

**Ten-Year Change in Neighborhood Socioeconomic Deprivation and Rates of Total, Cardiovascular Disease, and
Cancer Mortality in Older US Adults**

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Neighborhood socioeconomic deprivation

Baseline addresses from 1995–1996 were geocoded to latitude/longitude and linked to the 1990 and 2000 US Census at the census tract level. In total, there were 17,850 census tracts in our study. We applied an adapted version of the method developed by Messer et al.¹ and Major et al.² to generate an empirical neighborhood socioeconomic deprivation index for both census years where higher deprivation meant lower neighborhood socioeconomic status (SES). In brief, we selected 14 census tract-variables present in both 1990 and 2000 censuses that were related to seven components of the neighborhood environment (housing characteristics, residential stability, poverty, employment, occupation, racial composition, and education). We performed principal component analysis (PCA) on these variables, stratified by state, and retained variables with the consistently loadings across states and in both census years. More specifically, a variable is retained when at least one loading was in the upper 20% of all the 224 variable loadings (>0.33) and with no loading lower than 90% (<0.06). We retained six variables, including % total with less than high school, % total unemployed, % households with income below poverty, % households with an income $< \$22,500$ (1990) or $< \$30,000$ (2000), % households on public assistance, and % households with no car. Using the retained variables, we re-ran the PCA for the whole cohort for 1990 and 2000 separately. We used the final item loadings to weight each of the six variable's contribution to the deprivation index for each census tract in 1990 and 2000. The loadings of census variables across states and in the deprivation index are presented in **Web Table 1**. To assess whether the specific method used to construct the neighborhood deprivation index has a large impact on our results, we performed sensitivity analyses using two additional indicators of neighborhood deprivation: 1) a deprivation index derived from all 14 census variables; and 2) % households with income below poverty. To characterize changes in neighborhood conditions, we created tertiles in both 1990 and 2000 based on the deprivation index and jointly classified the census tracts into nine categories, including consistently low (T1) (reference group), medium (T2), and high deprivation (T3) in 1990 and 2000. The six remaining categories included three categories with improvements in neighborhood SES between 1990 and 2000 (T3 in 1990 to T2 in 2000, T3 to T1, and T2 to T1) and three categories with worsening of neighborhood SES between the time periods (T1 in 1990 to T2 in 2000, T1 to T3, and T2 to T3). To examine the dose-response relationship between changes in neighborhood deprivation and mortality, we further calculated the difference in the percentiles for the deprivation index between 1990 and 2000. Changes in individual census variable between the two censuses according to different categories of percentile changes in the neighborhood deprivation index are presented in **Web Table 2**.

Statistical analysis: model selection and inverse probability weighting

In all our models, we adjusted for potential confounders including demographic characteristics (age and race/ethnicity), education as an individual-level SES indicator, and state of residence. We also considered a wide range of variables that could serve as both confounders and mediators, including lifestyle and medical history (smoking, Healthy Eating Index (HEI), BMI, vigorous physical activity, TV viewing, self-rated health, and history of heart disease, stroke, diabetes and cancer). Because the role of these variables in the causal pathway is complicated and controlling of them only had a small effect ($<2\%$ change in effect estimates when adjusted individually and $<5\%$ change when all aforementioned variables were adjusted in the model) on our results, we did

not include them in our final analysis. We further considered the role of neighborhood socioeconomic deprivation in 1990: on one hand, it may confound the relationship between changes in neighborhood deprivation and mortality; on the other hand, as pointed out by earlier studies,³ controlling for baseline variable while studying changes in such variable may induce bias. Therefore, we presented results from models with and without adjustment for neighborhood deprivation in 1990.

Finally, because a large proportion (44%) of the baseline cohort were excluded primarily due to moving out of the neighborhood or death before 2000, we compared study characteristics between those who were included and those excluded (**Web Table 3**). Although the study characteristics appeared to be largely comparable between the two groups, some small differences were noted. Therefore we conducted sensitivity analysis using inverse probability weighting to account for the potential impact of exclusions.⁴ Briefly, we calculated a probability score of being included in the analytic cohort using multiple logistic regression that included the deprivation index in both 1990 and 2000, as well as all the study characteristics shown in **Web Table 3**, and then used the reciprocal of the score as weight in the analysis.

Web Table 1. State-specific and overall loadings of census variables

	CA		FL		GA		LA		MI		NC		NJ		PA		Overall	
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Variables used included in deprivation index																		
Percent of total with less than high school	0.32	0.31	0.34	0.33	0.28	0.30	0.30	0.30	0.31	0.29	0.29	0.29	0.31	0.32	0.28	0.28	0.40	0.41
Percent of total unemployed	0.34	0.32	0.31	0.29	0.33	0.31	0.33	0.31	0.32	0.31	0.30	0.27	0.32	0.29	0.33	0.29	0.40	0.38
Percent of HH with income below poverty	0.35	0.36	0.37	0.37	0.34	0.34	0.34	0.35	0.34	0.33	0.35	0.35	0.34	0.35	0.34	0.34	0.44	0.45
Percent of HH income < \$22,500	0.35	0.35	0.33	0.32	0.33	0.35	0.33	0.34	0.37	0.32	0.34	0.35	0.32	0.33	0.33	0.33	0.42	0.42
Percent of HH on public assistance	0.35	0.33	0.35	0.33	0.32	0.31	0.33	0.30	0.31	0.32	0.34	0.33	0.33	0.31	0.34	0.32	0.41	0.40
Percent of HH with no car	0.26	0.27	0.29	0.30	0.32	0.32	0.31	0.31	0.30	0.31	0.33	0.34	0.33	0.33	0.32	0.33	0.37	0.38
Variables not used included in deprivation index																		
Percent of Unemployed Men	0.32	0.30	0.28	0.26	0.31	0.29	0.31	0.30	0.31	0.30	0.27	0.25	0.30	0.27	0.32	0.29	NA	NA
Percent of renter occupied housing units	0.23	0.25	0.17	0.25	0.20	0.23	0.13	0.20	0.25	0.23	0.16	0.23	0.26	0.29	0.20	0.25	NA	NA
Percent of housing units vacant	0.07	0.08	-0.04	-0.03	0.18	0.18	0.20	0.18	0.06	0.24	0.04	0.05	0.08	0.09	0.10	0.18	NA	NA
Median value of all owner occupied housing units	-0.26	-0.24	-0.23	-0.22	-0.18	-0.19	-0.23	-0.23	-0.30	-0.21	-0.26	-0.25	-0.22	-0.20	-0.24	-0.23	NA	NA
Percent of female headed HH with dependent children	0.29	0.29	0.27	0.30	0.30	0.29	0.27	0.29	0.23	0.29	0.29	0.31	0.30	0.30	0.29	0.30	NA	NA
Percent of non-Hispanic (NH) blacks.	0.15	0.15	0.29	0.29	0.29	0.27	0.29	0.30	0.18	0.27	0.28	0.30	0.23	0.24	0.23	0.25	NA	NA
Percent of residents 65 years and over	-0.01	-0.08	-0.02	-0.10	0.07	-0.03	0.06	-0.03	0.18	-0.02	0.09	0.02	0.07	0.02	0.09	0.00	NA	NA
Percent of persons in same residence since 1985	0.12	-0.22	-0.10	-0.08	-0.01	-0.12	-0.04	-0.05	-0.02	-0.09	-0.13	-0.02	0.07	-0.18	-0.03	-0.12	NA	NA

Web Table 2. Changes in census variable between 1990 and 2000 according to changes in neighborhood socioeconomic deprivation index

Change in Census Variable ^a , Mean (SD)	Change in Percentile of Neighborhood Socioeconomic Deprivation Index								
	Reduced Deprivation				≤2.5% Change	Increased Deprivation			
	>30%	>20–30%	>10–20%	>2.5–10%		>2.5–10%	>10–20%	>20–30%	>30%
Percent of total with less than high school	-14.3 (8.0)	-9.4 (5.0)	-7.3 (4.5)	-5.8 (4.4)	-4.0 (4.8)	-2.0 (4.5)	-0.1 (5.0)	2.1 (5.4)	6.3 (8.2)
Percent of total unemployed	-3.1 (3.2)	-2.3 (2.4)	-1.7 (2.1)	-1.2 (2.2)	-0.1 (3.1)	0.8 (2.8)	1.6 (2.9)	2.4 (3.7)	4.2 (6.2)
Percent of HH with income below poverty	-6.4 (5.2)	-3.2 (3.2)	-1.8 (3.0)	-0.9 (3.0)	0.6 (3.5)	2.0 (3.1)	3.1 (3.6)	4.3 (3.8)	6.8 (6.0)
Percent of HH on public assistance	-5.8 (5.5)	-4.2 (2.8)	-3.8 (2.9)	-3.7 (3.5)	-3.9 (4.6)	-1.9 (2.2)	-1.2 (1.9)	-0.6 (1.8)	0.4 (2.5)
Percent of HH with no car	-5.2 (6.6)	-2.5 (3.9)	-1.6 (3.3)	-0.9 (3.3)	-0.2 (3.8)	1.2 (3.0)	2.2 (3.4)	3.5 (4.1)	6.4 (6.3)

^a Because we used different threshold for the income distribution variable in 1990 and 2000 (% households with an income <\$22,500 (1990) or <\$30,000 (2000)), we did not provide a direct comparison for this variable in this table.

Web Table 3. Baseline (1995–1996) study characteristics according to exclusion status^a among 566,388 participants in the National Institutes of Health-AARP Diet and Health Study

Baseline Characteristic	Exclusion Status	
	Included	Excluded ^a
Neighborhood deprivation index, 1990, mean (SD)	0.02 (2.1)	-0.02 (2.1)
Age, mean (SD)	62.2 (5.3)	62.1 (5.4)
Female, %	39.4	40.7
White, non-Hispanic, %	90.2	92.3
Less than high school, %	6.6	6.1
College and post college, %	37.8	38.4
Married, %	71.2	66.4
Current smoker, %	11.3	12.7
Physical activity \geq 5 times/wk, %	19.7	18.5
TV viewing \leq 2 hours/day, %	20.5	21.7
Nighttime sleep 7–8 hours/day, %	35.8	37.0
Body mass index, kg/m ² , mean (SD)	27.1 (5.0)	27.1 (5.2)
alcohol consumption, g/day, mean (SD)	13.1 (38.2)	13.4 (38.4)
HEI-2005 total score	66.6 (11.5)	66.6 (11.5)
Self-reported health, excellent, %	16.4	16.2
Self-reported health, poor or fair, %	12.5	14.4
Chronic conditions		
Heart disease	13.6	14.8
Stroke	2.1	2.5
Cancer	24.6	22.7
Diabetes	8.9	9.7

Abbreviation: SD, standard deviation.

^a Participants were excluded if they moved before 2004 ($n = 263,225$), if they died before 2000 ($n = 14,619$), or if they had missing neighborhood information ($n = 463$).

Web Table 4. Associations^a between total mortality and neighborhood socioeconomic deprivation in 1990 and 2000, using three different indicators

Neighborhood Deprivation		Indicator of Neighborhood Deprivation		
1990	2000	6-Variable Index	14-Variable Index	Poverty
<i>Women</i>				
	T1	Referent	Referent	Referent
T1	T2	1.07 (1.00, 1.15)	1.09 (1.01, 1.17)	1.08 (1.01, 1.16)
	T3	1.03 (0.82, 1.31)	1.17 (0.95, 1.44)	1.18 (0.99, 1.41)
	T1	1.09 (1.01, 1.17)	1.13 (1.05, 1.21)	1.08 (1.02, 1.16)
T2	T2	1.19 (1.13, 1.24)	1.16 (1.11, 1.22)	1.15 (1.10, 1.21)
	T3	1.28 (1.20, 1.37)	1.28 (1.20, 1.37)	1.28 (1.20, 1.37)
	T1	1.16 (0.91, 1.48)	1.24 (1.03, 1.51)	1.24 (1.07, 1.44)
T3	T2	1.28 (1.19, 1.37)	1.25 (1.17, 1.34)	1.25 (1.17, 1.33)
	T3	1.42 (1.36, 1.48)	1.43 (1.36, 1.49)	1.38 (1.32, 1.45)
<i>Men</i>				
	T1	Referent	Referent	Referent
T1	T2	1.10 (1.06, 1.15)	1.14 (1.09, 1.19)	1.10 (1.06, 1.14)
	T3	1.24 (1.08, 1.43)	1.12 (0.99, 1.26)	1.18 (1.07, 1.31)
	T1	1.12 (1.07, 1.17)	1.10 (1.05, 1.15)	1.10 (1.06, 1.15)
T2	T2	1.15 (1.12, 1.18)	1.16 (1.13, 1.20)	1.14 (1.10, 1.17)
	T3	1.27 (1.22, 1.33)	1.26 (1.21, 1.32)	1.24 (1.19, 1.29)
	T1	1.18 (1.03, 1.36)	1.18 (1.02, 1.38)	1.23 (1.12, 1.36)
T3	T2	1.22 (1.17, 1.27)	1.22 (1.17, 1.27)	1.17 (1.13, 1.23)
	T3	1.31 (1.27, 1.34)	1.33 (1.30, 1.37)	1.30 (1.26, 1.34)

^a Adjusted for age (50–<55, 55–<60, 60–<65, ≥65), race/ethnicity (non-Hispanic white, non-Hispanic black, other), education (<12 years, high school graduate, some college, college and post graduate). State of residence (CA, FL, GA, LA, MI, NC, NJ, PA) was included as a random effect.

Web Table 5. Total, CVD, and cancer mortality according to neighborhood socioeconomic deprivation in 1990 and 2000: comparison between results from regression models with and without adjustment of neighborhood socioeconomic deprivation in 1990

Tertile of Neighborhood Socioeconomic Deprivation Index		Total Deaths		CVD Deaths		Cancer Deaths	
1990	2000	Model 1 ^a	Model 2 ^b	Model 1 ^a	Model 2 ^b	Model 1 ^a	Model 2 ^b
<i>Men</i>							
T1 (low deprivation)	T1	Referent	Referent	Referent	Referent	Referent	Referent
	T2	1.10 (1.06, 1.15)	1.09 (1.05, 1.14)	1.17 (1.08, 1.26)	1.15 (1.06, 1.24)	1.09 (1.02, 1.17)	1.08 (1.01, 1.16)
	T3	1.24 (1.08, 1.43)	1.23 (1.07, 1.41)	1.76 (1.41, 2.19)	1.73 (1.39, 2.16)	1.03 (0.80, 1.33)	1.02 (0.79, 1.32)
T2	T1	1.12 (1.07, 1.17)	1.08 (1.04, 1.13)	1.21 (1.12, 1.30)	1.16 (1.07, 1.25)	1.08 (1.01, 1.16)	1.06 (0.98, 1.14)
	T2	1.15 (1.12, 1.18)	1.10 (1.07, 1.13)	1.21 (1.15, 1.28)	1.15 (1.09, 1.22)	1.11 (1.06, 1.16)	1.08 (1.03, 1.14)
	T3	1.27 (1.22, 1.33)	1.21 (1.16, 1.27)	1.44 (1.33, 1.55)	1.35 (1.25, 1.46)	1.14 (1.06, 1.23)	1.11 (1.02, 1.20)
T3 (high deprivation)	T1	1.18 (1.03, 1.36)	1.09 (0.94, 1.26)	1.22 (0.95, 1.58)	1.11 (0.85, 1.43)	1.10 (0.87, 1.40)	1.05 (0.82, 1.34)
	T2	1.22 (1.17, 1.27)	1.12 (1.07, 1.18)	1.33 (1.23, 1.43)	1.20 (1.11, 1.31)	1.19 (1.11, 1.27)	1.13 (1.04, 1.22)
	T3	1.31 (1.27, 1.34)	1.15 (1.10, 1.20)	1.47 (1.40, 1.54)	1.27 (1.18, 1.38)	1.15 (1.10, 1.20)	1.07 (0.99, 1.16)
<i>Women</i>							
T1 (low deprivation)	T1	Referent	Referent	Referent	Referent	Referent	Referent
	T2	1.07 (1.00, 1.15)	1.07 (1.00, 1.15)	1.41 (1.23, 1.61)	1.40 (1.22, 1.61)	0.90 (0.81, 1.02)	0.90 (0.80, 1.01)
	T3	1.03 (0.82, 1.31)	1.01 (0.80, 1.28)	0.87 (0.51, 1.51)	0.86 (0.49, 1.48)	0.87 (0.59, 1.28)	0.86 (0.58, 1.27)
T2	T1	1.09 (1.01, 1.17)	1.06 (0.99, 1.14)	1.21 (1.05, 1.41)	1.18 (1.02, 1.37)	1.05 (0.94, 1.18)	1.04 (0.93, 1.17)
	T2	1.19 (1.13, 1.24)	1.15 (1.10, 1.21)	1.44 (1.31, 1.59)	1.39 (1.26, 1.54)	1.02 (0.95, 1.10)	1.01 (0.93, 1.09)
	T3	1.28 (1.20, 1.37)	1.24 (1.16, 1.33)	1.56 (1.36, 1.78)	1.49 (1.30, 1.71)	1.13 (1.02, 1.26)	1.11 (0.99, 1.24)
T3 (high deprivation)	T1	1.16 (0.91, 1.48)	1.12 (0.87, 1.42)	1.34 (0.83, 2.17)	1.27 (0.78, 2.06)	0.82 (0.53, 1.27)	0.81 (0.52, 1.26)
	T2	1.28 (1.19, 1.37)	1.22 (1.13, 1.31)	1.70 (1.49, 1.94)	1.60 (1.39, 1.84)	0.99 (0.88, 1.11)	0.97 (0.86, 1.10)
	T3	1.42 (1.36, 1.48)	1.32 (1.24, 1.40)	1.78 (1.63, 1.95)	1.61 (1.42, 1.81)	1.18 (1.10, 1.27)	1.14 (1.03, 1.27)

^a adjusted for age (50–<55, 55–<60, 60–<65, ≥65), race/ethnicity (non-Hispanic white, non-Hispanic black, other), and education (<12 years, high school graduate, some college, college and post graduate). State of residence (CA, FL, GA, LA, MI, NC, NJ, PA) was included as a random effect.

^b adjusted for all the covariates in footnote ^a and additionally included neighborhood socioeconomic deprivation in 1990 as a covariate (continuous)

Web Table 6. Association between reduction in neighborhood socioeconomic deprivation and total mortality in men and women who lived in neighborhoods with more socioeconomic deprivation (index score > median) in 1990

	Less Than 2.5% Reduction or Increased Deprivation	Reduction in Deprivation				Per 5 Percentile Point Reduction	P-Trend
		>2.5–10%	>10–20%	>20–30%	>30%		
<i>Men</i>							
No. of deaths	12194	5365	3750	1340	818		
HR (95% CI), model 1 ^a	Referent	0.95 (0.92, 0.99)	0.94 (0.91, 0.98)	0.92 (0.87, 0.97)	0.89 (0.83, 0.95)	1.011 (1.006, 1.016)	<.0001
HR (95% CI), model 2 ^b	Referent	0.95 (0.92, 0.99)	0.96 (0.93, 1.00)	0.94 (0.89, 1.00)	0.90 (0.84, 0.97)	1.012 (1.007, 1.018)	<.0001
<i>Women</i>							
No. of deaths	6575	2548	4587	487	293		
HR (95% CI), model 1 ^a	Referent	0.97 (0.92, 1.01)	0.93 (0.88, 0.99)	0.84 (0.76, 0.92)	0.81 (0.72, 0.91)	1.020 (1.012, 1.027)	<.0001
HR (95% CI), model 2 ^b	Referent	0.97 (0.92, 1.01)	0.95 (0.90, 1.00)	0.86 (0.78, 0.94)	0.82 (0.73, 0.92)	1.021 (1.014, 1.029)	<.0001

^a Adjusted for age (50–<55, 55–<60, 60–<65, ≥65), race/ethnicity (non-Hispanic white, non-Hispanic black, other), and education (<12 years, high school graduate, some college, college and post graduate). State of residence (CA, FL, GA, LA, MI, NC, NJ, PA) was included as a random effect.

^b Adjusted for all the covariates in footnote ^a and additionally included neighborhood socioeconomic deprivation in 1990 as a covariate (continuous)

Web Table 7. Association between increase in neighborhood socioeconomic deprivation and total mortality in men and women who lived in neighborhoods with less socioeconomic deprivation (index score \leq median) in 1990

	Less Than 2.5% Increase or Reduced Deprivation	Increase in Deprivation				Per 5 Percentile Point Increase	<i>p</i> -Trend
		>2.5–10%	>10–20%	>20–30%	>30%		
MEN							
No. of deaths	11188	4256	3024	1379	887		
HR (95% CI), model 1 ^a	Referent	1.01 (0.97, 1.04)	1.04 (1.00, 1.08)	1.10 (1.04, 1.16)	1.11 (1.03, 1.18)	1.007 (1.002, 1.012)	0.008
HR (95% CI), model 2 ^b	Referent	1.02 (0.99, 1.06)	1.04 (1.00, 1.08)	1.09 (1.03, 1.15)	1.10 (1.03, 1.18)	1.010 (1.005, 1.015)	0.0001
WOMEN							
No. of deaths	3736	1512	1158	552	370		
HR (95% CI), model 1 ^a	Referent	1.01 (0.95, 1.07)	1.04 (0.98, 1.12)	1.08 (0.99, 1.19)	1.07 (0.96, 1.19)	1.006 (0.998, 1.014)	0.14
HR (95% CI), model 2 ^b	Referent	1.02 (0.96, 1.09)	1.04 (0.98, 1.11)	1.08 (0.99, 1.18)	1.07 (0.96, 1.19)	1.008 (1.000, 1.016)	0.05

^a Adjusted for age (50–<55, 55–<60, 60–<65, \geq 65), race/ethnicity (non-Hispanic white, non-Hispanic black, other), and education (<12 years, high school graduate, some college, college and post graduate). State of residence (CA, FL, GA, LA, MI, NC, NJ, PA) was included as a random effect.

^b Adjusted for all the covariates in footnote ^a and additionally included neighborhood socioeconomic deprivation in 1990 as a covariate (continuous).

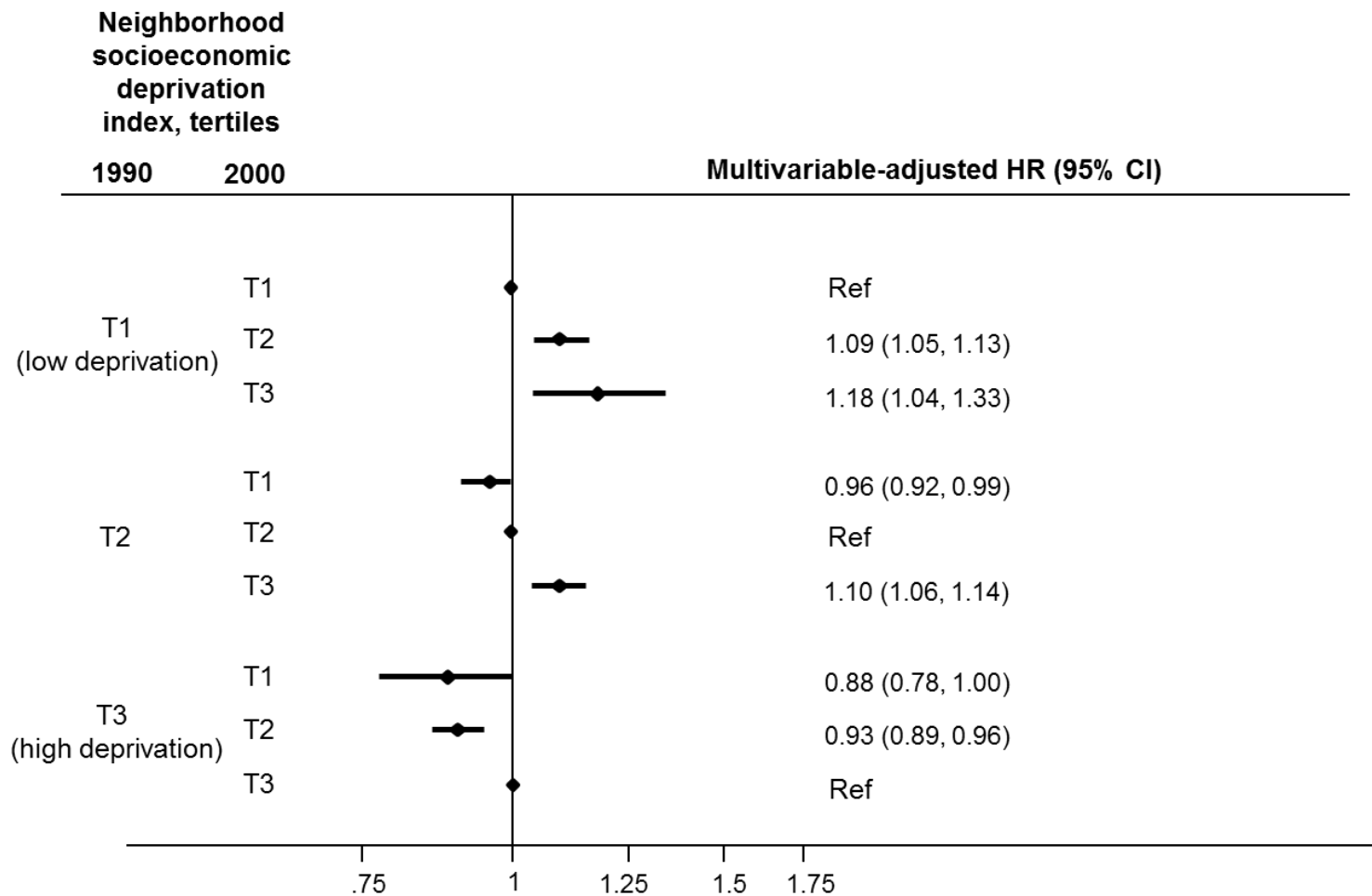
Web Table 8. Association between changes in neighborhood socioeconomic deprivation and total mortality among women who lived in neighborhoods with a socioeconomic deprivation index higher than median in 1990, by health and disease status

	Less Than 2.5% Reduction or Increased Deprivation	Reduction in Deprivation				Per 5 Percentile Point Reduction	<i>p</i> -Trend
		>2.5–10%	>10–20%	>20–30%	>30%		
<i>MEN</i>							
<i>More healthy</i> ^a							
No. of deaths	2979	1254	852	321	219		
HR (95% CI) ^c	Referent	0.92 (0.86, 0.99)	0.88 (0.81, 0.95)	0.90 (0.80, 1.01)	0.93 (0.81, 1.07)	1.013 (1.002, 1.023)	0.02
<i>Less healthy</i> ^b							
No. of deaths	9109	4070	2872	1011	596		
HR (95% CI) ^c	Referent	0.96 (0.93, 1.00)	0.97 (0.93, 1.02)	0.93 (0.87, 0.99)	0.90 (0.83, 0.98)	1.009 (1.003, 1.015)	0.002
<i>WOMEN</i>							
<i>More healthy</i> ^a							
No. of deaths	1784	724	456	140	85		
HR (95% CI) ^c	Referent	1.00 (0.92, 1.09)	0.96 (0.87, 1.07)	0.83 (0.70, 0.98)	0.85 (0.68, 1.06)	1.019 (1.005, 1.033)	0.009
<i>Less healthy</i> ^b							
No. of deaths	4711	1788	1114	343	206		
HR (95% CI) ^c	Referent	0.95 (0.90, 1.00)	0.93 (0.87, 0.99)	0.90 (0.80, 1.00)	0.79 (0.68, 0.90)	1.019 (1.010, 1.029)	<.0001

^a Defined as no history of heart disease, stroke, cancer or diabetes at baseline and excellent, very good and good self-rated health.

^b Defined as with a history of heart disease, stroke, cancer or diabetes at baseline or fair and poor self-rated health.

^c Adjusted for age (50–<55, 55–<60, 60–<65, ≥65), race/ethnicity (non-Hispanic white, non-Hispanic black, other), and education (<12 years, high school graduate, some college, college and post graduate). State of residence (CA, FL, GA, LA, MI, NC, NJ, PA) was included as a random effect.



Web Figure 1. Hazard ratios (HRs) and 95% confidence intervals (CIs) for the association between tertiles of neighborhood socioeconomic deprivation in 1990 and 2000 and total mortality. Models were adjusted for age (50–<55, 55–<60, 60–<65, ≥65), race/ethnicity (non-Hispanic white, non-Hispanic black, other), and education (<12 years, high school graduate, some college, college and post graduate). State of residence (CA, FL, GA, LA, MI, NC, NJ, PA) was included as a random effect.

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