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JUE Insight: COVID-19, race, and gender

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The evidence on the demographics of COVID-19 fatalities points to an overrepresentation of minorities and an underrepresentation of women. We investigate the joint impact of race and gender using individual-level georeferenced death data collected by the Cook County Medical Examiner, which we structure as a cell-level panel at a race, block group, week, and year level. Through an event study approach, we establish that Black individuals are affected more harshly than White and that the effect is driven by Black women. The Black female bias is associated with occupational segregation in the health care and transportation sectors and by commuting on public transport.

1. Introduction

The evidence on the demographics of COVID-19 fatalities points to an overrepresentation of minorities and an underrepresentation of women, but analyses at the intersection between race and gender have thus far been lacking.

The disproportionate impact of COVID-19 on African Americans has taken center stage in the debate on the socioeconomic implications of the pandemic (Kendi, 2020). The emerging consensus is that the observed racial differentials are associated with socioeconomic correlates (Yancy, 2020). A large share of Black Americans are concentrated in areas characterized by widespread poverty, low housing quality, and higher prevalence of comorbidities, making low socioeconomic status a critical risk factor. Attention has also been called to the fact that racial minorities tend to hold highly-exposed jobs in health care, retail, and public transportation, and to live in crowded housing often occupied by multigenerational households. Black Americans suffer from further disadvantage in access to health care and in their ability to adhere to social distancing norms, as avoiding public transport and working from home is denied to the majority of them. On the other hand, irrespec-

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in 2020, relative to the same race, block group, and week in 2019. Our empirical strategy is based on an event study model that captures differential trends in deaths between years, pre- and post-COVID-19 weeks, and races. We uncover a Black–White differential in excess deaths which varies by sex, being more prolonged and more pronounced for females rather than males. Indeed Black females are hit more harshly than White women, while the difference between Black and White males is attenuated. In other words, a male bias in excess deaths is only present within the White population, while within the Black population we do not observe any significant sex-related differences in excess deaths. Thus, not only is the Black population hit by COVID-19 earlier and more severely, but this effect largely runs through its female component. The emergence of a Black female bias exposes an interaction between race and sex that had been thus far overlooked.

We then explore which channels lead to the observed racial and gendered patterns in epidemic outcomes, using 2016–2020 American Community Survey (ACS) data. We first look at occupational segregation by gender and establish that Black women’s vulnerability is linked with female overrepresentation in low-pay jobs belonging to two essential sectors—health care and transportation/warehousing—that are especially exposed to the risk of contagion and were not subject to lockdown. A second, related contributing channel is the intensity in using public transport and the length of commute to work. By contrast, we find no explanatory power for living arrangements, captured by a measure of housing overcrowding and a proxy for multigenerational family structure, and lack of health insurance coverage.

A large literature has been developing on the effect of race and gender on COVID-19 outcomes. We refer to Bertocchi and Dimico (2021) for a review including contributions both from the medical/epidemiological and the economics literature. However, very few had so far looked at the interaction between race and gender.

The rest of the paper is organized as follows. Section 2 presents the data and preliminary evidence on COVID-19 deaths in Cook County. Section 3 introduces an event study approach and the corresponding triple difference-in-differences results. In Section 4 we investigate channels of transmission. Section 5 concludes. An Online Appendix contains additional figures and tables.

2. Data and descriptive evidence

We use information from deaths collected by the Medical Examiner’s Office and made available by the Government of Cook County, Illinois.5 Daily information is reported about those deaths that are under the Medical Examiner’s jurisdiction. In addition to deaths from diseases that represent a threat for public health, such as epidemics, the data include deaths related to trauma, injury, violence, accident, suicide, homicide, and other specific reasons, as well as cases when individuals die suddenly when in apparent good health or without medical attendance preceding death.6 In 2019, the last pre-pandemic year, the Medical Examiner recorded 6272 deaths, out of 40,771 in the county. In addition to the cause of death, the Medical Examiner provides information about sex, age, race, and residence (home address, city, ZIP code, and geographical coordinates). A death is recorded as a COVID-19 death when COVID-19 is reported among either primary or secondary causes.4 We spatially merge the death data from the Medical Examiner with census block group boundary files.

The Medical Examiner recorded the first COVID-19 death in Cook County on March 16, 2020. By September 15, 2020—which roughly marks the end of the first wave of the epidemic in the county—the death toll had reached 5685 individuals.5 Missing geographical coordinates and/or information about race reduce the sample to 5162 deaths. The spatial distribution of the COVID-19 deaths is shown in Fig. A1 in the Online Appendix, by mapping each fatality into a specific block group on the basis of the georeferenced home address of the deceased. The figure reveals a concentration of COVID-19 deaths in the area that roughly correspond to the City of Chicago.

The demographics of the COVID-19 fatalities up to September 15, 2020 are illustrated in Figs. A2–A4, separately for Blacks and non-Hispanic Whites (hereafter, Whites) and by sex, age, and age and sex combined. The breakdown by sex reveals that, compared to Whites, Blacks have a much more similar number of deaths between men and women. The breakdown by sex and age shows that women of both races are more likely than men to die from COVID-19 in old age, but this pattern is largely driven by White women, while Black women are much more likely to die at a younger age.

Fig. 1 plots the daily number of COVID-19 deaths in the sample, separately for Blacks and Whites and by sex. The figure shows that the shape of the epidemiological curve is quite different across races, with a delayed peak for Whites. Besides, especially during the first few weeks of the epidemic, the number of fatalities is higher for Blacks, despite their smaller population share, and Black women display a number of fatalities equal to or higher than that of Black men, contrary to what we observe for Whites.8 These patterns document that Blacks were the first to be hit and were hit more harshly, and also suggest a specific vulnerability of Black women.

By the end of the sample period, the cumulative share of Black COVID-19 deaths is 33 percent, which implies that cumulatively Blacks are dying at a rate 1.21 times higher than their population share, while Whites are underrepresented at a 0.95 rate.9 While both Black and White males are overrepresented relative to their population share (1.29 and 1.05, respectively), White females are underrepresented (0.85)—which is not the case for Black females (1.14), pointing again to a Black female bias.

To understand the above-reported patterns, we shall rely on an event study analysis. To this end, we construct a dataset including all deaths under the Medical Examiner’s jurisdiction—from COVID-19 and any other cause—that were recorded during the first 37 weeks of 2020, that is, from January 1 to September 15. In order to assess the change in the number of deaths, compared to the same week and block group in the previous year, we also include all deaths occurred during the same weeks in 2019. We map deaths into block groups using the georeferenced home address of the deceased and then we aggregate them by cell at a race, block group, week, and year level.

by the Johns Hopkins University & Medicine Coronavirus Resource Center at https://coronavirus.jhu.edu/.

5 See IPUMS NHGIS at https://www.nhgis.org/ and Manson et al. (2020). A block group represents a combination of census blocks and a subdivision of a census tract, and is defined to contain between 600 and 3000 individuals. In the 2010 Census, Cook County comprises of 3993 block groups, to be compared with only 164 ZIP codes.

6 Data until September 15 were downloaded on November 6, 2020.

7 The racial distribution remains very similar, whether or not individuals with missing information are included.

8 The 2020 population shares are 28 percent for Blacks and 39 percent for Whites, and respectively 14, 16, 19, and 20 percent for Black males, Black females, White males, and White females. The source is ACS.

9 This crude measure of racial disparity is lower than the one reported by the Centers for Disease Control and Prevention, since the latter is age adjusted. See https://www.cdc.gov/nchs/nvss/vsr/covid19/health_disparities.htm.
We add to the dataset block group-level information provided by the 2016–2020 ACS for a set of socioeconomic characteristics including employment by gender in 20 separate occupational sectors, public transport use, commuting distance, occupants per room, households with co-living relatives, and individuals with no health insurance coverage.\(^{10}\)

Table A1 reports variable definitions and sources and Table A2 summary statistics. Separately for Blacks an Whites, Fig. A5 plots the difference between the log of weekly deaths in 2020 and the log of weekly deaths in 2019 for males and females. It is on this measure of excess deaths—that can also be interpreted as the annual rate of growth of weekly deaths—that we shall focus in the implementation of our empirical strategy. For all population groups, excess deaths between 2020 and 2019 fluctuate around zero for the first ten weeks, while the impact of COVID-19 is clearly visualized from the month of March. The figure also highlights dissimilarities between races in the size and evolution of the gender gap in excess deaths. In particular, in the early phase of the epidemic, we observe a noticeable gap among Blacks, with Black women at disadvantage relative to Black men.

As is well-known, reliance on excess deaths may imply both an over-estimation and an underestimation of COVID-19 deaths. Overestimation may occur since not all the excess deaths in the weeks following the outbreak may be directly attributable to the epidemic. For instance, individuals may die from other diseases that go undetected or untreated because of the induced pressure on the health system, and from “deaths of despair” (Case and Deaton, 2020) only indirectly related to the epidemic. On the other hand, underestimation may be induced by the fact that deaths by other manners such as accidents and crime may decline due to lockdowns. Because of these factors combined, officially reported COVID-19 deaths often fall short of excess deaths. However, the specific nature of the deaths under the Medical Examiner jurisdiction alleviates this concern and in fact, in our dataset, the discrepancy between confirmed COVID-19 deaths (5162) and excess deaths (5095) is contained, pointing to a slight underestimation of the former.

3. An event study approach

3.1. Empirical strategy

In order to assess the joint effect of race and gender on fatalities, we start by investigating racially differentiated trends over our cell-level panel, which provides variation across races, block groups, weeks, and years. Aggregating at a cell level carries an advantage in terms of identification, since it allows each race within a block group to display its own distribution of deaths. In the absence of specific shocks (such as COVID-19), the latter is assumed to be time invariant. Thus, focusing on cells and comparing deaths for a specific race in a block group before and after the COVID-19 shock should filter out any sort of heterogeneity at a block group and race level and allow us to exploit changes in the distribution of deaths for specific groups which should not otherwise appear in the absence of a shock.

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\(^{10}\) See the US Census Bureau’s (2016–2020) American Community Survey 5-year estimates at https://api.census.gov/data.html.
Our empirical strategy is based on a triple difference-in-differences (hereafter DDD) estimator that exploits the difference between the log of deaths in 2020 and 2019 for a specific block group and week, together with differences between pre- and post-COVID-19 weeks and, lastly, between Blacks and Whites. The event study model, which we shall estimate separately by sex, can be written as:

\[ \Delta D_{t,g,w} = \delta_g + \gamma_g + \xi_g + \sum_{r=10}^{26} \hat{\beta}_{t,w} \cdot \epsilon_r \cdot I(t - T_w = r) + \mu_{t,g,w} \]  

(1)

where event time is set in terms of weeks, \( \Delta D_{t,g,w} = \log(0.1 + Deaths_{2020,t,g,w}) - \log(0.1 + Deaths_{2019,t,g,w}) \) represents excess deaths in 2020 relative to 2019 for race \( r \) in block group \( g \) and week \( w \). To capture permanent differences over weeks and across block groups, we include week fixed effects \( \delta_g \) (capturing also overall migration) and block group fixed effects \( \gamma_g \). The dummy variable \( \xi_g \) captures differences in excess deaths for Blacks relative to Whites and controls for the fact that the overall number of deaths among Blacks is normally larger than the number of deaths among Whites (i.e., it amounts to a scale factor). The treatment variable is constructed by intersecting the dummy for Blacks, \( \xi_g \), with dummies for each week before and after the COVID-19 outbreak, as indicated by the event time dummy \( I(t - T_w = r) \). The latter is set equal to 1 for \( t = -10, \ldots, 0, \ldots, 26 \) weeks from the reference period \( T_w \) which corresponds to treatment initiation (that is, week 11 in the sample or, in calendar time, the week from March 11 to 17, 2020 when the first COVID-19 death was recorded on March 16). Because the first death was recorded on March 16 (one day before the end of week 11), we omit the period corresponding to week 11. In this setting, the coefficient \( \hat{\beta}_{t,w} \) will capture the impact of the epidemic on the Black-White differential in excess deaths, or in the annual rate of growth of deaths. The error \( \mu_{t,g,w} \) is clustered at a block group level.

The above estimator filters out the trend in the rate of growth of deaths among Whites and captures the differential trend for Blacks with respect to Whites. Under the assumption that Blacks and Whites are affected in the same way by the epidemic, we would expect no statistically significant differences to emerge both in the pre- and in the post-COVID-19 weeks. The inclusion of the pre-treatment period allows us to verify the parallel trend assumption by testing for potential differences in mortality between treated and control groups, thus providing a response to concerns about the occurrence of a selection bias leading to different rates of disease transmission between groups. Because the sample includes the universe of the block groups in the county, sample selection issues are also ruled out. Learning and adaptation to the treatment before it kicks in, as it would otherwise occur with staggered treatment, is also unlikely given that the treatment period is constant. The only potential source of bias is therefore potentially related to measurement error, since not all the deaths that occur in Cook County are reported to the Medical Examiner.

3.2. Results

Fig. 2 (bottom panels) reports estimation results for the \( \beta \) of the DDD in Eq. (1), separately by sex. Preliminarily, the top two panels start by plotting excess deaths against week dummies for Blacks and Whites separately and by sex, with respect to the reference week (week 11, i.e., event time 0 on the horizontal axis). Thus, in this variant, only the variation between the treated and untreated year and the weeks before and after the epidemic outbreak is exploited. To ease the reading, the diamonds and squares respectively indicating Blacks and Whites are staggered. For the first ten weeks, that is, before treatment initiation, excess deaths for both races and sexes are not statistically different from zero, which amounts to a validation of the parallel trends assumption. After the COVID-19 outbreak, the plots reveal sharp differences in the shape of the epidemiological curves across races and sexes. Namely, the effect for Whites manifests itself a week later, grows in a much more gradual fashion, reaches its peak with a substantial delay in early May, and exhausts itself sooner. Furthermore, the estimation results confirm that excess deaths are more numerous for men (top right panel) relative to women (top left panel), independently of race. However, racial differences in the timing and intensity of the effect of COVID-19 appear to be more pronounced for females rather than males. In other words, it is among females that Blacks are hit by the epidemic earlier and more severely.

The bottom two panels of Fig. 2 report estimation results for the \( \beta \) of the fully fledged DDD in Eq. (1), by plotting the racial differential in excess deaths for each sex. The figure confirms that the racial differential is larger and more prolonged for females, while for males it is statistically significant only in a single week, with a compensating reversal in a subsequent one. In the bottom left panel, the estimated \( \beta \) coefficient is over 3 percent in event time 3 and 4, which implies that in those two weeks the increase in deaths for Black females is about three times the increase for White females. To further quantify the effect, consider that—in the raw data—in event time 0 there are 7 excess deaths of White women compared to the same week in 2019, a figure that reaches 44 in event time 4, with a 6 times increase. For Black women, the corresponding figures are 9 and 102, with an 11 times increase. Thus, excess deaths among Black women are about five times larger than for White women, which is comparable with the estimated effect.

Table A3 displays the magnitude and statistical significance of the estimates, overall and by sex. Thus, Models 2 and 3 refer to the two bottom panels of Fig. 2. Even though the underlying models include all pre- and post-treatment terms, we display only the \( \beta \) for \( t = 1, \ldots, 5 \). Inspecting Model 1 reveals that the impact of COVID-19 on Blacks exceeds the one on Whites by 5.6 percentage points in event time 3 and by 3.4 percentage points in event time 4. As shown by Models 2 and 3, in event time 3 the effect is larger and more precise for females relative to males. By the following week, the racial differential is exclusively borne by females. To sum up, the evidence we thus far collected establishes that the Black population in Cook County is hit by COVID-19 earlier and more severely and that this racial disproportion is largely due to a Black female bias, uncovering an interaction between race and sex that had been up to now overlooked.

The distribution of COVID-19 deaths by race, sex, and age in Fig. A4 suggests that the effects we uncover may be driven by the working-age population, despite the role of age as a risk factor. This is confirmed by Fig. A7, showing that our results are unaltered if we replicate Fig. 2 after confining the sample to 15–64 years old. A potential concern is that each cell in our dataset receives equal weight in the regressions, even though the population of each race differs across block groups. If Fig. A8 we replicate Fig. 2 after weighting each cell by the size of the 2020 population by race, using analytic (i.e., cell size) weights. Even though the racial differential increases for both sexes, it remains larger for females as in the unweighted baseline. When in Fig. A9 weighted estimates are confined to working age (where weights reflect size of the labor force by race) results are very similar to those in Fig. 2.

Lastly, we present three further robustness checks. The first is a falsification test based on pre-pandemic trends. A potential threat to the identification of the effect of COVID-19 on Blacks, and in particular on Black women, may come from the fact that it could be driven by endemic factors.
annual trends in mortality (e.g., the flu) that would have occurred irrespective of the COVID-19 epidemic. To rule this out, we re-estimate Eq. (1) by sex for 2019 relative to 2018 and for 2018 relative to 2017 and find no previous effect of the treatment (Fig. A10). The second check replicates Fig. 2 for Whites and Latinos (Fig. A11). The impact on Latinos is milder than that on Whites except for a short time in late June (top panel). At the beginning of the epidemic, both Latino males and Latino females are relatively shielded from its impact, even though the effect is diluted for Latino women (bottom panel). Thus, a female bias only emerges for the Black population. Thirdly, to make sure that the patterns we uncover are directly related to COVID-19, we examine gun-related deaths and “deaths of despair” (that is, deaths from suicide and drug overdose) and find no evidence that the epidemic outbreak has modified previous trends (Fig. A12). By contrast, when we plot COVID-19 deaths in 2020 minus all deaths in 2019 (given that COVID-19 deaths are zero in 2019), the racial differential for females is preserved (Fig. A13).

The measure of excess deaths that we have employed thus far (i.e., the difference between the log of the number of years in two subsequent years) has the advantage of allowing an interpretation in terms of deaths’ annual rate of growth (since it is corresponds to the log of the ratio of deaths in 2020 over deaths in 2019). Alternatively, one could simply take the difference between the number of deaths. Even though this approach does not allow a proper comparison between population groups of different size, with this caveat in mind Fig. A14 shows that our results are robust to a definition of excess deaths involving the difference between the number of deaths in 2020 and 2019.

4. Channels

We have thus far provided robust evidence that the racial differential in excess deaths following the COVID-19 outbreak is driven by Black women. To evaluate factors that can explain the observed disparities, this section goes on to investigate the channels that make Black women more vulnerable. We shall evaluate four potential—and not mutually exclusive—channels: the occupational structure of the labor force, the use of public transportation, the prevailing living arrangements, and

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**Fig. 2.** Excess deaths for Blacks and Whites and Black–White excess death differential, by sex.

Note: The dependent variables are excess deaths for Blacks and Whites, by sex (females in top left panel, males in top right panel) and the Black–White differential in excess deaths, by sex (females in bottom left panel, males in bottom right panel). The coefficients are least-squares estimates of the $\beta$s. Block group fixed effects are included in all panels and week fixed effects are also included in the bottom panels. Vertical lines represent 95 percent confidence intervals based on standard errors clustered at a block group level. The sample refers to deaths recorded by the Medical Examiner in Cook County, January 1–September 15, 2020 and 2019. The omitted period is $r = 0$, i.e., week 11.
access to medical care through health insurance coverage. Each factor may play a role at a different stage of disease progression: the first and the second determine the degree of exposure to the risk of contracting the virus at the workplace and on the way to work; the third can magnify the rate of transmission once the virus has been contracted; the fourth affects the individual response to the virus once contagion has occurred.

4.1. Occupations

Low-wage workers constitute a large share of the US workforce and are disproportionately represented in sectors such as health care, food services, transportation, and administration, many of which tend to be female-dominated (Ross and Bateman, 2019). In turn, low-paid jobs are common in sectors that need physical proximity to operate and that are more exposed to infections (e.g., health care, food, and transportation). In the face of the COVID-19 epidemic, occupations can be further disaggregated into those that have been deemed essential (health care and transportation) and those that were instead subject to lockdowns (food). The former have been associated with fewer job losses, but at a cost in term of health. The trade-off between employment risk and health risk is easier to avoid for a third type of occupations, represented by those that can be performed from home, which is scarcely represented among low-pay jobs.

To assess whether the higher risk of contracting the virus at the workplace can explain the Black female bias in COVID-19 deaths, we compute the block group-level share of women employed in each of 20 industries relative to the female workforce in the block group. We also compute the corresponding share for men. Next, for each industry, we perform a heterogeneity analysis by splitting the sample between block groups with above and below median shares of employed women and men.

Visual inspection of Fig. 3 reveals that health care and transportation/warehousing do explain the excess death racial differential, and they do so only for women, as a differential emerges only in block groups that exhibit an above median share of women employed in those two sectors. The effect is particularly clear-cut in health care since, in event time 3 and 4, female excess deaths are four to five times larger among Black compared to White ones. In terms of raw data, between event time 0 and 4 excess deaths among Black women increase from 4 to 54, i.e.,

Following the US Standard Occupational Classification system, the occupational categories are agriculture, mining, construction, manufacturing, wholesale trade, retail trade, transportation and warehousing, utilities, information, finance and insurance, real estate, professional services, management of companies, administrative services, education, health care, arts and entertainment, accommodation and food, other services, and public administration.
13 times, while for White women the change is from 3 to 19, i.e., only 6 times. Instead, the relative share of men does not make a difference, consistent with the hypothesis that it is female exposure at the workplace that drives COVID-19 outcomes.

None of the other sectors contributes to the explanation of the outcomes of interest, as shown in Figs. A15–A19. For ten of them (agriculture, manufacturing, retail trade, information, finance and insurance, real estate, administrative services, education, accommodation and food, and public administration), the Black female bias emerges irrespectively of the share of women employed, which implies that it cannot be explained by the occupational structure of these sectors (even though in some of them, notably education, an above median share of female employees determines considerably worse outcomes). For the residual six sectors (construction, wholesale trade, utilities, other services, professional services, and arts and entertainment), where men typically dominate the labor force, we actually detect worse outcomes for women when their share in the corresponding labor force is below median, which most likely reflects their higher representation in other, more exposed sectors.\textsuperscript{18}

The above evidence corroborates the hypothesis that Black women’s vulnerability to COVID-19 is determined by their overrepresentation in those frontline jobs, in health care and transportation/warehousing, that not only are especially exposed to the risk of contagion, but were also not shut down. This conclusion is reinforced by the fact that other high-exposure jobs, for instance in restaurants (comprised in the accommodation and food sector, see Fig. A19) where again women are heavily represented, are not a driver of the effects, since the lockdown policies—albeit at a cost in terms of layoffs—managed to protect workers’ health. Likewise, school closures and working from home are the likely reasons why we do not detect significant effects among workers respectively in education and administrative services (Fig. A17), two high-exposure sectors characterized by gender segregation. To conclude, occupational segregation by race and gender emerges as a crucial driver of the higher toll in terms of COVID-19 deaths born by Black women.

4.2. Public transport and other channels

Using public transport is another COVID-19 risk factor, because of the involved physical proximity, often in crowded spaces. We capture these considerations by examining the share of individuals who use public transport and by complementing it with commuting distance to assess its intensity. Fig. 4 is obtained by splitting the sample between block...
groups above and below median, separately for each dimension, and shows that both factors (but especially public transport) match the excess death racial differential for females (while the first factor also captures some of the effect for males). Thus, in addition to occupations, reaching the workplace emerges as another channel through which the Black female bias in COVID-19 deaths manifests itself. This is not surprising, given that frontline workers had to continue commuting during the lockdowns, likely using public transport, while working from home was rarely an option for low-pay workers.

Living in crowded dwellings is yet another risk factor for COVID-19 death since it amplifies the risk to which a worker may be exposed outside the home, by transmitting the virus to family members. This source of risk is magnified when essential workers are unable to reduce workplace presence during lockdowns, when working from home is prevented by lack of space, and/or when the sick cannot properly isolate. To assess the extent to which living arrangements may be behind the Black female bias in COVID-19 deaths, in Fig. A19 (left panels) we split the sample between block groups with above and below median share of households with more than one occupant per room. Again we check the response separately for women and men. We find that this specific characteristic does not seem to explain the Black female bias, since the increase in deaths for Black women following the epidemic outbreak occurs irrespectively, even though the increase is more pronounced when crowding is above median. Another factor having to do with living arrangements is the underlying family structure. Belonging to a multigenerational household tends to expose to a high risk of contagion elderly family members. In Fig. A19 (middle panels) we split the sample between block groups with above and below median share of households with co-living relatives. We find that this specific characteristic also fails to explain the Black female bias.

Access to medical care is another potential channel through which socioeconomic conditions may determine COVID-19 mortality. The availability of health insurance and the level of medical attention are key to obtain such access. We can test the former channel by collecting block group-level data on the share of individuals who are uninsured. Inspection of Fig. A19 (left panels) reveals that heterogeneity along this dimension does not explain the pattern of the epidemic outcomes.

To conclude, the occupational structure of the labor force, with the overrepresentation of Black women in high-exposure frontline jobs, together with the additional risk represented by the use of public transportation to commute to work, jointly explain the disproportionate racial and gendered impact of the COVID-19 epidemic, as well as its timing, with Black women starting to succumb to it earlier than other groups.

Generally speaking, in the evaluation of the determinants of the eventual decline in fatalities as the epidemiological curve followed its course, one should keep in mind the simultaneous influence of lockdown policies and behavioral changes—which may also differ across demographic groups—such as the use of personal protective equipment (PPP) and spontaneous self-isolation. The latter practices may have anticipated the effect of lockdowns, while in principle a refusal to comply may have undone it. In the case of Cook County, the stay-at-home order was put in place on March 21 but, even after considering its lagged (by about three/four weeks) impact on fatalities, it cannot explain the drop in fatalities among frontline workers since they were not directly protected by it. Thus, the inversion of the epidemiological curve can only be accounted for by a combination of factors. On the one hand, health care workers were at some point equipped with PPP that was initially unavailable even in hospitals. On the other, a combination of PPP use and lock-down-induced mobility slow-down can explain the inversion for transportation workers, with a further beneficial effect of the reduction of overcrowding on those health care workers using public transport.

5. Conclusion

Using a detailed source of information on deaths provided by the Cook County Medical Examiner, we show that the COVID-19 epidemiological curve appears to be racially segregated, with different groups displaying distinct patterns even in the timing of their exposure to the epidemic. In particular, combining individual-level information on race and sex uncovers a Black female bias. We reach this conclusion through an event study design where we look at the excess death racial differential by sex as the outcome variable. Our estimates confirm that the earlier and stronger impact of the epidemic on Black Americans is driven by Black women, who tend to be as vulnerable as Black men are—unlike White women who are more shielded than White men. Our search for the factors that determine the Black female bias reveals that the higher vulnerability of Black women is channeled by their overrepresentation in high-risk essential jobs in the health care and transportation/warehouses sectors, that they tend to access through commute by public transport.

Our results are subject to a number of limitations. First of all, they only cover a single county, even though it is the second most populous in the US and contains Chicago, the third largest metropolitan area in the country. Furthermore, they deal with a single epidemic outcome (deaths rather than, e.g., cases or ICU occupancy), albeit the most salient one. Lastly, the Medical Examiner records are not fully representative of the whole population and its demographics. Nevertheless, our results demonstrate the need for highly disaggregated databases along the racial and gendered dimensions combined, in association with socioeconomic information. It is only through such data that scientists can produce evidence capable of guiding effective policy responses to further outbreaks of COVID-19 or other viral diseases and, more broadly, to the joint influence of race and gender on socioeconomic status.

CRediT authorship contribution statement

Graziella Bertocchi: Conceptualization, Data curation, Methodology, Investigation, Visualization, Writing – original draft. Arcangelo Dimico: Conceptualization, Data curation, Methodology, Investigation, Visualization, Writing – original draft.

Supplementary material

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