Why Aren't Mountain State Folks Getting the Shot?: Health Literacy, COVID-19, and Vaccination Rates in West Virginia Counties

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WHY AREN'T MOUNTAIN STATE FOLKS GETTING THE SHOT? HEALTH LITERACY, COVID-19, AND VACCINATION RATES IN WEST VIRGINIA COUNTIES


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I. INTRODUCTION

"[Y]ou know, a lot of people think that [the coronavirus] goes away in April with the heat — as the heat comes in. Typically, that will go away in April."

– President Donald J. Trump predicting the end of the COVID-19 pandemic. February 10, 2020

In December 2019, a new disease threat, SARS-CoV-2 betacoronavirus (commonly called "coronavirus") emerged and quickly ravaged communities, disrupted social activities, negatively impacted economies, created food insecurity crises, wreaked havoc with the supply chain, and changed the world. About a year later, vaccines to combat the devastating effects of the coronavirus were made available. The rapidity with which the coronavirus vaccine was developed necessitated the precipitous deployment of information concerning efficacy and safety. Much of this information was conveyed over the internet.

At the beginning of vaccine distribution, West Virginia was a leader in vaccination uptake. Overtime, however, West Virginia’s prominence as a vaccination champion has waned. As of February 2022, with a vaccination rate of 56%, West Virginia ranks 36th in the nation for fully vaccinated adults.

What factors are contributing to West Virginian's low vaccine uptake? This study analyzed whether any individual population characteristics are associated with vaccine uptake in West Virginia. A county-level analysis of vaccine rates in West Virginia and their relationship to a variety of sociodemographic characteristics such as age, educational attainment, poverty, disability, and insurance was conducted. The ability to access the internet was also studied. To contextualize the study, this paper presents information regarding the coronavirus, vaccination development and deployment, governmental authority to intercede in matters of public health, and factors impacting personal health literacy.

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II. WHAT IS COVID-19?

"We have it totally under control. It's one person coming in from China."

– President Donald J. Trump. January 22, 2020

COVID-19, an acronym derived from "coronavirus disease 2019," is an acute respiratory disease caused by a coronavirus. Similar to Middle Eastern Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS), the coronavirus that causes COVID-19 is highly infectious and can result in severe respiratory illness and death. This new type of coronavirus was first detected in Wuhan City, Hubei Province, China in December 2019 when a group of individuals presented with shortness of breath and fever. On January 7, 2020, Chinese officials identified a novel coronavirus as the cause of the outbreak. An outbreak occurs when there is an increase in the occurrence of a disease beyond what is normally expected. COVID-19 spread quickly across multiple countries, impacted a large number of people, and was deemed to be a pandemic. Previous pandemics have included the 1918 Pandemic (H1N1...

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8 Id.


virus), the 1957–1958 Pandemic (H2N2 virus), 1968 Pandemic (H3N2 virus), and the 2009 H1N1 Pandemic (H1N1pdm09 virus).11

By January 30, 2020, the World Health Organization (WHO) declared that the spread of the coronavirus constituted a Public Health Emergency of International Concern (PHEIC)—only the sixth time in its history that the WHO issued such a declaration.12 Previous diseases for which the WHO issued a PHEIC declaration were for H1N1 (2009), polio (2014), Ebola in Western Africa (2014), Zika (2015–2016), and Kivu Ebola (2018–2020).13 A PHEIC is declared when there is sudden, unexpected public health risk to other states that requires a coordinated response.14 The first confirmed case of COVID-19 in West Virginia was on March 13, 2020.15

As of January 27, 2022, 223 countries and territories have reported a total of 363,941,212 confirmed cases of COVID-19.16 The United States (U.S.) leads the world in both the number of confirmed cases (74,176,403) and the number of coronavirus-related deaths (898,680).17 As of January 27, 2022, West Virginia has reported more than 429,000 COVID-19 cases and 5,674 deaths.18 Although the number of COVID-19 cases continues to surge in the Mountain State, the West Virginia Department of Education and West Virginia University have recently suspended the reporting of school outbreak cases.19

13 Id. at 3–6.
17 Id.
III. THE COVID-19 VACCINE

Getting a COVID-19 vaccination "stacks the deck to keep you out of the hospital—I'm living proof."

- Governor Jim Justice. January 21, 2022

Vaccines offer protection against infection and mitigate the severity of illness by stimulating an individual’s immune response against disease. Smallpox, a disease caused by the variola virus, was one of the first diseases for which vaccines were created. The mortality rate for smallpox was very high, as about 50% of individuals who contracted the disease died. For those who did survive the virus, many were left permanently scarred or blinded.

Historians note that a form of the smallpox vaccine was used in China and India as early as the 1500s. Vaccination as a successful public health intervention was confirmed in the U.S. in 1796 when Dr. Edward Jenner injected cowpox pus into a nine-year-old boy (a practice formally known as "variolation"). The vaccine effectively protected the boy against the ravishes of smallpox and vaccination started to gain acceptance worldwide as an efficacious public health intervention. The last natural case of the disease occurred in 1977 in the Merca District of Somalia. By 1980, the WHO certified that smallpox was eradicated worldwide. The eradication of smallpox is directly attributable to the efficaciousness of vaccines.

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22 History of Smallpox, CTRS. FOR DISEASE CONTROL AND PREVENTION, https://www.cdc.gov/smallpox/history/history.html#:~:text=The%20basis%20for%20vaccination%20began,used%20to%20protect%20against%20smallpox (last visited May 11, 2022).


24 Id.

25 See generally JOSEPH NEEDHAM, SCIENCE AND CIVILISATION IN CHINA (2000).

26 History of Smallpox, supra note 22.


28 History of Smallpox, supra note 22.

29 Notice to Readers: 25th Anniversary of the Last Case of Naturally Acquired Smallpox, CTRS. FOR DISEASE CONTROL AND PREVENTION (Oct. 25 2002), https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5142a5.htm#:~:text=On%20October%26%2326%22%2C%201977%22,and%20unprecedented%20accomplishment.
In addition to individual protection, vaccines help to create "herd immunity."30 Herd immunity (also referred to as "community immunity") is reached when a sufficient percentage of the population becomes immune to a disease, either through vaccination or a prior infection, thus the disease can no longer spread due to a lack of susceptible hosts.31 The percentage of the population that is required for herd immunity to be reached varies with different types of diseases. For example, in order to attain herd immunity for measles, an extremely contagious disease, about 95% of the population must be immune.32 The immunity threshold for polio is about 80%.33 Herd immunity is important because, when attained, the further spread of disease is significantly more unlikely.34 Herd immunity protects our most vulnerable populations who cannot become vaccinated, such as babies and individuals who are immunocompromised. Some scientists estimate that 85% of the population will have to be immunized to reach herd immunity for COVID-19.35

Different types of vaccines are effective against different types of diseases. For example, inactivated vaccines use a killed form of a germ to trigger an individual’s immune response to protect against hepatitis A and seasonal influenza.36 Live vaccines use an attenuated, or weakened, form of a germ to protect against measles and smallpox.37 Toxoid vaccines are manufactured using poisons produced by certain diseases, such as tetanus and diphtheria.38 All of these vaccines are produced using germs found in nature.39 Some vaccines, such as the influenza vaccine, need to be updated to protect against different strains of the pathogen. As of February 2, 2022, five coronavirus variants have been

30 About Smallpox, supra note 23.
33 Id.
35 Id.
36 Notice to Readers: 25th Anniversary of the Last Case of Naturally Acquired Smallpox, supra note 29.
37 Id.
39 See generally id.
identified: Alpha; Beta; Gamma; Delta; and Omicron. As the number of variants increases, so do more contagious strands of the virus.

Two COVID-19 vaccines, those manufactured by Pfizer-BioNTech (Pfizer) and Moderna, use a very different process to stimulate an immune response. The Pfizer and Moderna vaccines are mRNA vaccines. Unlike vaccines that are created from germs found in nature, mRNA vaccines use laboratory created processes to teach cells how to make proteins to trigger immune response. Since the COVID-19 vaccines do not contain live coronavirus, it is impossible to get COVID-19 from the shot. mRNA vaccines were first tested in the 1990s to combat influenza and cancer in mice. Since that time, mRNA vaccines have been studied to fight Zika, rabies, and cytomegalovirus (the virus that causes mononucleosis and pneumonia).

A viral vector vaccine manufactured by J&J/Janssen has also been authorized for emergency use in the U.S.; however, because of rare but serious side effects associated with this vaccine, the CDC recommends that the Pfizer and Moderna mRNA vaccines be used when possible.

The Food and Drug Administration's (FDA) Center for Biologics Evaluation and Research regulates the development and approval process for vaccines manufactured in the U.S. The typical stages that a vaccine must go through before attaining FDA approval include an exploratory stage, a pre-clinical stage, clinical development (a three-phase process), regulatory review and approval, manufacturing, and quality control. Also included in the FDA protocol are re-licensure clinical trials, inspections of the manufacturing facility,
and a presentation of findings to the FDA’s Vaccines and Related Biological Products Advisory Committee.\textsuperscript{50} Pfizer and Moderna conducted clinical trials that included participants representing diverse communities including Black people (about 10\%), Latinx (about 20\%), elderly (about 25\%), and individuals with comorbidities including obesity, diabetes, heart disease, and respiratory conditions.\textsuperscript{51} After approval, the FDA continues to monitor the vaccine for as long as the manufacturer maintains a license for the product.\textsuperscript{52}

It can take over ten years to navigate the standard vaccine approval process;\textsuperscript{53} however, the process can be significantly shortened during extraordinary circumstances. The Project BioShield Act of 2004\textsuperscript{54} amended Section 564 of the Federal Food, Drug, and Cosmetic Act of 1938 (FD&C Act)\textsuperscript{55} and gave authority to the FDA to issue Emergency Use Authorizations (EUA).\textsuperscript{56} An EUA allows an unapproved medical product to be introduced, such as the COVID-19 vaccines.\textsuperscript{57} An EAU can also be issued to allow for the unapproved use of an approved medical product.\textsuperscript{58}

Certain criteria must be met before an EUA is issued. First, the Secretary of the Department of Health and Human Services (DHHS), the Secretary of the Department of Homeland Security, or the Secretary of the Department of Defense must determine that an emergency exists.\textsuperscript{59} Second, an emergency declaration must be issued.\textsuperscript{60} Third, the FDA must determine that (1) a chemical, biological, radiological, or nuclear agent is causing a serious or life-threatening situation; (2) it is reasonable to believe that the unauthorized product may be effective in diagnosing, treating, or preventing the serious or life-threatening situation; (3) the known and potential benefits of the unapproved medical product

\textsuperscript{50} Id.


\textsuperscript{56} Id. § 360bbb-3.

\textsuperscript{57} Id. § 360bbb-3(a)(2)(A).

\textsuperscript{58} Id. § 360bbb-3(a)(2)(B).

\textsuperscript{59} Id. § 360bbb-3(b)(1).

\textsuperscript{60} Id.
outweigh its potential risks; and (4) the FDA must determine that no adequate, approved, or available alternative to the unapproved medical product is available.\footnote{Id. § 360bbb-3.}


accordance with other governments, Governor Justice adopted a phased approach for distributing COVID-19 vaccines. During Phase 1, individuals with the highest risks of complications from COVID-19 and essential frontline workers were given access.\(^1\) By March 3, 2021, West Virginia moved to Phase 2-A and the COVID-19 vaccines were available for all residents over 50, all state education workers age 40–50, and West Virginians age 16 and older with enumerated co-morbidities, such as diabetes and Down Syndrome.\(^2\) On March 22, 2021, COVID-19 vaccine distribution restrictions were lifted and all West Virginians age 16 years and older could access the vaccine.\(^3\)

As of January 31, 2022, 4.17 billion individuals have been fully vaccinated, or 53.4% of the world’s population.\(^4\) Many African nations have extremely low vaccination rates for COVID-19, including the Democratic Republic of the Congo, which has a vaccination rate of 0.5 per 100 individuals.\(^5\) In the U.S, 537 million doses of the COVID-19 vaccine have been administered and 210 million individuals (or 63.8% of the U.S. population) are fully vaccinated.\(^6\) As aforementioned, 56% of West Virginians are full vaccinated.\(^7\)

Vaccines are not always safe. Forty-four percent of West Virginians who have not received COVID-19 vaccinations indicate that they are vaccine hesitant because of possible side effects.\(^8\) The CDC and FDA maintain a database to collect, track, and investigate serious vaccine side effects. The Vaccine Adverse

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\(^4\) [Coronavirus (COVID-19) Vaccinations, OUR WORLD IN DATA, https://ourworldindata.org/covid-vaccinations?country=OWID_WRL (last visited Feb. 27, 2022).]


\(^6\) [Coronavirus (COVID-19) Vaccinations, supra note 74.]


Event Reporting System (VAERS) was established in 1990 as a "national early warning to detect possible safety problems in U.S.-licensed vaccines."\(^{79}\) After an individual submits a report of an adverse event through an online website, the CDC and FDA make a determination of whether additional investigation is warranted.\(^{80}\)

Adverse events associated with the Pfizer and Moderna vaccine have been extremely rare, but they have been confirmed. Anaphylaxis, a severe allergic reaction that can be life-threatening, has been confirmed in about .0005% of the population (or five people per million) who have received the Pfizer or Moderna vaccines.\(^{81}\) The VAERS has also received 967 preliminary reports of myocarditis (an inflammation of the heart muscle) and pericarditis (an inflammation in the sac surrounding the heart) in individuals under the age of 18.\(^{82}\) As of February 9, 2022, no cases have been confirmed.\(^{83}\) However, it should be noted that risk of myocarditis and pericarditis was multiple times higher after SARS-CoV-2 infection than after vaccination.\(^{84}\)

There have been approximately 18.7 million J&J/Janssen vaccinations administered.\(^{85}\) As of March 18, 2022, 60 cases of thrombosis with thrombocytopenia syndrome (blood clots) and nine deaths associated with this condition have been confirmed.\(^{86}\) In addition, 310 cases of Guillain-Barre syndrome (an inflammation of the peripheral nerves outside of the brain and

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80 Id.


82 Id.

83 Id.


spinal cord)\(^87\) have been reported.\(^88\) While these events are serious and should be avoided, they should be compared to case-fatality rates of COVID-19 infection, which range from 0.1% to 2.6% of cases depending on country characteristics.\(^89\)

IV. THE GOVERNMENT’S AUTHORITY TO ENACT LEGISLATION TO COMBAT THE COVID-19 CRISIS

“The protection of the health and safety of the public is one of the most important roles of the state.”

— Perry v. Miller, 171 W.Va. 509, 512 (1983)\(^90\)

The U.S. public health system involves numerous public, private, and voluntary agents that, in theory, work collaboratively to provide ten essential public health services. These include assessing population health status, investigating health problems that affect populations, implementing laws that impact health, and using regulatory actions as protective measures.\(^91\) Central to the public health system at the federal, tribal, territorial, state, and local levels is governmental public health.\(^92\)

Public health law involves governments’ legal power and duty to assure the conditions for people to be healthy and enforce limitations on the state’s power to constrain individual liberties.\(^93\) The origins of public health can be traced to Leviticus—the third book of the Torah in the Bible’s Old Testament. In Leviticus, Moses described sanitary laws and practices surrounding food safety,\(^94\) hazardous environmental conditions,\(^95\) and quarantine and isolation.\(^96\)

\(^88\) Selected Adverse Events Reported After COVID-19 Vaccination, supra note 81.
\(^94\) Leviticus 11:11.
\(^95\) Id. at 11:14.
\(^96\) Id. at 11:13.
Virtually every public health law is a violation of individual rights; therefore, there is constant conflict between the government’s authority to enact public health law for societal benefit and its citizens’ liberties.

As in all other legal areas, at the federal level, authority for Congress to intercede in matters of public health must be found in the U.S. Constitution. Congressional powers are set forth in 18 clauses of the U.S. Constitution. These enumerated powers do not give Congress express authority to be involved in public health; however, the Supreme Court has found implicit authority under two constitutional provisions. First, the Commerce Clause allows Congress to “regulate Commerce with foreign Nations, among the several States, and with Indian Tribes.” Food safety regulations, vaccination laws, and environmental protections all fall within the government’s power to regulate commerce. Second, the General Welfare Clause permits Congress to “lay and collect Taxes, Duties, Imposts and Excises, to pay the Debts and provide for the common Defence and general Welfare of the United States.” Taxing power not only provides funding for the delivery of public health services, but also shapes behaviors that contribute public health outcomes. It allows the government to encourage behaviors it seeks to promote, such as giving tax incentives to those who purchase health insurance and withholding federal funding until a state lowers its speed limits. Furthermore, the taxing power also permits the government to punish behaviors it dismisses, such as imposing taxes on cigarettes, alcohol and firearms.

The primary federal agency tasked with ensuring the public’s health is the U.S. Public Health Service (PHS). The PHS is comprised of the CDC, NIH, FDA, and the Centers for Medicare & Medicaid (CMS). Each of these agencies have been instrumental in the effort to mitigate the effects of the pandemic. The Secretary of DHHS has the authority to relax certain regulatory provisions during emergencies. This authority is triggered after the president has

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97 U.S. CONST. art. 1, § 8.
98 Id. at cl. 3.
99 Id.
100 Id. at cl. 1.
101 Id.
105 Id. § 5051.
106 Id. § 5821.
issued a disaster or emergency declaration under the Stafford Act\textsuperscript{108} or the National Emergencies Act,\textsuperscript{109} and the Secretary of Health has declared a public health emergency under the Public Health Service Act.\textsuperscript{110} When these declarations are made, the Secretary of DHHS can invoke section 1135 of the Social Security Act\textsuperscript{111} to waive or modify certain Medicare, Medicaid, Children’s Health Insurance Program (CHIP) and Health Insurance Portability and Accountability Act (HIPAA) provisions.\textsuperscript{112}

During the COVID-19 pandemic, the Secretary exercised this authority to relax telehealth requirements that restrict the types of health care practitioners who can be reimbursed by Medicaid.\textsuperscript{113} The waivers also allowed additional types of telecommunications systems to be used to furnish telehealth services.\textsuperscript{114} The Secretary also waived enforcement of certain provisions of the Emergency Medical Treatment & Labor Act (EMTALA)\textsuperscript{115} to allow hospitals, psychiatric facilities, and critical access hospitals to expand patient screening locations.\textsuperscript{116} Waivers also permitted physicians whose privileges have expired to continue practicing and allowed new physicians to practice before governing body review.\textsuperscript{117} The waivers were made retroactive to March 1, 2020 and will expire when the federal emergency declaration is ended.\textsuperscript{118}

Numerous other executive branch agencies have issued orders, provided guidance, and promulgated regulations to protect the public’s health and mitigate the economic impact of the pandemic. On March 17, 2021, the U.S. Treasury Department and the Internal Revenue Service extended the date for individuals

\begin{footnotesize}
\begin{enumerate}
\item 42 U.S.C.A. § 247d (West 2022).
\item Id. § 1320b–5.
\item See id.
\item Id.
\item 42 U.S.C.A. § 1395dd.
\item COVID-19 Emergency Declaration Blanket Waivers for Health Care Providers, supra note 113.
\item Id.
\end{enumerate}
\end{footnotesize}
to file their 2020 tax returns from April 15, 2021 to May 17, 2021. In addition, the original coronavirus emergency relief statute, the CARES Act, instructed financial institutions to temporarily suspended payments and involuntary collection efforts on most federally held student loans. Both the Trump and Biden administrations have extended the termination date for these benefits and, currently, the pause is scheduled to expire on August 31, 2022.

The U.S. Department of Agriculture (USDA) has undertaken extraordinary actions to address food insecurity precipitated by the COVID-19 pandemic through its National School Lunch and School Breakfast programs, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and the Supplemental Nutrition Assistance Program (SNAP). USDA also created the Coronavirus Food Assistance Program to deliver assistance to agricultural producers who sustained economic losses.

On September 9, 2020, the U.S. Department of Education launched a new grant program to provide funding to school districts that were penalized by their states for implementing COVID safety measures, such as universal masking. Dubbed Project SAFE, local school districts can apply for grants to supplement funding for salaries and other costs that were reduced or withheld by state governments.

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121 Id.
128 Id.
In addition to legislative efforts, the executive branch has used executive orders to combat the impact of the pandemic. Executive orders allow presidents and governors to direct executive branch agencies, establish policy, and issue declarations. Executive orders are neither constitutionally nor statutorily defined but are given the full force and effect of the law when issued pursuant to constitutional or statutory authority. President Trump issued executive orders to ensure access to U.S. government COVID-19 vaccines, provide economic assistance to renters and homeowners, expedite infrastructure investments, and encourage the production of personal protection equipment and other goods under the Defense Production Act. President Biden used his authority to require COVID-19 vaccinations for federal workers, and to promote safety in domestic and international travel.

Although the federal government has provided much leadership during the pandemic, historically, most public health initiatives are instituted at the state level or, through delegation, to local governments. State rights existed prior to the formation of the Constitution and "are derived from the nature of sovereignty and freedom." In contrast to powers of the federal government, state governments' powers are plenary. Under the Tenth Amendment, "powers not

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141 Gibbons v. Ogden, 22 U.S. 1, 87 (1824).
delegated to the United States by the Constitution, nor prohibited by it ... are
reserved to the States." 143

In addition to implicit constitutional authority, two doctrines reflect
states' inherent authority to protect the health of its communities. The first, police
power, allows states to enact statutes and promulgate regulations to protect,
preserve, and promote the health, safety, and morals of its citizens. 144 The West
Virginia Supreme Court has recognized that police power encompasses "the
power of government inherent in every sovereignty to enact laws, within
constitutional limits, to promote the general welfare of its citizens." 145 This
power gives authority to states to enact inspection laws, quarantine laws, and
"health laws of every description." 146

In addition, parens patriae, Latin for the "parent of the country," is the
duty of state and local governments to protect individuals who are unable to
protect themselves, such as those who are incapacitated or mentally disabled. 147
State and local governments have exercised this authority to control chronic
diseases (such as lung cancer or obesity) by regulating the behaviors that
contribute to the outcome (like taxing cigarettes to deter smoking or high fat
foods). 148

Each of the 51 U.S. jurisdictions has a state health department. 149 In
addition, there are about 3,000 local health departments. 150 The relationship
between state and local health departments is defined by their governance
structure. Virginia, for example, has a largely centralized governance
organization in which the Virginia Department of Health acts as the central
public health authority and the Commonwealth's local public health departments
take direction from the state. 151 Pennsylvania has a hybrid system. The
Pennsylvania Department of Health is the central public health authority but

143 U.S. CONST. amend. X.
146 Gibbons, 22 U.S. at 78.
147 West Virginia v. Chas. Pfizer & Co., 440 F.2d 1079, 1089 (2d Cir. 1971).
148 William H. Dietz, Donald E. Benken & Alicia S. Hunter, Public Health Law and the
149 State and Territorial Health Department Websites, CTRS. FOR DISEASE CONTROL AND
PREVENTION, https://www.cdc.gov/publichealthgateway/healthdirectories/healthdepartments.html
150 COMM. FOR THE STUDY OF THE FUTURE OF PUB. HEALTH, THE FUTURE OF PUBLIC HEALTH:
151 Health Department Governance, CTRS. FOR DISEASE CONTROL AND PREVENTION,
there are ten county/municipal health departments that act autonomously. West Virginia has a decentralized governance system, meaning that, although there is a state-run health department (i.e., the West Virginia Department of Health and Human Resources Bureau), much autonomy is given to West Virginia's 49 local boards of health. Recently, however, the West Virginia legislature has begun to erode some of the rulemaking authority of the local boards of West Virginia. Since the passage of Senate Bill 12, any rule proposed by a local health board must be approved by the local governing bodies before it can be finalized.

Governor Justice issued a variety of executive orders and proclamations in response to the pandemic. Even before there was a single confirmed case of COVID-19 in West Virginia, the governor restricted visitation to all West Virginia long-term care facilities to protect the elderly. Some of his other early initiatives include closing businesses and facilities, such as barbershops, hair salons, and nail salons; the West Virginia Division of Motor Vehicles; gyms and recreational facilities; state park lodges; schools; and restaurants. In response to food insecurity experienced by children after schools were closed,

152 Id.; see also County and Municipal Health Departments, PA. DEP’T OF HEALTH, https://www.health.pa.gov/About/Pages/County-Municipal%20Health%20Depts.aspx (last visited Feb. 27, 2022).
153 W. VA. CODE ANN. § 16-1-1 (West 2022)
155 Id.
159 Exec. Order No. 3-20 (W. Va. 2020).
Governor Justice ordered the West Virginia Department of Education to open over 500 sites to feed West Virginia youth.163

V. VACCINE MANDATES

"Now, there's talk by the Biden Administration again about closing schools and even vaccine mandates for school children. This is an outrage, and MAGA nation should rise up and oppose this egregious federal government overreach."

– Former President Donald J. Trump. January 5, 2022164

One of the most controversial initiatives introduced during the coronavirus pandemic was vaccination mandates. Even though this strategy has been met with much divisiveness, it is not novel. In the 1905 case of Jacobson v. Massachusetts,165 the Supreme Court considered the constitutionality of a smallpox mandate that was promulgated by the Cambridge Massachusetts Board of Health.166 A medical exemption was permitted for children, but not adults.167 Mr. Jacobson, a pastor from Sweden, refused to be vaccinated, claiming that he previously suffered deleterious effects from vaccines and that the vaccine mandate violated his constitutional right to liberty and equal protection.168

The Supreme Court dismissed Mr. Jacobson's claims and held that individual rights can be preempted by societal good.169 "The liberty secured by the Constitution... does not import an absolute right in each person to be... wholly freed from restraint..."170 The right of the state to infringe upon constitutionally protected rights, however, is not unlimited. In order to withstand constitutional scrutiny, laws such as vaccine mandates must be necessary, reasonable, proportional, and fair.171 Subject to these limitations, the Supreme Court unequivocally held that the ability to require vaccine mandates is clearly within state's police power authority.172

166 See generally id.
167 Id. at 36.
168 Id. at 26, 36.
169 Id. at 26.
170 Id. at 26.
171 Id. at 39.
172 Id. at 38–39.
President Biden failed in his attempt to impose a national vaccine mandate. On September 9, 2021, the president introduced his "Path Out of the Pandemic" initiative in which he directed the Department of Labor to develop Emergency Temporary Standards to require all employees working in businesses with 100 employees or more to be fully vaccinated. On November 5, 2021, the Occupational Safety and Health Administration (OSHA), an agency within the U.S. Department of Labor that is tasked with protecting worker safety, adopted vaccination and COVID-19 testing requirements for large employers. On January 13, 2022, the U.S. Supreme Court stayed the Emergency Temporary Standards on the basis that the challengers to the requirements were likely to prevail on their claims. Recognizing that the federal government would be unsuccessful in a judicial challenge, President Biden and OSHA withdrew their proposal for a national vaccine mandate.

West Virginia has joined other jurisdictions, such as Arizona, in blocking the enforcement of any sort of a state-wide vaccine mandate. States have adopted three different types of exemptions to compulsory vaccination requirements: medical, religious, and philosophical. There is tremendous interjurisdictional variance with respect to what is necessary to obtain an exemption and which agency decides whether an exemption request should be granted. West Virginia, California, Connecticut, Maine, Mississippi, and New York are the only states that do not allow religious or philosophical exemptions for children's vaccine requirements. It is not easy to obtain a medical exemption in West Virginia. A parent or guardian must obtain a statement from the child's physician that a particular vaccine should not be administered, the

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179 Id.
medical contraindications must be described, and a statement whether the exemption should be permanent or temporary given.\textsuperscript{180}

Unlike vaccine requirements for school-aged children, House Bill 335, signed into law by Governor Justice on October 22, 2021, adds a religious exemption for any COVID-19 vaccination mandates required by employers.\textsuperscript{181} An employee can be granted a religious exemption by simply presenting a notarized certificate that their religious beliefs prevent them from getting the vaccine.\textsuperscript{182} The employer is prohibited from penalizing or discriminating against an exempted employee regarding benefits, hiring, firing, bonuses, pay raises, or promotions.\textsuperscript{183}

VI. PERSONAL HEALTH LITERACY IN WEST VIRGINIA

"I applaud Governor Jim Justice’s announcement of a billion-dollar strategy to bring broadband availability to over 200,000 West Virginia homes and businesses."

\textit{— U.S. Congressman Alex Mooney’s (R-WV) reaction to Governor Jim Justices’ broadband strategy}\textsuperscript{184}

Information and misinformation concerning the efficacy and safety of the COVID-19 vaccines has been issued from governmental agencies, scientists, health care professionals, academics, political pundits, rumor mongers, and conspiracy theorists. There has been a barrage of mixed messaging from virtually every source concerning who is eligible for COVID-19 testing.\textsuperscript{185} Recently, President Biden advised that Americans need to learn to live with COVID-19, but that things will “be better,” on the same day that the CDC Director, Rochelle Walensky, warned that the number of cases of COVID-19 would soon reach the highest level ever.\textsuperscript{186}

\textsuperscript{180} Medical Exemptions Information, W. VA. DEP’T OF HEALTH & HUM. RES., https://oeps.wv.gov/Pages/Medical-Exemptions-Information.aspx#q2 (last visited Feb. 27, 2022).
\textsuperscript{181} W. VA. CODE ANN. § 16-3-4b (West 2022).
\textsuperscript{182} Id.
\textsuperscript{183} Id.
\textsuperscript{185} Drew Hill, Mixed Messages from Health Officials on When to Get Tested for COVID, WINK NEWS (Jan. 4, 2022), https://www.winknews.com/2022/01/04/mixed-messages-from-health-officials-on-when-to-get-tested-for-covid/.
Personal health literacy is the degree to which an individual has the ability to (1) access information, (2) understand information, and (3) use information for health-related decision making. Individuals who attain personal health literacy exert greater control over health care options and choices than those who do not.

Low personal health literacy creates a barrier to accessing and understanding messaging regarding the safety and efficacy of the COVID-19 vaccine. Low personal health literacy, a risk factor, is also associated with poor health outcomes. Cost-efficiency is impacted by low personal health literacy since these individuals are more likely to use emergency departments for care, are more frequently hospitalized, and are less likely to use a preventive approach to health care. Social determinants of health, defined as “conditions in the places where people live, learn, work, and play that affect a wide range of health and quality-of life-risks and outcomes” impact personal health literacy. Research suggests that social determinants of health that impact health literacy include educational attainment, poverty level, cultural beliefs, age, and disability. The built environment (i.e., the buildings, spaces, and products created by people) is also a social determinant of health. In accordance with the definition, computers, computer software, and access to the internet are components of the built environment.

Ninety percent of Americans report that the internet has been essential or important to them during the pandemic. Accessing the internet for entertainment, social interactions during times of social distancing, and as

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191 Id. at 103.
194 Id. at 2152.
platforms for work and learning have increased during the pandemic.\textsuperscript{197} Much of the information concerning the availability, efficacy, and safety of the COVID-19 vaccination has been disseminated over the internet through local news sites, national news sites such as The New York Times and The Washington Post, and the CDC and Johns Hopkins Resource Center.\textsuperscript{198} The internet has also been used to disseminate COVID-19 information to West Virginians. On February 27, 2020, Governor Justice directed the West Virginia Department of Health and Human Resources to create a website to act as a repository of information.\textsuperscript{199}

Of the approximately 1.8 million individuals who live in West Virginia,\textsuperscript{200} approximately 403,000 of them (or 22\%) do not have any access to a wired broadband.\textsuperscript{201} Experts suggest that West Virginia’s rugged terrain, vast rural areas, and harsh weather contribute to the difficulties of delivering internet service.\textsuperscript{202} Many West Virginians with internet access have incredibly slow internet systems. Although the national download speed average is 100 Mbps, the median download speed in West Virginia is 25 Mbps.\textsuperscript{203} A speed of 25 Mbps is too slow for a household with more than two people to surf the internet or share files.\textsuperscript{204} When asked to evaluate their ability to navigate the internet, 40\% of surveyed West Virginians rate their proficiency as “fair,” “poor,” or “very poor.”\textsuperscript{205}

\begin{footnotesize}
\begin{enumerate}
\item Id.
\item West Virginia Internet Coverage and Availability, BROADBANDNOW, https://broadbandnow.com/West-Virginia (last visited Feb. 27, 2022).
\end{enumerate}
\end{footnotesize}
VII. IS THERE A CORRELATION BETWEEN VACCINE UPTAKE, INTERNET ACCESS, OR SOCIODEMOGRAPHIC CHARACTERISTICS?

"Before COVID, people might access the Internet from many places, including schools, workplaces, universities, public libraries, and cafes. As attempts to prevent the spread of COVID made many of those places inaccessible, much of the Internet communications had to shift to the home, or be lost entirely."

— Findings from Lessons from Internet Use and Performance During COVID-19

A. Methods

This study analyzed whether there are any individual population characteristics associated with vaccine uptake in West Virginia. Data was derived in each of West Virginia’s 55 counties for the following characteristics: sociodemographic variables (i.e., educational attainment at the high school and Bachelor’s levels, poverty, race, individuals who are foreign born, individuals 65 years and older, disabled individuals under age 65, individuals who live in poverty, and insurance); vaccination rates; and, broadband internet access. The sociodemographic variables were selected because research suggests they may impact personal health literacy. Sociodemographic variables were obtained from the U.S. Census Bureau. COVID-19 case and death rates were included because they could theoretically impact subsequent vaccination decisions. These data were obtained on September 27, 2021 from USA Facts. Vaccination rates, reported as full doses per 1,000 population, were obtained from West Virginia’s Department of Health and Human Resources on September 2021.

207 See supra Part VI.
27, 2021. Internet access was reported as the percentage of the population with access to broadband internet as of June 7, 2021.

An ecological analysis, or analysis of aggregated data, can determine whether there is an association (or relationship) between variables at a population level. In this study, the population studied were adults residing within each of West Virginia’s counties. An ecologic analysis of West Virginia’s county-level data was conducted to identify if any county-level characteristics (i.e., internet access or a sociodemographic variable) were associated with vaccination rates. All analyses were conducted using SAS 9.4. SAS is command-driven software that assists with statistical analysis and creates visualizations of outcomes.

Most common significance tests examine the probability of whether a relationship exists between two variables and, if it does, the strength of the relationship. These tests often assume that data is normally distributed. In a normal distribution, also called a Gaussian distribution, data is symmetrical, is based on the mean, and follows a bell curve. Continuous variables refer to a variable that may, in theory, have an infinite number of possible values. All continuous variables were checked for normal distribution prior to analysis.

Scatterplots are used to visualize associations between two continuous measures, where one continuous variable (i.e., county-level vaccination rate) is plotted on the vertical axis and another continuous variable (i.e., percentage of the population with broadband internet access) is plotted on the horizontal axis. This study used scatterplots to visually explore relationships between two continuous variables. Figure 1 represents scatterplots for vaccination rate and internet broadband access and vaccination rate and high school education.

212 West Virginia Internet Coverage and Availability, supra note 201.
216 Id.
217 Id.
Pearson correlation coefficients measure the strength of a linear association between two continuous variables and is denoted by “r.” Linear relationships are found when the increase or decrease in one variable is related to the linear increase or decrease in another variable. This relationship is sometimes represented by a line of best fit, or a line that minimizes the distances between all the points and that line. The stronger the relationship, the more concentrated the data are along the line and the higher the absolute value of the Pearson correlation coefficient. The Pearson correlation coefficient can range from values of +1 to -1. A value of 0 indicates that there is no association between two variables. Positive values indicated positive associations (i.e., as the value of one variable increases, so does the value of the other variable). Negative values indicate a negative association (i.e., as the value of one variable increases, the value of the other variable decreases).

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223 Pearson Product-Moment, Correlation, supra note 220
224 Id.
225 Id.
Both scatterplots and Pearson correlation coefficients were used in this study to explore the bivariate, linear association between two variables: full vaccination doses per 1,000 population, and the other county-level variables. Multivariable linear regression models the relationship between a continuous response variable (vaccination rate) and continuous explanatory variables (i.e., the county-level internet access). By including other variables in the model (such as education, COVID-19 death rates, and other county-level variables), the impact of one exposure (e.g., broadband internet access) can be explored while holding other factors that may be associated with both internet access and vaccination rates constant.

**B. Results**

As depicted in Map 1, there is tremendous variance among West Virginia counties with respect to COVID-19 vaccination rates. County-level rates of fully vaccinated adults ranged from 258 per 1,000 population in Mingo County (located in the southwestern part of West Virginia bordering on Kentucky) to 553 per 1,000 in Kanawha County (the seat of the state capital and home to several universities), which is located in the central part of the state. At the time the data were obtain, on average, there were 435 fully vaccinated adults per 1,000 population in West Virginia. (Table 1).

![Fully Vaccinated Rate per 1000](image)

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West Virginia ranks 44th among U.S. states with respect to internet connectivity.\textsuperscript{227} As shown in Map 2, Beckley, in Raleigh County, is the state’s best-connected city.\textsuperscript{228} The city of Monterville in Randolph County is the worst. There is a paucity of broadband internet connection in the central and northwestern counties. Also, Monongalia County, home to West Virginia University, is not in the top tier of counties with internet access.

West Virginia lags behind the rest of the nation with respect to educational attainment. Nationwide, 30.1\% of Americans have at least a bachelor’s degree.\textsuperscript{229} In West Virginia, 20.6\% of its population holds such degrees.\textsuperscript{230} Map 3 shows the percentage of college graduates in each West Virginia county. Six counties have fewer than 10\% of its citizens with a college degree. Barbour County in the northeastern part of the state has the lowest percentage of college graduates (1.6\%). Five of the six counties with the highest percentages are also homes to four-year colleges and universities: Monongalia County (42.8\%—West Virginia University); Ohio County (32\%—Bethany College, West Liberty University, Wheeling Jesuit University, and Wheeling University); Jefferson County (31.8\%—Shepard University); Cabell County

\begin{itemize}
\item \textsuperscript{227} Internet Service in West Virginia, BROADBAND SEARCH, https://www.broadbandssearch.net/service/west-virginia (last visited Mar. 4, 2022).
\item \textsuperscript{228} Id.
\item \textsuperscript{229} Quick Facts: United States, supra note 208.
\item \textsuperscript{230} Id.
\end{itemize}
(26.0%—Marshall University); and Kanawha County (25.5%—University of Charleston and West Virginia State University).\textsuperscript{231}

Table 1, Correlation of County-Level COVID-19 Vaccination Rates with Count-Level Factors in West Virginia, depicts the results of the bivariate analysis. The bivariate analysis revealed that county-level vaccination rates were moderately correlated with internet availability ($r=0.46$, $p<0.001$) and with the percent of population who are college graduates ($r=0.45$, $p<0.001$). This means that those counties with greater access to broadband internet and a higher percentage of college graduates had higher vaccination rates than other counties.

\textsuperscript{231} Id.
Table 1. Correlation of county-level COVID-19 vaccination rate with count-level factors, West Virginia

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean (Std)</th>
<th>Correlation with Vaccination rate (r)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full vaccination (per 1000 residents)</td>
<td>434.6 (62.7)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>% Broadband internet</td>
<td>66.2 (21.9)</td>
<td>0.456</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>% High school graduates</td>
<td>85.0 (4.9)</td>
<td>0.342</td>
<td>0.01</td>
</tr>
<tr>
<td>% Bachelor's degree or higher</td>
<td>16.5 (8.7)</td>
<td>0.452</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>% Poverty</td>
<td>17.2 (4.5)</td>
<td>-0.225</td>
<td>0.098</td>
</tr>
<tr>
<td>% Uninsured</td>
<td>8.5 (1.2)</td>
<td>-0.236</td>
<td>0.083</td>
</tr>
<tr>
<td>% Non-white</td>
<td>4.4 (3.3)</td>
<td>0.182</td>
<td>0.184</td>
</tr>
<tr>
<td>% Foreign born</td>
<td>1.1 (1.1)</td>
<td>0.179</td>
<td>0.192</td>
</tr>
<tr>
<td>% Over age 65</td>
<td>21.9 (2.7)</td>
<td>-0.042</td>
<td>0.761</td>
</tr>
<tr>
<td>% Disabled</td>
<td>15.1 (4.7)</td>
<td>-0.199</td>
<td>0.144</td>
</tr>
<tr>
<td>COVID case rate (per 100 population)</td>
<td>16.5 (4.7)</td>
<td>0.078</td>
<td>0.57</td>
</tr>
<tr>
<td>COVID death rate (per 100 pop)</td>
<td>0.27 (0.094)</td>
<td>0.207</td>
<td>0.129</td>
</tr>
<tr>
<td>Population density*</td>
<td>64.1 (64.7)</td>
<td>0.349</td>
<td>0.009</td>
</tr>
</tbody>
</table>

*Population density was not normally distributed, so correlation coefficient was calculated using log of population density.

County-level vaccination rates were weakly correlated with the percent of population who were high school graduates (r=0.35, p=0.008) and population density (r=0.35, p=0.009). Neither the percentage of the counties’ population who were age 65 and older nor the COVID-19 case or death rates were associated with county-level vaccination rates. Furthermore, even though the percent of the population living in poverty was significantly correlated with the percent of individuals who were college graduates (r=-0.44, p<0.001) and high school graduates (r=-0.72, p<0.001), poverty was only weakly correlated with full vaccination rates (r=-0.225, p=0.098), as was percent uninsured (r=-0.236, p=0.083). Neither of these variables were statistically significant at the p=0.05 level.

Internet access, percent of population who are college graduates, percent of population who are high school graduates, percent uninsured, percent poverty, and population density were all considered in the multivariable model. However, in the final model, only internet access and the percent of the population with a college degree remained statistically significant predictors of vaccination rates, explaining 26% of the variance in vaccination rates by county. Estimates shown in Table 2, County-Level Factors Associated with Vaccination Rate Per 1,000 Population in West Virginia, suggest that a 1% increase in the proportion of the population with broadband internet is associated with one additional vaccine per 1,000 people; every 1% increase in the proportion of the population with college degrees is associated with 3 additional vaccines per 1,000 people.
Table 2. County-Level Factors Associated with Vaccination Rate Per 1,000 Population in West Virginia

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>95% Confidence Interval</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Broadband internet</td>
<td>0.96</td>
<td>(0.25, 1.67)</td>
<td>0.009</td>
</tr>
<tr>
<td>% Bachelor's degree or higher</td>
<td>3.10</td>
<td>(0.77, 5.39)</td>
<td>0.010</td>
</tr>
</tbody>
</table>

C. Limitations

This study analyzed whether there was a relationship, or a correlation, between vaccine uptake, access to internet and a number of sociodemographic characteristics. This type of analysis only identifies patterns in the data and does not identify any causative effects between vaccine uptake and the other variables. Whether the change in one variable (i.e., an increase in vaccine uptake) was as a result of an occurrence in the other variable (i.e., greater access to broadband internet) was not determined.

VIII. CONCLUSION

COVID-19 morbidity and mortality statistics do not favor West Virginians. Unvaccinated adults aged 18 years and older are four times more likely to test positive for COVID-19 and are 15 times more likely to die from coronavirus than adults who are vaccinated. People with underlying medical conditions, such as cancer, chronic kidney disease, and chronic lung diseases, are at increased risk for contracting and dying from COVID-19. West Virginia ranks 48th in the nation for poor health outcomes. Older adults and disabled individuals under the age of 65 are more likely to become severely ill from the coronavirus. Over 20% of West Virginians are over 65 and 14% of individuals under the age of 65 are disabled—62.79% higher than the national average. Lack of trust in COVID-19 vaccines and the government are the two primary

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235 People with Certain Medical Conditions, supra note 233.
236 Quick Facts: United States, supra note 208.
reasons West Virginians report for not receiving the shot.\textsuperscript{237} Research needs to be conducted to determine why West Virginians hold these beliefs.

Information concerning vaccination sites and events in West Virginia, frequently asked questions concerning the COVID-19 vaccines, and an information line are found on the West Virginia Department of Health & Human Resources website;\textsuperscript{238} however, in order to avail oneself of this plethora of information, one must have internet access. Although West Virginia leaders claim that improving internet access is a priority, in fact, it is getting worse in the Mountain State.\textsuperscript{239} Nearly 66\% of the world's population has internet,\textsuperscript{240} but only 39.3\% of West Virginians have access to affordable internet plans of under $60 per month.\textsuperscript{241} Additional research is needed to determine what sources West Virginian's are accessing to obtain information (or misinformation) about COVID-19 vaccines. Our study's findings indicating a relationship between college education, internet access, and vaccine uptake is important, but is only a preliminary, fractional explanation of why West Virginians are not taking advantage of a safe, effective vaccine that could save their lives.

\textsuperscript{237} VinZant, \textit{supra} note 78.

\textsuperscript{238} \textit{COVID Data Tracker, supra} note 232.

