Comparison of Deaths from COVID-19 and Seasonal Influenza in the USA

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Abbreviations

COVID-19	Coronavirus disease 2019
CDC	Centers for disease control
ICD-10	International classification of diseases, 10th revision
OR	Odds ratio

classification of diseases, 10th revision (ICD-10) codes J09–J11 for the years 2010 to 2019 using the CDC Multiple Cause of Death database [2]. Comorbidities were identified using the appropriate ICD-10 codes. Counts and percentages were examined as predictors using crude odds ratio (OR).

Introduction

Coronavirus disease 2019 (COVID-19) has contributed to significant mortality in the USA and worldwide. Since influenza has both similar risk factors and modes of transmission leading to severe respiratory illness, there is significant interest in comparing both epidemics. The objective of this study is to compare the differences in demographics and comorbidities in decedents with COVID-19 and influenza in the USA to identify specific sub-groups that would benefit from more aggressive preventative measures and interventions.

Methods

This is a retrospective, population-based study based on death certificate data received and coded by the National Center for Health Statistics and available on the Centers for Disease Control and Prevention (CDC) website. COVID-19-related deaths were assessed between January 4, 2020 and January 2, 2021 and are provisional death counts (data acquired on January 9, 2021) [1]. Influenza-related deaths and mortality rates were identified using international

Results

During the study period, there were a total of 313,171 recorded COVID-19-related deaths and 54,792 recorded influenza-related deaths. Decedents were stratified by demographics and the presence of comorbidities (Table 1). Decedents with COVID-19, when compared to influenza, were more likely to be male (OR 1.37) and between ages 65 and 84 years (OR 1.45–1.51). Decedents with COVID-19 were more likely to be Black (OR 2.24) and Hispanic (OR 2.74) compared to those who had influenza and less likely to be White (OR 0.36). Compared to decedents with influenza, decedents with COVID-19 were more likely to have diabetes, obesity, and hypertension; but less likely to have malignancy, chronic lung disease, renal failure, and heart failure. There was a higher percentage of deaths in nursing homes and a lower percentage of deaths at home and hospice in decedents with COVID-19.

Discussion

Our study is an important examination of the epidemiologic characteristics of U.S. decedents with COVID-19 compared to influenza. Older age and the comorbidities we evaluated are considered to be risk factors for having severe illness in both diseases. However, compared to influenza, we noted that decedents with COVID-19 are more likely to be males, aged 65–84 years, and have obesity, diabetes, and hypertension. In contrast, decedents with influenza were more likely to be 85 years or older and have heart failure, renal failure, chronic respiratory failure, or malignancy, which were

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Table 1 Characteristics of decedents with COVID-19 compared to influenza

Variable	Influenza crude mortality rate per 100,000 (95% CI)	Influenza ^a deaths (n = 54,792)	Covid-19 ^a deaths (n = 313,171)	Odds ratio ^b (95% CI)	p value
Sex					
Female	1.8 (1.8–1.8)	29,409 (53.7)	143,423 (45.8)	0.73 (0.72–0.74)	< 0.001
Male	1.6 (1.6–1.6)	25,383 (46.3)	169,748 (54.2)	1.37 (1.35–1.40)	
Age (Years)					
25–34	0.2 (0.2–0.2)	1026 (1.9)	2129 (0.7)	0.36 (0.33–0.39)	< 0.001
35–44	0.5 (0.4–0.5)	1875 (3.4)	5559 (1.8)	0.51 (0.48–0.54)	
45–54	0.9 (0.8–0.9)	3711 (6.8)	14,963 (4.8)	0.69 (0.67–0.72)	
55–64	1.7 (1.7–1.8)	6915 (12.6)	37,235 (11.9)	0.93 (0.91–0.96)	
65–74	3.1 (3.0–3.2)	8315 (15.2)	66,745 (21.3)	1.51 (1.48–1.55)	
75–84	8.0 (7.9–8.2)	11,327 (20.7)	85,925 (27.4)	1.45 (1.42–1.48)	
≥ 85	32.2 (31.8–32.7)	19,480 (36.2)	100,016 (31.9)	0.85 (0.83–0.87)	
Race					
Non-Hispanic Black	1.1 (1.0–1.1)	4463 (8.1)	52,044 (16.6)	2.24 (2.18–2.32)	< 0.001
Non-Hispanic White	2.2 (2.2–2.2)	44,004 (80.3)	185,593 (59.3)	0.36 (0.35–0.36)	
Hispanic	0.8 (0.7–0.8)	4193 (7.7)	57,928 (18.5)	2.74 (2.65–2.83)	
Asian	0.8 (0.8–0.9)	1536 (2.8)	11,701 (3.7)	1.35 (1.28–1.42)	
Native American	1.8 (1.6–1.9)	469 (0.9)	3527 (1.1)	1.32 (1.20–1.45)	
Comorbidities					
Hypertension	n/a	5779 (10.5)	62,579 (20.0)	2.11 (2.06–2.18)	< 0.001
Diabetes	n/a	5069 (9.3)	48,891 (15.6)	1.81 (1.76–1.87)	
Obesity	n/a	1126 (2.1)	11,483 (3.7)	1.81 (1.71–1.93)	
Vascular/unspecified dementia	n/a	4797 (8.8)	34,049 (10.9)	1.27 (1.23–1.31)	
Alzheimer's disease	n/a	1875 (3.4)	12,059 (3.9)	1.13 (1.08–1.19)	
Renal failure	n/a	6057 (11.1)	26,609 (8.5)	0.75 (0.73–0.77)	
Malignancy	n/a	3839 (7.0)	13,297 (4.2)	0.59 (0.57–0.61)	
Heart failure	n/a	6522 (11.9)	22,312 (7.1)	0.57 (0.55–0.58)	
Chronic respiratory disease	n/a	9215 (16.8)	27,112 (8.7)	0.47 (0.46–0.48)	
Place of death					
Inpatient	n/a	35,738 (65.2)	200,132 (63.9)	0.94 (0.93–0.96)	< 0.001
Home	n/a	5037 (9.2)	18,365 (5.9)	0.62 (0.60–0.64)	
Hospice	n/a	2507 (4.6)	9045 (2.9)	0.62 (0.59–0.65)	
Nursing home	n/a	7982 (14.6)	69,075 (22.1)	1.66 (1.62–1.70)	

International Classification of Diseases-10 codes used are as follows: Influenza: J09–J11, Diabetes: E10–E14, Malignancy: C00–C97, Hypertension: I10–I15, Chronic respiratory disease: J40–J47, Heart failure: I50–I50.9, Alzheimer's disease: G30, Vascular/unspecified dementia: F01–F03, Obesity: E65–E68, Renal failure: N17–N19

All data are covered by the provisions of the Public Health Service Act [42 U.S.C. 242 m (d)] and the data can be used for publication without additional permission

n/a not applicable

^aData are presented as number (%). Data are for COVID-19-related provisional deaths between January 4, 2020 and January 2, 2021 (acquired on January 9, 2021). Influenza-related deaths are for the years 2010 to 2019

^bThe overall risk in COVID-19 compared to Influenza

consistent with a previous study [3]. This suggests that the influence of different comorbidities in disease prevalence and severity could vary between viral diseases.

We noted a higher percentage of deaths in the nursing home in those with COVID-19 compared to influenza. Since nursing home residents are more likely to be older, the lower percentage of deaths from COVID-19 in those 85 years and

older could be due to delays or underreporting of nursing home deaths. Higher nursing home deaths from COVID-19 could also have been due to challenges in patients obtaining hospital care during certain time points in the pandemic due to overburdened hospital capacity.

Our study is the first to compare the difference in race between decedents with COVID-19 and influenza. In our

analysis of mortality rates from influenza, the highest mortality rates were in Whites, followed by Native Americans and Blacks. The rates were lowest in Hispanics and Asians. However, compared to influenza, decedents with COVID-19 were more likely to be Hispanic, Black, or other non-White races. This is likely due to the higher incidence of severe COVID-19 illness in these races, influenced by disparities in healthcare access, underlying comorbidities, and increased exposure due to certain occupations and poorer living conditions. Genetics and biological differences also likely influence the response to infection and treatment.

Our study is complementary to several other studies that have identified the characteristics and risk factors for severe COVID-19 pneumonia. Additionally, our study demonstrates significant differences compared to influenza that could be influential in formulating clinical decisions, future research, and public health decisions related to preventive measures, vaccine distribution, and treatment. The strength of this dataset is that it includes all U.S. decedents (both inpatient and outpatient) and therefore provides a large sample size. The major limitation, like other epidemiologic studies, is the possible underreporting of comorbidities contributing to death. Another limitation with the COVID-19 data is that the death counts are provisional and delays in reporting may vary by demographic factors and geographic location. The comparison is not direct because the testing periods are different and may be influenced by testing capacity and differences in reporting. We compared all decedents with a listed diagnosis of influenza and COVID-19 and therefore some deaths may not have been due to the viral infection. The database also does not have clinical information to allow comparison of secondary infections, thrombotic events, or laboratory data between both viruses. As population immunity increases for COVID-19 due to natural infection and vaccination, another

comprehensive review would be justified to determine if observed differences compared to influenza still hold.

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Data Availability All data generated or analyzed during this study are included in this published article.

Declarations

Conflict of interest The authors declare that they have no conflict of interest or competing interest.

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