Stratification and Accumulation?

Explaining Changing Mortality Inequities Between Business Owners and Non-owners in the United States (1984–2022)

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Background: Given established relationships between social class and mortality, the growing concentration of income, wealth, and power among business owners in the United States may have increased mortality inequities across classes. To investigate this hypothesis, we analyzed temporal changes in mortality inequities between owners and non-owners.

Methods: Our sample included respondents ages 25–64 in the 1984, 1989, 1994, and 1999–2013 Panel Study of Income Dynamics with mortality follow-up through 2022 (respondents: 22,103; observations: 103,965). Business owners were individuals with personal or family ownership of, or direct financial interest in, a business in the prior year. Using g-computation, we estimated how inequities between owners and non-owners in 10-year age-adjusted mortality risks changed from 1984 to 2013. Next, we analyzed whether any changes were attributable to shifting social stratification. Finally, we analyzed whether growing income and wealth disparities between owners and non-owners exacerbated inequities.

Results: In 1984, non-owners had 1.4 times (95% confidence interval [CI]: 1.1, 1.8) greater 10-year age-adjusted mortality risks than owners. In 2013, the figure was 2.3 (95% CI: 1.8, 3.0), yielding a ratio of risk ratios of 1.7 (95% CI: 1.1, 2.5). After social-stratification adjustment, within-year inequities lessened; however, increases across years attenuated only somewhat (2013 vs. 1984 ratio of risk ratios: 1.5 [95% CI: 0.99, 2.2]). Finally, we did not find that increases in inequities across years would have lessened if income and wealth distributions had remained at 1984 levels.

Conclusion: Mortality inequities between owners and non-owners have increased and cannot be fully explained by social stratification and individual-level income and wealth distributions.

Keywords: Disparities; g-computation; Income; Inequities; Mortality; Social class; Stratification; Wealth

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Theorizing social class relationally,[1–3] class inequities in the United States (US) have soared across multiple dimensions, including income[4,5] and wealth.[6–9] Wodtke estimated mean personal income among proprietors (i.e., business owners with employees) increased 30% from 1980 to 2010, five times workers' increase.[4] Zucman estimated the share of household wealth owned by those in the top 1% of the wealth distribution increased from 25% to 30% in the 1980s to 40% in 2016,[9] wealth that is increasingly concentrated in business assets.[6,8] Worsening inequities in mortality by income and education parallel these trends.[10,11] Consolidating class power among business owners, reflected in plunging labor-union density[12] and growing prevalence of precarious employment,[13] may be fueling pervasive inequities.[1,14]

While these socioeconomic conditions suggest social-class inequities in mortality may also be growing, to our knowledge, only one US study has investigated this issue by comparing business owners and non-owners.[15] That study estimated worsening mortality inequities between incorporated business owners and workers from 1986 to 2019.[15] However, the study neither incorporated detailed confounder data nor investigated the contribution of income and wealth disparities to the mortality inequities.

Using Panel Study of Income Dynamics (PSID) data,[16] we (1) quantified temporal changes in mortality inequities between US business owners and non-owners, (2) analyzed whether any changes were attributable to shifting social stratification (i.e., selection, or segregation, out of business ownership), and (3) estimated how mortality inequities would have changed under counterfactual income and wealth distributions.

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Code for our analyses is available at https://osf.io/jvyez/overview?view_only=cc9bd2a6103a4e23811e2cdfdd37d06f, where readers can find information about accessing the underlying Panel Study of Income Dynamics data used in our analyses.

SDC Supplemental digital content is available through direct URL citations in the HTML and PDF versions of this article (www.epidem.com).

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METHODS

Data

PSID contains annual waves from 1968 to 1997 and biennial waves thereafter, with most interviews conducted via telephone.[16] Our sample included reference persons and partners ages ≥25 observed at any point in the 1984, 1989, 1994, and 1999–2013 waves, a period (1984–2013) characterized by worsening socioeconomic mortality inequities.[10,15] We analyzed just three annual waves before 1999 (1984, 1989, and 1994) because they were the only waves before 1999 in which PSID collected wealth data. We excluded the "Latino Sample" (because they lacked 1994 family-income data[17]) and respondents with missing data (6%). When respondents had missing education values in certain waves but not others, we imputed their missing values by carrying forward (or backward, if needed) their nearest non-missing value. eAppendix 1 https://links.lww.com/EDE/C360 contains a flow diagram.

Measures

Social Class

Drawing on relational theories, we conceptualize social class in terms of social relations, not individual attributes (e.g., occupation).[1–3] In capitalist societies, the pivotal distinction is between owners of productive property (i.e., capital) and non-owners, who sell their labor to owners to survive.[1–3] We measured social class in each wave using responses to a question regarding whether respondents or anyone in respondents' family units owned a business or had a financial interest in a business at any point in the year before the survey interview. (In PSID, family units are groups of economically interdependent people who live together.[18]) We categorized those responding affirmatively as "business owners" and those responding negatively as "non-owners." Other studies using PSID data have measured business ownership or "entrepreneurship" analogously.[19–22] Several factors suggest the question measures direct ownership of a business (e.g., active ownership and management of a privately held business) rather than indirect ownership (e.g., passive ownership of a publicly traded business via stocks in a retirement account): (1) just ~13% of PSID respondents report business ownership, whereas ~60% of all Americans report stock ownership[23]; (2) PSID probes respondents about their role in the business(es), including job title and duties[17]; and (3) PSID contains a separate survey module covering stock ownership.[17] The question measures business ownership at the family level, enabling it to capture the sharing of salubrious material resources accumulated from business ownership within families.[3,24] This is particularly apt for the patriarchal US context, where the material well-being of families headed by heterosexual couples often depends primarily on resources accumulated from the man's dominant class position.[25,26]

Mortality

Respondents' all-cause mortality status was available with the year of death in PSID's mortality file.[16] For deaths occurring from 1984 to 2021, the National Death Index (NDI) supplied almost all death information. For deaths occurring in 2022 (when NDI linkage was unavailable) or when NDI linkage failed, death information came from PSID sources, including surviving relatives.[16,27] NDI and PSID year of death had 94% agreement. The precise death year was available for >99% of deaths, while almost all others were known to have occurred within a 1- to 2-year range; for such deaths, we used the range's latter year as the death year. We excluded six respondents only known to have died within a ≥3-year range. We classified as "dead" those who died within 10 years of a survey wave, calculating their follow-up times as the death year minus the interview year plus one, assuming interviews happened at the beginning of the year and deaths at the end. We classified others as "alive," assigning them follow-up times of 10 years.

Covariates

We analyzed respondents' covariates of interest, measured contemporaneously with exposure, in three sets. Set one included age. Set two included set one (age) plus gender, race, nativity, education, marital status by partner's employment status, region of residence, disability status, and occupation by employment status. Set three included set two plus parental wealth during childhood and parental educational attainment.

Statistical Analyses

How Did Mortality Inequities Between Business Owners and Non-owners Change Across Calendar Years, and Were Any Changes Attributable to Shifting Social Stratification?

We used parametric g-computation to estimate temporal changes in mortality inequities between owners and non-owners (aims one and two).[28–31] We first converted PSID into a person-year dataset, in which respondents had one row per year from their initial observed wave until death or end of follow-up (10 years), whichever came first.[28–31] We analyzed each PSID wave as its own cross-section with longitudinal mortality follow-up (i.e., we treated business ownership and covariates as time-fixed in each wave). For example, if a respondent appeared in 2007 and 2009 and died in 2010, they had two sets of person-year observations in the dataset, one for their 2007 observation (with rows for 2007, 2008, 2009, and 2010, carrying forward 2007 ownership/covariate data) and one for their 2009 observation (with rows for 2009 and 2010, carrying forwards 2009 ownership/covariate data). We analyzed the data in this way because our aim was *not* to estimate the causal effects of time-varying business ownership on mortality (e.g., the effects of always/never being an owner on mortality), but rather to explain changes over time in extant owner/non-owner mortality inequities, akin to decomposition analysis.[32,33] We refer to respondents' repeated observations across waves as separate "respondents" throughout this subsection and the next subsection.

Next, we fit a pooled logistic regression model to the dataset, predicting mortality with business ownership, follow-up time, an interaction term between business ownership and follow-up time, and a given covariate set, interacting all these predictors with calendar year (hereafter generally referred to as "year").[28–31] We specified age, follow-up time, and year as 3-knot restricted cubic splines in all main effects.[34] However, we specified follow-up time and year as linear in the interaction terms. The former specification (of follow-up time) allowed the relative mortality hazard between owners and non-owners to change linearly with follow-up time, while the latter specification (of year) allowed the relationship between all predictors and mortality to change linearly with year, including the ownership–mortality relationship.

Then, for each calendar year, we estimated owners' and non-owners' covariate-standardized 10-year mortality risks.[28–31] Accordingly, we took respondents' baseline observations, leaving covariate values as observed but setting business ownership to first, "ownership," and second, "non-ownership," for all respondents.[28–31] Next, using these observations and parameters from the logistic regression model, we predicted the probability of mortality (i.e., discrete-time hazard) for each respondent and ownership value (ownership and non-ownership) at each follow-up time.[29–31] Finally, we estimated the cumulative mortality risk over follow-up for each respondent and ownership value, defined as:

$$\sum_{w}\sum_{k=0}^{K} Pr(Y_{k+1}=1|\bar{Y}_k=0, W=w, A=a)$$

$$\times \prod_{j=0}^{k} Pr(Y_j=0|\bar{Y}_{j-1}=0, W=w, A=a)$$

$$\times Pr(W=w)$$

where A is baseline business ownership, W is baseline covariates, and Y_k is death by time k.[29–31] More simply, for each respondent and ownership value, we estimated the probability of mortality occurring in time $k+1$, which equaled the mortality hazard at $k+1$ times the cumulative probability of survival through k.[29–31] We then estimated the cumulative mortality risk through $k+1$ as the sum of the k-specific probabilities from baseline through $k+1$.[29–31] Finally, we estimated the sample-average cumulative mortality risk over follow-up for each ownership value as a weighted average of the covariate-specific risks.[29–31] We estimated risk ratios (RRs) and risk differences (RDs) to compare the covariate-standardized risks at the end of follow-up among non-owners versus owners in each calendar year, and estimated changes across years by contrasting the RRs and RDs in a given year with those in 1984.[29–31]

We repeated these steps in 1000 bootstrap samples clustered at the family-clan level (with "clans" consisting of related family units in the PSID dataset), using the percentile method for confidence interval (CI) estimation.[28–31] We examined model misspecification by comparing mortality risks in the "natural course," in which we left business ownership as observed rather than setting it to a specific level, with risks from the complement of the Kaplan–Meier estimator.[28–31]

Including covariate set one (age) in the mortality model allowed us to estimate temporal changes in mortality inequities net of the shifting age structure. We conceptualized these age-adjusted estimates as our baseline estimates of changes in mortality inequities across years (i.e., the referent estimates to which we compared our social-stratification-adjusted estimates), as we aimed to remove the contribution of the shifting age structure to better detect those arising from shifting social stratification and class power.[35,36] We also ran unadjusted analyses excluding covariates to estimate crude changes for comparison. Meanwhile, including covariate set two or three in the mortality model allowed us to estimate temporal changes in mortality inequities net of shifting social stratification (including inherited socioeconomic resources), as proxied by measured factors. Smaller temporal changes in inequities after adjustment for the covariate sets would suggest they explained the mortality trends, that is, increasingly affected the likelihood of business ownership and/or mortality across years. Residual changes in inequities after adjustment for the covariate sets would suggest shifts in factors not included in the sets, including class power, explained the trends. If participants inherited their businesses, variables like parental wealth during childhood could be on the ownership–mortality pathway. However, research suggests the vast majority of businesses are not inherited.[37–41]

How Would Mortality Inequities Between Business Owners and Non-owners Have Changed Across Calendar Years Under Counterfactual Individual-level Income and Wealth Distributions?

To estimate how social-stratification-adjusted mortality inequities would have changed across years under counterfactual income and wealth distributions (aim three), we used the same g-computation procedure,[28–31] with modifications inspired by Sudharsanan and Bijlsma.[42] Broadly, this entailed fitting models to predict income and wealth, in addition to mortality, using parameters from these models to specify counterfactual income and wealth distributions, and then estimating mortality risks for owners and non-owners as a function of covariates and counterfactual income and wealth distributions.

More specifically, we first fit intercept-only linear models to the observed PSID dataset with respondents' family income or wealth at the time of business-ownership measurement as the dependent variable. PSID defines family income as prior-year income from all sources, which we bottom-coded at $1 for cross-wave consistency (i.e., set all values below $1 to $1),[43] and family wealth as net worth from all sources, excluding public/private pensions.[44,45] We fit one set of intercept-only models stratified by year and ownership (i.e., one model for each year and ownership combination), and another stratified by year only (i.e., pooling together owners and non-owners). Next, we converted PSID into a person-period dataset. We then fit a pooled logistic regression model to the dataset, predicting mortality with business ownership, follow-up time, a follow-up-time-by-business-ownership interaction term, covariate set three, and an income-by-wealth-by-business-ownership interaction term, interacting all predictors with year. Again, we specified age, follow-up time, and year as three-knot restricted cubic splines in all main effects,[34] and specified follow-up time and year as linear in the interaction terms. However, we specified income and wealth as linear in the main effects and interaction terms.

Next, we drew a Monte Carlo pseudo-sample of respondents' baseline observations, 2.25 times the observed sample size to reduce Monte Carlo error.[28,42] Then, in the pseudo-sample, we left covariates at their observed values but set business ownership to a given level and predicted respondents' income and wealth using parameters from the intercept-only linear models, approximating the observed income and wealth distributions by sampling with replacement from the models' residuals. We analyzed three scenarios. In the "observed" scenario, we predicted respondents' income and wealth for each year and ownership value using the corresponding year- and ownership-specific intercept-only linear model. In this scenario, predicted income and wealth distributions among owners and non-owners in each year approximated their observed year- and ownership-specific distributions. Absent model misspecification, estimated mortality risks in this "observed" scenario should have resembled those from the aim two analyses that incorporated covariate set three (i.e., all covariates). In the "stable" scenario, we predicted respondents' income and wealth for each year and ownership value using the 1984 ownership-specific intercept-only linear model. In this scenario, predicted income and wealth distributions among owners and non-owners in each year approximated the 1984 ownership-specific distributions. Last, in the "socialized" scenario, in the 1984 wave, we predicted respondents' income and wealth for each ownership value as in the other scenarios. In subsequent waves (1989–2013), we predicted respondents' income and wealth using the 1984-specific intercept-only linear model, which was fit on data pooled across owners and non-owners (i.e., not stratified by business ownership). In this scenario, predicted income and wealth distributions among owners and non-owners in 1984 approximated their observed 1984 ownership-specific distributions, while from 1989-on, they approximated the 1984 marginal distribution (i.e., the scenario equalized income and wealth among owners and non-owners from 1989-on).

Then, using these predicted income and wealth distributions and parameters from the logistic regression model, we estimated mortality risks over follow-up for owners and non-owners. We estimated RRs and RDs to compare mortality risks at the end of follow-up among non-owners versus owners in each calendar year, and estimated changes across years by contrasting the RDs and RRs in a given year with those in 1984.[29–31] We also contrasted estimated changes across years under the "stable" and "socialized" scenarios with those under the "observed" scenario (i.e., we estimated ratios of ratios of RRs and differences in differences in RDs across scenarios and years). We estimated confidence intervals via the family-clan-level cluster bootstrap.

The stable scenario held income and wealth distributions among owners and non-owners from 1989 to 2013 at 1984 levels. Thus, smaller stratification-adjusted temporal changes in mortality inequities in the stable scenario compared with the observed scenario would suggest that shifting individual-level income and wealth distributions exacerbated mortality inequities across years. Meanwhile, the socialized scenario equalized income and wealth distributions among owners and non-owners from 1989 to 2013, providing an upper bound on the potential contribution of individual-level income and wealth distributions to temporal changes in mortality inequities.

Our estimates' validity depended on strong assumptions, including no: model misspecification, selection bias, information bias, or unmeasured confounding of the income–mortality and wealth–mortality relationships.[28,30,42] We discuss these in the Results and Discussion. eAppendix 2 https://links.lww.com/EDE/C360 contains a directed acyclic graph.

Sensitivity Analyses

First, to make estimates nationally representative, we incorporated PSID's individual longitudinal weights in the model-fitting and sample-averaging steps.[29,46] Primary analyses were unweighted because weights were missing for 37% of respondents ("nonsample" respondents[47]). Second, we specified follow-up time and year as three-knot restricted cubic splines in all interaction terms to relax linearity constraints. Third, we adjusted for industry, not occupation, as occupation may be caused by business ownership. We did not adjust for industry-by-employment *and* occupation-by-employment to avoid positivity violations. Fourth, to assess the influence of the COVID-19 pandemic and lack of 2022 NDI data, we estimated inequities in 7-year mortality risks, ending mortality follow-up in 2019. Finally, we examined the counterfactual scenarios' sensitivity to (1) incorporating covariate set three into the income and wealth models (i.e., simulating covariate-specific income and wealth distributions), (2) considering only income *or* wealth in the scenarios, and (3) specifying income and wealth as three-knot restricted cubic splines in the mortality model.

Code

Our R code is at https://osf.io/jvyez/overview?view_only=cc9bd2a6103a4e23811e2cdfdd37d06f, which contains information about accessing PSID data.

Ethical Review

NYU Grossman School of Medicine's IRB approved this study (i24-01216).

RESULTS

Descriptives

Our sample included 22,103 unique respondents and 1,784 unique deaths (eAppendix 3 https://links.lww.com/EDE/C360). Pooling respondents' repeated waves, there were 103,965 observations, including 88,960 non-owner observations, 15,005 owner observations, and 3,927 deaths (Table). Compared with non-owners, owners were more often men, older, college graduates, White, married, and able-bodied. They were also more likely to have managerial/professional occupations, parents with at least a high-school degree, and to have grown up well-off.

The proportion of respondents reporting business ownership was 13% in 1984 and 12% in 2013, peaking at 16% from 1999 to 2001 (eAppendix 4 https://links.lww.com/EDE/C360). Gender, educational, marital, childhood wealth, and parental educational differences in the probability of ownership were similar across years (eAppendix 5 https://links.lww.com/EDE/C360). However, racial differences in the probability of ownership lessened across years while age differences grew, with owners growing older relative to non-owners (eAppendix 5 https://links.lww.com/EDE/C360).

Absolute owner versus non-owner inequities in mean income were smallest in 1984 ($53,914), peaked in 2005 ($107,045), and decreased by 2013 ($69,759) (2022 dollars; eAppendix 6 https://links.lww.com/EDE/C360). Likewise, absolute owner versus non-owner inequities in mean wealth were smallest in 1984 ($515,131), peaked in 2007 ($1,025,471), and decreased by 2013 ($616,118).

How Did Mortality Inequities Between Business Owners and Non-owners Change Across Calendar Years, and Were Any Changes Attributable to Shifting Social Stratification?

Age-adjusted mortality inequities and changes in such inequities across years were generally larger than unadjusted ones (Figures 1 and 2 and eAppendix 7 https://links.lww.com/EDE/C360). Regarding the age-adjusted inequities, in 1984, the RR in 10-year mortality risks for non-owners versus owners was 1.4 (95% CI: 1.1, 1.8), while the RD per 100 was 1.4 (95% CI: 0.4, 2.3). The figures in 2013 were 2.3 (95% CI: 1.8, 3.0) and 2.6 (95% CI: 2.0, 3.2), respectively, for a ratio of RRs of 1.7 (95% CI: 1.1, 2.5) and a difference in RDs per 100 of 1.3 (95% CI: −0.1, 2.5) across years.

Social-stratification-adjusted mortality inequities were smaller than age-adjusted mortality inequities. However, adjustment for social stratification attenuated the *relative* increase in the inequities across years only somewhat while amplifying the *absolute* increase (Figures 1 and 2 and eAppendix 7 https://links.lww.com/EDE/C360). For example, adjusting for covariate set three (all covariates), in 1984, the RR in 10-year mortality risks for non-owners versus owners was 0.96 (95% CI: 0.75, 1.3), while the RD per 100 was −0.2 (95% CI: −1.5, 1.0). The figures in 2013 were 1.4 (95% CI: 1.1, 1.9) and 1.3 (95% CI: 0.5, 2.1), respectively, for a ratio of RRs of 1.5 (95% CI: 0.99, 2.2) and a difference in RDs per 100 of 1.5 (95% CI: −0.1, 3.2) across years.

Natural-course risks matched observed risks, suggesting minimal model misspecification (eAppendix 7 https://links.lww.com/EDE/C360)

How Would Mortality Inequities Between Business Owners and Non-owners Have Changed Across Calendar Years Under Counterfactual Individual-level Income and Wealth Distributions?

Our findings did not suggest that social-stratification-adjusted increases in mortality inequities across years would have lessened if income and wealth distributions from 1989 to 2013 had remained at 1984 levels (the stable scenario) (Figure 3 and eAppendix 8 https://links.lww.com/EDE/C360). Specifically, in the stable scenario, the ratio of RRs in 2013 versus 1984 was 1.6 (95% CI: 1.0, 2.5), while the difference in RDs per 100 was 1.6 (95% CI: −0.1, 3.4). These were 1.0 (95% CI: 0.92, 1.2) times, or 0.0 per 100 (95% CI: −0.3, 0.6) different from, the change in the observed scenario.

Our findings did suggest that social-stratification-adjusted increases in mortality inequities across years would have lessened somewhat if income and wealth distributions from 1989 to 2013 had been equal among owners and non-owners (the socialized scenario), although CIs were compatible with heterogeneous inferences (Figure 3 and eAppendix 8 https://links.lww.com/EDE/C360). Specifically, in the socialized scenario, the ratio of RRs in 2013 versus 1984 was 1.5 (95% CI: 0.92, 2.3), while the difference in RDs per 100 was 1.3 (95% CI: −0.4, 3.1). These were 0.92 (95% CI: 0.79, 1.2) times, or −0.3 per 100 (95% CI: −0.8, 0.6) different from, the change in the observed scenario.

Natural-course risks again matched observed risks (eAppendix 8 https://links.lww.com/EDE/C360). Changes across years under the observed scenario differed from changes across years in the aim two analyses that incorporated covariate set three (i.e., all covariates), suggesting some model misspecification. However, confidence intervals overlapped considerably.

TABLE. Descriptive Statistics of 1984, 1989, 1994, and 1999–2013 Panel Study of Income Dynamics Sample of Respondents Ages 25–64, Stratified by Business Ownership

N (%) or Median [IQR][a]	Non-owner	Owner
Observations	88,960	15,005
Year	2003 [1994, 2009]	2003 [1994, 2009]
Age	40 [32, 50]	43 [35, 52]
Family income[b]	8.0 [4.5, 12.5]	12.4 [7.4, 19.8]
Household wealth[b]	5.3 [0.4, 19.4]	32.5 [8.2, 88.8]
Men	40,534 (45.6)	7,594 (50.6)
Educational attainment		
<High school	16,156 (18.2)	1,267 (8.4)
High school	29,529 (33.2)	4,082 (27.2)
Some college	22,281 (25.0)	4,058 (27.0)
≥College	20,994 (23.6)	5,598 (37.3)
Race		
Black	30,323 (34.1)	2,068 (13.8)
Other	6,363 (7.2)	720 (4.8)
White	52,274 (58.8)	12,217 (81.4)
US born	83,239 (93.6)	14,321 (95.4)
Marital by partner employment[c]		
Married/cohab and employed	48,175 (54.2)	11,200 (74.6)
Married/cohab & unemployed/NLF	14,918 (16.8)	1,984 (13.2)
Not married/cohab	25,867 (29.1)	1,821 (12.1)
Region of residence[d]		
Midwest	21,424 (24.1)	3,982 (26.5)
Northeast	12,551 (14.1)	2,411 (16.1)
South	38,899 (43.7)	5,408 (36.0)
West	16,086 (18.1)	3,204 (21.4)
Parental wealth[e]		
Poor	26,808 (30.1)	3,226 (21.5)
Average/varied	39,053 (43.9)	7,301 (48.7)
Pretty well-off	23,099 (26.0)	4,478 (29.8)
Father's education[f]		
<High school	29,304 (32.9)	4,011 (26.7)
High school	27,401 (30.8)	5,211 (34.7)
>High school	17,961 (20.2)	4,395 (29.3)
Other	14,294 (16.1)	1,388 (9.3)
Mother's education[f]		
<High school	25,763 (29.0)	3,201 (21.3)
High school	34,694 (39.0)	6,662 (44.4)
>High school	17,710 (19.9)	3,959 (26.4)
Other	10,793 (12.1)	1,183 (7.9)
Work disability[g]	12,653 (14.2)	1,641 (10.9)
Occupation by employment[h]		
Farming, forestry, fishing, military	1,701 (1.9)	337 (2.2)
Managerial	6,244 (7.0)	2,688 (17.9)
Operators, fabricators, and laborers	9,959 (11.2)	824 (5.5)
Precision production, craft, and repair	7,033 (7.9)	1,494 (10.0)
Professional specialty	12,704 (14.3)	3,005 (20.0)
Services	10,972 (12.3)	1,462 (9.7)
Technical, sales, and admin support	18,643 (21.0)	3,069 (20.5)
NLF	16,314 (18.3)	1,816 (12.1)
Unemployed	5,390 (6.1)	310 (2.1)
Follow-up time	10 [10, 10]	10 [10, 10]
Dead (%)	3,565 (4.0)	362 (2.4)

[a]IQR: interquartile range, displayed as quartile 1 and quartile 3.
[b]In tens of thousands of 2022 dollars.
[c]Marital status by partner's employment status; cohab: cohabiting; NLF: not in the labor force.
[d]"West" includes those living in US territories and foreign countries.
[e]Parental wealth when respondent was growing up.
[f]Other" category includes those (1) whose parents were educated outside the US only or whose parents received no education, (2) who had no parent of given type (father or mother), or (3) who had missingness for the variable, groups which could not be distinguished in the data.
[g]Disability limits type or amount of work respondent can do.
[h]Occupation by employment status; NLF: not in the labor force

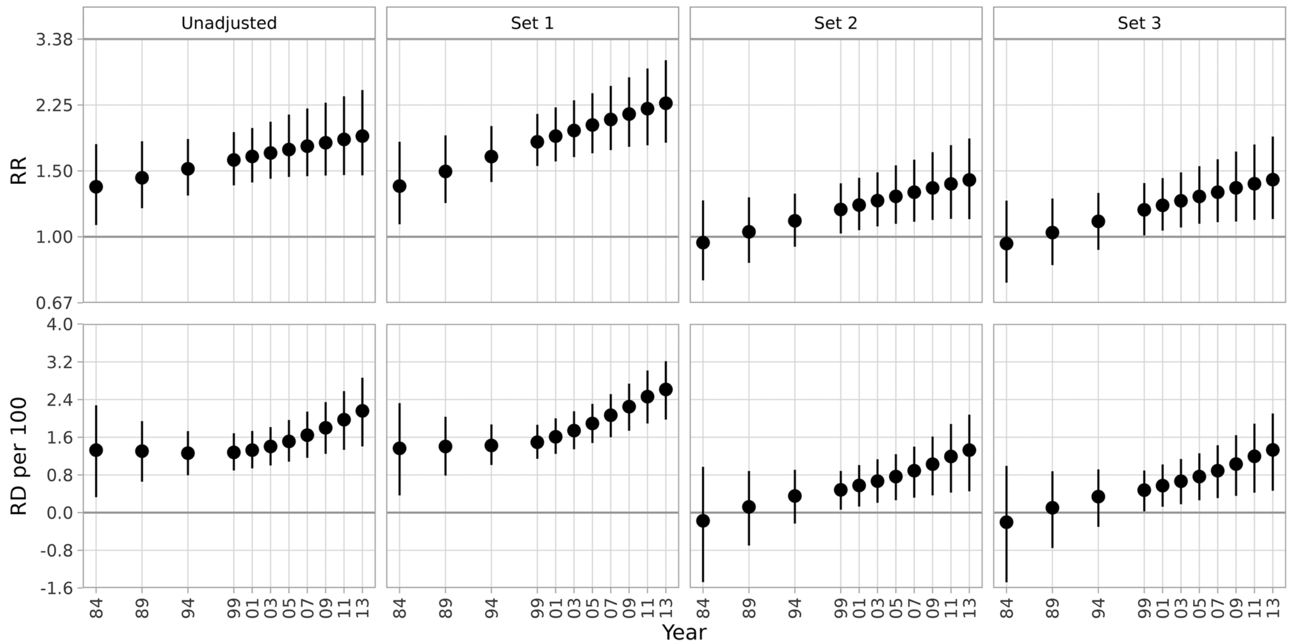

FIGURE 1. Risk ratios (RRs) and risk differences (RDs) in 10-year mortality risks among non-owners versus owners in each calendar year, adjusted for a given covariate set. Point estimates and 95% confidence intervals from parametric g-computation analyses of data on respondents ages 25–64 in the Panel Study of Income Dynamics (unique observations: 103,965; unique respondents: 22,103). Analyses specified as described in the text, with standard errors estimated via nonparametric bootstrapping clustered at the family-clan-level (unique clans: 3,169). Adjustment set 1 included age as a covariate; adjustment set two included set one, plus gender, race, nativity, education, marital status by partner's employment status, division of residence, disability status, and employment status by occupation; and adjustment set three included those in set two, plus parental wealth during childhood and parents' education.

Sensitivity Analyses

Estimates from sensitivity analyses were qualitatively similar to those from primary analyses, although some were imprecise (eAppendices 9–16 https://links.lww.com/EDE/C360). Moreover, while estimates from the stable scenario were consistent across specifications, we observed substantial attenuation of the growth in mortality inequities across years under certain specifications of the socialized scenario.

DISCUSSION

We found increasing mortality inequities between business owners and non-owners in recent decades in the US, which could only be partially explained by shifting social stratification. Moreover, we did not find that growing individual-level income and wealth disparities between owners and non-owners contributed to the social-stratification-adjusted increases. Finally, we found that the social-stratification-adjusted increases would have attenuated somewhat if individual-level income and wealth distributions among owners and non-owners had been equal, although estimates were imprecise and sensitive to modeling specifications.

Our study complements others documenting worsening US social-class inequities in income,[4,5] wealth,[6–8] and mortality.[15] The mortality study[15] also found that a limited set of sociodemographic factors could not explain worsening mortality inequities by social class, but did not investigate the contribution of income and wealth to the trends.[15]

In our sample, owners tended to be older than non-owners. Thus, age-adjusted mortality inequities between owners and non-owners within years were greater than unadjusted ones. Moreover, owners became older relative to non-owners across years. Accordingly, owners in later years faced greater age-related mortality risks than other respondents, which could have partially masked secular changes in mortality inequities arising from shifting social stratification, class power, and other factors. Thus, increases in mortality inequities across years were greater after age adjustment than before it. Additional adjustment for social stratification reduced within-year mortality inequities considerably, yet attenuated the increase across years only somewhat. This suggests that social stratification explained a nearly stable proportion of the mortality inequities across years, and that other individual-level and structural factors are needed to fully explain the growth in mortality inequities observed across the study period. Thus, we assessed the contribution of individual-level income and wealth disparities, finding that they did not explain the growth in social-stratification-adjusted mortality inequities either.

Our findings suggest that the benefits of business ownership changed across the study period in ways that were not

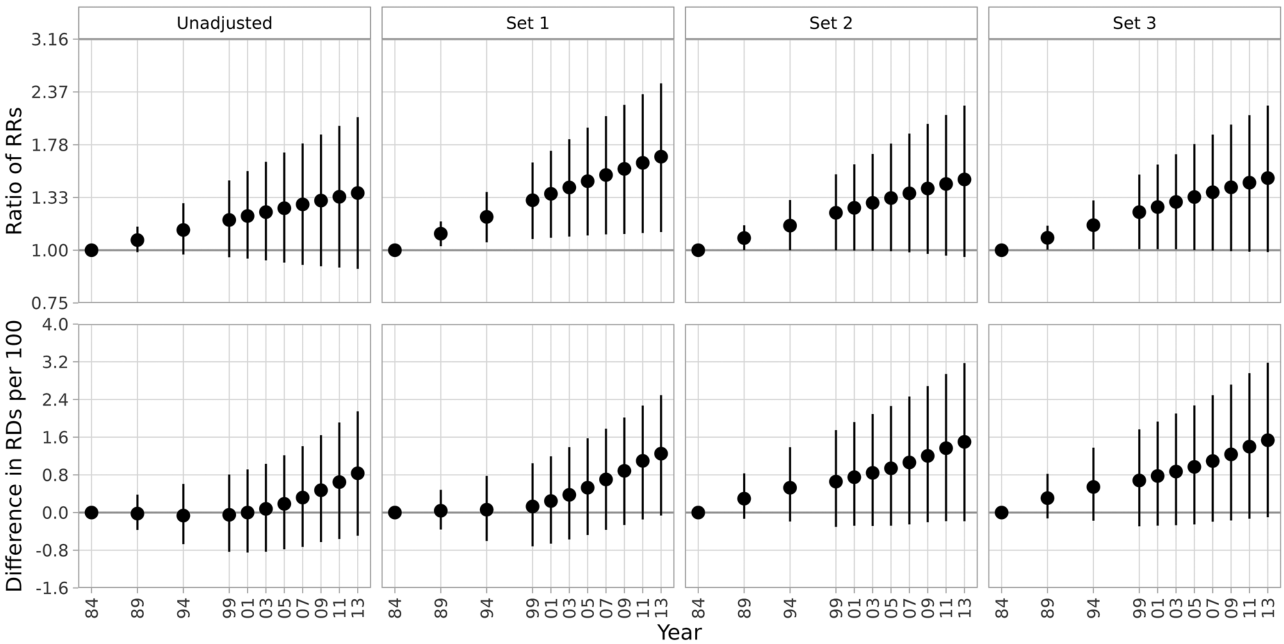

FIGURE 2. Risk ratios (RRs) and risk differences (RDs) in 10-year mortality risks among non-owners versus owners in a given calendar versus in 1984 (i.e., ratios of risk ratios and differences in risk differences), adjusted for a given covariate set. Point estimates and 95% confidence intervals from parametric g-computation analyses of data on respondents ages 25–64 in the Panel Study of Income Dynamics (unique observations: 103,965; unique respondents: 22,103). Analyses specified as described in the text, with standard errors estimated via nonparametric bootstrapping clustered at the family-clan-level (unique clans: 3,169). Adjustment set 1 included age as a covariate; adjustment set two included set one, plus gender, race, nativity, education, marital status by partner's employment status, division of residence, disability status, and employment status by occupation; and adjustment set three included those in set two, plus parental wealth during childhood and parents' education.

reducible to individual-level measures of income, wealth, and social stratification. Consolidating power among business owners (and allied elites) as a *class*, reflected in complex phenomena ranging from the labor movement's declining strength to the burgeoning prison population, may be a crucial factor underlying the growth in mortality inequities.[48,49] Shifts in unmeasured sociodemographic or health-related factors affecting business ownership and mortality may have also contributed. Fallout from the current sociopolitical conjuncture, including increased funding for the military and criminal-legal system coupled with cuts to health and social welfare funding, taxes on the wealthy, and regulatory-agency authority, may exacerbate the mortality inequities in coming years.[50–52]

Given the requisite assumptions,[28,30,42] we interpret findings from the stable scenario as follows: increases in social-stratification-adjusted mortality inequities *would not have lessened* if individual-level income and wealth disparities between owners and non-owners had remained at baseline (1984) levels. We do not make an interventional interpretation of the findings. That is, we do not interpret the findings as corresponding to the effect that an intervention lessening income and wealth disparities *would have* on *future* mortality inequities. Indeed, the effects of any such intervention would depend on *how* it modified income and wealth distributions (e.g., taxation versus expropriation). Moreover, an intervention could have spillover effects on structural factors associated with mortality inequities, like the balance of class power. These phenomena could violate the well-defined intervention assumption required for identifying effects of hypothetical interventions.[53]

Our study had limitations. First, there was potential unmeasured confounding of the income–mortality and wealth–mortality relationships, including by other dimensions of respondents' socioeconomic backgrounds and preexisting health status. Respondents' prior income and wealth may have also been confounders; thus, our counterfactual scenarios may not have captured the effects of changes to current income and wealth alone, but also changes to prior income and wealth, to the extent they are correlated with current income, wealth, and mortality. However, unmeasured confounding by these factors would likely have upwardly biased the estimated contributions of shifting income and wealth distributions to the mortality trends, as advantageous values of the factors are correlated with higher current income and wealth[37,54] and lower mortality risk.[10,55] Consequently, adjustment for them would likely have lessened the apparent protectiveness of greater income and wealth on mortality.[56] Thus, unmeasured confounding is unlikely to explain our modest counterfactual-scenario findings. Second, income and wealth may have been misclassified,

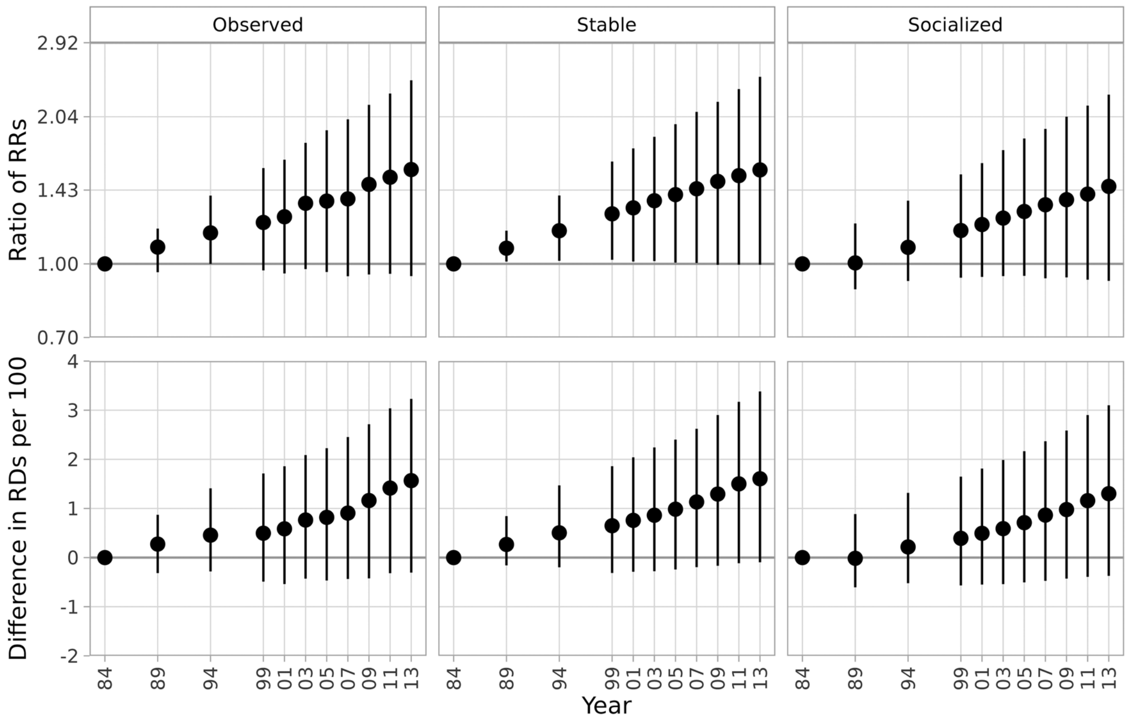

FIGURE 3. Risk ratios (RRs) and risk differences (RDs) in 10-year mortality risks among non-owners versus owners in a given calendar versus in 1984 under a given income and wealth scenario (i.e., ratios of risk ratios and differences in risk differences). Point estimates and 95% confidence intervals from parametric g-computation analyses of data on respondents ages 25–64 in the Panel Study of Income Dynamics (unique observations: 103,965; unique respondents: 22,103). Analyses specified as described in the text, with standard errors estimated via nonparametric bootstrapping clustered at the family-clan-level (unique clans: 3,169). In the "observed" scenario, the predicted income and wealth distributions among owners and non-owners in each year approximated the observed year-ownership-specific distributions. In the "stable" scenario, the predicted income and wealth distributions among owners and non-owners in each year approximated the observed 1984 ownership-specific distributions. In the "socialized" scenario, the predicted income and wealth distributions among owners and non-owners in 1984 approximated their observed 1984 ownership-specific distributions, while from 1989-on, they approximated the observed 1984 marginal distribution.

which—in expectation—would have downwardly biased estimates of the contributions of shifting income and wealth distributions to the mortality trends, assuming the misclassification were nondifferential.[57] Regarding income, values are generally somewhat higher in PSID than values in the Current Population Survey.[44,45] Nonetheless, values align closely throughout most of the distribution, only departing substantially beyond the 5th and 95th percentiles; moreover, temporal trends are comparable across surveys.[44,45] Family-wealth patterns in PSID versus in the Survey of Consumer Finances are similar, with values aligning closely throughout most of the distribution, only departing in the extremes.[18,45] To our knowledge, no US datasets contain better business, mortality, income, and wealth data than PSID. Moreover, PSID's income and wealth variables have been analyzed extensively,[58] with studies often estimating income-health and wealth–health relationships in the expected (protective) directions. Thus, like unmeasured confounding, we think it unlikely that misclassification can explain our modest counterfactual-scenario findings. Nonetheless, future research could address misclassification using data linked to administrative earnings records[59] and consider alternative income and wealth operationalizations, like cumulative life-course values. Third, in measuring social class, we elided respondents' relationship to others' labor, which can distinguish types of owners (e.g., those who do/do not hire labor) and non-owners (e.g., those who do/do not supervise others' labor).[1–3] This may have obscured heterogeneity in our findings. Regarding mortality trends, research suggests wellbeing has risen most sharply among privileged owners (e.g., large-business owners) and stagnated among marginalized non-owners (e.g., nonsupervisory workers),[4,15,60] suggesting the growth in mortality inequities may have been starkest across these subgroups. Regarding the counterfactual scenarios, marginalized non-owners may have disproportionately benefited from socialization, since they would have experienced the greatest income/wealth increases.[55,61] However, pooling poor and wealthy non-owners together may have masked such benefits. Nonetheless, because business ownership is a fundamental factor distinguishing social classes, our measure distinguished meaningful, albeit heterogeneous, groups,[1–3] reflected in the considerable inequities we estimated across this axis. Finally, analyses were generally imprecise, with confidence intervals compatible with minimal changes or substantial increases in mortality inequities across years.

CONCLUSION

We found increasing mortality inequities between business owners and non-owners in the US, which could not be fully explained by shifting social stratification and individual-level income and wealth distributions. Our study adds to evidence documenting large and growing social-class inequities in income, wealth, and health.[4–8,15,62] Research should monitor how mortality inequities continue to unfold and elucidate underlying mechanisms.

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