IJTMGH
International Journal of Travel Medicine and Global Health

Int J Travel Med Glob Health. 2021 Dec;9(4):176-182
http://ijtmgh.com

doi 10.34172/ijtmgh.2021.29

Original Article

Open Access

Inequalities in Accessing Healthcare in the United States of America: A Major Contributor to the Increasing COVID-19 Morbidity and Mortality

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Received July 14, 2021; **Accepted** November 20, 2021; **Online Published** December 5, 2021

Abstract

Introduction: Many COVID-19 cases and deaths have been reported from the United States (US). This study aimed to assess the health system inequalities as a determinant of COVID-19 case morbidity and mortality in the US.

Methods: This study collected data on US COVID-19 cases and deaths as of the 27th of January 2021 from the Worldometer and COVID-19 Community Vulnerability Index. The strength of association between the social vulnerability index (SVI), total COVID-19 deaths and tests, and regional population in the US were determined using Pearson's correlation. *P* values < 0.05 were statistically significant.

Results: New York has the highest SVI (0.94) in the North-Eastern region and the highest percentage of non-Whites. California has the highest SVI (0.90) in the Western region and the highest proportion of Asians. In the mid-Western region of the US, Illinois has the highest SVI (0.88) and the highest proportion of African Americans and Asians. North Carolina has the highest SVI of (1.00) in the Southern region and the highest proportion of African Americans. A strong positive correlation exists between the SVI and total COVID-19 tests ($P=0.001$) in the North-eastern and Southern regions ($P=0.025$). In addition, a positive correlation ($P<0.039$) exists between SVI and the total population in the Western and mid-Western regions ($P<0.003$).

Conclusion: Multi-sectoral collaboration should be encouraged to promote equity in accessing COVID-19 healthcare in the US, especially in States with high COVID-19 SVI.

Keywords: Healthcare Policy, Health Services Accessibility, Health Status Disparities, Public Health

Citation: Ilesanmi OS, Afolabi AA, Awoniyi O. Inequalities in accessing healthcare in the united states of america: a major contributor to the increasing covid-19 morbidity and mortality. Int J Travel Med Glob Health. 2021;9(4):176-182. doi:10.34172/ijtmgh.2021.29.

Introduction

The novel coronavirus (COVID-19) outbreak has swept across the globe and has accentuated the frailties and inequities existing in the state of the World's system.[1,2] Prior to the COVID-19 pandemic, inequity has been evident in the unequal distribution of material and economic resources across different population groups motivated by education, conflicts, famine, low living standards, geographical location.[3,4] It has therefore resulted in better access to healthcare for some populations than others.[4]

During the COVID-19 pandemic, however, the inherent inequities have made some population groups more vulnerable to the risk of COVID-19 morbidity and mortality than others.[5] For example, in the United States of America (US), unequal access to healthcare has been reported against minority groups such as residents in areas of low socioeconomic status.[6,7] It has therefore contributed to a reduction in the quality of life of individuals in these groups.[6,7] In addition, poor access to nutritious and adequate diets in many states with a high population of minorities groups could have also increased the vulnerability of this group to COVID-19.[7]

In addition, the low income earned by many in numerous communities with a high minority population could lead to a delay in accessing adequate healthcare.[7] Furthermore, the increasing rate of unemployment from 3.68%-3.86% in 2019 and 2020 respectively in the US, caused by quarantining, nationwide lockdown, and work closure, could have led to a fall in personal and household income.[8,9] According to the Center for Disease Control and Prevention (CDC), people experiencing food insecurity are likely in poorer health than the rest of the population. They are more vulnerable to diabetes mellitus and hypertension.

People with these chronic medical conditions are at a high risk of severe symptoms if they contract COVID-19.[10]

These could have reduced economic capacity to meet dietary requirements, thus leading to household food insecurity and an increased vulnerability to infections which could have made many individuals increasingly susceptible to COVID-19. In addition, long-term exposure to adverse working conditions such as ergonomic hazards and working conditions that are associated with an increased risk of musculoskeletal and respiratory diseases could increase the burden of COVID-19.[7]

Some essential service providers such as those working in food production, sanitation companies, and other service sectors are more likely to be disadvantaged.[6,7] In most cases, these persons are commuters on public transport, and this could increase their chances of being infected with COVID-19.[7] These factors could therefore explain to a reasonable extent the high proportion of COVID-19 cases and deaths in the US during the first wave of COVID-19 pandemic. Higher morbidity, case fatality, and transmission rate are all characteristic of the second wave of COVID-19. As the second wave ends and the third COVID-19 wave emerges, COVID-19 cases are expected to rise in the United States, especially in communities with a large proportion of minority groups.[11,12]

It becomes pertinent to assess the inequities in healthcare access in the US as a gateway to identify potential population groups who may compromise the healthcare of persons in other communities and the entire US knowledge obtained in this regard. It would be needful to avert an overwhelmed state of the healthcare system associated with an increasing burden of the COVID-19. Such research would be essential to develop a proactive approach to strategize the modalities for reducing vulnerability to COVID-19 both at an individual and a regional level in the US. This study, therefore, aimed to assess the inequities in the healthcare system as a significant determinant of COVID-19 case morbidity and mortality in the US.

Methods

The current study collected data on COVID-19 cases and deaths as of the 27th of January 2021 from online repositories.[13] The US COVID-19 data were retrieved from the social vulnerability index (SVI). The SVI is a certified measuring tool developed by the Centers for Disease Control and Prevention (CDC) to identify vulnerable communities, especially those needing extra resources throughout a natural or artificial disaster.[14,15] The SVI is aimed at improving the response of policymakers and critical health officials to health emergencies. Several factors are assessed to determine the vulnerability of each community.

In this context, the healthcare system factors include the strength or weakness of the health system, healthcare accessibility, and health system preparedness. The indicators included health expenditure per capita, the aggregate cost of medical care, percent of the population with a primary care physician, per capita funding for total health emergency preparedness, number of health laboratories per 100 000 population, and emergency services per 100 000 population in the United States. The composite CCVI measuring tool was used to rank each state concerning others on a scale of "0", indicating "least vulnerable," to "1," indicating "most vulnerable." Using information retrieved from National Geographic, the 50 states in the US and the district of Columbia were grouped into regional zones, namely the North-Eastern, Southern, Mid-Western, and Western.[16] Population percentages based on race were obtained from the United States Census Bureau on the 1st of July 2019.

The data obtained were entered into the Statistical Software for the Social Sciences, on which data analysis was done.[17] The strength of association between the SDI, total COVID-19 deaths, total COVID-19 tests, total COVID-19 tests per million population, and the population of the United States of America regions were determined using Pearson's correlation. P values < 0.05 were statistically significant.

Results

In the North-Eastern region of the US, New York has the highest SVI of 0.94. 2208 COVID19 deaths per million population were recorded in New York as of the 27th of January 2021. In New York, 31 128 149 COVID-19 tests had been conducted, with 1 600 126 COVID-19 tests per million population conducted out of a total population of 19 453 561 as of the reference date. New York had the highest percentage of African Americans, Hispanics, and Asians in the North-Eastern region (Table 1).

Vermont has the lowest SVI of 0 in the North-Eastern and has recorded 276 COVID-19 deaths per million population of the 27th of January 2021. In Vermont, 862 821 COVID-19 tests had been conducted, with 1 382 750 COVID-19 tests per million population conducted out of a total population of 623 989 of the reference date. In addition, Vermont has the lowest percentage of African Americans and Hispanics in the North-Eastern region (Table 1)

In the Western region of the US, California has the highest SVI of 0.90, while Arizona has the second-highest of 0.82. 978 and 1737 COVID-19 deaths per million population were recorded in California and Arizona, respectively, as of the 27th of January 2021. In California, 41 252 482 COVID-19 tests had been conducted, with 1 044 044 COVID-19 tests per million population conducted out of a total population of 39 512 223 of the reference date. California has the highest percentage of Asians in the Western region (Table 2).

Montana has the lowest SVI of 0.14 in the western region and has recorded 1124 COVID-19 deaths per million population as of the 27th of January 2021. In Montana, 927 981 COVID-19 tests had been conducted, with 868 264 COVID-19 tests per million population conducted out of a total population of 1 068 778 of the reference date. In addition, Montana has the lowest percentage of African Americans and Asians in the Western region (Table 2).

In the mid-Western region of the US, Illinois has the highest SVI of 0.88, while Missouri has the second-highest of 0.78. Also, 1653 and 1190 COVID-19 deaths per million population were recorded in Illinois and Missouri, respectively, as of the 27th of January 2021. In Illinois, 15 633 443 COVID-19 tests had been conducted, with 1 233 717 COVID-19 tests

Table 1. Social Vulnerability Index of Healthcare System Factors, COVID-19 Tests and Deaths, and the Population in the North-Eastern Region of the United States

State	SVI*	COVID-19 Deaths/1 Million Population	Total COVID-19 Tests	Tests /1 million Population	Total Population	African Americans	American Indians and Alaska Natives	Hispanics or Latino [a]	Whites Alone	Asians Alone
Connecticut	0.12	1957	5 618 321	1 575 840	3 565 287	12.2%	0.6%	16.9%	65.9%	5.0%
Maine	0.16	418	1 507 150	1 121 215	1 344 212	1.7%	0.7%	1.8%	93.0%	1.3%
Massachusetts	0.36	2075	13 192 478	1 914 033	6 892 503	9.0%	0.5%	12.4%	71.1%	7.2%
New Hampshire	0.08	740	1 224 489	900 551	1 359 711	1.8%	0.3%	4.0%	89.8%	3.0%
New Jersey	0.56	2389	9 224 963	1 038 591	8 882 190	15.1%	0.6%	20.9%	54.6%	10.0%
New York	0.94	2208	31 128 149	1 600 126	19 453 561	17.6%	1.0%	19.3%	55.3%	9.0%
Pennsylvania	0.54	1651	8 994 398	702 578	12 801 989	12.0%	0.4%	7.8%	75.7%	3.8%
Rhode Island	0.04	2015	2 451 147	2 313 798	1 059 361	8.5%	1.1%	16.3%	71.4%	3.7%
Vermont	0.00	276	862 821	1 382 750	623 989	1.4%	0.4%	2.0%	92.6%	1.9%

Abbreviation: SVI, social vulnerability index.
The percentage of Native Hawaiian and other pacific islanders alone was not shown on the table because they have values greater than zero but less than half of the measurements shown.
[a]Hispanics may be of any race, so they also are included in applicable race categories.

Table 2. Social Vulnerability Index of Healthcare System Factors, COVID-19 Tests and Deaths, and the Population in the Western Region of the United States

State	SVI	COVID-19 Deaths/ 1 Million Population	Total Tests	Tests/ 1 Million Population	Total Population	African Americans	American Indians and Alaska Natives	Hispanics or Latino[a]	Whites Alone	Asians Alone
Alaska	0.24	354	1 467 400	2 005 892	731 545	3.7%	15.6%	7.3%	60.2%	6.5%
Arizona	0.82	1,737	3 809 098	523 320	7 278 717	5.2%	5.3%	31.7%	54.1%	3.7%
California	0.90	978	41 252 482	1 044 044	39 512 223	6.5%	1.6%	39.4%	36.5%	15.5%
Colorado	0.44	964	2 368 241	411 243	5 758 736	1.8%	0.3%	4.0%	67.7%	3.0%
Hawaii[b]	0.28	285	953 191	673 218	1 415 872	2.2%	0.4%	10.7%	21.7%	37.6%
Idaho	0.38	959	975 555	545 898	1 787 065	0.9%	1.7%	12.8%	81.6%	1.6%
Montana	0.14	1124	927 981	868 264	1 068 778	0.6%	6.7%	4.1%	85.9%	0.9%
Nevada	0.66	1342	2 445 386	793 916	3 080 156	10.3%	1.7%	29.2%	48.2%	8.7%
New Mexico	0.64	1525	2 271 257	1 083 187	2 096 829	2.6%	11.0%	49.3%	36.8%	1.8%
Oregon	0.58	456	3 122 704	740 374	4 217 737	2.2%	1.8%	13.4%	75.1%	4.9%
Utah	0.80	505	3 251 095	1 014 079	3 205 958	1.5%	1.6%	14.4%	77.8%	2.7%
Washington	0.74	565	4 470 215	587 036	7 614 893	4.4%	1.9%	13.0%	67.5%	9.6%
Wyoming	0.22	1030	616 677	1 065 516	578 759	1.3%	2.7%	10.1%	83.7%	1.1%

Abbreviation: SVI, social vulnerability index.
[a]Hispanics may be of any race, so also are included in applicable race categories
[b]Hawaii has a 10.1% Native Hawaiian and Other Pacific Islander population, and they also have 24.2% people with two or more races.
The percentage of Native Hawaiian and other pacific islanders alone was not shown on the table because they have values greater than zero but less than half of the measurements shown.

per million population conducted out of a total population of 12 671 821 f the reference date. In addition, Illinois has the highest percentage of African Americans, Hispanics or Latinos, and Asians in the mid-Western region (Table 3).

Nebraska has the lowest SVI of 0.14 in the mid-western region and has recorded 985 COVID-19 deaths per million population as of the 27th of January 2021. In Nebraska, 914 909 COVID-19 tests had been conducted, with 472 966 COVID-19 tests per million population conducted out of a total population of 1,934,408 of the reference date. Nebraska has a relatively high population of Whites and Hispanics or Latinos in the mid-Western region (Table 3).

In the Southern region of the US, North Carolina has the highest SVI of 1.00. Also, 850 COVID-19 deaths per million population were recorded in North Carolina as of the 27th of January 2021. In North Carolina 8 580 157 COVID-19 tests had been conducted, with 818 086 COVID-19 tests per million population conducted out of a total population of 10,488,084 as of the reference date. North Carolina has a higher proportion of Whites than other races (Table 4).

The District of Columbia has the lowest SVI of 0.02 in the Southern region and has recorded 1268 COVID-19 deaths per million population as of the 27th of January 2021 (Table 4). In the District of Colombia, 1 064 329 COVID-19 tests had been conducted, with 1 508 084 COVID-19 tests per million population conducted out of a total population of 705 749 of the reference date. The District of Colombia has the highest proportion of African Americans in the Southern region (Table 4).

There is a strong positive correlation of 0.91 between the

Table 3. Social Vulnerability Index of Healthcare System Factors, COVID-19 Tests and Deaths, and the Population in the Mid-Western Region of the United States

State	SVI	COVID-19 Deaths/ 1 Million Population	Total COVID-19 Tests Conducted	Tests /1 Million Population	Total Population	African Americans	American Indian and Alaska Native	Hispanics or Latino[a]	White Alone	Asians Alone
Illinois	0.88	1653	15 633 443	1 233 717	12 671 821	14.6%	0.6%	17.5%	60.8%	5.9%
Indiana	0.62	1462	6 830 296	1 014 568	6 732 219	9.9%	0.4%	7.3%	78.4%	2.6%
Iowa	0.52	1426	1 459 926	462 724	3 155 070	4.1%	0.5%	6.3%	85.0%	2.7%
Kansas	0.40	1276	1 159 776	398 095	2 913 314	6.1%	1.2%	12.2%	75.4%	3.2%
Michigan	0.68	1533	9 801 902	981 480	9 986 857	14.1%	0.7%	5.3%	74.7%	3.4%
Minnesota	0.72	1098	6 420 268	1 138 420	5 639 632	7.0%	1.4%	5.6%	79.1%	5.2%
Missouri	0.78	1190	4 815 665	784 639	6 137 428	11.8%	0.6%	4.4%	79.1%	2.2%
Nebraska	0.18	985	914 909	472 966	1 934 408	5.2%	1.5%	11.4%	78.2%	2.7%
North Dakota	0.26	1858	392 001	514 395	762 062	3.4%	5.6%	4.1%	83.7%	1.7%
Ohio	0.46	935	8 872 864	759 072	11 689 100	13.1%	0.3%	4.0%	78.4%	2.5%
South Dakota	0.32	1966	399 210	451 259	884 659	2.3%	9.0%	4.2%	81.5%	1.5%
Wisconsin	0.30	994	3 023 506	519 286	5 822 434	6.7%	1.2%	7.1%	80.9%	3.0%

Abbreviation: SVI, social vulnerability index.
The percentage of Native Hawaiian and other pacific islander alone were not shown on the table because they have values great than zero but less than half unit of measure shown.
[a]Hispanics may be of any race, so also are included in applicable race categories.

Table 4. Social Vulnerability Index of Healthcare System Factors, COVID-19 Tests and Deaths, and the Population in the Southern Region of the United States

State	SVI	COVID-19 Deaths/ 1 Million Population	Total COVID-19 Tests Conducted	Tests /1 Million Population	Total Population	African Americans	American Indian and Alaska Native	Hispanics or Latino [a]	White Alone	Asians Alone
Alabama	0.96	1463	2 208 752	450 473	4 903 185	26.8%	0.7%	4.6%	65.3%	1.5%
Arkansas	0.70	1571	2 730 372	904 755	3 017 804	15.7%	1.0%	7.8%	72.0%	1.7%
Delaware	0.10	1101	576 414	591 944	973 764	23.2%	0.7%	9.6%	61.7%	4.1%
District of Columbia	0.02	1268	1 064 329	1 508 084	705 749	46.0%	0.6%	11.3%	37.5%	4.5%
Florida	0.92	1203	18 631 782	867 493	21 477 737	16.9%	0.5%	26.4%	53.2%	3.0%
Georgia	0.98	1285	6 733 930	634 234	10 617 423	32.6%	0.5%	9.9%	52.0%	4.4%
Kentucky	0.48	793	3 964 224	887 313	4 467 673	8.5%	0.3%	3.9%	84.1%	1.6%
Louisiana	0.50	1869	5 200 248	1 118 623	4 648 794	32.8%	0.8%	5.3%	58.4%	1.8%
Maryland	0.20	1157	6 819 049	1 127 921	6 045 680	31.1%	0.6%	10.6%	50.0%	6.7%
Mississippi	0.60	1988	2 153 200	723 485	2 976 149	37.8%	0.6%	3.4%	56.4%	1.1%
North Carolina	1.00	850	8 580 157	818 086	10 488 084	22.2%	1.6%	9.8%	62.6%	3.2%
Oklahoma	0.34	856	3 114 290	787 039	3 956 971	7.8%	9.4%	11.1%	65.0%	2.4%
South Carolina	0.42	1296	4 760 665	924 632	5 148 714	27.0%	0.5%	6.0%	63.7%	1.8%
Tennessee	0.76	1364	6 233 246	912 738	6 829 174	17.1%	0.5%	5.7%	73.5%	2.0%
Texas	0.86	1246	19 329 087	666 615	28 995 881	12.9%	1.0%	39.7%	41.2%	5.2%
Virginia	0.84	730	6 323 165	740 806	8 535 519	19.9%	0.5%	9.8%	61.2%	6.9%
West Virginia	0.06	1090	1 867 235	1 041 898	1 792 147	3.6%	0.3%	1.7%	92.0%	0.8%

Abbreviation: SVI, social vulnerability index.
The percentage of Native Hawaiian and other pacific islander alone were not shown on the table because they have values great than zero but less than half unit of measure shown.
[a]Hispanics may be of any race, so also are included in applicable race categories.

SVI and the number of COVID-19 tests conducted ($P = 0.001$) and population ($P < 0.001$) in the North-Eastern region. There is a positive correlation of 0.576 between the SVI and total population ($P < 0.039$). The SVI and total COVID-19 tests are positively correlated in the Southern region of the US ($P = 0.025$). In the Mid-western region, there is a positive correlation of 0.78 between the SVI and total population ($P < 0.003$) (Table 5).

Discussion

This study revealed a strong positive correlation between the SVI and the number of COVID-19 tests conducted in the North-Eastern USA region. It implies that the more the number of COVID-19 tests conducted, the higher the SVI. Many states in the North-Eastern region of the US have a low SVI, characterized by health system preparedness and a strong health system. As a result, plans were put in place to

Table 5. Correlation Between the Social Vulnerability Index, COVID-19 Tests and Deaths, and the Population of the Regions in the United States

Region	Statistics	COVID-19 Deaths Per Million	Total COVID-19 Tests	COVID-19 Tests Per Million	Population
	Pearson correlation with SVI	0.592	0.910	-0.167	0.977
North-eastern	*P* value	0.093	**0.001***	0.667	**<0.001***
	N	9	9	9	9
	Pearson correlation with SVI	0.261	0.523	-0.238	0.576
Western	*P* value	0.388	0.067	0.434	**0.039***
	N	13	13	13	13
	Pearson correlation with SVI	0.059	0.542	-0.583	0.594
Southern	*P* value	0.823	**0.025**	**0.014***	**0.012***
	N	17	17	17	17
	Pearson correlation with SVI	0.047	0.780	0.846	0.684
Mid-western	*P* value	0.885	**0.003***	**0.001***	**0.014***
	N	12	12	12	12

Abbreviation: SVI, social vulnerability index.
*$P<0.05$.

ensure access to rapid testing among many individuals. Such plans have been reported to have been conducted in many countries around the globe.[18] Although the North-Eastern region is less vulnerable to COVID-19, the higher prevalence of the non-communicable disease among Whites (who are more in this region) is a risk factor for COVID-19 morbidity and comorbidity, and fatality. Therefore, to put COVID-19 case morbidity and mortality in check in the North-Eastern region, COVID-19 tests were provided and made accessible to many to protect them from COVID-19 infection and associated comorbidities. Therefore, this could explain our findings on the insignificant association between SVI and COVID-19 deaths per million in the North-Eastern USA region.

In the Western region of the US, we found a significant moderate positive association between the total population and SVI. It implies that residents of the Western Region of the US are at high risk for COVID-19 infection. Underlying factors responsible for this could include the large population of females compared to males, the aging population, and comorbidity associated with the aging population. For instance, literature has proven that women's hormonal factors predispose them to infections than their male counterparts.[19-21] The aging population is characterized by a higher risk of hypertension and reduced body immunity, all of which increase their vulnerability to COVID-19. As a result, the high SVI in the Western region translated to increased COVID-19 tests and reduced COVID-19 deaths, although at insignificant levels. Therefore, this finding suggests that increasing COVID-19 tests due to high SVI could reduce the expected proportion of COVID-19-related deaths.

In the Western region of the US, we found a significant moderate correlation between SVI and total COVID-19 tests conducted, COVID-19 tests per million, and total population. Therefore, it affirms the evidence presented in the literature on the greater vulnerability and higher rate of COVID-19 transmission in crowded communities.[22] It shows that the high COVID-19 SVI in many States in the Western Region of the US influenced decision-making regarding total COVID-19 tests. However, a slight positive correlation was observed between the SVI and COVID-19 deaths per million. This finding shows that implementing COVID-19 tests and increasing the tests conducted per million population due to the high SVI is likely to reduce COVID-19 deaths. Therefore, commencing COVID-19 tests early enough during the COVID-19 outbreak would contribute towards placing COVID-19 deaths in check.

In the Mid-Western region of the US, we found a significantly strong positive correlation between SVI and total COVID-19 tests conducted, COVID-19 tests per million, and total population. A weak positive correlation was observed between SVI and COVID-19 deaths per population. This finding highlights that the COVID-19 SVI in the Mid-Western region increased COVID-19 deaths. Although the correlation was insignificant, it could be inferred that the total COVID-19 tests and tests per million helped to identify positive COVID-19 cases early enough. This would have helped prompt care for positive cases and reduce the proportion of deaths due to COVID-19. Prompt identification of COVID-19 cases through testing has been identified as a strategy to break the chain of transmission of COVID-19 and reduce COVID-19-associated deaths.[23,24]

Racial and ethnic minority groups such as African Americans, Native American Indians, and Hispanics earn less than non-Hispanic Whites and earn less income, and are less likely to have health insurance, afford required medications, and specialized care. These factors are associated with a higher risk for COVID-19 morbidity and mortality.[25] For example, in societies such as Bronx and Brooklyn in New York, Hispanics and African Americans have been found to have obesity rates of 32% and 27%, respectively. Thus having an increased susceptibility to COVID-19.[26] American Indians and Alaska natives have a high rate of COVID-19 hospitalization of about 5.3 times that non-Hispanic whites. Also, African Americans and Hispanics are nearly 4.7 times at risk for COVID19 hospitalization than non-Hispanic whites.[26] Therefore, strategies to ensure the universal provision of COVID-19 services at reduced cost should be considered. These could

include the inclusion of COVID-19 services as a part of the social protection services.

Strengths and Limitation

The findings from this study could have been limited using secondary data in the analysis. Despite this limitation, the data were retrieved from national and credible databases. Also, our findings provide relevant knowledge on the underlying factors influencing COVID-19 cases and deaths in the US; available knowledge regarding the second wave of the COVID-19 outbreak during this period adds more relevance to this study.

Conclusion

The pre-existing healthcare inequity has contributed to an increased vulnerability of minority groups in the US to COVID-19. If left unaddressed, the rapid spread of COVID-19 among these groups could promote the COVID-19 transmission rate in the US as the third wave emerges. Therefore, effective strategies need to be promptly implemented against healthcare inequity in the US to avert their ripple effect, and a bulk of this responsibility lies with policymakers. Firstly, the American public policy should embrace a policy that promotes fairness, justice, and equity to all. Secondly, policymakers should be more responsible and responsive towards enacting and enforcing the protection of civic rights, including access to quality healthcare and resources. Finally, equity in the provision of COVID-19 tests and management should be implemented early enough. Equity will promote the US's overall progress, contribute to a considerable fall in the COVID-19 cases and deaths, and enhance some level of health system preparedness in the US, especially as the third wave of COVID-19 emerges. To achieve such multi-sectoral collaboration is essential.

Research Highlights

What Is Already Known?

- Prior to the COVID-19 pandemic, inequity has been evident in the unequal distribution of material and economic resources across different population groups.
- Long-term exposure to adverse working conditions such as ergonomic hazards and working conditions that are associated with an increased risk of musculoskeletal and respiratory diseases could increase the burden of COVID-19.
- In the United States of America, unequal access to healthcare could contribute to a reduction in the quality of life of affected individuals.

What Does This Study Add?

- The SVI is an indicator of the strength and preparedness of the health system preparedness.
- Conducting COVID-19 tests and increasing the tests conducted per million population due to a high SVI is likely to reduce COVID-19 deaths.
- Commencing COVID-19 tests early enough during the COVID-19 outbreak would contribute towards placing COVID-19 deaths in check.

Authors' Contributions

OSI conceptualized the study. OSI, AAA, and OA participated in data collection. OSI and AAA conducted data analysis. AAA wrote the initial draft of the manuscript. All three authors revised the manuscript for critical intellectual content and approved the final version of the manuscript.

Conflict of Interest Disclosures

The authors declared no conflict of interest.

Ethical Approval

This study utilized secondary data. As a result, ethical issues such as confidentiality, privacy, and informed consent were not considered. In addition, no ethical approval from an ethics board was required.

Funding/Support

None.

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