

# Health Disparities of Coronavirus Disease 2019 in Texas, March–July 2020

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**Objectives:** Although disparities in coronavirus disease 2019 (COVID-19) prevalence are known, knowledge of the recent surge of COVID-19 in Texas and factors affecting fatality rates is limited. Understanding the health disparities associated with COVID-19 can help healthcare professionals determine the populations that are most in need of COVID-19 preventive care and treatment. The aim of this study was to assess COVID-19-related case and mortality rates.

**Methods:** Our cross-sectional analysis used Texas Department of State Health Services COVID-19 case surveillance counts. Case, hospitalization, and mortality counts were obtained from March to July 2020.

**Results:** From March to July 2020, there were 420,397 COVID-19-related cases and 6954 deaths in Texas. There were 3277 new cases and 104 deaths in March, and 261,876 new cases and 3660 deaths in July. The number of new COVID-19 cases was the highest from March to April (relative risk 1.77, 95% confidence interval [CI] 1.76–1.78). Although the death rate in June was a 30% increase over the rate in May, death rates nearly tripled by the end of July, for a total of 3660 deaths. Of the 3958 deaths, demographic data were available for 753 deaths. Of these, 440 were male, 16 Asian, 95 Black, 221 Hispanic, 325 White, and 96 were “Other” or “Unknown.” Males were associated with a slightly higher chance of acquiring COVID-19 than females (odds ratio [OR] 1.11, 95% CI 1.09–1.14) and nearly a 29% higher chance of dying of COVID-19 compared with females (OR 1.29, 95% CI 1.11–1.49). Bivariate analysis revealed that the probability of acquiring COVID-19 was 12% higher in older adults compared with individuals younger than 65 years old (OR 1.12, 95% CI 1.08–1.16), and older adults had an 18.8 times higher risk of death when compared with the rate of younger individuals (OR 18.79, 95% CI 15.93–22.15). Hispanics and Blacks were 70% and 48%, respectively, more likely to contract COVID-19 than Whites. All races had lower significant chance of death when compared with Whites. At the end of July, there was a total of 430,485 Texas COVID-19 cases and 6387 fatalities (8.8% of all cases and 4% of all deaths in the United States.). Case fatality ratios were the highest in older adults. As we continued to observe data, in contrast to

previous study time points, we found that Asians and Hispanics had no significant difference in COVID mortality rates and were comparable in terms of mortality odds and death case ratios when compared with Whites.

**Conclusions:** This time period represents the highest COVID-19 surge time in Texas. Although our data consist of a short time period of population-level data in an ongoing pandemic and are limited by information reported to the Texas Department of State Health Services, older age, male sex, Hispanics, and Blacks are currently associated with higher infection rates, whereas older age, male sex, and Whites are associated with higher mortality rates. Clinicians and decision makers should be aware of the COVID-19 health disparities and risk factors for mortality to better promote targeted interventions and allocate resources accordingly.

**Key Words:** COVID-19, morbidity, mortality, pandemic, Texas

Coronavirus disease 2019 (COVID-19) is a severe acute respiratory infection and has led to an ongoing pandemic that has spread to almost every country around the world.<sup>1</sup> The primary route of transmission is through airborne droplets, but the infection also can spread through airborne means in certain environments.<sup>1</sup> Although social distancing, masking, and vaccination efforts are under way to reduce transmission risk, cases, hospitalizations, and deaths continue to rise at alarming rates that have severely affected the southern United States, especially in recent months.<sup>1,2</sup>

COVID-19 has caused an enormous global health burden, with cases, fatalities, and healthcare costs on the rise. Vaccinations are available from pharmaceutical companies such as Moderna and Pfizer, but vaccine allocation has been a difficult

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## Key Points

- There has been an increase in coronavirus disease 2019 cases in the southern United States, but little is known about the demographic distribution of the disease in Texas.
- Male sex, White race, and older age are associated with more adverse outcomes throughout our study from July 22 to August 1, 2020, but by the end of July, Hispanic and Asian races and male sex were associated with equal odds of mortality compared with Whites and females, respectively.
- Clinicians and policy makers should collaborate to target at-risk populations and minimize health disparities.

and ongoing process that initially focused on prioritizing the immunizations of older adults and those with underlying conditions, and at the time of writing still does not include young children.<sup>3–5</sup> Many studies are examining the impact of demographics such as sex, gender, and race on COVID-19 outcomes. In England, Black individuals had a nearly four times higher risk of being hospitalized because of COVID-19 infection, and Asians and other non-White races had an approximately two times higher risk of COVID-19 infection. Even when controlling for factors such as smoking, body size, A1c, and mental illness, rates of COVID-19 infection remained high for these ethnic groups. In the Sutter Health System located in northern California, a health disparity study revealed that African Americans have a 2.7 times higher probability of hospitalization from COVID-19 than other races, and hospitalization was particularly higher in African Americans who lived in poorer income neighborhoods.<sup>6</sup> In a New York City study, subway use among lower socioeconomic neighborhoods was associated with a higher disease burden and COVID-19 transmission.<sup>7</sup> There also are several other editorials and publications calling for an exploration of COVID-19 health disparities, as initial and preliminary data suggest that racial and ethnic minorities are at the highest risk of COVID-19-related hospitalization and mortality.<sup>8–11</sup> The basic characteristics of newly emerging COVID-19 had been reported in different cases<sup>12</sup>; however, this situation has not yet been evaluated in a major southern state like Texas. An editorial published in the *Southern Medical Journal* revealed that there is an overwhelming number of positive COVID-19 cases in the African American community in the southern United States, possibly the result of marginalized communities that cannot afford to social distance.<sup>9</sup>

There is scarce information available about the most affected and at-risk populations in Texas. Understanding the health disparities associated with COVID-19 can help health professionals identify individuals who are in the most need of prevention and treatment to prioritize immunization efforts and provide priority individualized care when viable treatment options are available. In turn, targeting such individuals with these interventions can help decrease disease burden and reduce cases and fatalities. The aim of this study was to assess statistical differences among age, sex, and ethnicity and their possible association with COVID-19-related hospitalization and mortality rates in Texas.

## Methods

The Texas Department of State Health Services (TDSHS) COVID-19 dashboard was used to obtain case surveillance counts during the highest surge of COVID-19 cases and deaths in Texas during the first phase of the pandemic. Cumulative mortality and hospitalization counts were obtained between April and July 2020 for a retrospective cohort analysis to examine trends over time. Mortality and hospitalization counts also were collected at a variety of single time points (July 19, July 22, July 27, and August 1) for a cross-sectional analysis to determine the impact of COVID-19 on age, sex, and ethnicity. Analyses used completed

case investigations by local and regional health departments that were collected and reported to the TDSHS Center for Health Statistics.

Individuals diagnosed as having COVID-19 in Texas and who had demographic information reported to the TDSHS as of July 2020 were included in our analysis. Reference population estimates were obtained from the US Census Bureau as of July 1, 2019 because 2020 census data are being tabulated. Cases and fatalities were excluded if the diagnosis of COVID-19 was not confirmed and if demographic information was not available or reported to the TDSHS.

Because the names of races and ethnicities differ based on source, the ethnicity identified as “White alone, not Hispanic or Latino” by the Census Bureau corresponded with “White” as described by the TDSHS dataset. Ethnicities identified as “American Indian and Alaska Native alone” and “Native Hawaiian and Other Pacific Islander alone” by the Census Bureau were classified as “Other” per TDSHS. All other ethnicities were matched accordingly per Census Bureau and TDSHS standards. Because the percentage of individuals older than age 65 was given by the Census Bureau, the percentage and number of individuals younger than age 65 was calculated by subtracting 100 from the percentage of individuals older than age 65. This number was then used to estimate the Texas population for the study population “Age < 65.”

We reported changes in cumulative cases, cumulative deaths, and average hospitalizations per day and analyzed the demographic distribution of death case ratios over time. Cumulative mortality and case rates are reported using descriptive statistics. Differences in mortality and case rates between races, age groups (age 65 and older vs age younger than 65), and sex (female vs male) were analyzed using the  $\chi^2$  test in SPSS Statistics 25 (IBM SPSS, Armonk, NY) and R software.

## Results

Table 1 and Figure 1 reveal monthly Texas COVID-19 cases, average hospitalization days, and mortality from March to July 2020. In March, at the beginning of the pandemic, the total case count was 3244, with 104 confirmed deaths (Fig. 1). Total positive COVID-19 cases rose by nearly 7.5 and 11 times in April and May, respectively, when compared with positive cases in March. From May to June, there was a nearly 2.6 times increase in case count, for a total of 94,223 new cases. This increase was similar to the increase seen from June to July, with 261,876 new cases in July (Fig. 1). Bivariate analysis revealed that the risk of COVID-19 infection was nearly 2 times higher from March to April (relative risk 1.77, 95% confidence interval [CI] 1.76–1.78), but although a decreased infection risk was seen in May, relative infection risk increased steadily from May to June and July, with the highest increase seen from May to June (Table 1).

Monthly death rates had similar increases, with an increase in deaths of nearly ninefold in both April and May when compared with deaths in March. The total number of deaths in March at the beginning of the pandemic was 104, and by the

**Table 1. Monthly Texas COVID-19 case, death, and case fatality ratios, March–July 2020**

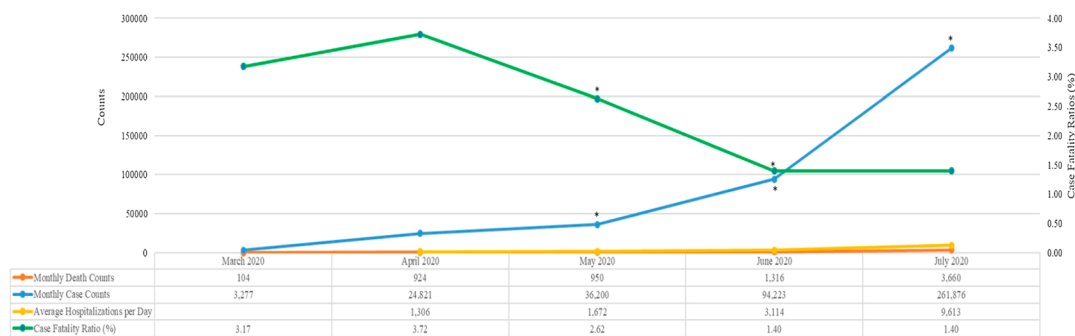
	Monthly case counts	Monthly change in case counts, %	RR (95% CI)	Monthly death counts	Monthly change in death counts, %	RR (95% CI)	Case fatality ratio, %
March	3277	Baseline	Baseline	104	Baseline	Baseline	3.17
April	24,821	657	1.77 (1.76–1.78)	924	788	1.02 (1.00–1.04)	3.72
May	36,200	46	1.19 (1.18–1.20)	950	3	0.85 (0.81–0.89)	2.62
June	94,223	160	1.45 (1.44–1.45)	1316	39	0.80 (0.77–0.83)	1.40
July	261,876	178	1.48 (1.47–1.48)	3660	178	1.00 (0.98 to –1.02)	1.40
Totals	420,397			6954			

At the end of July, there were 420,397 COVID-19 confirmed cases and 6954 deaths in Texas. The greatest changes in case and death counts were seen from March to April and June to July. The highest risk of acquiring COVID-19 occurred in the months of April and July. Death risk was the lowest in May and June and insignificant in April and July. Case fatality ratios were the highest in April and May. CI, confidence interval; COVID-19, coronavirus disease 2019; RR, relative risk.

end of July, the total new death count was 3660. Although the death rate in June was a 39% increase over that of May, death rates increased by nearly 178% from June to July (Fig. 1). Bivariate analysis showed that death risk decreased in both May and June, but was insignificant in April and July. Seemingly, case fatality ratios increased from March to April but then decreased in May and June. June and July had the same case fatality ratio of 1.40, indicating a stagnation of case fatality ratios throughout the summer. Average hospitalizations per day were similar in April and May. There was an average of 9613 hospitalizations per day in July, which nearly tripled from the 3114 hospitalizations per day in June (Fig. 1).

Table 2 and Figure 2 show Texas demographic characteristics of COVID-19 case, mortality, and case fatality ratios on July 19 and August 1. Figure 3 reports case fatality ratios by various demographic populations. On July 19, demographic COVID-19 case data were available for 28,205 individuals. Of these, 13,244 (47.7%) were females and 14,586 (51.7%) were males. Males were associated with slightly higher chance of COVID-19 infection than females (odds ratio [OR] 1.11, 95% CI 1.09–1.14) and a nearly 29% higher chance of dying of COVID-19 when compared with females (OR 1.29, 95% CI 1.11–1.49). The higher

probability of positive cases and deaths in males over females was approximately the same on July 22. On July 19, 24,178 (85.7%) individuals with confirmed cases were younger than age 65. Bivariate analysis revealed that the odds of COVID-19 infection were 12% higher in older adults when compared with the odds for individuals younger than 65 years (OR 1.12, 95% CI 1.08–1.16). Although the majority of the cases were individuals younger than 65 years, the case fatality ratio was nearly 16 times higher in older adults when compared with the case fatality ratio for individuals younger than 65 years (13.72 vs 0.84; Fig. 3). A total of 627 of the 5852 individuals 65 years old and older who tested positive for COVID-19 died, corresponding to an 18.8 times higher risk of death when compared with younger individuals (OR 18.79, 95% CI 15.93–22.15). These odds did not change on July 22. In terms of total cases, Hispanics (11,458 or 40.6%) and Whites (6998 or 24.8%) represented the highest percentage of confirmed cases on July 19, and this was a consistent trend at all study time points. Hispanics were 70% more likely to contract COVID-19 when compared with Whites (OR 1.70, 95% CI 1.65–1.75). Similarly, Blacks had a 48% higher risk of acquiring COVID-19 than Whites (OR 1.48, 95% CI 1.42–1.55). Asians and “Other” races were the only ethnicities



**Fig. 1. Monthly Texas coronavirus disease 2019 incidence, hospitalizations, and deaths from March to July 2020.** This graph depicts the incidence, average hospitalization days, and mortality rates for Texas from March to July 2020. Monthly cases, mortality, and average hospitalization days increased from month to month, with the highest increases seen from June to July. Although the risk of being infected with coronavirus disease 2019 increased from May to July, the mortality rate significantly decreased in May and June and was insignificant in April and July. Case fatality ratios showed a similar trend, with the highest death case ratio in April and a subsequent decrease from May to July. \*Statistical significance of relative risk.

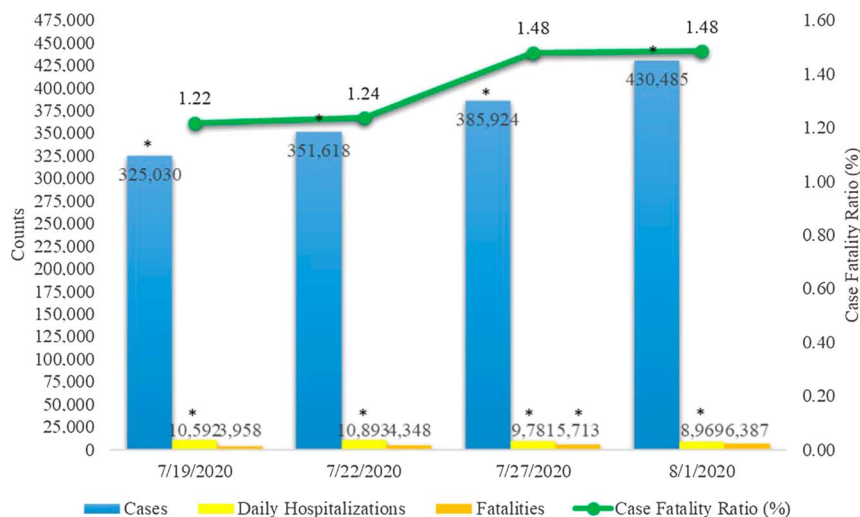
**Table 2. Demographic case, fatality, and case fatality ratios on July 19 and August 1, 2020**

	July 19, 2020					August 1, 2020				
	Cases	OR (95% CI)	Deaths	OR (95% CI)	Case fatality ratio, %	Cases	OR (95% CI)	Deaths	OR (95% CI)	Case fatality ratio, %
Sex										
Female	13,244	1.11 (1.09–1.14)	312	1.29 (1.11–1.49)	2.36	14,601	1.43 (1.40–1.46)	2758	1.01 (0.96–1.06)	18.89
Male <sup>a</sup>	14,586		440		3.02	21,049		4079	19.38	
Age, y										
<65	24,178	1.12 (1.08–1.16)	203	18.79 (15.93–22.15)	0.84	31,602	1.03 (1.00–1.06)	1983	N/A	6.27
>65 <sup>a</sup>	4008		550		13.72	4816		4854		100.79
Race/ethnicity										
Asian	661	0.75 (0.69–0.81)	16	0.51 (0.31–0.85)	2.42	703	0.57 (0.53–0.62)	167	1.02 (0.85–1.22)	23.76
Black	3249	1.48 (1.42–1.55)	95	0.62 (0.49–0.78)	2.92	4997	1.64 (1.59–1.70)	910	0.73 (0.67–0.79)	18.21
Hispanic	11,458	1.70 (1.65–1.75)	221	0.40 (0.34–0.48)	1.93	14,534	1.55 (1.51–1.59)	3423	1.01 (0.95–1.07)	23.55
Other	147	0.79 (0.67–0.93)	2	0.28 (0.07–1.15)	1.36	166	0.64 (0.55–0.74)	53	1.53 (1.10–2.13)	31.93
White <sup>a</sup>	6998	Reference	325	Reference	4.64	9737	Reference	2280	Reference	23.42
Unknown	5692	N/A	94	0.35 (0.27–0.44)	1.65	6309	N/A	4	0.002 (0.001–0.006)	0.06
Total	28,205		753			36,446		6837		

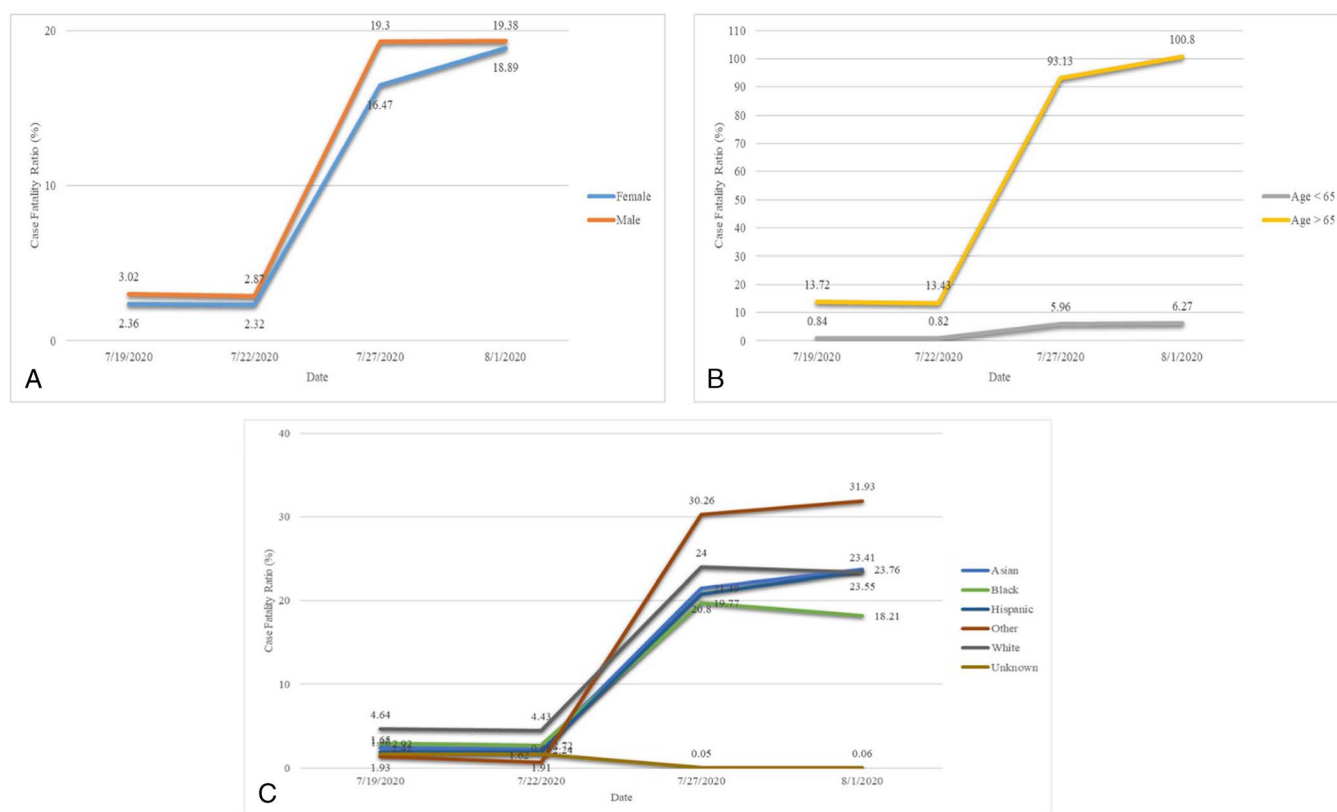
On July 19, 2020, demographic data were available for 28,205 cases and 753 deaths. Of these, 13,244 females and 14,586 males tested positive for COVID-19. Males were more likely to acquire and die of COVID-19 compared with females in Texas. On August 1, although males were 43% more likely to become infected with COVID-19, mortality rates were insignificant between males and females. On July 19, 24,178 individuals infected with COVID-19 were younger than age 65 compared with 4008 individuals older than age 65. At every study time point, older adults were more likely to acquire and die of COVID-19 at much higher odds than individuals younger than 65 years. On July 19, Hispanics (11,458, or 40.6%) and Whites (6998, or 24.8%) tested positive for COVID-19. Hispanics and Blacks were consistently at the highest chance of being infected with COVID-19 compared with Whites, but also consistently had lower chances of death, except on August 1, when the odds of dying were similar between Whites and Hispanics. This trend is similarly seen with Asians, who have a lower probability of cases and mortality counts on each study point, except on August 1, when Asians have insignificant mortality odds compared with Whites. CI, confidence interval; COVID-19, coronavirus disease 2019; OR, odds ratio. <sup>a</sup>Used as a comparator/standard.

that had a significantly lower risk of acquiring COVID-19 than Whites, and this was a consistent trend seen throughout all of the study time points. Although the majority of the cases were

Hispanic, all of the other studied races had a lower significant chance of death when compared with Whites. Bivariate analysis showed that ethnicities with the lowest probability of death include



**Fig. 2. Total cases, daily hospitalizations, fatalities, and case fatality ratios at study time points.** The total number of positive cases was 325,030 and deaths was 3958 on July 19, which increased to 430,485 cases and 6387 deaths on August 1. Cases increased over time, whereas daily hospitalizations decreased, possibly because of increased recoveries or discharges home and fatalities. Fatalities increased at the end of July, corresponding to an increase in death case ratio over time. The chance of acquiring COVID-19 from each study point to the next increased significantly, whereas the chances of being hospitalized with COVID-19 decreased steadily throughout time. The probability of dying from COVID-19 was only significant from July 22 to July 27. \*Statistical significance of odds ratio. COVID-19, coronavirus disease 2019.



**Fig. 3.** Impact of sex, age, and race/ethnicity on COVID-19 case fatality ratios at study time points. (A) Case fatality ratios between males and females. Males had higher case fatality ratios at all study points compared with females. Males had a case fatality ratio of 3.02 on July 19, 2020, which increased to 19.38 on August 1, 2020. (B) Case fatality ratios between individuals younger and older than 65 years. Older adults had the highest case fatality ratio compared with individuals younger than 65 years and among other demographics. (C) Case fatality ratios among the different races and ethnicities. Of the known races, Whites, Asians, and Hispanics had the highest case fatality ratios. Although most of the races had an increase in case fatality ratios over time, Whites and Blacks experienced a decrease in death case ratio by the end of July 2020. COVID-19, coronavirus disease 2019.

Hispanics (OR 0.40, 95% CI 0.34–0.48) and Asians (OR 0.50, 95% CI 0.31–0.85). The number of cases among ethnicities did not change appreciably between July 20 and 22. On July 22, similar trends were seen, with Hispanics (OR 0.42, 95% CI 0.35–0.50) and Asians (OR 0.49, 95% CI 0.29–0.83) having the lowest chance of death. Case fatality ratios also were the highest for Whites on both July 19 and July 22 (4.64 and 4.243, respectively).

A week later, on July 27, there were 385,924 cases. Of the 32,258 cases with available demographic data, 43.3% were females and 54.8% were males. The probability of COVID-19 infection in males within a 7-day span increased by 14% when compared with that of females (OR 1.25, 95% CI 1.22–1.28). There was a total of 5713 COVID-19 related fatalities within those 7 days. Of these, 40% were female and 60% were males, corresponding to a 20% higher chance of death in males when compared with females. This was a 9% decline in mortality odds from the July 22 data (Table 2). Although the chance of acquiring COVID-19 decreased by 5% in individuals older than 65 years, 4052 (70.9%) individuals older than age 65 died, which is substantially higher than the 1661 individuals younger than 65 years who died on July 22. The chance of death in individuals older

than age 65 was significantly higher (OR 214, 95% CI 183.4–243.1) on July 27 when compared with younger individuals than it was on July 19 and 22. The three ethnicities with the largest number of positive cases were Hispanics (13,003, or 40.3%), Whites (8360, or 25.9%), and Blacks (4076, or 12.6%). Bivariate analysis revealed Hispanics and Blacks to be associated with, respectively, 56% and 62% significantly higher chances of being infected with COVID-19 when compared with Whites, but these odds were similar to odds seen in other study time points. Although Hispanic was the group with the largest number of fatalities (2705, or 47.3%), they had a 17% lower chance of death when compared with Whites. Although Asians at previous time points revealed to have lower probability of death compared with Whites, the odds on July 27 were not significant (OR 0.87, 95% CI 0.72–1.05). White and “Other” ethnicities still had the largest case fatality ratios at 24 and 30.26, respectively. Also, Blacks had the lowest chance of mortality when compared with Whites (OR 0.78, 95% CI 0.71–0.86).

At the end of July, there were 430,485 total Texas COVID-19 cases and 6387 fatalities. This represents 8.8% of all of the cases and approximately 4% of all deaths in the United States. Of the

36,446 available cases, 14,601 were females, and 21,049 were males (Table 2). This correlated to a 43% higher chance of acquiring COVID-19 in males compared with females. By August 1, 2758 (40.3%) females and 4079 (59.7%) males had died. The OR of death between females and males was not significant. Death case ratios increased at a faster pace in females over the end of July but was still consistently higher in males (Fig. 3). In total, 86.7% of individuals younger than 65 had COVID-19, but the chance of them acquiring COVID-19 were not significantly higher than the chance of older adults. On August 1, 4854 (71%) of individuals 65 and older who had COVID-19 died. Case fatality ratios were consistently much higher in individuals older than age 65 when compared with individuals younger than 65 years (Fig. 3). Case rates and odds of acquiring COVID-19 among all of the studied races were similar to those of previous time points by the end of July; however, in contrast to previous study time points, Asians and Hispanics had no significant difference and were comparable in terms of mortality rates, mortality odds, and death case ratios when compared with Whites. Blacks still had a 27% lower chance of death when compared with Whites (OR 0.73, 95% CI 0.67–0.79), but the races labeled as “Other” had significantly higher chances of death when compared with Whites, despite reporting insignificant odds at other time points (Table 2).

## Discussion

Texas COVID-19 incidences continued to increase each month since the start of the pandemic in March, with the highest surges of cases from March to April and June to July. The surge in cases from March to April could be explained by increased testing and knowledge of spread in the United States, and the surge of cases from June to July could be explained by the opening of businesses and other entities in Texas. As case counts increase, mortality also increases (955% increase in case rates and 96.1% increase in death rates between April and July), but at a slower pace. In terms of acquiring COVID-19 infection, males (OR 1.43, 95% CI 1.40–1.46), individuals older than 65 (OR 1.12, 95% CI 1.08–1.16), Blacks (OR 1.64, 95% CI (1.59–1.70), and Hispanics (OR 1.55, 95% CI 1.51–1.59) were the most at-risk populations in Texas when compared with females, those younger than 65 years, and Whites, respectively. Older adults also consistently had much higher mortality rates (OR 18.79, 95% CI 15.93–22.15) than individuals younger than 65 years and had the highest case fatality ratio compared with other demographics (case fatality ratio 13.72). Older age has been consistently correlated with higher mortality risk in several studies, as explained by higher incidences of underlying medical conditions and lower immunity when compared with individuals younger than 65 years. Both of these factors may contribute to lower resilience in older adults in combating COVID-19 infection, leading to higher case and mortality rates.<sup>13–15</sup>

The highest risk of acquiring COVID-19 did not directly translate to higher mortality rates in our study, however. These findings are both similar to and different from other studies

conducted in other parts of the world. Although males had consistently higher COVID-19 incidence rates, by the end of July, males had equivalent chances of COVID-19-related death when compared with females. Higher male COVID-19 acquisition and mortality rates have been shown similarly in early and later Chinese COVID-19 risk factor studies and European case studies.<sup>16–19</sup> It is unclear why male mortality rates became insignificant near the end of July in our study. Smoking prevalence for all forms of tobacco and e-cigarette use is higher in males in Texas, and smoking has been linked to more severe COVID-19 illness.<sup>20,21</sup> Considering our data represent a certain time period in the pandemic, this relation may change with time and may not provide the full picture of case or mortality rates in males, especially because significant differences in mortality between males and females were seen at all study points, except for our last study point. Moreover, we did not account for smoking status in our study. If we control for smoking, then we may see changes in the OR for both case and mortality rates in males when compared with those of females.

Blacks consistently had higher chances of being infected with COVID-19 and lower chances of mortality when compared to Whites, at all study points. Compared with Whites, Hispanics consistently had an approximately 60% to 70% higher chance of acquiring COVID-19, yet they had a 60% lower chance of dying from COVID-19 until near the end of the month, when this difference became smaller and insignificant. Asians also did not have a significant difference in mortality rates when compared with Whites by the end of July. Higher transmission rates in minorities may be the result of limited social and physical distancing in neighborhoods, housing projects and prisons’ limited access to health care, and a higher concentration of demanding jobs that require them to work on site.<sup>8</sup> Other studies have reported similar reasoning for higher COVID-19-positive rates in minorities. Moreover, editorials and other studies reveal that Blacks and Asians may have higher incidence and hospitalization rates in the South and other parts of the United States and Europe when accounting for comorbidities and other factors.<sup>8–11,13</sup> It is hard, however, to evaluate the impact of COVID-19 in minorities because race and ethnicity studies are continuing and the pandemic is ongoing. In a Louisiana cohort study, Blacks, especially if living in a low-income residential area, had comorbidities, and were of older age, were associated with higher hospitalization rates, but Blacks were not independently associated with higher mortality when compared with Whites.<sup>11</sup> A large study in 5.8 million veterans reveals that minorities such as Hispanics and Blacks were more likely to test positive for COVID-19, and yet, 30-day mortality did not differ in both groups.<sup>22</sup> These studies were similar to our findings. Although we saw a difference in earlier time points, by the end of July, the gap in mortality differences was becoming smaller and insignificant. This may be because of improved knowledge of the COVID-19 pandemic over time. Testing discrepancies may contribute to the differences in COVID-19 reporting, as several studies reported more COVID-19 testing in White individuals living in suburban

areas.<sup>23–25</sup> Moreover, there have been studies describing a potential link between stroke and heart disease and COVID-19; cardiovascular disease risk is typically higher in minority populations.<sup>26–29</sup> The reported numbers of COVID-19 deaths used in this study may not take into account these other causes of death in individuals who tested positive for COVID-19. As such, the current known case and death numbers may be underreported and underestimated and may not fully depict the impact of COVID-19 on minorities. Underlying health conditions also are more prevalent in minorities, especially Blacks and Hispanics in Texas, and many studies corroborate the association between underlying health conditions and severity of COVID-19 illness.<sup>6,10,11,14,16,19,21</sup> As such, it is expected that there will be higher hospitalization and mortality rates in minorities, but our study does not show this exact connection; however, we also did not account for underlying conditions in our analysis. Adjusting for underlying health conditions may show different probabilities of case and mortality rates, especially in ethnicities, and is a consideration for future studies. As the pandemic continues, more demographic data become available and are frequently reported to health departments, and testing is up to date (especially in rural, minority, and underserved communities), we may see more accurate mortality rates among minorities.

There are some limitations in our study. First, population estimates were gathered from the 2019 Census Data since 2020 Census data are being tabulated. Second, our study is a snapshot of an ongoing pandemic, in which demographic trends, cases, hospitalizations, and mortality rates change on a daily basis. As such, we decided to analyze the data on a cumulative monthly basis, and on certain dates in July when the pandemic was known to affect Texas the most, during the early months of the pandemic to help reduce this limitation bias. Third, the availability of demographic data also was consistently scarce. Case demographic data were consistently approximately 8.5% of all reported Texas cases; therefore, there was still a large number of cases missing from our dataset. Fatality data were only 19% and 17.5% of all deaths for July 19 and July 22, respectively; however, starting at the July 27 study point, all of the demographic data were available for reported fatalities. The lack of data corresponded with a significant impact on case fatality ratios. Some case fatality ratios were reported to be higher than 100% because of the mismatch between available case and fatality demographic data. As the TDSHS continues to gather information, more demographic data should be available at a later date for a more accurate exploration of incidence and mortality rates among different populations. Lastly, our study did not control for confounding factors such as comorbidities like diabetes mellitus, hypertension, asthma, and chronic obstructive pulmonary disease and smoking status. These factors have been known to be associated with higher COVID-19 hospitalization and mortality rates in previous studies and may alter the odds and risks of case, hospitalization, and mortality rates. To address the limitations in our study, future studies should focus on expanding pandemic timelines to observe changes in incidence, hospitalization, and mortality trends over a larger time period and

consider county-level and geographic mapping to identify transmission spread across Texas and identify growing pandemic areas.

Our findings highlight disparities that are not new but that need to be addressed quickly to reduce the severity of the situation for communities of color. The impact of COVID-19 in these communities needs a multifaceted approach that effectively combats this pandemic. We are emphasizing the need to focus prevention and treatment strategies on older adults, minorities, and males. Based on our findings, we see higher case rates in these specific populations, which could translate directly to higher transmission rates and disease burden and indirectly into higher mortality rates. Considering the high transmission rates among older adults, Hispanics, Blacks, and males, it is important to acknowledge healthcare education needs in these populations and promote adherence to preventive measures such as social distancing and masks to reduce disease burden and spread. As rates continue to rise, adverse outcomes such as hospitalizations and mortality will increase in these populations, increasing health disparities and resulting in enormous healthcare costs. Moreover, during vaccination dissemination, older adults, males, Hispanics, and Blacks should be prioritized to positively affect health outcomes and reduce health disparities in these populations. Viable treatment options should be targeted for individuals 65 years old and older, males, and White individuals, because these options have been shown to have higher mortality rates in our study. Targeting these populations may be the key to controlling the pandemic, minimizing the impact of COVID-19 in marginalized communities, and promoting better and equitable health care.

Clinicians and decision makers need to collaborate to control the pandemic by understanding the health disparities and populations at most need for intervention. By effectively promoting public health preventive measures such as social distancing, masks, hand hygiene, and vaccination to these populations, we can ensure better outcomes, lower healthcare costs, and minimize disparities.

## Conclusions

Clinicians and decision makers should be aware of COVID-19 health disparities and risk factors for mortality to better promote targeted interventions for at-risk populations that contribute to the disease burden and spread of COVID-19 in Texas.

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