CONNECTICUT COVID-19 MORTALITY: DEMOGRAPHIC COMPARISONS AND DISPARITIES, MARCH 2020–FEBRUARY 2021

DATA BRIEF • SEPTEMBER 2021

Background

Outbreaks across the world of COVID-19, a respiratory disease caused by the novel, highly infectious virus SARS-CoV-2, sparked a global human pandemic declared by the World Health Organization (WHO) on March 11, 2020.[1-3] The first human case of COVID-19 in the U.S. was reported on January 21, 2020. In the six weeks that followed, COVID-19 outbreaks occurred along the West Coast and in Northeastern states.[4] Several counties in Connecticut were early hotspots of SARS-CoV-2 transmission with the first COVID-19 case and death reported for Connecticut on March 8, 2020 and March 17, 2020, respectively.[5]

COVID-19 case reporting in the U.S. showed that the majority of people with COVID-19 developed mild symptoms while 14% required hospitalization and 5% died from the disease during the early months of the pandemic.[6] Epidemiological analyses of COVID-19 for geographies outside of Connecticut have reported certain behaviors and medical conditions to be associated with higher risks for COVID-19 morbidity (sickness) or mortality (death), including smoking, cancer, cerebrovascular disease, chronic kidney disease, COPD, diabetes mellitus, types 1 and 2, heart conditions, obesity, and recent/current pregnancy.[7,8] Studies have also reported significant demographic differences, such that older individuals and populations facing long-standing barriers to health and social inequities attributed to race, ethnicity, and disability status have the highest mortality risks.[8-24]

This Data Brief provides information on Connecticut's COVID-19-related mortality by age, sex, and race and ethnicity during the first twelve months of the pandemic in the state (March 1, 2020–February 28, 2021).[a] Counts, rates, and disparity ratios were calculated for deaths with COVID-19 as a primary or contributing cause of death on the death certificate.[25,26] Analysis and interpretation of COVID-19 mortality patterns supplement regular reporting of COVID-19 statistics by the Connecticut Department of Public Health (DPH) at https://portal.ct.gov/coronavirus/covid-19-data-tracker and furthers the agency's commitment to identifying and eliminating or reducing health inequities among state residents whether due to social or biological causes.[27]

**Fig. 1. Cumulative Connecticut COVID-19 Death by Date of Death Occurrence**

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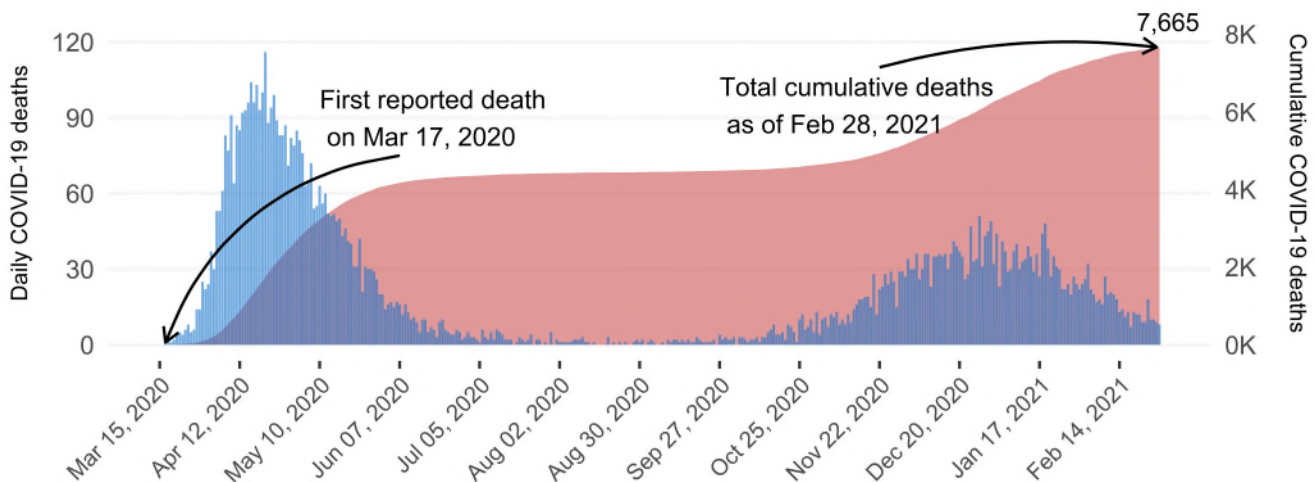
[a] The Data Brief was developed by the Surveillance Analysis and Reporting Unit in the Health Statistics and Surveillance Section of CT DPH which reports mortality statistics for the State of Connecticut.

Analysis Results

The first Connecticut resident deaths due to COVID-19 were reported during the week beginning March 15, 2020 with cumulative death counts rising over the subsequent twelve months to a total of 7,665 COVID-19 deaths by February 28, 2021 (Fig. 1). Overall, COVID-19 deaths comprised 20% of the 38,770 total deaths during this period. Among the 7,665 COVID-19 deaths, COVID-19 was determined as the primary cause of death for 7,034 (92%) of the decedents and as a contributing cause of death for 572 (7%). Fifty-nine of the 7,665 COVID-19 deaths (<1%) were pending verification of COVID-19 as a primary or contributing cause of death at the time of this report. The majority these pendings were deaths that had occurred outside of Connecticut.

Fig. 2. Connecticut COVID-19 Age-specific Mortality Rates by age group, March 1, 2020–February 28, 2021.
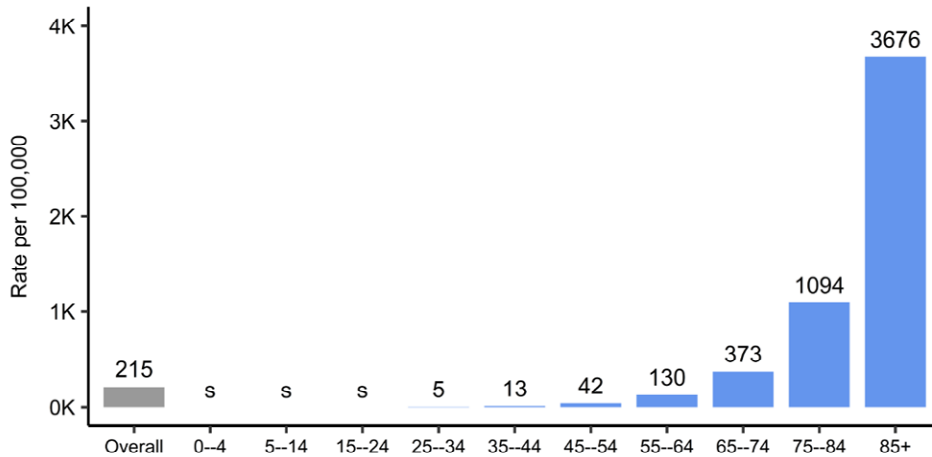
Analyses show that risk of mortality due to COVID-19 among Connecticut residents increases with age. During the 12-month period, 6 residents aged 0–24 years died which precluded the calculation of age-specific rates for the 3 youngest age groups. Deaths among residents aged 25 and older were large enough to calculate statistically reliable age-specific mortality rates (ASMRs, i.e., death rates for specific age groups) by ten-year age groups. Among residents 25–34 years old, 24 people died from COVID-19 resulting in an ASMR of 5.4 deaths per 100,000 (Fig. 1; Table 1). Among residents 85 years and older, 3,357 people died for an ASMR of 3,675.7 deaths per 100,000. To understand the differential risk associated with increasing age, the ASMR for each age group was compared to the age group with the lowest ASMR. Age-specific rate ratios ranged from 2 (35–44 years) to 681 (85 years and older) and highlight the magnitude of the increased mortality risk associated with older age among Connecticut residents (Table 1).

Table 1. Connecticut COVID-19 Mortality Statistics by age group, March 1, 2020–February 28, 2021.

| Age group (years)	Death Total	Population	Age-Specific Rate (95% CI)	Age-Specific Rate Ratio (95% CI)
0–4	1	181,710	s	s
5–14	1	409,000	s	s
15–24	4	478,803	s	s
25–34	24	448,029	5.4 (3.2, 7.5)	Ref
35–44	54	427,141	12.6 (9.3, 16)	2.3 (1.2, 4.5)
45–54	202	476,905	42.4 (36.5, 48.2)	7.9 (4.4, 13.9)
55–64	670	513,455	130.5 (120.6, 140.4)	24.2 (14.0, 41.8)
65–74	1,316	352,819	373.0 (352.8, 393.1)	69.1 (40.1, 118.9)
75–84	2,035	186,095	1093 (1046, 1141)	202.5 (117.8, 348.1)
85+	3,357	91,330	3675 (3551, 3800)	680.7 (396.5, 1168.6)

‡Confidence intervals for disparity ratios include adjustment for multiple comparisons using the Bonferroni method.

ˢ Rates are suppressed for age groups with <15 deaths.

COVID-19 mortality was assessed for 4 race and ethnicity groups using 3 mortality metrics: total deaths (N), crude mortality rate (CMR), and age-adjusted mortality rate (AAMR). For total COVID-19 deaths, non-Hispanic (NH) White residents had the most deaths (N=5,712) which accounted for 75% of all COVID-19 deaths while NH Black residents had 982 deaths (13%), Hispanic residents had 772 deaths (10%), and NH Asian residents had 112 deaths (1%) (Table 2). Crude mortality rates, which provide the group-specific death rates, were highest among NH Blacks (251 per 100,000), followed by NH Whites (240), Hispanics (129), and NH Asians (62). Rate ratios for crude mortality show no difference between NH White mortality and NH Black mortality and decreased risk for Hispanic and NH Asian mortality compared with NH White mortality (Table 2). Crude rates do not account for the age at which a person died even though risk of death from COVID-19 is highly associated with age.

Age-adjusted mortality rates (AAMRs) are a third way of assessing the impact of a disease on different population groups and allow for a more equitable comparison of disease burden. They standardize the age distributions of the population groups thereby allowing for direct comparison of rates between groups with differing age structures.[28] AAMRs by race and ethnicity ranked differently than crude rates: NH Blacks (285 per 100,000) remained highest, Hispanics ranked second highest (230), followed by NH Whites (130) and NH Asians (89) (Fig. 3; Table 2). Rate ratios indicate that AAMRs among NH Black and Hispanic populations were approximately twice that for NH Whites while the AAMR for NH Asian was approximately two-thirds of the NH White AAMR (Table 2).

Fig. 3. Connecticut COVID-19 Age-adjusted Mortality Rates by Race and Ethnicity (A) and by Sex (B), March 1, 2020– February 28, 2021.
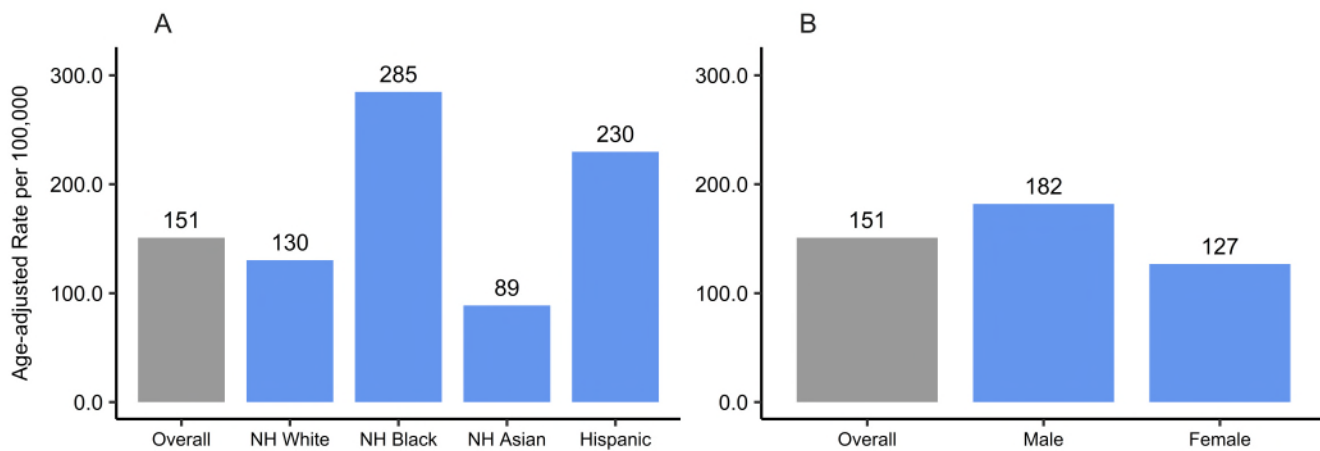
Male and female COVID-19 deaths totaled 3,749 and 3,912, respectively, over the analysis period. Crude mortality rates for male and female residents of Connecticut were similar while the age-adjusted mortality rate was significantly higher among men (Table 2; Fig. 3). The age-adjusted rate ratios of 1.4 for men compared to women indicates a sizable sex disparity for Connecticut men (182 per 100,000 versus 127) (Table 2; Fig. 3).

Discussion

Connecticut's cumulative total of 7,665 COVID-19 resident deaths, among which COVID-19 was leading cause of death for 7,034, establishes the disease as a major source of mortality in the state during the first year of the pandemic (March 1, 2020–February 28, 2021). By comparison, provisional mortality counts for the top five causes of non-COVID-19 death among Connecticut residents for the same 12-month period were 6,807 for heart disease, 6,492 for cancer, 2,352 for accidents, 1,495 for lower respiratory diseases, and 1,178 for cerebrovascular disease. As such, COVID-19 was the leading cause of death during the analysis period based on provisional mortality totals available at the time of release of this report.

Table 2. Connecticut COVID-19 Mortality Statistics by race and ethnicity and sex, March 1, 2020–February 28, 2021

Characteristic	Death Total	Population	Crude Rate (95% CI)	Crude Rate Ratio (95% CI)	Age-Adjusted Rate (95% CI)	Age-Adjusted Rate Ratio (95% CI)
Race and Ethnicity						
Overall	7,664	3,564,651	215 (210.2, 219.8)	-	150.9 (147.5, 154.4)	-
NH White	5,712	2,381,985	239.8 (233.6, 246)	Ref	130.3 (126.9, 133.9)	Ref
NH Black	982	391,547	250.8 (235.1, 266.5)	1.0 (1.0, 1.1)	284.7 (266.8, 303.4)	2.2 (2.0, 2.4)
NH AI/AN	5	9,634	s	s	s	s
NH Asian	112	180,937	61.9 (50.4, 73.4)	0.3 (0.2, 0.3)	88.7 (72.5, 107.2)	0.7 (0.5, 0.9)
Hispanic	772	600,778	128.5 (119.4, 137.6)	0.5 (0.5, 0.6)	229.8 (213.1, 247.4)	1.8 (1.6, 1.9)
Gender						
Female	3,912	1,825,478	214.3 (207.6, 221)	Ref	126.7 (122.7, 130.9)	Ref
Male	3,749	1,739,675	215.5 (208.6, 222.4)	1.0 (0.96, 1.05)	181.9 (176, 187.9)	1.4 (1.37, 1.5)

‡ Confidence intervals for disparity ratios include adjustment for multiple comparisons using the Bonferroni method.

S Rates are suppressed for races and ethnicities with <15 deaths.

By demographic group, a majority of COVID-19 deaths occurred among NH Whites, women, and individuals 75 and older in Connecticut. A different picture of disease burden emerges, however, when population size and age structure differences among demographic groups are considered which illustrates the significant disparities by sex and race and ethnicity. Men had elevated COVID-19 AAMRs compared to women. NH Black and Hispanic AAMRs approximately double those for NH Whites. Only with age-specific comparisons did the highest mortality counts rankings mirror those of the population size-adjusted rates, with both counts and ASMRs highest in older populations. The demographic disparities among Connecticut residents are consistent with those identified in other studies.[9-24]

Examination of the social and biological drivers of disparities in COVID-19 mortality specific to Connecticut are beyond the scope of this report. Recent studies of such disparities in COVID-19 mortality outside of Connecticut have identified multiple factors. Studies of racial and ethnic disparities indicate higher percentages in public-facing occupations, lower rates of access to healthcare, higher rates of comorbidities (preexisting conditions), and increased likelihood of living in crowded housing conditions among populations of color as influential factors in elevated rates in these populations.[9,15-18] A male bias towards higher COVID-19 mortality rates has also been documented elsewhere but is not fully understood.[19,22,23] Increased rates of COVID-19 mortality with increasing age are also well-documented and mirror increased risk of mortality due to all causes, not just COVID-19, as individuals age.[12-14] Impaired responses to infection due to aging immune systems and higher rates of comorbidities in older individuals are implicated as potential factors in age-related COVID-19 mortality risk.[11]

Centralized review of all suspected COVID-19 deaths that occurred in Connecticut by the Office of the Chief Medical Examiner (OCME) increases confidence that the state's death certificates, taken as a whole, accurately reflect COVID-19 mortality in Connecticut. Review by the OCME reduced the likelihood of misclassification or under-reporting of COVID-19 on Connecticut death certificates. A limitation remains, however, that interpretation of mortality rates and disparities by population groups assume that COVID-19 testing and diagnosis rates among deceased individuals are consistent between groups compared, an assumption which may require further evaluation.[29] Individuals with illness severe enough to cause death typically received clinical care prior to death at a facility that routinely tests for COVID-19. If testing, diagnosis rates, or clinical care rates are lower in populations of color, the COVID-19 mortality rates reported here may underestimate the disparity without additional correction.[24] Another limitation is that decedent's race(s) as listed on the death certificate may differ from the race(s) the decedent may have self-reported if living. This limitation may explain slight differences in death counts and rates by race group when compared with reports of COVID-19 mortality based on other types of public health surveillance data.[30] Finally, this analysis used 2019 Connecticut population estimates instead of those current for 2020 since the US Census Bureau had not yet released 2020 estimates.

Analytical Methods

Data on Connecticut deaths were obtained from the Connecticut Deaths Registry maintained by the DPH Office of Vital Records. Dates of death for inclusion were March 1, 2020–February 28, 2021. Cause of death was determined by a death certifier (e.g., physician, APRN, medical examiner) using their best clinical judgment. Additionally, all COVID-19 deaths, including suspected or related, are required to be reported to OCME. On April 4, 2020, CT DPH and OCME released a joint memo to providers and facilities within Connecticut providing guidelines for certifying deaths due to COVID-19 that were consistent with the CDC's guidelines and a reminder of the required reporting to OCME.[25,26] To date, OCME has reviewed every case reported and performed additional investigation on about one-third of reported deaths to better ascertain if COVID-19 did or did not cause or contribute to the death. Some of these investigations resulted in the OCME performing postmortem swabs for PCR testing on individuals whose deaths were suspected to be due to COVID-19, but antemortem diagnosis was unable to be made.[31] The OCME issued or re-issued about 10% of COVID-19 death certificates and, when appropriate, removed COVID-19 from the death certificate. For standardization and tabulation of mortality statistics, written cause of death statements made by the certifiers on death certificates are sent to the National Center for Health Statistics (NCHS) at the CDC which assigns cause of death codes according to the *International Causes of Disease 10th Revision* (ICD-10) classification system.[25,26] COVID-19 deaths in this report are defined as those for which the death certificate has an ICD-10 code of U07.1 as either a primary (underlying) or a contributing cause of death or for which an ICD-10 code of U07.1 is pending (<1%).

COVID-19 death counts among Connecticut residents were tabulated separately by specific demographic groups: age group (as 0–4 years, 5–14, 15–24, 25–34, 35–44, 55–64, 65–74, 75–84, 85 and older), sex (as male and female), and race and ethnicity (as either NH Black, NH White, Hispanic, NH Asian, or NH American Indian/Alaskan Native). Low death totals (<15) in smaller demographic groups in Connecticut, including the youngest age groups and the NH American Indian Alaskan Native population, prevented accurate estimation of mortality rates and subsequent inference of mortality patterns for those groups relative to others. Race and ethnicity were reported on death certificates for 100% of COVID-19 deaths included in analyses. Federal standards require self-reporting of an individual's race and ethnicity; however, since the decedent is unable to self-report, race and ethnicity on the death certificate is provided by an informant, such as family or a decedent's long-term care facility. Completeness of death certificate reporting of age and sex was greater than 99%.

Tabulated total death counts by demographic group were used together with their respective state-level total population estimates (as of July 1, 2019) to develop crude and direct age-adjusted mortality rates (AAMRs).[32] AAMRs were calculated using 18 age groups (as 0–4 years, 5–9, 10–14, 15–19, … 85 years and older) and the 2000 U.S. Standard Population.[33] Rates were compared within demographic subgroups using Chi-Squared Tests of Independence.[34] Statistically significant between-group differences were inferred using an alpha cut-off of $p < 0.05$, Bonferroni-adjusted for multiple comparisons.[35] Additionally, Rate Ratios (RRs) within each demographic group, assessed relative to the rate of the group with the best outcome (i.e. the Reference group), were analyzed. The 95% Confidence Intervals for RRs, also adjusted for multiple comparisons, were based on the Taylor Linear Approximation of RR variance.[36] Statistical testing used the null hypothesis RR= 1.0 with statistical significance inferred based on exclusion of unity from Bonferroni-adjusted 95% Confidence Intervals.[37]

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