



Original Investigation

Local Wealth Inequality and Working-Age Mortality in US Counties

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Abstract

IMPORTANCE Household wealth is associated with health and survival, but little is known about whether wealth inequality is associated with mortality as a contextual exposure.

OBJECTIVE To examine the association between local wealth inequality and age-adjusted all-cause mortality across US counties over 5 decades.

DESIGN, SETTING, AND PARTICIPANTS This longitudinal, county-level study of up to 18 344 county-year observations from 1970 to 2019 linked restricted-access, all-cause mortality data from the US National Center for Health Statistics with county-level population and sociodemographic information and commuting zone estimates of household wealth inequality from the GEOWEALTH-US database. US counties were observed at decennial intervals from 1970 to 2019, with 2019 mortality used for the final period to avoid distortion from the COVID-19 pandemic. After listwise deletion, the estimation sample included up to 18 344 county-year observations nested in 732 commuting zones.

EXPOSURE Commuting zone Gini index score of household net wealth inequality.

MAIN OUTCOMES AND MEASURES County-specific, sex-specific, age-adjusted all-cause mortality rates for ages 25 to 44, 45 to 54, and 55 to 64 years, modeled on the natural log scale.

RESULTS In adjusted 2-way fixed-effects models with county, year, and state by year fixed effects, higher local wealth inequality was associated with higher mortality across all sex-age groups. Unstandardized regression coefficients (*b*) were 1.72 (95% CI, 0.99-2.45), 1.57 (95% CI, 0.96-2.18), and 1.11 (95% CI, 0.65-1.57) for female individuals aged 25 to 44, 45 to 54, and 55 to 64 years, respectively, and 0.75 (95% CI, 0.12-1.37), 0.71 (95% CI, 0.27-1.14), and 0.66 (95% CI, 0.24-1.08), respectively, for male individuals in the same age groups.

CONCLUSIONS AND RELEVANCE In this aggregate longitudinal cross-sectional study, increases in local wealth inequality were associated with within-county increases in working-age mortality. These findings suggest that wealth inequality may be relevant to population health beyond income inequality, although mechanisms and causality require further study.

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Introduction

Socioeconomic inequalities in health and mortality are a defining feature of public health in the US. A large body of individual-level research has shown that household wealth is associated with survival independently of other indicators of socioeconomic position, and recent studies have suggested that wealth may capture mortality disparities at least as well as income or education.¹⁻⁷ In parallel, a long-standing literature has examined whether living in places with more economic inequality harms

Key Points

Question Is rising local wealth inequality associated with changes in working-age mortality in US counties?

Findings In this longitudinal, county-level cross-sectional study of up to 18 344 county-year observations from 1970 to 2019, increases in commuting zone wealth inequality were associated with higher age-adjusted all-cause mortality for female and male individuals aged 25 to 44, 45 to 54, and 55 to 64 years.

Meaning The study results suggest that rising local wealth inequality may be associated with population health risks beyond income inequality.

+ Supplemental content

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population health.⁸⁻¹⁸ That evidence is more contested, but meta-analytic work has still suggested that higher income inequality is associated with worse mortality and self-rated health.¹⁹

Wealth inequality has received much less attention despite long-standing calls for public health research to take wealth more seriously.^{11,20-22} That omission matters because wealth is not simply stored income: it is a durable stock of advantage that shapes housing security, protection against shocks, and the resources available to families and communities over time. Recent work on economic inequality and mental health has also pointed to mechanisms, such as social comparison and the erosion of social capital, that may plausibly extend to mortality outcomes.^{23,24}

Empirical evidence on wealth inequality as a contextual exposure remains sparse and mixed. A cross-national comparative study found an association between greater wealth inequality and worse population health,²⁵ whereas a study from Norway found no association between changes in wealth inequality and changes in mortality.²⁶ In the US, recent work has also suggested that community wealth is associated with cognitive health in later life, underscoring the broader health relevance of local wealth environments.²⁷

In this county-level study, we addressed that gap by linking newly available commuting zone estimates of household wealth inequality to county-level age-adjusted all-cause mortality over 5 decades in the US. Using restricted-access mortality records and weighted 2-way fixed-effects models, we examined whether within-place increases in local wealth inequality were associated with mortality for female and male individuals aged 25 to 44 years, 45 to 54 years, and 55 to 64 years. By focusing on changes within counties over time, our design reduced bias from time-invariant differences between places and potentially provides new evidence on whether rising local wealth inequality tracks with worsening working-age mortality in the US. In exploratory analyses, we additionally examined mortality of specific causes of death to assess which pathways were consistent with the observed associations. Because the exposure and outcomes were measured for geographic areas, our findings speak to places rather than individuals and should not be interpreted as evidence about the association between a person's own wealth and their mortality risk.

Methods

Reporting Guidelines and Ethics Information

This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline. The University of North Carolina, Chapel Hill deemed that this study did not require institutional review board approval because it used deidentified, aggregated secondary data and did not constitute human participants.

Data

We used data from restricted-access, all-cause mortality information from the US National Center for Health Statistics and age-specific and sex-specific population estimates from the US Census Bureau.²⁸ We additionally drew on county-level characteristics based on the American Community Survey that were made available through the Integrated Public Use Microdata Series.²⁹ We merged these data with commuting zone-level aggregate wealth estimates from the GEOWEALTH-US database.³⁰ GEOWEALTH-US imputes household net wealth in geographically identified census microdata using ensemble machine-learning models that are trained on harmonized variables from the Survey of Consumer Finances (SCF), with additional correction of the upper tail using SCF-informed adjustments and a reweighted Pareto distribution. Household estimates are aggregated to commuting zones to produce comparable measures of local wealth inequality over time. We used geographic crosswalks that matched counties to commuting zones from the National Historical Geographic Information System.²⁹ After listwise deletion, our estimation sample included up to 18 344 observations nested in 732 commuting zones across 50 years.

Exposures and Outcomes

The exposure measure was local wealth inequality, which was measured as the Gini index score of household net wealth at the commuting zone level. Commuting zones are bundles of counties that capture local labor markets more closely than idiosyncratic political geographies.³¹ Because the Gini index is measured for the full commuting zone, it captures the dispersion of household wealth across the broader local labor market and may also reflect the spatial sorting of high-wealth and low-wealth households across counties or neighborhoods within that labor market. Household net wealth equaled the sum of real estate values and all financial assets owned by the household, minus the sum of all debts. We retrieved this measure from the GEOWEALTH-US dataset. The data were available for each decennial between 1970 and 2020.

The primary outcomes were county-specific, age-adjusted all-cause mortality rates by sex and age group. We built these measures using restricted-access death certificate data from the US National Center for Health Statistics, as well as sex-specific and age-specific population counts from the US Census Bureau. We studied sex-specific mortality rates for groups aged 25 to 44, 45 to 54, and 55 to 64 years. For each group, we computed mortality rates of all causes at each decennial between 1970 and 2020. For the last decennial, we used 2019 death certificates to avoid distortion from the COVID-19 pandemic.

Statistical Analyses

We estimated the association between local wealth inequality and age-adjusted all-cause mortality using 2-way fixed-effects models. Specifically, we estimated versions of the regression model $\log(M_{ist}) = \beta_i G_{zt} + X'_{zt} \gamma + \alpha_i + \delta_t + \lambda_{st} + \epsilon_{ist}$, in which M_{ist} is the age-adjusted all-cause mortality rate in county i for sex-age group s at time t . G_{zt} is the wealth Gini index score in commuting zone z at time t . X'_{zt} is a vector of time-varying covariates, α_i denotes county fixed effects, and δ_t denotes year fixed effects. λ_{st} denotes state-by-year interactions, reducing the scope for confounding by state-level policies.³²

The unit of analysis was the county-year. Separate models were estimated for males and female individuals aged 25 to 44 years, 45 to 54 years, and 55 to 64 years. The outcome was the natural logarithm of the county-specific, age-adjusted all-cause mortality rate. The main exposure was the commuting zone Gini index score of household net wealth. Models adjusted for time-varying county and commuting zone characteristics, including median wealth, median income, population share with a college degree, population share of Black individuals, population share of Hispanic individuals, employment, manufacturing employment, income inequality, working age population, poverty, and the population share of the focal age group. These covariates were selected as proxies for time-varying local economic restructuring and compositional change that could be jointly associated with local wealth inequality and mortality. Because some covariates (eg, poverty, employment, median income, and median wealth) may themselves respond to changing local wealth inequality, fully adjusted estimates may be conservative; therefore, we also reported estimates from nested adjustment sets (eTable 1 in [Supplement 1](#)). All models were weighted by the size of the relevant age-sex population group. Weighting yielded estimates representative of the average working-age resident rather than the average county and reduced the influence of sparsely populated counties, in which age-specific and sex-specific mortality rates are measured with substantial noise³³; unweighted estimates are reported in eTable 2 in [Supplement 1](#).

County fixed effects accounted for all time-invariant county characteristics, and year fixed effects adjusted for period shocks common to all counties. Because the state-by-year interactions absorb nationwide period shocks, the year fixed effects were redundant in estimation and retained in the notation for clarity. Standard errors were clustered at the commuting zone level to account for nonindependence of counties sharing the same exposure and for within-zone correlation over time. Because the outcome was modeled on the log scale, coefficients can be interpreted as approximate percentage differences in mortality. Specifically, the percentage difference in mortality associated with a change Δ in the wealth Gini index score was computed as $100 \times (\exp[\beta \times \Delta] - 1)$. We

interpreted the coefficient from these models as a covariate-adjusted, population-weighted, within-county association between commuting zone wealth inequality and county mortality, conditional on county, year, and state by year fixed effects rather than as a homogeneous treatment effect.

Because 2-way fixed-effects estimates can be difficult to interpret when associations vary across places, periods, or exposure levels, we added a first difference sensitivity analysis.^{34,35} These models regressed decennial changes in log mortality on decennial changes in commuting zone wealth inequality and covariates and included state by period fixed effects, age-sex population weights, and clustered standard errors at the commuting zone level (eTable 3 in [Supplement 1](#)). We also estimated a lead first difference specification in which prior decennial changes in mortality were regressed on subsequent decennial changes in commuting zone wealth inequality to assess whether mortality was already changing in places that later experienced rising wealth inequality. Lead first difference models did not reproduce the main pattern across most sex-age groups, although the estimate for male individuals aged 25 to 44 years was positive, indicating some evidence of prior mortality divergence for this subgroup (eTable 4 in [Supplement 1](#)). Additional sensitivity analyses re-estimated the main models without state-by-year interactions, with the bottom 50% wealth share instead of the wealth Gini index score, excluding the 20 largest metropolitan areas, with mortality averaged over each decennial interval to allow for lagged associations and using the first difference specification described previously.

All tests were 2-sided, and 95% CIs are reported. Missing data were handled by listwise deletion. Covariate information was complete for all county-years; observations were excluded only when a sex-age cell recorded no deaths during a given county-year, leaving the log rate undefined. Such cells occurred almost exclusively in sparsely populated counties and accounted for at most 1% of the population at risk in any group (eTable 5 in [Supplement 1](#)). Sensitivity and heterogeneity analyses were considered exploratory. To probe selective migration, we additionally estimated placebo models linking wealth inequality to county working-age population size and demographic composition and first difference models linking decennial changes in wealth inequality to decadal county net migration rates from the Age-Specific Net Migration Estimates for US Counties (eTables 6-8 in [Supplement 1](#)). To assess the behavior of the log-linear specification when death counts were small, we additionally estimated Poisson pseudo maximum-likelihood count models that retained county-years with 0 deaths (eTable 9 in [Supplement 1](#)).

A causal reading of our estimates requires several assumptions. First, there must be no unmeasured time-varying confounding at the county or commuting zone level: county fixed effects remove stable differences between counties, state-by-year interactions absorb state-level shocks, and the covariates adjust for observed local economic and demographic change, but unmeasured local shocks correlated with wealth inequality and mortality could remain. Second, there can be no interference between areas; because labor markets can spill across commuting zone boundaries, this assumption is unlikely to hold exactly, even though commuting zones are designed to capture local areas where people live, work, and commute. Third, changes in who lives in an area must not jointly determine local wealth inequality and mortality; supplementary analyses found no association between changes in inequality and population turnover or net migration, although health-selective migration cannot be excluded. Therefore, we interpreted the estimates as covariate-adjusted, population-weighted, within-county associations rather than causal effects. Analyses were conducted in Stata, version 19 (StataCorp). In exploratory analyses, we repeated the main models for mortality of cardiovascular disease, cancer, infectious disease, unintentional injury, suicide, drug-related causes, and all remaining causes. Because cause-specific death counts were frequently 0 in smaller counties, these models were estimated with the Poisson pseudomaximum likelihood, which retains county-years with no recorded deaths; log-linear estimates are reported alongside them (eTable 25 in [Supplement 1](#)).

Results

The study analyzed up to 18 344 county-year observations from 1970 to 2019. **Table 1** summarizes local characteristics in 2020 and changes between 1970 and 2020. Local wealth inequality increased markedly during the study period, with a mean rise of 0.07 points in the Gini index, whereas income inequality changed little on average. During the same period, age-adjusted all-cause mortality declined for all sex-specific age groups, with the largest average declines observed among male individuals aged 45 to 54 years and 55 to 64 years. Counties also became more populated, wealthier, and more highly educated over time, while poverty and manufacturing employment generally decreased. These patterns indicated substantial within-county change in the main exposure and outcomes, providing the longitudinal variation exploited in the fixed-effects analyses.

Figure 1 showed marked geographic heterogeneity in county mortality levels and trends over time. In 2019, overall age-adjusted all-cause mortality rates were highest across much of Appalachia and the southern US, with lower rates observed in many counties in the West and Northeast. Mortality generally declined between 1970 and 2019, but these improvements were unevenly distributed: declines were smaller across parts of the South and Appalachian region, where mortality remained comparatively high, whereas larger declines were more common in other parts of the country. Taken together, the maps suggested substantial spatial variation and diverging patterns in county mortality during the study period.

Figure 2 showed positive within-county associations between local wealth inequality and age-adjusted all-cause mortality after accounting for county and year fixed effects. Across all 6 sex-specific age groups, counties experiencing higher wealth inequality also tended to have higher mortality, and these associations were approximately linear over the observed range of the wealth Gini index. The gradients were somewhat stronger for female than male individuals. These residualized associations indicated that increases in local wealth inequality tracked increases in mortality within counties over time, before adjustment for additional covariates.

In adjusted 2-way fixed-effects models, higher local wealth inequality was associated with higher age-adjusted all-cause mortality for all sex-age groups (**Table 2**). Unstandardized regression

Table 1. Descriptive Statistics

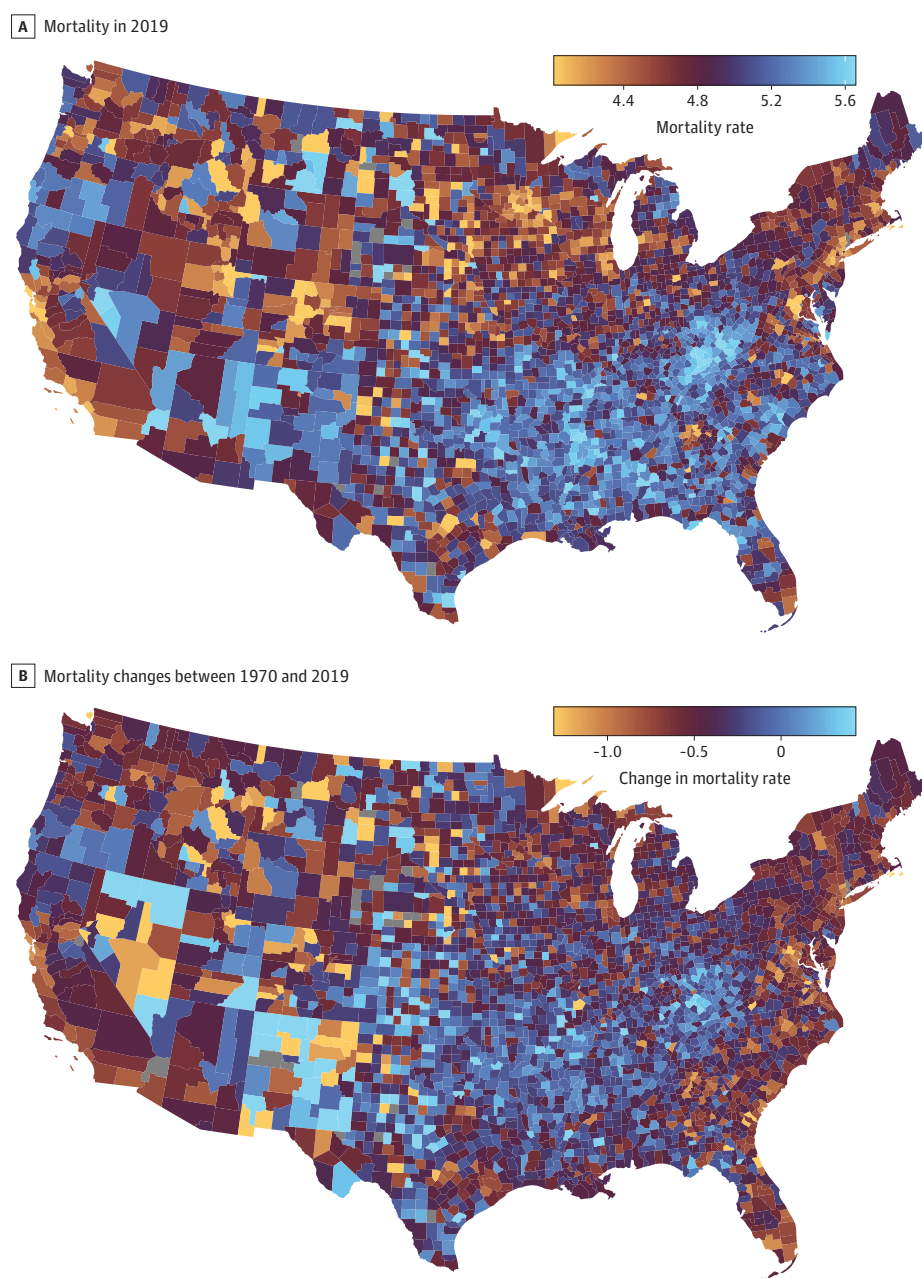
Statistic	Mean (SD) ^a	
	2020	Δ1970-2020
Wealth inequality, Gini index score ^b	0.79 (0.02)	0.07 (0.03)
Female log mortality rate, age, y		
25-44	4.99 (0.58)	-0.16 (0.71)
45-54	5.88 (0.54)	-0.27 (0.70)
55-64	6.63 (0.45)	-0.22 (0.61)
Male log mortality rate, age, y		
25-44	5.54 (0.55)	-0.23 (0.68)
45-54	6.32 (0.51)	-0.50 (0.62)
55-64	7.10 (0.42)	-0.54 (0.52)
Population, log	9.58 (1.52)	0.38 (0.50)
Income inequality, Gini index score	0.46 (0.03)	-0.01 (0.04)
Poverty, population share	0.14 (0.04)	-0.05 (0.06)
Median wealth, log	11.92 (0.35)	0.89 (0.31)
Median income, log	11.00 (0.18)	0.25 (0.16)
Demographic characteristic, population share		
College education	0.39 (0.08)	0.16 (0.07)
Black race	0.07 (0.10)	-0.02 (0.04)
Hispanic ethnicity	0.04 (0.06)	0.04 (0.06)
Employed	0.55 (0.06)	-0.16 (0.05)
Manufacturing employment	0.08 (0.03)	-0.12 (0.08)

^a Values are county level. Mortality measures are the natural logarithm of age-adjusted, all-cause mortality rates by sex and age group.

^b Wealth inequality is measured as the commuting zone Gini index score of household net wealth.

coefficients (b) were 1.72 (95% CI, 0.99-2.45), 1.57 (95% CI, 0.96-2.18), and 1.11 (95% CI, 0.65-1.57) for female individuals aged 25 to 44, 45 to 54, and 55 to 64 years, respectively, and 0.75 (95% CI, 0.12-1.37), 0.71 (95% CI, 0.27-1.14), and 0.66 (95% CI, 0.24-1.08), respectively, for male individuals in the same age groups. Interpreted on the log scale, a 0.1-point increase in local wealth inequality was associated with an approximately 18.8% higher mortality among female individuals aged 25 to 44 years, 17.0% among female individuals aged 45 to 54 years, 11.7% among female individuals aged 55 to 64 years, 7.8% among male individuals aged 25 to 44 years, 7.4% among male individuals aged 45 to 54 years, and 6.8% among male individuals aged 55 to 64 years. Scaled to the observed within-county variation, a 1-SD increase in the wealth Gini index score (0.03) was associated with approximately 5.7%, 5.2%, and 3.7% higher mortality for female individuals aged 25 to 44, 45 to 54,

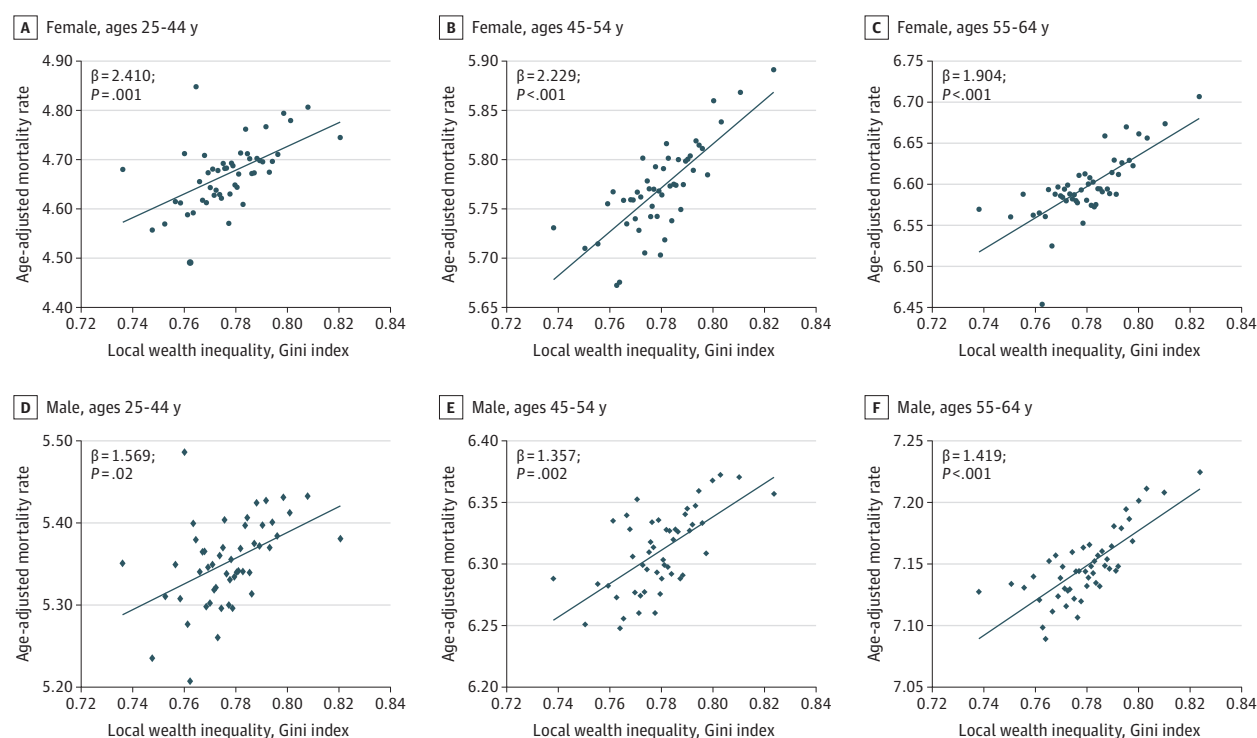
Figure 1. County-Level Maps of Spatial Variation in Overall Age-Adjusted All-Cause Working Age Mortality in 2019 and Changes Between 1970 and 2019



Gray areas indicate missing data.

and 55 to 64 years, respectively, and 2.5%, 2.3%, and 2.2% for male individuals, respectively, in the same age groups, and the mean observed within-county change between 1970 and 2020 (0.07) with approximately 12.5%, 11.3%, 7.9%, 5.3%, 5.0%, and 4.6% higher mortality, respectively. Overall, these findings indicated that within-county increases in local wealth inequality were consistently associated with higher mortality among female and male individuals across the full working age range. The estimated associations were descriptively larger among female than male individuals in all age groups, with the largest relative difference observed among adults aged 25 to 44 years. In stacked models that allowed all parameters to differ by sex, the female-male difference in the association was statistically significant on the log scale in all age groups (differences of 0.97 [95% CI,

Figure 2. Dot Plots of Binned Bivariate Associations Between Local Wealth Inequality and Sex-Specific, Age-Adjusted All-Cause Mortality



Points show binned within-county associations between local wealth inequality and log age-adjusted all-cause mortality after absorbing county fixed effects and adjusting for year fixed effects; lines show fitted linear trends. Models are weighted by the relevant age-sex population.

Table 2. Association Between Local Wealth Inequality and Age-Adjusted All-Cause Mortality Estimated by 2-Way Fixed-Effect (FE) Models by Sex and Age Group^a

Characteristic	Female individuals, age, y			Male individuals, age, y		
	25-44	45-54	55-64	25-44	45-54	55-64
Wealth inequality, b (95% CI)	1.72 (0.99-2.45)	1.57 (0.96-2.18)	1.11 (0.65-1.57)	0.75 (0.12-1.37)	0.71 (0.27-1.14)	0.66 (0.24-1.08)
Observations, No.	15 821	16 782	17 904	17 386	17 714	18 344
R^2	0.64	0.66	0.70	0.70	0.77	0.82
County FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
State by year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Population weighted	Yes	Yes	Yes	Yes	Yes	Yes

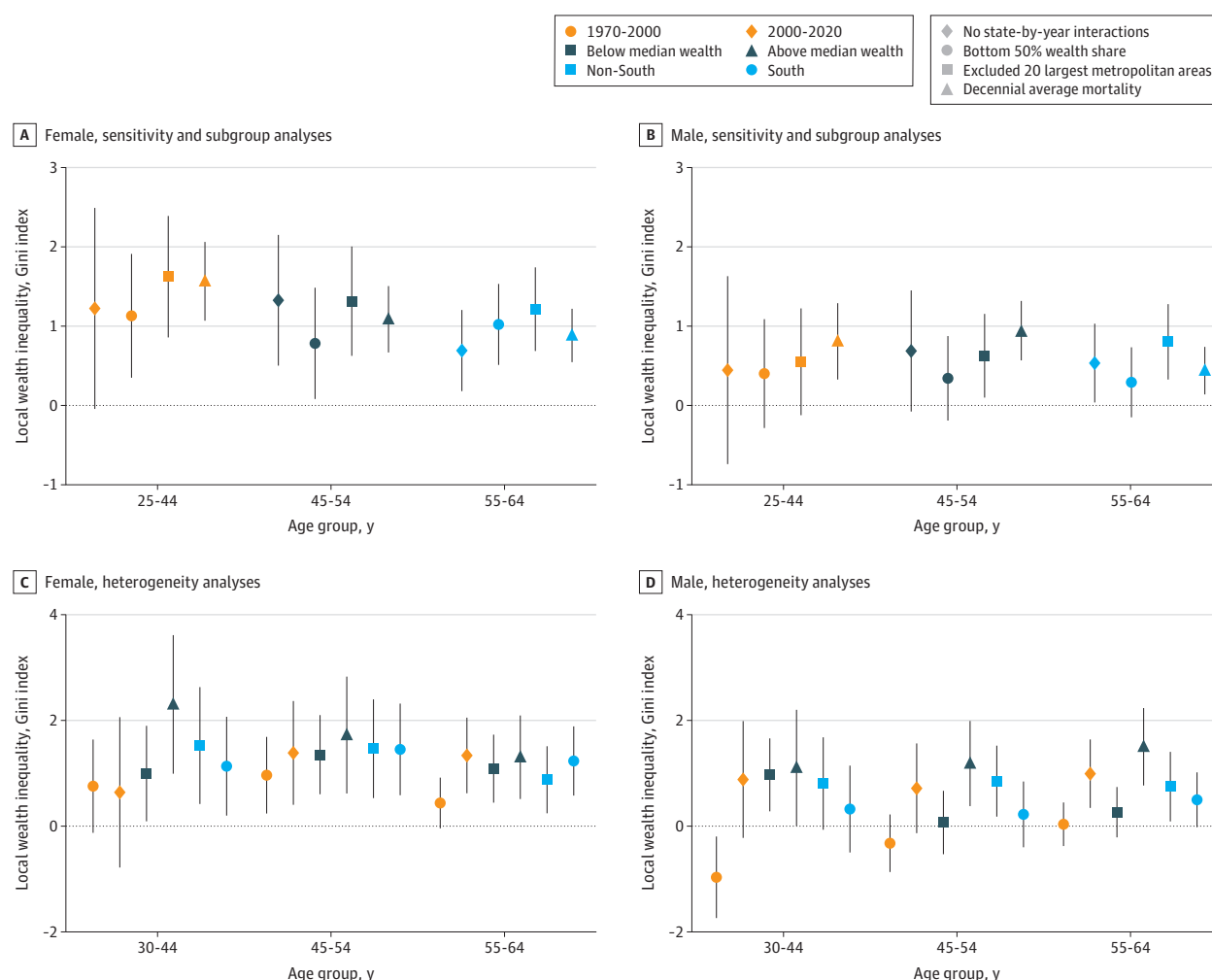
^a Values are coefficients from weighted 2-way FE linear models. The outcome was the natural logarithm of the county-specific age-adjusted all-cause mortality rate. All models included county and year FEs as well as state by year FEs and were weighted by the relevant age-sex population. Standard errors were clustered at the commuting zone level. Models were additionally adjusted for group population share, total working

age population, income inequality, poverty, median wealth, median income, college attainment, racial composition, Hispanic population share, employment, and manufacturing employment. Full covariate estimates are shown in eTable 11 in Supplement 1.

0.30-1.64], 0.86 [95% CI, 0.30-1.42], and 0.45 [95% CI, 0.05-0.85] for ages 25-44, 45-54, and 55-64 years, respectively); differences on the absolute rate scale were also positive but less precisely estimated (eTable 10 in Supplement 1).

Sensitivity and subgroup analyses generally pointed to a similar overall pattern to the main models (Figure 3). Positive associations between local wealth inequality and age-adjusted all-cause mortality for all female age groups as well as for male individuals aged 55 to 64 years were generally robust to excluding state-by-year interactions. First difference estimates were slightly attenuated compared with the main models but remained positive for all female age groups and for male individuals aged 55 to 64 years; lead specifications showed no association between prior mortality changes and subsequent inequality changes for most groups, with the exception of a positive lead estimate for male individuals aged 25 to 44 years. Coefficients from models that adjusted only for fixed effects, or additionally for demographic composition, were similar to or larger than the fully adjusted estimates. Models using the bottom 50% wealth share instead of the wealth Gini index, excluding the 20 largest metropolitan areas, or those that measured mortality as the average over

Figure 3. Dot Plots of Sensitivity Analyses



Points show coefficients and lines indicate 95% CIs from weighted 2-way fixed-effects models estimating the association between local wealth inequality and log age-adjusted all-cause mortality. All models included county and year fixed effects as well as state-by-year interactions, were weighted by the relevant age-sex population, and used SEs clustered at the commuting zone level. Sensitivity analyses were additionally estimated without state-by-year interactions, used the bottom 50% wealth share instead of the

wealth Gini index, excluded the 20 largest metropolitan areas as defined by 1970 population size, and had mortality measured as the average over each decennial interval to allow for lagged associations. Heterogeneity analyses were estimated separately for 1970 to 2000 and 2000 to 2019, commuting zones less vs greater than the median 1970 wealth level, and counties in the South vs other parts of the country. Full results of all sensitivity analyses are shown in eTables 14 to 23 in Supplement 1.

each decennial interval to allow for lagged associations maintained estimate precision for female individuals, whereas coefficients for male individuals were largely unchanged (or slightly improved). In Poisson count models that retained county-years with 0 deaths, associations were consistent with the main estimates and remained statistically significant for all female age groups. Unweighted estimates were attenuated and remained statistically significant only for female individuals aged 55 to 64 years; consistent with attenuation from small-county measurement error, excluding county-years with small sex-age-specific populations moved unweighted estimates back toward the weighted results (eTable 12 in [Supplement 1](#)).

In heterogeneity analyses, coefficients tended to be larger from 2000 to 2019 than 1970 to 2000 and were equally strong outside the South vs within the South. Positive associations were observed in commuting zones less than and greater than the median baseline wealth level, suggesting that the findings were not limited to initially affluent places, although estimates were often somewhat larger in lower-wealth areas. In models that entered the 2 inequality measures separately and jointly, the association was specific to wealth inequality: income inequality was not associated with mortality conditional on the covariates, and the wealth Gini index score estimates were unchanged or larger when income inequality was included (eTable 13 in [Supplement 1](#)).

Cause-specific analyses showed that the association was concentrated in particular causes of death (eTables 24 and 25 in [Supplement 1](#)). Associations were largest for drug-related deaths and suicide: unstandardized regression coefficients (*b*) were 4.07 (95% CI, 1.25-6.90) for drug-related mortality among male individuals aged 25 to 44 years, 5.36 (95% CI, 1.15-9.57) among female individuals aged 55-64 years, and 5.88 (95% CI, 2.78-8.98) for suicide among female individuals aged 55 to 64 years, several times the corresponding all-cause estimates. Associations were observed for cardiovascular disease and remaining causes, whereas no association was observed for cancer mortality in any sex-age group. Estimates for infectious disease mortality were unstable. Log-linear estimates were broadly consistent for the less sparse causes but excluded a large share of county-years for drug-related deaths and suicide, where 0 death cells are common.

Discussion

In this longitudinal, county-level cross-sectional study covering 5 decades in the US, within-commuting zone increases in local wealth inequality were associated with higher age-adjusted all-cause mortality across all female and male working-age groups. The estimated coefficients were consistently larger among female than male individuals, particularly at ages 25 to 44 years. The female-male difference was statistically significant in all age groups. This pattern could reflect gendered pathways through which local wealth inequality becomes embodied, including labor market exclusion, caregiving burdens within conditions of resource scarcity, and differential exposure to the erosion of local public goods and social infrastructure. The overall pattern was generally supported by multiple sensitivity checks, including models without state-by-year interactions, alternative measures of wealth concentration, exclusion of the largest metropolitan areas, and mortality averaged over decennial intervals to allow for lagged associations. A more demanding first difference specification produced slightly attenuated estimates, with the clearest evidence among female individuals aged 45 to 54 and 55 to 64 years.

These findings contribute to 2 associated literatures. First, they extend evidence showing that household wealth is a fundamental determinant of health and survival.¹⁻⁷ Second, they add to research on contextual inequality and population health, which has focused primarily on income inequality and produced mixed but often suggestive evidence of harmful associations with mortality.⁸⁻¹⁷ By contrast, wealth inequality has remained comparatively understudied in public health, despite long-standing arguments that wealth captures more durable and consequential forms of socioeconomic advantage than income alone.^{20,36} Therefore, our findings provide new longitudinal evidence that rising local wealth inequality tracks with worsening midlife mortality in the US. They are also broadly consistent with emerging work on the association of local wealth

environments with other health outcomes²⁷ while helping to clarify a literature that has thus far relied on a small and mixed set of descriptive and international studies.

Limitations

This study had several limitations. First, the wealth data were available at the commuting zone level and associated with local mortality outcomes, which means that we could not distinguish between associations that were attributable to wealth inequality itself and those attributable to the spatial concentration or segregation of wealth within local labor markets. More generally, all measures describe areas rather than individuals; therefore, the estimates pertain to places and cannot be interpreted as evidence about the association between a person's own wealth and their mortality risk. Second, although our findings were consistent with several plausible pathways, including uneven local public investment, institutional exclusion, psychosocial stress, or the erosion of social cohesion, we did not test mechanisms directly. Nonetheless, exploratory cause-specific analyses are informative about which pathways are plausible: associations were strongest for drug-related deaths and suicide and absent for cancer, a cause whose long latency makes a response to contemporaneous local conditions unlikely. This pattern was consistent with the deaths of despair literature and psychosocial and material pathways operating locally. Similarly, although the larger female coefficients point to potentially gendered pathways, our analyses did not identify the specific mechanisms that produced these differences. Third, despite the use of county fixed effects, extensive covariate adjustment, and state-by-year interactions, the analyses remain observational and cannot definitively establish causality. In particular, because local populations shape the wealth distribution and mortality, selective migration could in principle contribute to the observed associations. However, in supplementary analyses, changes in wealth inequality were not associated with changes in county working-age population size, age-sex composition, or working-age net migration, suggesting that differential population turnover is unlikely to explain our findings, although health-selective migration cannot be fully ruled out with aggregate data. Fourth, mortality and wealth were measured at decennial intervals, which is appropriate for studying long-run structural change but does not capture shorter-term dynamics. Fifth, the commuting zone wealth Gini index is estimated from an imputation model, and our CIs did not incorporate this imputation uncertainty; because the reported uncertainty is nontrivial compared with the within-county variation in the exposure, classical measurement error would attenuate our estimates toward 0, making the reported associations conservative. Reported imputation uncertainty was not larger in the earliest study waves.

Conclusions

Future research should investigate the mechanisms linking local wealth inequality to mortality more directly and with more spatially granular wealth data. In particular, it will be important to distinguish local wealth inequality from wealth segregation within localities and assess whether local institutional capacity, public investment, residential stratification, or social fragmentation mediate the observed associations. Building on the exploratory cause-specific results reported in this article, additional work should examine causes of death in greater detail, alongside younger and older age groups, and whether similar patterns are found outside the US. Taken together, our findings suggest that rising wealth inequality should be considered not only as an economic or political concern, but also as a potentially important contextual risk factor for population health.

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Author Contributions: Dr Schechtel had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: Schechtel, O'Brien, Zang, Venkataramani.

Acquisition, analysis, or interpretation of data: Schechtel, O'Brien, Bair.

Drafting of the manuscript: Schechtel.

Critical review of the manuscript for important intellectual content: All authors.

Statistical analysis: Schechtel, O'Brien, Bair.

Administrative, technical, or material support: O'Brien.

Supervision: O'Brien, Venkataramani.

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SUPPLEMENT 1.

eTable 1. Association between local wealth inequality and log mortality across nested adjustment sets

eTable 2. Weighted and unweighted estimates of the association between local wealth inequality and log mortality

eTable 3. First-difference sensitivity analysis: decennial changes in commuting-zone wealth inequality and changes in log mortality

eTable 4. Lead first-difference (pre-trend) check: prior decennial changes in log mortality and subsequent changes in commuting-zone wealth inequality

eTable 5. Extent and characteristics of county-years excluded because of zero recorded deaths, by sex and age group

eTable 6. Decennial changes in commuting-zone wealth inequality and county net migration rates

eTable 7. Placebo models: commuting-zone wealth inequality and county working-age population size and composition (levels)

eTable 8. Placebo models: decennial changes in commuting-zone wealth inequality and changes in county composition (first differences)

eTable 9. Poisson (PPML) count models of deaths, retaining county-years with zero deaths

eTable 10. Formal tests of female-male differences in the association between local wealth inequality and mortality, by age group and outcome scale

eTable 11. Association between local wealth inequality and age-adjusted all-cause mortality estimated by TWFE, by sex and age group (full model results)

eTable 12. Unweighted estimates excluding sparsely populated county-years

eTable 13. Wealth inequality and income inequality entered separately and jointly

eTable 14. Association between local wealth inequality and age-adjusted all-cause mortality estimated by TWFE, by sex and age group (no state-by-year interactions, full model results)

eTable 15. Association between local wealth inequality and age-adjusted all-cause mortality estimated by TWFE, by sex and age group (bottom 50% wealth share, full model results)

eTable 16. Association between local wealth inequality and age-adjusted all-cause mortality estimated by TWFE, by sex and age group (excluded largest metros, full model results)

eTable 17. Association between local wealth inequality and age-adjusted all-cause mortality estimated by TWFE, by sex and age group (decennial average mortality, full model results)

eTable 18. Association between local wealth inequality and age-adjusted all-cause mortality estimated by TWFE, by sex and age group (1970-2000 subsample, full model results)

eTable 19. Association between local wealth inequality and age-adjusted all-cause mortality estimated by TWFE, by sex and age group (2000-2020 subsample, full model results)

eTable 20. Association between local wealth inequality and age-adjusted all-cause mortality estimated by TWFE, by sex and age group (below median wealth subsample, full model results)

eTable 21. Association between local wealth inequality and age-adjusted all-cause mortality estimated by TWFE, by sex and age group (above median wealth subsample, full model results)

eTable 22. Association between local wealth inequality and age-adjusted all-cause mortality estimated by TWFE, by sex and age group (non-South subsample, full model results)

eTable 23. Association between local wealth inequality and age-adjusted all-cause mortality estimated by TWFE, by sex and age group (South subsample, full model results)

eTable 24. Local wealth inequality and cause-specific mortality, Poisson (PPML) count models

eTable 25. Local wealth inequality and cause-specific mortality, log-linear models

SUPPLEMENT 2.

Data sharing statement