



# New insights into the burden of COVID-19 mortality for U.S. Hispanics and Blacks when examined by country/region of origin: An observational study

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## Summary

**Background** Florida's diverse population composition includes persons from throughout Latin America and the Caribbean. This facilitated an insightful examination of disparities in 2020 Florida COVID-19 deaths not only among racial/ethnic populations in the aggregate (non-Hispanic White, non-Hispanic Black, Hispanic) but also at the level of country/region of origin.

**Methods** Age-adjusted mortality rates (AAMRs) for 2020 Florida COVID-19 deaths were calculated by race, ethnicity, and country/region of origin along with mean age at death, mean number of comorbidities, and percentage of decedents who had not completed secondary education. Regression-derived mortality rate ratios (MRRs) compared death rates for each racial/ethnic/country-of-origin population to non-Hispanic whites.

**Findings** The overall AAMR (per 100,000) for 18,342 Florida COVID-19 deaths in 2020 was 55.4, with a much lower AAMR for non-Hispanic Whites (39.3) than for Hispanics (86.8) or Blacks (107.6). Marked differences in AAMRs were observed for specific Black and Hispanic ethnic groups from varied countries/regions of origin. COVID-19 decedents from Mexico and Central America had the highest AAMRs (170.7 and 168.8 per 100,000, respectively), lowest age at death, lowest educational level, and fewest comorbidities. Mean comorbidities were highest for Blacks (all origins) and Cuban Hispanics.

**Interpretation** Florida Blacks and Hispanics experienced disproportionately high COVID-19 mortality rates throughout 2020, with notable variability based on country/region of origin. Inequities were particularly pronounced for Hispanic populations from Mexico and Central America. To better understand these heterogeneous COVID-19 mortality trends, more nuanced racial/ethnic analyses and detailed data on social determinants of health are needed.

**Funding** Supplemental funding was provided by the Sylvester Comprehensive Cancer Center at University of Miami Miller School of Medicine. Research reported in this publication was also supported by the National Cancer Institute of the National Institutes of Health under Award Number P30CA240139.

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## Introduction

In the United States (U.S.), marked racial and ethnic inequities in COVID-19 mortality rates were detected in the earliest months of the pandemic and have persisted.<sup>1,2</sup> COVID-19 death rates also varied substantially by age group.<sup>3</sup> These disparate patterns extended throughout the 2020 pre-vaccine era and continue to the present.<sup>1-3</sup> Elevated rates of COVID-19 cases,

hospitalizations, and deaths were observed in Blacks, Hispanics, and American Indians, compared to the numerical majority population of non-Hispanic Whites.<sup>2</sup> Currently, the highest COVID-19 mortality rates are observed among Hispanics, American Indians, and Pacific Islanders.<sup>2,4,5</sup>

Florida is the third most populous U.S. state and also the state with the most diverse representation of persons who have come to the U.S. from Latin America and the Caribbean, in essence, exemplifying a melting pot of the Americas. Three racial/ethnic populations account for 96% of the state's 21,478,000 residents:

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The Lancet Regional Health - Americas  
2022;5: 100090  
Published online 5 November 2021  
<https://doi.org/10.1016/j.iana.2021.100090>

## Research in context

### *Evidence before this study*

From the earliest days of the COVID-19 pandemic in the U.S., racial/ethnic minority populations have experienced higher rates of cases, hospitalizations, and deaths compared to non-Hispanic whites. Surveillance data demonstrate that these observed disparities have persisted throughout the pre-vaccine era of 2020.

### *Added value of this study*

This study confirms the expected higher rates of COVID-19 mortality for Blacks and Hispanics in the State of Florida during 2020. However, as the state with the most diverse population of persons who have come to the U.S. from Latin America and the Caribbean, we were able to analyze the disparities in COVID-19 mortality rates by country of origin for Blacks from U.S., Haiti, and West Indies, and Hispanics from Mexico, Cuba, Puerto Rico, Central and South America.

Our findings underscore that analyses of Hispanic and Black populations in the aggregate obscure important differences among more detailed groups; these are heterogeneous rather than monolithic populations. Also, the observed country of origin differences in COVID-19 death rates intimate that important underlying differences in social determinants of health (SDOH) are operating.

### *Implications of all available evidence*

Glaring health inequities exist and persist by race, ethnicity, country of origin (studied here), and key SDOH indicators in relation to COVID-19 disease and death, as well as access to nonpharmacological protection measures, testing, vaccination, and timely care. In order to optimally slow and prevent the ongoing spread of COVID-19—for all population groups—there is a compelling need to learn more about SDOH data and to design and target culturally competent interventions defined not only by race and ethnicity, but also by country of origin, educational level, occupation, and special needs status.

non-Hispanic Whites (53.2%), Hispanics (26.4%), and non-Hispanic Blacks (16.9%).<sup>6</sup> Florida's multinational Hispanic population features large contingents from South America, Central America, and the Caribbean (including Cuba, Dominican Republic, and Puerto Rico). Throughout the remainder of the U.S., most Hispanics are from Mexico. In contrast, while Florida's Mexican population is indeed sizeable (exceeding 700,000), they comprise just 14% of the state's Hispanics.<sup>7</sup> In parallel, substantial proportions of Florida's non-Hispanic Black population are Haitian and Afro-Caribbean, allowing cross-group comparisons that are generally not possible throughout much of the country where most Blacks are U.S.-born.<sup>7</sup> The unique makeup

of the Florida population provides the opportunity to examine COVID-19 mortality disparities by race, ethnicity, and country of origin

## Methods

We analyzed the State of Florida COVID-19 mortality data, obtained from the Florida Department of Health's Bureau of Vital Statistics, dating from the first pandemic death through year-end 2020.<sup>8</sup> This data source is publicly available and includes all deaths among Florida residents occurring through December 31, 2020. In this study, we analyzed all deaths that were coded as U071.9, according to the International Classification of Diseases Tenth Revision (ICD-10), for the main cause of death field, signifying COVID-19 as the primary cause of death.<sup>9</sup> Decedents with U071.9 as an accessory cause of death, rather than the primary cause, were excluded.

Age at death was available for all 2020 Florida COVID-19 deaths. Race and ethnicity categories were available for 99% of decedents. For the first level of analysis, COVID-19 deaths were broadly partitioned into four mutually exclusive racial/ethnic groups: non-Hispanic Whites, non-Hispanic Blacks, non-Hispanic Asian/Pacific Islanders, and Hispanics (of any race).

Country of birth was available for 98% of 2020 Florida COVID-19 deaths. For non-Hispanic Blacks, mortality rates were calculated for three countries/regions of birth: U.S., Haiti, and West Indies (including Jamaica and all other non-Hispanic Caribbean islands), as specified elsewhere.<sup>10</sup> It was possible to classify 96% of Hispanic COVID-19 decedents according to country/region of origin. This permitted Florida COVID-19 mortality rate calculations for decedents from the following countries and geographic regions: Mexico, Puerto Rico, Cuba, Central America, South America, and the Dominican Republic. Florida Hispanics from Spain were not reported due to low numbers of COVID-19 deaths. For each of these studied groups defined by race, Hispanic ethnicity, and country/region of birth, the corresponding Florida population denominators were obtained from the 2019 American Community Survey,<sup>7</sup> as 2020 data have not been made available at this time.

Chi-Square and t-tests were used to compare the mean age at death, mean comorbidities, and proportion of those that did not complete high school among decedents from all racial/ethnic/country-of-origin categories. Mortality rates were calculated by dividing the number of deaths due to COVID-19 by the corresponding population-at-risk in Florida (i.e., population denominators obtained from 2019 American Community Survey). Age-adjusted mortality rates (AAMR) were calculated per 100,000 persons for each racial/ethnic/country-of-origin group, and age-standardized to the 2000 U.S. Standard Population for 18 age bands (5-year age bands for ages 0 to 84 years, plus 85 and older). Gamma intervals

modification was used to calculate 95% confidence intervals (CIs) for AAMRs.<sup>11</sup> For COVID-19 deaths occurring in each of five broader age brackets (less than 50 years, 50–64 years, 65–74 years, 75–84 years, 85 years and above), age-adjusted MRRs comparing each racial/ethnic/country-of-origin group to the reference population, non-Hispanic Whites, were computed using negative binomial regression.

The Florida COVID-19 mortality database included several additional searchable fields that were included in the analyses. For each death, the presence of any of the following COVID-19-related comorbidities was recorded: cancer, hypertension, coronary heart disease, congestive heart failure, asthma, chronic obstructive pulmonary disease (COPD), immunosuppression, kidney disease, liver cirrhosis, obesity, and diabetes. Comorbidities were tallied for each death record and the mean number and type of comorbidity were computed for each racial/ethnic/country-of-origin group. Also noted for each death record was whether the decedent had completed secondary education.

*Role of the funding source:* Funders had no role in study design, data collection, data analysis, interpretation, writing of the report or decision to submit.

## Results

In 2020, 18,342 Florida deaths were ascribed to COVID-19, ranging in age of death between 9 and 108 years old. AAMRs were highest among Blacks, followed by Hispanics, with lower rates observed among Whites and Asians/Pacific Islanders (Table 1). Considerable heterogeneity was observed across Black and Hispanic populations from various countries/regions of origin. For all racial/ethnic/country-of-origin groups, AAMRs for males significantly exceeded those among females (Supplementary Table 1).

Compared to decedents from all other racial/ethnic/country-of-origin categories, Mexicans and Central Americans were highly distinctive on a cluster of five factors: (1) highest AAMRs (170.7 and 168.8 per 100,000, respectively), (2) youngest mean ages at death (63.6 and 66.9 years) ( $P < 0.05$ ), (3) fewest mean comorbidities (0.97 and 1.09) ( $P < 0.05$ ), (4) highest proportions who did not graduate from high school (64.2% and 45.7%) ( $P < 0.05$ ), and (5) highest all-ages MRRs compared to non-Hispanic Whites, 5.4 [95% CI:4.7–6.3] and 5.2 [95% CI:4.5–6.1], respectively.

For non-Hispanic Blacks, AAMRs for all ages combined were highest for Blacks born in Haiti, 123.2 [95% CI: 112.9–134.5] and those born in U.S., 113.4 [95% CI: 108.8–118.2], but significantly lower for Blacks born in the West Indies, at 74.4 [95% CI: 66.8–83.3]. Blacks in the aggregate (1.48), and for each of the three country-of-origin groups individually, had the highest mean

comorbidities among all groups, apart from Cuban Hispanics (1.59).

Age-specific MRRs for both Florida Blacks born in the U.S., Haiti, and the West Indies; and for Florida Hispanics from Mexico, Central America, and Puerto Rico displayed a distinctive pattern: MRRs were highest for the youngest age group (<50 years) and declined with increasing age (Fig. 1). Compared to young non-Hispanic Whites, below age 50, young Mexicans and Central Americans had markedly elevated MRRs: 8.0 [95% CI: 6.1–10.5] and 7.1 [95% CI 5.3–9.6], respectively.

Additionally, among Hispanics, Puerto Ricans and South Americans, respectively, had 2.7 times [95% CI:1.9–3.8] and 1.9 times [95% CI:1.3–2.8] greater mortality than non-Hispanic Whites. Among Blacks, U.S.-born Blacks, Haiti-Born Blacks, and West Indies-Born Blacks, respectively, had 6.7 times [95% CI:5.4–8.4], 5.0 times [95% CI:3.4–7.3], and 3.4 times [95% CI:2.1–5.4] higher mortality in comparison to their non-Hispanic White counterparts.

A strikingly different pattern was found for Florida Hispanics of Cuban or South American origin. For Cubans, the largest differentials from non-Hispanic Whites were observed among those aged 65–74 and 75–84. For South Americans, MRRs were most elevated compared to non-Hispanic Whites—2 to 3 times higher—for ages 50–64, 65–74, and 75–84. For U.S.-born Blacks, MRRs in relation to non-Hispanic Whites were highest among those younger than age 50, 6.7 [95% CI: 5.4–8.4] and lowest among those older than 85, 1.8 [95% CI 1.7–2.0].

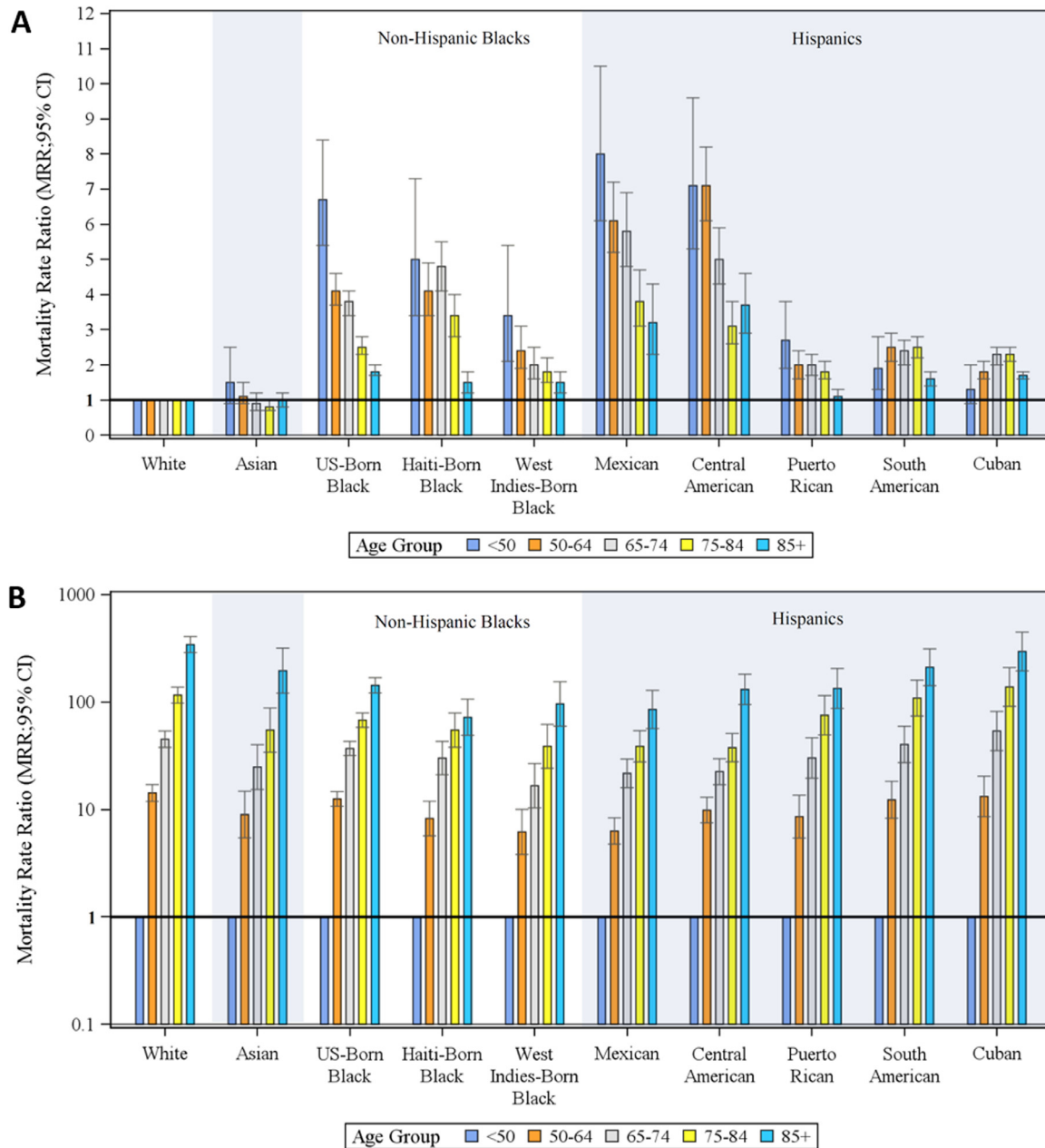
Differences in the distribution of MRRs between age-groups for each racial/ethnic/country-of-origin groups were noted in Fig. 1B. In comparison to those less than 50, the largest differentials were found for non-Hispanic Whites [MRR: 342.8, 95% CI: 288.8–406.9], Cubans [MRR: 295.6, 95% CI: 195.2–447.7], South Americans [MRR: 210.8, 95% CI: 142.1–312.8], and Asians [MRR: 196.0, 95% CI: 120.9–317.8] older than 85. Meanwhile, Mexicans, Central Americans, Haiti-born Blacks, and West Indies-born Blacks older than 85 had MRRs of 85.3 [(95% CI: 56.6–128.5), 131.1 [(95% CI: 94.7–181.5), 72.2 [(95% CI: 49.0–106.3), 96.0 [(95% CI: 59.6–154.6), respectively, compared to their counterparts in the youngest age group (i.e., <50 years).

Lastly, Table 2 shows the distribution of the top five comorbidities by racial/ethnic and country-of-origin group. Among all deaths attributed to COVID-19, the most common comorbidities in decreasing order were hypertension (37.9%), diabetes (21.0%), ischemic heart disease (19.6%), chronic obstructive pulmonary disease (12.5%), dementia and/or Alzheimer's disease (11.3%), kidney disease (8.8%), heart failure (5.1%), cancer (4.1%), and stroke (4.0%).

	COVID-19 Deaths	2019 Population	Age-adjusted mortality rate (AAMR)	Age at death	Number of comorbidities	Did not complete high school
	N	1000s (%)	per 100,000 (95% CI)	Mean (median)	mean	%
<b>Primary racial/ethnic categories</b>						
All combined <sup>a</sup>	18,342	21,478 (100.0)	55.4 (54.6–56.3)	76.1 (78)	1.36	20.4
Non-Hispanic Whites	9,540	11,340 (52.8)	39.3 (38.5–40.1)	79.3 (81)	1.32	10.7
Non-Hispanic Blacks <sup>b</sup>	3,388	3,516 (16.4)	107.6 (103.9–111.3)	70.6 (72)	1.48	25.9
Non-Hispanic Asians	283	778 (3.60)	38.3 (33.8–43.2)	72.4 (74)	1.23	15.2
Hispanics <sup>c</sup>	4,993	5,708 (26.6)	86.8 (84.4–89.2)	74.0 (76)	1.35	35.4
<b>Hispanic and Black populations by country/region of origin</b>						
Hispanics	Mexico	777	170.7 (152.6–190.1)	63.6 (64)	0.97	64.2
	Puerto Rico	1,243	66.2 (61.5–71.1)	73.7 (76)	1.33	30.8
	Cuba	1,620	78.1 (74.7–81.6)	79.3 (81)	1.59	34.7
	Other	425	168.4 (153.6–184.2)	66.9 (67)	1.09	45.7
	Central America <sup>d</sup>	790	83.1 (77.2–89.4)	73.7 (75)	1.16	16.3
	South America <sup>d</sup>	143	63.3 (53.0–84.2)	74.4 (75)	1.37	39.2
	Dominican Republic <sup>d</sup>	2,745	113.4 (108.8–118.2)	70.1 (71)	1.47	24.4
Non-Hispanic	US-born Blacks	363	123.2 (112.9–134.5)	71.1 (71)	1.50	38.2
Blacks	Haiti-born Blacks	374	74.4 (66.8–83.3)	72.9 (75)	1.45	20.1
	West Indies-born Blacks					

**Table 1: Distribution of 2020 Florida COVID-19 deaths and age-adjusted mortality rates (AAMRs) by race, ethnicity, and country of origin.**

In addition to the listed groups: a. includes American Indians, Multiracial and others. b includes non-listed countries of birth such as Ghana, Nigeria, Canada c. includes those born in Spain, and Hispanics of non-traceable specific origin d. foreign-born only. West Indies includes Jamaica and all non-Spanish speaking nations/territories in the Caribbean except Haiti. Central America includes Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Belize (Hispanic only). South America includes Argentina, Bolivia, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela.



**Fig. 1.** Mortality Rate Ratios (MRRs) for 2020 Florida COVID-19 deaths by age group, race, ethnicity, and country/region of origin. **(A)** Bar chart representing the age-adjusted mortality rate ratios (MRR) comparing COVID-19 deaths among racial/ethnic and country-of-origin groups to the reference population, non-Hispanic Whites. The dark blue, orange, light gray, yellow, and light blue bars represent those ages less than 50 years, 50–64 years, 65–74 years, 75–84 years, 85 years and above, respectively. The background shading distinguishes racial/ethnic groups, i.e., Asians are a standalone group; Blacks are composed of US-Born Blacks, Haiti-Born Blacks, and West Indies-Born Blacks; Hispanics are composed of Mexicans, Central Americans, Puerto Ricans, South Americans, and Cubans. The horizontal line at 1 represents the reference point for the MRR. MRR is relative to the non-Hispanic White class. **(B)** Bar chart representing the age-adjusted mortality rate ratios (MRR) comparing COVID-19 deaths among age classes to the reference population, those ages less than 50 years old. The dark blue, orange, light gray, yellow, and light blue bars represent those ages less than 50 years, 50–64 years, 65–74 years, 75–84 years, 85 years and above, respectively. The background shading distinguishes racial/ethnic groups, i.e., Asians are a standalone group; Blacks are composed of US-Born Blacks, Haiti-Born Blacks, and West Indies-Born Blacks; Hispanics are composed of Mexicans, Central Americans, Puerto Ricans, South Americans, and Cubans. The horizontal line at 1 represents the reference point for the MRR. MRR is relative to those under 50 years old bracket. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article).

		Total	Hypertension	Diabetes	Ischemic Heart Disease	Chronic Obstructive Pulmonary Disease	Dementia/Alzheimer's Disease
		N	%	%	%	%	%
<b>Primary racial/ethnic categories</b>							
All combined <sup>a</sup>		18,342	37.9	21.0	19.6	12.5	11.3
Non-Hispanic Whites		9,540	32.1	15.4	21.5	15.3	16.7
Non-Hispanic Blacks <sup>b</sup>		3,388	46.9	30.6	15.8	10.1	7.9
Non-Hispanic Asians		283	43.1	26.9	19.1	6.4	12.7
Hispanics <sup>c</sup>		4,993	42.7	24.7	18.3	9.2	10.4
<b>Hispanic and Black populations by country/region of origin</b>							
Hispanics	Mexico	517	31.5	26.3	9.5	5.6	2.1
	Puerto Rico	750	37.1	22.8	23.1	10.4	11.1
	Cuba	2,067	50.5	25.5	21.8	12.4	15.1
	Other	635	27.7	27.7	11.5	5.0	4.6
		Central America <sup>d</sup>	790	21.4	21.4	15.9	6.1
	South America <sup>d</sup>	143	26.6	26.6	25.2	8.4	8.4
	Dominican Republic <sup>d</sup>						
Non-Hispanic	US-born Blacks	2,375	44.8	29.3	16.4	12.1	7.5
Blacks	Haiti-born Blacks	574	55.1	35.5	13.4	3.8	5.1
	West Indies-born Blacks	374	46.3	31.3	13.9	7.0	13.1

**Table 2: Proportion of top five comorbidities among 2020 Florida COVID-19 deaths by racial/ethnic and country-of-origin group.**

In addition to the listed groups: a. includes American Indians, Multiracial and others. b includes non-listed countries of birth such as Ghana, Nigeria, Canada c. includes those born in Spain, and Hispanics of non-traceable specific origin d. foreign-born only. West Indies includes Jamaica and all non-Spanish speaking nations/territories in the Caribbean except Haiti. Central America includes Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Belize (Hispanic only). South America includes Argentina, Bolivia, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela.

## Discussion

Our analyses revealed salient patterns. First, consonant with national data, COVID-19 AAMRs were much higher for Blacks and Hispanics compared to non-Hispanic Whites and Asians.<sup>1–5</sup> Second, findings of elevated COVID-19 AAMRs relative to non-Hispanic Whites were consistent across the entire spectrum of Black and Hispanic population groups, regardless of country of origin. Third, heterogeneity was pronounced for AAMRs and all ancillary variables (age at death, high school completion, comorbidities) depending upon country/region of origin for Blacks and Hispanics. Fourth, Blacks were distinguished for high numbers of comorbidities across all countries of origin and compared to non-Hispanic Whites and Asian/Pacific Islanders, for lower levels of high school completion. Fifth, the findings of much higher COVID-19 AAMRs in younger Mexicans and Central Americans with few comorbidities, coupled with MRRs that are steeply higher for younger age brackets, are startling and counterintuitive. This suggests that Florida decedents from these two groups may have experienced significant impediments for accessing and utilizing COVID-19 testing and care services.

These findings for Mexican and Central American Hispanic groups in Florida align with aggregate national patterns—including studies from Texas and California—where Hispanics, predominantly from Mexico, have the highest COVID-19 mortality rates.<sup>4,5</sup> However, when Hispanics are considered as a whole, Florida's mortality rates for Blacks exceed those for Hispanics, mimicking similar observations in the state of New York but contrasting with COVID-19 mortality patterns in both Texas and California. As a commonality linking Florida and New York, both states have Hispanic populations that are predominantly of Caribbean rather than Mexican origin.

While genetic susceptibility within distinctive Hispanic populations may be a contributing and understudied factor thus far,<sup>12</sup> social determinants of health (SDOH)—including employment, occupation, income, immigration status, and access to care—are likely to be powerful underlying drivers of the elevated rates of COVID-19 transmission and death.<sup>13–15</sup> Additionally, comorbidities are also associated with worse COVID-19 prognosis.<sup>16</sup> Most comorbidities (e.g., dementia/Alzheimer's, ischemic heart disease) are intrinsically associated with increasing age as demonstrated by the higher proportion of comorbidities among racial/ethnic and country-of-origin groups with a higher mean age at death due to COVID-19. However, there was a striking exception for diabetes, in which Mexicans, Central Americans, and Blacks (including US-, Haiti-, and West-Indies-born Blacks), despite their younger age at death, had a high proportion of diabetes.

Compared to 2020, the first half of 2021 has been a distinctly different phase of the COVID-19 pandemic.

Throughout the U.S., the highest-ever COVID-19 incidence rates peaked in January 2021, followed by a sharp downturn with decreasing rates continuing throughout February to June. COVID-19 vaccination has reached about half of the Florida population (54.6% one dose, 46.7% fully vaccinated) through the end of June.<sup>17</sup> The SARS-CoV-2 Alpha variant (also known as B.1.1.7) became predominant nationally and in Florida throughout the Spring months even while cases and deaths continued to decline. More ominously, the Delta (B.1.617.2) variant has become predominant nationally in early July and by mid-July, cases began rising sharply in most states, including Florida.

What is critically lacking from the Florida COVID-19 mortality dataset and other truly population-based datasets which include all subjects rather than just convenience samples, is the inclusion and adjustment for SDOH measures at the individual level (e.g., occupation, income, household composition, educational attainment, social vulnerability index). As an example of the impact of these, the dataset contained a single indicator of educational attainment from which the percentage of those who completed secondary education could be derived. Even this simplistic measure of high-school completion displayed remarkable—and useful—differences when examined by country/region of origin. These important SDOH indicators are known to be predictive of risks for COVID-19 transmission, infection, hospitalization, and death.<sup>18–20</sup>

What our analyses have added is the ability to differentiate COVID-19 mortality rates at the level of country/region of origin. Notable disparities were revealed. While country of origin is not a direct proxy for socioeconomic status, it is related. For example, Florida residents born in Cuba and South America (with large subsets from Colombia and Venezuela) are largely concentrated in South Florida (Miami, Fort Lauderdale, Palm Beach) where these communities are well-established over multiple generations and contribute substantively to the economic and political power bases in those communities. It is therefore not surprising to find that AAMRs for Cubans and South Americans are considerably closer to those of non-Hispanic Whites (and Asian/Pacific Islanders) in relation to most other racial/ethnic subgroups, despite being significantly higher than those of non-Hispanic Whites. In contrast, the newest, poorest, least connected, and most vulnerable Hispanic groups are those from Mexico and Central America, including many living in families with “mixed” immigration status where fear of exposure may be a disincentive to seeking COVID-19 testing, care, and vaccination. Furthermore, members of these subgroups have much lower levels of education, tend to be employed as essential workers or migrant workers, and live below the poverty line.<sup>21</sup>

In the absence of directly collecting traditional indicators of socio-economic status and critical SDOH

measures that differentiate individual and population abilities to take preventive and protective actions like socially distancing, wearing masks, and receiving COVID-19 vaccines, the country/region of origin measure provides a partial insight into these inequities. The racial/ethnic differentials in COVID-19 rates—incidence, hospitalization, and mortality—are likely to be explained by SDOH variables that are lacking from most datasets. Analyzing mortality by country of origin provides a start.

However, not to overplay the importance of socioeconomic and SDOH measures constituting a main limitation of this—and most—population studies, it is remarkable that similarly economically-disadvantaged non-Hispanic groups, e.g., Haiti-born Blacks, have lower mortality rates compared to Mexican and Central American Hispanics, suggesting specific vulnerabilities for these Hispanic populations that should be further explored. For example, the cultural value of “*familismo*” may have an influencing role in COVID-19 outcomes given the strong emphasis on extended family networks/relationships which make multigenerational housing more common and public health measures more difficult to follow. Additionally, differences in “essential” occupation could be an attributing factor. In terms of genetic susceptibility, vulnerabilities to SARS-CoV-2 infection, its complications, and side effects of therapies, could also contribute.

Extending beyond these alarming disparities in COVID-19 mortality rates by race/ethnicity throughout 2020, we must be concerned about widening gaps going forward. COVID-19 vaccination presents a compelling example; within the first months of 2021, COVID-19 vaccination rates were much lower among Blacks and Hispanics than for non-Hispanic Whites.<sup>22</sup> Inequitable health system access, flawed vaccine distribution systems, and elevated rates of vaccine hesitancy in racial/ethnic minorities contribute to these disparities.<sup>23</sup> The early phases of the national and global vaccine rollout coincided with the emergence of more transmissible and deadly COVID-19 variants; populations whose vaccination is delayed will be more vulnerable to infection with these mutated strains.

Analyses presented here, showing conspicuous inequities in COVID-19 mortality rates by race, ethnicity, and country of origin, underscore the need to carefully target race-ethnicity in different ways in face of a health crisis. COVID-19 prevention and response strategies must be tailored and prioritized for populations that are unequally affected by the pandemic. U.S. racial/ethnic minorities are inadequately provided with critical capabilities for mitigating transmission (clear communications, opportunities for effective social distancing, workplace safeguards, masking, appropriate personal protective equipment).<sup>24</sup> They lack equitable access to COVID-19 testing, vaccination, and treatment.<sup>25</sup> COVID-19 prevention/intervention measures

can no longer treat racial/ethnic populations in a monolithic manner; risks for COVID-19 transmission, disease, and death vary by country of origin, culture, and geography.

Our analyses have demonstrated startling disparities in 2020 COVID-19 mortality rates in Florida by race, ethnicity, and especially, country/region of origin. Differences among countries of origin become even more distinctive when examining MRRs for younger age brackets. Future studies must strive to gather critical information on SDOH measures to be able to meaningfully intervene on these observed inequities.

### Declaration of Competing Interest

The authors declare no potential conflicts of interests.

### Acknowledgments

Supplemental funding was provided by the Sylvester Comprehensive Cancer Center at University of Miami Miller School of Medicine. Research reported in this publication was also supported by the National Cancer Institute of the National Institutes of Health under Award Number P30CA240139. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

### Data sharing statement

The authors confirm that, for approved reasons, some access restrictions apply to the data underlying the findings. These data can only be released for specific use upon approvals from the Florida Department of Health Bureau of Vital Statistics and the Florida Department of Health Institutional Review Board. These data are never available for public repository given the confidential information they contain. The datasets are available by request with required approvals from the Florida Department of Health Bureau of Vital Statistics and Florida Department of Health Institutional Review Board. Applications for data request are available from: <http://www.floridahealth.gov/statistics-and-data/data-and-statistics/index.html>.

### Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.lana.2021.100090](https://doi.org/10.1016/j.lana.2021.100090).

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