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

*Elizabeth Van Nostrand**, *Taylor J. Robinson***, *Aimee J. Palumbo****

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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, 2020¹

In December 2019, a new disease threat, SARS-Co-V-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.² 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.³

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.

¹ Philip Bump, *Yet Again, Trump Pledges That the Coronavirus Will Simply Go Away*, WASH. POST (Apr. 28, 2020), <https://www.washingtonpost.com/politics/2020/04/28/yet-again-trump-pledges-that-coronavirus-will-simply-go-away/>.

² Barbara Goldberg, Nathan Layne & Maria Caspani, *West Virginia Touts COVID-19 Vaccination Success Story as National Rollout Sputters*, REUTERS, (Jan. 21, 2021, 5:46 PM), <https://www.reuters.com/business/healthcare-pharmaceuticals/west-virginia-touts-covid-19-vaccination-success-story-national-rollout-sputters-2021-01-21/>.

³ *COVID Data Tracker*, CTRS. FOR DISEASE CONTROL AND PREVENTION, https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-total-admin-rate-pop18 (last visited Feb. 15, 2022).

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, 2020⁴

COVID-19, an acronym derived from “coronavirus disease 2019,”⁵ 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.⁶ 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.⁷ On January 7, 2020, Chinese officials identified a novel coronavirus as the cause of the outbreak.⁸ An outbreak occurs when there is an increase in the occurrence of a disease beyond what is normally expected.⁹ COVID-19 spread quickly across multiple countries, impacted a large number of people, and was deemed to be a pandemic.¹⁰ Previous pandemics have included the 1918 Pandemic (H1N1

⁴ Matthew J. Belvedere, *Trump Says He Trusts China’s Xi on Coronavirus and the US Has It “Totally Under Control”*, CNBC (Jan. 22, 2020, 5:01 AM), <https://www.cnbc.com/2020/01/22/trump-on-coronavirus-from-china-we-have-it-totally-under-control.html>.

⁵ *Naming the Coronavirus Disease (COVID-19) and the Virus That Causes It*, WORLD HEALTH ORG., [https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-\(covid-2019\)-and-the-virus-that-causes-it#:~:text=ICTV%20announced%20”severe%20acute,two%20viruses%20are%20different](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it#:~:text=ICTV%20announced%20”severe%20acute,two%20viruses%20are%20different) (last visited May 11, 2022).

⁶ *Coronavirus Disease (COVID-19)*, WORLD HEALTH ORG., https://www.who.int/health-topics/coronavirus#tab=tab_1 (last visited May 11, 2022).

⁷ *CDC Museum COVID-19 Timeline*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/museum/timeline/covid19.html#:~:text=December%2012%2C%202019%20A,of%20breath%20and%20fever.> (last visited May 11, 2022).

⁸ *Id.*

⁹ *Disease Outbreak News*, WORLD HEALTH ORG., <https://www.who.int/teams/environment-climate-change-and-health/emergencies/disease-outbreaks/#:~:text=A%20disease%20outbreak%20is%20the,or%20to%20radioactive%20materials> (last visited May 11, 2022).

¹⁰ *Identifying the Outbreak Source*, CTRS. FOR DISEASE CONTROL AND PREVENTION, https://www.cdc.gov/coronavirus/2019-ncov/science/about-epidemiology/identifying-source-outbreak.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fcases-updates%2Fabout-epidemiology%2Fidentifying-source-outbreak.html (last visited May 11, 2022).

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

¹¹ *Past Pandemics*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/flu/pandemic-resources/basics/past-pandemics.html> (last visited May 11, 2022).

¹² Annelies Wilder-Smith & Sarah Osman, *Public Health Emergencies of International Concern: A Historic Overview*, 27 J. Travel Med. 1 (2020).

¹³ *Id.* at 3–6.

¹⁴ *Emergencies: International Health Regulations and Emergency Committees*, WORLD HEALTH ORG. (Dec. 19, 2019), <https://www.who.int/news-room/questions-and-answers/item/emergencies-international-health-regulations-and-emergency-committees>.

¹⁵ *COVID-19 Daily Update—3-17-2020*, W. VA. DEP'T OF HEALTH & HUM. RES. (Mar. 17, 2020), <https://dhhr.wv.gov/News/2020/Pages/COVID-19-Daily-Update—March-17,-2020.aspx>.

¹⁶ *Countries Where COVID-19 Has Spread*, WORLDOMETER, <https://www.worldometers.info/coronavirus/countries-where-coronavirus-has-spread/> (last visited Feb. 15, 2022).

¹⁷ *Id.*

¹⁸ *Tracking Coronavirus in West Virginia: Latest Map and Case Count*, N.Y. TIMES, <https://www.nytimes.com/interactive/2021/us/west-virginia-covid-cases.html> (last visited Feb. 15, 2022).

¹⁹ Ryan Quinn, *Amid Unprecedented COVID-19 Surge, WV Stops Reporting School Outbreak Cases; WVU Also Ceases*, CHARLESTON GAZETTE MAIL (Jan. 14, 2022), https://www.wvgazette.com/news/education/amid-unprecedented-covid-19-surge-wv-stops-reporting-school-outbreak-cases-wvu-also-ceases/article_82002ada-dd2f-5cf9-ab05-5dc86a6e324a.html.

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, 2022²⁰

Vaccines offer protection against infection and mitigate the severity of illness by stimulating an individual’s immune response against disease.²¹ Smallpox, a disease caused by the variola virus, was one of the first diseases for which vaccines were created.²² The mortality rate for smallpox was very high, as about 50% of individuals who contracted the disease died.²³ For those who did survive the virus, many were left permanently scarred or blinded.²⁴

Historians note that a form of the smallpox vaccine was used in China and India as early as the 1500s.²⁵ 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”).²⁶ The vaccine effectively protected the boy against the ravishes of smallpox and vaccination started to gain acceptance worldwide as an efficacious public health intervention.²⁷ The last natural case of the disease occurred in 1977 in the Merca District of Somalia.²⁸ By 1980, the WHO certified that smallpox was eradicated worldwide.²⁹ The eradication of smallpox is directly attributable to the efficaciousness of vaccines.

²⁰ *COVID-19 UPDATE: Gov. Justice: Getting Vaccinated and Boosted “Stacks the Deck to Keep You Out of the Hospital—I’m Living Proof.”*, OFF. OF THE GOVERNOR: JIM JUSTICE, <https://governor.wv.gov/News/press-releases/2022/Pages/COVID-19-UPDATE-Gov.-Justice-living-proof-getting-vaccinated-and-boosted-works.aspx> (last visited Mar. 2, 2022).

²¹ *Immunization: The Basics*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/vaccines/vac-gen/imz-basics.htm> (last visited Feb. 15, 2022).

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).

²³ *About Smallpox*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/smallpox/about/index.html> (last visited Feb. 15, 2022).

²⁴ *Id.*

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

²⁶ *History of Smallpox*, *supra* note 22.

²⁷ Stefan Riedel, *Edward Jenner and the History of Smallpox and Vaccination*, 18 BAYLOR UNIV. MED. CTR. 21, 24 (2005).

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%2026%2C%201977%2C%20the,disease%20was%20an%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.

³¹ *Herd Immunity and COVID-19 (Coronavirus): What You Need to Know*, MAYO CLINIC, <https://www.mayoclinic.org/diseases-conditions/coronavirus/in-depth/herd-immunity-and-coronavirus/art-20486808> (last visited Mar. 2, 2022).

³² Carrie MacMillan, *Herd Immunity: Will We Ever Get There?*, YALE MED. (May 21, 2021), <https://www.yalemedicine.org/news/herd-immunity#:~:text=Put%20simply%2C%20herd%20immunity,or%20from%20a%20vaccine.>

³³ *Id.*

³⁴ *Herd Immunity and COVID-19 (Coronavirus): What You Need to Know, supra* note 31.

³⁵ *Id.*

³⁶ *Notice to Readers: 25th Anniversary of the Last Case of Naturally Acquired Smallpox, supra* note 29.

³⁷ *Id.*

³⁸ *Module 2: Types of Vaccine and Adverse Reactions*, WORLD HEALTH ORG., <https://vaccine-safety-training.org/toxoid-vaccines.html> (last visited Mar. 2, 2022).

³⁹ *See generally id.*

identified: Alpha; Beta; Gamma; Delta; and Omicron.⁴⁰ As the number of variants increases, so do more contagious strands of the virus.⁴¹

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 message RNA (mRNA) vaccines.⁴² 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.⁴³ Since the COVID-19 vaccines do not contain live coronavirus, it is impossible to get COVID-19 from the shot.⁴⁴ mRNA vaccines were first tested in the 1990s to combat influenza and cancer in mice.⁴⁵ Since that time, mRNA vaccines have been studied to fight Zika, rabies, and cytomegalovirus (the virus that causes mononucleosis and pneumonia).⁴⁶

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.⁴⁷

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.⁴⁸ 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.⁴⁹ Also included in the FDA protocol are re-licensure clinical trials, inspections of the manufacturing facility,

⁴⁰ *Tracking SARS-CoV-2 Variants*, WORLD HEALTH ORG., <https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/> (last visited May 11, 2022).

⁴¹ *Id.*

⁴² *Understanding mRNA COVID-19 Vaccines*, CTNS. FOR DISEASE CONTROL AND PREVENTION, https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/mRNA.html?s_cid=11344:what%20is%20mrna%20vaccine.sem.ga:p:RG:GM:gen:PTN:FY21 (last visited Mar. 2, 2022).

⁴³ *Id.*

⁴⁴ *Myths and Facts About COVID-19 Vaccines*, CTNS. FOR DISEASE CONTROL AND PREVENTION, https://www.cdc.gov/coronavirus/2019-ncov/vaccines/facts.html?s_cid=11354:vaccine%20shedding%20covid%20cdc.sem.ga:p:RG:GM:gen:PTN:FY21 (last visited Mar. 2, 2022).

⁴⁵ Elie Dolgin, *The Tangled History of mRNA Vaccines*, NATURE (Sept. 14 2021), <https://www.nature.com/articles/d41586-021-02483-w>.

⁴⁶ *Understanding mRNA COVID-19 Vaccines*, *supra* note 42.

⁴⁷ *Vaccine Testing and the Approval Process*, CTNS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/vaccines/basics/test-approve.html> (last visited Feb. 15, 2022).

⁴⁸ *Development and Approval Process (CBER)*, U.S. FOOD & DRUG ADMIN., <https://www.fda.gov/vaccines-blood-biologics/development-approval-process-cber> (last visited Mar. 2, 2022).

⁴⁹ *Vaccine Testing and the Approval Process*, *supra* note 47.

and a presentation of findings to the FDA's Vaccines and Related Biological Products Advisory Committee.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.⁵¹ After approval, the FDA continues to monitor the vaccine for as long as the manufacturer maintains a license for the product.⁵²

It can take over ten years to navigate the standard vaccine approval process,⁵³ however, the process can be significantly shortened during extraordinary circumstances. The Project BioShield Act of 2004⁵⁴ amended Section 564 of the Federal Food, Drug, and Cosmetic Act of 1938 (FD&C Act)⁵⁵ and gave authority to the FDA to issue Emergency Use Authorizations (EUA).⁵⁶ An EUA allows an unapproved medical product to be introduced, such as the COVID-19 vaccines.⁵⁷ An EAU can also be issued to allow for the unapproved use of an approved medical product.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.⁵⁹ Second, an emergency declaration must be issued.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

⁵⁰ *Id.*

⁵¹ Sherita Hill Golden, *COVID-19 Vaccine Hesitancy: 12 Things You Need to Know*, JOHNS HOPKINS MED., <https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/covid19-vaccine-hesitancy-12-things-you-need-to-know> (last visited Mar. 2, 2022).

⁵² *See generally* ENSURING THE SAFETY OF VACCINES IN THE UNITED STATES, U.S. FOOD & DRUG ADMIN., <https://www.fda.gov/files/vaccines,%20blood%20&%20biologics/published/Ensuring-the-Safety-of-Vaccines-in-the-United-States.pdf> (2011).

⁵³ *Vaccine Development, Testing, and Regulation*, HISTORY OF VACCINES, <https://www.historyofvaccines.org/content/articles/vaccine-development-testing-and-regulation> (last visited Feb. 15, 2022).

⁵⁴ *See generally* Project Bioshield Act of 2004, Pub. L. No. 108-276, 118 Stat. 835 (2004).

⁵⁵ 21 U.S.C.A. §§ 301–92 (West 2022).

⁵⁶ *Id.* § 360bbb-3.

⁵⁷ *Id.* § 360bbb-3(a)(2)(A).

⁵⁸ *Id.* § 360bbb-3(a)(2)(B).

⁵⁹ *Id.* § 360bbb-3(b)(1).

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.⁶¹

In March 2020, the National Institutes of Health (NIH) began disseminating information about clinical trials for COVID-19 vaccinations.⁶² On December 11, 2020, the FDA issued an EUA for the Pfizer vaccine for individuals age 16 and older.⁶³ The primary series for the Pfizer vaccine includes two doses given three weeks apart with a booster five months later.⁶⁴ On December 18, 2020, a second EUA was issued for the Moderna vaccine for individuals aged 18 and older.⁶⁵ Two doses of the Moderna vaccine are given four weeks apart.⁶⁶ A booster is given five months later.⁶⁷ Full vaccination is reached two weeks after the second dose of the Pfizer or Moderna vaccine is received.⁶⁸

On December 7, 2020, West Virginia's governor, Jim Justice, announced that he ordered 16,575 doses of the Pfizer vaccine.⁶⁹ Shortly thereafter, 32,600 doses of the Moderna vaccine were requisitioned.⁷⁰ In

⁶¹ *Id.* § 360bbb-3.

⁶² *NIH Clinical Trial of Investigational Vaccine for COVID-19 Begins*, NAT'L INSTS. OF HEALTH (Mar. 16, 2020), <https://www.nih.gov/news-events/news-releases/nih-clinical-trial-investigational-vaccine-covid-19-begins>.

⁶³ *Comirnaty and Pfizer-BioNTech COVID-19 Vaccine*, U.S. FOOD & DRUG ADMIN., <https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/comirnaty-and-pfizer-biontech-covid-19-vaccine> (last visited Mar. 2, 2022).

⁶⁴ *COVID-19 Vaccine Booster Shots*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/booster-shot.html> (last visited Mar. 2, 2022).

⁶⁵ *Spikevax and Moderna COVID-19 Vaccination*, U.S. FOOD & DRUG ADMIN., <https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/spikevax-and-moderna-covid-19-vaccine> (last visited Feb. 27, 2022).

⁶⁶ *Vaccine Dosing & Schedule*, INFECTIOUS DISEASES SOC'Y OF AM., <https://www.idsociety.org/covid-19-real-time-learning-network/vaccines/vaccine-dosing--schedule/> (last visited Mar. 2, 2022).

⁶⁷ *Id.*

⁶⁸ *Stay Up to Date with Your Vaccines*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/stay-up-to-date.html> (last visited Mar. 2, 2022).

⁶⁹ *COVID-19 UPDATE: Gov. Justice Announces Initial Vaccine Order of More Than 16,000 Doses Submitted to CDC*, OFF. OF THE GOVERNOR: JIM JUSTICE (Dec. 7, 2020), <https://governor.wv.gov/News/press-releases/2020/Pages/COVID-19-UPDATE-Gov.-Justice-announces-initial-vaccine-order-of-more-than-16,000-doses-submitted-to-CDC.aspx>.

⁷⁰ *COVID-19 UPDATE: Gov. Justice Announces West Virginia's Initial Moderna Vaccine Allocation to Increase; New Rapid Testing Lab Established at WVU*, OFF. OF THE GOVERNOR: JIM JUSTICE (Dec. 9, 2020), <https://governor.wv.gov/News/press-releases/2020/Pages/COVID-19-UPDATE-Gov.-Justice-announces-initial-Moderna-vaccine-allocation-to-increase;-new-rapid-testing-lab-at-WVU.aspx>.

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.⁷¹ 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.⁷² On March 22, 2021, COVID-19 vaccine distribution restrictions were lifted and all West Virginians age 16 years and older could access the vaccine.⁷³

As of January 31, 2022, 4.17 billion individuals have been fully vaccinated, or 53.4% of the world's population.⁷⁴ 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.⁷⁵ 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.⁷⁶ As aforementioned, 56% of West Virginians are full vaccinated.⁷⁷

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.⁷⁸ The CDC and FDA maintain a database to collect, track, and investigate serious vaccine side effects. The Vaccine Adverse

⁷¹ *COVID-19 UPDATE: Gov. Justice Provides New Details on Phases of Vaccine Allocation Plan*, OFF. OF THE GOVERNOR: JIM JUSTICE (Dec. 11, 2020), <https://governor.wv.gov/News/press-releases/2020/Pages/COVID-19-UPDATE-Gov.-Justice-provides-new-details-on-phases-of-vaccine-allocation-plan.aspx>.

⁷² *COVID-19 UPDATE: Gov. Justice Makes Vaccines Available to Residents Age 50+, Education Workers Age 40–50, and All 16+ with Certain Medical Conditions*, OFF. OF THE GOVERNOR: JIM JUSTICE (Mar. 3, 2020), <https://governor.wv.gov/News/press-releases/2021/Pages/COVID-19-UPDATE-Gov.-Justice-makes-vaccines-available-to-additional-West-Virginians.aspx>.

⁷³ *COVID-19 UPDATE: Gov. Justice Makes Vaccinations Available to All West Virginians Age 16 and Older; Fairs and Festivals Permitted to Resume May 1*, OFF. OF THE GOVERNOR: JIM JUSTICE (Mar. 22, 2021), <https://governor.wv.gov/News/press-releases/2021/Pages/COVID-19-UPDATE-Gov.-Justice-makes-vaccinations-available-to-all-West-Virginians-age-16-and-older.aspx>.

⁷⁴ *Coronavirus (COVID-19) Vaccinations*, OUR WORLD IN DATA, https://ourworldindata.org/covid-vaccinations?country=OWID_WRL (last visited Feb. 27, 2022).

⁷⁵ *More Than 10.8 Billion Shots Given: Covid-19 Tracker*, BLOOMBERG, <https://www.bloomberg.com/graphics/covid-vaccine-tracker-global-distribution/> (last visited Mar. 2, 2022).

⁷⁶ *Coronavirus (COVID-19) Vaccinations*, *supra* note 74.

⁷⁷ *COVID Data Tracker: COVID-19 Vaccinations in the United States*, CTRS. FOR DISEASE CONTROL AND PREVENTION, https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-total-admin-rate-pop18 (last visited Mar. 2, 2022).

⁷⁸ Nick VinZant, *COVID-19 Vaccine Hesitancy by State*, QUOTEWIZARD (Jan. 3, 2022), <https://quotewizard.com/news/posts/covid-vaccine-data>.

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

⁷⁹ *Vaccine Adverse Event Reporting System*, U.S. DEP’T OF HEALTH AND HUM. SERVS., <https://vaers.hhs.gov/> (last visited Feb. 27, 2022).

⁸⁰ *Id.*

⁸¹ *Selected Adverse Events Reported After COVID-19 Vaccination*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/safety/adverse-events.html> (last visited Mar. 2, 2022).

⁸² *Id.*

⁸³ *Id.*

⁸⁴ Jason P. Block, Tegan K. Boehmer, Christopher B. Forrest, Thomas W. Carton, et al., *Cardiac Complications After SARS-CoV-2 Infection and mRNA COVID-19 Vaccination—PCORnet, United States, January 2021–January 2022*, MORBIDITY AND MORTALITY WKLY. REP. (Apr. 8, 2022), <https://www.cdc.gov/mmwr/volumes/71/wr/mm7114e1.htm>.

⁸⁵ *COVID Data Tracker: COVID-19 Vaccinations in the United States*, CTRS. FOR DISEASE CONTROL AND PREVENTION, https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-total-admin-rate-total (last visited May 17, 2022).

⁸⁶ *Coronavirus (COVID-19) Update: FDA Limits Use of Janssen COVID-19 Vaccine to Certain Individuals*, U.S. FOOD & DRUG ADMIN., <https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-limits-use-janssen-covid-19-vaccine-certain-individuals> (last visited May 17, 2022).

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

⁸⁷ *What Is Guillain-Barre Syndrome (GBS)*, GBS/CIDP FOUND. INT'L, https://www.gbs-cidp.org/gbs/?utm_source=google&utm_medium=cpc&gclid=CjwKCAiA9aKQBhBREiwAyGP5leAKXSZi51jUbKhh8YITuTv1JeYz0d-uIAXiAUACrkUxTpG2xGntMhoCoMoQAvD_BwE (last visited Feb. 27, 2022).

⁸⁸ *Selected Adverse Events Reported After COVID-19 Vaccination*, *supra* note 81.

⁸⁹ *Mortality Analyses*, JOHNS HOPKINS UNIV. OF MED. (May 17, 2022), <https://coronavirus.jhu.edu/data/mortality>.

⁹⁰ *State ex rel. Perry v. Miller*, 171 W.Va. 509, 512 (1983).

⁹¹ *10 Essential Public Health Services*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/publichealthgateway/publichealthservices/essentialhealthservices.html> (last visited Mar. 2, 2022).

⁹² *See generally* Tamika Jarvis, Fran Scott, Fadi El-Jardali & Elizabeth Alvarez, *Defining and Classifying Public Health Systems: A Critical Interpretive Synthesis*, 18 HEALTH RSCH. POL'Y SYS. 68 (2020).

⁹³ LAWRENCE O. GOSTIN & LINDSAY F. WILEY, *PUBLIC HEALTH LAW: POWER, DUTY, RESTRAINT* 4–5 (3d. ed. 2016).

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.⁹⁷ 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 Clause⁹⁸ allows Congress to "regulate Commerce with foreign Nations, among the several States, and with Indian Tribes."⁹⁹ Food safety regulations, vaccination laws, and environmental protections all fall within the government's power to regulate commerce. Second, the General Welfare Clause¹⁰⁰ 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."¹⁰¹ 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 insurance¹⁰² and withholding federal funding until a state lowers its speed limits¹⁰³. Furthermore, the taxing power also permits the government to punish behaviors it disapproves, such as imposing taxes on cigarettes,¹⁰⁴ alcohol,¹⁰⁵ and firearms).¹⁰⁶

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).¹⁰⁷ 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

⁹⁷ U.S. CONST. art. 1, § 8.

⁹⁸ *Id.* at cl. 3.

⁹⁹ *Id.*

¹⁰⁰ *Id.* at cl. 1.

¹⁰¹ *Id.*

¹⁰² *See Nat'l Fed'n of Indep. Bus. v. Sebelius*, 567 U.S. 519, 588 (2012).

¹⁰³ *See South Dakota v. Dole*, 483 U.S. 203, 212 (1987).

¹⁰⁴ 26 U.S.C.A. § 5701 (West 2022).

¹⁰⁵ *Id.* § 5051.

¹⁰⁶ *Id.* § 5821.

¹⁰⁷ *HHS Agencies & Offices*, U.S. DEP'T OF HEALTH AND HUM. SERVS., <https://www.hhs.gov/about/agencies/hhs-agencies-and-offices/index.html> (last visited May 17, 2022).

issued a disaster or emergency declaration under the Stafford Act¹⁰⁸ or the National Emergencies Act,¹⁰⁹ and the Secretary of Health has declared a public health emergency under the Public Health Service Act.¹¹⁰ When these declarations are made, the Secretary of DHHS can invoke section 1135 of the Social Security Act¹¹¹ to waive or modify certain Medicare, Medicaid, Children's Health Insurance Program (CHIP) and Health Insurance Portability and Accountability Act (HIPAA) provisions.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.¹¹³ The waivers also allowed additional types of telecommunications systems to be used to furnish telehealth services.¹¹⁴ The Secretary also waived enforcement of certain provisions of the Emergency Medical Treatment & Labor Act (EMTALA)¹¹⁵ to allow hospitals, psychiatric facilities, and critical access hospitals to expand patient screening locations.¹¹⁶ Waivers also permitted physicians whose privileges have expired to continue practicing and allowed new physicians to practice before governing body review.¹¹⁷ The waivers were made retroactive to March 1, 2020 and will expire when the federal emergency declaration is ended.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

¹⁰⁸ See generally Robert T. Stafford Disaster Relief and Emergency Assistance Act, Pub. L. No. 100-707, 102 Stat. 4689 (2022) (amended the Disaster Relief Act of 1974, Pub. L. No. 93-288.)

¹⁰⁹ See generally National Emergencies Act, Pub. L. No. 94-412, 90 Stat. 1255 (2022).

¹¹⁰ 42 U.S.C.A. § 247d (West 2022).

¹¹¹ *Id.* § 1320b-5.

¹¹² See *id.*

¹¹³ *COVID-19 Emergency Declaration Blanket Waivers for Health Care Providers*, CTRS. FOR MEDICAID AND MEDICARE, <https://www.cms.gov/files/document/summary-covid-19-emergency-declaration-waivers.pdf> (last visited Mar. 2, 2022).

¹¹⁴ *Id.*

¹¹⁵ 42 U.S.C.A. § 1395dd.

¹¹⁶ *COVID-19 Emergency Declaration Blanket Waivers for Health Care Providers*, *supra* note 113.

¹¹⁷ *Id.*

¹¹⁸ *Coronavirus Waivers and Flexibilities*, CTRS. FOR MEDICARE AND MEDICAID SERVS., <https://www.cms.gov/about-cms/emergency-preparedness-response-operations/current-emergencies/coronavirus-waivers> (last visited Mar. 2, 2022).

to file their 2020 tax returns from April 15, 2021 to May 17, 2021.¹¹⁹ In addition, the original coronavirus emergency relief statute, the CARES Act,¹²⁰ instructed financial institutions to temporarily suspended payments and involuntary collection efforts on most federally held student loans.¹²¹ 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, 2022.¹²²

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 Lunch¹²³ and School Breakfast programs,¹²⁴ the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC),¹²⁵ and the Supplemental Nutrition Assistance Program (SNAP).¹²⁶ USDA also created the Coronavirus Food Assistance Program to deliver assistance to agricultural producers who sustained economic losses.¹²⁷

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.¹²⁸ 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.¹²⁹

¹¹⁹ *Tax Day for Individuals Extended to May 17: Treasury, IRS Extend Filing and Payment Deadline*, INTERNAL REVENUE SERV. (Mar. 17, 2021), <https://www.irs.gov/newsroom/tax-day-for-individuals-extended-to-may-17-treasury-irs-extend-filing-and-payment-deadline>.

¹²⁰ Coronavirus Aid, Relief, and Economic Security (CARES) Act, Pub. L. No.116-136, § 3513, 134 Stat. 281, 404 (2020).

¹²¹ *Id.*

¹²² *COVID-19 Emergency Relief and Federal Student Aid*, FED. STUDENT AID, <https://studentaid.gov/announcements-events/covid-19> (last visited Feb. 17, 2022).

¹²³ *National School Lunch Program*, U.S. DEP'T OF AGRIC., <https://www.fns.usda.gov/nslp> (last visited Feb. 27, 2022).

¹²⁴ *School Breakfast Program*, U.S. DEP'T OF AGRIC., <https://www.fns.usda.gov/sbp/school-breakfast-program> (last visited Feb. 27, 2022).

¹²⁵ *Supplemental Nutrition Program for Women, Infants, and Children (WIC)*, U.S. DEP'T OF AGRIC., <https://www.fns.usda.gov/wic> (last visited Feb. 27, 2022).

¹²⁶ *Supplemental Nutrition Assistance Program (SNAP)*, U.S. DEP'T OF AGRIC., <https://www.fns.usda.gov/snap/supplemental-nutrition-assistance-program> (last visited Feb. 27, 2022).

¹²⁷ The Coronavirus Food Assistance Program was terminated in December 2020. *See Coronavirus Food Assistance Program*, U.S. DEP'T OF AGRIC., <https://www.farmers.gov/archived/cfap2> (last visited Feb. 27, 2022).

¹²⁸ *Id.*

¹²⁹ *U.S. Department of Education Announces New Grant Program to Provide Funding to School Districts Being Penalized for Implementing COVID Safety Measures*, U.S. DEP'T OF EDUC. (Sept. 9, 2021), <https://www.ed.gov/news/press-releases/us-department-education-announces-new-grant-program-provide-funding-school-districts-being-penalized-implementing-covid->

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.¹³⁰ 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.¹³¹ President Trump issued executive orders to ensure access to U.S. government COVID-19 vaccines,¹³² provide economic assistance to renters and homeowners,¹³³ expedite infrastructure investments,¹³⁴ and encourage the production of personal protection equipment and other goods¹³⁵ under the Defense Production Act.¹³⁶ President Biden used his authority to require COVID-19 vaccinations for federal workers,¹³⁷ ensure protocols for federal contractors,¹³⁸ and to promote safety in domestic and international travel.¹³⁹

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.¹⁴⁰ State rights existed prior to the formation of the Constitution and “are derived from the nature of sovereignty and freedom.”¹⁴¹ In contrast to powers of the federal government, state governments’ powers are plenary.¹⁴² Under the Tenth Amendment, “powers not

safety-

measures#:~:text=Today%2C%20the%20U.S.%20Department%20of,with%20the%20Centers%20for%20Disease.

¹³⁰ *Executive Branch*, WHITE HOUSE, <https://obamawhitehouse.archives.gov/1600/executive-branch> (last visited Mar. 2, 2022).

¹³¹ COMM. ON GOV’T OPERATIONS, 85TH CONG., EXECUTIVE ORDERS AND PROCLAMATIONS: A STUDY OF A USE OF PRESIDENTIAL POWERS 1 (1957).

¹³² Exec. Order No. 13,962, 85 Fed. Reg. 79,777 (2020).

¹³³ Exec. Order No. 13,945, 85 Fed. Reg. 49,935 (2020).

¹³⁴ Exec. Order No. 13,927, 85 Fed. Reg. 35,165 (2020).

¹³⁵ Exec. Order No. 13,922, 85 Fed. Reg. 30,583 (2020).

¹³⁶ 50 U.S.C.A. §§ 4501–4568 (West 2022).

¹³⁷ Exec. Order No. 14,043, 86 Fed. Reg. 50,989 (2021).

¹³⁸ Exec. Order No. 14,042, 86 Fed. Reg. 50,985 (2021).

¹³⁹ Exec. Order No. 13,998, 86 Fed. Reg. 7,205 (2021).

¹⁴⁰ COMM. ON ASSURING THE HEALTH OF THE PUB. IN THE 21ST CENTURY, THE FUTURE OF THE PUBLIC’S HEALTH IN THE 21ST CENTURY 111 (2002), https://www.ncbi.nlm.nih.gov/books/NBK221239/pdf/Bookshelf_NBK221239.pdf.

¹⁴¹ *Gibbons v. Ogden*, 22 U.S. 1, 87 (1824).

¹⁴² John Dinan, *The Emergency Powers of State Governments and Governors in the U.S. Federal System*, FEDERALISM INDEX (June 5, 2020), <https://www.federalismindex.org/post/the-emergency-powers-of-state-governments-and-governors-in-the-u-s-federal-system>.

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.

¹⁴⁴ *Jacobson v. Massachusetts*, 197 U.S. 11, 24–25 (1905).

¹⁴⁵ *Nulter v. State Road Comm’n of W. Va.*, 193 S.E. 549, 550 (W.Va. 1937).

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 Prevention and Control of Obesity*, 87 MILBANK Q. 215, 218–21 (2009).

¹⁴⁹ *State and Territorial Health Department Websites*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/publichealthgateway/healthdirectories/healthdepartments.html> (last visited Mar. 2, 2022).

¹⁵⁰ COMM. FOR THE STUDY OF THE FUTURE OF PUB. HEALTH, *THE FUTURE OF PUBLIC HEALTH: APPENDIX A, SUMMARY OF THE PUBLIC HEALTH SYSTEM IN THE UNITED STATES* 185 (1988).

¹⁵¹ *Health Department Governance*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/publichealthgateway/sitesgovernance/index.html> (last visited Feb. 18, 2022).

there are ten county/municipal health departments that act autonomously.¹⁵² 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.¹⁵³ Recently, however, the West Virginia legislature has begun to erode some of the rulemaking authority of the local boards of West Virginia.¹⁵⁴ 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.¹⁵⁵

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.¹⁵⁶ Some of his other early initiatives include closing businesses and facilities, such as barbershops, hair salons, and nail salons;¹⁵⁷ the West Virginia Division of Motor Vehicles;¹⁵⁸ gyms and recreational facilities;¹⁵⁹ state park lodges;¹⁶⁰ schools;¹⁶¹ and restaurants.¹⁶² 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)

¹⁵⁴ See S. 12, 85th Leg., Reg. Sess. (W. Va. 2021).

¹⁵⁵ *Id.*

¹⁵⁶ *COVID UPDATE: Gov. Justice Announces State Employee Travel Ban, Basketball Tournament Cancellation Among Latest Precautionary Coronavirus Measures*, OFF. OF THE GOVERNOR: JIM JUSTICE (Mar. 12, 2020), <https://governor.wv.gov/News/press-releases/2020/Pages/COVID-UPDATE-Gov.-Justice-announces-State-employee-travel-ban%2c-basketball-tournament-cancellation-among-latest-precautions.aspx>.

¹⁵⁷ Exec. Order No. 6-20 (W. Va. 2020).

¹⁵⁸ *WV DMV Regional Offices to Close*, W. VA. DIV. MOTOR VEHICLES (Mar. 18, 2020), <https://transportation.wv.gov/DMV/News/Pages/WV-DMV-regional-offices-to-close.aspx>.

¹⁵⁹ Exec. Order No. 3-20 (W. Va. 2020).

¹⁶⁰ Exec. Order No. 8-20 (W. Va. 2020).

¹⁶¹ *COVID-19 UPDATE: Gov. Justice Announces Closure of West Virginia Schools*, OFF. OF THE GOVERNOR: JIM JUSTICE (Mar. 13, 2020), <https://governor.wv.gov/News/press-releases/2020/Pages/COVID19-UPDATE-Gov.-Justice-announces-closure-of-West-Virginia-schools.aspx>.

¹⁶² *COVID-19 UPDATE: Gov. Justice Details Latest Coronavirus Precautions in Statewide Address*, OFF. OF THE GOVERNOR: JIM JUSTICE (Mar. 17, 2020), <https://governor.wv.gov/News/press-releases/2020/Pages/COVID-19-UPDATE-Gov.-Justice-holds-statewide-address-to-discuss-coronavirus-precautions.aspx.2>

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

¹⁶³ *WV Department of Education and Counties Open 500 Sites to Feed Children*, W. VA. DEP’T OF EDUC., <https://wvde.us/wv-department-of-education-and-counties-open-500-sites-to-feed-children/> (last visited Feb. 19, 2022).

¹⁶⁴ *Statement by Donald J. Trump, 45th President of the United States of America*, DONALD J. TRUMP (Jan. 5, 2022), <https://www.donaldjtrump.com/news/news-ittdhgnhp4d1378>

¹⁶⁵ *Jacobson v. Massachusetts*, 197 U.S. 11, 12 (1905).

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.¹⁷³ 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.¹⁷⁴ 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.¹⁷⁵ Recognizing that the federal government would be unsuccessful in a judicial challenge, President Biden and OSHA withdrew their proposal for a national vaccine mandate.¹⁷⁶

West Virginia has joined other jurisdictions, such as Arizona, in blocking the enforcement of any sort of a state-wide vaccine mandate.¹⁷⁷ States have adopted three different types of exemptions to compulsory vaccination requirements: medical, religious, and philosophical.¹⁷⁸ 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.¹⁷⁹ 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

¹⁷³ THE WHITE HOUSE, PATH OUT OF THE PANDEMIC: PRESIDENT BIDEN’S COVID-19 ACTION PLAN (Sept. 2021), <https://ncpa.org/sites/default/files/2021-09/path-out-of-pandemic-potus-plan.pdf>.

¹⁷⁴ See generally COVID-19 Vaccination and Testing; Emergency Temporary Standard, 86 Fed. Reg. 61402-01 (Nov. 5, 2021).

¹⁷⁵ See generally Nat’l Fed’n of Indep. Bus. v. Dep’t of Lab., Occupational Safety and Health Admin., 142 S. Ct. 661 (2022).

¹⁷⁶ 29 C.F.R. § 1910 (2022); Robert Gilmore & Hannah Kraus, *Biden Administration Withdraws Workplace Vaccine Mandate*, JD SUPRA (Jan. 27, 2022), <https://www.jdsupra.com/legalnews/biden-administration-withdraws-5034261/>.

¹⁷⁷ COVID-19 UPDATE: Gov. Justice Proposes Bill Requiring Exemptions from Vaccine Mandates in the Workplace, OFF. OF THE GOVERNOR: JIM JUSTICE (Oct. 13, 2021), <https://governor.wv.gov/News/press-releases/2021/Pages/COVID-19-UPDATE-Gov-Justice-proposes-bill-requiring-exemptions-from-vaccine-mandates-in-the-workplace.aspx>.

¹⁷⁸ *State Information*, IMMUNIZE.ORG, <https://www.immunize.org/laws/exemptions.asp> (last visited Feb. 19, 2022).

¹⁷⁹ *Id.*

medical contraindications must be described, and a statement whether the exemption should be permanent or temporary given.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.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.¹⁸² The employer is prohibited from penalizing or discriminating against an exempted employee regarding benefits, hiring, firing, bonuses, pay raises, or promotions.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.”

– U.S. Congressman Alex Mooney’s (R-WV) reaction to Governor Jim Justice’s broadband strategy¹⁸⁴

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 testing¹⁸⁵ 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.¹⁸⁶

¹⁸⁰ *Medical Exemptions Information*, W. VA. DEP’T OF HEALTH & HUM. RES., <https://oepls.wv.gov/Pages/Medical-Exemptions-Information.aspx#q2> (last visited Feb. 27, 2022).

¹⁸¹ W. VA. CODE ANN. § 16-3-4b (West 2022).

¹⁸² *Id.*

¹⁸³ *Id.*

¹⁸⁴ *What They’re Saying: Gov. Justice’s Billion-Dollar Broadband Strategy for West Virginia*, OFF. OF THE GOVERNOR: JIM JUSTICE, <https://governor.wv.gov/News/press-releases/2021/Pages/What-they%E2%80%99re-saying-Gov.-Justice%E2%80%99s-Billion-Dollar-Broadband-Strategy-for-West-Virginia.aspx> (last visited Feb. 19, 2022).

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/>.

¹⁸⁶ Steven Nelson, *Biden Says COVID Won’t Go Away but the “New Normal” Will “Be Better”*, N.Y. POST (Jan. 7, 2022), <https://nypost.com/2022/01/07/joe-biden-says-americans-will-have-to-adapt-to-covid-19/>.

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.¹⁸⁷ Individuals who attain personal health literacy exert greater control over health care options and choices than those who do not.¹⁸⁸

Low personal health literacy creates a barrier to accessing and understanding messaging regarding the safety and efficacy of the COVID-19 vaccine.¹⁸⁹ Low personal health literacy, a risk factor, is also associated with poor health outcomes.¹⁹⁰ 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.¹⁹¹ 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”¹⁹² 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.¹⁹³ The built environment (i.e., the buildings, spaces, and products created by people)¹⁹⁴ is also a social determinant of health.¹⁹⁵ 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.¹⁹⁶ Accessing the internet for entertainment, social interactions during times of social distancing, and as

¹⁸⁷ *What Is Health Literacy?*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/healthliteracy/learn/index.html> (last visited Feb. 19, 2022).

¹⁸⁸ Don Nutbeam, *The Evolving Concept of Health Literacy*, 67 SOC. SCI. & MED. 2072, 2072–78 (2008).

¹⁸⁹ Kay Benyon, *Health Literacy*, 7 INNOVAT 437, 437–40 (2014).

¹⁹⁰ Nancy D. Berkman, Stacey L. Sheridan, Katrina E. Donahue, David J. Halpern et al., *Low Health Literacy and Health Outcomes: An Updated Systematic Review*, 155 ANNALS OF INTERNAL MED. 97, 99 (2011).

¹⁹¹ *Id.* at 103.

¹⁹² *Social Determinants of Health*, U.S. DEP’T OF HEALTH AND HUM. SERVS., <https://health.gov/healthypeople/objectives-and-data/social-determinants-health> (last visited Feb. 27, 2022).

¹⁹³ Noor Aljassim & Remo Ostini, *Health Literacy in Rural and Urban Populations: A Systematic Review*, 103 PATIENT EDUC. AND COUNSELING 2142, 2144 (2020).

¹⁹⁴ *Id.* at 2152.

¹⁹⁵ *Impact of the Built Environment on Health*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/nceh/publications/factsheets/impactofthebuiltenvironmentonhealth.pdf> (last visited Feb. 27, 2022).

¹⁹⁶ Colleen McClain, Emily A. Vogels, Andrew Perrin, Stella Sechopoulos et al., *The Internet and the Pandemic*, PEW RSCH. CTR. (Sept. 1, 2021), <https://www.pewresearch.org/internet/2021/09/01/the-internet-and-the-pandemic/>.

platforms for work and learning have increased during the pandemic.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.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.¹⁹⁹

Of the approximately 1.8 million individuals who live in West Virginia,²⁰⁰ approximately 403,000 of them (or 22%) do not have any access to a wired broadband.²⁰¹ Experts suggest that West Virginia's rugged terrain, vast rural areas, and harsh weather contribute to the difficulties of delivering internet service.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.²⁰³ A speed of 25 Mbps is too slow for a household with more than two people to surf the internet or share files.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."²⁰⁵

¹⁹⁷ *Id.*

¹⁹⁸ Ella Koeze & Nathaniel Popper, *The Virus Changed the Way We Internet*, N.Y. TIMES (Apr. 7, 2020), <https://www.nytimes.com/interactive/2020/04/07/technology/coronavirus-internet-use.html>.

¹⁹⁹ *West Virginia's Response to COVID-19*, OFF. OF THE GOVERNOR: JIM JUSTICE, <https://governor.wv.gov/Pages/WV-COVID-19-actions-and-executive-orders.aspx> (last visited Feb. 27, 2022).

²⁰⁰ *Quick Facts: West Virginia*, U.S. CENSUS BUREAU, <https://www.census.gov/quickfacts/WV> (last visited Feb. 27, 2022).

²⁰¹ *West Virginia Internet Coverage and Availability*, BROADBANDNOW, <https://broadbandnow.com/West-Virginia> (last visited Feb. 27, 2022).

²⁰² *Why Is Rural Internet So Bad?*, BLINQ NETWORKS, <https://blinqnetworks.com/why-is-rural-internet-so-bad/> (last visited Feb. 27, 2022).

²⁰³ Claire Park, *The Cost of Connectivity in West Virginia*, NEW AM., <https://www.newamerica.org/oti/reports/cost-connectivity-west-virginia/> (last visited Mar. 3, 2022).

²⁰⁴ Rebecca Armstrong, *How Much Internet Speed Do I Need?*, MOVE.ORG (Apr. 14, 2022), <https://www.move.org/how-much-internet-speed/>.

²⁰⁵ Erin Hudnall, Katie E. Corcoran & Christopher P. Scheitle, *Internet Access in West Virginia*, W. VA. SOC. SURV. REP. (Oct. 22, 2020), <https://survey.wvu.edu/files/d/2ecc6402-b338-46b5-9c06-2a881c72d1e8/internet-access-accessible.pdf>.

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-19²⁰⁶

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.²⁰⁷ Sociodemographic variables were obtained from the U.S. Census Bureau.²⁰⁸ COVID-19 case and death rates were included because they could theoretically impact subsequent vaccination decisions.²⁰⁹ These data were obtained on September 27, 2021 from USA Facts.²¹⁰ Vaccination rates, reported as full doses per 1,000 population, were obtained from West Virginia’s Department of Health and Human Resources on September

²⁰⁶ Shefali Dahiya, Lila N. Rokanas, Surabhi Singh, Melissa Yang et al., *Lessons from Internet Use and Performance During COVID-19*, 11 J. INFO. POL’Y 202, 203 (2021).

²⁰⁷ See *supra* Part VI.

²⁰⁸ *Annual Estimates of the Resident Population for Counties: April 1, 2010 to July 1, 2019*, U.S. CENSUS BUREAU, https://www.census.gov/data/datasets/time-series/demo/popest/2010s-counties-total.html#par_textimage_739801612 (last visited Feb. 27, 2022); *Quick Facts: United States*, U.S. CENSUS BUREAU, <https://www.census.gov/quickfacts/fact/table/US/PST045221> (last visited Feb. 27, 2022).

²⁰⁹ *Fayette County, West Virginia Coronavirus Cases and Deaths*, USA FACTS, <https://usafacts.org/visualizations/coronavirus-covid-19-spread-map/state/west-virginia/county/fayette-county> (last visited Feb. 27, 2022).

²¹⁰ *US COVID-19 Cases and Deaths by State*, USA FACTS, <https://usafacts.org/visualizations/coronavirus-covid-19-spread-map/> (last visited Feb. 27, 2022).

27, 2021.²¹¹ Internet access was reported as the percentage of the population with access to broadband internet as of June 7, 2021.²¹²

An ecological analysis, or analysis of aggregated data, can determine whether there is an association (or relationship) between variables at a population level.²¹³ 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.²¹⁴

Most common significance tests examine the probability of whether a relationship exists between two variables and, if it does, the strength of the relationship.²¹⁵ These tests often assume that data is normally distributed.²¹⁶ In a normal distribution, also called a Gaussian distribution, data is symmetrical, is based on the mean, and follows a bell curve.²¹⁷ Continuous variables refer to a variable that may, in theory, have an infinite number of possible values.²¹⁸ 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.²¹⁹ 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.

²¹¹ *Coronavirus Disease 2019 (COVID-19)*, W. VA. DEP'T OF HEALTH AND HUM. RES., <https://dhhr.wv.gov/COVID-19/Pages/default.aspx> (last visited Feb. 27, 2022).

²¹² *West Virginia Internet Coverage and Availability*, *supra* note 201.

²¹³ Kate Ann Levin, *Study Design VI—Ecological Studies*, NATURE, <https://www.nature.com/articles/6400454.pdf?origin=ppub> (last visited Feb. 27, 2022).

²¹⁴ *Curiosity Forever*, SAS, https://www.sas.com/en_us/curiosity.html?utm_source=other&utm_medium=cpm&utm_campaign=non-cbo-us&dclid=&gclid=Cj0KCCQiAr5iQBhCsARIsAPcwROMKiwzb1mk9RnKblRckCtpEBCIKDM DwAbbvGO_kkuLk_UIVQiMRWa4aAvTeEALw_wcB (last visited Feb. 27, 2022).

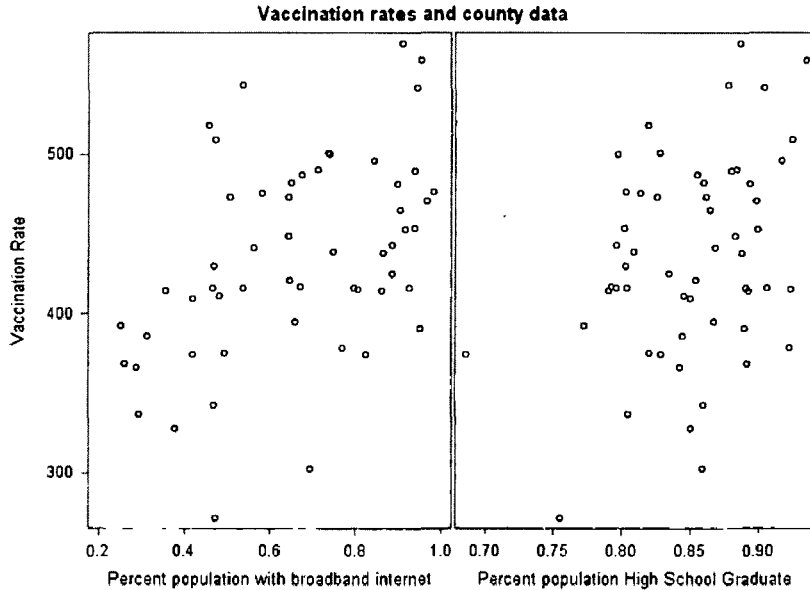
²¹⁵ *PPA 696 Research Methods: Tests for Significance*, CAL. STATE UNIV. LONG BEACH, <https://home.csulb.edu/~msaintg/ppa696/696stsig.htm> (last visited May 17, 2022).

²¹⁶ *Id.*

²¹⁷ *Id.*

²¹⁸ *4.2 Types of Variables*, STAT. CAN., <https://www150.statcan.gc.ca/n1/edu/power-pouvoir/ch8/5214817-eng.htm> (last visited Feb. 27, 2022).

²¹⁹ *Relationships Between Two Continuous Variables*, UNIV. OF WIS.-MADISON SOC. SCI. COMPUTING COOP., <https://ssc.wisc.edu/sscc/pubs/DWE/book/3-2-relationship-between-two-continuous-variables.html> (last visited May 17, 2022).



Pearson correlation coefficients measure the strength of a linear association between two continuous variables and is denoted by “ r .”²²⁰ Linear relationships are found when the increase or decrease in one variable is related to the linear increase or decrease in another variable.²²¹ 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.²²² The Pearson correlation coefficient can range from values of +1 to -1.²²³ 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).²²⁴ Negative values indicate a negative association (i.e., as the value of one variable increases, the value of the other variable decreases).²²⁵

²²⁰ *Pearson Product-Moment Correlation*, LAERD STAT., <https://statistics.laerd.com/statistical-guides/pearson-correlation-coefficient-statistical-guide.php> (last visited May 17, 2022).

²²¹ Siddharth Kalla, *Linear Relationships*, EXPLORABLE (Jan. 10, 2011), <https://explorable.com/linear-relationship>.

²²² *Scatterplot*, BETTEREVALUATION, <https://www.betterevaluation.org/en/evaluation-options/scatterplot#:~:text=Scatterplots%20are%20used%20to%20analyse,two%20sets%20of%20continuous%20data> (last visited Feb. 27, 2022).

²²³ *Pearson Product-Moment, Correlation*, *supra* note 220

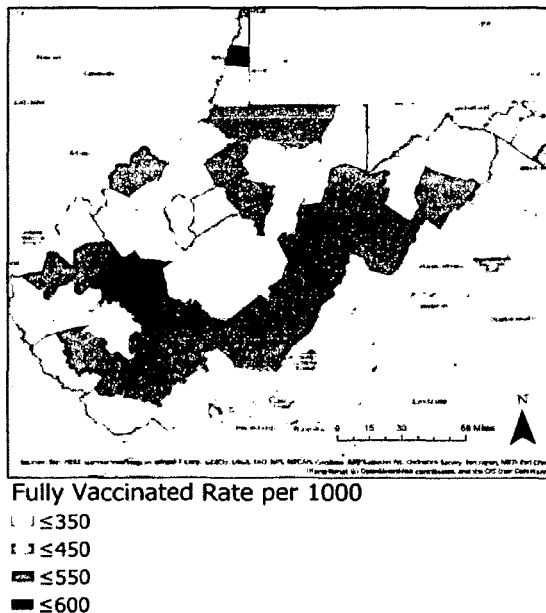
²²⁴ *Id.*

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).²²⁶ 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.

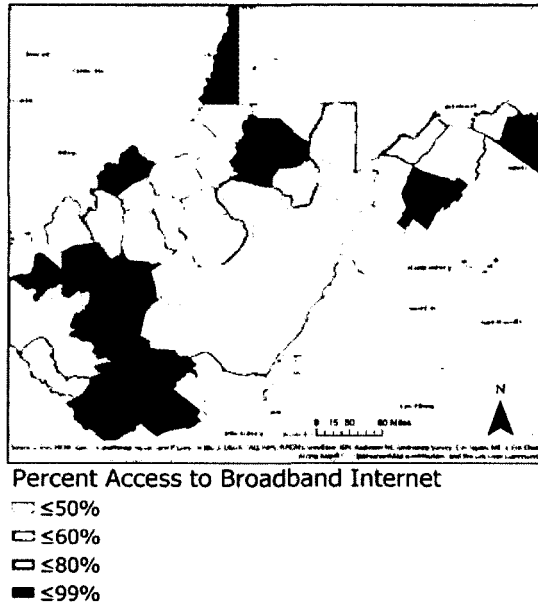
B. Results

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).



²²⁶ *Multiple Linear Regression*, STAT. DISCOVERY, https://www.jmp.com/en_us/statistics-knowledge-portal/what-is-multiple-regression.html (last visited Mar. 4, 2022).

West Virginia ranks 44th among U.S. states with respect to internet connectivity.²²⁷ As shown in Map 2, Beckley, in Raleigh County, is the state's best-connected city.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.²²⁹ In West Virginia, 20.6% of its population holds such degrees.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

²²⁷ *Internet Service in West Virginia*, BROADBAND SEARCH, <https://www.broadbandsearch.net/service/west-virginia> (last visited Mar. 4, 2022).

²²⁸ *Id.*

²²⁹ *Quick Facts: United States*, *supra* note 208.

²³⁰ *Id.*

(26.0%—Marshall University); and Kanawha County (25.5%—University of Charleston and West Virginia State University).²³¹

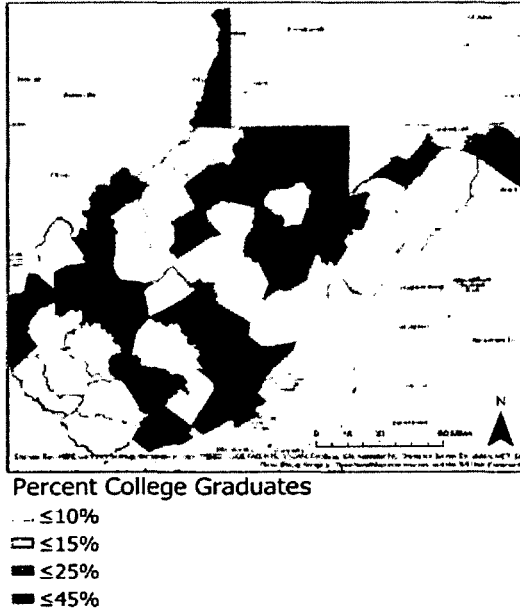


Table 1, Correlation of County-Level COVID-19 Vaccination Rates with Count-Level Factors in West Virginia, depicts the results of the bivariate analysis. The bivariate analysis revealed that county-level vaccination rates were moderately correlated with internet availability ($r=0.46$, $p<0.001$) and 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.

231 *Id.*

Table 1. Correlation of county-level COVID-19 vaccination rate with count-level factors, West Virginia

Characteristic	Mean (Std)	Correlation with Vaccination rate (r)	p-value
Full vaccination (per 1000 residents)	434.6 (62.7)	-	-
% Broadband internet	66.2 (21.9)	0.456	<0.001
% High school graduates	85.0 (4.9)	0.342	0.01
% Bachelor's degree or higher	16.5 (6.7)	0.452	<0.001
% Poverty	17.2 (4.5)	-0.225	0.098
% Uninsured	8.5 (1.2)	-0.236	0.083
% Non-white	4.4 (3.3)	0.182	0.184
% Foreign born	1.1 (1.1)	0.179	0.192
% Over age 65	21.9 (2.7)	-0.042	0.761
% Disabled	15.1 (4.7)	-0.199	0.144
COVID case rate (per 100 population)	16.5 (4.7)	0.078	0.57
COVID death rate (per 100 pop)	0.27 (0.094)	0.207	0.129
Population density*	64.1 (64.7)	0.349	0.009

*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

Variable	Estimate	95% Confidence Interval	p-value
% Broadband internet	0.96	(0.25, 1.67)	0.009
% Bachelor's degree or higher	3.10	(0.77, 5.39)	0.010

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.²³² 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-19.²³³ West Virginia ranks 48th in the nation for poor health outcomes.²³⁴ Older adults and disabled individuals under the age of 65 are more likely to become severely ill from the coronavirus.²³⁵ 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.²³⁶ Lack of trust in COVID-19 vaccines and the government are the two primary

²³² *COVID Data Tracker*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://covid.cdc.gov/covid-data-tracker/#rates-by-vaccine-status> (last visited Mar. 4, 2022).

²³³ *People with Certain Medical Conditions*, CTRS. FOR DISEASE CONTROL AND PREVENTION <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html> (last visited Mar. 4, 2022).

²³⁴ *2021 Annual Report*, AM.'S HEALTH RANKINGS, <https://www.americashealthrankings.org/learn/reports/2021-annual-report> (last visited Feb. 20, 2022).

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.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;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.²³⁹ Nearly 66% of the world's population has internet,²⁴⁰ but only 39.3% of West Virginians have access to affordable internet plans of under \$60 per month.²⁴¹ Additional research is needed to determine what sources West Virginians are accessing to obtain information (or disinformation) 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.

²³⁷ VinZant, *supra* note 78.

²³⁸ *COVID Data Tracker*, *supra* note 232.

²³⁹ Lucas Manfield, *West Virginia Leaders Say Improving Internet Is a Top Priority. The Latest Numbers Show Access in the State Is Just Getting Worse*, MOUNTAIN STATE SPOTLIGHT (Feb. 16, 2021), <https://mountainstatespotlight.org/2021/02/16/west-virginia-leaders-say-improving-internet-is-a-top-priority-the-latest-numbers-show-access-in-the-state-is-just-getting-worse/>.

²⁴⁰ *Internet Users Distribution in the World—2021*, INTERNET WORLD STAT., <https://www.internetworldstats.com/stats.htm> (last visited Feb. 27, 2022).

²⁴¹ Tyler Cooper & Julia Tanberk, *Best and Worst States for Internet Coverage, Prices and Speeds, 2021*, BROADBANDNOW RSCH. (Nov. 5, 2021), <https://broadbandnow.com/research/best-states-with-internet-coverage-and-speed>.