

Exploring the Impact of COVID-19 on the Healthcare System and Vulnerable Populations in the United States

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Abstract

Beginning in early 2020, SARS-CoV-2, the virus responsible for COVID-19, spread across the world, giving rise to a global pandemic that impacted billions of people. Surprisingly, the United States was among one of the worst affected countries with over a million deaths. The purpose of this review is to discuss the impact of COVID-19 in the United States from the perspectives of government policies and the U.S. healthcare system. The emergence of multiple viral variants was at the center of sequential waves of infection in the U.S., resulting in increased number of cases, hospitalizations, and deaths along with associated mental health sequelae in the population. Lack of uniform policies at the local, state, and federal levels exacerbated the situation. These factors contributed to significant healthcare worker burnout. Furthermore, the disease caused higher morbidity and mortality rates in specific groups such as lower average socioeconomic status, rural and underserved communities, Native Americans and African Americans, and older age groups (65+ years). The lessons learned from this broad analysis highlight many inadequacies and challenges experienced in the U.S. during the pandemic. Here we propose several suggestions for healthcare and government responses in the event of future unanticipated healthcare crises.

Introduction

COVID-19 (Coronavirus Disease 2019) is caused by the virus SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) and presents with common symptoms of fever, persistent cough, congestion, fatigue, and notable anosmia (loss of smell) and ageusia (loss of taste).¹ The virus first appeared in the Hubei Province of Wuhan, China on December 12, 2019.^{2,3} On January 20, 2020, the first laboratory-confirmed case was identified in the United States in Snohomish County, Washington state from an individual who had recently traveled to Wuhan. Throughout the first month of 2020, cases were identified in Arizona, California, and Illinois.³

The rapid spread and growing number of cases and deaths led the WHO to declare COVID-19 a global pandemic on March 11. The emergence of multiple variant viruses with enhanced infectivity in the subsequent months and years led to a total of 775,431,269 cases and 7,047,741 deaths globally as of May 5, 2024.⁴ By September 28, 2020, COVID-19 deaths reached 1 million globally.³ To date, there have been approximately 652 million cases and 6.6 million deaths globally from COVID-19.⁵ The United States has recorded over 10 million cases and over 1 million deaths, and it is estimated that costs from COVID-19 have exceeded \$16 trillion in U.S. dollars.⁶

COVID-19 created an unprecedented crisis both globally and in the U.S. Although there have been several reviews discussing the

impact of COVID-19 on a global, as well as local, scale, none have yet discussed how COVID-19 challenged the U.S. government, healthcare system, and ability to care for socially disadvantaged populations. Therefore, in this review, we explore how COVID-19 impacted not only government and health care policies, but also how this may have exaggerated the disease's impact on historically socially disadvantaged populations including ethnic minorities, low socioeconomic regions, and underserved areas. Specifically, we strive to highlight key aspects of COVID-19 challenges, outcomes, and takeaways to further increase awareness among healthcare and public health professionals for more efficient, effective, and equitable healthcare system preparedness and public health responses to deal with future unanticipated epidemics.

Methods

Data for this literature review was obtained through searching the database PubMed for articles addressing COVID-19 in the United States. A general search engine query was performed for current, up-to-date case, hospitalization, and death rate statistics. The following keywords, or combinations of keywords, were used: "COVID-19," "SARS CoV-2," "United States," "U.S.," "government policies," "healthcare," "vulnerable populations," and "disparities." Articles selected for inclusion ranged from 2020 – 2023 and were written in English. A total of 45 articles were selected for this analysis.

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Layout Editor: Julian A. Zapata-Rios

Submission: May 18, 2023
Revisions: Sep 14, 2023, May 4, 2024,
May 13, 2024
Responses: Sep 30, 2023, Jun 3 2024
Acceptance: Jun 7, 2024
Publication: Jun 11, 2024
Process: Peer-reviewed

Results

The Impact of COVID-19 on Government Policies and Strategies

In the U.S., COVID-19 was met with considerable confusion, controversy, and chaos in its initial stages. Implementation of COVID-19 measures varied widely across states, schools, and workplaces; in many cases, policies at one level contradicted policies at another level. Compared to developed countries like Australia that exhibited relatively lower death rates, the U.S. lacked inter-government collaboration and a centralized, unified plan, which further worsened confusion and conflict regarding the status, spread, and response to the virus. Prevention strategies such as mask-wearing and social distancing were implemented at different levels and to different degrees, with variation in policies exhibited at the federal, state, and local levels.

Discoordination Between the Federal and State Level

In total, 39 out of 50 states issued statewide mask mandates. The first state to issue a mask mandate was New Jersey on April 10, 2020; the first state to end mask orders was Iowa on February 7, 2021. Moreover, the length of mask mandate periods varied greatly from state to state: the state with the shortest period of mask mandates was Mississippi (56 days) while the state with the longest mask mandate was Hawaii (704 days).¹¹

As the pandemic gained momentum, statewide lockdowns—which discouraged travel outside the home and restricted nonessential movement—were enforced starting in March 2020 and continued into May 2020. In April, 42 U.S. states were under mandatory lockdown; however, by May 2020 most states had begun lifting lockdown protocols and relaxing masking and social distancing guidelines.¹²

Discoordination at the Local Level

Across schools nationwide, COVID-19 mitigation efforts varied according to region, state, county, and school district. Masking in school was required by 18 states while 8 states prohibited mandatory school masking. Out of 50 states, 11 states required vaccination for school employees; California was the only state to require vaccination for both students and school employees.¹³ Hybrid learning (containing both virtual and in-person components) was implemented to different degrees in different regions.

The Impact of COVID-19 on the Healthcare System

The initial 2020 surge in COVID-19 cases placed significant demands on the healthcare system. Following the initial surge, hospitalizations in the U.S. reached a 7-day average of 58,261 nationwide on April 30. Hospitalization surges for the second, third, fourth, and fifth waves were as follows: 73,069 in July 2020, 137,335 in January 2021, 102,778 in September 2021, and 159,401 in January 2022—the highest surge thus far [Figure 1](#).¹⁴ In states with highly populated areas such as New York, the number of newly hospitalized patients reached its highest, peak 7-day average of 13,623 in April 2020 (following the pandemic's initial

surge) and experienced its second largest spike in hospitalizations in January 2022 with a 7-day average of 13,183 admissions.¹⁴

In March 2020, healthcare systems began discussing guidelines for prioritizing critical care in the event that ventilator supplies could not meet demand.

Shortage of Healthcare Workers

With increasing patient numbers, many hospitals, especially those in busy cities, experienced understaffing. In a study encompassing 6,194 hospitals enrolled in the National Healthcare Safety Network (NHSN) from March to July 2020, approximately one-third reported shortage of healthcare workers (including physicians, nurses, respiratory therapists, environmental service staff, pharmacists, and temporary workers), with approximately 16% reporting a shortage of nurses.¹⁵ Of those staff serving at the frontlines, many had to work overtime with dwindling supplies to meet increased hospitalization demands.

Between June 2020 and January 2021, increased temporary absences and terminating departures from nursing homes following severe COVID-19 outbreaks created even greater staffing gaps. Increased absences and departures were driven by increased job demands (working overtime, assuming more roles, etc.), increased high-risk exposure, and insufficient pay.¹⁶

Even before the pandemic, nurses working at hospitals in New York and Illinois experienced increased patient volumes and lack of adequate supplies. This ongoing, preexisting situation was exacerbated by the initial and subsequent surges in COVID-19 cases and admissions, which created greater demands on working staff along with inadequate supplies, insufficient time to complete tasks, and greater feelings of overwork, job dissatisfaction, and burnout.¹⁷

Furthermore, 17% of the estimated 3,500 healthcare workers who died during the pandemic consisted of physicians, representing a tragic loss to an already understaffed healthcare system. Increased demands on and for physicians during the pandemic further highlights an ongoing, nationwide shortage of physicians with concurrent increase in physician burnout.¹⁸

Shortages in PPE and Healthcare Equipment

As hospitalizations increased acutely, many hospitals did not have adequate supplies or equipment to meet increasing hospitalizations. In a study encompassing 6,194 hospitals enrolled in the National Healthcare Safety Network (NHSN) from March to July 2020, 11% reported PPE or ventilator supply shortages.¹⁵

In April 2020, supply shortages drove healthcare providers to improvise—as in the extreme case of frontline healthcare workers using trash bags to compensate for gown shortages—which compromised quality and safety of patient care.¹⁹ Other

workarounds in response to PPE shortages included reusing PPE and using less-safe alternatives, such as bandanas for masks.²⁰

In the wake of the pandemic, it was estimated the U.S. needed approximately 300 million N95 respirators, which left substantial deficits considering roughly 35 million N95 respirators were produced and supplied by a single, primary manufacturer.²¹ The estimated need for ventilators in the U.S. in April 2020 ranged from 60,000 to 160,000, depending on ventilator functionality.²⁰ In one national study, ventilator use peaked in April; during this time, 25% of surveyed hospitals had over 76% ventilators dedicated to patients with COVID-19. Meanwhile, orders for drugs used to treat symptoms of COVID (midazolam, fentanyl, and albuterol) increased by 53-100%, and 533-4100% in especially hard-hit areas such as NYC.²¹

Prior to the pandemic, approximately half of the global face mask supply was produced by China. Following the initial infection surge in China, supplies were diverted to internal use and much-needed exports were decreased, while those available for export increased in price.²⁰

Effects on Other Healthcare Areas

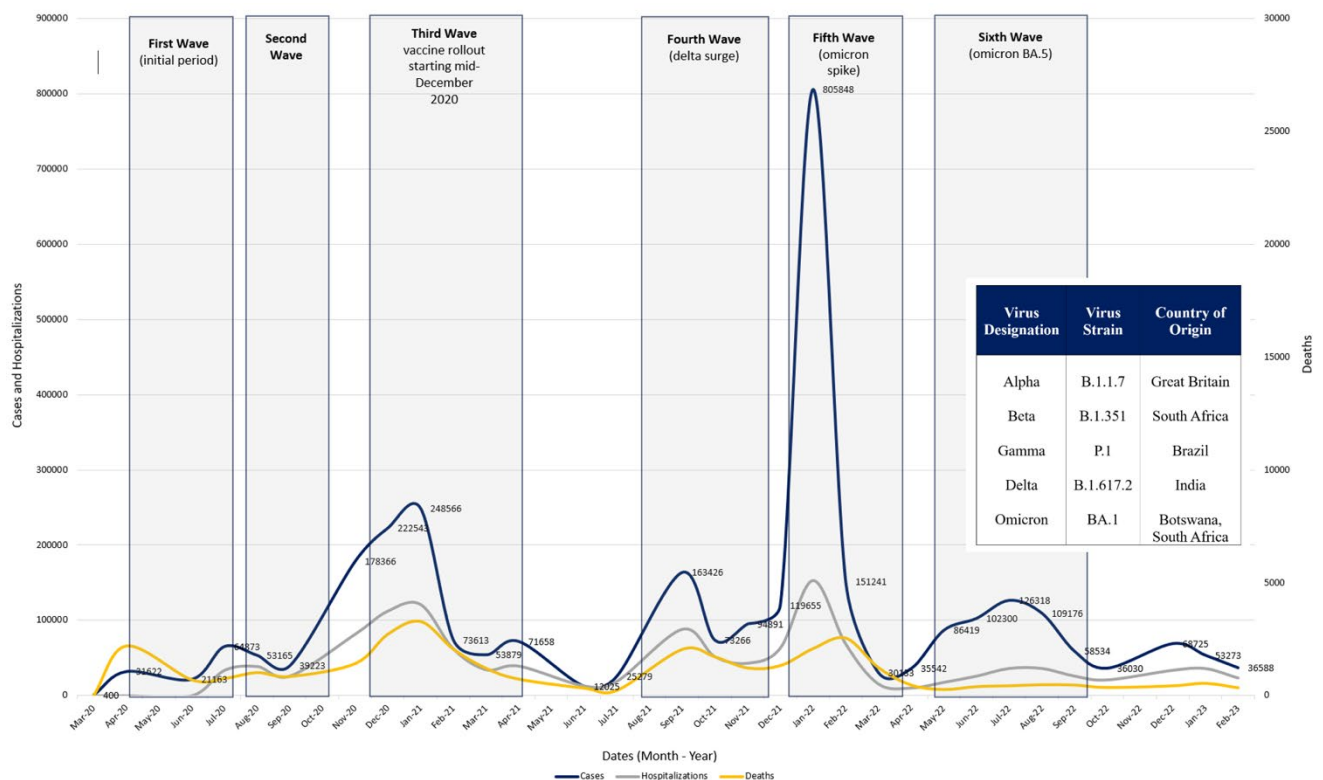
COVID-19 infections were shown to negatively impact healthcare-associated infections (HAIs) such as methicillin-resistant *S. aureus* (MRSA). Increased rates of bacterial

bloodstream infections and antibiotic resistant pathogens paralleled surges in COVID-19 cases.^{22, 23}

In contrast to increases in infectious disease cases, non-COVID, inpatient, emergency, and same-day surgery hospital admissions declined starting in March 2020 and into the end of the year, with the greatest declines in groups 17-years and younger and 65-years and older. Furthermore, surges in COVID cases were paralleled by decreases in acute care admissions, most likely due to aversion to catching COVID.²⁴ COPD/asthma, non-COVID pneumonia, and transient ischemic attack were among the top conditions associated with the largest admission declines. Hospitalization for pancreatitis, alcohol-related disorders, and diabetes returned to pre-pandemic levels; however, reduced admissions for conditions such as UTI, sepsis, COPD/asthma, and pneumonia persisted into June and July of 2020. Urgent conditions requiring immediate medical care, most notably, acute STEMI and cerebral infarction, demonstrated concerning declines.²⁵

During the early months of 2020, declines in routine cancer screenings (as a result of clinic closures and increased patient caution), such as those for the breast, colon, and cervix, decreased by 86-94%.²⁶ As prognosis and treatment outcomes for cancer greatly benefit from early detection, undetected and undiagnosed cancer could impact disease progression, treatment options, survival rates, and outcomes.²⁷

Figure 1. Number of Daily COVID-19 Cases, Hospitalizations, and Deaths from March 2020 – February 2023. Data sourced from Our World in Data “United States: Coronavirus Pandemic Country Profile” by Edouard Mathieu et al.⁵¹



Impact on Healthcare Workers

Physical, occupational, and psychological strain from the pandemic led to significant rates of burnout. In line with the Great Resignation—a period starting in early 2021 involving mass waves of workers leaving their jobs due to job dissatisfaction and burnout, among several things—many healthcare workers resigned, including an estimated 30% of nurses and nearly 1.7 million healthcare workers from January to May 2022.²⁸ An October 2021 study estimated 1 in 5 healthcare workers had quit their jobs. Subsequent employment varied, with workers reporting relocating to new healthcare employment locations, switching to more flexible healthcare roles, or departing from healthcare entirely.²⁹

During the initial and subsequent surges, healthcare workers faced uncertainty, increased hospitalizations, overwork, understaffing, massive supply shortages, detriments to mental health, and large-scale burnout. Mental health conditions such as anxiety, depression, and PTSD were observed in healthcare workers. Moreover, a survey comparing pre- and post-pandemic emotional exhaustion among healthcare workers (nurses, physicians, hospital staff, etc.) demonstrated preexisting burnout that was exacerbated by the pandemic.

Healthcare workers serving at the frontlines were at increased risk of infection. In a survey of 20,947 healthcare workers spanning from May to October 2020, 61% of surveyed individuals experienced fear over personal or family exposure to SARS-CoV-2. Anxiety or depression and work overload was reported in 38% and 43% of participants, respectively. Nearly half (49%) of participants reported experiencing burnout. Notably, higher scores were observed in frontline workers (nurses, nursing and medical assistants, respiratory therapists, and housekeepers) and minority populations (women and Black and Latinx employees). Allied health professionals (speech and occupational therapists and social workers) reported 60% burnout—the highest rate among those groups surveyed.³⁰

The Impact of COVID-19 on Mental Health in the U.S.

During the pandemic, rates of loneliness, anxiety, depression, substance use disorder, and suicide increased nationwide.

In a June 2020 CDC mental health survey, 41% of participants reported mental health difficulties, with 11% recently considering suicide. Groups with higher mental health risks include essential and frontline workers, ethnic and racial minority groups, unpaid caregivers, and young adults. In addition, 26.3% of survey respondents reported pandemic-related trauma-and-stressor-related disorder (TSRD).^{3, 31} During the winter of 2020, the CDC reported the highest number of drug overdose deaths in a year over 81,000. Amidst an ongoing U.S. opioid epidemic, synthetic opioid deaths for cocaine, methamphetamines, and synthetic opioids (predominantly fentanyl) increased by 27%, 35%, and 37% respectively.³

Common causes for decreased mental health in the U.S. during COVID-19 include financial instability, unemployment, job loss, homelessness, uninsured status, rising prices (inflation), lack of supplies (food, PPE), pervasive uncertainty, lack of social interaction, prolonged time indoors along with social confinement, loss of normalcy, feelings of frustration, confusion, and hopelessness, dislocation from normal routine, excess technology and social media usage, transition to a predominantly online environment, anxiety and worry regarding the virus and pandemic-related effects, and acute and chronic stress. As healthcare and frontline workers suffered from preexisting and COVID-19-related overwork, stress, and burnout, employees from all sectors faced similar feelings of stress, frustration, and burnout, leading many to exit their current positions.

Several studies have proposed COVID-19-related post-traumatic stress disorder (PTSD) in individuals who experienced particularly traumatizing COVID-19-related events, such as survivors who resided in high-risk hospitals or ICUs, individuals who required intensive treatments (ventilation, intubation), families who lost or witnessed sick loved ones, and vulnerable populations (children, youth, those with preexisting mental health disorders, and ethnic and racial groups who experienced discrimination).³² Alongside this, individuals who served as their family's primary caretakers experienced increased stressors, especially those tasked with taking care of both their children and parents (the sandwich generation) or those who lost loved ones during the pandemic. Two major peaks (in the beginning months of 2020 and ending months of 2020) in depression and worry occurred in 2020, followed by gradual resolution, mental health resilience, and relative return to baseline mental health status throughout 2021 and 2022 following vaccination and decreased death rates [Figure 2](#). Mental health struggles saw a peak in April 2020 where a Gallup poll demonstrated stress rising from 46% of surveyed participants in 2019 to 60%, which then declined back to 44% in June 2021. Increases in COVID-19 cases were paralleled by decreases in mental health status; however, this relationship was less well reflected during the January 2022 omicron peak, suggesting stabilizing or improvements in mental health following lower death rates, lower perceived virus severity, and increased vaccination.³³

The Impact of COVID-19 on Vulnerable Populations in the U.S.

Socioeconomic Status

As COVID-19 intensified, certain populations were more impacted compared to others [Figure 2](#). COVID-19 intensified and highlighted existing socioeconomic status (SES) disparities. SES determinants demonstrated strong associations with COVID-19 outcomes.

Interestingly, COVID-19 mortality was highest for higher SES groups in the beginning of the pandemic (March 2020 – May 2020) but shifted to higher mortality rates in lower SES groups in June 2020 – December 2020; this disparity increased as the

pandemic progressed. Death rates in lower SES counties were reportedly 2.58 times higher compared to higher SES counties.³⁴ In a study by Magesh et al., county median income was negatively associated with mortality (higher incomes were correlated with lower mortality rates) in White, Hispanic, African American, and Asian, populations.³⁵ Furthermore, lower educational levels were associated with greater rates of COVID-19 infection and mortality.³⁶ A study by Thryselius et al. found that individuals from higher SES and those who had earned higher educational degrees were more likely to perceive COVID-19 with higher risks and partake in preventive behaviors.³⁷

At the same time, pandemic conditions exacerbated systemic and deeply rooted nationwide food and shelter insecurity. During the pandemic, 52 million people in the U.S. were impacted by food insecurity, which increased by 17 million compared to before the pandemic.³ Individuals experiencing homelessness faced increased risk factors, including lack of safe housing, adequate food, proper PPE, accessible, adequate, and timely healthcare, and essential support services. Among those residing in shelters, social distancing and preventive practices were compromised as a result of limited space and supplies.³⁸

Additionally, amidst nationwide decreases in cancer screenings, individuals from low SES and minority groups were among those most affected.²⁶

Rural and Medically Underserved Populations

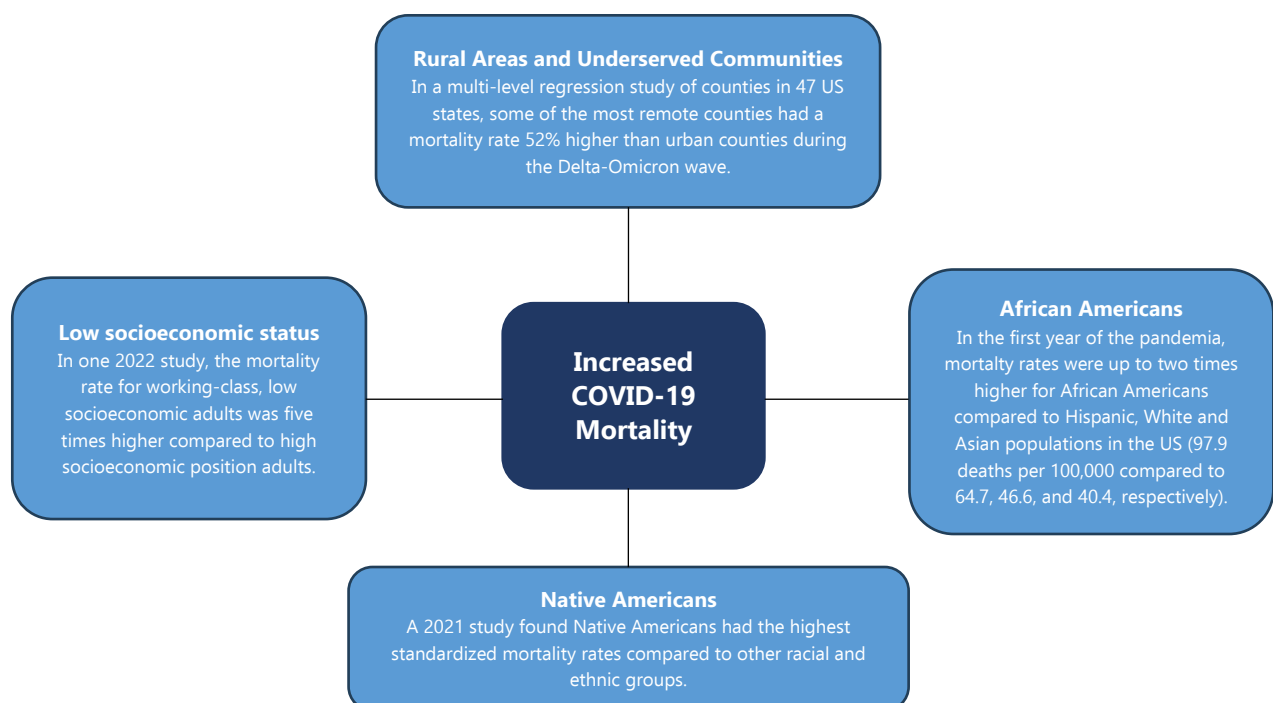
Over half of individuals living in rural areas did not have access to ICU beds compared to higher income areas.³ Lack of intensive

care facilities, along with higher COVID-19 infection rates, chronic disease, limited PPE and testing, preexisting comorbidities, and decreased access to healthcare services created the opportunity for higher rates of morbidity and mortality in rural communities and other underserved areas such as Native American reservations, inner cities, and urban gentrification zones. Food and shelter insecurity and lack of access to mental health services exacerbated these conditions.

For instance, decreased access to primary care providers among Hispanic populations was associated with higher rates of COVID-19 positivity. Among Black populations, rates of uninsurance and lack of healthcare coverage were positively associated with COVID-19 infection.³⁵

Interestingly, death rates among different population densities varied throughout the pandemic. Initially, highly and densely populated urban areas experienced the highest death rates. During the first wave, the death rate in highly populated areas was nine times that of less populated areas. However, following the first wave, higher death rates were consistently experienced in the least populated U.S. regions. Moreover, COVID-19 death rate hot spots shifted from the highly populated Northeast region to the less populated Midwest region over the course of the pandemic. Over the long-term course of the pandemic, overall death rates in least populated regions slightly exceed that of highly populated regions: 15 deaths per 100,000 compared to 13 deaths per 100,000.⁹

Figure 2. Groups Most Affected by COVID-19 in Terms of Mortality.⁵²⁻⁵⁵



Racial and Ethnic Minorities

A March 2020 – December 2020 CDC analysis demonstrated higher percentages of COVID-19 hospitalizations in racial and ethnic minority patients compared to White patients.³⁹

Death rates adjusted to age were lowest among multiracial, Asian, and Hispanic populations (378.8, 457.9, and 724.1 deaths per 100,000, respectively), and highest among American Indian/Alaskan Natives and Black populations (1,024 and 1,105 deaths per 100,000, respectively) compared to White populations (827.1 deaths per 100,000). However, the age-adjusted death rate for White populations was higher than that of multiracial, Asian, and Hispanic populations.⁴⁰ Furthermore, communities with a higher proportion of Black residents exhibited higher COVID-19 infection and mortality rates.³⁶ Moreover, higher COVID-19 positivity and ICU admissions were found in African, Hispanic, and Asian American groups compared to White patients.³⁵

Variations in healthcare and socioeconomic disparities were observed among different racial and ethnic groups. In a March 2021 U.S. Census Bureau report, 18 million adults and 8.8 million children lived in a home without adequate food. Of those facing food insecurity, 16% of the adults were Black, 16% were Latinx, and 6% were White. Of the children included in the report, 20% were Black or Latinx.³

In a study conducted by the American Medical Association (AMA), Black and Latinx worker-reported stress due to SARS-CoV-2 exposure or transmission was 70.1% and 74.4%, respectively, compared to 56% of White healthcare workers, though rates for burnout were slightly lower for these two groups compared to White healthcare workers.³⁰ Additionally, turnover (exiting from healthcare employment) rates were higher, as well as slower to recover, for healthcare workers from marginalized racial and ethnic groups, including female workers with younger children.⁴¹

Aged Population

Persons older than 60 years, along with persons with preexisting comorbidities (overweight or obese, cardiovascular disease, diabetes, chronic lung or kidney disease, autoimmune diseases, etc.) have an increased risk of COVID-19 infection, morbidity, and mortality.

As of February 2023, roughly 75.4% of total COVID-19 deaths in the United States were from the 65 years and older age group. The second highest age group was 50-64 years, representing 18.0% of U.S. COVID-19 deaths, followed by the middle age category (40-49 years) at 4.1% and the early middle age category (30 – 39 years) at 1.8%. Younger age groups (0-29 years) represented 0.75% of U.S. COVID-19 deaths.⁴² Higher COVID-19 mortality in older populations may be due to preexisting comorbidities (chronic heart disease, diabetes, kidney failure, liver disease, etc.), decreased respiratory capacity, decreased muscle mass, increased fat percentage, and malnutrition.

Discussion

COVID-19 disrupted global, national, and personal operations and disproportionately affected vulnerable and disadvantaged groups. The COVID-19 pandemic, and the resulting nationwide response to the pandemic, aggravated longstanding, accumulated healthcare inequities. Socioeconomically disadvantaged, medically underserved, and minority populations experienced higher death rates, as well as were more significantly affected by compounding factors worsened by the pandemic such as food insecurity, homelessness, decreased access to timely and adequate medical care, lack of insurance coverage, and discrimination. Black and Hispanic individuals made up a large percentage of frontline and service workers; increased exposure was augmented by decreased healthcare and insurance coverage and vaccine hesitancy. Compared to White populations, Black populations had lower vaccination rates while also having higher COVID-19 mortality rates.⁴³ Healthcare systems suffered from low supply, high demand, and burnout, and overall mental health declined during peak pandemic waves. We propose several suggestions for future healthcare and government responses based on these COVID-19 challenges and outcomes with emphasis on generating future policies that will minimize disadvantages to underserved and underrepresented populations and provide more equitable care.

Based on our analysis of the published literature, we are proposing several suggestions [Figure 3](#) to appropriately deal with potential future pandemics.

Using Technology to Increase Access to Care

The use of technology to adapt to pandemic needs allowed for the expansion of healthcare access to sectors previously underserved, thereby increasing healthcare access as well as reducing travel-associated costs and concerns. Individuals living in rural areas, older adults in longitudinal living facilities, and individuals living in medically underserved areas are better able to access health, therapy, and counseling services in an online format that also provides greater scheduling and location flexibility. Though technology may increase access to care, underserved populations may still not have the adequate infrastructure (computer and Internet access) to access services remotely. Therefore, additional funding would need to be allocated to address the drawbacks of this suggestion. Additionally, telehealth should not be used as a cure-all replacement for in-person clinical exams and evaluations and more so a way to increase patient options and healthcare access. Outreach programs targeting vulnerable populations may also be implemented to increase awareness of available health resources.

Increased Collaboration and Coordination

Implementation of COVID-19 measures varied widely across states, schools, and workplaces; in many cases, policies at one level contradicted policies at another level. Prevention strategies such as mask-wearing and social distancing were implemented at different levels and to different degrees. Lack of a centralized, unified plan and decentralization of the COVID-19 response from the federal government to individual states further worsened

confusion and conflict regarding the status, spread, and response to the virus and left vulnerable groups even more susceptible to infection and lack of access to adequate care, preventive equipment, and resources.

A more robust pandemic response may escalate the pandemic response to an issue of national security involving a centralized government response across multiple departments, states, and locales, and one with unified, clearly delineated procedures and supports for all 50 states.⁴⁴ Government officials may consider forming departments or positions staffed with scientists and public health authorities dedicated to proactively planning and implementing policies—in collaboration with government officials—in response to public health crises such as the COVID-19 pandemic. Positions may be formed to specifically direct and oversee public health responses focused on underserved and vulnerable populations.

Collaboration across cultural, political, and social differences is perhaps one of the most important components of a robust pandemic response. Insight can be taken from resource-limited countries such as Laos PDR, which, though faced with a severe shortage of resources and healthcare workers, was able to quickly and cohesively mobilize supplies, personnel, and vaccines to successfully control the virus following a sudden spike in cases.⁴⁵ Similar ideas to develop a robust, multi-disciplinary, multi-sector emergency response plan can be taken from a sample of 15 countries in the WHO Africa region in recruiting healthcare workers despite limited resources.⁴⁶ Additionally, implementation strategies from high-income countries—such as Canada, Germany, Norway, and Japan—can be integrated to specifically assess vulnerable populations.^{47, 48} Building trust and fostering open communication is an important step in creating and executing a more cohesive, coordinated pandemic response.

Preventing Medical Supply Shortages

Shortage of PPE and related equipment proved an obstacle in the initial pandemic phase. In conjunction with a centralized government response, companies may be incentivized to shift to PPE production during an emergency state and to increase internal production of equipment (PPE, ventilators) instead of relying on hard-stretched overseas imports. A centralized distribution system could be established for distributing preexisting stocks of equipment and PPE with priority ranking systems in place for COVID-19 hotspots. Priority should be placed on hard-hit healthcare areas and populations identified to be high-risk.^{20, 49}

Shifting from a predominantly external to internal source of PPE and healthcare equipment may pose a challenge regarding lack of infrastructure to meet short-term production demands and shortage of companies and personnel willing to participate. Thus, this drawback may require additional funding and consideration before implementation.

Combating Misinformation

Misinformation persisted widely in the U.S. during the pandemic and in extreme cases resulted in dangerous health behaviors. Vaccine hesitancy was notably prevalent in groups with worse COVID-19 outcomes. In combating misinformation and fostering an environment of trust and collaboration, emphasis should be placed on collaboration between the sciences, social sciences, and communication studies in delivering sound, secure, and factual information in a social media age of rapid information proliferation.

Figure 3. Proposed Strategies for Effective Responses Against Future Pandemics in the U.S.



In this technological age, partnerships between science and social media are important in identifying, screening for, and stopping misinformation and finding ways to increase health literacy on a widespread scale in the interest of public health without violating the right to freedom of speech and press.

In a “fight fire with fire approach,” the scientific community can use the massive scale and speed of social media to combat misinformation and share vetted, peer-reviewed facts to correct misinformation and increased trust in the scientific, medical, and scholarly community and their findings.

Conclusions

Takeaways from the Pandemic

The SARS-CoV-2 pandemic shook the globe with impacts echoing through all systems, communities, and nations. We present the following takeaways from the COVID-19 pandemic in the U.S.:

- In the U.S., the pandemic was met with an initial stage of confusion, overwhelmingness, and shock to healthcare systems.
 - Healthcare systems faced inadequate supplies, understaffing concurrent with overloading, and mass burnout.
- Long-standing inequities and gaps in healthcare, especially in minority and underserved populations, were exacerbated by the pandemic.
 - Higher morbidity and mortality rates were found for counties with lower average socioeconomic status, rural and underserved communities, certain racial and ethnic minorities, older age groups (65+ years), and individuals with preexisting comorbidities (obesity and heart, lung, liver, and kidney disease).
- Perhaps the most critical lesson and takeaway is the importance of collaboration.
 - The efforts of brave healthcare, frontline, and essential workers, as well as the perseverance of scientists led to the development of a relatively effective vaccine and COVID-19 treatments.

- The unprecedented sharing of reagents and resources between scientists and doctors from different countries contributed to advances in this area.
- International journals made special efforts by providing COVID-19 scientific publications through open access forums for scientists to follow the ongoing work on diagnostics, drug, and vaccine development.
- Collaboration, open communication, and a centralized, cohesive response across cultural, political, and social differences will allow for a more robust future pandemic response—if another such arises—and one that can save millions of lives.

Summary – Accelerating Translation

The purpose of this review was to discuss the impact of COVID-19 in the United States from the perspectives of government policies and the U.S. healthcare system. Specifically, we strive to highlight key COVID-19 challenges, outcomes, and takeaways to further increase awareness among healthcare and public health professionals for more efficient, effective, and equitable healthcare system preparedness and public health responses to deal with future epidemics. A narrative review was conducted and data for this review was obtained through searching the database PubMed for articles addressing COVID-19 in the United States. Articles selected for inclusion ranged from 2020 – 2023 and were written in English. A total of 45 articles were selected for this analysis. The emergence of multiple viral variants was at the center of sequential waves of infection in the U.S., resulting in increased number of cases, hospitalization, and deaths along with associated mental health sequelae in the population.⁵⁰ Lack of uniform policies at the local, state, and federal levels exacerbated the situation. These factors contributed to significant healthcare worker burnout. Furthermore, the disease caused higher morbidity and mortality rates in specific groups such as lower average socioeconomic status, rural and underserved communities, Native Americans and African Americans, and older age groups (65+ years). Based on these results and analyses, we proposed several suggestions for healthcare and government responses to address potential future epidemics, including using technology to increase access to care, increasing collaboration and coordination, preventing medical supply shortages, and combatting misinformation.

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Acknowledgments

None

Conflict of Interest Statement & Funding

The Authors have no funding, financial relationships or conflicts of interest to disclose.

Author Contributions

RW, MP, AS. Methodology: RW, MP; Formal Analysis: RW, MP; Investigation: RW, MP; Writing – Original Draft: RW, MP, AS; Writing – Review & Editing: RW, MP, AS; Visualization: RW, AS; Supervision: MP; Project Administration: MP.

Cite as

Williams R, Srinivasan A, Periasamy M. Exploring the Impact of COVID-19 on the Healthcare System and Vulnerable Populations in the United States. *Int J Med Stud*. 2024 Apr-Jun;12(2):185-194

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ISSN 2076-6327

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