# Dead Labor: Mortality Inequities by Class, Gender, and Race/Ethnicity in the United States, 1986–2019

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**Objectives.** To estimate social class inequities in US mortality using a relational measure based on power over productive property and workers' labor.

**Methods.** We used nationally representative 1986–2018 National Health Interview Survey data with mortality follow-up through December 31, 2019 (n = 911 850). First, using business-ownership, occupational, and employment-status data, we classified respondents as incorporated business owners (IBOs), unincorporated business owners (UBOs), managers, workers, or not in the labor force (NLFs). Next, using inverse-probability-weighted survival curves, we estimated class mortality inequities overall, after subdividing workers by employment status and occupation, and by period, gender, race/ethnicity, and education.

**Results.** UBOs, workers, and NLFs had, respectively, 6.3 (95% confidence interval [CI] = −8.1, −4.6), 6.6 (95% CI = −8.1, −5.0), and 19.4 (95% CI = −21.0, −17.7) per 100 lower 34-year survival rates than IBOs. Mortality risk was especially high for unemployed, blue-collar, and service workers. Inequities increased over time and were greater among male, racially minoritized, and less-educated respondents.

**Conclusions.** We estimated considerable mortality inequities by class, gender, and race/ethnicity. We also estimated that class mortality inequities are increasing, threatening population health.

**Public Health Implications.** Addressing class inequities likely requires structural, worker-empowering interventions. (*Am J Public Health*. Published online ahead of print March 16, 2023:e1–e10. https://doi.org/10.2105/AJPH.2023.307227)

"Capital is dead labour, which, vampire-like, lives only by sucking living labour, and lives the more, the more labour it sucks."

—*Karl Marx*[1(p342)]

**M**ining the abyss of 19th century capitalism, Marx unearthed capitalism's deadly structural logic: the material welfare and security of the owning class depends on the deprivation and alienation of the working class and dispossessed.[1(pp340–416),2] Much subsequent epidemiological research

has documented health inequities across social positions defined by socioeconomic indicators like income, education, occupation, and working conditions.[2] However, by treating social positions as individual-level attributes rather than as constituted by social relations, the research has elided the structural relationships, such as differences in economic power, that produce social positions and ultimately cause health inequities.[2,3] Here, we return to Marx. Leveraging 1986–2018 National Health Interview Survey (NHIS) data, we

apply a relational social class theory based on power over productive property and workers' labor to analyze US mortality inequities by class, gender, and race/ethnicity. Only a relational theory, which recognizes that the material welfare of some groups causally depends on the deprivation of others,[4] can identify the root causes of health inequities across social positions. Such root causes may be more efficient and effective targets for public health intervention than downstream, individual-level factors.[5]

# RELATIONAL SOCIAL CLASS AND HEALTH INEQUITIES

Tapping Marxist theories, we define social class in terms of power over labor and productive property (i.e., the tangible and intangible assets used to make commodities).[2–4,6] Capitalists (e.g., business owners), who constitute a minority of the population, own productive property, control workers' labor processes (dominating them), and appropriate as surplus the difference in value between what workers produce and what they are compensated (exploiting them).[2,3,6] Conversely, workers, who constitute a majority of the population, lack productive property and survive by selling their labor power to capitalists for a wage.[2,3,6] The inversely interdependent relationship between capitalists and workers is the root cause of many socioeconomic health inequities.[2,3,5] Indeed, capitalists' productive property is derived from the undercompensated output of workers' past, dead labor, and their profits and accumulating wealth flow from the ongoing exploitation and domination of workers' current, living labor.[1(pp340–416)] Thus, the material well-being of capitalists requires workers' deprivation, subjugation, and overexertion,[2,3,5] which is wrought by the drive to increase surplus extraction, absolutely (e.g., prolonging working hours) or relatively (e.g., debasing wages and working conditions).[1(p432)]

Additional class relationships beyond capitalists and workers also affect health and well-being.[3–5,7] For example, the petite bourgeoisie (e.g., independent shopkeepers) own some productive property but labor themselves rather than controlling workers' labor.[3–5,7] Although the petite bourgeoisie often have considerable control over their working lives, they may lack sufficient resources to compete with capitalists, elevating their risk of business failure, stress, and poverty.[8] Conversely, most managers lack productive property, but they supervise workers' labor at capitalists' behest, exercising delegated ownership authority.[3–5,7] Although high-level managers or executives may resemble capitalists by enjoying considerable compensation, ownership stakes (e.g., stocks), autonomy, and authority (i.e., less domination and exploitation), low-level managers may be simultaneously exploited and dominated by management and face antagonism from subordinates, inducing stress and other hazards.[7] Consequently, the petite bourgeoisie's and low-level managers' health risks may resemble or exceed workers', a phenomenon difficult to identify or explain with gradational, stratificationist theories of social position that predict linear class-outcome relationships (e.g., the "socioeconomic gradient").[3,7,8]

Class relations interact with structural sexism and racism to produce health inequities.[9–13] Women and racialized people, especially those who are Black, Indigenous, Hispanic, or undocumented, are segregated into the working class.[5] There, they are further segregated into hyperexploited employment, including service work and hazardous blue-collar occupations, where they face high rates of workplace sexism, racism, and other forms of discrimination.[9–13] This discrimination has health-harming material and psychosocial consequences such as poverty and chronic stress.[9–13] Minoritized people are also disproportionately segregated into unemployment,[10] where they cycle into and out of precarious, low-wage jobs,[14] or they are excluded from waged labor entirely because of disability (often precipitated by work-related injuries),[13] incarceration,[10] or unpaid domestic labor.[15]

Changes in the balance of power across classes also shape health inequities.[5] Since the 1980s, power in the United States has tipped further away from workers. From 1989 to 2020, union density dropped from 16% to 11%, including from 22% to 12% among non-Hispanic Black workers.[16] Plummeting union density has eroded workers' power over wages and working conditions.[17,18] Indeed, the ratio of mean income among the top 1% versus the bottom 50% of earners grew from 27 to 81 from 1980 to 2015.[19] Surging mortality disparities across socioeconomic groups defined by income, education, and other factors[20] may reflect employers' consolidating class power.

# RESEARCH GAPS AND OBJECTIVES

A small but growing body of US research has identified social class relations as drivers of numerous health outcomes, including self-rated health, mental illness, and substance use.[2,3] Yet, despite well-theorized and empirically supported mechanisms linking class relations to mortality inequities, few US-based studies have applied relational theories to investigate the topic. Moreover, to our knowledge, no studies have examined temporal changes in class mortality inequities, a substantial gap given burgeoning mortality disparities across other social axes.

Data limitations have impeded previous research, as epidemiological data sets rarely contain detailed social class and mortality data, let alone adequate sample sizes to precisely estimate inequities within time periods, genders, or races/ethnicities.[18] A few previous

US-based studies estimated considerable class mortality inequities, but they were conducted decades ago or had imprecise findings.[21,22]

We addressed these gaps by applying a relational social class theory to nationally representative 1986–2018 NHIS data linked to the National Death Index (NDI) through 2019. Our specific objectives were to (1) estimate the magnitude of class mortality inequities among working-age adults from 1986 to 2018, (2) analyze changes in such inequities over time, and (3) identify how class mortality inequities vary within and across genders, races/ethnicities, and socioeconomic subgroups.

## METHODS

The NHIS is a repeated cross-sectional, nationally representative survey of the noninstitutionalized US population conducted by the US Census Bureau on behalf of the National Center for Health Statistics.[23] The NHIS has collected sociodemographic and health data since 1957.[23] From 1997 to 2018, household response rates were 64% to 92%.[23] Respondents aged 18 years and older in the 1986–2018 survey are linked to the NDI using available identifying information (e.g., social security number, names, birth date, gender, race, birth location, and state of residence), with mortality follow-up through December 31, 2019.[24] For select records, synthetic data are substituted for date of death to reduce disclosure risk; mortality status is unperturbed.[24]

For our analyses, we used harmonized 1986–2018 NHIS data from the Integrated Public Use Microdata Series.[25] We then made sample restrictions. First, we excluded respondents younger than 25 or older than 64 years to focus on populations with high labor-force

attachment.[22] Next, we addressed data issues. First, we excluded the 1997–2000 survey waves and non–sample adults from 2001 to 2018, as such waves and respondents lacked complete social class data. Second, we excluded respondents with insufficient identifying information for NDI linkage (< 3%). Third, per the advice of NHIS administrators, we excluded the 1992 Hispanic oversample (< 0.5%).[24] Finally, we excluded respondents (< 3%) with missing exposure or covariate data. Appendix A1 (available as a supplement to the online version of this article at http://www.ajph.org) contains a flow diagram.

Our analyses used NHIS eligibility-adjusted sampling weights to make estimates nationally representative and address linkage ineligibility, nonresponse, and oversampling.[24] We conducted our analyses in R version 4.1.0 (R Foundation for Statistical Computing, Vienna, Austria). Our code is available on GitHub (https://github.com/Critical-Social-Epi/NHIS_class_mortality).

## Measures

*Social class.* To measure social class, we used data on respondents' employment status, as well as their business-ownership status and occupation as proxies for power over productive property and labor.[8,26] First, those not in the labor force (NLFs) were those who identified their employment status in the past 1 to 2 weeks as "not in the labor force." Second, workers were those who identified as unemployed or as an employee with a nonexecutive, nonadministrative, and nonmanagerial occupation. We classified the unemployed as workers because many precarious workers cycle between employment and unemployment.[8,14] Although NLFs

may also cycle into and out of employment, especially into working-class employment, others may remain out of the labor force because of disability, retirement, domestic-labor responsibilities, or otherwise.[8,14] Third, managers were those who identified as an employee with an executive, administrative, or managerial occupation. Finally, unincorporated business owners (UBOs) were those who identified as self-employed in an unincorporated business, whereas incorporated business owners (IBOs) were those who identified as self-employed in an incorporated business. An incorporated business (i.e., corporation) is a shareholder-owned independent legal entity that is itself liable for business actions and debts,[27] unlike unincorporated businesses, whose proprietors remain liable. Although incorporation provides legal protections and tax benefits, smaller businesses use it less frequently than larger ones because of administrative costs and complexities.[27,28] Indeed, in 2015, 41% of IBOs employed workers versus just 13% of UBOs[27]; moreover, IBOs have higher mean incomes.[28] This suggests that IBOs are more likely to be capitalists than UBOs, although many IBOs do not employ workers and thus are not capitalists. Therefore, we refrain from referring to IBOs and UBOs as "capitalists" and "petite bourgeoisie," despite overlap. Appendix A2 (available as a supplement to the online version of this article at http://www.ajph.org) contains questionnaire wording and a decision tree.

*Mortality.* Mortality status and death year (if applicable) were available for all respondents eligible for NDI linkage.[24] For the deceased, we calculated follow-up time by subtracting the interview year from the death year, assuming the

interview happened at the beginning of each year and deaths occurred at the end of each year. For those living through December 31, 2019, we calculated follow-up time by subtracting the interview year from 2020. We calculated follow-up time at the year level for simplicity and to increase the stability of our estimates.

*Covariates.* Covariates of interest included respondents' age, race/ethnicity (self-identified), gender (generally assigned by the interviewer based on respondents' first names or relationship to household head), education, region of residence, and interview year.

## Analyses

First, we estimated class-stratified descriptive statistics of our sample. We also characterized the class composition of each gender–race/ethnicity group and the gender–race/ethnicity composition of each class, and estimated the yearly proportion of respondents in each class.

Next, we estimated class mortality inequities using inverse-probability-weighted survival curves and Cox proportional hazards models.[29] First, we estimated the inverse probability weights (IPW). For a given respondent, the IPW numerator was the unconditional probability of belonging to their observed class in the sample, and the denominator was the conditional probability of belonging to their observed class, given their confounder values. Using R's "ipw" package,[30] we estimated the numerator and denominator probabilities using multinomial logistic regression models with social class outcomes, weighted by the NHIS's sampling weights.[31] The numerator model contained only the intercept as a predictor, and the denominator contained predictors of gender, age, and interview year (with the latter 2 specified

as 3-knot and 5-knot restricted cubic splines, respectively). Next, we multiplied together the IPW and NHIS sampling weights.[31] Finally, using the combined weights and R's "survival" package,[32] we ran inverse-probability-weighted Kaplan–Meier survival curves with robust standard errors and a years-since-baseline timescale, which estimated the probability of survival over follow-up by class and the difference in the probability of survival (survival difference [SVD]) at the end of follow-up (34 years) in each class relative to the probability of survival among IBOs.[29] We estimated standard errors (SEs) for the SVDs as follows[33]:

$$(1) \quad SE_{SVD} = \sqrt{\left(SE_{Probability\ of\ survival\ in\ given\ class}\right)^2 + \left(SE_{Probability\ of\ survival\ in\ IBOs}\right)^2}$$

Using "survival,"[32] we also ran inverse-probability-weighted Cox models with robust standard errors and a years-since-baseline timescale, which estimated the mortality hazard across follow-up among each class relative to IBOs' hazard.[29] Because the survival curves and Cox models were inverse probability weighted, their estimates were nationally representative and adjusted for confounding by age, gender, and interview year.[29] In our primary analyses, we did not adjust for additional confounders via the IPW to capture the total magnitude of class inequities, including inequities reflecting the segregation of minoritized and oppressed respondents into more exploited and dominated classes.[5]

We also estimated the IPW, survival curves, and Cox models (1) after subdividing "workers" by employment status and occupation (i.e., unemployed workers, service workers, blue-collar workers [production, craft, and repair; operator, fabricator, and laborer; farming, forestry, and fishing; and military occupations],

and white-collar workers [professional–specialty and technical, sales, and administrative-support occupations]); (2) within time periods (1986–1996 waves with follow-up through December 31, 2004, vs 2001–2018 waves with follow-up through December 31, 2019); and (3) after interacting class with gender (women vs men), race/ethnicity (non-Hispanic Black, Hispanic, and non-Hispanic "other" vs non-Hispanic White), and educational attainment (≤ high school vs > high school).

## RESULTS

Our sample (n = 911 850) was 2% IBOs, 6% UBOs, 10% managers, 61% workers, and 21% NLFs (Table 1), a structure that was mostly stable from 1986 to 2018 (Appendix A3, available as a supplement to the online version of this article at http://www.ajph.org). Workers constituted over half of each gender–race/ethnicity group (online Appendix A3). Nonetheless, we identified gendered and racialized labor segregation, with non-Hispanic White men more likely to be IBOs, UBOs, or managers (25%) than other gender–races/ethnicities, especially than non-Hispanic Black women (10%; online Appendix A3). Consequently, workers and NLFs were disproportionately women and racially minoritized; they were also disproportionately unmarried and were less educated than IBOs and managers (Table 1). IBOs and managers, meanwhile, were disproportionately non-Hispanic White, more educated, and married; IBOs were also disproportionately men (Table 1). Fifty-two percent of workers had white-collar occupations, 14% had service occupations, 27% had blue-collar occupations, and 7% were unemployed (online Appendix A3).

Our sample included 170 834 deaths over 18 350 369 follow-up years.

## TABLE 1— Sociodemographic Composition of Sample, Stratified by Social Class: National Health Interview Survey, United States, 1986–2018

| | IBOs | UBOs | Managers | Workers | NLFs |
|---|---|---|---|---|---|
| Total, % | 2.3 | 6.0 | 10.0 | 60.6 | 21.1 |
| Women, % | 27.5 | 39.0 | 45.9 | 47.7 | 69.7 |
| Race/ethnicity, % | | | | | |
|   Hispanic | 6.8 | 10.9 | 7.3 | 13.2 | 13.6 |
|   Non-Hispanic Black | 4.2 | 5.9 | 8.0 | 12.5 | 12.9 |
|   Non-Hispanic other | 5.8 | 4.6 | 5.4 | 5.4 | 5.6 |
|   Non-Hispanic White | 83.2 | 78.7 | 79.3 | 68.8 | 68.0 |
| Education, % | | | | | |
|   <high school | 4.7 | 12.3 | 2.0 | 11.0 | 22.7 |
|   High school | 23.3 | 33.2 | 17.1 | 32.5 | 34.8 |
|   Some college | 26.3 | 26.4 | 25.3 | 27.8 | 24.1 |
|   College or more | 45.7 | 28.2 | 55.6 | 28.7 | 18.4 |
| Marital status, % | | | | | |
|   Married | 80.9 | 72.6 | 70.4 | 64.3 | 66.0 |
|   Single | 8.3 | 12.4 | 15.3 | 19.2 | 14.9 |
|   Widowed/divorced/separated | 10.9 | 15.0 | 14.2 | 16.5 | 19.1 |
| Region, % | | | | | |
|   Midwest | 23.1 | 23.3 | 23.4 | 24.5 | 21.5 |
|   Northeast | 19.3 | 16.5 | 19.9 | 18.9 | 18.2 |
|   South | 36.3 | 34.0 | 34.4 | 35.4 | 38.1 |
|   West | 21.3 | 26.3 | 22.3 | 21.2 | 22.2 |
| Age, median (IQR[a]) | 46 (38, 54) | 45 (36, 53) | 42 (34, 51) | 41 (32, 50) | 49 (36, 59) |
| Interview year, median (IQR[a]) | 2005 (1994, 2012) | 2003 (1992, 2010) | 2006 (1995, 2013) | 2006 (1994, 2012) | 2006 (1994, 2012) |

*Note.* IBOs = incorporated business owners; IQR = interquartile range; NLFs = those not in the labor force; UBOs = unincorporated business owners. Estimates are based on survey-weighted data from respondents aged 25–64 years to the United States' 1986–2018 National Health Interview Survey (n = 911 850).
[a]Interquartile range (quartile 1, quartile 3).

Respondents were followed for a median and maximum of 24 and 34 years, respectively. Appendix A4 (available as a supplement to the online version of this article at http://www.ajph.org) contains IPW distributions.

We estimated considerable class mortality inequities (Figure 1 and Appendix A5, available as a supplement to the online version of this article at http://www.ajph.org). Indeed, UBOs, workers, and NLFs had, respectively, 6.3 (95% confidence interval [CI] = −8.1, −4.6), 6.6 (95% CI = −8.1, −5.0), and 19.4 (95% CI = −21.0, −17.7) per 100 lower 34-year survival rates than IBOs. Managers fared similarly to IBOs.

Blue-collar, service, and unemployed workers were at especially increased mortality risk, whereas white-collar workers fared similarly to IBOs and managers. Inequities lessened but persisted in further-adjusted analyses (gender, age, and year, plus education, marital status, region, and race/ethnicity; online Appendix A5). Including the Hispanic oversample did not meaningfully alter estimates, nor did alternative standard-error-estimation approaches (online Appendix A5).

We estimated that the class mortality inequities increased over time (Figure 2 and Appendix A6, available as a supplement to the online version of this

article at http://www.ajph.org). For example, in the 1986–1996 waves with follow-up through December 31, 2004, only NLFs had a meaningfully lower 19-year survival rate than IBOs (SVD per 100 = −11.0; 95% CI = −12.7, −9.3). However, in the 2001–2018 waves with follow-up through December 31, 2019, UBOs, workers, and NLFs had, respectively, 3.5 (95% CI = −5.2, −1.7), 2.9 (95% CI = −4.3, −1.4), and 14.9 (95% CI = −16.6, −13.3) per 100 lower 19-year survival rates than IBOs. The estimated growth in mortality inequities persisted in more-adjusted analyses and appeared greater in Cox models incorporating class-by-interview-year
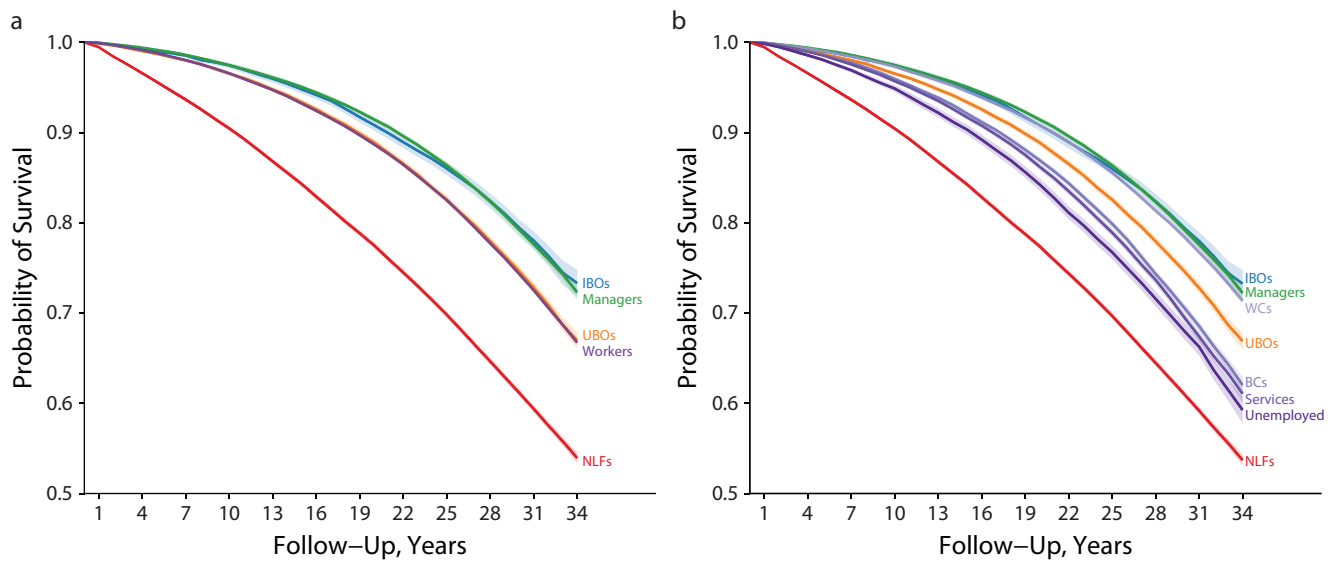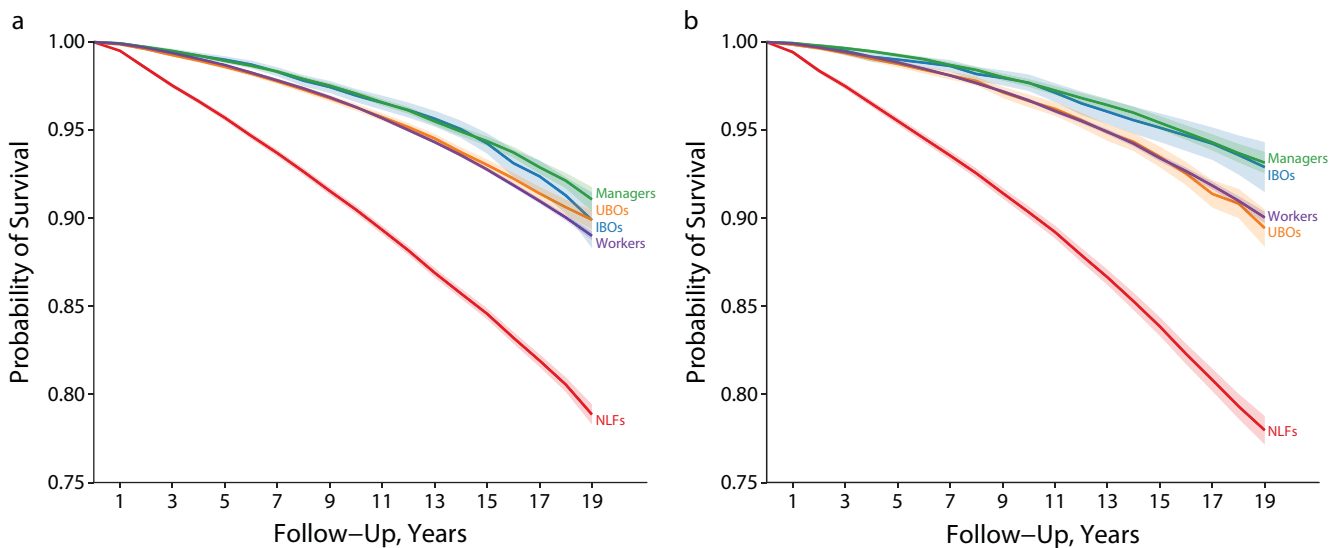
**FIGURE 1—** Inverse-Probability-Weighted Kaplan–Meier Survival Curves Depicting Probability of Survival During Follow-Up (a) by Class Overall and (b) After Subdividing Workers by Occupation and Employment Status: United States

*Note.* BCs = blue-collar workers; IBOs = incorporated business owners; NLFs = those not in the labor force; UBOs = unincorporated business owners; WCs = white-collar workers. Curves estimated on sample of respondents aged 25–64 years to the United States' 1986–2018 National Health Interview Survey (NHIS) with mortality follow-up through December 31, 2019 (n = 911 850). Via inverse probability weighting, estimates from curves are nationally representative and adjusted for gender, age, and interview year. Ninety-five percent confidence bands estimated with robust standard errors.
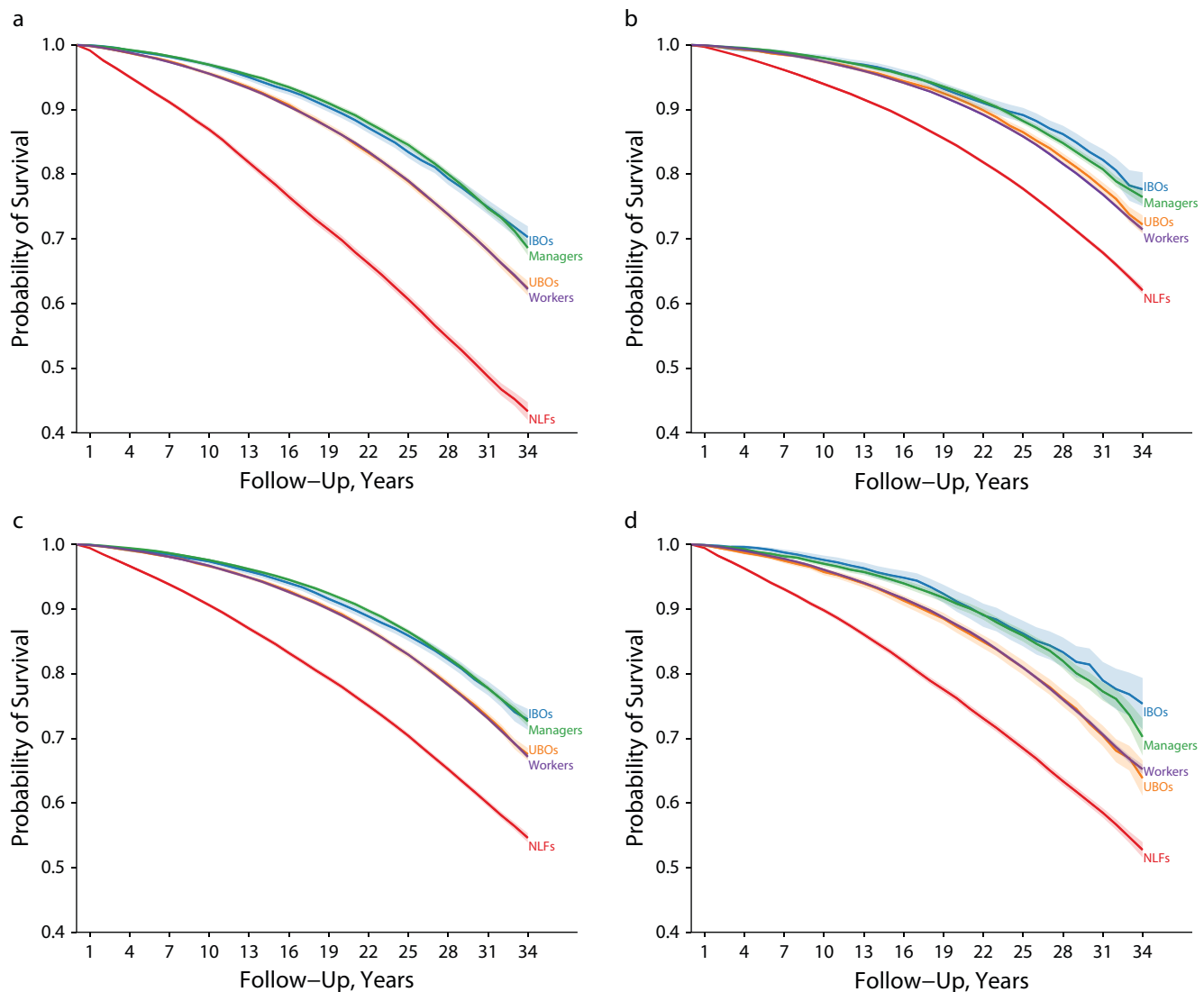


**FIGURE 2—** Inverse-Probability-Weighted Kaplan–Meier Survival Curves Depicting Probability of Survival During Follow-Up by Class in (a) 1986–1996 With Follow-Up Through 2004 and (b) 2001–2019 With Follow-Up Through 2019: United States

*Note.* IBOs = incorporated business owners; NLFs = those not in the labor force; UBOs = unincorporated business owners. Curves in left panel (a) estimated on sample of respondents aged 25–64 years to the United States' 1986–1996 National Health Interview Survey (NHIS) with mortality follow-up through December 31, 2004 (n = 564 202). Curves in right panel (b) estimated on similar sample, but restricted to the 2001–2018 NHIS with mortality follow-up through December 31, 2019 (n = 347 648). Via inverse probability weighting, estimates from curves are nationally representative and adjusted for gender, age, and interview year. Ninety-five percent confidence bands estimated with robust standard errors.

interaction rather than period stratification, although estimates were imprecise (online Appendix A6).

We also estimated greater class mortality inequities among men than women (Figure 3 and Appendix A7, available as a supplement to the online version of this article at http://www.ajph.org). For example, among men, UBOs, workers, and NLFs had, respectively, 7.9 (95% CI = −9.9, −5.9), 8.0 (95% CI = −9.8, −6.3), and 26.9 (95% CI = −29.1, −24.8) per 100 lower 34-year survival rate than IBOs. Meanwhile, among women, UBOs, workers, and NLFs had, respectively, just 5.5 (95% CI = −8.4, −2.5), 6.2 (95% CI = −8.9, −3.6), and 15.6 (95% CI = −18.3, −12.9) per 100 lower 34-year survival rates than IBOs.

Likewise, we estimated greater class mortality inequities among racially



**FIGURE 3—** Inverse-Probability-Weighted Kaplan–Meier Survival Curves Depicting Probability of Survival During Follow-Up Among (a) Men, (b) Women, (c) Non-Hispanic White, and (d) Non-Hispanic Black, Hispanic, or Non-Hispanic Other: United States

*Note.* IBOs = incorporated business owners; NLFs = those not in the labor force; UBOs = unincorporated business owners. Curves estimated on sample of respondents aged 25–64 years to the United States' 1986–2018 National Health Interview Survey with mortality follow-up through December 31, 2019 (n = 911 850). Via inverse probability weighting, estimates from curves are nationally representative and adjusted for age and interview year. Class–race/ethnicity curves are additionally adjusted for gender. Ninety-five percent bands estimated with robust standard errors.

minoritized respondents than non-Hispanic White respondents (Figure 3 and Appendix A8, available as a supplement to the online version of this article at http://www.ajph.org). For example, among non-Hispanic Black, Hispanic, and non-Hispanic other respondents, UBOs, workers, and NLFs had, respectively, 11.5 (95% CI = −16.4, −6.7), 10.1 (95% CI = −14.2, −6.1), and 22.6 (95% CI = −26.8, −18.5) per 100 lower 34-year survival rates than IBOs. Meanwhile, among non-Hispanic White respondents, UBOs, workers, and NLFs had, respectively, just 5.4 (95% CI = −7.3, −3.5), 5.8 (95% CI = −7.5, −4.1), and 18.3 (95% CI = −20.1, −16.6) per 100 lower 34-year survival rates than IBOs. Racially minoritized IBOs had somewhat lower mortality risks than their non-Hispanic White counterparts, whereas racially minoritized UBOs, workers, and NLFs had somewhat higher mortality risks, fueling the group's elevated inequities.

Finally, we estimated greater class mortality inequities among less-educated than more-educated respondents (Appendix A9, available as a supplement to the online version of this article at http://www.ajph.org). For example, among those with a high school degree or less, UBOs, workers, and NLFs had, respectively, 5.7 (95% CI = −8.7, −2.7), 5.8 (95% CI = −8.6, −3.0), and 18.3 (95% CI = −21.2, −15.5) per 100 lower 34-year survival rates than IBOs. However, among those with more than a high school degree, UBOs, workers, and NLFs had, respectively, just 4.1 (95% CI = −6.3, −1.9), 3.3 (95% CI = −5.1, −1.4), and 13.1 (95% CI = −15.2, −11.1) per 100 lower 34-year survival rates than IBOs.

Cox models yielded substantively similar estimates to the curves (online Appendices A5–A9).

## DISCUSSION

Using a relational social class measure based on power over property and labor, we analyzed the US class structure and class mortality inequities, including within time periods, genders, races/ethnicities, and educational groups.

We estimated that the class structure has remained mostly stable during the last 32 years, with workers constituting over half the population, including within genders and races/ethnicities. Nonetheless, women and racially minoritized respondents were segregated into the working class or excluded from the labor force entirely, whereas non-Hispanic White men were overrepresented among IBOs, UBOs, and managerial classes. These findings align with previous research[5,21] and suggest that labor-market segregation contributes to excess mortality among racially minoritized people.

We also estimated considerable class mortality inequities, with UBOs, NLFs, and workers (especially blue-collar, service, and unemployed workers) at greater mortality risk than IBOs and managers. The estimated inequities attenuated but persisted after adjustment for race/ethnicity, education, and other sociodemographics, suggesting—following European research on the topic[3]—that class inequities cannot be explained by different distributions of such factors across classes alone. We also estimated that class mortality inequities increased over time, driven by disproportionate mortality-rate decreases among managers and IBOs relative to changes among UBOs, workers, and NLFs. Such trends, which mirror trends in socioeconomic mortality inequities,[20] may partially reflect surging incomes among the upper classes relative to income changes among others,[19,34] an explanation that future research should investigate.

Finally, we estimated differences in class mortality inequities among sociodemographic subgroups, with greater inequities among male, racially minoritized, and less-educated respondents. Greater inequities among men may reflect a patriarchal gender division of labor, whereby economic well-being and health among heterosexual couples depend primarily on the man's class position and higher earnings.[15,35] Meanwhile, greater inequities among racially minoritized and less-educated respondents may reflect the segregation of marginalized workers and UBOs into especially oppressed segments of the class structure, including unemployment, hyperexploited service and blue-collar work, and precarious gig employment or sole proprietorship.[10–13] Moreover, such hazards may not be buffered by familial wealth or other resources available to the more privileged.[10]

## Limitations

A primary limitation of our study is the NHIS's social class data. First, the NHIS lacks consistent data on whether respondents supervise anyone at work, a measure frequently used to distinguish workers from managers and the petite bourgeoisie from capitalists.[3] Given that we classified a lower proportion of respondents as "managers" than previous studies,[5,21] our "worker" subgroup likely contained respondents with supervisory authority who would have been classified as "managers" had the NHIS contained more detailed data. Moreover, those classified as "manager" were likely high-level managers with substantial authority and autonomy, including chief executives who share

many characteristics with capitalists (e.g., stock options and delegated ownership authority). Second, we used incorporation status to distinguish business-owner subtypes. Although IBOs are more likely to employ workers than UBOs—making them more likely to be capitalists—many IBOs do not.[27] Thus, the owning classes in our study do not precisely coincide with the Marxist classes of "capitalists" and "petite bourgeoisie." Precise measurement would require consistent, detailed supervisory-authority data or data on the number of employees that employers employ, which are seldom available in epidemiological data sets.[3]

Another limitation is our coding of gender and race/ethnicity. First, interviewers generally assigned respondent gender—dichotomized as female and male—based on first name or relationship to household head. This assumes that gender is ascertainable from name and household structure alone, and may misclassify transgender, non-binary, and other respondents, who face extensive labor-market discrimination.[9] Second, because of small counts, we could not subdivide "non-Hispanic Black," "Hispanic," and "non-Hispanic other" respondents in survival analyses. Such respondents experience unique forms of racism, including in the labor market.[12] Moreover, the class distribution varies across such subgroups, with non-Hispanic Black and Hispanic respondents less likely to be IBOs, UBOs, or managers than non-Hispanic "other" respondents (online Appendix 3). Thus, lumping these respondents together concealed probable mortality inequities.

Finally, the NHIS's income data are categorical, with only broad categories available in many years and changing top codes across waves, preventing us from quantifying how income disparities mediated class mortality inequities.

Despite these data limitations, the NHIS befitted our objectives, as it is among the largest, longest-running nationally representative epidemiological data sets containing detailed social class and mortality data.

## Public Health Implications

We estimated considerable mortality inequities by class, gender, and race/ethnicity, inequities that may be increasing and that threaten population health. The COVID-19 pandemic has likely intensified the inequities, with harms concentrated among Black, Hispanic/Latinx, and Indigenous workers.[13] Our findings lay bare needs for structural interventions to build power among workers and other oppressed groups, including unionization campaigns, policies to strengthen labor protections and decommodify necessities, and social movements targeting broader economic transformation.[6] *AJPH*

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