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Don E. Albrecht
Utah State University, don.albrecht@usu.edu

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Please address all correspondence to Dr. Don E. Albrecht (don.albrecht@usu.edu).

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Utah State University

ABSTRACT
Early in the COVID-19 pandemic, case and death rates from the disease in rural counties were significantly lower than in urban counties. This pattern changed during the summer and fall of 2020, and by December, death rates in rural counties were higher than in urban counties. This article uses data from the U.S. Census Bureau and voting and COVID-19 data from *The New York Times* to explore factors related to the increase in COVID-19 deaths in rural counties in the United States. Further analysis is conducted to understand variations in death rates across different types of rural counties. Multivariate regression models revealed that death rates were related to both measures of disadvantage and political views.

KEYWORDS
COVID-19, political views, rural America

INTRODUCTION

The COVID-19 pandemic has impacted the lives of virtually every person on earth (Wright 2021). Most significantly, the disease has killed millions of people worldwide, while hundreds of thousands of Americans have died (Slavitt 2021; Lewis 2021). Understanding the differential health, economic, social, political, educational, and many other impacts of this disease should be a high priority for years to come (Bambra et al. 2020). This understanding is vital as we strive to recover from the current pandemic. Additionally, insights are essential as we prepare for future health pandemics or other significant disruptive events (Manzanedo and Manning 2020).

This article seeks to contribute to our understanding the impacts of COVID-19 by providing insights on factors related to deaths caused by the virus across the counties of nonmetropolitan America (Stone et al. 2021). As of March 1, 2021, more than 80 thousand individuals in nonmetro U.S. counties had died from the disease and the per capita death rate was greater in nonmetro counties than in metro counties. Despite the severity of the pandemic in rural America, it has received limited research attention (Mueller et al. 2021). This article seeks to contribute to the social science literature on COVID-19 by analyzing factors that explain and improve our understanding of variations in COVID-19 impacts across the counties of nonmetro America. In conducting this analysis, it is important to recognize that nonmetro America is extremely diverse. Thus, the analysis will provide a more detailed examination of different types of nonmetro counties.

COVID-19 in Rural America

From the beginning of the COVID-19 pandemic, it was apparent that residents of some communities were in less danger from the virus than residents of other communities. In particular, data from early in the pandemic showed that people residing in rural areas were much less likely to test positive for and die from the disease than residents of large cities. For example, on May 1, 2020, the death rate per 100,000 residents in nonmetro (the term treated as synonymous with rural in this article) counties was 5.3, about one-third the rate of 15.6 in metro counties. While many major U.S. cities had struggled with significant outbreaks, only 107 of the 643 (17 percent) most rural counties had 10 or more known cases, and in hundreds of rural counties there were no cases or deaths at all. A recognition of the relative safety of rural communities led some observers to embrace potential economic benefits to rural America resulting from their health and safety advantages (Albrecht et al. 2020; Wilson and Hill 2020).

The reasons the disease was concentrated in cities are apparent. In large cities, travelers congregate from trips to places all over the world where they may have contracted the disease. In cities people live and work in close proximity to one another and are more dependent upon mass transit, all of which makes social distancing more difficult. These circumstances provide prime conditions for an infectious disease to spread. In contrast, in rural areas there are fewer people, and these people are more widely dispersed, making it easier for people to remain apart, slowing virus spread. Of course, residents of rural counties are not immune to danger from the virus. Travelers cross county lines regularly, and many people live in one county and work in another county. Overall, however, there is little doubt that reduced crowding provides some safety for rural compared to urban residents from infectious diseases such as COVID-19.

During the summer of 2020, however, the geographic dispersion of the disease began to change (Paul et al. 2020). Specifically, from July 1, 2020 until February 1, 2021, the proportional increase in the number of cases and deaths from COVID-19 in nonmetro counties exceeded the rate of change in metro counties. By December 2020, death rates were greater in nonmetro than metro counties. The structural advantages of rural areas to reduce virus spread were unchanged; thus, the growing impact of the virus in rural areas must be attributed to other factors. Two sets of variables seem relevant in understanding the rapid increase of COVID-19 in rural America and will be explored in this analysis. The first are measures of disadvantage, while the second are political views. Each is discussed below.

Disadvantage and COVID-19

A substantial literature has found that a person’s residence has important consequences for their life chances (Lobao, Hooks, and Tickamyer 2007). Among life chances impacted by where someone lives are social mobility and health outcomes (e.g., Case and Deaton 2020; Chetty et al. 2014; Chetty, Hendren, and Katz 2016; Link and Phelan 1995; Monnat and Brown 2017; Monnat and Chandler 2015). In vibrant communities with good schools, a dynamic economy, and lower levels of segregation and inequality, a high proportion of young people tend to achieve economic and other measures of success as adults; a significant proportion of them achieve an even higher social class than their parents (Chetty et al. 2014). Similarly, in such communities people tend to live relatively long and healthy lives (Case and Deaton 2020; Link and Phelan 1995; Monnat and Brown 2017; Monnat and Chandler 2015). In contrast, in communities lacking the advantages of good schools, a dynamic economy, and lower levels of segregation and inequality, upward social mobility is much more limited, severe health problems are common, and life expectancy has actually been declining in recent years (Case and Deaton 2020).

The relationship between spatial location and social outcomes is clearly apparent in rural America (Lobao et al. 2007). Residents of advantaged rural communities experience extensive economic and health benefits (Farrell 2021). In many other rural communities, however, residents have lower incomes, lower levels of educational attainment, and higher rates of poverty and unemployment relative to other Americans (Albrecht and Albrecht 2000). In many rural communities, already severe economic concerns have become more pronounced in recent years because of steady declines in the number of jobs in sectors such as manufacturing and the natural resource industries of farming, logging, and mining. These sectors have traditionally been the primary employer of rural workers. The loss of these jobs has meant economic and demographic decline for hundreds of rural communities (Albrecht et al. 2020).

The economic struggles in many rural communities have significant negative health consequences. Of special concern are growing rates of “deaths of despair.” These are deaths that occur as a result people feeling great hopelessness and include suicide, drug overdose, and diseases related to alcohol abuse (Case and Deaton 2020). Deaths of despair have increased significantly in rural communities that lack vibrant economies (Monnat 2016). Health outcomes in rural areas are made worse by the fact that rural residents are, on average, older (James 2014; Johnson 2020; Monnat and Pickett 2011), have more preexisting health conditions, and are more likely to lack access to quality health care (Henning-Smith 2020; Peters 2020).

Because of their existing health disadvantages, the emergence of the COVID-19 pandemic represents a major concern for rural America. This is especially true for disadvantaged rural communities. Most likely, death rates from COVID-19 in disadvantaged communities will be greater than in more advantaged communities. In this article, six measures of disadvantage are used. Each is described below.

Race/ethnicity. Data clearly show that minorities are much more likely than white people to test positive for and die from COVID-19 (e.g., Desmet and Wacziarg 2021; Hawkins 2020; Karaca-Mandic, Georgiou, and Sen 2020; Knittel and Ozaltun 2020; McLaren 2020; Ogedegbe et al. 2020; Raifman and Raifman 2020), and this tendency extends to rural communities (Cheng, Sun, and Monnat 2020). Many communities with large minority populations have struggled with significant virus outbreaks. For example, the pandemic has had extensive consequences in Black communities in the rural South and in urban neighborhoods with large Black populations throughout the nation. The virus had major consequences on Native American reservations in the West. The Navajo Reservation in Arizona, New Mexico, and Utah was especially hard hit (Kovich 2020).

There are several factors that may account for high disease impacts among minority populations. Greater risk results from lower levels of educational attainment and type of employment are variables related to both race/ethnicity and COVID-19 and are described below. Additionally, because of language barriers and a lack of trust in authority figures, minorities may be less likely to heed expert advice (Howell and Fagan 1988; Nunnally 2012). In this analysis, three measures of race/ethnicity are utilized including percent non-Hispanic white, percent black, and percent Hispanic. It is expected that there will be a positive relationship between the percent of the population in a county that is minority and death rates from COVID-19.

*Educational attainment***.** Counties with higher levels of educational attainment are expected to have lower rates of COVID-19 deaths. There are several reasons for this expectation. First, the professional, white-collar jobs that are conducive to remote work are typically held by persons with an advanced education. Remote work clearly provides a level of protection from COVID-19. Counties where a higher proportion of the workforce are employed in these types of jobs are thus likely to have lower infection rates. Second, persons with higher levels of education have more trust in science (Drummond and Fischhoff 2017; Roberts et al. 2013). This trust likely results in behaviors such as wearing a mask and social distancing that will slow virus spread. It is thus expected that as educational attainment levels in a county increase, deaths from COVID-19 will decline.

Employment in high-risk industries. During the pandemic, millions of Americans were able to work from home, which provided some safety from the virus by reducing contact with other people. Millions of other people, however, were employed in sectors where remote work was much less feasible. Contact with more people through their employment clearly increases the likelihood of getting COVID-19. For purposes of this study, employment in an industry more likely to require face-to-face interactions with other people are defined as “high-risk.” This definition is in accordance with standards established by the Occupational Safety and Health Administration (OSHA 2021).

It seems likely that counties more dependent on high-risk industries are more at risk from the virus than counties more reliant on industries where remote work is more feasible. For example, early in the pandemic there were a number of major outbreaks in meatpacking plants where people work shoulder-to-shoulder (Krumel 2020). It is expected that there will be a positive relationship between percent of the labor force in a county employed in high-risk industries and per capita deaths from COVID-19.

Risk factors. People with certain characteristics are much more at risk from COVID-19 than others. In particular, there is a strong relationship between age and danger from COVID-19, with risk increasing sharply as individuals become older (e.g., Davies et al. 2020). In addition, risk increases for persons with underlying health conditions such as heart or respiratory diseases or diabetes (e.g., Wortham et al. 2020). Counties where higher proportions of the population are elderly, have underlying health conditions, or with some other risk factors are likely to have higher rates of COVID-19 cases, and especially COVID-19 deaths than other counties. For this analysis it is expected that there will be a positive relationship between risk factors and death rates from COVID-19.

COVID-19 and Political Views

Scientists and health professionals have long warned of the possible emergence of a new infectious disease for which humans had little or no resistance (e.g., Hatchett, Mecher, and Lipsitch 2007; Lewis 2021; Morens and Fauci 2007; Quammen 2012; Quick and Fryer 2018; Webster, Shortridge, and Kawaoka 1997). These fears became reality with the emergence of COVID-19 in late 2019. COVID-19 is highly contagious, is spread by close contact with other people, and is often spread by persons with no symptoms. To control spread of the disease until vaccines were developed, health professionals recommended washing hands often, wearing a mask, and social distancing. These practices have been found effective in limiting disease spread (Greenhalgh et al. 2021).

In the U.S., however, implementation of safety measures to protect against COVID-19 was very inconsistent across time and varied greatly from one location to another. A primary reason was that efforts to address the COVID-19 pandemic quickly became politicized (Hill, Gonzalez, and Davis 2020; Slavitt 2021). From the outset, Republicans were less likely to take the virus seriously and less likely to take precautions recommended by health experts to prevent virus spread (Bruine de Bruin, Saw, and Goldman 2020; Hamilton and Safford 2020). President Donald Trump, other Republican political leaders, and the right-wing media continually downplayed the significance of the pandemic (Allcott et al. 2020). State and local governments under Republican control were less likely to implement restrictive policies (Hsiehchen Espinoza, and Slovic 2020). Early research found that counties with a higher share of Trump voters tended to have lower perceptions of the dangers of COVID-19, and these perceptions led to riskier behavior (Barrios and Hochberg 2020). Likely as a result, Desmet and Wacziarg (2021) found that Trump voting counties were initially safer from the virus, but this changed as the pandemic progressed.

In Republican dominated counties, events such as church, weddings, and funerals often continued unaltered. States with more Trump voters were more resistant to stay-at-home orders (Hill et al. 2020). In more religious states, which tend to be more Republican, people were found to be more mobile during the pandemic despite recommendations to stay home (Hill, Gonzalez, and Burdette 2020). Perry, Whitehead, and Grubbs (2020) found that Christian Nationalism, which has strong ties to the Republican Party, was related to many of the far-right responses to COVID-19. Ulrich-Schad, Givens, and Wengreen (2020) found much more resistance to mask wearing and social distancing in the heavily Republican rural areas of Utah compared to urban areas with more Democrat voters. The significance of political views for this study is that rural residents are much more likely to vote Republican than their urban counterparts (Albrecht 2019; Goetz et al. 2018). Resulting from their political views, research found that rural residents were significantly less likely than their urban counterparts to practice safety measures to keep them safe from COVID-19 such as wearing masks and avoiding dining in restaurants and bars (Callaghan et al. 2021). Behavioral differences in COVID-19 safety measures between rural and urban residents were evident of older adults who were most at-risk from the virus (Probst, Crouch, and Eberth 2021). For this study, political views are determined by percent of voters in a county who cast their ballot for Donald Trump in the 2020 presidential election. It is expected that there will be a positive relationship between percent voting for Trump in a county and death rates from COVID-19 in that county.

METHODS

The county/county equivalent is the unit of analysis for this study. Counties are relatively small geographic units where data is available for all of the variables utilized in the study. Analysis is conducted on the 1,950 nonmetropolitan counties in the contiguous United States where data is available on all variables. All variables used in the analysis are available from publicly available sources.

The dependent variable is the number of deaths per 100,000 residents resulting from COVID-19 as of March 1, 2021. The focus of this study is on deaths rather than cases because deaths are the more critical outcome. Additionally, the data on deaths is more accurate as it is widely recognized that many people have had the disease without receiving a positive test. Deaths per county are based on where individuals were residing at the time of their death and not where the death occurred.

March 1, 2021 was chosen as the cutoff date for the analysis because by that time, vaccines were being broadly distributed significantly changing how the disease spreads.

To measure the dependent variable, county level data were obtained from *The New York Times* dataset (*The New York Times* 2021). This dataset provides the number of COVID-19 cases and deaths for each county in the U.S. on a daily basis. *The New York Times* obtains data from state, regional, and county sources on a continual basis. *The New York Times* data is virtually identical to COVID-19 data from other sources such as Johns Hopkins University or the CDC (Centers for Disease Control and Prevention) since they all get their information from the same places. The advantage of *The New York Times* dataset is that it is available to the public and can be easily downloaded. The dependent variable is developed by dividing the total number of deaths in each county as of March 1, 2021 by the total population of that county as determined by the 2018 American Community Survey (ACS) five-year (2014 to 2018) estimates and then multiplying by 100,000.

Seven independent variables are used in the analysis. The first six are measures of disadvantage, while the final variable measures political views. Three measures of race/ethnicity are used, including the percent of the population in each county that is non-Hispanic white, the percent of the population that is Black, and the percent of the population that is Hispanic. All measures are based on data from the 2014-2018 ACS. Educational attainment is determined by the percent of persons age 25 and older with a college degree in each county as determined by 2014-2018 ACS. A high-risk industry measure was created using data from the American Community Survey by determining the percent of the total workforce employed in industries more likely to require person-to-person contact in each county as defined by OSHA (OSHA 2021). High-risk industries were defined as the natural resource industries (agriculture, logging, mining), manufacturing, retail trade, health care, education, and entertainment, arts, accommodations, and food services. The Health Risk Factor measure was obtained from the Census (U.S. Census Bureau 2020). The measure used in this study is percent of households in each county with three or more risk factors from a list of 11 possible risk factors. The 11 possible risk factors include (1) income less than 130 percent of poverty; (2) zero or one individual in the household between ages 18-64; (3) household is residing in a high-density tract with more than 4,000 per square mile; (4) household has communication barriers, including no one in the household who speaks English or no one in the household with a high school degree; (5) no employed person in the household; (6) a person in the household with a disability constraining life activities such as vision, hearing, ambulatory, or cognitive difficulties; (7) no health insurance coverage; (8) at least one person older than 65 years of age in the household; (9) someone in the household with a serious heart condition; (10) someone in the household with diabetes; and (11) someone in the household with emphysema or asthma. In the average county, 25.9 percent of households had 3 or more risk factors. In nonmetro counties, this proportion was slightly higher at 26.8 percent.

The measure of political views is the percent of votes for Donald Trump in each county in the 2020 presidential election. County level voting data were obtained from *The New York Times* (2020), and determination was made of the percent of votes for Trump of the total ballots cast in each county in the 2020 presidential election.

Rural America is an incredibly diverse place. In an attempt to get a better understanding of the impacts of COVID-19 on different types of communities, the counties of nonmetro America are broken into categories based on a cluster analysis (the SAS FASTCLUS procedure), using the study's independent variables. This analysis was done to categorize counties into similar groups based on characteristics of relevance to this analysis, which are the independent variables. The cluster analysis created three categories of counties. The first is (1) the 1,366 counties where a majority of the residents voted for Donald Trump in the 2020 presidential election. A vast majority of the residents of these counties are white, and educational attainment levels tend to be low. To a large extent, residents of these counties tend to be the white working class. These counties comprise a majority of the residents of rural America. These counties are labeled as "Republican Leaning." The second cluster includes (2) 181 counties where a large share of residents are minorities. In these counties, the proportion voting for Trump was much smaller, educational attainment levels were low, and the proportion with health risk factors tends to be high. These counties are labeled as "Minority." Finally, there are (3) 403 counties where a vast majority of residents are white, but where Trump received a smaller proportion of the votes. The major distinguishing factor in this cluster of counties is high levels of educational attainment. These counties include many high amenity counties, such as Pitkin County (Aspen), Colorado and Teton County (Jackson), Wyoming. These counties are labeled as "High Education."

Table 1 provides an overview of the counties of nonmetro America and the three types of counties on the independent variables used in this article. Figure 1 presents a map showing the distribution of county categories. As is apparent in Figure 1, Republican Leaning counties are prominent in the Midwest and West; Minority counties are common in the South, along the Mexican border, and in counties throughout the West and Midwest that are home to Native American reservations; High Education counties tend to be located along the west coast, the Rocky Mountains, the Upper Midwest, and New England.

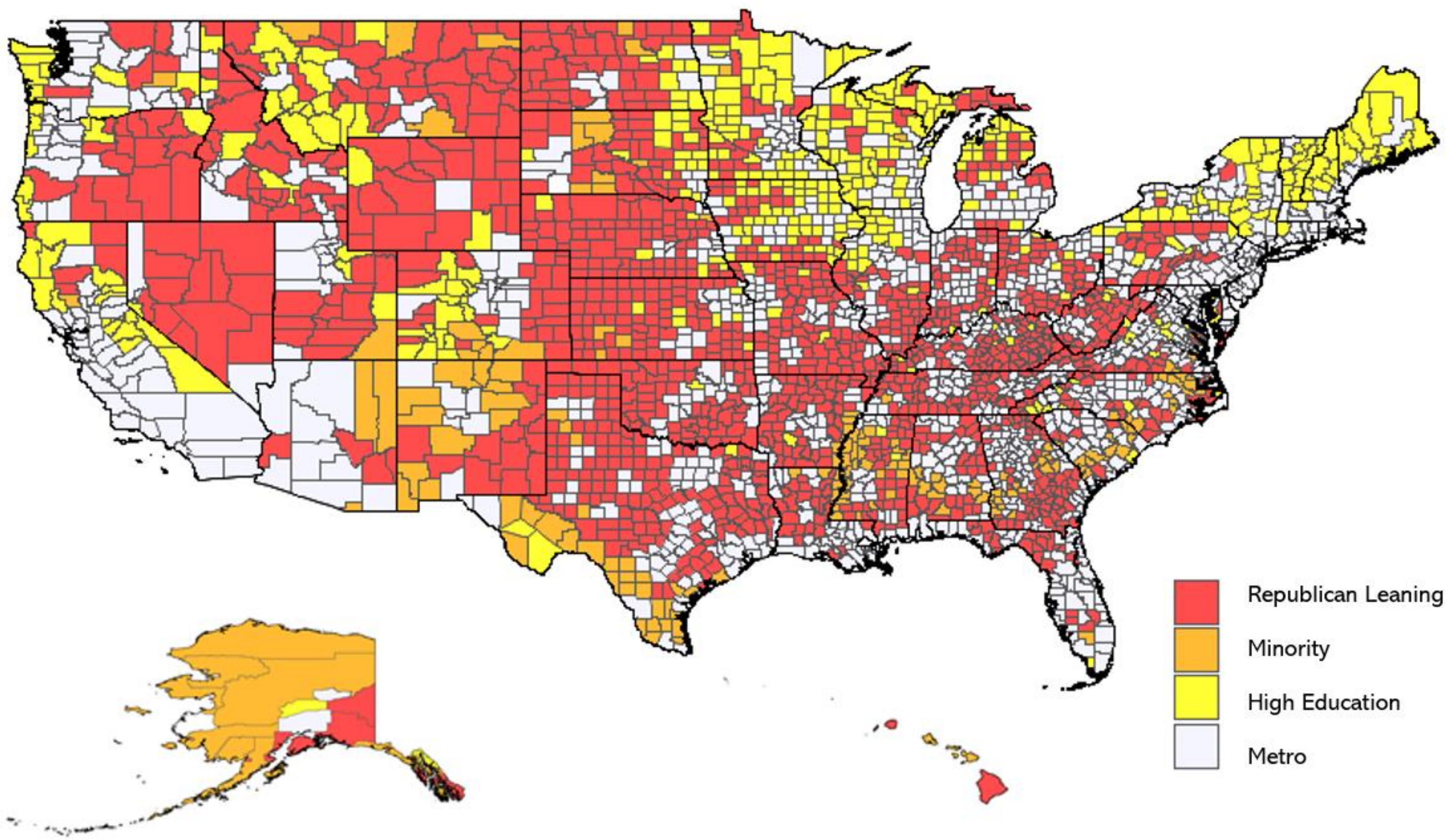
The analysis consists of a comparison of COVID-19 deaths in nonmetro compared to metro counties and then COVID-19 deaths across the three categories of counties over time. This is followed by the presentation of a correlation matrix. Correlations will allow an overview of bivariate relationships of all variables used in the model and also provides a test for multicollinearity. Finally, a set of regression models are provided for all nonmetro counties and then for each of the three categories of counties (Republican Leaning, Minority, and High Education). For the regression analysis, deaths per 100,000 residents from COVID-19 are the dependent variables, while the three measures of race/ethnicity, educational attainment, percent employed in high-risk industries, health risk factors, and political views are the independent variables. The regression models are weighted by the population of the county.

Table 1: Overview of Variables Used in the Model in Different Types of Nonmetro Counties

Variables	Nonmetro Total (N=1,950)				Republican Leaning (N=1,366)			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
Perc. Non-Hispanic White	79.3	20.0	0.9	99.8	82.5	14.9	35.0	99.8
Perc. Black	7.8	14.9	0.0	85.9	6.2	10.4	0.0	45.3
Perc. Hispanic	8.5	14.2	0.0	98.7	7.7	11.0	0.0	62.0
Perc. of Adults with College Degree	17.6	6.6	1.9	64.2	16.0	4.5	1.9	35.6
Perc. Employed in High-Risk Industries	50.3	6.0	20.2	83.7	50.4	6.0	31.2	83.7
Health Risk Factor	26.8	5.0	13.5	46.5	26.8	4.6	13.5	46.5
Perc. Voting For Trump in 2020	70.5	14.4	9.5	96.9	77.5	7.8	53.3	96.9
Total Population Estimate	45,824,682	-	-	-	27,997,023	-	-	-
Population in Average County	23,500	22,278	169	201,513	20,496	19,103	169	141,359

Variables	Minority (N=181)				High Education (N=403)			
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Min.	Max.
Perc. Non-Hispanic White	34.1	12.9	0.9	56.9	88.9	8.2	52.9	99.5
Perc. Black	32.7	28.7	0.0	85.9	2.3	4.8	0.0	37.0
Perc. Hispanic	22.5	30.8	0.0	98.7	4.9	5.8	0.0	43.3
Perc. of Adults with College Degree	14.4	4.6	6.7	28.6	24.6	8.7	11.5	64.2
Perc. Employed in High-Risk Industries	50.5	5.9	32.0	67.4	49.5	6.1	20.2	67.2
Health Risk Factor	32.9	4.4	20.3	45.2	24.1	4.0	14.0	44.6
Perc. Voting For Trump in 2020	46.0	14.1	9.5	89.7	57.7	10.7	21.0	74.9
Total Population Estimate	3,968,281	-	-	-	13,859,378	-	-	-
Population in Average County	21,924	23,879	404	201,513	34,391	27,589	728	180,333

Figure 1: Categories of Counties Used in the Data Analysis



FINDINGS

In Table 2, data are presented comparing COVID-19 deaths in nonmetro compared to metro counties. The data in this table show that early in the pandemic, deaths per 100,000 were much higher in metro counties. After July 1, however, the rate of increase was greater in nonmetro counties. By December 1, rates were almost even between nonmetro and metro counties. On March 1, 2021, there were 176.4 deaths per 100,000 residents in nonmetro counties compared to 148.9 in metro counties.

Table 2: Comparison of COVID-19 Deaths in Metro/Nonmetro Counties Over Time

	Nonmetro (N=1,950)			**Metro (N=1,162)**			**Total (N=3,112)**		
Date	**Total COVID-19 Deaths**	**Deaths per 100,000**	**Perc. Change from Prev. Month**	**Total COVID-19 Deaths**	**Deaths per 100,000**	**Perc. Change from Prev. Month**	**Total COVID-19 Deaths**	**Deaths per 100,000**	**Perc. Change from Prev. Month**
1-Apr-20	171	0.4	-	2,970	1.1	-	3,141	1.0	-
1-May-20	2,419	5.3	1,314.6	44,133	15.6	1,386.0	46,552	14.2	1,382.1
1-Jun-20	5,162	11.3	113.4	78,419	27.8	77.7	83,581	25.5	79.5
1-Jul-20	7,085	15.5	37.3	111,637	39.6	42.4	118,722	36.2	42.0
1-Aug-20	10,413	22.7	47.0	134,980	47.8	20.9	145,393	44.3	22.5
1-Sep-20	15,427	33.7	48.1	158,635	56.2	17.5	174,062	53.1	19.7
1-Oct-20	19,989	43.6	29.6	176,805	62.7	11.5	196,794	60.0	13.1
1-Nov-20	25,889	56.5	29.5	193,669	68.6	9.5	219,558	66.9	11.6
1-Dec-20	36,473	79.6	40.9	224,823	79.7	16.1	261,296	79.7	19.1
1-Jan-21	53,147	116.0	45.7	284,342	100.8	26.5	337,489	102.9	29.2
1-Feb-21	69,623	151.9	31.0	361,812	128.2	27.2	431,435	131.5	27.8
1-Mar-21	80,833	176.4	16.0	420,053	148.9	16.1	500,886	152.7	16.1
Total Pop.	45,824,682			282,176,462			328,001,144		

A comparison of the three categories of counties on COVID-19 deaths over time is provided in Table 3. This table shows that from the outset, death rates were much higher in Minority counties. By March 1, 2021, the death rate per 100,000 in these counties was 260.8, which is much higher than in other categories of counties. In contrast, death rates were consistently lower in High Education counties than in other categories of counties. On March 1, 2021, High Education counties death rate per 100,000 was 120.6, less than one-half the rate in Minority counties. Republican Leaning counties had intermediate death rates, and

Table 3: Comparison of COVID-19 Deaths in Types of Nonmetro Counties Over Time

Date	Republican Leaning (N=1,366)			Minority (N=181)			High Education (N=403)		
	Total COVID-19 Deaths	Perc. Change from Prev. Month	Deaths per 100,000	Total COVID-19 Deaths	Perc. Change from Prev. Month	Deaths per 100,000	Total COVID-19 Deaths	Perc. Change from Prev. Month	Deaths per 100,000
1-Apr-20	87	-	0.3	21	-	0.5	63	-	0.5
1-May-20	1,430	1543.7	5.1	403	1819.0	10.2	586	830.2	4.2
1-Jun-20	3,010	110.5	10.8	1,014	151.6	25.6	1,138	94.2	8.2
1-Jul-20	4,128	37.1	14.7	1,577	55.5	39.7	1,380	21.3	10.0
1-Aug-20	6,216	50.6	22.2	2,509	59.1	63.2	1,688	22.3	12.2
1-Sep-20	9,609	54.6	34.3	3,575	42.5	90.1	2,243	32.9	16.2
1-Oct-20	12,789	33.1	45.7	4,378	22.5	110.3	2,822	25.8	20.4
1-Nov-20	16,839	31.7	60.1	5,057	15.5	127.4	3,993	41.5	28.8
1-Dec-20	23,730	40.9	84.8	5,842	15.5	147.2	6,901	72.8	49.8
1-Jan-21	34,763	46.5	124.2	7,204	23.3	181.5	11,180	62.0	80.7
1-Feb-21	45,812	31.8	163.6	9,094	26.2	229.2	14,717	31.6	106.2
1-Mar-21	53,767	17.4	192.0	10,350	13.8	260.8	16,716	13.6	120.6

experienced rapid increases during fall months. Overall, their death rate per 100,000 was 192.0.

A correlation matrix is shown in Table 4. Of significance, none of the correlation coefficients between independent variables were large enough to raise concerns about multicollinearity. The strongest correlations with COVID-19 death rates were for percent non-Hispanic white (inverse), percent Black (positive), percent of adults with a college degree (inverse), and health risk factors (positive). The direction of all of these bivariate relationships was as predicted.

Table 5 presents results of regression models where the independent variables are used to explain deaths per 100,000 from COVID-19 in nonmetro U.S. counties. The first model in Table 5 considers all U.S. nonmetro counties. In this model, most of the independent variables were statistically significantly related to death rates, and all significant relationships were in the expected direction. The strongest relationship was percent non-Hispanic white where it was found that death rates declined as the percent of county residents that were non-Hispanic white increased. Further, there was a positive relationship between

COVID-19 death per 100,000 and percent voting for Trump. Thus, as expected, death rates were higher in counties with a higher share of Trump voters. There was also a relatively strong inverse relationship between death rates and percent of adults with a college degree. Finally, there were positive relationships with percent Black, percent employed in high-risk industries and health risk factors, and COVID-19 death rates. Overall, the independent variables explained 29 percent of the variation in per capita deaths in nonmetro counties.

Table 5 also shows regression models for each of the three categories of counties. Overall relationships were weaker for the model analyzing Republican Leaning counties compared to models for the other two categories of counties. In Republican Leaning counties, only 14 percent of the variation in the dependent variables is explained. Critically important, there was a very strong and positive relationship between percent Black and percent Hispanic and COVID-19 death rates in Republican Leaning counties. Also, there were strong relationships between death rates and percent non-Hispanic white (inverse) and percent voting for Trump (positive).

The independent variables explained a much higher proportion of the variation in the other two categories of counties. In Minority counties, there was a very strong relationship with health risk factors – where health risk factors were more extensive, death rates were much higher. Additionally, as the percent non-Hispanic white increased, death rates declined, and there was a positive relationship between the percent voting for Trump and COVID-19 death rates. In High Education counties, the death rate was significantly related to four of the independent variables. The strongest relationship was the percent voting for Trump. As the proportion of Trump voters increased, death rates also increased. Further, as educational attainment levels increased, the death rate tended to decline, as employment in high-risk industries increased, the death rates also increased, and as the percent Black increased, death rates tended to increase. The independent variables explained 36 percent of variation in the dependent variable in Minority counties, and 30 percent in High Education counties.

Table 4: Correlation Coefficient from Variables Used in the Model (N=1,950 Counties)

Variables	Deaths per 100,000	Cases per 100,000	Perc. Non-Hisp. White	Perc. Black	Perc. Hispanic	Perc. Adults with College Degree	Perc. Employed in High-Risk Industries	Health Risk Factors	Perc. Voting for Trump
Deaths per 100,000	-								
Cases per 100,000	.487*	-							
Perc. Non-Hisp. White	-.286*	-.255*	-						
Perc. Black	.253*	.130*	-.607*	-					
Perc. Hispanic	.115*	.140*	-.597*	-.125*	-				
Perc. Adults with College Degree	-.267*	-.193*	.197*	-.236*	-.052	-			
Perc. Employed in High-Risk Industries	.012	.086*	.014	-.065*	.063*	-.037	-		
Health Risk Factors	.257*	.052	-.527*	.438*	.207*	-.349*	-.120*	-	
Perc. Voting for Trump	.025	.087*	.470*	-.463*	-.049	-.299*	.116*	-.161*	-

*Statistically significant at p≤.01

Table 5: Regression Models Showing the Relationships Between Independent Variables and Deaths per 100,000 Population from COVID-19 in Different Categories of Nonmetro Counties

Independent Variables	**Nonmetro Total (N=1,950)**		**Republican Leaning (N=1,366)**		**Minority (N=181)**		**High Education (N=403)**	
	Parameter Estimate	Stand. Beta	Parameter Estimate	Stand. Beta	Parameter Estimate	Stand. Beta	Parameter Estimate	Stand. Beta
Perc. Non-Hisp. White	-121.9*	-.234	181.4*	-.300	-304.5*	-.301	217.3	.211
Perc. Black	107.6*	.148	446.3*	.550	14.8	.030	480.2*	.289
Percent Hispanic	-12.2	-.016	219.1*	.241	-91.6	.056	287.0	.187
Perc. Adults with College Degree	-262.1*	-.189	-123.1	-.057	-267.0	-.104	-179.4*	-.185
Perc. Employed in High-Risk Industries	121.0*	.068	116.2	.072	-276.1	-.108	186.6*	.138
Health Risk Factors	2.8*	.128	2.4*	.111	11.8*	.391	.2	.008
Perc. Voting for Trump	139.5*	.196	183.8*	.155	238.2*	.245	247.0*	.326
Intercept	87.0*	0	-246.1*	0	74.1	0	-287.7*	0
F-Value	112.3*		31.4*		13.9*		24.2*	
Model R^2	.288*		.139*		.360*		.300	

*Statistically significant at $p \leq .01$

CONCLUSIONS

When the COVID-19 pandemic began, the residents of rural America seemed relatively safe from the disease as case and death rates were much lower than in urban communities. Through the summer and fall months, however, per capita cases and deaths from the disease increased rapidly in rural counties. By December 2020, per capita deaths in nonmetro counties exceeded death rates in metro counties. While the overall impacts of the disease on nonmetro counties were extensive, the consequences of the pandemic varied greatly from one type of county to another. Minority counties were impacted by the virus more severely than other types of counties, while more advantaged High Education counties had lower death rates.

Regression models determined that several variables were significantly related to variations in death rates in nonmetro counties. Specifically, it was found that as the percent voting for Trump increased, death rates increased; as the percent of county resident that were minority increased, the death rate increased; as educational attainment levels increased, death rates declined; as the percent employed in high-risk industries increased, death rates increased, and as the proportion of the population with risk factors increased, death rates increased.

Two primary conclusions can be drawn from this analysis. First, the impacts of the pandemic in nonmetro America were much most extensive for persons residing in more disadvantaged counties. That is, death rates were greatest in counties with larger minority populations, in counties with lower levels of educational attainment, and in counties with higher rates of risk factors. Thus, like virtually every event in U.S. history, the costs are borne most heavily by the disadvantaged. Second, political views have important consequences for pandemic impacts. Death rates from COVID-19 tended to increase as the percent of Trump voters in the county increased. This is especially significant for this study because rural residents are much more likely to vote for Trump than urban residents (Albrecht 2019; Goetz et al. 2018; Monnat and Brown 2017). A growing body of research indicates that in Trump leaning counties, elected officials were less likely to implement measures to assure the safety of residents such as mask mandates and business closures. Further, individuals in these counties were less likely to follow the policies that were implemented or recommended by health professionals.

Many lessons can be gained from the way the COVID-19 pandemic unfolded. Hopefully these lessons can help us reduce health, economic, and other costs when faced with future crises. During the COVID-19 pandemic, leaders at local, state, and national levels were forced to make numerous pandemic related decisions. These leaders had no precedence for making these decisions. Often decisions involved weighing the benefits of policies to keep people safe versus the economic and other costs of implementing safety policies. Possible costs from implementing safety policies included people potentially losing their jobs, businesses failing, and the educational costs associated with closing schools. In an ideal world, persons making decisions would examine the data, consult with experts, and then make the relevant decision. Discussion and compromise could be made on the degree to which shutdowns or closures were implemented. Adjustments could be made as circumstances changed or as new data became available. Unfortunately, during the COVID-19 pandemic, facts were often rejected and decisions were made based on little more than divisive politics. Rumors and misinformation were widespread. The consequence was that thousands of people died unnecessarily and the economic and other costs were more severe than they needed to be. Moving forward, it is critical that we find ways to reduce the political division in this country. If people could sit around the same table and discuss evidence openly, better decisions could be made.

DISCLOSURE STATEMENT

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