.01$) were part of the Louisville, Kentucky, or Cincinnati, Ohio, metropolitan areas. All of the counties in Clusters 1 and 2 produced significant amounts of coal (Jay et al., 2011). The study' principal investigator found that environmental exposures related to the coal-mining industry could contribute to the high mortality of lung cancer in southeastern Kentucky (Jay et al., 2011). Lack of evidence for this effect in western Kentucky could be due to regional differences in mining practices and access to public water utilities. Future research should collect biological specimens and environmental samples to test for the presence of trace elements and other lung carcinogens (Jay et al., 2011).

According to More about KY-NDNP (2018), the six geographic regions of Kentucky, which are Pennyrile, Bluegrass, Jackson Purchase, Eastern Mountain Coal Fields, Eastern Coal Fields, and Knobs Arc, Ire examined. Per More about KY-NDNP (2018), these regions on the map represent clustered counties in Kentucky by geographic regional proximities to one another.

According to the National Cancer Institute (NCI, 2019a), the characterization of the cancer burden was reviewed using a standardized approach to motivate action, integrate surveillance into cancer control planning, characterize areas and demographic groups, and expose health disparities. Per the NCI (2018a), the focus was on cancer sites with evidence-based control interventions and interactive graphics and maps provided to support decisions where to focus cancer control efforts.

According to the North American Association of Central Cancer Registries (NAACCR, 2016), the reduction of the cancer burden in populations marked by high rates of poverty and low educational attainment can be very challenging. Per the NAACCR (2016), the study on cancer kills Kentuckians at the highest rate found that in one of the Kentucky Appalachian counties, more than 42% of the population is living below the federal poverty level. According to NAACCR (2016), In the U.S. more than 85% of the population over age 25 have a high school degree. In some counties in the Appalachian region of Kentucky, just over half of the population has a high school degree. Consistent with the association between these measures and increased risk behaviors, the Appalachian region of Kentucky has higher rates of smoking and extraordinarily high rates of lung cancer incidence and resulting mortality (NAACCR, 2016). However, principal investigators from several recent studies provided strong evidence that the high rates of lung cancer are not accounted for by smoking alone, and that the excessively high lung cancer mortality rates might be due to the higher rates of smoking in combination with exposure to arsenic and chromium according to NAACCR (2016) elaboration.

Research on trace elements and the effects of their ingestion on human health is often seen in scientific literatures per Rembert et al (2017) illustration. However, little research has been done on the distribution of trace elements in the environment and their impact on health according to Rembert et al (2017) denotation. The study' principal investigator examines what characteristics among participants in the Reasons for Geographic and Racial Differences in Stroke (REGARDS) study are associated with levels of environmental exposure to arsenic, magnesium, mercury, and selenium according to Rembert et al (2017) elaboration. Demographic information from REGARDS participants was combined with trace element concentration data from the US Geochemical Survey (USGS). Each trace element was characterized as either low (magnesium and selenium) or high (arsenic and mercury) exposure per Rembert et al (2017) illustration. Associations between demographic characteristics and trace element concentrations were analyzed with unadjusted and adjusted logistic regression models per Rembert et al (2017) illustration. Individuals who resided in the Stroke Belt had lower odds of high exposure (4th quartile) to arsenic (OR 0.33, CI 0.31, 0.35) and increased exposure to mercury (OR 0.65, CI 0.62, 0.70) than those living outside of these areas, while the odds of low exposure to trace element concentrations were increased for magnesium (OR 5.48, CI 5.05, 5.95) and selenium (OR 2.37, CI 2.22, 2.54) according to Rembert et al (2017) elaboration. The study' principal investigator found an association between levels of trace elements in the environment and geographic region of residence, among other factors per Rembert et al (2017) explanation. According to Rembert et al (2017), future studies are needed to further examine this association and determine whether or not these differences may be related to geographic variation in disease.

An examination on how Kentucky's metropolitan (urban) counties compare to micropolitan (sub-urban) and rural areas of the Commonwealth was Also, conducted (The Community Research Collaborative Blog, 2018). The analysis included comparisons for several key demographic variables, including population growth, racial characteristics, educational attainment levels and poverty rates of the residents of each area (The Community Research Collaborative Blog, 2018). The study' principal investigator found that the trends of social and economic development across Kentucky demonstrated racial, education attainment, and poverty inequity (The Community Research Collaborative Blog, 2018). The rural areas in general were growing slowly and had higher rates of poverty and lower rates of educational attainment than the urban areas. (The Community Research Collaborative Blog, 2018). The micropolitan areas of the state had trends between those of the rural and metropolitan counties (The Community Research Collaborative Blog, 2018). As part of the decennial Census, the U.S. Census Bureau published population counts for all metropolitan and micropolitan statistical areas (The Community Research Collaborative Blog, 2018). A metro area contains a core urban area of 50,000 or more people, and a micro area contains an urban core of at least 10,000 (but less than 50,000) people (The Community Research Collaborative Blog, 2018). Each metro or micro area consists of one or more counties and includes the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core (The Community Research Collaborative Blog, 2018). Each county in Kentucky is categorized as a metropolitan, micropolitan or rural county. Counties are designated as rural if they are not part of a metropolitan or micropolitan area as defined by the U.S (The Community Research Collaborative Blog, 2018) Office of Management and Budget (OMB). In 2010, of Kentucky's 120 counties, 35 were metropolitan counties, 26 were micropolitan counties and the remaining 59 were rural counties (The Community Research Collaborative Blog, 2018). Although nearly half of Kentucky's counties are rural, the rural population in 2010 accounted for just 23.3% of the Commonwealth's total population (The Community Research Collaborative Blog, 2018).

The southern region of the United States, particularly central and southern Appalachia, has long been identified as an area of health inequities (Schoenberg, Huang, Seshadri, & Tucker, 2015). An updated and more complete understanding of the association among the leading risk factors for such health inequities allows researchers, clinicians, and policymakers to focus their efforts on the most effective strategies to minimize these risks (Schoenberg et al., 2015). The study' principal investigator illustrated that women and men from Appalachian Kentucky smoked cigarettes at rates 1.8 times and 1.6 times higher, respectively, than their national counterparts (Schoenberg et al., 2015). Although rates of smoking in Appalachian Kentucky, non-Appalachian Kentucky, and the United States have decreased, such decreases among Appalachian Kentucky women have been minimal (Schoenberg et al., 2015). Adding to these concerning trends, obesity rates in Appalachian adults are much higher than in non-

Appalachian Kentucky or the United States overall, although Appalachian Kentucky smokers are less likely to be obese than nonsmokers (Schoenberg et al., 2015). Low socioeconomic status and impeded access to health care, including education attainment, characterize the Appalachian communities in which these risk behaviors occur and likely account for the prevalence of these most risky behaviors that may contribute to the high incidence and mortality rates of lung and bronchus cancer in Kentucky (Schoenberg et al., 2015).

The current study is using community health information on Kentucky through county health data to solve the research problem (County Health Rankings & Roadmaps, 2019). I layout health factors and outcomes such as prevalence of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, income inequality, preventable hospital stays, adult smoking, and adult obesity in each of the 120 counties of the state of Kentucky according to the County Health Rankings and Roadmaps (2019) illustration. The study' principal investigator developed logical pathways that explain how effective policies and programs can control health factors and improve health outcomes. For example, policies and programs that promote a healthy environment and living conditions may reduce the incidence and mortality rates of lung and bronchus cancer in Kentucky (County Health Rankings & Roadmaps, 2019).

Literature Review related to key variables and/or concepts

The examination of recent research on geographic patterns of the incidence and resulting mortality of lung and bronchus cancer in Kentucky suggested that the coal-mining industry contributes to lung cancer risk in Appalachia (Jay, Huang, Rinehart, & Hopenhayn, 2011). The study' principal investigator focused on the southeastern portion of the state, which has some of the highest lung cancer rates in the nation (Jay et al., 2011). Appalachian Kentucky (App KY) leads the nation in lung cancer incidence and resulting mortality. Trace elements such as Arsenic (As) have been associated with lung cancers in other regions of the country, and the Unrine et al. (2019) demonstrated that a population-based study was reveal higher trace element concentrations in App KY individuals with cancer compared to controls (Unrine et al., 2019). Using toenail and drinking water trace element samples, the study' principal investigator investigated a possible association between lung cancer mortality and trace-element exposure in residents of this region according to Unrine et al (2019) denotation. This population-based, case-control study had 520 subjects, and 367 subjects provided toenail samples. Additionally, the study' principal investigator explored the relationship between toenail and fingernail trace-element concentrations to determine if fingernails could be used as a surrogate for toenails when patients are unable to provide toenail samples (Unrine et al., 2019). The study' principal investigator found that, contrary to the initial hypothesis, trace element concentrations Aluminum(Al), As, Chromium(Cr), Manganese(Mn), Cobalt(Co), Iron(Fe), Nickel(Ni), Copper(Cu), Selenium(Se), and Lead(Pb)) were not higher in cancer cases than controls, with the exception of Zinc(Zn) where concentrations were slightly higher in cases (Unrine et al., 2019). In fact, univariate logistic regression models showed that individuals with lower concentration of several elements (Al, Mn, Cr, and Se) were more likely to have lung cancer, although only Mn was significant in multivariate models which controlled for confounding social and demographic factors (Unrine et al., 2019). While drinking water concentrations of Al, Cr and Co were positively related to cancer mortality in univariate models, only Co remained significant in multivariate models (Unrine et al., 2019). However, since the drinking water concentrations were extremely low and not reflected in the toenail concentrations, the significance of this finding is unclear (Unrine et al., 2019). The study' principal investigator Also, found that fingernail concentrations were not consistently predictive of toenail concentrations, indicating that fingernails should not be used as surrogates for toenails in future studies (Unrine et al., 2019; Jay et al., 2011).

Definitions

Main Concept

Kentucky has the highest incidence and mortality rates of lung and bronchus cancer than other states in the United States (National Cancer Institute, 2019a). Social and demographic factors are health determinants of lung and bronchus cancer in the United States and around the world (National Cancer Institute, 2019a, National Cancer Institute, 2019b). For example, smoking, education attainment, and median household income were found to be considerable contributors to the variations observed on the incidence and mortality rates of lung and bronchus cancer in the United States and across the globe (National Cancer Institute, 2019b; NAACCR, 2016; Schoenberg et al., 2015). So, knowing that social and demographic factors influence the incidence and mortality rates of lung and bronchus cancer in the United Sates and across the world, it is believed that social and demographic factors may not be the sole contributors to the high incidence and mortality rates of lung and bronchus cancer observed in the state of Kentucky (NAACCR, 2016; Unrine et al., 2019; Schoenberg et al., 2015).

Unique Concept

The high incidence and mortality rates of lung and bronchus cancer cannot be solely associated with social and demographic factors, but Also, to geographic factors per NAACCR (2016) illustration. Thus, regional variation (different regions) may be most responsible for the high average age-adjusted incidence and mortality rates of lung and bronchus cancer observed in the state of Kentucky according to Unrine et al (2019); Jay, Huang, Rinehart, and Hopenhayn (2011) elaboration. Therefore, the study' principal investigator assessed the effect of geographic factors on the variation observed in the incidence and mortality rates of lung and bronchus cancer in Kentucky, controlling for social, and demographic factors Unrine et al (2019); NAACCR (2016) elaboration.

Assumptions

Since I was using secondary data, I am assuming that these data are adequate and reliable for the study. So, it is believed that the high incidence and mortality rates of lung and bronchus cancer in the southeast of Kentucky compared to the center and western areas of Kentucky are due to regional differences in mining practices and access to public water utilities per Jay, Huang, Rinehart, and Hopenhayn (2011) illustration. Research has shown that regional differences in mining enterprises may be a big contributor to the high incidence and mortality rates of lung and bronchus cancer in the Appalachian region per Jay, Huang, Rinehart, and Hopenhayn (2011) elaboration. However, previous research has not been able to demonstrate how such high rates are Also, associated with access to public water utilities Jay, Huang, Rinehart, and Hopenhayn (2011) denotation. So future research is needed to collect biological specimens and environmental samples to test for the presence of trace elements and other lung carcinogens in water Jay, Huang, Rinehart, and Hopenhayn (2011) elaboration. The purpose of the study was to assess the confounding effect of social and demographic factors on the association between geographic factors and the incidence and mortality rates of lung and bronchus cancer in the state of Kentucky per Jay, Huang, Rinehart, and Hopenhayn (2011) illustrations.

Scope and Delimitations

The research can only be generalized to communities across all parts of Kentucky (120 counties) as the data retrieved pertain to the state of Kentucky according to National Cancer Institute (2019a) illustration. Meanwhile, the study can serve as the impetus to conduct similar research in different areas across the United States and the globe National Cancer Institute, 2019a; DataUSA (2018) elaboration. Furthermore, as mentioned earlier, populations living in the eastern region of the state of Kentucky are more exposed to environmental chemicals than those living in the central and western regions of the state National Cancer Institute (2019a) denotation. So, the incidence and mortality rates of lung and bronchus cancer in the Appalachian eastern region may not be representative of those of populations living in other areas across Kentucky per DataUSA, 2018; National Cancer Institute (2019a) elaboration.

Significance, Summary, and Conclusions

Significance

This study assessed geographic factors that may influence the incidence and mortality rates of lung and bronchus cancer. the study is unique in that it addressed the confounding nature of geographic factors on the relationship between social and demographic factors and lung and bronchus cancer rates in Kentucky according the GeoDa Center for Geographic Analysis and Computation (n.d.); Jay, Huang, Rinehart, & Hopenhayn (2011) illustrations. the study had public health relevance in that it promoted the mobilization of individuals in communities using Community Based Participatory Approach (CBPA) to decrease exposures to environmental pollutants Suk et al (2016) elaboration. Furthermore, it also, helped individuals to identify increased risk to environmental chemicals through information sharing. It did so by using CBPA to gather more people and advise them to share information and seek immediate assistance on the adverse effect of exposures in low-income and high risks areas in Kentucky and across the United States (Barry & Honoré, 2009; Suk et al., 2016). Additionally, it promoted the use of CBPA in schools, workplace, and neighborhoods to identify the characteristics of factors related to exposure to environmental pollutants by advising the used of bi-weekly meetings in those settings (Suk et al., 2016; Barry & Honoré, 2009). Finally, it encouraged the use of CBPA in vulnerable areas across Kentucky to inhibit exposure to pollutants (Barry & Honoré, 2009; Suk et al., 2016). The results of the study may assist public health professionals to understand how tobacco use and exposure to arsenic, magnesium, mercury, selenium, and chromium influences the variation observed in the incidence and mortality rates of lung and bronchus cancer in counties across Kentucky (The Community Research Collaborative Blog, 2018; Rembert et al., 2017).

Summary

The results of the study Also, provided insights into the strength and direction of the relationship between educational attainment in each county and the high incidence and mortality rates of lung and bronchus cancer in Kentucky. As a result, health education could perhaps be used as an intervention to address this health issue (U. S. Census Bureau, 2018; The Community Research Collaborative Blog, 2018). The findings of the study could perhaps encourage community health educators to organize community outreach seminars to educate residents on lung cancer and potential risk factors. Education about lung cancer and related risk factors in various regions might possibly have an influence on the high incidence and mortality rates of lung and bronchus cancer across Kentucky (Gross, 2010; U. S. Census Bureau, 2018; Tatalovich et al., 2015). the study findings might Also, help public health officials and community leaders of each county in Kentucky to identify risk factors and then reduce the prevalence of them to make communities healthier across Kentucky (Hsu, Chang, & Lu, 2017; Rembert et al., 2017). For example, reduction of environmental exposures related to the coal-mining industry could have perhaps contributed to a lowering of the high incidence and mortality rates of lung cancer in southeastern Kentucky (Jay, Huang, Rinehart, & Hopenhayn, 2011).

Conclusions

The potential findings from the study helped implement social change by creating aware about biological and personal health history factors such as genetic biomarkers and previous health conditions that may had increased their likelihood to develop lung and bronchus cancer (CDC, 2018). More specifically, the use of the Social Ecological framework helped model how family members interact with the ecosystem that may had increased exposure to environmental contaminants and increased their likelihood to develop lung and bronchus cancer (CDC, 2018). In addition, the application of SEM assisted community leaders to explores settings, such as schools, workplaces, and neighborhoods, where social relationships occurred and seemed to identify the characteristics of these settings associated with becoming exposed to environmental chemicals (CDC, 2018) in order to control and reduce exposures at the community level. Finally, the application of the SEM during the study encouraged society leaders to look at the broader societal factors that help create a climate in which exposure to environmental chemicals is encouraged or inhibited (CDC, 2018) to assess and reduce exposure at the societal level. The reduction of exposure at the individual, family, community, and societal levels may had significantly decreased the incidence and mortality rates of lung and bronchus cancer and improved the morbidity and state of health of communities across Kentucky (ODPHP, 2019; CDC, 2018; CDC, 2019; NCI, 2019b).

Section 2: Research Design and Data Collection

Introduction

The purpose of this study was to address the high incidence and mortality rates of lung and bronchus cancer in the state of Kentucky that may not have been caused solely by social and demographic factors according to ACS (2018); CRCB (2018) illustrations. The high incidence and mortality rates may have Also, been related to the variation observed in geographic locations, which were counties clustered by geographic regions, types, and areas (NCI, 2018). It was necessary to examine these associations and determine if the differences between areas of Kentucky in lung and bronchial cancer rates were associated with geographic variation of counties in the state of Kentucky according to Rembert et al (2017); Jay, Huang, Rinehart, and Hopenhayn (2011) elaboration.

Research Design and Rationale

Variables

Dependent variables. The dependent variables of my study were the incidence rates (low, moderate, and high): the measure of the rate that new cases of lung and bronchus cancer occurred between 2011 to 2015; Mortality rates (low, moderate, and high): the measure of the rate that deaths from lung and bronchus cancer occurred between 2011 to 2015 (National Cancer Institute [NCI], 2019a). The population was categorized as such 2134 thru 12231; 12232 thru 19088; 19089 thru 35914, and 35915 thru 7771158.

Independent variables. The independent variables were the counties by geographic regions: Pennyrile, Bluegrass, Jackson Purchase, Eastern Mountain Coal Fields, Eastern Coal Fields, and Knobs Arc regions; the counties by geographic types: metropolitan, micropolitan, and rural counties; the counties by geographic areas with dummy (each level under geographic areas set as a distinct variable) variables: west, center, and east areas.

Then the geographic regions were dummy variables: Pennyrile (0, 1), Bluegrass (0, 1), Jackson Purchase (0, 1), Eastern Mountain Coal Fields (0, 1), Eastern Coal Fields (0, 1), and Knobs Arc regions (0, 1). Furthermore, the Geographic types were Also, dummy variables: Metropolitan (0, 1), Micropolitan (0, 1), and Rural (0, 1). Furthermore, the Geographic areas were dummy variables: West (0, 1), Center (0, 1), and East (0, 1) (Laureate Education, 2016; Gerstman, 2015).

Covariate/ Confounding variables. The study confounding variables were gender, age group, median household income, educational attainment, prevalence of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, income inequality, preventable hospital stays, and adult obesity.

Thus, gender was coded: 1 for male; 0 for female, and age group coded: 1 for <50; 2 for 50+, but ≤60; 3 for < 65, but >60; 4 for 65+ (Laureate Education, 2016; Gerstman, 2015).

According to the research theoretical framework, design, and questions, I found no need to code (create dummy variables) on the median household income, the educational attainment, the prevalence of smoking, lower birth weight, poorer physical health, physical inactivity, poorer mental health, the income inequality, preventable hospital stays, adult smoking, and adult obesity to test the hypotheses according to Gerstman (2015); Laureate Education (2016) illustrations. Every variable illustrated above was continuous and binning any of this may had misrepresented the magnitude of their effects size on the variation observed in the rates of lung and bronchus cancer during the analysis; thus, this may had distorted the inference on the effects of one of the main factors (population) and the confounding social, and demographic factors according to Gerstman (2015) elaboration.

Research design. Although the cross-sectional study design has many limitations (i.e. difficulty determining causality, inability to measure mortality, and selection bias), I choose to use it so that I am able to compare many different variables at the same time per Institute for Work and Health (IWH, 2015) elaboration. Hence, the design easily allowed me to swiftly assess the confounding effect of social and demographic factors on the association between geographic factors and the incidence and mortality rates of lung and bronchus cancer in Kentucky, while giving me the strength and direction of the association at a single point of time according to IWH (2015) illustration. The design choice may align with the geographic study of lung and bronchus cancer rates in the state of Kentucky by allowing me easy access to data and prompted evaluation of the research problem which possibly advanced my public health knowledge on lung and bronchus cancer in Kentucky, the United States, and across the world per IWH (2015) elaboration.

Despite the many limitations the cross-sectional study has, my study was a beacon for case-control and cohort studies so that future researchers can used biospecimen and bioinformation in addition to existing secondary data to run a deeper and adequate analysis on lung and bronchus cancer in Kentucky according to Laureate Education, (2016); Gerstman (2015) denotation.

Methodology

Population

The population for this study consisted of those living near mining locations, with low education attainment and social and demographic challenges across the counties of the state of Kentucky. My study sample size used was n=960 observed counties derived from the combined data obtained about the state of Kentucky according to the National Cancer Institute (NCI, 2019a) elaboration.

Sampling and Sampling Procedures Used to collect Data

My study used secondary data derived from several web pages and websites that have public information on Kentucky lung and bronchus cancer rates, social, demographic, and geographic factors of each of its 120 counties. The average age-adjusted incidence and mortality rates of lung and bronchus cancer by gender in each county came from the state cancer profiles of the National Cancer Institute web page (National Cancer Institute [NCI], 2019a). I retrieved the ages-specific cancer rate by county (<50; 50+, but ≤ 60; <65, but > 60; and 65+) from the state cancer profiles of the National Cancer Institute web page (NCI, 2019a). I then extracted the population size for each county rom the Kentucky Demographic website (Kentucky Demographics, 2018). I extracted the median household income per county from the United States Census Bureau web page (United States Census Bureau, 2018). The counties by geographic regions **(**Pennyrile, Bluegrass, Jackson Purchase, Eastern Mountain Coal Fields, Eastern Coal Fields, and Knobs Arc**)** came from the More About KY-NDNP website (More About KY-NDNP, 2018). The counties by geographic types (metropolitan, micropolitan, and rural) came from the Community Research Collaborative Blog (The Community Research Collaborative Blog, 2018). The counties by geographic areas west, center [N&S], and east [N&S] were taken from the County High Pointers Association home page (County High Pointers Association, 2018). The educational attainment in each county in Kentucky was retrieved from the Index Mundi webpage (Index Mundi, 2018). I extracted the prevalence of smoking by county from the Kentucky Healthy Facts website (Kentucky Healthy Facts, 2018). I retrieved the prevalence of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, income inequality, preventable hospital stays, adult smoking, and adult obesity from the County Health Rankings & Roadmaps webpage (County Health Rankings & Roadmaps, 2019).

Steps to combine the data. Initially I generated an excel table, then from the sampling procedures illustrated earlier, I created a column named counties made of the 120 counties of Kentucky. I created a variable named gender that represented the incidence and mortality rates of lung and bronchus cancer for males and females, respectively in Kentucky, which was generated by the NCI website, bringing the total number of observations to 240 (120 for males and 120 for females) counties. I then add another variable named age group made of four levels as elaborated earlier. The NCI website provided the incidence and mortality rates for females, and males in each of the four levels, bringing the total observations to 960 (120*4=480 for females, and 480 for males) counties. Finally, I entered each of the remaining variables illustrated on the sampling procedures or the initial 120 counties, then repeated eight times [120*4 (for each age group) *2 (for each gender)] to meet the data inputs of 960 observed counties.

Power Analysis. The sample size determination was based on linear multiple regression and a priori (before data collection) power analysis, given the significance level (α), power, and effect size (Laureate Education, 2016; Gerstman, 2015). I choose input parameters for a two tailed test using an effect size of 0.0188, by adjusting the input value on G*power to meet the projected sample size required to detect such effect size with an alpha (α) error probability of 0.05, power of 0.9888, and 24 predictors to yield a sample size of 960 per Gerstman, (2015); Laureate Education (2016) elaborations. The outcome gave me output parameters consisting of a noncentrality parameter of 4.248, a critical t of 1.962, degrees of freedom (Df) of 935, sample size of 960, and actual power of 0.9888 according to the Gerstman (2015); Laureate Education (2016) illustrations. According to the table of t critical values in Gerstman (2015), the obtained critical t of 1.962 corresponds to a two tailed p-value < 0.05 which was an indicative of a significant result (Laureate Education, 2016; Gerstman, 2015).

The rationale for selecting an effect size. To address the research problem and questions adequately my initial sample was 120 counties which the number of counties in the state of Kentucky are, representing the initial number of subjects for the study according to the Laureate Education (2016) elaboration. Then, I combined the study data as explained earlier, and derived a total number of observations of 960 required to address the research problem and questions efficiently according to Laureate Education (2016) illustration. Therefore, 960 was the sample size needed to detect an effect size of 0.0188 with a 98.88% power at $\alpha = 0.05$ (two-sided; Gerstman, 2015). The illustrated magnitude or size of the effect was perhaps small, but per Gerstman (2015) the larger the sample size the smaller the effect size and reduce power. After data collection and analysis, I conducted a post hoc power analysis to see if the obtained sample size is adequate.

Instrumentation and Operationalization of Constructs

Published instruments. I did not need published instruments for this study. I used secondary data derived from several web pages and websites that have public information on Kentucky lung and bronchus cancer rates and social and ecological factors of each of its 120 counties.

All researcher instruments. I found no need to refer to all researcher instruments as my study did not used survey, test, and questionnaires to collect data. I used secondary data I formulated from different sources.

Operationalization of constructs. I used variables representing the social, demographic, and geographic characteristics of the state of Kentucky in the study. I use these variables to assess the research problem adequately.

Table 1
Operationalization of Constructs

Name of variable	Variable label	Level of measurement
Average Age-Adjusted Mortality Rate (per 100,000)	Average age-adjusted mortality rate of lung and bronchus cancer	Continuous
Average Age-Adjusted Mortality Rate (per 100,000)	Average age-adjusted mortality rate of lung and bronchus cancer	Continuous
Gender (Male/Female)	Age-adjusted incidence and mortality rates of lung and bronchus cancer by gender	Dichotomous/ Nominal

Table 1

Continued

Name of variable	Variable label	Level of measurement
Age Group (Years)	Age-adjusted incidence and mortality rates of lung and bronchus cancer by age range	Continuous/Nominal
Population Size	Size of the populations per county	Continuous

Table 1

Continued

Name of Variable	Variable Label	Level of Measurement
Median Household Income ($)	Estimate median family income per County	Continuous
Education Attainment (%)	High School graduate or Higher degree in persons age 25+	Continuous
Prevalence of smoking (%)	Percent of adults current smokers	Continuous
Geographic Regions	Counties clustered by regional proximity	Nominal

Table 1

Continued

Name of Variable	Variable Label	Level of Measurement
Geographic Types	Counties clustered by urban, rural, and sub-urban classification	Nominal
Geographic Areas	Counties clustered by west, center, and east classification	Nominal
Premature Death (Years)	Number of years of personal life lost before 75	DiscreteDiscrete Discretee
Low Birth Weight (%)	Proportion of live births with low birthweight	Continuous Continuous
Poor Physical Health (Day)	Average number of physical unhealthy days	Continuous

Table 1

Continued

Name of Variables	Variable Label	Level of Measurement
Physical Inactivity (%)	Percentage of adults age 20 and over with no leisure-time activity	Continuous
Poor Mental Health (Days)	Average number of mentally unhealthy days within 30 days	Discrete
Preventable Hospital Stays (Rate)	Number of hospitals stays for ambulatory-care sensitive conditions	Continuous
Adult Obesity (%)	Percentage of adults with BMI > 30 or more	Continuous

For each variable as required by the rubric. The average age-adjusted incidence, and mortality rates of lung and bronchus cancer in Kentucky were calculated using the number of cases and deaths per 100,000 population per year (National Cancer Institute [NCI], 2019a). Gender was used to differentiate male and female age-adjusted incidence and mortality rates of lung and bronchus cancer in Kentucky (NCI, 2019a). The age group measured in years was used to differentiate the incidence and mortality rates of lung and bronchus cancer by age group (<50; 50+ but ≤ 60; <65 but > 60; and 65+) (NCI, 2019a). The population size was used to indicate the size in thousands of the population of each county in Kentucky (Kentucky Demographics, 2018). The median household income was used to estimate median family income in the past 12 months in each county (United States Census Bureau, 2018). The educational attainment in each county was used to identify the median percentage of people 25+ in the county who at least graduated from high school, 2009-2013 (Index Mundi, 2018). The prevalence of smoking measured in percent adults represented the proportion of adults who are current smokers in the state of Kentucky (Kentucky Healthy Facts, 2018). The counties by geographic regions **were** categorized as follows: Pennyrile, Bluegrass, Jackson Purchase, Eastern Mountain Coal Fields, Eastern Coal Fields, and Knobs Arc regions (More About KY-NDNP, 2018). Each of the 6 “counties by region” was then set as a dummy variable representing the incidence and mortality rates of lung and bronchus cancer of each region (Gerstman, 2015; Laureate Education, 2016). The counties by geographic types classifies counties as metropolitan, micropolitan, and rural counties (The Community Research Collaborative Blog, 2018). Each of the 3 categories was set as a dummy variable representing the incidence and mortality rates of lung and bronchus cancer of each county (Gerstman, 2015; Laureate Education, 2016). The counties by geographic areas categorizes counties in west, center [N&S], and east [N&S] areas (County High Pointers Association, 2018). Thereafter, each of the 3 was transformed to a dummy variable representing the incidence and mortality rates of lung and bronchus cancer of each county (Gerstman, 2015; Laureate Education, 2016).

The low birth weight measured in percent represented the proportion of live births with low birthweight (< 2500 grams). The poor physical health measures in days represents the average number of physically unhealthy days reported in past 30 days. The physical inactivity was measured in percent and represents the percentage of adults age 20 and over reporting no leisure-time activity (County Health Rankings & Roadmaps, 2019). Poor mental health was measured in days and represented the average number of mentally unhealthy days reported in past 30 days (age-adjusted). Fair or poor health was measured in percent and represents the percentage of adults reporting fair or poor health in past 30 days (age-adjusted). The income inequality represented the ratio of household income at the 80th percentile to the 20th percentile (County Health Rankings & Roadmaps, 2019). Preventable hospital stays were measured in percent and represented the number of hospital stays for ambulatory-care sensitive conditions per 1,000 Medicare enrollees. Smoking measured in percent represents the proportion of adults who were current smokers. Finally, adult obesity was measured in percent and represents the percentage of adults that report a BMI of 30 or more (County Health Rankings & Roadmaps, 2019).

Data Analysis Plan

I used SPSS to conduct the analyses (Wagner, 2016a; NCI, 2019a; NCI, 2019b). The data obtained were checked for errors and updates (Gerstman, 2015).

To examine effectively the influences of the confounding social and demographic elements on the association between geographic factors and the high incidence and mortality rates of lung and bronchus cancer in Kentucky, research questions were formulated as such:

Research Questions and Hypotheses

Research Question 1 (RQ1): Is there a significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age?

Null hypothesis ($H_0 1$): There is no significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age.

Alternative Hypothesis ($H_a 1$): There is a significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age.

Research Question 2 (RQ2): Is there a significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age?

Null Hypothesis ($H_0 2$): There is no significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age.

Alternative Hypothesis ($H_a 2$): There is a significant association between geographic factors (population size, geographic regions, types, and areas) and mortality rate of lung and bronchus cancer in Kentucky, controlling for the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age.

Statistical test. Multiple linear regression, which determines the direction and strength of the association of the primary relationship, while controlling for the influences of the confounding variables, was the statistical analysis used to test the hypotheses (Wagner, 2016a; Laureate Education, 2016).

To build an effective regression model, I conducted bivariate analysis, and ANOVA and then the significant predictors found in the bivariate analysis (continuous dependent variables and continuous independent variables) and ANOVA (continuous dependent variables and nominal independent variables) were included in the multiple regression model. An alternative multivariable analysis if the assumptions of linear regression were not meet was provided at the threat to internal validity section.

Procedures used to account for multiple statistical tests. The use of linear regression was appropriate since the dependent variable was continuous, the independent variables were nominal and continuous, and the control variables were nominal and continuous (Laureate Education, 2016; Gerstman, 2015).

Rationale for inclusion of potential covariates and/or confounding variables. To test the hypotheses adequately and answer the research questions effectively, the inclusion of potential covariates and/or confounding variables allowed us to assess effectively the confounding effects of social (prevalence of smoking by county, low birth weight, poor physical health, physical inactivity, poor mental health, income inequality, preventable hospital stays, adult smoking, and adult obesity) and demographic (median household income per county, education attainment in each county, gender, and age group) elements on the correlation between the geographic factors, population size for each county and the high incidence and mortality rates of lung and bronchus cancer in Kentucky (American FactFinder, 2018; GeoDa Center for Geographic Analysis and Computation, n. d.; Gerstman, 2015).

How results were interpreted. The output of the linear multiple regression model gave us a model summary table which includes R^2 and adjusted R^2 to estimate the association between the incidence and mortality rates of lung and bronchus cancer and the social, demographic, and geographic factors (Gerstman, 2015). The output Also, provided the ANOVA table to estimate the significance of the model. The coefficients table allowed us to use the unstandardized and standardized coefficients to compare the lung and bronchus cancer incidence and mortality rates means, among the dummy variables derived from the categorization of geographic factors (Gerstman, 2015). Finally, I Also, used the unstandardized and standardized coefficients to estimate the strength and direction of the association between the incidence and mortality rates of lung and bronchus cancer and geographic factors, controlling for social and demographic factors (Gerstman, 2015).

Threat to validity

Threat to external validity. The results of the study were generalized to the other populations through the notion that imply the recognition of the effect of the ecosystem on the prevalence, mortality, and mortality rates of lung and bronchus cancer that impact the health of communities in the United States and across the world. Thus, the outcome proposed immediate consideration of geographic health determinants as important contributors to the variation observed on diseases trend per region around the globe due to the difference of exposure to trace elements. According to the study design and methodology, there was no need to test for reactivity (interaction effects of selection and experimental variables) as the study was non experimental with no human subjects involved, inhibiting the reactive effect. According to the study design and methodology, all variables included in the study have been specified in the optimization section (Walden University Center for Research Quality, N.d.). There were no effects of experimental arrangements and multiple treatment interference based on the nature of the study (Laureate Education, 2008). Meanwhile, there was an existence of ecological bias (inferences about groups do not necessarily translate to the individual) as the incidence and mortality rates of lung and bronchus cancer associated with regions in Kentucky, may not translate appropriately to the individual level (NAACCR, 2016).

Threat to internal validity. The specific assumptions of the multiple regression tests were investigated prior to the analysis of the data (Laureate Education, 2016). Thus, I diagnosed linearity, independence of error, homoscedasticity, multicollinearity, undue influence, and normal distribution of errors to have a better interpretation of the multiple regression model (Laureate Education, 2016; Wagner, 2016a). The assumptions of the multiple linear regression model were not met; I used ordinal logistic regression to further my analysis. Then after its test of parallel lines were not significant, I finally ran the bivariate regression model between each geographic factors and the incidence and mortality rates of lung and bronchus cancer to adequately assess the topic of the study (Gerstman, 2015; Wagner, 2016a).

Threats to construct validity. The data were derived from sources entitled as follows: state cancer profiles of the National Cancer Institute, the County Health Rankings & Roadmaps, the Community Research Collaborative Blog, Kentucky Healthy Facts, Kentucky Demographic, and Community Research Collaborative Blog (Leischow & Milstein, 2006). The illustrated sources were retrieved from public record web pages and websites. The data retrieved from those web pages and websites may be trustworthy for use based on the consistency of the information obtained over time (Leischow & Milstein, 2006). When the data were trustworthy, they were valid and appropriate to run an effective analysis to answer the research questions adequately and perhaps promote social change, especially in areas most affected (Leischow & Milstein, 2006; National Cancer Institute, 2019a). Meanwhile, the extreme differences of exposure to potential and unknown toxins of the populations living in counties across Kentucky poses a threat to the validity of the data (Leischow & Milstein, 2006). For example, populations living in the eastern region of Kentucky, like the Appalachian, Ire highly exposed to environmental pollutants from coal mining, unlike those living in the central and western regions of Kentucky (Leischow & Milstein, 2006). Thus, occupational exposures based on regional differences should be considered to understand differences on the study outcome (Leischow & Milstein, 2006; National Cancer Institute, 2019a). A study without such bias provided valid data from which valid results were inferred (Leischow & Milstein, 2006).

Ethical Procedures

Per the Walden University IRB approval number 05-30-19-0406940 the data used in the study were derived from public record websites and web pages (National Cancer Institute [NCI], 2019a; County Health Rankings & Roadmaps, 2019). No human subjects were used for data collection purposes. The data were stored in a secure location. The data do not derive from webpages and websites related to me; thus, there was no indication of conflict of interest (Leischow & Milstein, 2006).

Summary

the study was cross sectional and uses secondary data derived from public record webpages and websites containing incidence and mortality rates of lung and bronchus cancer, as well as data on social, demographic, and geographic factors in Kentucky (National Cancer Institute [NCI], 2019a; County Health Rankings & Roadmaps, 2019). the study was quantitative. The population of interest included people living near mining locations such as those living in the eastern regions who were exposed to more toxins from coal mining and had lower educational attainment and more social and other demographic challenges than those living in the western and central regions of Kentucky. Secondary data derived from public records on Kentucky lung and bronchus cancer rates, and social and ecological factors of each of its 120 counties were used. The power analysis to determine the sample size was based on linear multiple regression and a priori (before data collection) statistical test, given the significance level (α), power, and effect size (Laureate Education, 2016; Gerstman, 2015). I used SPSS to conduct the analyses (Wagner, 2016a; NCI, 2019a; NCI, 2019b). Thus, I proceed to the development of the presentation of the results and findings section.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this study was to investigate the high incidence and mortality rates of lung and bronchus cancer in the state of Kentucky that may not be caused solely by social and demographic factors according to ACS (2018); CRCB (2018) illustrations. Thus, I am conducting the study to know whether there a significant association between geographic factors (population size, geographic regions, types, and areas) and incidence, and mortality rate of lung and bronchus cancer in Kentucky. Also, to examine whether that association is confounded by the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age per Wagner (2016a); Laureate Education (2016) elaborations. Therefore, I hypothesized on the significance over the non-significance of the association to answer the research problem adequately. I described this data collection section of secondary data set according to Wagner (2016a) illustration. Then I presented the result of the analysis and summary of my findings. Furthermore, I explained how the findings of my study can apply to professional practice and its implication to social change (Laureate Education, 2016). I did that by interpreting the findings effectively, illustrate the study limitations, and layout recommendations. Finally, I denoted the study 's outcome implications for professional and social change according to Laureate Education (2016); Wagner (2016a) denotation.

Data Collection of Secondary Data Set

I collected data directly from several websites and web pages with information dating from 2014 to 2019 according to NCI (2019a) elaboration. The data are factual, recent, retrieved without an issue, and represent all of the information needed to assess the research question effectively; thus, there are no discrepancies in the use of the secondary data set from the plan presented in Section 2 per Kentucky Healthy Facts (2018) illustration. The sample was made of geographic factors such as population size, geographic regions, types, and areas; incidence and mortality rates of lung and bronchus cancer in Kentucky according to The Community Research Collaborative Blog (2018) denotation. The sample was Also, composed of social and demographic factors such as the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, and median household income per county, education attainment in each county, gender, and age according to the County Health Rankings & Roadmaps (2019) elaboration. The populations of interest were those living in communities across the 120 counties of the state of Kentucky per Laureate Education (2016). The inclusion of age group and gender brought the sample size to 960 with geographic, social, and demographic attributes that represent the population of interest and meets the requirement to assess the research problem efficiently according to Laureate Education (2016); Gerstman (2015) elaborations. According to the study topic, research problems and questions, and hypotheses, I had no need to run univariate analyses to justify inclusion of covariates in the model as illustrated in the methodology and threat to validity sections according to Gerstman (2015) illustration.

Results

Report of Descriptive Statistics

The descriptive statistics appropriately characterized the sample. Thus, the most interesting statistics were the sum, mean, and standard deviation values of the incidence and mortality rates of lung and bronchus cancer whose show that in average the incidence rate of lung and bronchus cancer is higher than the mortality rate in the state of Kentucky. Those statistics were necessary to guide the inferences during the analyses of the study's data.

Table 2

Descriptive Statistics of the incidence and mortality rates of lung and bronchus cancer, and of the social and demographic factors.

Variables	N	Mean		Std. Deviation
		Value	Std. Error	Value
INCIDENCE RATE LUNG BRONCHUS CANCER (Per 100,000)	631	334.85	9.318	234.070
MORTALITY RATE LUNG BRONCHUS CANCER (Per 100,000)	544	282.80	8.229	191.925

Table 2
Continued

Variables	N	Mean Value	Mean Std. Error	Std. Deviation Value
PERCENTAGE OF PREVALENCE OF SMOKING (%) Percent of adults current smokers	960	27.06	.239	7.398
PERCENTAGE OF EDUCATION ATTAINMENT (%) high school graduate or higher degree in persons age 25+	960	78.40	.223	6.896
LOW BIRTH WEIGHT (%) a proportion of live births with low birthweight	960	9.07	.043	1.319

Table 2
Continued

Variables	N	Mean Value	Mean Std. Error	Std. Deviation Value
PERCENTAGE OF PREVALENCE OF SMOKING (%) Percent of adults current smokers	960	4.89	.017	.541
PERCENTAGE PHYSICAL INACTIVITY (%) of Adults age 20 and over with no leisure-time activity	960	31.02	.127	3.944

Table 2
Continued

Variables	N	Mean Value	Mean Std. Error	Std. Deviation Value
POOR MENTAL HEALTH IN DAYS (Days) an average number of mentally unhealthy days within 30 days	960	4.57	.012	.363
RATE OF PREVENTABLE HOSPITAL STAY(Rate) number of hospital stays for ambulatory-care	952	90.40	1.119	34.515
PERCENTAGE ADULT OBESITY (%) with BMI > 30	960	35.23	.099	3.058
MEDIAN HOUSEHOLD INCOME ($) estimate median family income per county	960	40051.06	341.440	10579.141
POPULATION size of the population per county	960	37118.24	2502.526	77537.923

Report of Frequency Statistics

I use the illustrated frequency statistics to appropriately characterize the sample. Thus, the most interesting statistics are the frequency that indicates missing values in each level category of each variable, and the valid percentage that represent the percentage of each level category of each variable without missing values. I used both statistics to analyze my data adequately and answer the research questions efficiently.

Table 3

Frequency Statistics of the age group, gender, population, incidence and mortality rates of lung and bronchus cancer, and counties by geographic regions, types, and areas.

Variables		Frequency	Percent	Valid Percent
AGE GROUP(Years)	Less than 50	240	25.0	25.0
	More than 50 but less or equal 60	240	25.0	25.0

Table 3

Continued

Variables		Frequency	Percent	Valid Percent
	Less than 65 but more than 60	240	25.0	25.0
	More than 65	240	25.0	25.0
GENDER	Male	480	50.0	50.0
	Female	480	50.0	50.0
POPULATION	2134 thru 12231	240	25.0	25.0
	12232 thru 19088	240	25.0	25.0
	19089 thru 35914	240	25.0	25.0

Table 3

Continued

Variables		Frequency	Percent	Valid Percent
	35915 thru 7771158	240	25.0	25.0
INCIDENCE RATE LUNG BRONCHUS CANCER (Per 100,000)	Low (4 thru 61)	160	16.7	25.4
	Moderate (62 thru 480)	314	32.7	49.9
	High (481 thru 1122)	155	16.1	24.6
	Missing	331	34.5	
MORTALITY RATE LUNG BRONCHUS CANCER (Per 100,000)	Low (3 thru 155)	135	14.1	25.0
	Moderate (156 thru 391)	271	28.2	50.2
	High (392 thru 834)	134	14.0	24.8
	Missing	420	43.8	
COUNTIES by GEOGRAPHIC REGIONS	Bluegrass	264	27.5	27.5
	Eastern	248	25.8	25.8
	Mountain			

Table 3

Continued

Variables		Frequency	Percent	Valid Percent
	Jackson Purchase	64	6.7	6.7
	Knobs Arc	64	6.7	6.7
	Pennyrile	232	24.2	24.2
	Western Coal Field	88	9.2	9.2
COUNTIES by GEOGRAPHIC TYPES	Metropolitan	280	29.2	29.2
	Micropolitan	208	21.7	21.7
	Rural	472	49.2	49.2
COUNTIES by GEOGRAPHIC AREAS	Central	392	40.8	40.8
	East	272	28.3	28.3
	West	296	30.8	30.8

Exploratory Bivariate Analyses with Incidence Rate of Lung and Bronchus Cancer

Bivariate analysis is included in tables 18 to 23 and figures of Appendix B. In statistics, a bivariate analysis is a form of a simple linear regression that involved the analysis of one dependent variable and one independent variable to establish the strength of the relationship between them. Based on the nature of the research topic, I explored the bivariate relationship of each of the geographic main factors with the incidence and mortality rates of lung and bronchus cancer. The purpose of my study is not only to assess the effect size but Also, to explore the nature of the relationship between the variables of interest.

Exact statistics-Confidence Intervals-Effect sizes of the bivariate analysis

The outcome of the model summary shows that 0.1 % variation observed on the mortality rate of lung and bronchus cancer in the state of Kentucky can be explained by the variation on counties by geographic regions. It also, indicates that the model is non-significant ($p = .05$) at the ANOVA table. The coefficient table shows that for every change in county by geographic regions the incidence rate of lung and bronchus cancer increase by a value of 3.566 unit non-significantly ($p > .05$). For everyone standard deviation unit increase in counties by geographic regions the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of.027 standard deviation, non-significantly ($p > .05$).

Furthermore, the outcome of the model summary Also, shows that 2 % variation observed on the mortality rate of lung and bronchus cancer in the state of Kentucky can be explained by the variation on counties by geographic types. It also, indicates that the model is very significant ($p < .05$) at the ANOVA table. Meanwhile, the coefficient table shows that for every change in counties by geographic types the mortality rate of lung and bronchus cancer increase by a value of 37.904 units significantly ($p < .05$). Also, for everyone standard deviation unit increase in counties by geographic types the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of.140 standard deviation significantly ($p < .05$). Whereby the outcome of the model summary shows that 0.2 % variation observed in the mortality rate of lung and bronchus cancer in the state of Kentucky can be explained by the variation on counties by geographic areas. It also, indicates that the model is non-significant ($p > .05$) at the ANOVA table. Meanwhile, the coefficient table shows that for every change in county by geographic types the mortality rate of lung and bronchus cancer increase by a value of 11.140 unit non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in counties by geographic areas the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of .040 standard deviation, non-significantly ($p > .05$).

Furthermore, the outcome of the model summary shows that 4.4 % variation observed in the mortality rate of lung and bronchus cancer in the state of Kentucky can be explained by the variation on population by category. It also, indicates that the model is very significant ($p < .05$) at the ANOVA table. Meanwhile, the coefficient table shows that for every increase in population by category the mortality rate of lung and bronchus cancer decrease by a value of 46.039 unit very significantly ($p < .05$). Also, for everyone standard deviation unit increase in population by category the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.211 standard deviation very significantly ($p < .05$).

Thus, for categories under counties by geographic regions, the Pennyrile for every change of location observed in Pennyrile region the mortality rate of lung and bronchus cancer increase by a value of.060 unit very non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in Pennyrile region the mortality rate of lung and bronchus cancer in the state of Kentucky stay constant by a value of.000 standard deviation very non-significantly (*p* > .05). Thus, for every change of location observed in the Bluegrass region the mortality rate of lung and bronchus cancer decrease by a value of 40.696 unit non-significantly (p ≥ .05). Also, for everyone standard deviation unit increase in Bluegrass region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.078 standard deviation very non-significantly (p ≥ .05).

Furthermore, every change of location observed in the Jackson purchase region the mortality rate of lung and bronchus cancer decrease by a value of 18.877 unit non-significantly (p ≥ .05). Also, for everyone standard deviation unit increase in Jackson purchase region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.018 standard deviation very non-significantly (*p* > .05). For every change of location observed in the Eastern Mountain region the mortality rate of lung and bronchus cancer decrease by a value of 46.867 units significantly (*p* < .05). Also, for everyone standard deviation unit increase in Eastern Mountain region the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of.089 standard deviation very significantly (*p* < .05). Additionally, every change of location observed in the Knobs Arc region the mortality rate of lung and bronchus cancer decrease by a value of 30.555 unit non-significantly (*p* > .05). Also, for everyone standard deviation unit increase in Knobs Arc region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.869 standard deviation, non-significantly (*p* > .05). Furthermore, for every change of location observed in the Western coalfield region the mortality rate of lung and bronchus cancer increase by a value of 27.285 unit very non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in the Western coalfield region the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of.032 standard deviation, non-significantly ($p > .05$).

The coefficients' table illustrates the effect sizes of the counties by type's categories. Thus, the outcome denotes that every change of location observed in the Rural region the mortality rate of lung and bronchus cancer increase by a value of 62.178 unit very significantly ($p < .05$). Also, for everyone standard deviation unit increase in the Rural region the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of.133 standard deviation, non-significantly ($p < .05$). Furthermore, every change of location observed in the Micropolitan region the mortality rate of lung and bronchus cancer decrease by a value of 15.271 unit non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in the Micropolitan region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.028 standard deviation, non-significantly ($p > .05$). Every change of location observed in the Metropolitan region the mortality rate of lung and bronchus cancer decrease by a value of 60.018 unit very significantly ($p < .05$). Also, for everyone standard deviation unit increase in the Metropolitan region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of. 118 standard deviation very significantly ($p <$. 05).

Meanwhile, the results also, illustrate the size effects of the counties by geographic areas; for every change of location observed in the Central area the mortality rate of lung and bronchus cancer decrease by a value of 34.742 unit non-significantly ($p > .05$). Also, for everyone standard deviation unit decrease in the Central region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.073 standard deviation, non-significantly ($p > .05$). Thereby, for every change of location observed in the West area the mortality rate of lung and bronchus cancer decrease by a value of 3.643 unit very non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in the West area the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.007 standard deviation very non-significantly ($p > .05$). Furthermore, for every change of location observed in the East area the mortality rate of lung and bronchus cancer significantly increase by a value of 44.372 ($p < .05$). Also, for everyone standard deviation unit increase in the East area the mortality rate of lung and bronchus cancer in the state of Kentucky significantly increase by a value of.086 standard deviation ($p < .05$).

Exploratory Bivariate Analyses with Mortality Rate of Lung and Bronchus Cancer

Exact statistics-Confidence Intervals-Effect sizes of the bivariate analysis. The outcome of the model summary shows that 0.1 % variation observed in the mortality rate of lung and bronchus cancer in the state of Kentucky can be explained by the variation on counties by geographic regions. It also, indicates that the model is non-significant ($p > .05$) at the ANOVA table. Meanwhile, the coefficient table shows that for every change in county by geographic regions the mortality rate of lung and bronchus cancer increase by a value of 3.349 unit non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in counties by geographic regions the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of.031 standard deviation, non-significantly ($p > .05$). Furthermore, the outcome of the model summary Also, shows that 3.6 % variation observed in the mortality rate of lung and bronchus cancer in the state of Kentucky can be explained by the variation on counties by geographic types. It also, indicates that the model is very significant ($p < .05$) at the ANOVA table. Meanwhile, the coefficient table shows that for every change in counties by geographic types the mortality rate of lung and bronchus cancer increase by a value of 42.105 units significantly ($p < .05$). For everyone standard deviation unit increase in counties by geographic types the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of.191 standard deviation significantly ($p < .05$). Whereby the outcome of the model summary shows that 0.1 % variation observed in the mortality rate of lung and bronchus cancer in the state of Kentucky can be explained by the variation on counties by geographic areas. It also, indicates that the model is non-significant ($p >.05$) at the ANOVA table. Meanwhile, the coefficient table shows that for every change in county by geographic types the mortality rate of lung and bronchus cancer increase by a value of 4.702 unit non-significantly ($p > .05$). For everyone standard deviation unit increase in counties by geographic areas the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of.020 standard deviation, non-significantly (*p*

> .05).

Furthermore, the outcome of the model summary shows that 8.8 % variation observed in the mortality rate of lung and bronchus cancer in the state of Kentucky can be explained by the variation on population by category. It also, indicates that the model is very significant ($p < .05$) at the ANOVA table. Meanwhile, the coefficient table shows that for every increase in population by category the mortality rate of lung and bronchus cancer decrease by a value of 54.107 unit very significantly ($p < .05$). Also, for everyone standard deviation unit increase in population by category the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.297 standard deviation very significantly ($p < .05$).

Thus, for categories under counties by geographic regions, the Pennyrile for every change of location observed in Pennyrile region the mortality rate of lung and bronchus cancer increase by a value of 11.168 unit very non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in Pennyrile region the mortality rate of lung and bronchus cancer in the state of Kentucky stay constant by a value of.025 standard deviation very non-significantly ($p > .05$). Thus, for every change of location observed in the Bluegrass region the mortality rate of lung and bronchus cancer decrease by a value of 28.412 unit non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in Bluegrass region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.066 standard deviation very non-significantly ($p > .05$).

Furthermore, every change of location observed in the Jackson purchase region the mortality rate of lung and bronchus cancer decrease by a value of 31.077 unit non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in Jackson purchase region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.036 standard deviation very non-significantly ($p > .05$). For every change of location observed in the Eastern Mountain region the mortality rate of lung and bronchus cancer increase by a value of 28.249 unit non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in Eastern Mountain region the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of.066 standard deviation, non-significantly ($p > .05$). Additionally, every change of location observed in the Knobs Arc region the mortality rate of lung and bronchus cancer decrease by a value of 17.442 unit non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in Knobs Arc region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.572 standard deviation, non-significantly ($p > .05$). Furthermore, for every change of location observed in the Western coalfield region the mortality rate of lung and bronchus cancer increase by a value of 9.413 unit very non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in the Western coalfield region the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of.014 standard deviation, non-significantly ($p > .05$).

The coefficients' table illustrates the effect sizes of the counties by type's categories. Thus, the outcome denotes that every change of location observed in the Rural region the mortality rate of lung and bronchus cancer increase by a value of 70.164 unit very significantly ($p < .05$). Also, for everyone standard deviation unit increase in the Rural region the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of.182 standard deviation, non-significantly ($p < .05$). Furthermore, every change of location observed in the Micropolitan region the mortality rate of lung and bronchus cancer decrease by a value of 16.340 unit non-significantly ($p > .05$). Also, for everyone standard deviation unit increase in the Micropolitan region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.036 standard deviation, non-significantly ($p > .05$). Every change of location observed in the Metropolitan region the mortality rate of lung and bronchus cancer decrease by a value of 66.024 unit very significantly ($p < .05$). Also, for everyone standard deviation unit increase in the Metropolitan region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.161 standard deviation very significantly ($p < .05$).

Meanwhile, the results also, illustrate the size effects of the counties by geographic areas; for every change of location observed in the Central area the mortality rate of lung and bronchus cancer decrease by a value of 19.461 unit non-significantly ($p > .05$). Also, for everyone standard deviation unit decrease in the Central region the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of.050 standard deviation, non-significantly ($p > .05$). Thereby, for every change of location observed in the West area the mortality rate of lung and bronchus cancer decrease by a value of 7.034 unit very non-significantly (*p* > .05). Also, for everyone standard deviation unit increase in the West area the mortality rate of lung and bronchus cancer in the state of Kentucky decrease by a value of .017 standard deviation very non-significantly (*p* > .05). Furthermore, for every change of location observed in the East area the mortality rate of lung and bronchus cancer increase by a value of 29.327 non-significantly (*p* >.05). Also, for everyone standard deviation unit increase in the East area the mortality rate of lung and bronchus cancer in the state of Kentucky increase by a value of .070 standard deviation non-significantly (*p* > .05).

Statistical Assumptions according to Tables 4-15 and Figures of Appendix B

Multiple regression was used as the initial multivariable analysis to answer the research questions and hypotheses according to the data analysis plan provided in Section 2 (Gerstman, 2015). Thus, I tested for linearity, independence of error, homoscedasticity, multicollinearity, undue influence, and normal distribution of errors to evaluate the appropriateness of the multiple regression model on the data (Walden University Center for Research Quality, n.d.). So, for the linearity test I assessed all the scatter plots illustrated in the figure section and found that each of those scatterplots such as in figure 2 for example, shows no U-shape pattern from the imaginary line (Laureate Education, 2008). Thus, the model passed the linearity test, but on the other hand it failed the homoscedasticity test as the scatterplots show a trumpet, funnel, or cone pattern (Laureate Education, 2016; Gerstman, 2015). The Durbin-Watson values in the model summary tables of the table section range from. 3 too. 5 (between 2-0) which is an indication that the model suffers strong positive correlation between residuals. Hence, the model failed the independence of error test (Walden University Center for Research Quality, N.d.; Gerstman, 2015). Furthermore, most of the variables included in the model meet the multicollinearity test except for the poor physical health and poor mental health Variance Inflation Factor (VIF) values that are above 10 (Gerstman, 2015; Laureate Education, 2008). Hence, the overall model does not meet the multicollinearity test as both of those values indicate correlation between poor physical health and poor mental health, and other independent variables in the model (Gerstman, 2015; Laureate Education, 2008). Furthermore, the Residuals Statistics tables in the table section illustrate the cook’s distance values of. 000 < 1.0 which is an indication of the absence of undue influences in the model. Thus, the model meets the undue influences test requirement (Gerstman, 2015). Finally, by observing the figures on the figure section there is an absence of normal distribution of errors from the histogram plots of regression standardized residual (errors) (Laureate Education, 2008). Therefore, I concluded that the model does not meet all six assumptions to proceed with multiple regression analyses. So, I decided to apply ordinal analysis to complete the study analysis according to the study’s topic, research questions and hypotheses to answer the research problem adequately (Walden University Center for Research Quality, ND; Gerstman, 2015).

Thus, the assumptions under the ordinal analysis was assessed to proceed onward with the study analysis. After assessing the output tables from the table section of the ordinal analysis, the overall assumptions analyses indicate that the model failed the assumption that it does not adequately predict the outcomes and fit the data well (Gerstman, 2015). Therefore, the model fit the information and meet the assumption significantly (p <. 05). Furthermore, the assumption test also, indicates that all observed data consist with the model it is fit into (Gerstman, 2015). Then, the goodness-of-fit test meet the assumption significantly (p ≥. 05). Additionally, the pseudo R-square test indicates that more than 95% variation observed in the incidence and mortality rates of lung and bronchus cancer is explained by the combination of variation observed on the geographic, social, and demographic factors (Laureate Education, 2008; Gerstman, 2015). Finally, the overall test for parallel lines shows that the odd for each outcome variable is not consistent across the threshold of the response categories (p =. 001). So, in an overall conclusion the test for parallel lines does not meet the assumption significantly (Laureate Education, 2008; Gerstman, 2015). Meanwhile, in spite that the location parameters (slope coefficients) are not the same across response categories, I can still proceed with the ordinal logistic regression analyses because the model predict the ordinal outcome of the incidence and mortality rates of lung and bronchus cancer effectively with 95% impact-variation on the outcome variables and a good fit for the data (Institute for Digital Research & Education [IDRE], 2019). Additionally, the outcome variable has three categories resulting in minimal loss of granularity when the continuous dependent variable was binned. Thus, I placed the result of the test for parallel lines in the limitation section (Gerstman, 2015; Laureate Education, 2008).

Report of Statistical Analysis Findings per Tables 16 and 17

I am interpreting my findings using the coefficient estimate and interval approach, then the log odds and odds ratio approaches to effectively explain the outcomes of the proportionate ordinal regression analysis that illustrates the same Odds of each level category within each variable (IDRE, 2019).

Research Question 1 (RQ1) and Null hypothesis ($H_0$1): I report statistical analysis findings, organized by research questions and hypotheses, including exact statistics and associated probability values; confidence intervals around the statistics, and effect sizes of the independent variables on the incidence rate of lung and bronchus cancer.

The education attainment, population categorized (35915 thru 35914), age group (more than 50 but less or equal 60), and gender (female) are statistically significant according to table 16b.

Exact statistics-Confidence Intervals-Effect sizes of the ordinal analysis. The prevalence of smoking slightly falls under the high threshold of the incidence rate of lung and bronchus cancer in Kentucky as suppose to the low incidence rate of lung and bronchus cancer with a non-significant (p >.05) Estimate of. 007 [-. 037 to. 052]. The low birthweight falls under the high incidence rate of lung and bronchus cancer in Kentucky as suppose to the low incidence rate of lung and bronchus cancer with a non-significant (p >. 05) Estimate of. 108 [-. 226 to. 441]. The poor physical health falls below the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a non-significant (*p* >. 05) Estimate of-. 454 [-2.690 to 1.782]. The physical inactivity falls below the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a non-significant (*p* >. 05) Estimate of-. 003 [-. 108 to. 101]. The poor mental health fall under the high incidence rate of lung and bronchus cancer in Kentucky as suppose to the low incidence rate of lung and bronchus cancer with a non-significant (*p* > .05) estimate of 1.843 [-1.000 to 4.687].

The preventable hospital stays fall under the moderate incidence rate of lung and bronchus cancer in Kentucky as suppose to the low incidence rate of lung and bronchus cancer with a non-significant (*p* >. 05) Estimate of. 003 [-. 007 to. 013]. The adult obesity falls under the high incidence rate of lung and bronchus cancer in Kentucky as suppose to the low incidence rate of lung and bronchus cancer with a non-significant (*p* >. 05) Estimate of. 076 [-. 060 to. 211]. The median household income falls under the high incidence rate of lung and bronchus cancer in Kentucky as suppose to the low incidence rate of lung and bronchus cancer with a non-significant (*p* >. 05) Estimate of 2.739E-6 [-7.889E-6 to 8.437E-5]. The education attainments fall below the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a significant (*p* >. 05) Estimate of-. 139 [-1.302 to 2.195].

The Bluegrass region falls below the high incidence rate of lung and bronchus cancer in Kentucky as suppose to the low incidence rate of lung and bronchus cancer with a non-significant (p >. 05) Estimate of. 447 [-1.302 to 2.195] as compared to the Western Coal Field region. The Eastern Mountain region falls below the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a non-significant (p >. 05) Estimate of-. 868 [-2.970 to 1.234] as compared to the Western Coal Field region. The Jackson Purchase region falls below the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a non-significant (p >. 05) Estimate of-. 550 [-2.277 to 1.177] as compared to the Western Coal Field region. The knobs Arc fall under the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a non-significant (p >. 05) Estimate of-. 294 [-2.335 to 1.747] as compared to the Western Coal Field region. The Pennyrile fall under the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a non-significant ($p > .05$) Estimate of -.998 [-2.257 to .261] as compared to the Western Coal Field region.

The Metropolitan fall under the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a non-significant ($p > .05$) Estimate of -.198 [-1.243 to .847] as compared to the Rural zone. The Micropolitan fall under the high incidence rate of lung and bronchus cancer in Kentucky as suppose to the low incidence rate of lung and bronchus cancer with a non-significant ($p > .05$) Estimate of.353 [-. 477 to 1.182] as compared to the Rural zone. The Central falls below the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a non-significant (*p* > .05) Estimate of -.534 [-1.810 to .742] as compared to the West area. The East fall under the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a non-significant (*p* >. 05) Estimate of-. 199 [-2.037 to 1.640] as compared to the West area.

The low population areas (Categorized as 1) fall under the high incidence rate of lung and bronchus cancer in Kentucky as suppose to the low incidence rate of lung and bronchus cancer with a non-significant (*p* >. 05) Estimate of. 912 [-. 115 to 1.940] as compared to the high population areas. The medium population areas (Categorized as 2) fall below the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a non-significant (*p* >. 05) Estimate of-. 749 [-1.755 to. 257] as compared to the high population areas. The moderate population areas (Categorized as 3) fall below the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a significant (*p* >. 05) Estimate of-. 967 [-1.907 to-. 027] as compared to the high population area.

The age group below 50 years of age fall under the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a very significant (*p* <. 05) Estimate of -46.089 [-46.089 to -46.089] as compared to the age group above 65 years old. The age group above 50 years but below 60 years of age fall under the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a very significant (p < .05) Estimate of -4.134 [-4.954 to -3.315] as compared to the age group above 65 years of age. The age group above 60 years but below 65 years of age fall under the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a very non-significant (p > .05) Estimate of -29.963 [-2826.520 to -2766.594] as compared to the age group above 65 years of age. Female fall under the low incidence rate of lung and bronchus cancer in Kentucky as suppose to the high incidence rate of lung and bronchus cancer with a very significant (p < .05) Estimate of -3.778 [-4.543 to -3.014] as compared to male.

Furthermore, after running a proportionate ordinal regression on the incidence rate of lung and bronchus cancer, the output generated ordered log odds (B). Then after the exponentiation of B through syntax coding on SPSS I obtained the Odd Ratio (OR) according to the Institute for Digital Research & Education (IDRE, 2019) illustrations. Then, according to table 16b, using proportionate ordinal logistic regression I elaborate that the odds of the moderate incidence rate is .018 higher than the odds of the high incidence rate of lung and bronchus cancer. Furthermore, it also, illustrate that for prevalence smoking, I could say that for a one unit increase in the prevalence of smoking (going from 0 to 1), I expect a .007 increase in the ordered log odds of being at a high level of incidence rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the prevalence of smoking, I could Also, say that for a one unit increase in the prevalence of smoking, going from 0 to 1, the odds of high incidence versus the combined moderate and low categories are 1.007 greater, given that all of the other variables in the model are held constant. For low birth weight, I can Also, say that for a one unit increase in low birth weight (going from 0 to 1), I expect a .108 increase in the ordered log odds of being at a high level of incidence rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the low birth weight, I could Also, say that for a one unit increase in the low birth weight, going from 0 to 1, the odds of high incidence versus the combined moderate and low categories are 1.114 greater, given that all of the other variables in the model are held constant.

For poor physical health, I could say that for a one unit increase in poor physical health (going from 0 to 1), I expect a.454 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the poor physical health, I could Also, say that for a one unit increase in the poor physical health, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.635 greater, given that all of the other variables in the model are held constant. For poor physical inactivity, I could say that for a one unit increase in physical inactivity (going from 0 to 1), I expect a.003 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the physical inactivity, I could Also, say that for a one unit increase in the poor physical inactivity, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are .997 greater, given that all of the other variables in the model are held constant.

For poor mental health, I could say that for a one unit increase in poor mental health (going from 0 to 1), I expect a 1.843 increase in the ordered log odds of being at a high level of incidence rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the poor mental health, I could Also, say that for a one unit increase in the poor mental health, going from 0 to 1, the odds of high incidence versus the combined moderate and low categories are 6.315 greater, given that all of the other variables in the model are held constant. For preventable hospitals stay, I could say that for a one unit increase in preventable hospitals stay (going from 0 to 1), I expect a.003 increase in the ordered log odds of being at a high level of incidence rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the preventable hospitals stay**,** I could Also, say that for a one unit increase in the preventable hospitals stay, going from 0 to 1, the odds of high incidence versus the combined moderate and low categories are 1.003 greater, given that all of the other variables in the model are held constant.

For adult obesity, I could say that for a one unit increase in adult obesity (going from 0 to 1), I expect a.076 increase in the ordered log odds of being at a high level of incidence rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the adult obesity**,** I could Also, say that for a one unit increase in the adult obesity, going from 0 to 1, the odds of high incidence versus the combined moderate and low categories are 1.079 greater, given that all of the other variables in the model are held constant. For median household income, I could say that for a one unit increase in median household income (going from 0 to 1), I expect a 2.739E-6 increase in the ordered log odds of being at a high level of incidence rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the median household income**,** I could Also, say that for a one unit increase in the median household income, going from 0 to 1, the odds of high incidence versus the combined moderate and low categories are 1 greater, given that all of the other variables in the model are held constant.

For education attainment, I could say that for a one unit increase in education attainment (going from 0 to 1), I expect a .139 significant ($p < .05$) increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the education attainment, I could Also, say that for a one unit increase in the education attainment, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.870 significantly ($p < .05$) greater, given that all of the other variables in the model are held constant. For Bluegrass, I could say that for a one unit increase in Bluegrass (going from 0 to 1), I expect a .447 increase in the ordered log odds of being at a high level of incidence rate of lung and bronchus cancer as compared to Western coal field, given all of the other variables in the model are held constant. Then for the Bluegrass, I could Also, say that for a one unit increase in the Bluegrass, going from 0 to

1, the odds of high incidence versus the combined moderate and low categories are 1.564 greater as compared to Western coal field, given that all of the other variables in the model are held constant.

For Eastern mountain, I could say that for a one unit increase in Eastern mountain (going from 0 to 1), I expect a .868 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to Western coal field, given all of the other variables in the model are held constant. Then for the Eastern mountain, I could Also, say that for a one unit increase in the Eastern mountain, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.419 greater as compared to Western coal field, given that all of the other variables in the model are held constant.

. For Jackson purchase, I could say that for a one unit increase in Jackson purchase (going from 0 to 1), I expect a.550 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to Western coal field, given all of the other variables in the model are held constant. Then for the Jackson purchase, I could Also, say that for a one unit increase in the Jackson purchase, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.577 greater as compared to Western coal field, given that all of the other variables in the model are held constant. For Knobs arc region, I could say that for a one unit increase in Knobs arc region (going from 0 to 1), I expect a .294 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to Western coal field, given all of the other variables in the model are held constant. Then for the Knobs arc region, I could Also, say that for a one unit increase in the Knobs arc region, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.745 greater as compared to Western coal field, given that all of the other variables in the model are held constant.

For Pennyrile, I could say that for a one unit increase in Pennyrile (going from 0 to 1), I expect a.998 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to Western coal field, given all of the other variables in the model are held constant. Then for the Pennyrile, I could Also, say that for a one unit increase in the Pennyrile, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.369 greater as compared to Western coal field, given that all of the other variables in the model are held constant.

For Metropolitan, I could say that for a one unit increase in Metropolitan (going from 0 to 1), I expect a .198 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to Rural, given all of the other variables in the model are held constant. Then for the Metropolitan, I could Also, say that for a one unit increase in the Metropolitan, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.820 greater as compared to Rural, given that all of the other variables in the model are held constant. For Micropolitan, I could say that for a one unit increase in Micropolitan (going from 0 to 1), I expect a.353 increase in the ordered log odds of being at a high level of incidence rate of lung and bronchus cancer as compared to Rural, given all of the other variables in the model are held constant. Then for the Micropolitan, I could Also, say that for a one unit increase in the Micropolitan, going from 0 to 1, the odds of high incidence versus the combined moderate and low categories are 1.423 greater as compared to Rural, given that all of the other variables in the model are held constant.

For the Central area, I could say that for a one unit increase in Central (going from 0 to 1), I expect a.534 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to the West, given all of the other variables in the model are held constant. Then in the Central area, I could Also, say that for a one unit increase in the Central area, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.586 greater as compared to the West, given that all of the other variables in the model are held constant. About the East area, I could say that for a one unit increase in the East area (going from 0 to 1), I expect a.199 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to the West, given all of the other variables in the model are held constant. Then for the East area, I could Also, say that for a one unit increase in the East area, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.586 greater as compared to the West, given that all of the other variables in the model are held constant. Likewise, the odds of the combined moderate and low categories versus high categories are 0.586 times greater as compared to the West, given that all of the other variables in the model are held constant.

For population size 2134 thru 12231, I could say that for a one unit increase in population size 2134 thru 12231 (going from 0 to 1), I expect a.912 increase in the ordered log odds of being at a high level of incidence rate of lung and bronchus cancer as compared to the population size 35915 thru 771158, given all of the other variables in the model are held constant. Then for the population size 2134 thru 12231, I could Also, say that for a one unit increase in the population size 2134 thru 12231, going from 0 to 1, the odds of high incidence versus the combined moderate and low categories are 2.489 greater as compared to the population size 35915 thru 771158, given that all of the other variables in the model are held constant.

For population size 12232 thru 19088, I could say that for a one unit increase in population size 12232 thru 19088 (going from 0 to 1), I expect a.749 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to the population size 35915 thru 771158, given all of the other variables in the model are held constant. Then for the population size 12232 thru 19088, I could Also, say that for a one unit increase in the population size 12232 thru 19088, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.473 greater as compared to the population size 35915 thru 771158, given that all of the other variables in the model are held constant.

For population size 19089 thru 35914, I could say that for a one unit increase in population size 19089 thru 35914 (going from 0 to 1), I expect a significant .967 increase ($p < .05$) in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to the population size 35915 thru 771158, given all of the other variables in the model are held constant. Then for the population size 19089 thru 35914, I could Also, say that for a one unit increase in the population size 19089 thru 35914, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.380 significantly ($p < .05$) greater as compared to the population size 35915 thru 771158, given that all of the other variables in the model are held constant.

For the age group less than 50, I could say that for a one unit increase in the age group less than 50 (going from 0 to 1), I expect a 46.089 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to the age group more than 65, given all of the other variables in the model are held constant. Then for the age group less than 50, I could Also, say that for a one unit increase in the age group less than 50, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 9.634E-21 greater as compared to the age group more than 65, given that all of the other variables in the model are held constant.

For the age group more than 50 but less or equal to 60, I could say that for a one unit increase in the age group more than 50 but less or equal to 60 (going from 0 to 1), I expect a 4.134 very significant increase ($p < .05$) in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to the age group more than 65, given all of the other variables in the model are held constant. Then for the age group more than 50 but less or equal to 60, I could Also, say that for a one unit increase in the age group more than 50 but less or equal to 60, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.0160 significantly ($p < .05$) greater as compared to the age group more than 65, given that all of the other variables in the model are held constant.

For the age group less than 65 but more than 60, I could say that for a one unit increase in the age group less than 65 but more than 60 (going from 0 to 1), I expect a 29.963 increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to the age group more than 65, given all of the other variables in the model are held constant. Then for the age group less than 65 but more than 60, I could Also, say that for a one unit increase in the age group less than 65 but more than 60, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 9.710E-14 greater as compared to the age group more than 65, given that all of the other variables in the model are held constant.

For female, I could say that for a one unit increase in female (going from 0 to 1), I expect a 3.778 significant ($p < .05$) increase in the ordered log odds of being in a low level of incidence rate of lung and bronchus cancer as compared to the male, given all of the other variables in the model are held constant. Then for the female, I could Also, say that for a one unit increase in the female, going from 0 to 1, the odds of low incidence versus the combined moderate and high categories are 0.023 significantly ($p < .05$) greater as compared to the male, given that all of the other variables in the model are held constant.

The outcome of the initial analysis further tells us that the model predicts the outcome significantly ($p < .05$) from the model fitting information table. The outcome Also, denotes that the model is a good fit for the data ($p > .05$) from the goodness-of-fit table. Finally, the pseudo R-square table illustrate that the 98.1 % of variation observed in the incidence rate of lung and bronchus cancer is explained by all independent variables assessed in our earlier explanation.

Table 16b

Parameters estimate from the proportionate ordinal logistic regression of the incidence rate of lung and bronchus cancer, and social and demographic factors of populations living in communities across the 120 counties of Kentucky

	Estim ate(B)	Odds Ratio	P-value	95% Confidence Interval of B	
				Lower Bound	Upper Bound
INCIDENCE RATE OF LUNG-BRONCHUS CANCER (per 100,000) HIGH	-29.676	1.294	.983	-2826.285	2766.933
INCIDENCE RATE OF LUNG-BRONCHUS CANCER (per 100,000) MODERATE	-4.008	0.018	.642	-20.925	12.908

Table 16b Continued

PREVALENCE SMOKING (%)	.007	1.007	.745	-.037	.052

LOW BIRTH WEIGHT (%)	.108	1.114	.527	-.226	.441
POORPHYSICAL HEALTH (Days)	-.454	0.635	.691	-2.690	1.782
PHYSICAL INACTIVITY (%)	-.003	0.997	.948	-.108	.101
POOR MENTAL HEALTH (Days)	1.843	6.315	.204	-1.000	4.687
RATE PREVENTABLE HOSPITAL STAY (Rate)	.003	1.003	.538	-.007	.013
ADULT OBESITY (%)	.076	1.079	.273	-.060	.211
MEDIAN HOUSEHOLD INCOME ($)	2.739 E-6	1.000	.948	-7.889E-5	8.437E-5
EDUCATION ATTAINMENT (%)	-.139	0.870	.016	-.252	-.026
COUNTIES_BY_GEOREGIONS Bluegrass	.447	1.564	.617	-1.302	2.195

Table 16b
Continued

COUNTIES_BY_GEOR EGIONS Eastern Mountain	-.868	0.419	418	-2.970	1.234
COUNTIES_BY_GEORE GIONS Jackson Purchase	-.550	0.577	.533	-2.277	1.177
COUNTIES_BY_GEOR EGIONS Knobs Arch	-.294	0.745	.778	-2.335	1.747
COUNTIES_BY_GEOR EGIONS Pennyrile	-.998	0.369	.120	-2.257	.261
COUNTIES_BY_GEOR EGIONS Western Coal Field the reference category	0[a]	1	.	.	.

Table 16b
Continued

COUNTIES_BY_GEOTYPES Metropolitan	-.198	0.820	711	-1.243	.847
COUNTIES_BY_GEOTYPE Micropolitan	.353	1.423	.405	-.477	1.182
COUNTIES_BY_GEOTYPES Rural the reference category	0[a]	1	.	.	.
COUNTIES_BY_GEOAREAS Central	-.534	0.586	.412	-1.810	.742
COUNTIES_BY_GEOARES East	-.199	0.819	.832	-2.037	1.640
COUNTIES_BY_GEOAREAS West the reference category	0[a]	1	.	.	.

Table 16b
Continued

POPULATION_CATEGORIZED 2134 thru 12231	912	2.489	082	-.115	1.940
POPULATION_CATEGORIZED 12232 thru 19088	-.749	0.473	.144	-1.755	.257
POPULATION_CATEGORIZED 19089 thru 35914	-.967	0.380	.044	-1.907	-.027
POPULATION_CATEGORIZE 35915 thru 771158 the reference category	0[a]	1	.	.	.
AGE GROUP Less than 50	-46.089	9.634E-21	.	-46.089	-46.089
AGE GROUP More than 50 but less or equal 60	-4.134	0.0160	.000	-4.954	-3.315
AGE GROUP Less than 65 but more than 60	-29.963	9.710E-14	.983	-2826.520	2766.594

Table 16b
Continued

			.	.	.
AGE GROUP More than 65 the reference category	0[a]	1			
GENDER Female	-3.778	0.023	.000	-4.543	-3.014
GENDER Male the reference category	0[a]	1	.	.	.

Research Question 2 (RQ2) and Null hypothesis (*H_0*2). We report statistical analysis findings, organized by research questions and hypotheses, including exact statistics and associated probability values; confidence intervals around the statistics, and effect sizes of the independent variables on the mortality rate of lung and bronchus cancer.

Adult obesity, age group (more than 50 but less or equal 60), gender (female), Counties by geographic regions (Jackson Purchase) are statistically significant according to the output of table 17b.

Exact statistics- Confidence intervals- Effect sizes of the ordinal analysis. The prevalence of smoking falls under the high threshold of the mortality rate of lung and bronchus cancer in Kentucky as suppose to the low mortality rate of lung and bronchus cancer with a non-significant (*p* >.05) Estimate of. 027 [-. 023 to. 077]. The low birthweight falls under the high mortality rate of lung and bronchus cancer in Kentucky as suppose to the low mortality rate of lung and bronchus cancer with a non-significant (*p* >.05) Estimate of. 159 [-. 217 to. 535]. The poor physical health falls below the high mortality rate of lung and bronchus cancer in Kentucky as suppose to the low mortality rate of lung and bronchus cancer with a non-significant (*p* >. 05) Estimate of. 188 [-2.272 to 2.648]. The physical inactivity falls below the high mortality rate of lung and bronchus cancer in Kentucky as suppose to the low mortality rate of lung and bronchus cancer with a non-significant (*p* >. 05) Estimate of. 025 [-. 092 to. 142]. The poor mental health fall under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a non-significant (*p* > .05) Estimate of -.428 [-3.669 to 2.813].

The preventable hospital stays fall under the high mortality rate of lung and bronchus cancer in Kentucky as suppose to the low mortality rate of lung and bronchus cancer with a non-significant (*p* >.05) Estimate of. 007 [-. 005 to. 019]. The adult obesity falls under the high mortality rate of lung and bronchus cancer in Kentucky as suppose to the low mortality rate of lung and bronchus cancer with a significant (*p* >.05) Estimate of. 210 [.055 to. 366]. The median household income falls under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a non-significant (*p* > .05) Estimate of -2.191E-5 [.000 to 5.885E-

5]. The education attainments fall below the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a non-significant (p >.05) Estimate of-. 012 [-. 136 to. 112].

The Bluegrass region falls below the high mortality rate of lung and bronchus cancer in Kentucky as suppose to the low mortality rate of lung and bronchus cancer with a non-significant (p >. 05) Estimate of. 392 [-1.618 to 2.403] as compared to the Western Coal Field region. The Eastern Mountain region falls below the high mortality rate of lung and bronchus cancer in Kentucky as suppose to the low mortality rate of lung and bronchus cancer with a non-significant (p >.05) Estimate of. 556 [-1.863 to 2.974] as compared to the Western Coal Field region. The Jackson Purchase region fall under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a significant (p > .05) estimate of -2.123 [-4.041 to -.206] as compared to the Western Coal Field region. The knobs Arc fall under the high mortality rate of lung and bronchus cancer in Kentucky as suppose to the low mortality rate of lung and bronchus cancer with a non-significant (p >.05) Estimate of. 239 [-2.039 to 2.518] as compared to the Western Coal Field region. The Pennyrile fall under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a non-significant (p > .05) estimate of -.842 [-2.229 to .546] as compared to the Western Coal Field region.

The Metropolitan fall under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a non-significant ($p > .05$) estimate of -.983 [-2.194 to .228] as compared to the Rural zone. The Micropolitan fall under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a non-significant ($p > .05$) Estimate of -.169 [-1.162 to .824] as compared to the Rural zone. The Central falls below the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a non-significant (p >. 05) Estimate of-. 496 [-1.964 to. 973] as compared to the West area. The East fall under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a non-significant ($p > .05$) estimate of -1.409 [-3.540 to .722] as compared to the West area.

The low population areas (Categorized as 1) fall under the high mortality rate of lung and bronchus cancer in Kentucky as suppose to the low mortality rate of lung and bronchus cancer with a non-significant (p >.05) Estimate of. 739 [-. 424 to 1.902] as compared to the high population areas. The medium population areas (Categorized as 2) fall under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a non-significant ($p > .05$) estimate of -.283 [-1.401 to .834] as compared to the high population areas. The moderate population areas (Categorized as 3) fall below the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a significant (p >.05) Estimate of-. 750 [-1.788 to-. 288] as compared to the high population area.

The age group below 50 years of age fall under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a very significant (p <. 05) estimate of -24.739 [-24.739 to -24.739] as compared to the age group above 65 years old. The age group above 50 years but below 60 years of age fall under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a very significant (p <.05) Estimate of -5.164 [-6.227 to -4.101] as compared to the age group above 65 years of age. The age group above 60 years but below 65 years of age fall under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a very non-significant ($p > .05$) estimate of -32.034 [-1874.175 to -1810.108] as compared to the age group above 65 years of age. Female fall under the low mortality rate of lung and bronchus cancer in Kentucky as suppose to the high mortality rate of lung and bronchus cancer with a very significant ($p < .05$) Estimate of -5.695 [-6.864 to -4.526] as compared to male.

Furthermore, the Odd Ratio (OR) analyses illustrate that for prevalence smoking, I could say that for a one unit increase in the prevalence of smoking (going from 0 to 1), I expect a.027 increase in the ordered log odds of being at a high level of mortality rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the prevalence of smoking, I could Also, say that for a one unit increase in the prevalence of smoking, going from 0 to 1, the odds of high mortality versus the combined moderate and low categories are 1.027 greater, given that all of the other variables in the model are held constant. For low birth weight, I could say that for a one unit increase in low birth weight (going from 0 to 1), I expect a.159 increase in the ordered log odds of being at a high level of mortality rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the low birth weight, I could Also, say that for a one unit increase in the low birth weight, going from 0 to 1, the odds of high mortality versus the combined moderate and low categories are 1.172 greater, given that all of the other variables in the model are held constant.

For poor physical health, I could say that for a one unit increase in poor physical health (going from 0 to 1), I expect a.188 increase in the ordered log odds of being at a high level of mortality rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the poor physical health, I could Also, say that for a one unit increase in the poor physical health, going from 0 to 1, the odds of high mortality versus the combined moderate and low categories are 1.207 greater, given that all of the other variables in the model are held constant. For poor physical inactivity, I could say that for a one unit increase in physical inactivity (going from 0 to 1), I expect a .025 increase in the ordered log odds of being in a high level of mortality rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the physical inactivity, I could Also, say that for a one unit increase in the poor physical inactivity, going from 0 to 1, the odds of high mortality versus the combined moderate and low categories are 1.025 greater, given that all of the other variables in the model are held constant.

For poor mental health, I could say that for a one unit increase in poor mental health (going from 0 to 1), I expect a .428 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the poor mental health, I could Also, say that for a one unit increase in the poor mental health, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are .652 greater, given that all of the other variables in the model are held constant. For preventable hospitals stay, I could say that for a one unit increase in preventable hospitals stay (going from 0 to 1), I expect a .007 increase in the ordered log odds of being in a high level of mortality rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the preventable hospitals stay, I could Also, say that for a one unit increase in the preventable hospitals stay, going from 0 to 1, the odds of high mortality versus the combined moderate and low categories are 1.007 greater, given that all of the other variables in the model are held constant.

For adult obesity, I could say that for a one unit increase in adult obesity (going from 0 to 1), I expect a .210 increase in the ordered log odds of being in a high level of mortality rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the adult obesity, I could Also, say that for a one unit increase in the adult obesity, going from 0 to 1, the odds of high mortality versus the combined moderate and low categories are 1.234 greater, given that all of the other variables in the model are held constant. For median household income, I could say that for a one unit increase in median household income (going from 0 to 1), I expect a 2.191E-5 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the median household income, I could Also, say that for a one unit increase in the median household income, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are .999 greater, given that all of the other variables in the model are held constant.

For education attainment, I could say that for a one unit increase in education attainment (going from 0 to 1), I expect a .012 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer, given all of the other variables in the model are held constant. Then for the education attainment, I could Also, say that for a one unit increase in the education attainment, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 0.988 greater, given that all of the other variables in the model are held constant. For Bluegrass, I could say that for a one unit increase in Bluegrass (going from 0 to 1), I expect a .392 increase in the ordered log odds of being in a high level of mortality rate of lung and bronchus cancer as compared to Western coal field, given all of the other variables in the model are held constant. Then for the Bluegrass, I could Also, say that for a one unit increase in the Bluegrass, going from 0 to 1, the odds of high mortality versus the combined moderate and low categories are 1.479 greater as compared to Western coal field, given that all of the other variables in the model are held constant.

For Eastern mountain, I could say that for a one unit increase in Eastern mountain (going from 0 to 1), I expect a .556 increase in the ordered log odds of being in a high level of mortality rate of lung and bronchus cancer as compared to Western coal field, given all of the other variables in the model are held constant. Then for the Eastern mountain, I could Also, say that for a one unit increase in the Eastern mountain, going from 0 to 1, the odds of high mortality versus the combined moderate and low categories are 0.419 greater as compared to Western coal field, given that all of the other variables in the model are held constant.

. For Jackson purchase, I could say that for a one unit increase in Jackson purchase (going from 0 to 1), I expect a 2.123 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to Western coal field, given all of the other variables in the model are held constant. Then for the Jackson purchase, I could Also, say that for a one unit increase in the Jackson purchase, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 0.1196 greater as compared to Western coal field, given that all of the other variables in the model are held constant. For Knobs arc region, I could say that for a one unit increase in Knobs arc region (going from 0 to 1), I expect a .239 increase in the ordered log odds of being in a high level of mortality rate of lung and bronchus cancer as compared to Western coal field, given all of the other variables in the model are held constant. Then for the Knobs arc region, I could Also, say that for a one unit increase in the Knobs arc region, going from 0 to 1, the odds of high mortality versus the combined moderate and low categories are 1.2699 greater as compared to Western coal field, given that all of the other variables in the model are held constant.

For Pennyrile, I could say that for a one unit increase in Pennyrile (going from 0 to 1), I expect a .842 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to Western coal field, given all of the other variables in the model are held constant. Then for the Pennyrile, I could Also, say that for a one unit increase in the Pennyrile, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 0.4308 greater as compared to Western coal field, given that all of the other variables in the model are held constant.

For Metropolitan, I could say that for a one unit increase in Metropolitan (going from 0 to 1), I expect a .983 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to Rural, given all of the other variables in the model are held constant. Then for the Metropolitan, I could Also, say that for a one unit increase in the Metropolitan, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 0.374 greater as compared to Rural, given that all of the other variables in the model are held constant. For Micropolitan, I could say that for a one unit increase in Micropolitan (going from 0 to 1), I expect a .169 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to Rural, given all of the other variables in the model are held constant. Then for the Micropolitan, I could Also, say that for a one unit increase in the Micropolitan, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 0.844 greater as compared to Rural, given that all of the other variables in the model are held constant.

For the Central area, I could say that for a one unit increase in Central (going from 0 to 1), I expect a .496 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to the West, given all of the other variables in the model are held constant. Then for the Central area, I could Also, say that for a one unit increase in the Central area, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 0.609 greater as compared to the West, given that all of the other variables in the model are held constant. For the East area, I could say that for a one unit increase in East area (going from 0 to 1), I expect a 1.409 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to the West, given all of the other variables in the model are held constant. Then for the East area, I could Also, say that for a one unit increase in the East area, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 0.244 greater as compared to the West, given that all of the other variables in the model are held constant. Likewise, the odds of the combined moderate and low categories versus high categories are 0.244 times greater as compared to the West, given that all of the other variables in the model are held constant.

For population size 2134 thru 12231, I could say that for a one unit increase in population size 2134 thru 12231 (going from 0 to 1), I expect a .739 increase in the ordered log odds of being in a high level of mortality rate of lung and bronchus cancer as compared to the population size 35915 thru 771158, given all of the other variables in the model are held constant. Then for the population size 2134 thru 12231, I could Also, say that for a one unit increase in the population size 2134 thru 12231, going from 0 to 1, the odds of high mortality versus the combined moderate and low categories are 2.094 greater as compared to the population size 35915 thru 771158 , given that all of the other variables in the model are held constant.

For population size 12232 thru 19088, I could say that for a one unit increase in population size 12232 thru 19088 (going from 0 to 1), I expect a .283 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to the population size 35915 thru 771158, given all of the other variables in the model are held constant. Then for the population size 12232 thru 19088, I could Also, say that for a one unit increase in the population size 12232 thru 19088, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 0.754 greater as compared to the population size 35915 thru 771158 , given that all of the other variables in the model are held constant.

For population size 19089 thru 35914, I could say that for a one unit increase in population size 19089 thru 35914 (going from 0 to 1), I expect a .750 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to the population size 35915 thru 771158, given all of the other variables in the model are held constant. Then for the population size 19089 thru 35914, I could Also, say that for a one unit increase in the population size 19089 thru 35914, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 0.472 greater as compared to the population size 35915 thru 771158 , given that all of the other variables in the model are held constant.

For the age group less than 50, I could say that for a one unit increase in the age group less than 50 (going from 0 to 1), I expect a 24.739 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to the age group more than 65, given all of the other variables in the model are held constant. Then for the age group less than 50, I could Also, say that for a one unit increase in the age group less than 50, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 1.8E-11 greater as compared to the age group more than 65, given that all of the other variables in the model are held constant.

For the age group more than 50 but less or equal to 60, I could say that for a one unit increase in the age group more than 50 but less or equal to 60 (going from 0 to 1), I expect a 5.164 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to the age group more than 65, given all of the other variables in the model are held constant. Then for the age group more than 50 but less or equal to 60, I could Also, say that for a one unit increase in the age group more than 50 but less or equal to 60, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 0.006 greater as compared to the age group more than 65, given that all of the other variables in the model are held constant.

For the age group less than 65 but more than 60, I could say that for a one unit increase in the age group less than 65 but more than 60 (going from 0 to 1), I expect a 32.034 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to the age group more than 65, given all of the other variables in the model are held constant. Then for the age group less than 65 but more than 60, I could Also, say that for a one unit increase in the age group less than 65 but more than 60, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 1.22E-14 greater as compared to the age group more than 65, given that all of the other variables in the model are held constant.

For female, I could say that for a one unit increase in female (going from 0 to 1), I expect a 5.695 increase in the ordered log odds of being in a low level of mortality rate of lung and bronchus cancer as compared to the male, given all of the other variables in the model are held constant. Then for the female, I could Also, say that for a one unit increase in the female, going from 0 to 1, the odds of low mortality versus the combined moderate and high categories are 0.003 greater as compared to the male, given that all of the other variables in the model are held constant.

The outcome of the initial analysis further tells us that the model predicts the outcome significantly ($p < .05$) from the model fitting information table. The outcome Also, denotes that the model is a good fit for the data ($p >. 05$) from the goodness-of-fit table. Finally, the pseudo R-square table illustrate that the 96.7% of variation observed in the mortality rate of lung and bronchus cancer is explained by all the independent variables assessed in our earlier explanation.

Table 17b

Parameters Estimate from the ordinal logistic regression of the mortality rate of lung and bronchus cancer, and social and demographic factors of populations living in communities across the 120 counties of Kentucky

	Estimate(B)	Odds Ratio	P-value	95% Confidence Interval of B Lower Bound	Upper Bound
Mortality Rate LUNG BRONCHUS High	-6.044	.00238	.537	-25.245	13.157
Mortality Rate LUNG BRONCHUS Moderate	3.799	44.66	.698	-15.388	22.985
PREVALENCE SMOKING (%)	.027	1.027	.294	-.023	.077
LOW BIRTH WEIGHT (%)	.159	1.172	.408	-.217	.535
POOR PHYSICAL HEALTH (Days)	.188	1.207	.881	-2.272	2.648
PHYSICAL INACTIVITY (%)	.025	1.025	.677	-.092	.142

Table 17b
Continued

POOR MENTAL HEALTH (Days)	-.428	0.652	.796	-3.669	2.813
PREVENTABLE HOSPITAL STAY (Rate)	.007	1.007	.230	-.005	.019
ADULT OBESITY (%)	.210	1.234	.008	.055	.366
MEDIAN HOUSEHOLD INCOME ($)	-2.191E-5	0.999	.595	.000	5.885E-5
EDUCATION ATTAINMENT (%)	-.012	0.988	.850	-.136	.112
POPULATION_CATEGORIZED 2134 thru 12231	.739	2.094	.213	-.424	1.902
POPULATION_CATEGORIZED 12232 thru 19088	-.283	0.754	.619	-1.401	.834
POPULATION_CATEGORIZED 19089 thru 35914	-.750	0.472	.157	-1.788	.288
POPULATION_CATEGORIZED 35915 thru 771158 the reference category	0[a]	1	.	.	.

Table 17b
Continued

AGE GROUP Less than 50	-24.739	1.8E-11	.	-24.739	-24.739
AGEGROUP More than 50 but less or equal 60	-5.164	0.006	.000	-6.227	-4.101
AGE GROUP Less than 65 but more than 60	-32.034	1.22E-14	.973	-1874.175	1810.108
AGEGROUP More than 65 the reference category	0[a]	1	.	.	.
GENDER Female	-5.695	0.003	.000	-6.864	-4.526
GENDER Male the reference category	0[a]	1	.	.	.
COUNTIES_BY_GEOREGIONS Bluegrass	.392	1.479	.702	-1.618	2.403
COUNTIES_BY_GEOREGIONS Eastern Mountain	.556	1.744	.652	-1.863	2.974

Table 17b
Continued

COUNTIES_BY_GEOREGIONS Jackson Purchase	-2.123	0.1196	.030	-4.041	-.206
COUNTIES_BY_GEOREGIONS knobs Arc	.239	1.2699	.837	-2.039	2.518
COUNTIES_BY_GEOREGIONS Pennyrile	-.842	0.4308	.234	-2.229	.546
COUNTIES_BY_GEOREGIONS Western Coal Field the reference category	0[a]	1	.	.	.
COUNTIES_BY_GEOTYPES Metropolitan	-.983	0.374	.112	-2.194	.228
COUNTIES_BY_GEOTYPES Micropolitan	-.169	0.844	.739	-1.162	.824
COUNTIES_BY_GEOTYPES Rural the reference category	0[a]	1	.	.	.

Table 17b
Continued

COUNTIES_BY_GEOAREAS Central	-.496	0.609	.508	-1.964	.973
COUNTIES_BY_GEOAREAS East	-1.409	0.244	.195	-3.540	.722
COUNTIES_BY_GEOAREAS West the reference category	0[a]	1	.	.	.

Report Results of Post-hoc Analyses

There is no need to perform a post-hoc analyses of statistical tests because the results from the ordinal logistic regression provided adequate arguments to answer the research questions and hypotheses effectively; thus, gave better insight to address the research problem efficiently.

Summary

According to the outcomes of the ordinal and bivariate analyses, there is a significant association between counties by geographic types, and population and the incidence and mortality rates of lung and bronchus cancer in Kentucky, controlling for prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age. The outcomes Also, derived that there is a non-significant association between counties by geographic regions, and areas and the incidence and mortality rates of lung and bronchus cancer in Kentucky, controlling for prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age.

Furthermore, the results also, show that Eastern Mountain Coal Fields region, Rural and Metropolitan zones, and East areas have a significant association with the mortality rate of lung and bronchus cancer in Kentucky, controlling for prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age. The results also, denote that there is a significant association between Metropolitan, and Rural zones and mortality rates of lung and bronchus cancer in Kentucky, controlling for prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age. Meanwhile, there is a non-significant association between Eastern Mountain Coal Fields region, and East areas and mortality rates of lung and bronchus cancer in Kentucky, controlling for prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age.

Finally, the results indicate that the remaining categories under the geographic regions, types, and areas have a non-significant associations with the incidence and mortality rates of lung and bronchus cancer in Kentucky, controlling for prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age. For example, there is a non-significant association between micropolitan and the incidence and mortality rates of lung and bronchus cancer. After the presentation of the results and findings from the analyses of the collected secondary data set as illustrated earlier, I proceeded our proposal by illustrating the application of our findings to professional practice and implications for social change.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

I conducted this research because high incidence and mortality rates of lung and bronchus cancer in the state of Kentucky may not be caused solely by social and demographic factors according to ACS (2018); CRCB (2018) illustration. This study is non-experimental cross-sectional research that helped determine and assess the social and demographic factors that may confound the relationship between geographic factors and the high incidence and mortality rates in the state of Kentucky according to GeoDa Center for Geographic Analysis and Computation (n.d.) elaboration.

I use the results of the analyses to derive that larger populated areas such as the metropolitan and micropolitan zones have lower incidence and mortality rates of lung and bronchus cancer in the state of Kentucky compared to low populated Rural zones according to Wagner (2016a), while confounded by the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age. Furthermore, the outcomes of the analyses Also, illustrated that counties located in rural zones of the east area of Kentucky such as the Eastern Mountain Coal Field region have a high incidence and mortality rates of lung and bronchus cancer in Kentucky (Xiaoping & Limin, 2017) compared to other zones, regions and areas of Kentucky, while confounded by the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age. For example, the Appalachian communities on the eastern side of the state of Kentucky have a higher incidence and mortality rates of lung and bronchus cancer, according to the literatures illustrated earlier in the study (e.g. Schoenberg et al., 2015).

Interpretation of the Findings

The findings confirm peer-reviewed literature by illustrating the presence of high incidence and mortality rates of lung and bronchus cancer in rural zones of the East of Kentucky such as the Eastern Mountain Coal Field region where the Appalachian communities are located according to NAACCR (2016) elaboration. The high incidence and mortality rates can be partially attributed to the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age (NAACCR, 2016). In some counties in the Appalachian region of Kentucky, just over half of the population has a high school degree (NAACCR, 2016). Consistent with the association between these measures and increased risk behaviors, the Appalachian region of Kentucky has higher rates of smoking and extraordinarily high rates of lung cancer incidence and resulting mortality (NAACCR, 2016). However, several recent studies provide strong evidence that the high rates of lung cancer do not account for by smoking alone, and that the excessively high lung cancer incidence and mortality rates might be due to the higher rates of smoking in combination with exposure to arsenic and chromium (NAACCR, 2016).

I also, noticed that the geographic factors by regions such as the Bluegrass region which is close to the Eastern Mountain region had a high incidence rate of lung and bronchus cancer rate as compared to other regions. Meanwhile, the Bluegrass, Eastern Mountain, knobs Arc regions had a high mortality rate as compared to other regions. Among the social factors, prevalence of smoking, low birth weight, poor mental health, preventable hospital stays, adult obesity, and median household have a high incidence rate of lung and bronchus cancer as compared to the remaining factors. In the other hands, prevalence of smoking, low birth weight, poor physical heath, physical inactivity, preventable hospital stays, and adult obesity have a high mortality rates, as compared to other regions. Furthermore, micropolitan and rural areas had a high incidence rates as compared to the metropolitan area. Metropolitan and micropolitan areas had a low mortality rates as compared to rural areas. Meanwhile, the Central and the East zones have low incidence and mortality rates as compared to the west side of Kentucky. Furthermore, the larger the population the lower the incidence and mortality rates of lung and bronchus cancer. The younger the age group the lower the incidence and mortality rates of lung and bronchus cancer in average; higher the mortality rate. Finally, women have a lower incidence and mortality rates of lung and bronchus cancer in the state of Kentucky as compared to men.

I use the SEM to consider the complex interplay between individual, family, community, and societal factors according to the Centers for Disease Control and Prevention (CDC, 2018) elaboration. Thus, I understand the range of factors that put people at risk of exposures to environmental pollutants such as second-hand smoke, arsenic, chromium, magnesium, mercury, and selenium during windows of developmental vulnerability in their life in Kentucky according to the CDC (2018) elaboration. In larger populated areas such as metropolitan and micropolitan zones individuals, families, communities, and the society as a whole are less exposed to those risk factors and people have more access to better health care practices and surveillance compared to the rural zones. Thus, in metropolitan and micropolitan zones I can observe the lower incidence and mortality rates of lung and bronchus cancer in the state of Kentucky compared to low populated rural zones (Wagner, 2016a; NAACCR, 2016), while confounded by social and demographic factors. Furthermore, in counties located in rural zones in the East area of Kentucky such as the Eastern Mountain Coal Field region individuals, families, communities, and the society as a whole are more exposed to those risk factors. In addition, people have less access to better health care practices and surveillance as compared to the metropolitan and micropolitan zones (NAACCR, 2016). In rural zones located on the east side of the state of Kentucky we can witness higher incidence and mortality rates of lung and bronchus cancer in the state of Kentucky compared to high populated metropolitan and micropolitan zones (Wagner, 2016a; NAACCR, 2016), while confounded by social and demographic factors. The high incidence, and high resulting mortality rates of lung and bronchus cancer in the Appalachia area cannot be explained by smoking alone according to the NAACCR (2016) elaboration.

Limitations of the study

The results of the study were not generalized to the other populations through the notion that imply the recognition of the difference of the effect of the ecosystem across the counties of Kentucky. Furthermore, the incidence, and resulting mortality rates of lung and bronchus cancer do not impact the health of communities in the United States and across the world at the same pace due to regional differences. Thus, I proposed immediate consideration of geographic health determinants as important contributors to the variation observed on diseases trend per region around the globe due to the difference of exposure to trace elements according to NAACCR (2016) elaboration. Therefore, the outcome of the study cannot be generalized across counties due to the significant difference on the prevalence rate of lung and bronchus cancer, and morbidity rate of communities facing different social and demographic adversities from environmental differences per the NAACCR (2016) illustration.

I investigated the specific assumptions of the multiple regression tests prior to the analysis of the data per Laureate Education (2016) denotation. Thus, I diagnosed linearity, independence of error, homoscedasticity, multicollinearity, undue influence, and normal distribution of errors to have a better interpretation of the multiple regression model according to Laureate Education (2016); Wagner (2016a) illustration. The assumptions of the multiple linear regression model (multicollinearity, and normal distribution of errors) did not meet the criteria and we used ordinal logistic regression. Then I Also, conduct a parallel line test for ordinal logistic regression for non-significance. That test failed, but because the model ability to predict the outcome was significant; the data, aligning with the model was significant. In addition, more than 96% variation observed on the incidence and resulting mortality rates of lung and bronchus cancer can be explained by the predictors. I Also, ran the bivariate regression model between each geographic factors and the incidence and mortality rates of lung and bronchus cancer to adequately assess the topic of the study (Gerstman, 2015; Wagner, 2016a).

I retrieved the data from public record web pages and websites. The data retrieved from those web pages and websites may be trustworthy for use based on the consistency of the information obtained over time according to Leischow and Milstein (2006) elaboration. When the data are trustworthy, they are valid and appropriate to run an effective analysis to answer the research questions adequately and perhaps promote social change, especially in areas most affected (Leischow & Milstein, 2006; National Cancer Institute, 2019a). Meanwhile, the extreme differences of exposure to potential and unknown toxins of the populations living in counties across Kentucky poses a threat to the validity of the data (Leischow & Milstein, 2006). For example, populations living in the eastern region of Kentucky, like the Appalachian region, are highly exposed to environmental pollutants from coal mining, unlike those living in the central and Eastern regions of Kentucky (Leischow & Milstein, 2006). Thus, occupational exposures based on regional differences should be considered to understand differences on the study outcome (Leischow & Milstein, 2006; National Cancer Institute, 2019a).

Recommendations

Human exposure to environmental chemicals poses a threat to their overall state of health. So, it is important to have programs in those affected areas with an aim of reducing exposures. It can be accomplished by implementing community-based participatory studies to define the exposure factors efficiently according to County Health Rankings & Roadmap (2019) elaboration.

A human subject-based study should be conducted throughout a longitudinal prospective study to retrieve, analyze, and observed participants living in pilot area's bio-specimen and bio-information overtime based on Wagner (2016a) elaboration. It is of utmost importance to assess the state of exposure of those target populations by identifying specific trace elements in their blood stream through laboratory testing and link these chemicals to individuals’ living locations or occupations (Wagner, 2016a). Furthermore, the study outcomes supported and validated the literatures of previous studies made in Kentucky on similar subject concerning the Appalachian communities according to Wagner (2016a); NAACCR (2016) denotations. Therefore, the proposed study was proceeded beyond secondary data to adequately define the trace elements that are mostly responsible to the high incidence and resulting mortality rates of lung and bronchus cancer, beside social and demographic factors according to Wagner (2016a) illustration. The aim of defining the confounding variables through the use of the SEM approach could perhaps help assess their influences on lung and bronchus cancer effectively at the individual, family, community, and societal levels in every county across Kentucky according to Hawkins, Cole, and Law (2009) elaboration.

Implications for Professional Practice and Social Change

Professional Practice

I will share my study results with stakeholders according to guidelines that protect the privacy of families in communities across Kentucky during community outreach in the context of mobilizing and educating target populations. Based on my study outcome, I will advise the counties' public and environmental health departments, including state public health department to send the survey to community members in their respective counties to request about their state of health, potential exposure to trace elements, smoking, physical exercise, and frequency of medical visits according to Georgia et al (2015); Glanz, Rimer, and Viswanath (2015) illustration. The health departments of each county could then summarize the data and discuss with community members during follow-up monthly seminars where consensuses and solutions could be made to reduce exposure, promote healthy lifestyle, and reduce the prevalence of lung and bronchus cancer in each county in the state of Kentucky. Furthermore, Industry' leaders could Also, be advised to report each month the amount of chemical release by their respective facilities and enforced regulations that reduce communities' exposure to local public health and Environmental Protection Agency (EPA) officials according to Wagner

(2016a) illustration. Lawmakers and communities health leaders such as city councils, and state representatives could Also, require industry leaders to present their engagement and action plan to work with communities and health officials to reduce the prevalence of lung and bronchus cancer in their surrounding communities during each monthly seminar, while taking questions from community members according to the Office of Disease Prevention and Health Promotion (ODPHP, 2019) elaboration. During each seminar communities' members also, shared the state of their health so that appropriate action can be taken to eliminate the threat swiftly (ODPHP, 2019). Local and state lawmakers present at each seminar will be advised to write laws that promote stronger regulations on the reduction of the release of trace elements by industrial facilities around communities and report their course of action during each seminar to reduce the incidence and mortality rates of lung and bronchus cancer in the state of Kentucky according to what has been elaborated (ODPHP, 2019; Wagner, 2016a).

Positive Social Change

The results dissemination was be proactively sharing to enhance individuals, families, and community members and stakeholder participation for effective policy implementation. Thus, the results dissemination plan to further social change included meeting with city councils, state representatives, and senators; officials from the county public health department, and state public health department; community leaders, industry' leaders, and community members in monthly seminars as explained earlier according to Walden University Center for Research Quality (N.d.) illustration. During sessions, community members was be advice on how to identify potential trace elements of the individual, and family' level and have regular doctor visits with blood exam and X-ray to identify potential lung and bronchus cancer growth exclusively in high exposure areas and get to a treatment plan immediately if result are positives according to Wagner, (2016a) denotation. In summary, healthy individuals promote healthy families which in turn promote healthy communities; thus, promote local work force, investment, and development which enhanced self-esteem and social change in each county across Kentucky per Wagner (2016a) denotation.

Conclusion

After a thorough assessment made on the foundation of the study and the literature review, and research design, data collection and analyses, my results and findings from the bivariate analyses indicate that there a significant association between counties by geographic types and the incidence and mortality rates of lung and bronchus cancer in the state of Kentucky according to Wagner (2016a) elaboration. According to the output from the ordinal analysis that association is confounded by the prevalence rate of smoking, low birth weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age according to Wagner (2016a) illustration. The counties by geographic regions and areas do not have a significant association with the incidence and mortality rates of lung and bronchus cancer, controlling for the social and demographic factors. The outcome Also, illustrates that there is a significant association between Eastern Mountain Coal Field region (one category under counties by geographic regions), Rural zones (one category under counties by geographic types), and the East area (one category under counties by geographic areas), and population in each county of the state of Kentucky and the incidence and mortality rates of lung and bronchus cancer. According to the output from the ordinal analysis that association is Also, confounded by the prevalence rate of smoking, low birth Weight, poor physical health, physical inactivity, poor mental health, preventable hospital stays, adult obesity, median household income per county, education attainment in each county, gender, and age per Wagner (2016a) illustration. The remaining categories under geographic factors, types, areas do not have a significant association with the incidence and mortality rates of lung and bronchus cancer, controlling for the social and demographic factors per Gerstman (2015); Wagner (2016a) elaboration. Based on the outcomes from this study, I can infer that highly populated location, such as the Metropolitan (significant) and Micropolitan (non-significant) zones located in the Eastern area (significant) such as the Eastern Mountain Coal Field region (significant) have lower incidence and mortality rates of lung and bronchus cancer in the state of Kentucky. Meanwhile, both outcomes Also, denote that Rural zones (significant) which are less populated than Metropolitan zones have a higher incidence and mortality rates of lung and bronchus cancer according Gerstman (2015); Wagner (2016a) illustration. Therefore, populations that reside in Rural zones are significantly more likely exposed to trace elements with less access to effective care as compared to populations living in Metropolitan and Micropolitan zones. Therefore, health officials, and lawmakers should develop policies that promote less exposure to trace elements and more access to adequate and efficient health care in Rural zones as done in Metropolitan and Micropolitan areas according to Gerstman (2015); Wagner (2016a) denotation.

References

American Cancer Society. (2018). What causes non-small cell lung cancer? Retrieved at: https://www.cancer.org/search.html?q=What%20Causes%20Non-Small%20Cell%20Lung%20Cancer?

Barry, A., & Honoré, H. (2009). Everyday theory: A practical application of the ecological perspective. *American Journal of Health Education*, 40 (6), 368–373. Retrieved from https://www.questia.com/library/journal/1G1-213777080/everyday-theory-a-practical-application-of-the-ecological

Centers for Disease Control and Prevention. (2018). The Social-Ecological Model: A framework for prevention. Retrieved from https://www.cdc.gov/violenceprevention/overview/social-ecologicalmodel.html

Centers for Disease Control and Prevention. (2019). National program of cancer registries. Retrieved from https://nccd.cdc.gov/dcpc_Programs/index.aspx#/3

County Health Rankings & Roadmaps. (2019). Find out how healthy your county is and explore factors that drive your health. A Robert Wood Johnson Foundation Program. Retrieved from www.countyhealthrankings.org/app/kentucky/2018/overview

County High Pointers Association. (2018). Kentucky geographic region. Retrieved from http://www.cohp.org/ky/kentucky.xml

DataUSA. (2018). Kentucky. Retrieved from https://datausa.io/profile/geo/kentucky/

GeoDa Center for Geographic Analysis and Computation. (N.d.). Retrieved from https://geoplan.asu.edu/geodacenter-redirect). Statistics for public health practice (2nd Ed.). Basic Biostatistics. San Jose, CA: San Jose State University Department of Health Science.

Georgia, S., et al. (2015). Geospatial analysis of Cancer risk and residential proximity to coal mines in Illinois. Ecotoxicology and Environmental Safety, 120(1), 155-162. Retrieved from www.elsevier.com/locate/ecoenv

Gerstman, B. B. (2015). *Basic biostatistics. Statistics for Public Health Practice* (2nd Ed.). Burlington, MA: Jones & Barlett Learning

Glanz, K., Rimer, B. K., & Viswanath, K. (Eds.). (2015). Health behavior: Theory, research, and practice (5th Ed.), Chapter 3. San Francisco, CA: Jossey-Bass.

Gross, D. A. (2010). The relationship between educational attainment and lung cancer mortality in Kentucky: Implications for nurses. *Online Journal of Rural Nursing & Health Care, 10* (2), 75-86. Retrieved from http://rnojournal.binghamton.edu/index.php/RNO/article/view/59

Hahn, E. J., Rayens, M.K., Kercsmar, S.E., Robertson, H., Adkins, S.M. (2014). Results of a test and win a contest to raise radon awareness in urban and rural settings. *American Journal of Health Education*, 42 (2), 122-118. Retrieved from https://www.questia.com/library/journal/1G1-364575855/results-of-a-test-and-win-contest-to-raise-radon-awareness

Hawkins, S.S., Cole, T.J., & Law, C. (2009). An ecological system approach to examining risk factors for early childhood over Weight: Findings from the UK Millennium Cohort Study. *Journal of Epidemiology and Community Health*, *63* (2), 147-155.Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2678539/

Hsu, J.C., Chang S.M., Lu, C.Y. (2017). Geographic variations and time trends in cancer treatments in Taiwan. *BMC Public Health*, *18* (1), 89. Retrieved from https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-017-4615-y

Index Mundi. (2018). Kentucky Educational attainment - persons 25 years and over - percent high school graduate or higher, 2009-2013 by County. Retrieved from https://www.indexmundi.com/facts/united-states/quick-facts/kentucky/percent-of-people-25-years-and-over-with-high-school-degree-or-higher#table

Institute for Work and Health (IWH). (2015). Cross-sectional vs. longitudinal studies. At Work, 81(1). Toronto. Retrieved from https://www.iwh.on.ca/what-researchers-mean-by/cross-sectional-vs-longitudinal-studies

Institute for Digital Research & Education (IDRE). (2019). Ordinal logistic regression | SPSS data analyses examples. Retrieved from https://stats.idre.ucla.edu/spss/dae/ordinal-logistic-regression/

Islami, F., et al. (2015). Potentially preventable premature lung cancer deaths in the USA if overall population rates were reduced to those of educated whites in lower-risk states. *Cancer Causes & Control & Control*, *26* (3), 409-418. Retrieved from https://link.springer.com/article/10.1007/s10552-014-0517-9

Jay, W.C., Huang, B., Rinehart, J., Hopenhayn, C. (2011). Exploring Geographic Variation in Lung Cancer Mortality in Kentucky Using a Spatial Scan Statistic: Elevated risk in the Appalachian coal-mining region. *Public Health Report*, *126* (6), 789-796. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3185314/

Kentucky Demographics**.** (2018). Kentucky counties by population. Retrieved from https://www.kentucky-demographics.com/counties_by_population

Kentucky Healthy Facts. (2018). Prevalence of smoking. Retrieved from http://www.kentuckyhealthfacts.org/data/topic/show.aspx?ind=6

Laureate Education (Producer). (2016). Multiple regression [Video file]. Baltimore, MD.

Laureate Education (Producer). (2008). Research in public health [Video File]. Baltimore, MD: Author.

Leischow, S. J., & Milstein, B. (2006). Systems thinking and modeling for public health practice. *American Journal of Public Health*, *96* (3), 403–405. Retrieved from https://psycnet.apa.org/record/2006-02765-001

More about KY-NDNP. (2018). Kentucky's geographic regions. Retrieved from http://www.uky.edu/Libraries/ndnp/regions.html

National Cancer Institute. (2019a). Dynamics views of cancer statistics for prioritizing cancer efforts in the nation, states, and counties. State Cancer Profiles. Retrieved from https://statecancerprofiles.cancer.gov/quick-profiles/index.php?statename=ohio

National Cancer Institute (2019b). Surveillance, epidemiology, and end results program. Retrieved from https://seer.cancer.gov/popdata/

North American Association of Central Cancer Registries. (2016). Cancer kills Kentuckians at the highest rate. Retrieved from https://www. naaccr.org/cancer-kills-Kentuckians-at-highest-rate/

Office of Disease Prevention and Health Promotion. (2019). Healthy people 2020. Retrieved from https://www.healthypeople.gov/

Rembert, N., et al. (2017). The geographic distribution of trace elements in the environment: the REGARDS study. *Environmental Monitoring and Assessment*, *189* (2), 84. https://link.springer.com/article/10.1007/s10661-016-5733-1.

Rothwell, H., Shepherd, M., Murphy, S., Burgess, S., Townsend, N., & Pimm, C. (2010). Implementing a social-ecological model of health in Wales. *Health Education*, *110*(6), 471–489. Retrieved from https://researchportal.bath.ac.uk/en/publications/implementing-a-social-ecological-model-of-health-in-wales

Schoenberg, N.E., Huang, B., Seshadri, S., Tucker, T.C. (2015). Trends in cigarette smoking and obesity in Appalachian Kentucky. South Medical Journal, 108(3), 170-177. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/25772051

Suk, W. A., et al. (2016). Environmental pollution: An under-recognized threat to children's health, especially in low- and middle-income countries. *Environmental Health Perspectives*, *124*(3), 41-45. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/26930243

Tatalovich, Z., et al. (2015). Geographic disparities in late-stage breast cancer mortality: results from eight states in the United States. *International Journal of Health Geographics*, *14* (1), 31. Retrieved from https://ijhealthgeographics.biomedcentral.com/articles/10.1186/s12942-015-0025-5

The Community Research Collaborative Blog. (2018). Kentucky metropolitan areas out-perform rural and small urban areas. Retrieved from http://crcblog.typepad.com/crcblog/kentucky-metropolitan-areas-out-perform-rural-and-small-urban-areas.html

The Office of Disease Prevention and Health Promotion. (n.d.). Determinants of health: A framework for reaching Healthy People 2020 goals [Video]. Retrieved from http://healthypeople.gov/2020/about/DOHAbout.aspx

United States Census Bureau (2018). American FactFinder: Median household income (in 2016 inflation-adjusted dollars). United States Census Bureau Report. Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml

Unrine, J, M., et al. (2019). A case-control of trace-element status and lung cancer in Appalachian Kentucky. *PLoS ONE*, *14*(2), 1-19. Retrieved from https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0212340

U. S. Census Bureau. (2018). High school graduate or higher, percent of persons age 25+, 2009-2013. In the American Community Survey, 5-Year Estimates. Updated every year. Retrieved from https://www.indexmundi.com/facts/united-states/quick-facts/kentucky/percent-of-people-25-years-and-over-with-high-school-degree-or-higher#table

Xiaoping, S., Limin, W., Li, Z. (2017). Spatial analysis of regional factors and lung Cancer mortality in China, 1973-2013. *Cancer Epidemiology, Biomarkers & Prevention*. Retrieved from http://cebp.aacrjournals.org/content/26/4/569.long

Wagner, W. E. (2016a). *Correlation and regression analysis. Using IBM® SPSS® statistics for research methods and social science statistics* (6th Ed.), Chapter 8. Thousand Oaks, CA: Sage Publications.

Walden University Center for Research Quality. (N.d.). DrPH/DHA Doctoral study program. Retrieved September 12, 2014, from https://academicguides.waldenu.edu/researchcenter/osra/DrPH

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Appendix A: Study's Analyses Syntax Log from SPSS

Bivariate Analyses

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REGRESSION
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REGRESSION
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REGRESSION
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  /DEPENDENT MRLUNGBRONCHUS
```

```
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  /DEPENDENT IRLUNGBRONCHUS
  /METHOD=ENTER COUNTIES_BY_GEOREGIONS
  /RESIDUALS HISTOGRAM(ZRESID) NORMPROB(ZRESID).



REGRESSION
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REGRESSION
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  /STATISTICS COEFF OUTS R ANOVA
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  /METHOD=ENTER COUNTIES_BY_GEOAREAS
  /RESIDUALS HISTOGRAM(ZRESID) NORMPROB(ZRESID).
```

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  /STATISTICS COEFF OUTS R ANOVA
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  /DEPENDENT IRLUNGBRONCHUS
  /METHOD=ENTER POPULATION_CATEGORIZED
  /RESIDUALS HISTOGRAM(ZRESID) NORMPROB(ZRESID).


REGRESSION
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  /STATISTICS COEFF OUTS R ANOVA
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  /DEPENDENT MRLUNGBRONCHUS
  /METHOD=ENTER COUNTIES_BY_GEOREGIONS
  /RESIDUALS HISTOGRAM(ZRESID) NORMPROB(ZRESID).


REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
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  /NOORIGIN
  /DEPENDENT MRLUNGBRONCHUS
  /METHOD=ENTER COUNTIES_BY_GEOTYPES
  /RESIDUALS HISTOGRAM(ZRESID) NORMPROB(ZRESID).


REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT MRLUNGBRONCHUS
  /METHOD=ENTER COUNTIES_BY_GEOAREAS
```

```
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REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
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  /DEPENDENT MRLUNGBRONCHUS
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Multiple Regression

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  /DEPENDENT IRLUNGBRONCHUS
  /METHOD=ENTER COUNTIES_BY_GEOREGIONS COUNTIES_BY_GEOTYPES
COUNTIES_BY_GEOAREAS
    POPULATION_CATEGORIZED PREVALENCESMOKING_A.



REGRESSION
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  /STATISTICS COEFF OUTS R ANOVA
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  /DEPENDENT MRLUNGBRONCHUS
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COUNTIES_BY_GEOAREAS
    POPULATION_CATEGORIZED PREVALENCESMOKING_A.



REGRESSION
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  /DEPENDENT IRLUNGBRONCHUS
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COUNTIES_BY_GEOAREAS
    PREVALENCESMOKING_A POPULATION LOWBIRTHWEIGHT
DAYSPOORPHYSICALHEALTH PHYSICALINACTIVITY
    DAYSPOORMENTALHEALTH RATEPREVENTABLEHOSPITALSTAY
ADULTOBESITY MEDIANHOUSEHOLDINCOME
    EDUCATIONATTAINMENT_A GENDER AGEGROUP
```

```
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  /SAVE COOK ZRESID.



REGRESSION
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  /DEPENDENT MRLUNGBRONCHUS
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COUNTIES_BY_GEOAREAS
    PREVALENCESMOKING_A POPULATION LOWBIRTHWEIGHT
DAYSPOORPHYSICALHEALTH PHYSICALINACTIVITY
    DAYSPOORMENTALHEALTH RATEPREVENTABLEHOSPITALSTAY
ADULTOBESITY MEDIANHOUSEHOLDINCOME
    EDUCATIONATTAINMENT_A GENDER AGEGROUP
  /SCATTERPLOT=(*ZRESID ,*ZPRED)
  /RESIDUALS DURBIN HISTOGRAM(ZRESID)
  /SAVE COOK ZRESID.



REGRESSION
  /MISSING LISTWISE
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  /DEPENDENT MRLUNGBRONCHUS
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COUNTIES_BY_GEOAREAS
    PREVALENCESMOKING_A POPULATION LOWBIRTHWEIGHT
DAYSPOORPHYSICALHEALTH PHYSICALINACTIVITY
    DAYSPOORMENTALHEALTH RATEPREVENTABLEHOSPITALSTAY
ADULTOBESITY MEDIANHOUSEHOLDINCOME
    EDUCATIONATTAINMENT_A GENDER AGEGROUP Pennyrile Bluegrass
JacksonPurchase EasternMountainCoalFields
    KnobsArc EasternCoalFields Rural Micropolitan Metropolitan Central West East
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```
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  /RESIDUALS DURBIN HISTOGRAM(ZRESID)
  /SAVE COOK ZRESID.



REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL
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  /DEPENDENT IRLUNGBRONCHUS
  /METHOD=ENTER COUNTIES_BY_GEOREGIONS COUNTIES_BY_GEOTYPES
COUNTIES_BY_GEOAREAS
    PREVALENCESMOKING_A POPULATION LOWBIRTHWEIGHT
DAYSPOORPHYSICALHEALTH PHYSICALINACTIVITY
    DAYSPOORMENTALHEALTH RATEPREVENTABLEHOSPITALSTAY
ADULTOBESITY MEDIANHOUSEHOLDINCOME
    EDUCATIONATTAINMENT_A GENDER AGEGROUP Pennyrile Bluegrass
JacksonPurchase EasternMountainCoalFields
    KnobsArc EasternCoalFields Rural Micropolitan Metropolitan Central West East
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  /RESIDUALS DURBIN HISTOGRAM(ZRESID)
  /SAVE COOK ZRESID.



REGRESSION
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  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL
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  /DEPENDENT IRLUNGBRONCHUS
  /METHOD=ENTER PREVALENCESMOKING_A POPULATION
LOWBIRTHWEIGHT DAYSPOORPHYSICALHEALTH
    PHYSICALINACTIVITY DAYSPOORMENTALHEALTH
RATEPREVENTABLEHOSPITALSTAY ADULTOBESITY
    MEDIANHOUSEHOLDINCOME EDUCATIONATTAINMENT_A GENDER
AGEGROUP Pennyrile Bluegrass JacksonPurchase
    EasternMountainCoalFields KnobsArc EasternCoalFields Rural Micropolitan
Metropolitan Central West
    East
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LOWBIRTHWEIGHT DAYSPOORPHYSICALHEALTH
    PHYSICALINACTIVITY DAYSPOORMENTALHEALTH
RATEPREVENTABLEHOSPITALSTAY ADULTOBESITY
    MEDIANHOUSEHOLDINCOME EDUCATIONATTAINMENT_A GENDER
AGEGROUP Pennyrile Bluegrass JacksonPurchase
    EasternMountainCoalFields KnobsArc EasternCoalFields Rural Micropolitan
Metropolitan Central West
    East
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  /SAVE COOK ZRESID.



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  /STATWESTICS COEFF OUTS R ANOVA COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT MRLUNGBRONCHUS
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LOWBIRTHWEIGHT PHYSICALINACTIVITY
    RATEPREVENTABLEHOSPITALSTAY ADULTOBESITY
MEDIANHOUSEHOLDINCOME EDUCATIONATTAINMENT_A GENDER
    AGEGROUP Pennyrile Bluegrass JacksonPurchase EasternMountainCoalFields
KnobsArc EasternCoalFields
    Rural Micropolitan Metropolitan Central West East
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  /RESIDUALS DURBIN HWESTOGRAM(ZRESID)
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  /SAVE COOK ZRESID.



REGRESSION
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  /STATWESTICS COEFF OUTS R ANOVA COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT IRLUNGBRONCHUS
  /METHOD=ENTER PREVALENCESMOKING_A POPULATION
LOWBIRTHWEIGHT PHYSICALINACTIVITY
    RATEPREVENTABLEHOSPITALSTAY ADULTOBESITY
MEDIANHOUSEHOLDINCOME EDUCATIONATTAINMENT_A GENDER
    AGEGROUP Pennyrile Bluegrass JacksonPurchase EasternMountainCoalFields
KnobsArc EasternCoalFields
    Rural Micropolitan Metropolitan Central West East
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Proportionate Ordinal Analysis

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COUNTIES_BY_GEOTYPES COUNTIES_BY_GEOAREAS
    POPULATION_CATEGORIZED AGEGROUP GENDER WITH
PREVALENCESMOKING_A LOWBIRTHWEIGHT
    DAYSPOORPHYSICALHEALTH PHYSICALINACTIVITY
DAYSPOORMENTALHEALTH RATEPREVENTABLEHOSPITALSTAY
    ADULTOBESITY MEDIANHOUSEHOLDINCOME
EDUCATIONATTAINMENT_A
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PLUM MR_LUNGBRONCHUS_CODED BY POPULATION_CATEGORIZED
AGEGROUP GENDER COUNTIES_BY_GEOREGIONS
    COUNTIES_BY_GEOTYPES COUNTIES_BY_GEOAREAS WITH
PREVALENCESMOKING_A LOWBIRTHWEIGHT
    DAYSPOORPHYSICALHEALTH PHYSICALINACTIVITY
DAYSPOORMENTALHEALTH RATEPREVENTABLEHOSPITALSTAY
    ADULTOBESITY MEDIANHOUSEHOLDINCOME
EDUCATIONATTAINMENT_A
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PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
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PLUM IR_LUNGBRONCHUS_CODED BY AGEGROUP GENDER
POPULATION_CATEGORIZED Pennyrile Bluegrass
    JacksonPurchase EasternMountainCoalFields KnobsArc EasternCoalFields Rural
Micropolitan
    Metropolitan Central West East WITH PREVALENCESMOKING_A
LOWBIRTHWEIGHT DAYSPOORPHYSICALHEALTH
    PHYSICALINACTIVITY DAYSPOORMENTALHEALTH
RATEPREVENTABLEHOSPITALSTAY ADULTOBESITY
    MEDIANHOUSEHOLDINCOME EDUCATIONATTAINMENT_A
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=FIT PARAMETER SUMMARY TPARALLEL.
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PLUM MR_LUNGBRONCHUS_CODED BY AGEGROUP GENDER
POPULATION_CATEGORIZED Pennyrile Bluegrass
    JacksonPurchase EasternMountainCoalFields KnobsArc EasternCoalFields Rural
Micropolitan
    Metropolitan Central West East WITH PREVALENCESMOKING_A
LOWBIRTHWEIGHT DAYSPOORPHYSICALHEALTH
    PHYSICALINACTIVITY DAYSPOORMENTALHEALTH
RATEPREVENTABLEHOSPITALSTAY ADULTOBESITY
    MEDIANHOUSEHOLDINCOME EDUCATIONATTAINMENT_A
  /CRITERIA=CIN(95) DELTA(0) LCONVERGE(0) MXITER(100) MXSTEP(5)
PCONVERGE(1.0E-6) SINGULAR(1.0E-8)
  /LINK=LOGIT
  /PRINT=FIT PARAMETER SUMMARY TPARALLEL.
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Appendix B: Extended Tables and Figures

Table 1

Operationalization of Constructs

Name of variable	Variable label	Level of measurement
Average Age-Adjusted Mortality Rate(per 100,000)	Average age-adjusted mortality rate of lung and bronchus cancer	Continuous
Average Age-Adjusted Mortality Rate(per 100,000)	Average age-adjusted mortality rate of lung and bronchus cancer	Continuous
Gender (Male/Female)	Age-adjusted incidence and mortality rates of lung and bronchus cancer by gender	Dichotomous/ Nominal
Age Group	Age-adjusted incidence and mortality rates of lung and bronchus cancer by age range	Continuous/ Nominal

Population Size	Size of the populations per county	Continuous
Median Household Income ($)	Estimate median family income per County	Continuous
Education Attainment(%)	High School graduate or Higher degree in persons age 25+	Continuous
Prevalence of smoking (%)	Percent of adults current smokers	Continuous
Geographic Regions	Counties clustered by regional proximity	Nominal
Geographic Types	Counties clustered by urban, rural, and sub-urban classification	Nominal
Geographic Areas	Counties clustered by Ist, center, and east classification	Nominal
Premature Death (Years)	Number of years of personal life lost before 75	Discrete
Low Birth Weight (%)	Proportion of live births with low birthWeight	Continuous

Poor Physical Health (Days)	Average number of physical unhealthy days	Continuous
Physical Inactivity (%)	Percentage of adults age 20 and over with no leisure-time activity	Continuous
Poor Mental Health (Days)	Average number of mentally unhealthy days within 30 days	Continuous
Preventable Hospital Stays (Rate)	Number of hospital stays for ambulatory-care sensitive conditions	Discrete
Adult Obesity(%)	Percentage of adults with BMI > 30 or more	Continuous

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
IR LUNG BRONCHUS	631	1118	4	1122	211289	334.85	9.318	234.070	54788.560
MR LUNG BRONCHUS	544	831	3	834	153844	282.80	8.229	191.925	36835.132
%PREVALENCESMOKING	960	36	7	43	25980	27.06	.239	7.398	54.724
%EDUCATION ATTAINMENT	960	31	61	92	75264	78.40	.223	6.896	47.560
% LOWBIRTHWEIGHT	960	6	6	12	8704	9.07	.043	1.319	1.739
DAYSPOORPHYSICALHEALTH	960	3	4	6	4692	4.89	.017	.541	.293
%PHYSICALINACTIVITY	960	20	20	40	29783	31.02	.127	3.944	15.558
DAYSPOORMENTALHEALTH	960	2	4	5	4383	4.57	.012	.363	.132
RATEPREVENTABLEHOSPITALSTAY	952	176	34	210	86059	90.40	1.119	34.515	1191.298
%ADULTOBESITY	960	16	28	43	33822	35.23	.099	3.058	9.349
MEDIAN HOUSEHOLD INCOME	960	67352	18972	86324	38449016	40051.06	341.440	10579.141	111918227.100
POPULATION	960	769024	2134	771158	35633512	37118.24	2502.526	77537.923	6012129476.000
Valid N (listwise)	541								

Table 3

Frequency Statistics that Appropriately Characterize the Sample

Variables		Frequency	Percent	Valid Percent
AGE GROUP(Years)	Less than 50	240	25.0	25.0
	More than 50 but less or equal 60	240	25.0	25.0
	Less than 65 but more than 60	240	25.0	25.0
	More than 65	240	25.0	25.0
GENDER	Male	480	50.0	50.0
	Female	480	50.0	50.0
POPULATION	2134 thru 12231	240	25.0	25.0

	12232 thru 19088	240	25.0	25.0
	19089 thru 35914	240	25.0	25.0
	35915 thru 7771158	240	25.0	25.0
INCIDENCE RATE LUNG BRONCHUS CANCER(Per 100,000)	Low	160	16.7	25.4
	Moderate	314	32.7	49.9
	High	155	16.1	24.6
	Missing	331	34.5	
MORTALITY RATE LUNG BRONCHUS CANCER(Per 100,000)	Low	135	14.1	25.0
	Moderate	271	28.2	50.2
	High	134	14.0	24,8
	Missing	420	43.8	
COUNTIES by GEOGRAPHIC REGIONS	Bluegrass	264	27.5	27.5
	Eastern Mountain	248	25.8	25.8

	Jackson Purchas	64	6.7	6.7
	Knobs Arc	64	6.7	6.7
	Pennyrile	232	24.2	24.2
	Eastern Coal Field	88	9.2	9.2
COUNTIES by GEOGRAPHIC TYPES	Metropolitan	280	29.2	29.2
	Micropolitan	208	21.7	21.7
	Rural	472	49.2	49.2
COUNTIES by GEOGRAPHIC AREAS	Central	392	40.8	40.8
	East	272	28.3	28.3
	Ist	296	30.8	30.8

Table 4

Multiple Regression Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.508[a]	.258	.240	204.099	.316

a. Predictors: (Constant), AGE GROUP, %EDUCATIONATTAINMENT, SEX, COUNTIES BY GEOREGION, POPULATION, %PREVALENCESMOKING, RATEPREVENTABLEHOSPITALSTAY, COUNTIES BY GEOAREA, % LOWBIRTHWEIGHT, %ADULTOBESITY, COUNTIES BY GEOTYPE, %PHYSICALINACTIVITY, DAYSPOORMENTALHEALTH, MEDIAN HOUSEHOLD INCOME, DAYSPOORPHYSICALHEALTH

b. Dependent Variable: IR LUNG BRONCHUS

Table 5

Multiple Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	732.986	484.947		1.511	.131		
	COUNTIES BY GEOREGION	-3.678	6.365	-.028	-.578	.564	.513	1.950
	COUNTIES BY GEOTYPE	-4.377	14.385	-.016	-.304	.761	.429	2.332
	COUNTIES BY GEOAREA	9.311	13.284	.033	.701	.484	.542	1.846
	%PREVALENCE SMOKING	.094	1.328	.003	.071	.943	.750	1.333
	POPULATION	.000	.000	-.054	-1.330	.184	.721	1.387
	% LOWBIRTHWEIGHT	4.204	8.841	.023	.476	.635	.508	1.968
	DAYSPOORPHYSICALHEALTH	-45.399	62.051	-.108	-.732	.465	.056	17.950
	%PHYSICALINACTIVITY	.423	3.108	.007	.136	.892	.406	2.465
	DAYSPOORMENTALHEALTH	18.533	78.123	.029	.237	.813	.078	12.759
	RATEPREVENTABLEHOSPITALSTAY	.139	.303	.021	.459	.647	.583	1.716
	%ADULTOBESITY	-4.481	3.631	-.061	-1.234	.218	.494	2.026
	MEDIAN HOUSEHOLD INCOME	-.002	.002	-.097	-1.016	.310	.133	7.530
	%EDUCATIONATTAINMENT	-5.435	3.100	-.163	-1.754	.080	.140	7.126
	SEX	138.481	16.274	.296	8.509	.000	.997	1.003
	AGE GROUP	95.089	9.388	.353	10.129	.000	.993	1.007

a. Dependent Variable: IR LUNG BRONCHUS

Table 6

Multiple Regression Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-43.59	604.12	334.85	118.844	631
Std. Predicted Value	-3.184	2.266	.000	1.000	631
Standard Error of Predicted Value	19.422	68.507	31.804	6.694	631
Adjusted Predicted Value	-49.82	597.80	334.56	119.026	631
Residual	-433.306	555.532	.000	201.655	631
Std. Residual	-2.123	2.722	.000	.988	631
Stud. Residual	-2.148	2.747	.001	1.000	631
Deleted Residual	-443.571	565.897	.292	206.592	631
Stud. Deleted Residual	-2.154	2.762	.000	1.001	631
Mahal. Distance	4.706	69.980	14.976	8.202	631
Cook's Distance	.000	.013	.002	.002	631
Centered Leverage Value	.007	.111	.024	.013	631

a. Dependent Variable: IR LUNG BRONCHUS

Table 7

Multiple Regression Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.577[a]	.333	.314	158.987	.429

a. Predictors: (Constant), AGE GROUP, COUNTIES BY GEOTYPE, SEX, COUNTIES BY GEOREGION, %PREVALENCESMOKING, POPULATION, RATEPREVENTABLEHOSPITALSTAY, %ADULTOBESITY, COUNTIES BY GEOAREA, % LOWBIRTHWEIGHT, %PHYSICALINACTIVITY, MEDIAN HOUSEHOLD INCOME, DAYSPOORMENTALHEALTH, %EDUCATIONATTAINMENT, DAYSPOORPHYSICALHEALTH
b. Dependent Variable: MR LUNG BRONCHUS

Table 8

Multiple Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	1079.035	402.060		2.684	.008		
	COUNTIES BY GEOREGION	-1.413	5.398	-.013	-.262	.794	.498	2.007
	COUNTIES BY GEOTYPE	6.299	12.068	.029	.522	.602	.423	2.366
	COUNTIES BY GEOAREA	-5.283	11.363	-.023	-.465	.642	.523	1.911
	%PREVALENCESMOKING	-.466	1.112	-.017	-.419	.676	.735	1.361
	POPULATION	.000	.000	-.099	-2.359	.019	.711	1.406

% LOWBIRTHWEIGHT	1.447	7.573	.010	.191	.849	.494	2.026
DAYSPOORPHYSICALHEALTH	-34.719	50.322	-.101	-.690	.491	.059	16.967
%PHYSICALINACTIVITY	-.833	2.593	-.018	-.321	.748	.393	2.541
DAYSPOORMENTALHEALTH	-65.723	63.553	-.128	-1.034	.302	.082	12.192
RATEPREVENTABLEHOSPITALSTAY	.244	.256	.045	.953	.341	.568	1.759
%ADULTOBESITY	-1.401	3.074	-.024	-.456	.649	.465	2.152
MEDIAN HOUSEHOLD INCOME	-.003	.002	-.184	-1.891	.059	.134	7.468
%EDUCATION ATTAINMENT	-5.698	2.575	-.209	-2.213	.027	.142	7.051
SEX	124.237	13.720	.323	9.055	.000	.995	1.006
AGE GROUP	84.550	7.672	.393	11.021	.000	.995	1.005

a. Dependent Variable: MR LUNG BRONCHUS

Table 9

Multiple Regression Residuals Statistics[a]

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-104.68	549.90	282.80	110.709	544
Std. Predicted Value	-3.500	2.413	.000	1.000	544

Standard Error of Predicted Value	15.960	54.346	26.699	5.539	544
Adjusted Predicted Value	-118.78	552.17	282.52	111.006	544
Residual	-396.749	436.320	.000	156.776	544
Std. Residual	-2.495	2.744	.000	.986	544
Stud. Residual	-2.529	2.808	.001	1.000	544
Deleted Residual	-407.506	456.741	.277	161.233	544
Stud. Deleted Residual	-2.542	2.826	.000	1.002	544
Mahal. Distance	4.474	62.449	14.972	7.839	544
Cook's Distance	.000	.023	.002	.003	544
Centered Leverage Value	.008	.115	.028	.014	544

a. Dependent Variable: MR LUNG BRONCHUS

Table 10

Multiple Regression Model Summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.588[a]	.346	.319	158.338	.467

a. Predictors: (Constant), EAST, SEX, AGE GROUP, KNOBSARC, MICROPOLITAN, POPULATION, EASTERNCOALFIELD, JACKSONPURCHASE, %PREVALENCESMOKING, PENNYRILE, RATEPREVENTABLEHOSPITALSTAY, COUNTIES BY GEOTYPE, %PHYSICALINACTIVITY, % LOWBIRTHWEIGHT, %ADULTOBESITY, COUNTIES BY GEOAREA, DAYSPOORMENTALHEALTH, %EDUCATIONATTAINMENT, BLUEGRASS, MEDIAN HOUSEHOLD INCOME, DAYSPOORPHYSICALHEALTH

b. Dependent Variable: MR LUNG BRONCHUS

Table 11

Multiple Regression Coefficients

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	VIF
1	(Constant)	1001.622	433.000		2.313	.021		
	COUNTIES BY GEOTYPE	5.519	12.674	.025	.435	.663	.380	2.632
	COUNTIES BY GEOAREA	8.076	16.014	.035	.504	.614	.261	3.827
	%PREVALENCESMOKING	-.913	1.122	-.034	-.814	.416	.716	1.396
	POPULATION	.000	.000	-.110	-2.528	.012	.666	1.501
	% LOWBIRTHWEIGHT	4.149	8.834	.028	.470	.639	.360	2.779
	DAYSPOORPHYSICALHEALTH	-49.951	55.173	-.145	-.905	.366	.049	20.564
	%PHYSICALINACTIVITY	-1.384	2.654	-.030	-.521	.602	.373	2.683
	DAYSPOORMENTALHEALTH	-34.386	71.502	-.067	-.481	.631	.064	15.559
	RATEPREVENTABLEHOSPITALSTAY	.181	.266	.033	.682	.495	.524	1.907
	%ADULTOBESITY	.419	3.351	.007	.125	.901	.388	2.579

MEDIAN HOUSEHOLD INCOME	-.005	.002	-.262	-2.442	.015	.109	9.196
%EDUCATION ATTAINMENT	-5.950	2.655	-.218	-2.241	.025	.132	7.559
SEX	124.029	13.669	.322	9.074	.000	.994	1.006
AGE GROUP	85.531	7.648	.397	11.183	.000	.993	1.007
PENNYRILE	-3.304	43.591	-.007	-.076	.940	.135	7.419
BLUEGRASS	55.106	44.357	.128	1.242	.215	.119	8.419
JACKSONPURCHASE	-15.439	59.965	-.018	-.257	.797	.263	3.809
KNOBSARC	12.282	39.666	.017	.310	.757	.402	2.485
EASTERNCOALFIELD	18.067	52.343	.027	.345	.730	.202	4.962
MICROPOLITAN	-23.734	19.234	-.052	-1.234	.218	.704	1.421
EAST	-30.495	37.916	-.073	-.804	.422	.153	6.546

a. Dependent Variable: MR LUNG BRONCHUS

Table 12

Multiple Regression Residuals Statistics[a]

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-93.59	547.12	282.80	112.845	544
Std. Predicted Value	-3.336	2.342	.000	1.000	544
Standard Error of Predicted Value	17.943	54.487	31.241	6.160	544
Adjusted Predicted Value	-106.44	549.68	282.45	113.122	544
Residual	-403.533	410.972	.000	155.246	544

Std. Residual	-2.549	2.596	.000	.980	544
Stud. Residual	-2.586	2.666	.001	1.000	544
Deleted Residual	-415.442	433.483	.355	161.497	544
Stud. Deleted Residual	-2.600	2.681	.000	1.002	544
Mahal. Distance	5.975	63.302	20.961	9.126	544
Cook's Distance	.000	.024	.002	.003	544
Centered Leverage Value	.011	.117	.039	.017	544

a. Dependent Variable: MR LUNG BRONCHUS

Table 13

Multiple Regression Model Summary[b]

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.512[a]	.262	.237	204.452	.328

a. Predictors: (Constant), EAST, AGE GROUP, SEX, KNOBSARC, MICROPOLITAN, POPULATION, EASTERNCOALFIELD, %PREVALENCESMOKING, JACKSONPURCHASE, PENNYRILE, RATEPREVENTABLEHOSPITALSTAY, COUNTIES BY GEOTYPE, %PHYSICALINACTIVITY, %ADULTOBESITY, % LOWBIRTHWEIGHT, COUNTIES BY GEOAREA, DAYSPOORMENTALHEALTH, %EDUCATIONATTAINMENT, EASTERNMOUNTAIN, MEDIAN HOUSEHOLD INCOME, DAYSPOORPHYSICALHEALTH

b. Dependent Variable: IR LUNG BRONCHUS

Table 14

Multiple Regression Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	T	Sig.	Tolerance	VIF
(Constant)	796.196	510.150		1.561	.119		
COUNTIES BY GEOTYPE	-4.744	15.168	-.017	-.313	.755	.387	2.584
COUNTIES BY GEOAREA	11.663	18.761	.041	.622	.534	.272	3.670
%PREVALENCESMOKING	-.221	1.351	-.007	-.163	.870	.727	1.375
POPULATION	.000	.000	-.062	-1.479	.140	.681	1.469
% LOWBIRTHWEIGHT	5.255	10.328	.029	.509	.611	.374	2.676
DAYSPOORPHYSICALHEALTH	-61.264	68.384	-.145	-.896	.371	.046	21.726
%PHYSICALINACTIVITY	.062	3.204	.001	.019	.985	.383	2.610
DAYSPOORMENTALHEALTH	33.734	87.998	.054	.383	.702	.062	16.133
RATEPREVENTABLEHOSPITALSTAY	.101	.316	.015	.321	.748	.540	1.853

%ADULTOBESITY	-3.706	3.910	-.050	-.948	.344	.427	2.341
MEDIAN HOUSEHOLD INCOME	-.003	.002	-.152	-1.452	.147	.111	9.007
%EDUCATION ATTAINMENT	-5.484	3.228	-.164	-1.699	.090	.130	7.703
SEX	137.978	16.310	.295	8.460	.000	.997	1.003
AGE GROUP	95.433	9.406	.354	10.146	.000	.993	1.007
PENNYRILE	-41.008	37.912	-.075	-1.082	.280	.251	3.985
JACKSONPURCHASE	-34.970	60.019	-.034	-.583	.560	.361	2.772
EASTERNMOUNTAIN	-26.436	54.230	-.050	-.487	.626	.115	8.673
KNOBSARC	-39.047	38.439	-.044	-1.016	.310	.638	1.568
EASTERNCOALFIELD	-9.917	52.503	-.012	-.189	.850	.312	3.202
MICROPOLITAN	-21.619	23.079	-.039	-.937	.349	.699	1.430
EAST	-13.746	47.112	-.027	-.292	.771	.144	6.943

a. Dependent Variable: IR LUNG BRONCHUS

Table 15

Multiple Regression Residuals Statistics[a]

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-36.61	608.06	334.85	119.923	631
Std. Predicted Value	-3.097	2.278	.000	1.000	631
Standard Error of Predicted Value	21.902	69.202	37.433	7.502	631

Adjusted Predicted Value	-42.06	601.33	334.51	120.174	631
Residual	-437.191	544.827	.000	201.015	631
Std. Residual	-2.138	2.665	.000	.983	631
Stud. Residual	-2.166	2.695	.001	1.000	631
Deleted Residual	-448.621	557.114	.338	207.920	631
Stud. Deleted Residual	-2.172	2.709	.000	1.001	631
Mahal. Distance	6.231	71.179	20.967	9.516	631
Cook's Distance	.000	.011	.002	.002	631
Centered Leverage Value	.010	.113	.033	.015	631

a. Dependent Variable: IR LUNG BRONCHUS

Table 16

Ordinal Analysis for Incidence Rate of Lung Bronchus Cancer

Table 16a

Case Processing Summary

		N	Marginal Percentage
IR_LUNGBRONCHUS_CODED	Low IRate	160	25.4%
	Moderate IRate	314	49.9%
	High IRate	155	24.6%
COUNTIES BY GEOREGION	Bluegrass	175	27.8%
	EasternMount	166	26.4%
	JacksonPurch	34	5.4%
	KnobsArc	48	7.6%
	Pennyrile	153	24.3%
	EasternCoalF	53	8.4%
COUNTIES BY GEOTYPE	Metropolitan	193	30.7%
	Micropolitan	146	23.2%

	Rural	290	46.1%
COUNTIES BY GEOAREA	Central	263	41.8%
	East	183	29.1%
	Ist	183	29.1%
POPULATION_CATEGORIZED	2134 thru 12231	108	17.2%
	12232 thru 19088	159	25.3%
	19089 thru 35914	176	28.0%
	35915 thru 771158	186	29.6%
AGE GROUP	less than 50	6	1.0%
	More than 50 but less or equal 60	234	37.2%
	less than 65 but more than 60	172	27.3%
	More than 65	217	34.5%
SEX	Female	308	49.0%
	Male	321	51.0%
Valid		629	100.0%
Missing		331	
Total		960	

Table 16b

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Threshold	[IR_LUNGBRONCHUS_CODED = 1]	-29.676	1426.867	.000	1	.983	-2826.285	2766.933
	[IR_LUNGBRONCHUS_CODED = 2]	-4.008	8.631	.216	1	.642	-20.925	12.908
Location	PREVALENCESMOKING_A	.007	.023	.106	1	.745	-.037	.052
	LOWBIRTHWEIGHT	.108	.170	.401	1	.527	-.226	.441

DAYSPOORPHYSICALHEALTH	-.454	1.141	.159	1	.691	-2.690	1.782
PHYSICALINACTIVITY	-.003	.054	.004	1	.948	-.108	.101
DAYSPOORMENTALHEALTH	1.843	1.451	1.615	1	.204	-1.000	4.687
RATEPREVENTABLEHOSPITALSTAY	.003	.005	.380	1	.538	-.007	.013
ADULTOBESITY	.076	.069	1.200	1	.273	-.060	.211
MEDIANHOUSEHOLDINCOME	2.739E-6	4.165E-5	.004	1	.948	-7.889E-5	8.437E-5
EDUCATIONATTAINMENT_A	-.139	.058	5.785	1	.016	-.252	-.026
[COUNTIES_BY_GEOREGIONS=1]	.447	.892	.250	1	.617	-1.302	2.195
[COUNTIES_BY_GEOREGIONS=2]	-.868	1.072	.655	1	.418	-2.970	1.234
[COUNTIES_BY_GEOREGIONS=3]	-.550	.881	.390	1	.533	-2.277	1.177
[COUNTIES_BY_GEOREGIONS=4]	-.294	1.041	.080	1	.778	-2.335	1.747
[COUNTIES_BY_GEOREGIONS=5]	-.998	.642	2.414	1	.120	-2.257	.261
[COUNTIES_BY_GEOREGIONS=6]	0[a]	.	.	0	.	.	.

[COUNTIES_BY_GEOTYPES=1]	-.198	.533	.137	1	.711	-1.243	.847
[COUNTIES_BY_GEOTYPES=2]	.353	.423	.694	1	.405	-.477	1.182
[COUNTIES_BY_GEOTYPES=3]	0[a]	.	.	0	.	.	.
[COUNTIES_BY_GEOAREAS=1]	-.534	.651	.672	1	.412	-1.810	.742
[COUNTIES_BY_GEOAREAS=2]	-.199	.938	.045	1	.832	-2.037	1.640
[COUNTIES_BY_GEOAREAS=3]	0[a]	.	.	0	.	.	.
[POPULATION_CATEGORIZED=1]	.912	.524	3.028	1	.082	-.115	1.940
[POPULATION_CATEGORIZED=2]	-.749	.513	2.130	1	.144	-1.755	.257
[POPULATION_CATEGORIZED=3]	-.967	.480	4.067	1	.044	-1.907	-.027
[POPULATION_CATEGORIZED=4]	0[a]	.	.	0	.	.	.
[AGEGROUP=1]	-46.089	.000	.	1	.	-46.089	-46.089
[AGEGROUP=2]	-4.134	.418	97.844	1	.000	-4.954	-3.315
[AGEGROUP=3]	-29.963	1426.841	.000	1	.983	-2826.520	2766.594

[AGEGROUP=4]	0[a]	.	.	0	.	.	.
[GENDER=0]	-3.778	.390	93.776	1	.000	-4.543	-3.014
[GENDER=1]	0[a]	.	.	0	.	.	.

Link function: Logit.

a. This parameter is set to zero because it is redundant.

Table 16c

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	1308.581			
Final	78.604	1229.977	25	.000

Link function: Logit.

Table 16d

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	538.954	1231	1.000
Deviance	346.088	1231	1.000

Link function: Logit.

Table 16e

Pseudo R-Square

Cox and Snell	.858
Nagelkerke	.981
McFadden	.940

Link function: Logit.

Table 16f

Test of Parallel Lines[a]				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	78.604			
General	25.630[b]	52.974[c]	25	.001

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.
a. Link function: Logit.
b. The log-likelihood value cannot be further increased after maximum number of step-halving.
c. The Chi-Square statistic is computed based on the log-likelihood value of the last iteration of the general model. Validity of the test is uncertain.

Table 17

Ordinal Analysis for Mortality Rates of Lung Bronchus Cancer

Table 17a

Case Processing Summary

		N	Marginal Percentage
MR_LUNGBRONCHUS_CODED	LOW MRATE	135	25.0%
	MODERATE MRATE	271	50.2%
	HIGH MRATE	134	24.8%
POPULATION_CATEGORIZED	2134 thru 12231	78	14.4%
	12232 thru 19088	127	23.5%
	19089 thru 35914	157	29.1%
	35915 thru 771158	178	33.0%
AGE GROUP	less than 50	1	0.2%
	More than 50 but less or equal 60	227	42.0%
	less than 65 but more than 60	116	21.5%
	More than 65	196	36.3%

SEX	Female	246	45.6%
	Male	294	54.4%
COUNTIES BY GEOREGION	Bluegrass	146	27.0%
	EasternMount	146	27.0%
	JacksonPurch	28	5.2%
	KnobsArc	43	8.0%
	Pennyrile	127	23.5%
	EasternCoalF	50	9.3%
COUNTIES BY GEOTYPE	Metropolitan	174	32.2%
	Micropolitan	125	23.1%
	Rural	241	44.6%
COUNTIES BY GEOAREA	Central	220	40.7%
	East	161	29.8%
	Ist	159	29.4%
Valid		540	100.0%
Missing		420	
Total		960	

Table 17b

Parameter Estimates

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[MR_LUNGBRONCHUS_CODED = 1]	-6.044	9.797	.381	1	.537	-25.245	13.157
	[MR_LUNGBRONCHUS_CODED = 2]	3.799	9.789	.151	1	.698	-15.388	22.985
Location	PREVALENCESMOKING_A	.027	.026	1.103	1	.294	-.023	.077
	LOWBIRTHWEIGHT	.159	.192	.685	1	.408	-.217	.535
	DAYSPOORPHYSICALHEALTH	.188	1.255	.022	1	.881	-2.272	2.648

PHYSICALINACTIVITY	.025	.060	.174	1	.677	-.092	.142
DAYSPOORMENTALHEALTH	-.428	1.653	.067	1	.796	-3.669	2.813
RATEPREVENTABLEHOSPITALSTAY	.007	.006	1.441	1	.230	-.005	.019
ADULTOBESITY	.210	.079	7.029	1	.008	.055	.366
MEDIANHOUSEHOLDINCOME	-2.191E-5	4.121E-5	.283	1	.595	.000	5.885E-5
EDUCATIONATTAINMENT_A	-.012	.063	.036	1	.850	-.136	.112
[POPULATION_CATEGORIZED=1]	.739	.593	1.551	1	.213	-.424	1.902
[POPULATION_CATEGORIZED=2]	-.283	.570	.247	1	.619	-1.401	.834
[POPULATION_CATEGORIZED=3]	-.750	.530	2.006	1	.157	-1.788	.288
[POPULATION_CATEGORIZED=4]	0[a]	.	.	0	.	.	.
[AGEGROUP=1]	-24.739	.000	.	1	.	-24.739	-24.739
[AGEGROUP=2]	-5.164	.542	90.693	1	.000	-6.227	-4.101
[AGEGROUP=3]	-32.034	939.885	.001	1	.973	-1874.175	1810.108
[AGEGROUP=4]	0[a]	.	.	0	.	.	.
[GENDER=0]	-5.695	.596	91.159	1	.000	-6.864	-4.526

[GENDER=1]	0[a]	.	.	0	.	.	.
[COUNTIES_BY_GEOREGIONS=1]	.392	1.026	.146	1	.702	-1.618	2.403
[COUNTIES_BY_GEOREGIONS=2]	.556	1.234	.203	1	.652	-1.863	2.974
[COUNTIES_BY_GEOREGIONS=3]	-2.123	.978	4.711	1	.030	-4.041	-.206
[COUNTIES_BY_GEOREGIONS=4]	.239	1.163	.042	1	.837	-2.039	2.518
[COUNTIES_BY_GEOREGIONS=5]	-.842	.708	1.414	1	.234	-2.229	.546
[COUNTIES_BY_GEOREGIONS=6]	0[a]	.	.	0	.	.	.
[COUNTIES_BY_GEOTYPES=1]	-.983	.618	2.530	1	.112	-2.194	.228
[COUNTIES_BY_GEOTYPES=2]	-.169	.507	.111	1	.739	-1.162	.824
[COUNTIES_BY_GEOTYPES=3]	0[a]	.	.	0	.	.	.
[COUNTIES_BY_GEOAREAS=1]	-.496	.749	.437	1	.508	-1.964	.973
[COUNTIES_BY_GEOAREAS=2]	-1.409	1.087	1.680	1	.195	-3.540	.722
[COUNTIES_BY_GEOAREAS=3]	0[a]	.	.	0	.	.	.

Link function: Logit.
a. This parameter is set to zero because it is redundant.

Table 17c

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	1121.501			
Final	112.141	1009.360	25	.000

Link function: Logit.

Table 17d

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	407.679	1053	1.000
Deviance	277.212	1053	1.000

Link function: Logit.

Table 17e

Pseudo R-Square

Cox and Snell	.846
Nagelkerke	.967
McFadden	.900

Link function: Logit.

Table 17f

Test of Parallel Lines[a]

Model	-2 Log Likelihood	Chi-Square	df	Sig.

Null Hypothesis	112.141			
General	.000[b]	112.141	25	.000

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.
a. Link function: Logit.
b. The log-likelihood value is practically zero. There may be a complete separation in the data. The maximum likelihood estimates do not exist.

Table 18

Bivariate Regression

Table 18a

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	COUNTIES BY GEOREGION[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS
b. All requested variables entered.

Table 18b

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.027[a]	.001	-.001	234.169

a. Predictors: (Constant), COUNTIES BY GEOREGION

Table 18c

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25489.179	1	25489.179	.465	.496[b]

Residual	34491303.520	629	54835.141	
Total	34516792.700	630		

a. Dependent Variable: IR LUNG BRONCHUS
b. Predictors: (Constant), COUNTIES BY GEOREGION

Table 18d

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	324.179	18.214		17.798	.000
	COUNTIES BY GEOREGION	3.566	5.230	.027	.682	.496

a. Dependent Variable: IR LUNG BRONCHUS

Table 18e

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	COUNTIES BY GEOTYPE[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS
b. All requested variables entered.

Table 18f

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.140[a]	.020	.018	231.955

a. Predictors: (Constant), COUNTIES BY GEOTYPE

Table 18g

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	674487.813	1	674487.813	12.536	.000[b]
	Residual	33842304.890	629	53803.346		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS
b. Predictors: (Constant), COUNTIES BY GEOTYPE

Table 18h

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	253.093	24.868		10.177	.000
	COUNTIES BY GEOTYPE	37.904	10.705	.140	3.541	.000

a. Dependent Variable: IR LUNG BRONCHUS

Table 18i

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	COUNTIES BY GEOAREA[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS
b. All requested variables entered.

Table 18j

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.040[a]	.002	.000	234.072

a. Predictors: (Constant), COUNTIES BY GEOAREA

Table 18k

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	54092.472	1	54092.472	.987	.321[b]
	Residual	34462700.230	629	54789.666		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS
b. Predictors: (Constant), COUNTIES BY GEOAREA

Table 18l

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	313.979	22.977		13.665	.000
	COUNTIES BY GEOAREA	11.140	11.212	.040	.994	.321

a. Dependent Variable: IR LUNG BRONCHUS

Table 18m

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	POPULATION[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS
b. All requested variables entered.

Table 18n

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.124[a]	.015	.014	232.447

a. Predictors: (Constant), POPULATION

Table 18o

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	530892.364	1	530892.364	9.826	.002[b]
	Residual	33985900.340	629	54031.638		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS

b. Predictors: (Constant), POPULATION

Table 18p

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	348.796	10.268		33.970	.000
	POPULATION	.000	.000	-.124	-3.135	.002

a. Dependent Variable: IR LUNG BRONCHUS

Table 18q

Variables Entered/Removed[a]			
Model	Variables Entered	Variables Removed	Method

1	POPULATION_CATEGORIZED[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS

b. All requested variables entered.

Table 18r

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.211[a]	.044	.043	228.995

a. Predictors: (Constant), POPULATION_CATEGORIZED

Table 18s

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1532831.514	1	1532831.514	29.231	.000[b]
	Residual	32983961.190	629	52438.730		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS

b. Predictors: (Constant), POPULATION_CATEGORIZED

Table 18t

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	459.028	24.711		18.576	.000
	POPULATION_CATEGORIZED	-46.039	8.515	-.211	-5.407	.000

a. Dependent Variable: IR LUNG BRONCHUS

Table 18u

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PENNYRILE[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS

b. All requested variables entered.

Table 18v

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.000[a]	.000	-.002	234.256

a. Predictors: (Constant), PENNYRILE

Table 18w

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.420	1	.420	.000	.998[b]
	Residual	34516792.280	629	54875.663		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS

b. Predictors: (Constant), PENNYRILE

Table 18x

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	334.833	10.715		31.250	.000
	PENNYRILE	.060	21.759	.000	.003	.998

a. Dependent Variable: IR LUNG BRONCHUS

Table 18y

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	BLUEGRASS[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS

b. All requested variables entered.

Table 18z

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.078[a]	.006	.004	233.544

a. Predictors: (Constant), BLUEGRASS

Table 19

Bivariate Regression

Table 19a

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	209446.848	1	209446.848	3.840	.050[b]
	Residual	34307345.850	629	54542.680		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS

b. Predictors: (Constant), BLUEGRASS

Table 19b

Coefficients[a]

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.

		B	Std. Error	Beta		
1	(Constant)	346.134	10.937		31.649	.000
	BLUEGRASS	-40.696	20.767	-.078	-1.960	.050

a. Dependent Variable: IR LUNG BRONCHUS

Table 19c

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	JACKSONPURCHASE[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS
b. All requested variables entered.

Table 19d

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.018[a]	.000	-.001	234.217

a. Predictors: (Constant), JACKSONPURCHASE

Table 19e

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11462.932	1	11462.932	.209	.648[b]
	Residual	34505329.770	629	54857.440		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS
b. Predictors: (Constant), JACKSONPURCHASE

Table 19f

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	335.864	9.586		35.038	.000
	JACKSONPURCHASE	-18.877	41.296	-.018	-.457	.648

a. Dependent Variable: IR LUNG BRONCHUS

Table 19g

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	EASTERNMOUNTAIN[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS
b. All requested variables entered.

Table 19h

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.089[a]	.008	.006	233.335

a. Predictors: (Constant), EASTERNMOUNTAIN

Table 19i

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	270766.095	1	270766.095	4.973	.026[b]
	Residual	34246026.610	629	54445.193		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS
b. Predictors: (Constant), EASTERNMOUNTAIN

Table 19j

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	322.369	10.844		29.728	.000
	EASTERNMOUNTAIN	46.867	21.016	.089	2.230	.026

a. Dependent Variable: IR LUNG BRONCHUS

Table 19k

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	KNOBSARC[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS

b. All requested variables entered.

Table 19l

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.035[a]	.001	.000	234.115

a. Predictors: (Constant), KNOBSARC

Table 19m

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	41404.914	1	41404.914	.755	.385[b]
	Residual	34475387.790	629	54809.837		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS

b. Predictors: (Constant), KNOBSARC

Table 19n

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	337.172	9.696		34.774	.000
	KNOBSARC	-30.555	35.155	-.035	-.869	.385

a. Dependent Variable: IR LUNG BRONCHUS

Table 19o

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	EASTERNCOALFIELD[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS
b. All requested variables entered.

Table 19p

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.032[a]	.001	-.001	234.133

a. Predictors: (Constant), EASTERNCOALFIELD

Table 19q

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	36143.395	1	36143.395	.659	.417[b]
	Residual	34480649.310	629	54818.202		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS
b. Predictors: (Constant), EASTERNCOALFIELD

Table 19s

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	332.556	9.739		34.148	.000
	EASTERNCOALFIELD	27.285	33.603	.032	.812	.417

a. Dependent Variable: IR LUNG BRONCHUS

Table 19t

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	MICROPOLITAN[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS
b. All requested variables entered.

Table 19u

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.028[a]	.001	-.001	234.167

a. Predictors: (Constant), MICROPOLITAN

Table 19v

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	26169.492	1	26169.492	.477	.490[b]

	Residual	34490623.210	629	54834.059
	Total	34516792.700	630	

a. Dependent Variable: IR LUNG BRONCHUS
b. Predictors: (Constant), MICROPOLITAN

Table 19w

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	338.381	10.633		31.824	.000
	MICROPOLITAN	-15.271	22.105	-.028	-.691	.490

a. Dependent Variable: IR LUNG BRONCHUS

Table 19x

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	METROPOLITAN[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS
b. All requested variables entered.

Table 19y

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.118[a]	.014	.012	232.612

a. Predictors: (Constant), METROPOLITAN

Table 19z

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	482573.142	1	482573.142	8.919	.003[b]
	Residual	34034219.560	629	54108.457		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS
b. Predictors: (Constant), METROPOLITAN

Table 20

Bivariate Regression

Table 20a

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	353.205	11.115		31.778	.000
	METROPOLITAN	-60.018	20.097	-.118	-2.986	.003

a. Dependent Variable: IR LUNG BRONCHUS

Table 20b

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	RURAL[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS
b. All requested variables entered.

Table 20c

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	.133[a]	.018	.016	232.188

a. Predictors: (Constant), RURAL

Table 20d

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	606495.781	1	606495.781	11.250	.001[b]
	Residual	33910296.920	629	53911.442		
	Total	34516792.701	630			

a. Dependent Variable: IR LUNG BRONCHUS

b. Predictors: (Constant), RURAL

Table 20e

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	306.074	12.611		24.271	.000
	RURAL	62.178	18.538	.133	3.354	.001

a. Dependent Variable: IR LUNG BRONCHUS

Table 20f

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	CENTRAL[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS

b. All requested variables entered.

Table 20g

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.073[a]	.005	.004	233.626

a. Predictors: (Constant), CENTRAL

Table 20h

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	185136.653	1	185136.653	3.392	.066[b]
	Residual	34331656.050	629	54581.329		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS
b. Predictors: (Constant), CENTRAL

Table 20i

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	349.328	12.179		28.684	.000
	CENTRAL	-34.742	18.864	-.073	-1.842	.066

a. Dependent Variable: IR LUNG BRONCHUS

Table 20j

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	IST[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS
b. All requested variables entered.

Table 20k

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.007[a]	.000	-.002	234.250

a. Predictors: (Constant), IST

Table 20l

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1723.949	1	1723.949	.031	.859[b]
	Residual	34515068.750	629	54872.923		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS

b. Predictors: (Constant), IST

Table 20m

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	335.904	11.067		30.351	.000
	IST	-3.643	20.551	-.007	-.177	.859

a. Dependent Variable: IR LUNG BRONCHUS

Table 20n

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	EAST[b]	.	Enter

a. Dependent Variable: IR LUNG BRONCHUS

b. All requested variables entered.

Table 20o

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.086[a]	.007	.006	233.380

a. Predictors: (Constant), EAST

Table 20p

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	257452.040	1	257452.040	4.727	.030[b]
	Residual	34259340.660	629	54466.360		
	Total	34516792.700	630			

a. Dependent Variable: IR LUNG BRONCHUS

b. Predictors: (Constant), EAST

Table 20q

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	321.838	11.051		29.123	.000
	EAST	44.372	20.409	.086	2.174	.030

a. Dependent Variable: IR LUNG BRONCHUS

Table 20r

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	COUNTIES BY GEOREGION[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 20s

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.031[a]	.001	-.001	192.008

a. Predictors: (Constant), COUNTIES BY GEOREGION

Table 20t

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19524.415	1	19524.415	.530	.467[b]
	Residual	19981952.500	542	36867.071		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS
b. Predictors: (Constant), COUNTIES BY GEOREGION

Table 20u

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	272.712	16.125		16.913	.000
	COUNTIES BY GEOREGION	3.349	4.602	.031	.728	.467

a. Dependent Variable: MR LUNG BRONCHUS

Table 20v

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method

1	COUNTIES BY GEOTYPE[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 20w

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.191[a]	.036	.035	188.572

a. Predictors: (Constant), COUNTIES BY GEOTYPE

Table 20y

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	728186.302	1	728186.302	20.478	.000[b]
	Residual	19273290.610	542	35559.577		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS
b. Predictors: (Constant), COUNTIES BY GEOTYPE

Table 20z

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	193.406	21.345		9.061	.000
	COUNTIES BY GEOTYPE	42.105	9.304	.191	4.525	.000

a. Dependent Variable: MR LUNG BRONCHUS

Table 21

Table 21a

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	COUNTIES BY GEOAREA[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 21b

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.020[a]	.000	-.001	192.062

a. Predictors: (Constant), COUNTIES BY GEOAREA

Table 21c

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8270.777	1	8270.777	.224	.636[b]
	Residual	19993206.140	542	36887.834		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS
b. Predictors: (Constant), COUNTIES BY GEOAREA

Table 21d

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	273.926	20.474		13.379	.000
	COUNTIES BY GEOAREA	4.702	9.929	.020	.474	.636

a. Dependent Variable: MR LUNG BRONCHUS

Table 21f

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	POPULATION_CATEGORIZED[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 21g

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.297[a]	.088	.086	183.453

a. Predictors: (Constant), POPULATION_CATEGORIZED

Table 21h

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1760489.079	1	1760489.079	52.310	.000[b]
	Residual	18240987.840	542	33654.959		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS
b. Predictors: (Constant), POPULATION_CATEGORIZED

Table 21i

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.

1	(Constant)	434.581	22.411		19.391	.000
	POPULATION_CATEGORIZED	-54.107	7.481	-.297	-7.233	.000

a. Dependent Variable: MR LUNG BRONCHUS

Table 21j

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PENNYRILE[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 21k

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.025[a]	.001	-.001	192.043

a. Predictors: (Constant), PENNYRILE

Table 21j

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12207.772	1	12207.772	.331	.565[b]
	Residual	19989269.140	542	36880.570		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS
b. Predictors: (Constant), PENNYRILE

Bivariate Regression Continue

Table 21k

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	280.174	9.416		29.756	.000
	PENNYRILE	11.168	19.411	.025	.575	.565

a. Dependent Variable: MR LUNG BRONCHUS

Table 21l

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	BLUEGRASS[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS

b. All requested variables entered.

Table 21m

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.066[a]	.004	.002	191.685

a. Predictors: (Constant), BLUEGRASS

Table 21n

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	86596.221	1	86596.221	2.357	.125[b]
	Residual	19914880.690	542	36743.322		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS

b. Predictors: (Constant), BLUEGRASS

Table 21o

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	290.479	9.620		30.194	.000
	BLUEGRASS	-28.412	18.507	-.066	-1.535	.125

a. Dependent Variable: MR LUNG BRONCHUS

Table 21p

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	JACKSONPURCHASE[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 21q

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.036[a]	.001	-.001	191.979

a. Predictors: (Constant), JACKSONPURCHASE

Table 21s

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25649.300	1	25649.300	.696	.405[b]
	Residual	19975827.610	542	36855.771		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS
b. Predictors: (Constant), JACKSONPURCHASE

Table 21t

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	284.402	8.451		33.651	.000
	JACKSONPURCHASE	-31.077	37.252	-.036	-.834	.405

a. Dependent Variable: MR LUNG BRONCHUS

Table 21u

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	EASTERNMOUNTAIN[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 21v

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.066[a]	.004	.002	191.688

a. Predictors: (Constant), EASTERNMOUNTAIN

Table 21w

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	85976.291	1	85976.291	2.340	.127[b]
	Residual	19915500.620	542	36744.466		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS
b. Predictors: (Constant), EASTERNMOUNTAIN

Table 21x

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	275.117	9.633		28.561	.000
	EASTERNMOUNTAIN	28.249	18.468	.066	1.530	.127

a. Dependent Variable: MR LUNG BRONCHUS

Table 21y

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	KNOBSARC[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 21z

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.025[a]	.001	-.001	192.044

a. Predictors: (Constant), KNOBSARC

Table 22

Table 22a

ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.

1	Regression	12047.096	1	12047.096	.327	.568[b]
	Residual	19989429.820	542	36880.867		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS
b. Predictors: (Constant), KNOBSARC

Table 22b

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	284.181	8.580		33.122	.000
	KNOBSARC	-17.442	30.517	-.025	-.572	.568

a. Dependent Variable: MR LUNG BRONCHUS

Table 22c

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	EASTERNCOALFIELD[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 22d

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.014[a]	.000	-.002	192.082

a. Predictors: (Constant), EASTERNCOALFIELD

Table 22e

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4023.139	1	4023.139	.109	.741[b]
	Residual	19997453.780	542	36895.671		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS
b. Predictors: (Constant), EASTERNCOALFIELD

Table 22f

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	281.937	8.642		32.623	.000
	EASTERNCOALFIELD	9.413	28.506	.014	.330	.741

a. Dependent Variable: MR LUNG BRONCHUS

Table 22g

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	RURAL[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 22h

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.182[a]	.033	.031	188.896

a. Predictors: (Constant), RURAL

Table 22i

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	661919.168	1	661919.168	18.551	.000[b]
	Residual	19339557.750	542	35681.841		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS

b. Predictors: (Constant), RURAL

Table 22j

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	251.460	10.888		23.096	.000
	RURAL	70.164	16.291	.182	4.307	.000

a. Dependent Variable: MR LUNG BRONCHUS

Table 22j

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	MICROPOLITAN[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS

b. All requested variables entered.

Table 22k

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.036[a]	.001	-.001	191.978

a. Predictors: (Constant), MICROPOLITAN

Bivariate Regression Continue

Table 22l

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25705.747	1	25705.747	.697	.404[b]
	Residual	19975771.170	542	36855.666		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS
b. Predictors: (Constant), MICROPOLITAN

Table 22m

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	286.557	9.379		30.554	.000
	MICROPOLITAN	-16.340	19.565	-.036	-.835	.404

a. Dependent Variable: MR LUNG BRONCHUS

Table 22n

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	METROPOLITAN[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 22o

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.161[a]	.026	.024	189.593

a. Predictors: (Constant), METROPOLITAN

Table 22p

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	518989.901	1	518989.901	14.438	.000[b]
	Residual	19482487.010	542	35945.548		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS
b. Predictors: (Constant), METROPOLITAN

Table 22q

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	304.163	9.883		30.776	.000
	METROPOLITAN	-66.024	17.376	-.161	-3.800	.000

a. Dependent Variable: MR LUNG BRONCHUS

Table 22r

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	CENTRAL[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS
b. All requested variables entered.

Table 22s

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.050[a]	.002	.001	191.863

a. Predictors: (Constant), CENTRAL

Table 22t

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	49694.090	1	49694.090	1.350	.246[b]
	Residual	19951782.820	542	36811.407		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS

b. Predictors: (Constant), CENTRAL

Table 22u

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	290.708	10.676		27.231	.000
	CENTRAL	-19.461	16.749	-.050	-1.162	.246

a. Dependent Variable: MR LUNG BRONCHUS

Table 22v

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	IST[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS

b. All requested variables entered.

Table 22w

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.017[a]	.000	-.002	192.075

a. Predictors: (Constant), IST

Table 22x

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5588.165	1	5588.165	.151	.697[b]
	Residual	19995888.750	542	36892.784		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS

b. Predictors: (Constant), IST

Table 22y

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	284.871	9.802		29.063	.000
	IST	-7.034	18.074	-.017	-.389	.697

a. Dependent Variable: MR LUNG BRONCHUS

Table 22z

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	EAST[b]	.	Enter

a. Dependent Variable: MR LUNG BRONCHUS

b. All requested variables entered.

Table 23

Table 23a

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.070[a]	.005	.003	191.630

a. Predictors: (Constant), EAST

Table 23b

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	98189.162	1	98189.162	2.674	.103[b]
	Residual	19903287.750	542	36721.933		
	Total	20001476.910	543			

a. Dependent Variable: MR LUNG BRONCHUS

b. Predictors: (Constant), EAST

Table 23b

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	274.015	9.817		27.911	.000
	EAST	29.327	17.935	.070	1.635	.103

a. Dependent Variable: MR LUNG BRONCHUS

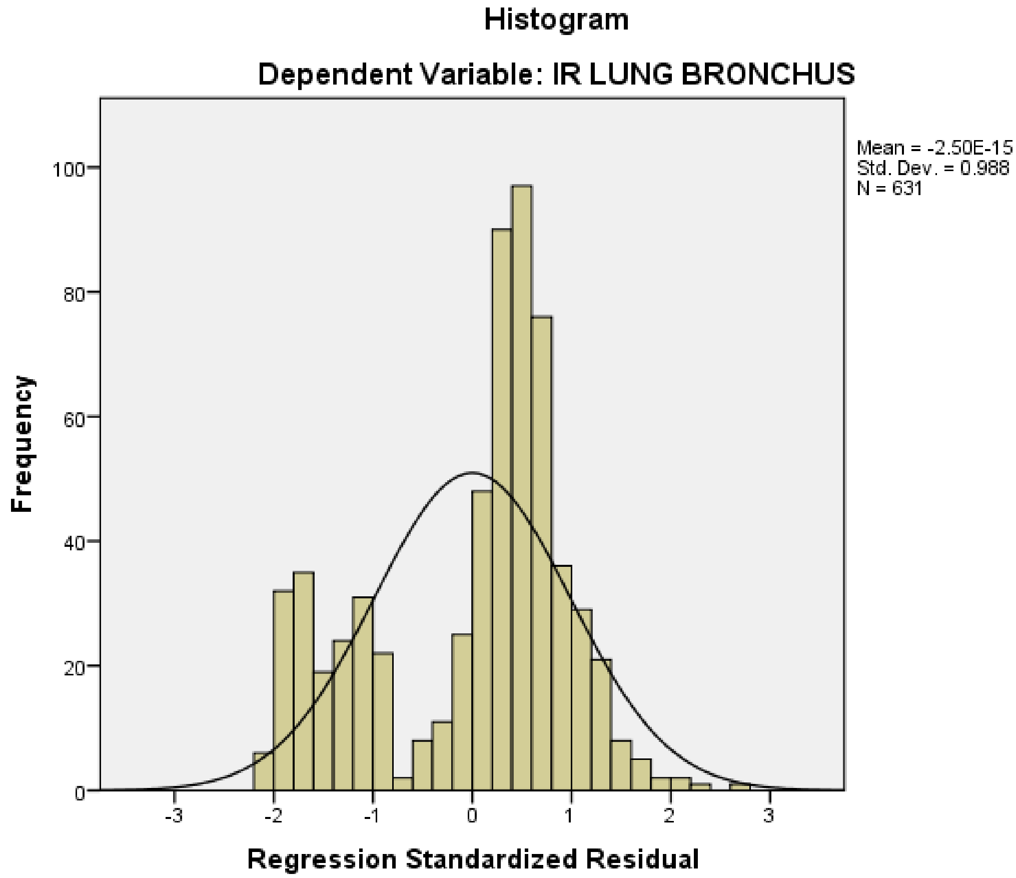

Figure 25. Histogram of Regression Standardized Residual of IR Lung Bronchus

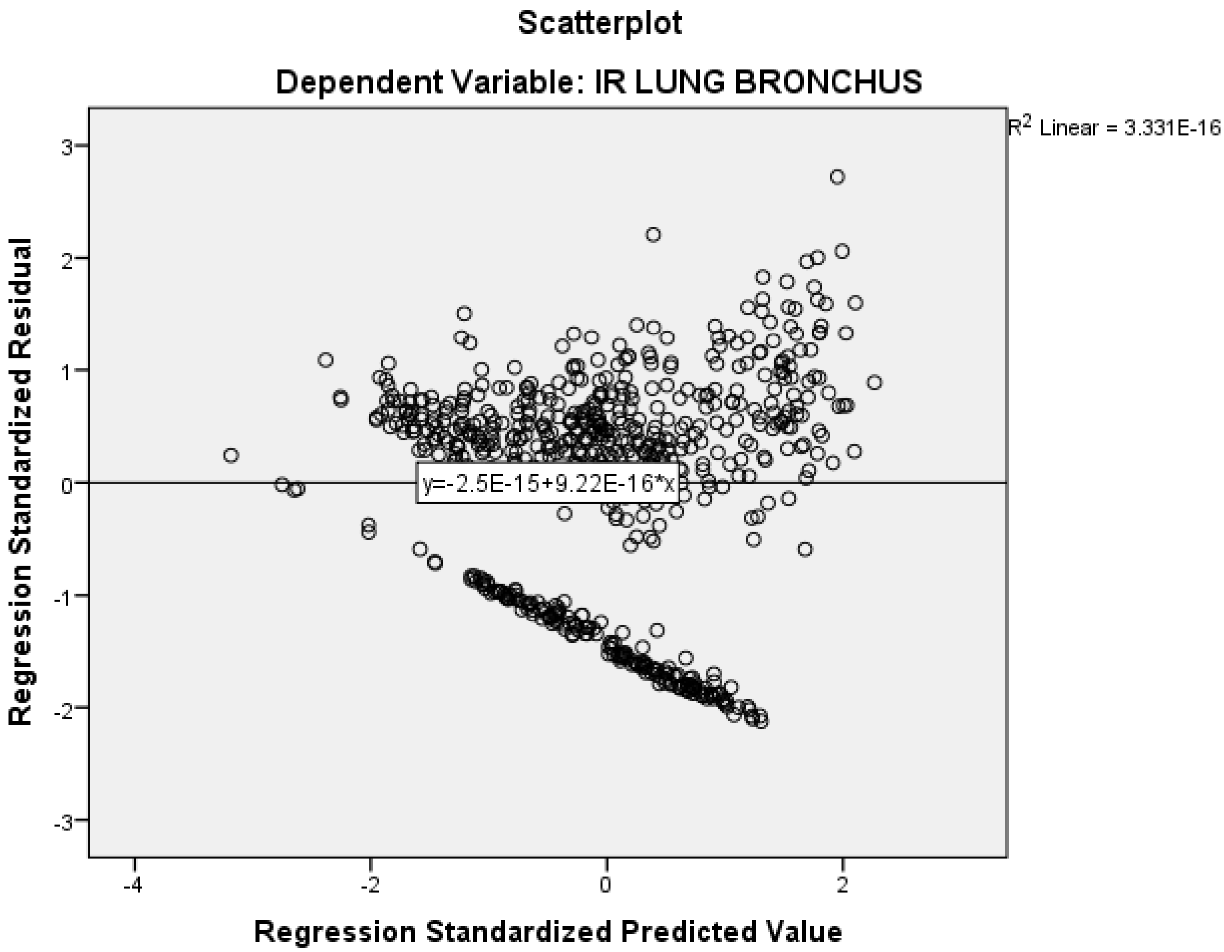

Figure 26. Scatterplot ZPRED vs. ZRESID of IR Lung Bronchus

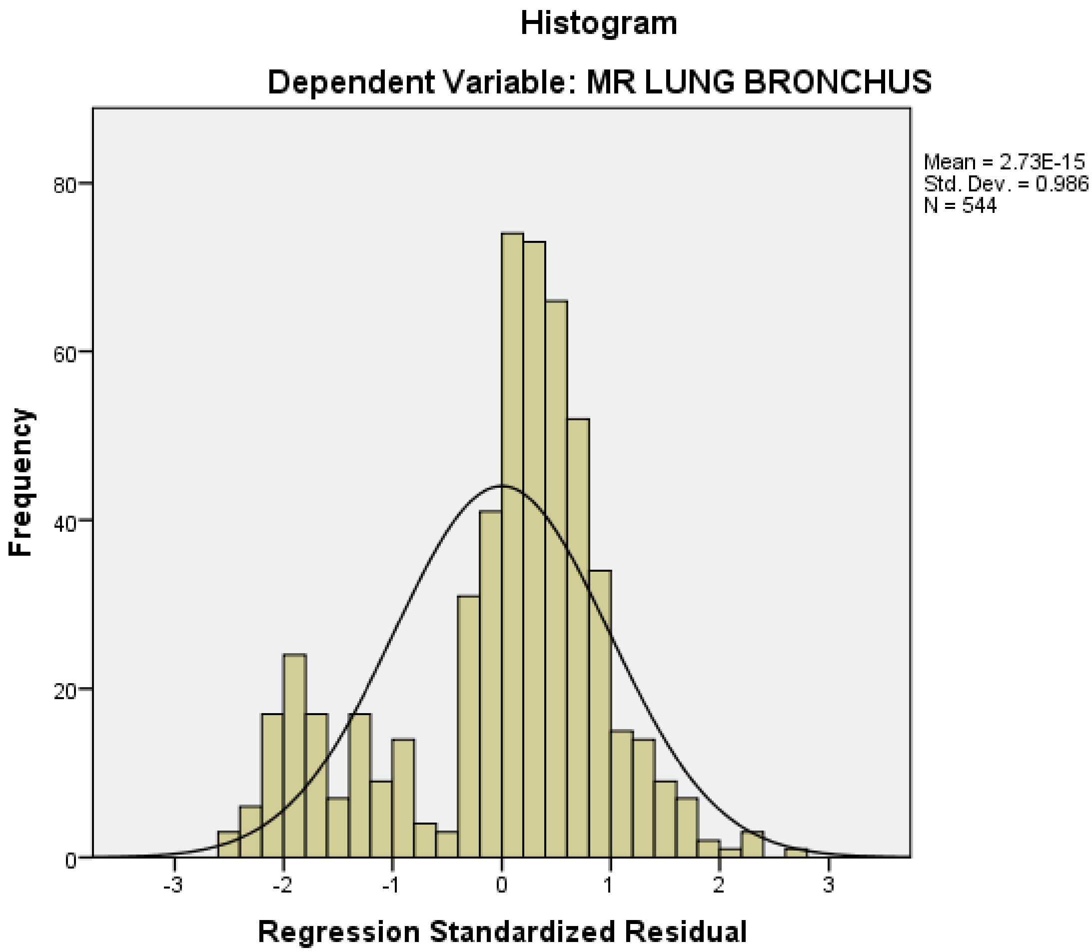

Figure 27. Histogram of Regression Standardized Residual of MR Lung Bronchus

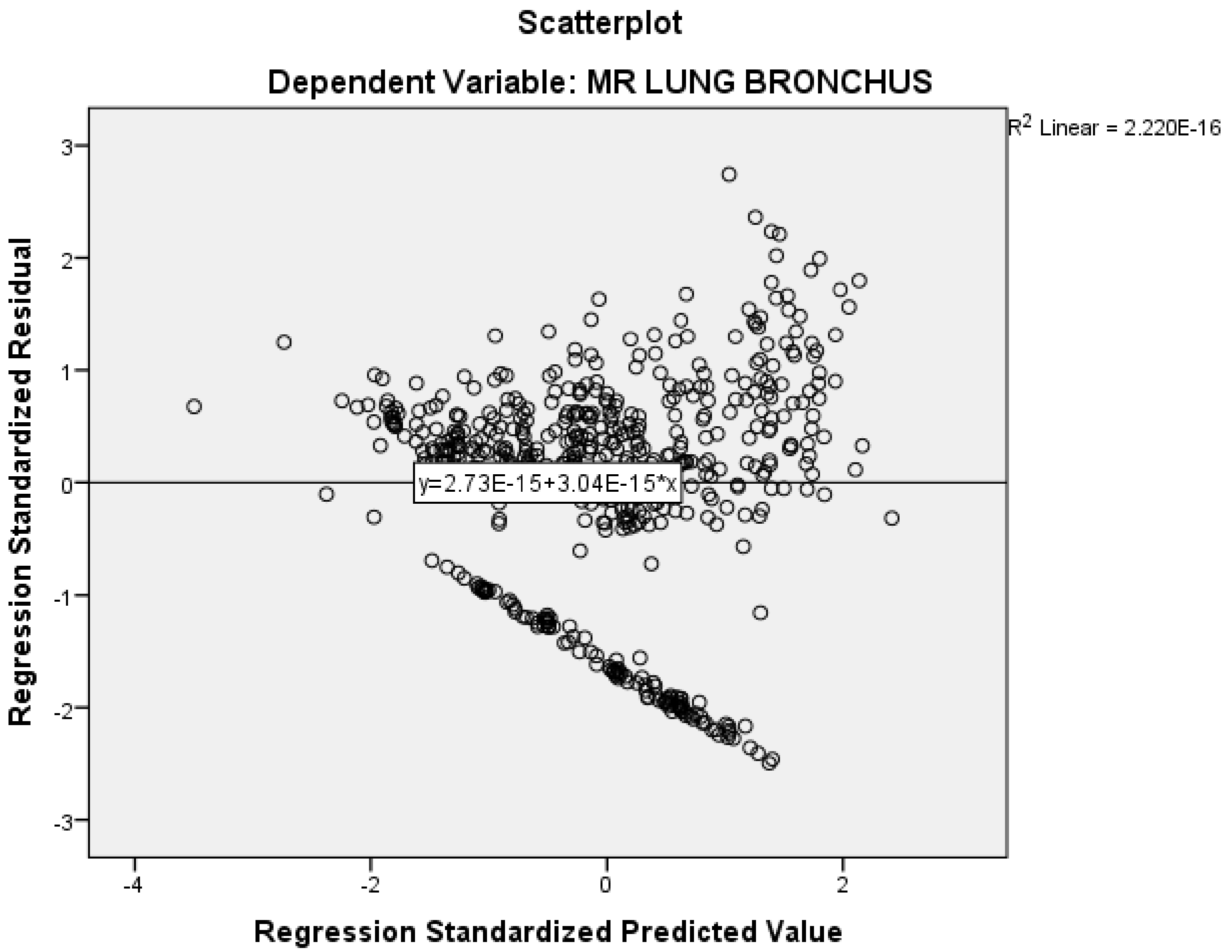

Figure 28. Scatterplot ZPRED vs. ZRESID of MR Lung Bronchus

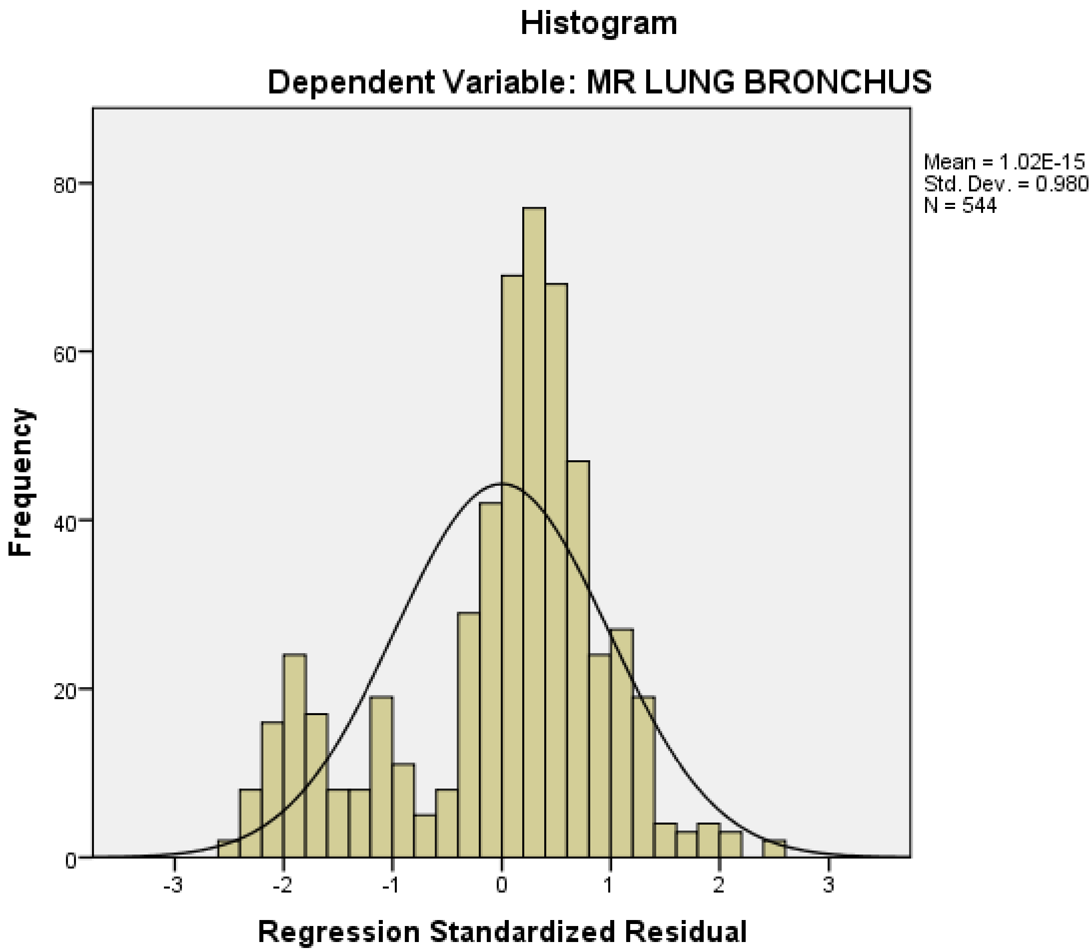

Figure 29. Histogram of Regression Standardized Residual of MR Lung Bronchus with dummy main factors

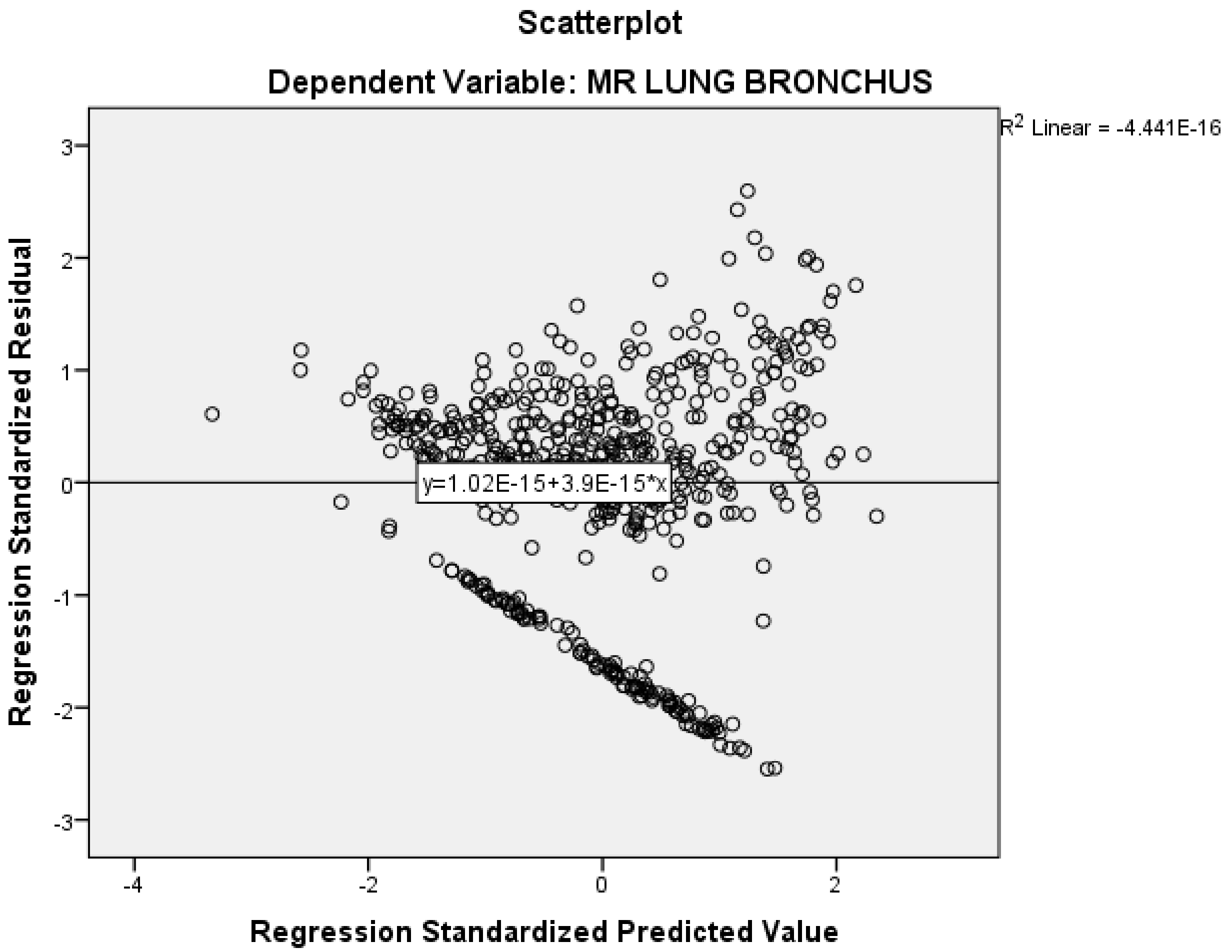

Figure 30. Scatterplot ZPRED vs. ZRESID of MR Lung Bronchus with Dummy main factors

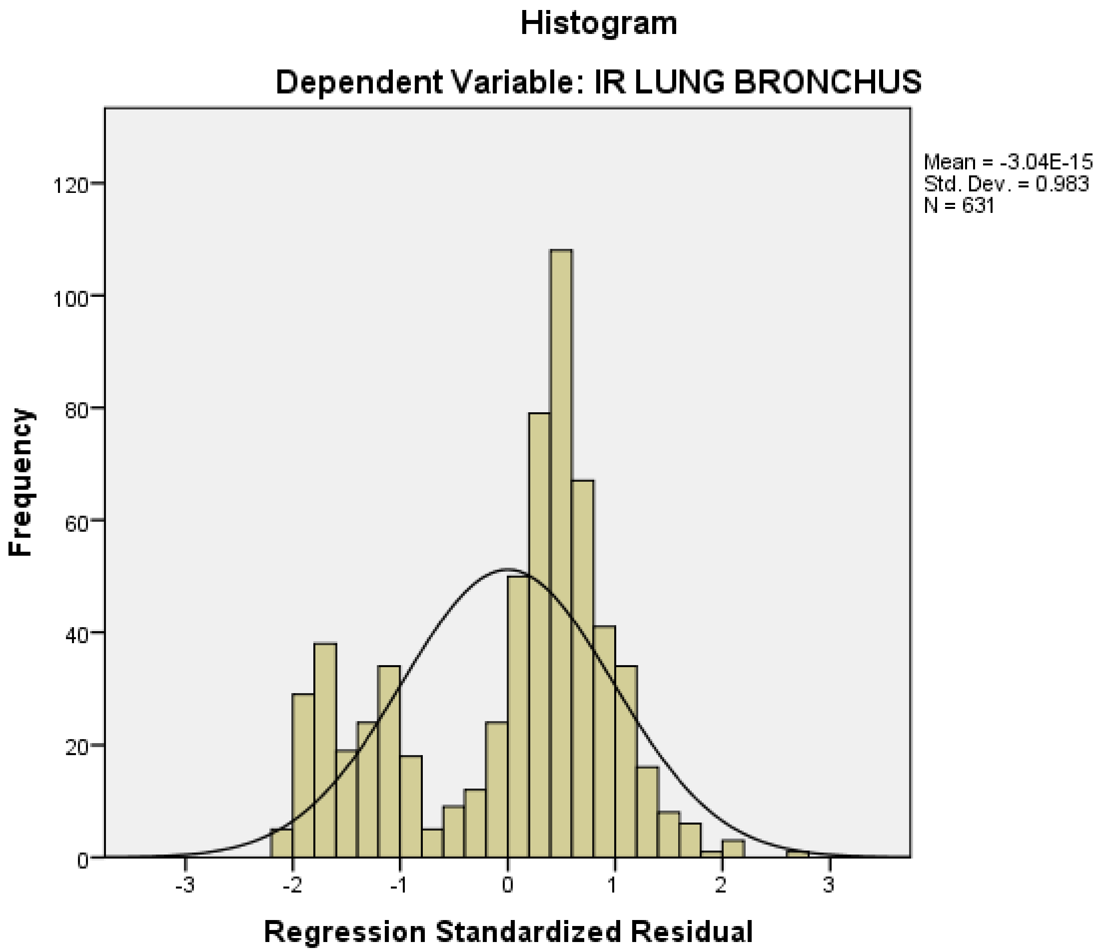

Figure 31. Histogram of Regression Standardized Residual of IR Lung Bronchus with dummy main factors

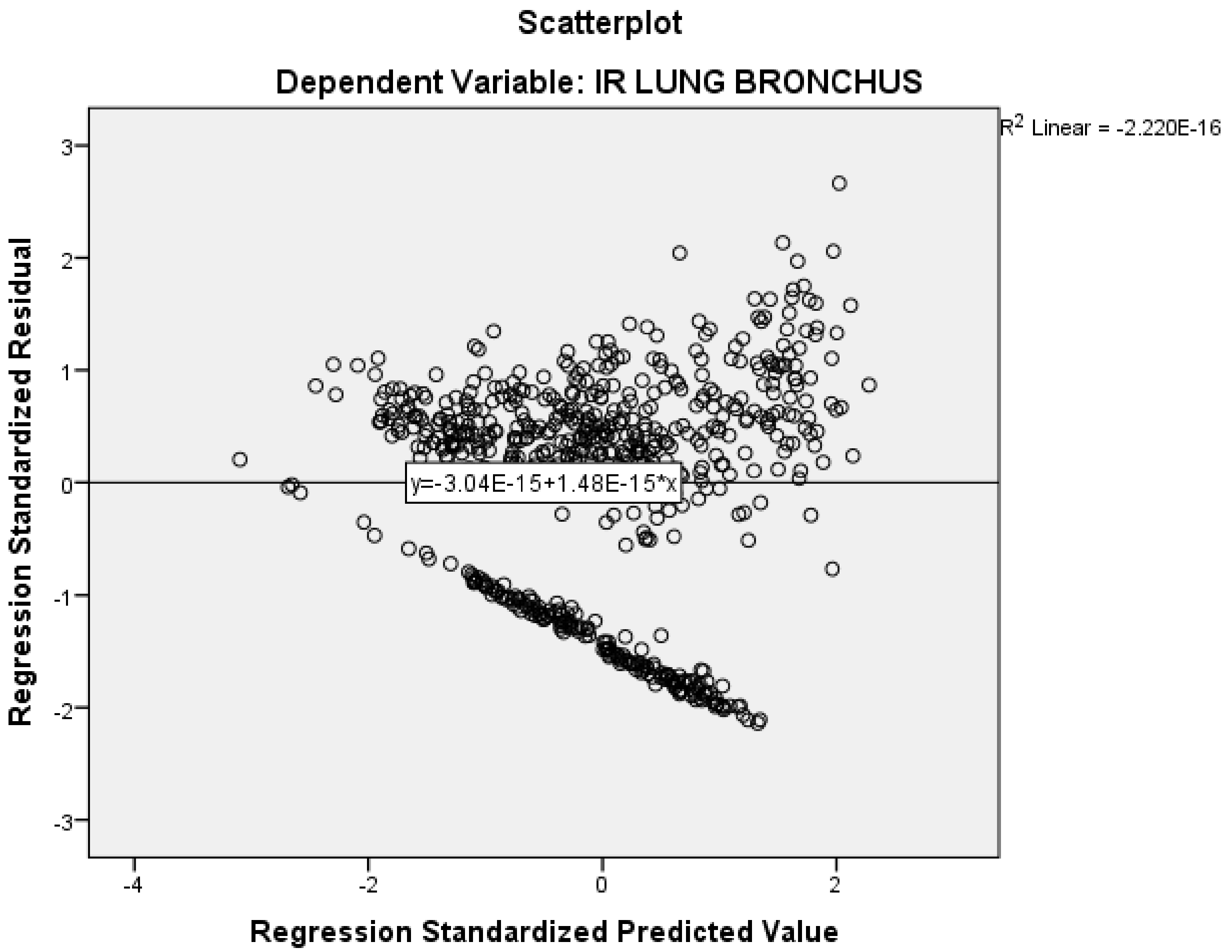

Figure 32. Scatterplot ZPRED vs. ZRESID of IR Lung Bronchus with Dummy main factors

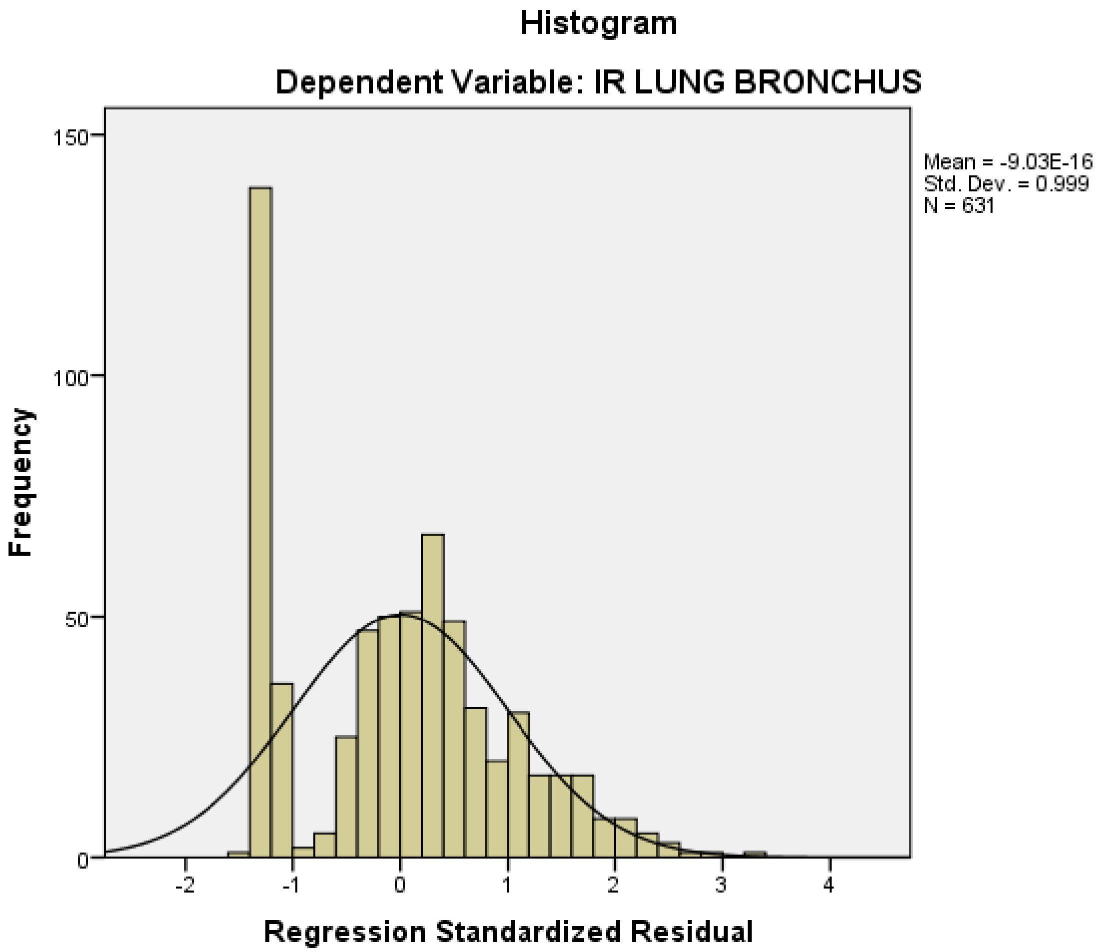

Figure 33. Bivariate Regression Standardized Residual Counties by Georegion on IR Lung Bronchus

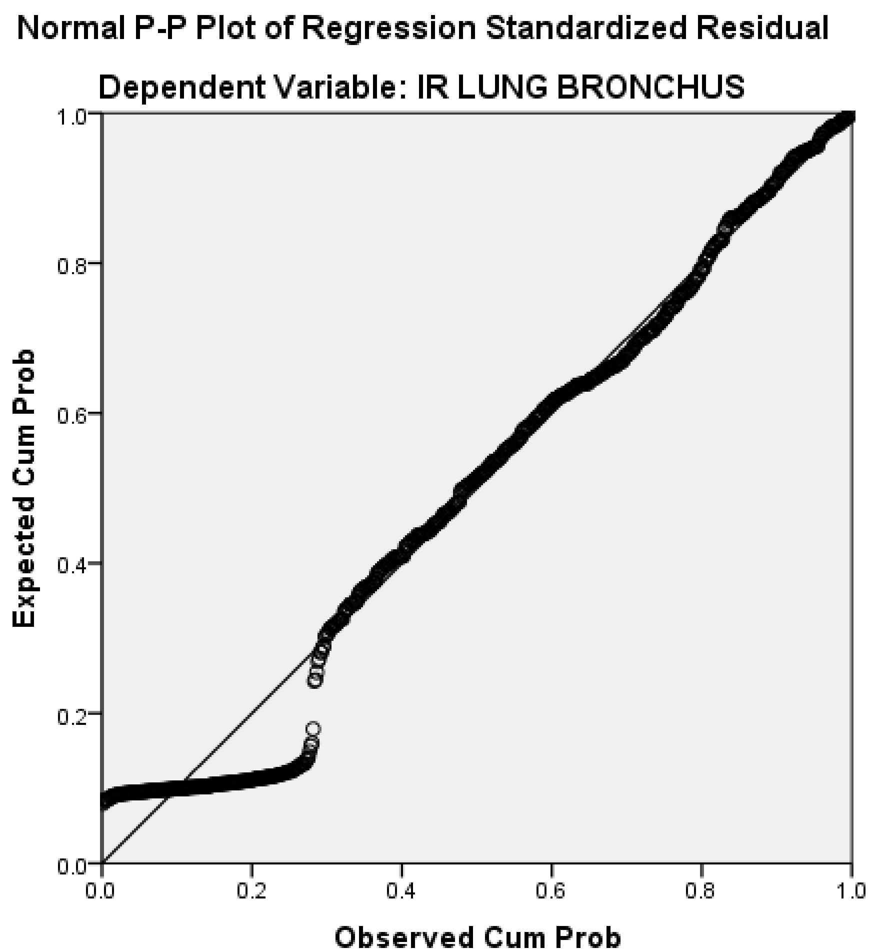

Figure 34. Bivariate Normal P-P Plot of Regression Standardized Residual

Counties by Georegion on IR Lung Bronchus

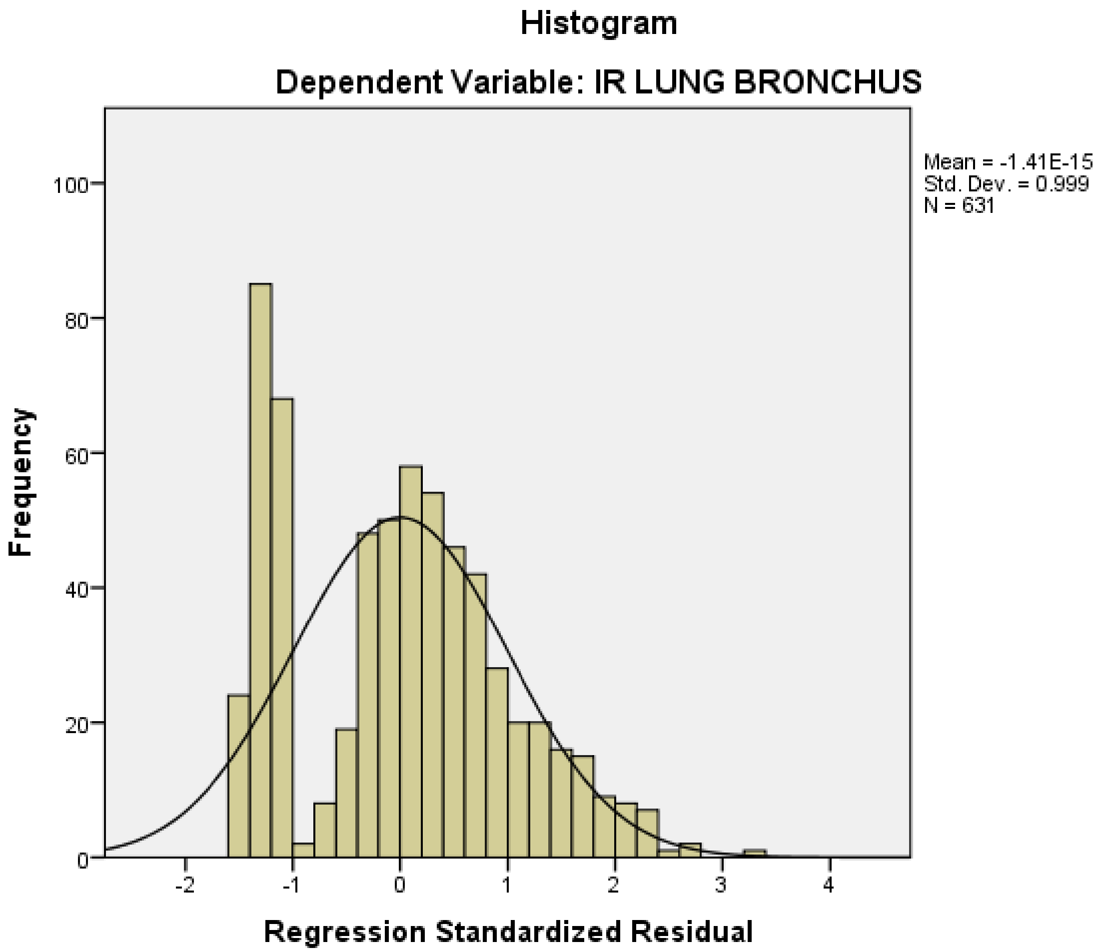

Figure 35. Bivariate Regression Standardized Residual Counties by GeoType on

IR Lung Bronchus

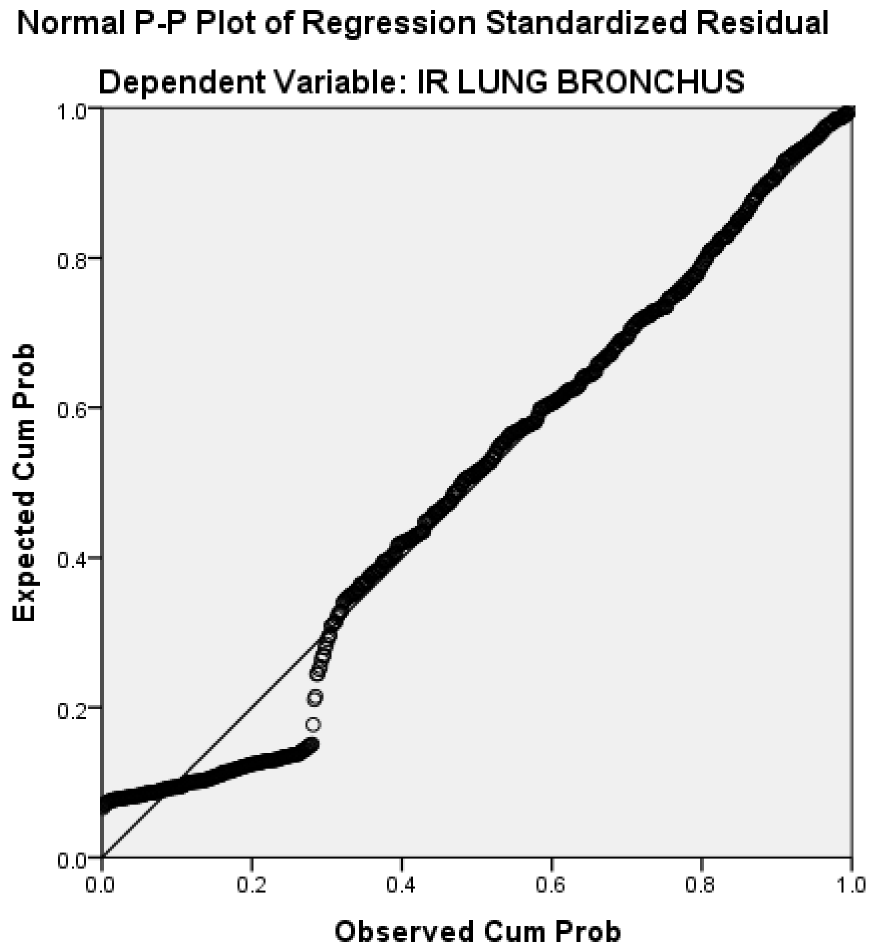

Figure 36. Bivariate Normal P-P Plot of Regression Standardized Residual

Counties by GeoType on IR Lung Bronchus

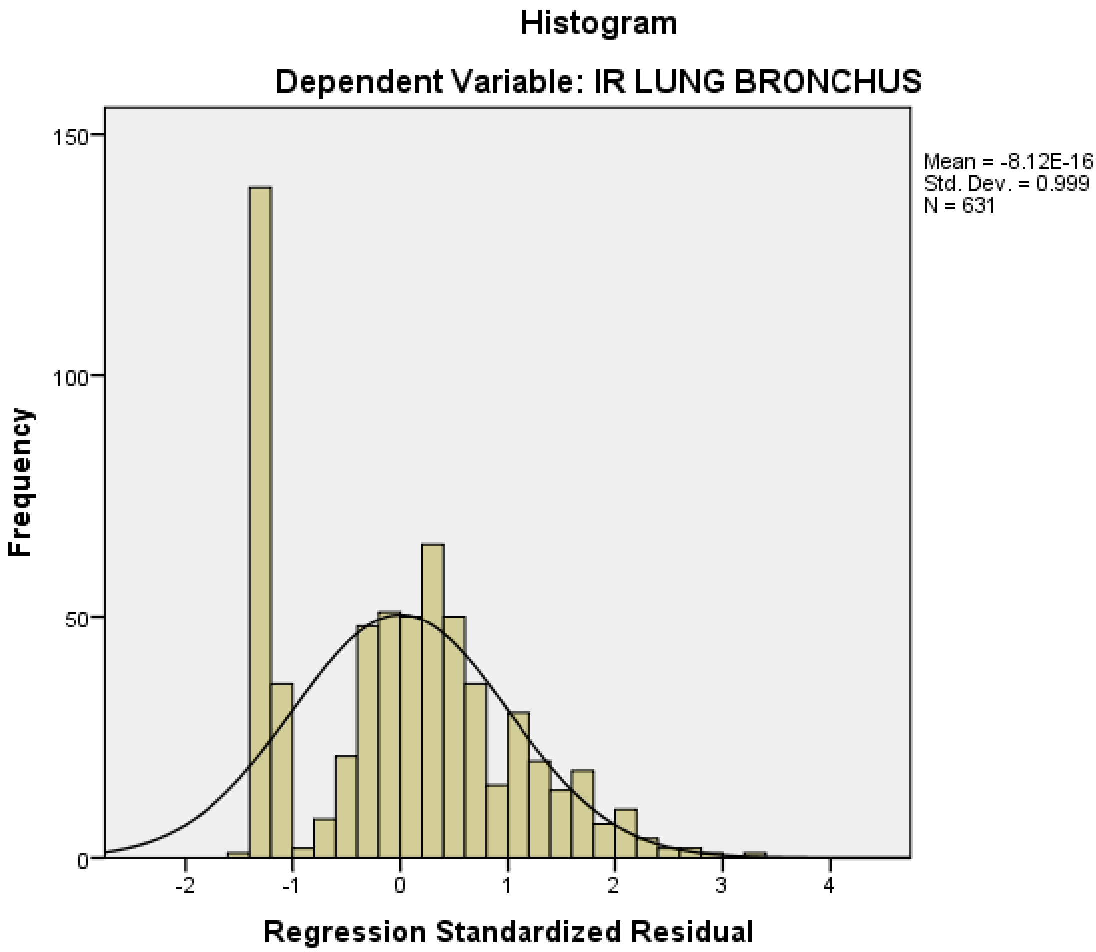

Figure 37. Bivariate Regression Standardized Residual Counties by GeoArea on IR Lung Bronchus

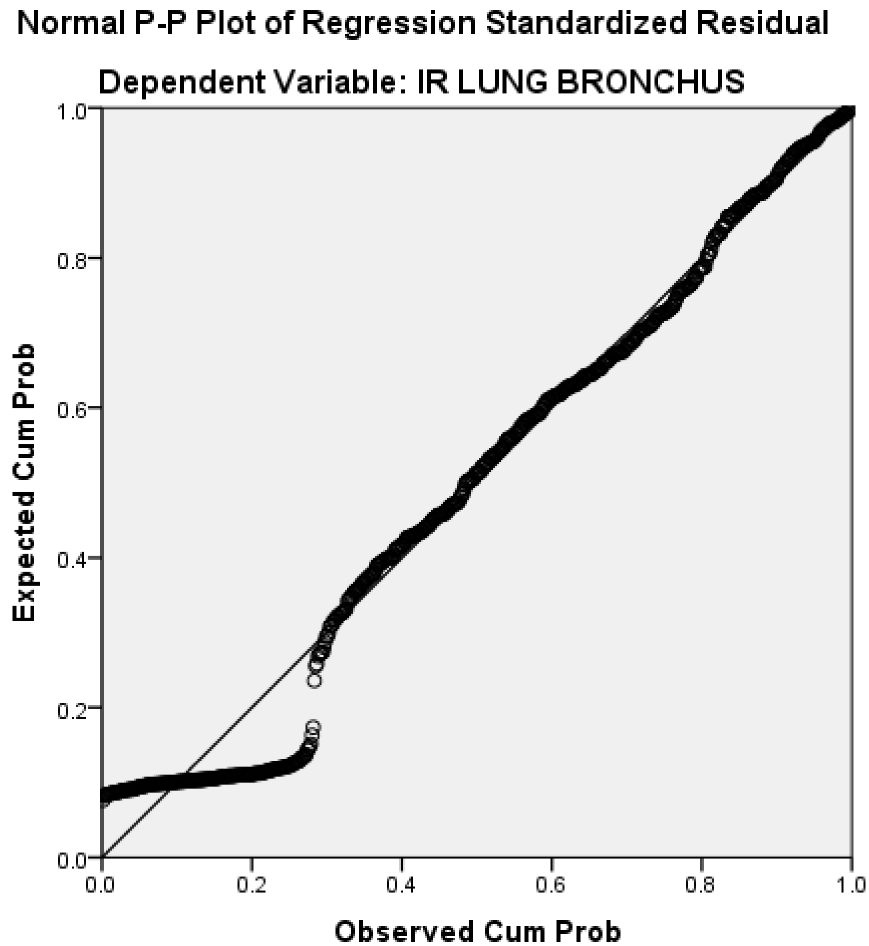

Figure 38. Bivariate Normal P-P Plot of Regression Standardized Residual

Counties by GeoArea on IR Lung Bronchus

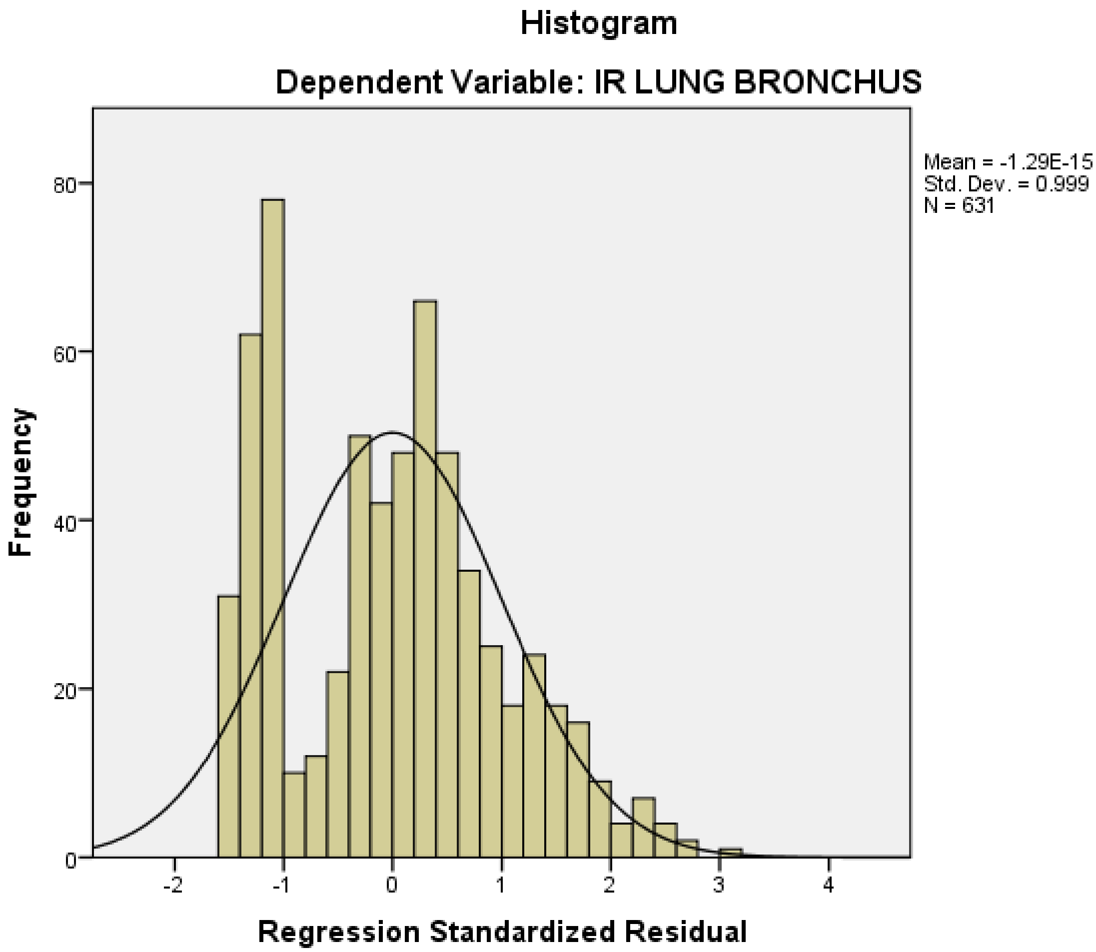

Figure 39. Bivariate Regression Standardized Residual Counties by

Population_Categorized on IR Lung Bronchus

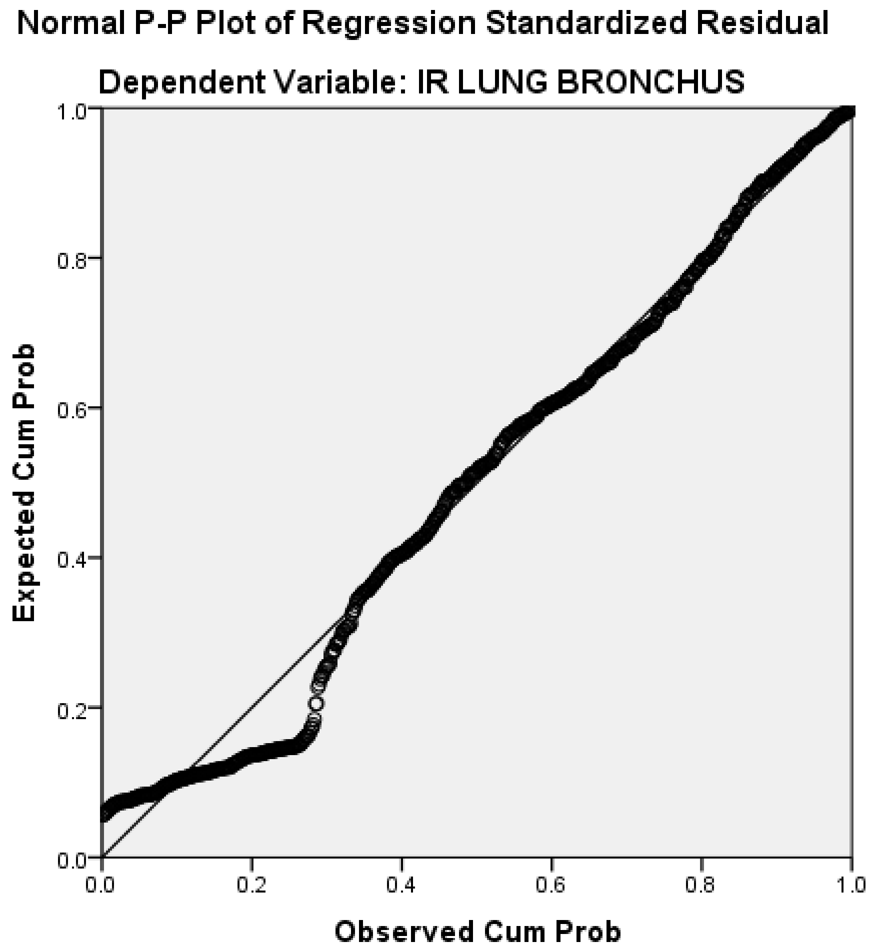

Figure 40. Bivariate Normal P-P Plot of Regression Standardized Residual

Counties by Population_Categorized on IR Lung Bronchus

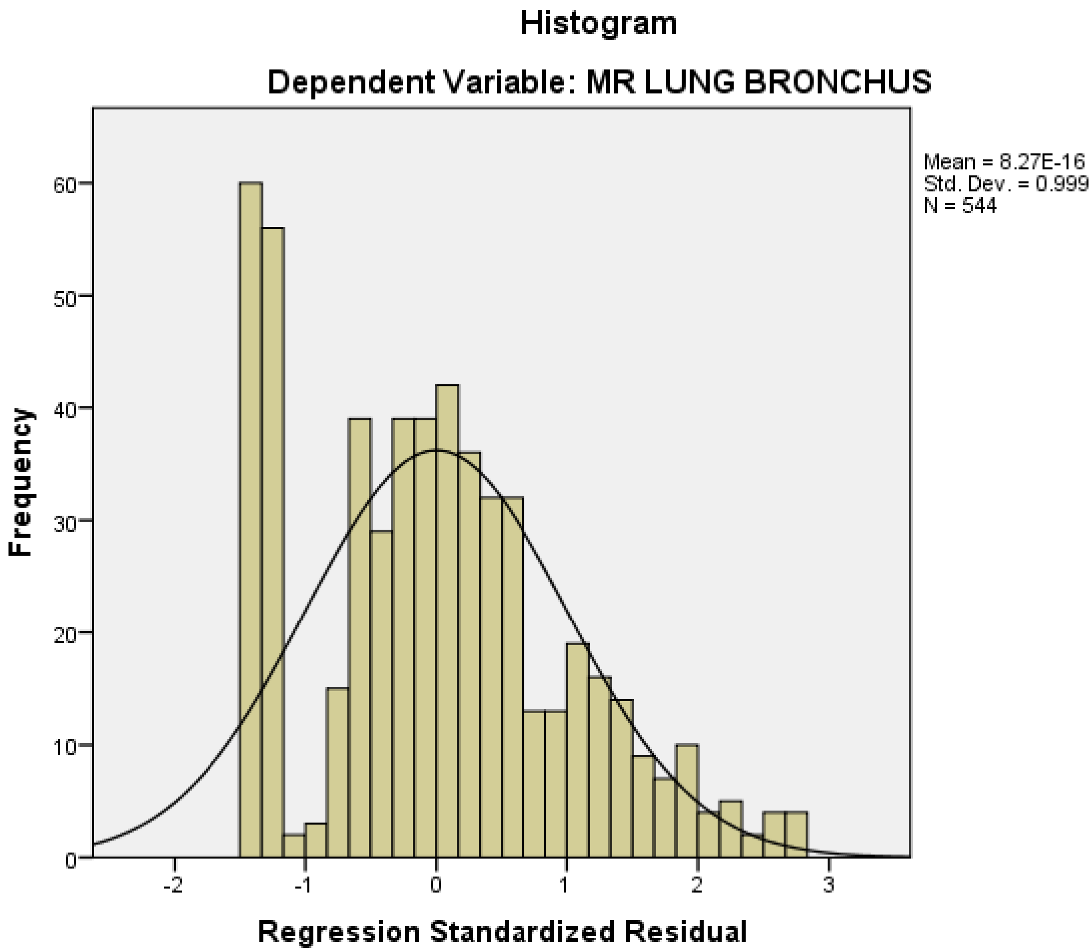

Figure 41. Bivariate Regression Standardized Residual Counties by Georegion on MR Lung Bronchus

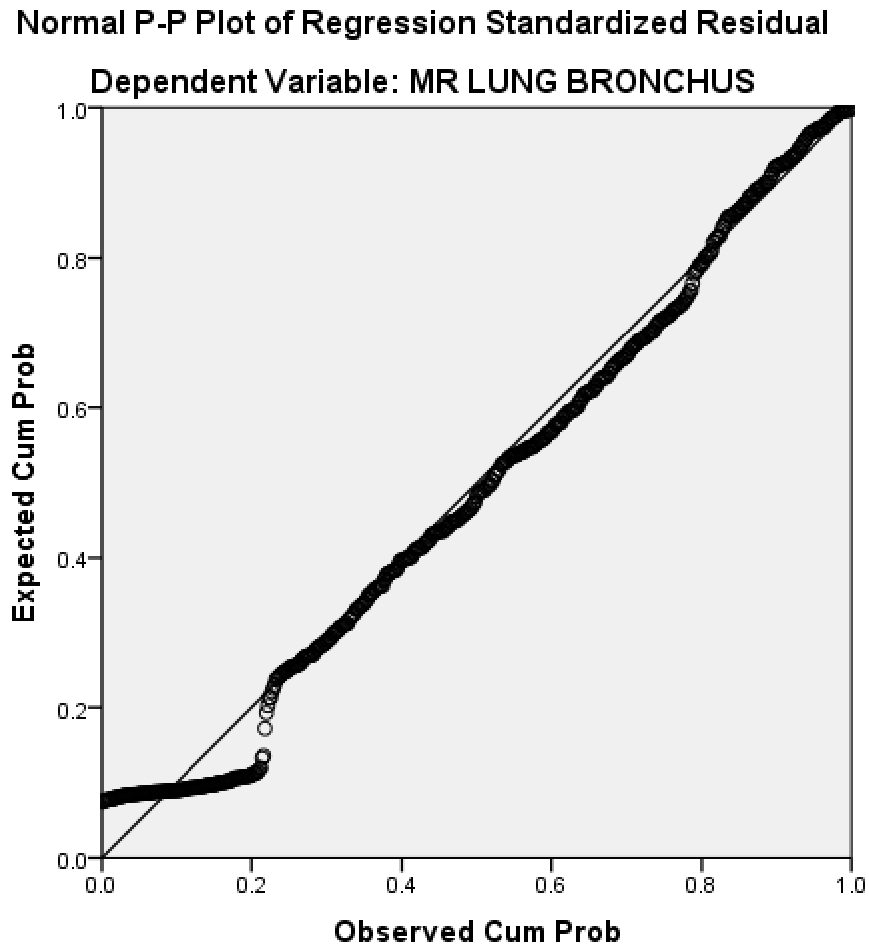

Figure 42. Bivariate Normal P-P Plot of Regression Standardized Residual

Counties by Georegion on MR Lung Bronchus

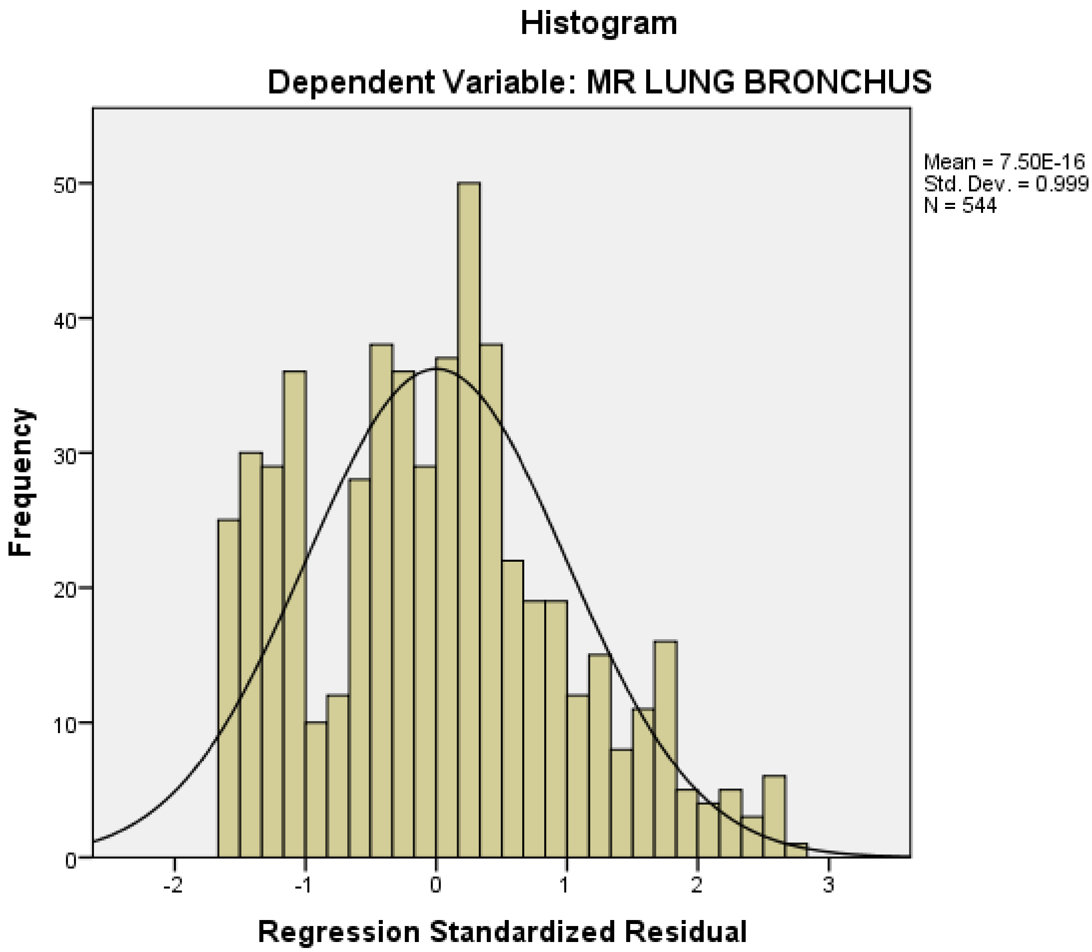

Figure 43. Bivariate Regression Standardized Residual Counties by GeoType on MR Lung Bronchus

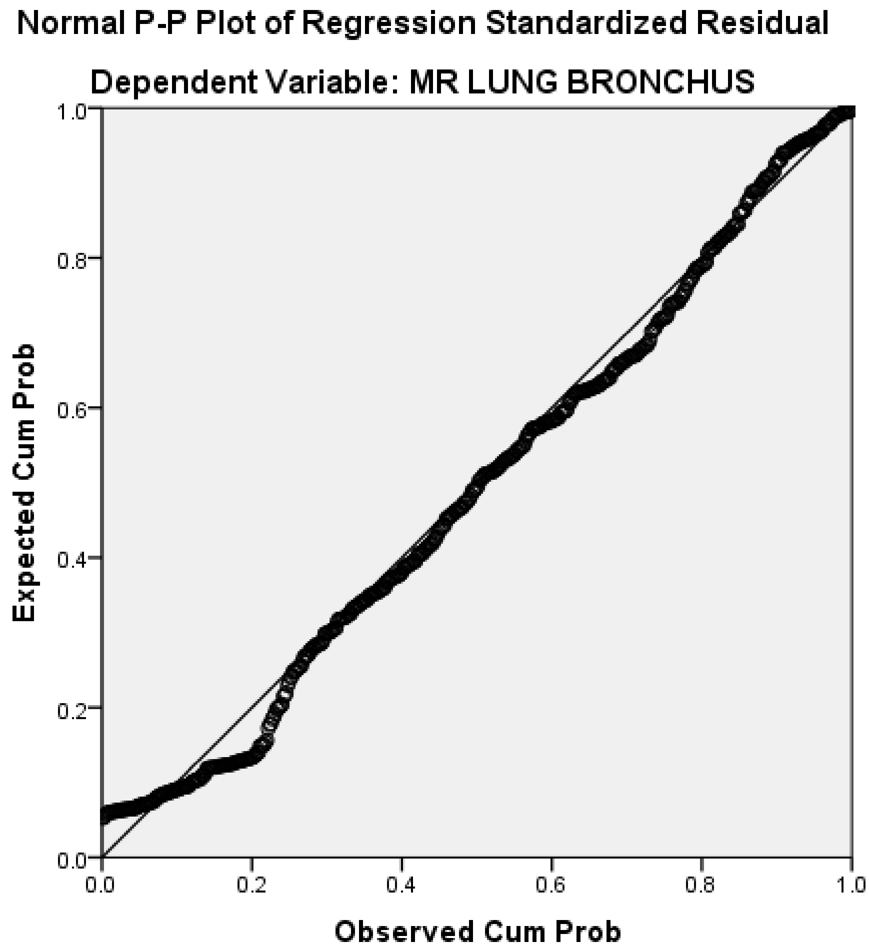

Figure 44. Bivariate Normal P-P Plot of Regression Standardized Residual

Counties by GeoType on MR Lung Bronchus

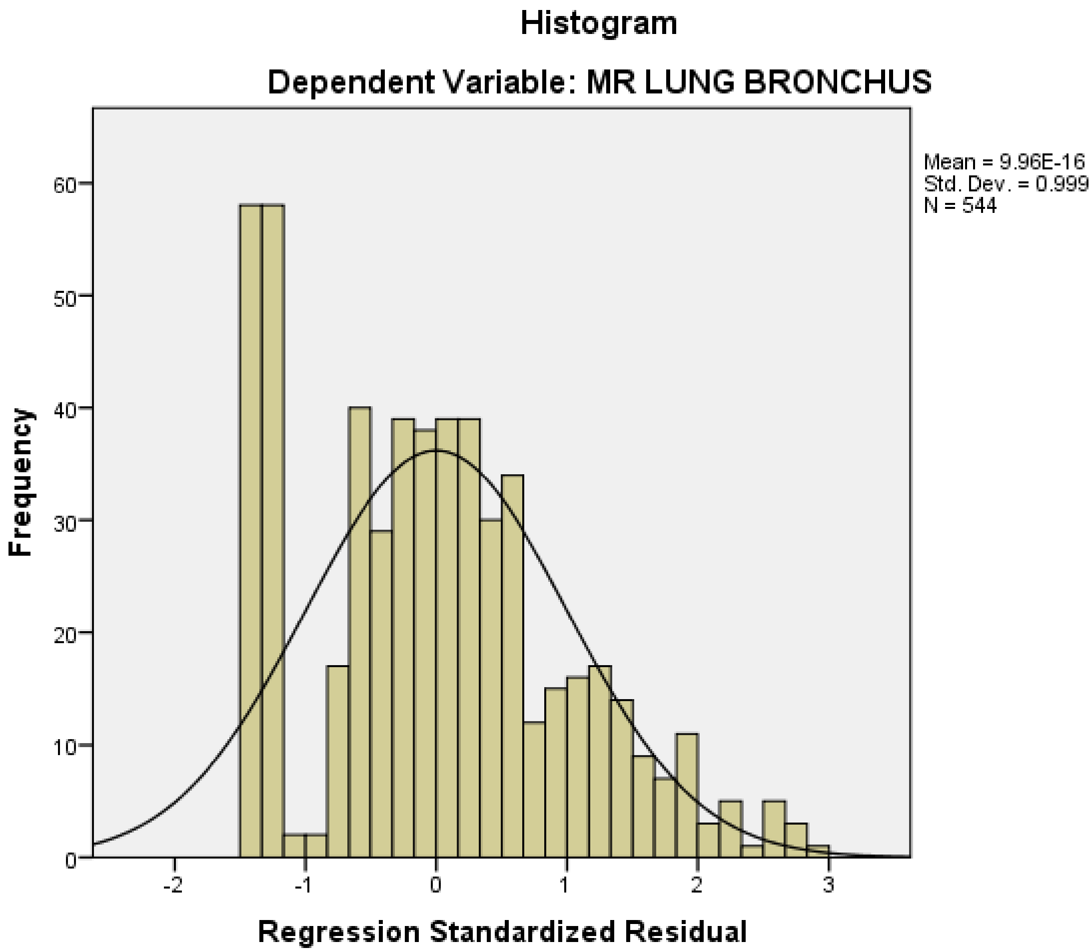

Figure 45. Bivariate Regression Standardized Residual Counties by GeoArea on MR Lung Bronchus

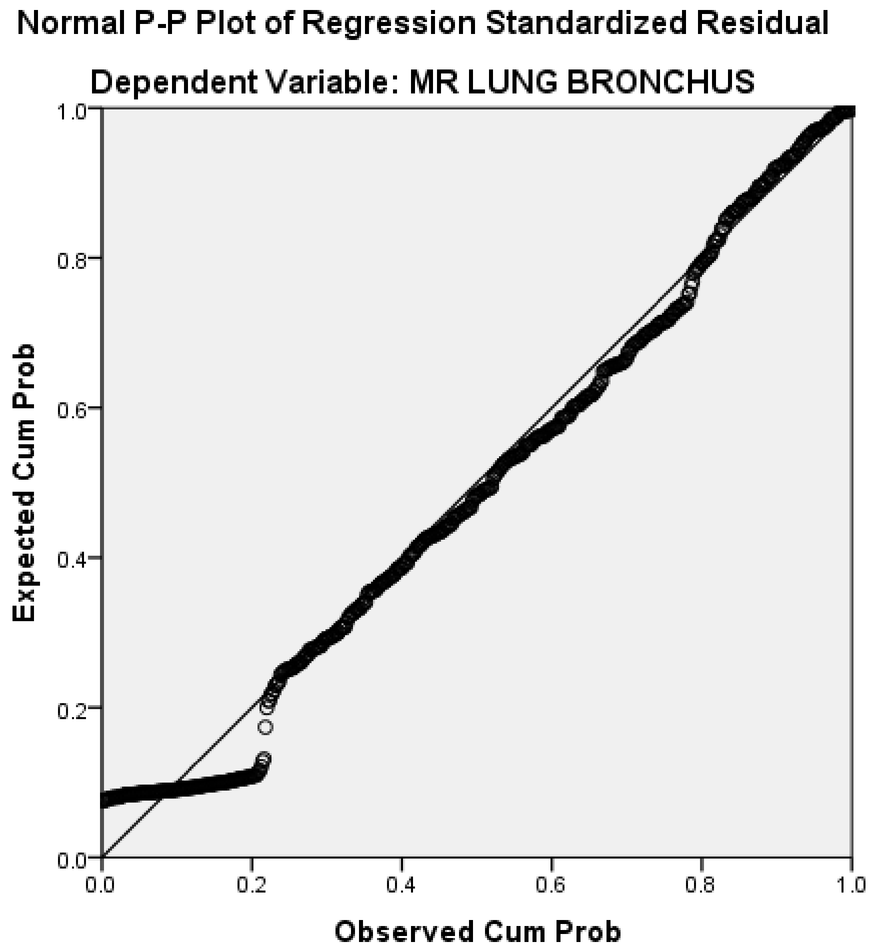

Figure 46. Bivariate Normal P-P Plot of Regression Standardized Residual

Counties by GeoArea on MR Lung Bronchus

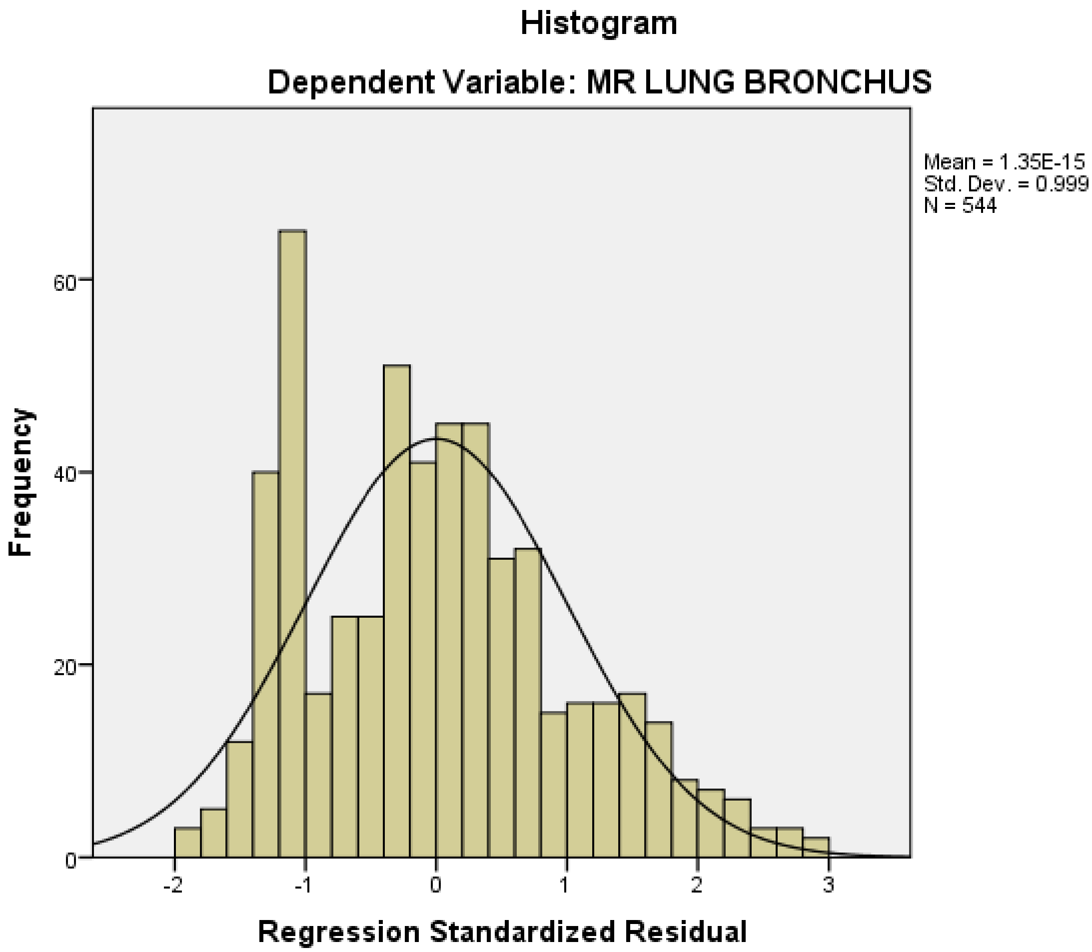

Figure 47. Bivariate Regression Standardized Residual Counties by Population

_Categorized on MR Lung Bronchus

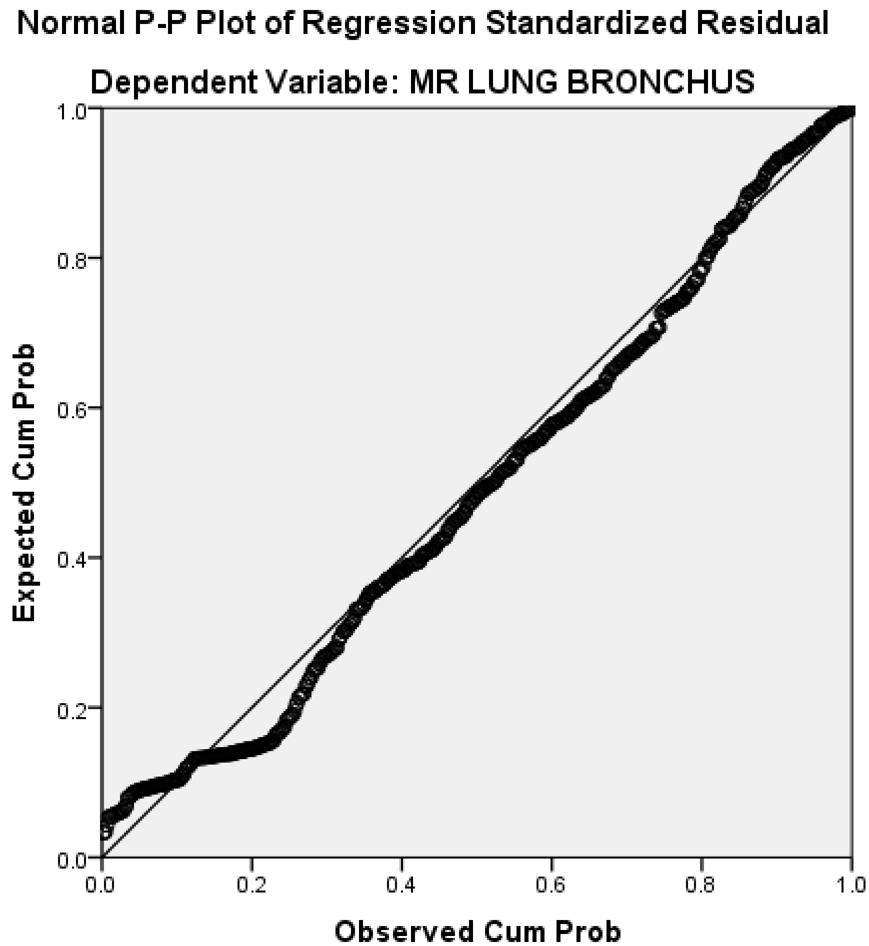

Figure 48. Bivariate Normal P-P Plot of Regression Standardized Residual

Counties by Population_Categorized on MR Lung Bronchus