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Descriptive Finding

Using race- and age-specific COVID-19 case data to investigate the determinants of the excess COVID-19 mortality burden among Hispanic Americans

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Using race- and age-specific COVID-19 case data to investigate the determinants of the excess COVID-19 mortality burden among Hispanic Americans

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Abstract

BACKGROUND

Age-adjusted COVID-19 mortality estimates have exposed a previously hidden excess mortality burden for the US Hispanic population. Multiple explanations have been put forth, including unequal quality/access to health care, higher proportion of pre-existing health conditions, multigenerational household composition, and disproportionate representation in telecommute-unfriendly occupations. However, these hypotheses have been rarely tested.

OBJECTIVE

We examine age-stratified patterns of Hispanic COVID-19 mortality vis-à-vis patterns of exposure to evaluate the multiple posited hypotheses.

METHODS

We use a combination of public and restricted data from the Centers of Disease Control and Prevention and leverage national and subnational race- and age-stratified COVID-19 mortality and case burdens/advantages to evaluate the workplace vulnerability hypothesis. We also use individual-level information on prior health conditions and mortality from the case data to assess whether observed patterns are consistent with the other hypotheses.

RESULTS

Our results indicate that the disproportionate burdens for both COVID-19 case and mortality for the Hispanic population are largest among the working-age groups, supporting the hypothesis that workplace exposure plays a critical role in heightening vulnerability to COVID-19 mortality. We find little evidence to support the hypotheses

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regarding multigenerational household composition, pre-existing health conditions, or unequal quality/access to health care.

CONCLUSION

Our findings point to the key roles played by age structure and differential exposure in contributing to the disproportionately severe impact of COVID-19 on the Hispanic population.

CONTRIBUTION

We contribute evidence to explain the driving factors in the observed excess COVID-19 mortality burden among Hispanics. Our findings underscore the importance of focusing on more robust workplace protections, particularly for working-age minority populations.

1. Introduction

As the coronavirus pandemic spread across the United States, it revealed stark racial/ethnic inequities in the US social structure. Nationally, COVID-19 mortality rates among Black and Indigenous Americans are two to three times that of non-Hispanic White Americans (The Atlantic 2020). The pattern for the Hispanic/Latino (henceforth, Hispanic) population, however, initially appeared to diverge from this trend. Early headlines and reports regarding the disproportionate burden of COVID-19 on the Hispanic population focused only on cases, presumably because overall mortality burdens for Hispanics suggested relatively little excess death overall (Strully, Yang, and Liu 2020; The Atlantic 2020). Indeed, Hispanics constitute 18.5% of the US population and represent, as of September 30, 2020, 21.3% of COVID-19 deaths nationally (Centers for Disease Control 2020a). In contrast, Hispanics make up 28.6% of cases (Centers for Disease Control 2020b). Taken together, this seemed to indicate that the inequity of COVID-19 infection among the Hispanic population had thus far not been translated into commensurate inequities in mortality.

However, the youthful age structure of the Hispanic population had masked the actual mortality burden borne by the Hispanic population. As of 2019, the median age for Hispanics was only 29.8 years, compared to the median age of 43.7 for non-Hispanic Whites (henceforth, Whites; Frey 2020). Because COVID-19 mortality rates are much lower for younger age groups (Dowd et al. 2020; Stokes et al. 2020), not accounting for the age structure of the Hispanic population had underestimated a considerable burden in COVID-19 mortality. For example, age-adjusted deaths for Hispanics revealed a 21.4 percentage point higher burden than their representation in the US population (19.39% of the age-standardized population vs. 40.83% of age-standardized deaths; Centers for Disease Control 2020a). One recent analysis finds that age-specific COVID-19 death

rates have been so high for the Hispanic population as to likely jeopardize the well-established Hispanic mortality advantage compared to Whites (Sáenz and Garcia 2021).

Less clear are the factors driving excess Hispanic mortality. Multiple explanations have been put forth for the disproportionate deaths facing racial/ethnic minority communities generally; these include higher proportion of pre-existing health conditions (Gil et al. 2020; Raifman and Raifman 2020), unequal quality/access to health care (Blumenthal et al. 2020), and vulnerability to COVID-19 via intrafamily transmission among older racial/ethnic minorities who are more likely to live in multigeneration households (Figueroa et al. 2020). By far the most commonly cited argument with respect to the Hispanic population concerns their heightened exposure as essential and frontline workers (Clark et al. 2020; Gil et al. 2020; Pangborn and Rea 2020; Rodriguez-Diaz et al. 2020; Selden and Berdahl 2020). The disproportionate share of Hispanics in essential industries, including construction, warehousing and storage, and grocery stores, has been readily documented (Dubay et al. 2020). The US Bureau of Labor Statistics finds Hispanics disproportionately represented in “telecommute unfriendly” occupations, with only 13% of Hispanics able to work from home compared to 25% for Whites (Bureau of Labor Statistics 2020). An analysis of data from the Medical Expenditure Panel Survey finds that nearly 80% of Hispanics worked in essential industries (e.g., food, health care, public safety, and utility) or in jobs in which they were unable to work from home, compared to roughly 60% of Whites (Selden and Berdahl 2020). Consistent with the workplace vulnerability hypothesis, workplace-outbreak-associated COVID-19 has disproportionately impacted Hispanics. For example, the CDC finds that recently Hispanics accounted for 59% of workers with workplace-associated COVID-19 in 15 industries in Utah despite accounting for less than 25% of the workforce in these industries (Bui et al. 2020).

However, owing to a lack of socioeconomic and demographic information on individual COVID-19 cases, linkages between exposure and excess Hispanic COVID-19 mortality have remained largely hypothetical, relying on oblique connections between COVID-19 mortality and cases and overall racial/ethnic patterns in workforce composition, socioeconomic status, and habitation. To date, no study has examined patterns of COVID-19 mortality vis-à-vis patterns of exposure to determine whether the disproportionate mortality experienced by the Hispanic population is indicative of workplace exposure or is more aligned with other explanations (e.g., pre-existing conditions, health-care access and/or quality, or intergenerational transmission). In response, we leverage age-stratified race/ethnic-specific COVID-19 deaths and cases alongside information from individual-level case data to more directly evaluate the multiple existing hypotheses, with particular attention to the possibility that heightened exposure for workers is driving the excess mortality burden among Hispanics.

2. Data and methods

2.1 Data

Data come from the CDC and the US Census Bureau. Data from the CDC include publicly available state-level data on COVID-19 death counts stratified by age within racial/ethnic groups (Centers for Disease Control 2020a) and restricted data on COVID-19 cases (Centers for Disease Control 2020c). The restricted COVID-19 case data are part of the COVID-19 case surveillance system database, which includes all patient-level data reported to the CDC. The data are lagged at least 14 days to maximize accuracy of time-dependent outcomes. Data include individual-level information on age, race/ethnicity, prior health conditions, mortality, and state and county of residence.

Data from the US Census Bureau's 2019 Annual County Resident Population Estimates provide county-level population estimates, stratified by age and race/ethnicity, and are used as a base of comparison for race-specific age-stratified case data (United States Census Bureau 2020a).

2.2. Methods

Because of the critical role that geography and the US racialized age structure has played in shaping the patterns of racial/ethnic COVID-19 disparities, we examine age-stratified COVID-19 mortality and case data at both the national and subnational levels for Whites and Hispanics separately. All analyses are based on the most recent data as of September 30, 2020.

2.2.1 Mortality analysis

To gauge the magnitude of the mortality burden/advantage, the proportion of COVID-19 deaths attributed to each population subgroup is compared against each group's adjusted population size. A positive difference reflects a disproportionate COVID-19 mortality burden (i.e., the proportion who had died from COVID-19 is higher than the group's adjusted representation in the population), while a negative difference reflects a disproportionate COVID-19 mortality advantage. The adjusted population size, generated by the CDC, reflects raw population distributions that were weighted by county-level COVID-19 mortality data to account for the geographic variation in COVID-19 deaths across counties (Centers for Disease Control 2020d). Because early COVID-19 deaths disproportionately occurred in urban areas, which tend to have larger

shares of minority populations, county-level death counts are used to weight county-level total and race-specific population estimates. Weights are proportional to the county deaths within a state and account for the geographic clustering in deaths.

2.2.2 Case analysis

For the COVID-19 case analysis, we document age-specific case burdens/advantages for Hispanics and Whites separately. We first aggregate individual-level case data and assess excess burdens at the national level. However, for cases, 45% of data on race/ethnicity is missing nationally, making inferences problematic. At the state level, the average percent of missing race/ethnicity case data is 41.3%, with a wide range of missing data across counties within a state, preventing reliable state-level estimates. We thus examine the extent of the case burden/advantage by comparing race-specific cases to the relevant population shares at the county level. We first restrict our analytical sample to counties with at least 10% Hispanic population, 100 total cases, and race-specific case counts of at least 20 individuals. This reduces our data from 2,819 counties to 351 counties. An additional restriction that excludes counties with 25% or more missing values on race/ethnicity results in a final analytical sample of 140 counties with a median race/ethnicity missing rate of 17%. Observations with missing race/ethnicity are excluded in the analysis.

3. Results

3.1 Mortality estimates

Figure 1 presents overall mortality burdens for Hispanics and Whites nationally and for the top 10 states with the highest overall death counts that had at least 10% Hispanic population and 100 deaths each for Hispanics and Whites. New York City is presented separately from New York state due to its high death count. Bars reflect percentage point differences between each group's share of deaths and their adjusted share of the population within the specified geographic area. Bars to the right of zero reflect excess mortality burdens while bars to the left of zero reflect mortality advantages. The (unadjusted by age) estimates indicate that Hispanics have an overall mortality advantage while Whites have excess mortality burdens. For instance, there is a negative 11 point difference for Hispanics at the national level, indicating that the percent of Hispanics who have died from COVID-19 is 11 percentage points lower than their adjusted share of the

population (first panel of Figure 1). Even in states where the proportion of Hispanic deaths exceeds their adjusted population, the disparity appears to be small.

Figure 1: COVID-19 overall and age-stratified mortality burden for Hispanic and Whites, nationally and for selected states

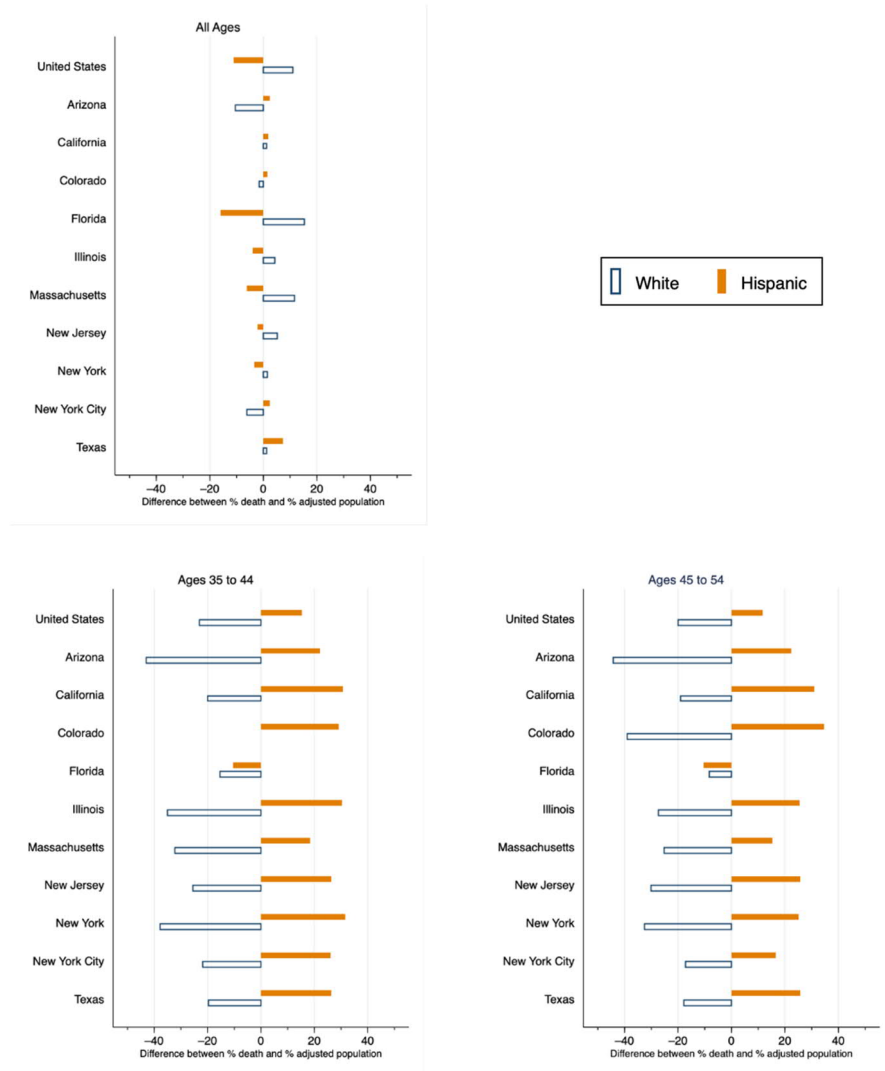
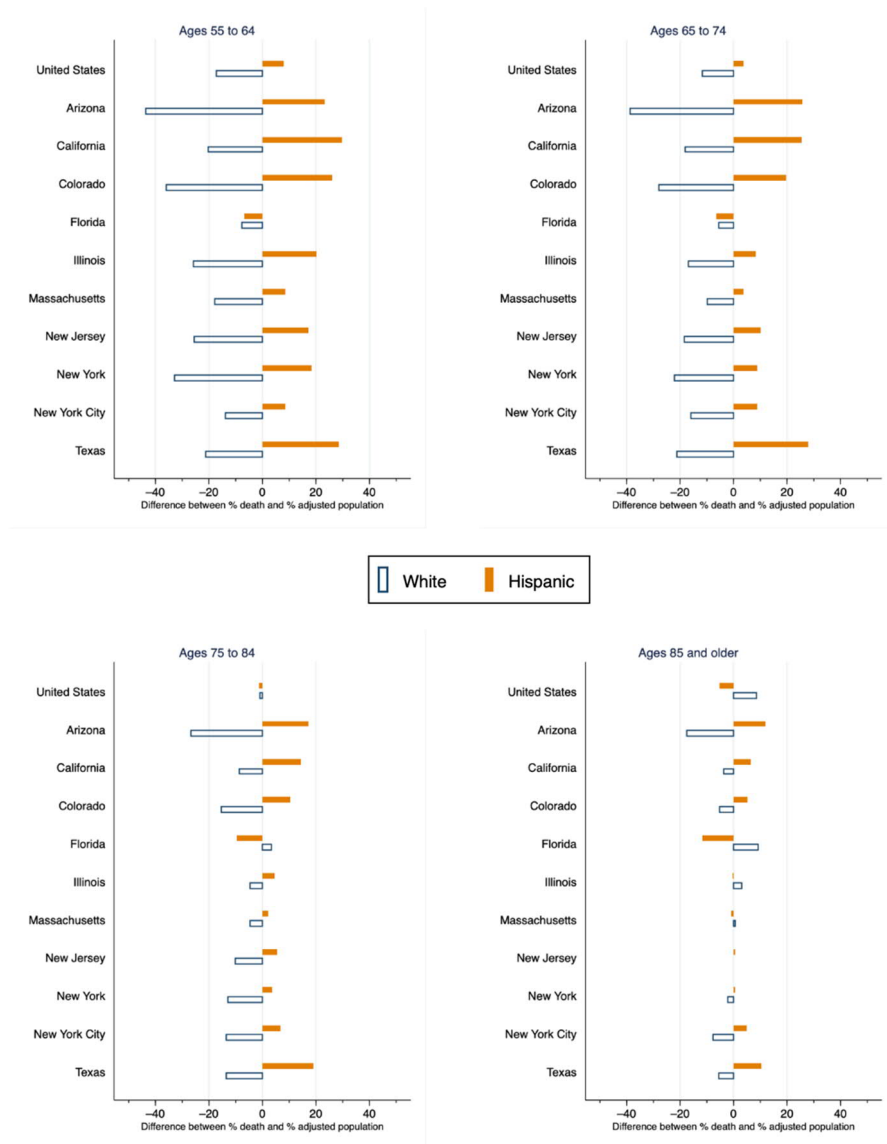


Figure 1: (Continued)



Note: Statistics for areas with less than 10 counts of deaths are suppressed.

The remaining panels in Figure 1 reflect age-stratified estimates. Immediately clear are the starkly opposing patterns characterizing the age-stratified versus overall estimates, which were previously hidden by the US racialized age structure. In nearly every case, Hispanics suffer excess COVID-19 mortality burdens whereas Whites display mortality advantages. The two exceptions are Florida, across all age groups, and nationally for ages 75 years and older. Age-stratified estimates also reveal pronounced age patterning. The excess mortality experienced by Hispanics is most evident at younger ages, with considerably less excess burden at the oldest age groups. For example, nationally, Hispanics ages 35 to 44 and 55 to 64 years face excess mortality burdens of 15.4 and 8 percentage points, respectively. Hispanics over 85 years are actually underrepresented in COVID-19 mortality by 6 percentage points. Similarly, disproportionate mortality impacts among Whites are also most evident among the younger age groups. However, unlike for Hispanics, these disproportionalities reflect mortality advantages for Whites. In the United States, Whites ages 35 to 44 and 55 to 65 years display 23 and 17 percentage point mortality advantages, respectively. Whites 85 years and older experience a 9 percentage point excess mortality burden.

3.2 Case estimates

What are the possible reasons behind the excess mortality burdens documented for Hispanics, and why are they most evident at younger ages? We can begin to address these questions by examining COVID-19 case patterns.

Table 1, which presents county-level COVID-19 excess case burdens overall and by age groups for Whites and Hispanics separately, reveals another set of nearly diametrically opposed patterns. Positive values indicate excess case burdens, and negative values represent disproportionate case advantages. Overall and within each age group, Whites are disproportionately underrepresented among COVID-19 cases. In contrast, Hispanics suffer excess COVID-19 burdens across all age groups. Importantly, the magnitudes of excess case burdens for Hispanics are most prominent among working-age groups, with the largest burdens among those aged 30 to 59. Excess COVID-19 cases are smallest among those aged 80 and over. Thus, the age patterning for excess case burden mirrors that for excess mortality burden.

Table 1: County-level COVID-19 excess case burden by race/ethnicity and age group

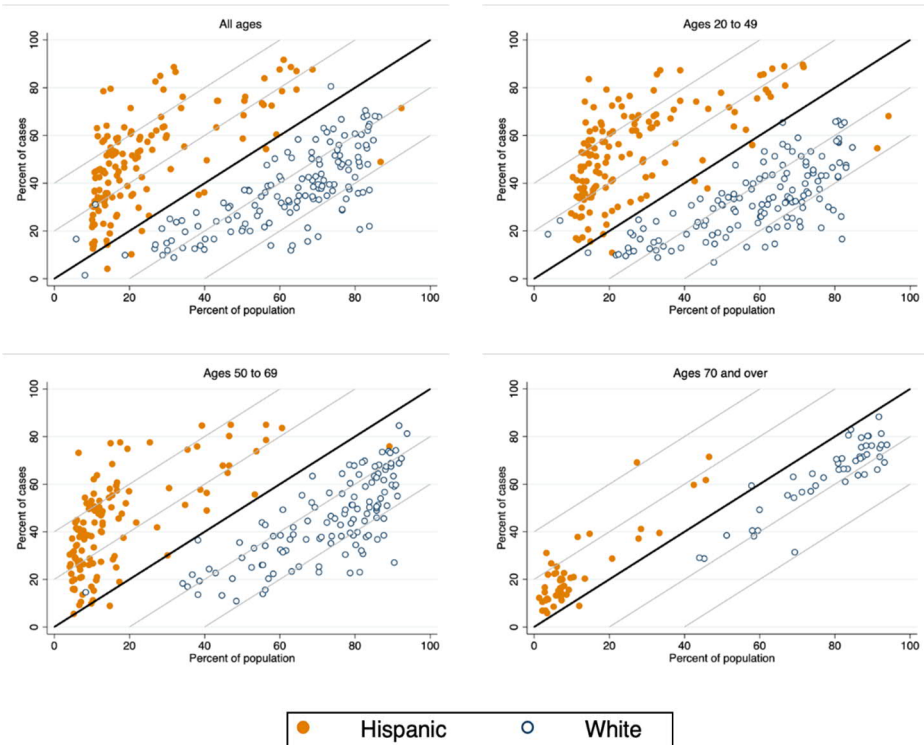
Number of counties	Age group (Years)	Non-Hispanic White excess burden percentage point (SD)	Hispanic excess burden percentage point (SD)
140	All	-25.16 (12.88)	24.60 (16.32)
117	20 to 29	-21.81 (11.17)	23.78 (14.34)
116	30 to 39	-27.94 (12.79)	27.59 (15.60)
111	40 to 49	-29.97 (13.24)	28.91 (16.43)
108	50 to 59	-29.40 (11.41)	27.61 (14.41)
83	60 to 69	-26.72 (10.85)	23.64 (12.34)
39	70 to 79	-21.34 (7.18)	16.49 (8.41)
19	80 and over	-11.07 (9.22)	7.42 (9.72)

Note: For each age group, the analytical sample is restricted to counties with greater than 10% Hispanic population, less than 25% missing values on race/ethnicity, greater than 100 cases in total, and greater than 20 cases for Hispanics and Whites separately.

This inequity in cases is even more striking when depicted graphically, which provides a clearer picture of the distribution of the burden. For each plot in Figure 2, points above and below the thick 45-degree line reflect county-level case burdens that are higher and lower, respectively, than their share of the population. Points farther away (vertically) from the thick line reflect larger burdens or advantages. The thinner 45-degree lines running parallel to the thick line, marked at 20 percentage point increments, are provided to help gauge the magnitude of the disparity.

Overall, in almost all counties, Hispanics are overrepresented in COVID-19 case reports and Whites are underrepresented. The excess case burdens are considerably more prominent among younger ages and diminish with age. That is, for the 20 to 49 and 50 to 69 age groups, a large proportion of counties had excess Hispanic case burdens over 20 percentage points. In contrast, the vast majority of counties had excess case burdens that were lower than 20 percentage points for Hispanics ages 70 years and older. Similarly, for Whites, the largest advantage in COVID-19 case burden is among the younger generations.

Figure 2: County-level population representation and COVID-19 burden for Hispanic and Whites, overall and by age group



Note: For each age group, the analytical sample is restricted to counties with greater than 10% Hispanic population, less than 25% missing values on race/ethnicity, greater than 100 cases in total, and greater than 20 cases for Hispanics and Whites separately.

Additionally, because of the notable persistent COVID-19 mortality advantage in Florida after age stratification, we examine the case patterns in Florida separately. Table 2 reveals that the excess case burdens overall and across all age groups in Florida are approximately half of the levels depicted nationally. This is likely a contributing factor in the observed Hispanic COVID-19 mortality advantage in Florida. While the specific determinants for these lower case disparities in Florida are unclear, the unique age structure in Miami-Dade County, the county with the highest death toll in Florida, may provide some clues. Hispanics make up 70% of the population in Miami-Dade County; moreover, this representation is relatively constant across age groups, reflecting an unusually uniform population age distribution (United States Census Bureau 2020b). The overwhelming majority representation of Hispanics in Miami-Dade County across all age

groups makes it less likely that Hispanics are overrepresented in any circumstance, including COVID-19 cases. The relative Hispanic COVID-19 advantages that we observe in Florida may also be related to the disproportionate representation of Cuban Americans, who are more likely to be foreign-born, have higher levels of education, and have lower poverty rates than most other Hispanic subgroups (Noe-Bustamante, Flores and Shah 2019). Whereas only 3.9% of Hispanics nationally identify as Cuban, over 27.8% in Florida and 52.3% in Miami-Dade County do (United States Census Bureau 2020b). A recent national county-level analysis finds lower COVID-19 case rates in counties with a higher proportion of Cuban residents (Strully et al. 2020). Hence, heterogeneity in risk factors across Hispanic subgroups may be a factor in the distinct patterns observed in Florida. Unfortunately, we do not have information on country of origin to conduct subgroup analyses within the broader Hispanic population.

Table 2: County-level COVID-19 Hispanic excess case burden for Florida by age group

Age group (Years)	Hispanic excess case burden percentage point (SD)	
	All counties ^a	Counties with less than 25% missing data on race/ethnicity ^b
All	8.68 (11.59)	14.76 (11.11)
20 to 29	8.52 (13.32)	14.35 (12.43)
30 to 39	10.02 (13.62)	15.95 (12.58)
40 to 49	8.61 (12.98)	14.35 (12.31)
50 to 59	8.03 (10.64)	12.45 (9.44)
60 to 69	5.29 (10.54)	10.00 (12.03)
70 to 79	1.96 (7.61)	6.28 (8.37)
80 and over	-0.42 (5.88)	1.03 (6.98)

Notes: ^a No restrictions

^b In addition to having less than 25% missing data on race/ethnicity, analytical sample restrictions include greater than 10% Hispanic population, greater than 100 cases in total, and greater than 20 cases for Hispanics and Whites separately.

We also examine whether there is any support for the possibility that pre-existing health conditions is a major factor underlying excess Hispanic COVID-19 mortality. Among the reported cases, we find no evidence to indicate that Hispanics have higher rates of reported underlying comorbidity or disease than Whites (56% vs. 60%, respectively). For the working-age population (ages 30 to 69) in our analytical sample, the prevalences of health conditions in Hispanics and Whites were 51% and 60%, respectively. Finally, we compare case fatality rates (CFRs), the proportions of deaths among confirmed cases of the disease, in order to assess whether differences in health care may be a factor driving excess Hispanic mortality. Table 3 illustrates that, contingent

on infection, Hispanics actually have a lower mortality rate (i.e., CFR) overall (1.04 vs. 5.12 for Whites), a pattern largely driven by the higher CFRs among Whites older than 59. Among the younger working ages, the differences in CFRs between Hispanics and Whites are considerably smaller and nonsignificant.

Table 3: COVID-19 case fatality rate for Hispanics and Whites, overall and by age group

Age group (Years)	Non-Hispanic White	Hispanic	P-value
All	5.12	1.04	0.00
20 to 29	0.03	0.06	0.08
30 to 39	0.19	0.19	0.92
40 to 49	0.38	0.45	0.30
50 to 59	1.32	1.41	0.53
60 to 69	4.92	3.68	0.00
70 to 79	15.24	12.22	0.00
80 and over	34.69	25.41	0.00

Note: Analytical sample restricted to individual cases in counties with less than 25% missing values on race/ethnicity and mortality.

4. Discussion

4.1 Explanations for the hidden Hispanic COVID-19 mortality burden

The previously hidden COVID-19 mortality burden on Hispanics is dramatic, is most pronounced at younger ages, and has largely been unaccounted for. We find that the greatest excess burden in cases for Hispanics is among the working-age population. This pattern mirrors the findings for mortality. Study results, combined with the established evidence of Hispanics being disproportionately represented in essential industries and “telecommute unfriendly” occupations (Bureau of Labor Statistics 2020; Dubay et al. 2020; Selden and Berdahl 2020), support the hypothesis that disproportionate workplace exposure plays a key role in contributing to the excess mortality burden observed among working-age Hispanics.

In contrast, two alternative prevailing hypotheses are not corroborated by the data. The observed age pattern for cases and mortality provides little evidence for vulnerability of multigeneration households as a driving factor. Although Hispanics have been shown to be more likely than Whites to live in multigenerational households (27% vs. 16%), our results are not suggestive of older Hispanics being more vulnerable to infection via younger-aged household members (Cohn and Passel 2018). If this were the true, we

would expect to see excess case burden in the older-aged Hispanic groups more comparable to those for younger age groups. Instead, we see lower excess case burden among older Hispanics ages 70 and over than for younger Hispanics (Table 1). This pattern is not consistent with the hypothesis that COVID-19 is being transmitted from younger to older Hispanics. Indeed, excess mortality for those aged 75 and older is negative, indicating a mortality advantage. While Hispanics aged 65 to 74 do incur a relatively small mortality disadvantage, this group is also more likely to still be engaged in the workforce than older groups. Both of these patterns are more consistent with the workplace vulnerability hypothesis. While our results do not preclude the possibility that racial/ethnic differences in the prevalence of multigenerational households may play a role in excess Hispanic mortality, they do not support it as a driving factor.

Nor do the data on the prevalence of pre-existing health conditions and case fatality rates offer strong support for the supposition that prior health conditions and/or unequal health care are driving the disproportionate Hispanic COVID-19 mortality burdens. Indeed, our evidence is more suggestive of the opposite. While caution should be used in making any inferences due to a high rate of missing data, both of these patterns are consistent with data from other sources (Mackey et al. 2020; Podewils et al. 2020). For example, CDC data based on surveillance of laboratory-confirmed COVID-19-associated hospitalizations find Hispanics to have lower rates of specific underlying medical conditions, including asthma, chronic kidney disease, chronic obstructive pulmonary disease/emphysema, coronary artery disease, diabetes, heart failure, and hypertension compared to Whites (Centers for Disease Control 2020e). Further, overall case fatality rates for New York City and Los Angeles – two areas with the highest death counts in the United States – indicate comparable or lower case fatality rates for Hispanics compared to Whites (Los Angeles County Department of Public Health 2020; NYC Department of Health and Mental Hygiene 2020). A study examining age-stratified case fatality rates in California, Illinois, and Ohio shows similar patterns (Pathak et al. 2020). Finally, cross-sectional studies and a recent systematic review of 15 cohort studies find no disparity in case fatality rates by race/ethnicity (Mackey et al. 2020). Thus, we find no evidence in support of the possibility that excess case fatality rates driven by higher rates of reported health conditions or other factors (e.g., disparities in health-care access) in the Hispanic population are driving the Hispanic COVID-19 mortality burden.

4.2 Limitations

Beyond the critical role of workplace exposure in driving excess Hispanic mortality, we are unable to evaluate other factors that may play a role in the excess COVID-19 case rates, including differential rates in precautionary behaviors (e.g., social distancing

outside of work, usage of face coverings, and frequency of handwashing). In a recent survey, usage of masks was slightly higher among adult respondents older than age 65 (88% vs. 82% to 85%), while Hispanics overall are more likely to wear a mask than Whites (74% vs. 62%; Kramer 2020). How these behaviors vary across age for Hispanics is unknown. Additionally, we do not have direct measures of health-care access (e.g., insurance) or quality. Nonetheless, the lower case fatality rates among Hispanics do not support the hypothesis that disparities in health care is a driving factor in the observed excess mortality burden. Indeed, if that were the case, we would expect to see higher recorded cases for Hispanics, strengthening the argument that higher case loads are driving the mortality burden.

Any analysis of COVID-19 is potentially impacted by incomplete or inaccurate reporting of COVID-19 cases in particular, but also of deaths (Weinberger, Chen, and Cohen 2020). The level of missing and/or inaccurate race/ethnicity data varies across counties and states, which might diminish the national representativeness of inferences. COVID-19 case fatality rates in our data may also be biased upwardly if cases that did not result in death are more likely to have missing information on death status. However, even if all Hispanics with missing death status were considered to have died, inferences would remain the same.

4.3 Implications

Our finding that substantial COVID-19 mortality burdens are most evident among working-age Hispanics, precisely those age groups with the highest excess case burdens, shines a harsh light on the likely role played by occupational exposure in elevating death risk in this population (Williams et al. 2020). The patterns presented here argue against giving disproportionate attention to individual-level risk factors (e.g., comorbidities and multigenerational household arrangements) in understanding Hispanic–White disparities in COVID-19 outcomes. Doing so runs the risk of obscuring the role of “differential transmission related to structural factors, in particular, work environments” (McClure et al. 2020). Increased attention to the role of work environments in perpetuating COVID-19 racial disparities is particularly important in light of what many argue has been little to no federal oversight of workplace COVID-19 vulnerabilities. At the end of the calendar year 2020, the Occupational Safety and Health Administration (OSHA), the federal agency charged with assuring healthy working conditions for US workers, had received close to 14,000 virus-related complaints and referrals but issued fewer than 300 citations (2.1%; US Department of Labor 2020). Because low-wage and essential worker populations in the United States are disproportionately members of racial/ethnic minority

groups, work environments, alongside paid sick leave policies, are obvious sites on which to focus efforts to address the alarming racial/ethnic disparities in COVID-19.

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