

Mortality by Socioeconomic Category in the United States: Extending the Analysis to 2023

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Project Overview

This report builds on a series of projects previously funded by the Society of Actuaries Research Institute (SOA), which developed life tables by sex from 1982 to 2022 for each of ten socioeconomic groupings of U.S. counties (Barbieri, 2020, 2021, 2023). The current study extends the series through 2023 to evaluate how the COVID-19 pandemic has influenced long-term mortality trends by socioeconomic category in the United States.

The initiative was driven by growing actuarial interest in understanding recent mortality differences—particularly those accentuated by the pandemic—to enhance pricing accuracy and refine models of mortality improvement. Broader public interest also underscores the importance of this work, especially in policy discussions around economic inefficiencies and variation in health outcomes. Since approximately 1980, survival differences have widened across the U.S., a trend exacerbated by the pandemic. Prior studies show these variations have contributed to stagnating life expectancy gains nationally and increased divergence in survival compared to other high-income democracies (Wilmoth, Boe, and Barbieri, 2011; Barbieri, 2022).

Evidence indicates that the pandemic was particularly severe in the U.S. and has disproportionately affected disadvantaged populations. Within this context, the study aims to support:

- Enhanced mortality pricing in the insurance and reinsurance sectors
- Monitoring of socioeconomic variations in mortality linked to COVID-19
- Improved understanding of the underlying mechanisms driving differences
- Policymaking and intervention evaluation related to variations in health outcomes
- Assessment of crisis recovery impacts across population subgroups

Caveat and Disclaimer

The opinions expressed and conclusions reached by the authors are their own and do not represent any official position or opinion of the Society of Actuaries Research Institute, Society of Actuaries, or its members. The Society of Actuaries Research Institute makes no representation or warranty to the accuracy of the information.

Research Plan

As in prior work, the relative affluence of each U.S. county was quantified using a composite index that reflects access to material and social resources, drawing from 2000 Census data. Counties were ranked and grouped into 10 deciles based on this index.

Using mortality data from the National Center for Health Statistics (NCHS), life tables were constructed annually for each decile. The methodology follows the standards of the Human Mortality Database (HMD), co-directed by the Principal Investigator. These methods include adjustments to improve mortality estimates at advanced ages by combining the extinct cohort and survival ratio techniques. These adjustments mitigate data limitations—such as age aggregation above 85 years—and correct for age misreporting. Importantly, newer data are used to refine earlier estimates, meaning the 2023 dataset enhances the accuracy of mortality rates for previous years.

Final outputs include age-standardized, cause-specific death rates by sex and decile. These were computed using the same data sources as the life tables: Census Bureau data for exposures and the restricted-use NCHS Multiple Cause-of-Death Files. These files provide comprehensive details on decedent demographics and reported causes of death, classified to the fourth digit under ICD-10. All causes were recoded into a standardized list of 58 exhaustive and mutually exclusive categories (see Appendix 1).

Project Outputs

The deliverables from this project include:

- A series of period life tables by sex for each calendar year from 1982 through 2023, organized by socioeconomic decile
- An updated dataset of age-standardized mortality rates by sex and decile, for each of the 58 predefined cause-of-death categories, covering the years 1982 to 2023
- Cause-specific death rates are provided across all ages and within broad age brackets: <20 years, 20–44, 45–64, 65–84, and 85+ years

As in prior agreements, confidentiality restrictions imposed by the Centers for Disease Control limit the release of data points derived from death counts between one and nine. These entries have been suppressed in accordance with the Data User Agreement governing access to geographically identified death records.

Appendix 1. Shortlist of the 58 Exhaustive Cause-of-Death Categories and Associated ICD-8, ICD-9, and ICD-10 Codes

No.	Title	Category Codes According to		
		ICD-8	ICD-9	ICD-10
1	Intestinal infectious diseases	001-009	001-009	A00-A09
2	Tuberculosis	010-019	010-018	A15-A19, B90
3	Septicaemia	38	38	A40-A41
4	Other and unspecified infectious and parasitic diseases	020-037, 039-068, 071-136	020-037, 039-041, 045-066, 071-139	A20-A39 A42-A99, B00-B09, B25-B89, B91-B99
5	HIV disease	--	042-044	B20-B24
6	Viral hepatitis	70	70	B15-B19
7	Malignant neoplasms of lip, oral cavity, and pharynx	140-149	140-149	C00-C14
8	Malignant neoplasm of esophagus	150	150	C15
9	Malignant neoplasm of stomach	151	151	C16
10	Malignant neoplasm of colon, rectum, and anus	153-154	153-154	C18-C21
11	Malignant neoplasm of pancreas	157	157	C25
12	Other malignant neoplasm of digestive system	152, 155, 156, 159	152, 155, 156, 159	C17, C22-C24, C26
13	Malignant neoplasm of larynx, trachea, bronchus, and lung	161-162	161-162	C32-C34
14	Malignant neoplasm of skin	172-173	172-173	C43-C44
15	Malignant neoplasm of breast	174	174-175	C50
16	Malignant neoplasm of uterus	180, 182	179-180, 182	C53-C55
17	Malignant neoplasm of ovary	183	183	C56
18	Malignant neoplasm of prostate	185	185	C61
19	Malignant neoplasm of other genital organs	181, 184, 186-187	181, 184, 186-187	C51-C52, C57-C60, C62, C63
20	Malignant neoplasm of bladder	188	188	C67
21	Malignant neoplasms of kidney and other urinary organ	189	189	C64-C66, C68
22	Leukemia	204-207	204-208	C91-C95
23	Other cancer, including in situ neoplasms, benign neoplasms, and neoplasms of uncertain or unknown behavior	158, 160, 163-171, 190-203, 208-239	158, 160, 163-171, 176, 190-203, 209-239	C30-C31, C37-C41, C45-C49, C69-C90, C96-C97, D00-D48
24	Blood diseases	280-289	280-289	D50-D89
25	Diabetes mellitus	250	250	E10-E14
26	Other endocrinologic and metabolic diseases	240-246, 251-279	240-249, 251-279	E00-E07, E15-E90
27	Alcohol abuse	291, 303	291, 303	F10
28	Drug abuse	304-305	304-305	F11-F19
29	Other mental disorders	290, 292-302, 306-315	290, 292-302, 306-319, 331	F00-F09, F20-F99, G30-G31

No.	Title	Category Codes According to		
		ICD-8	ICD-9	ICD-10
30	Other diseases of nervous system	320-389	320-330, 332-389	G00-G26, G32-G44, G46-G99, H00-H95
31	Rheumatic heart diseases	390-398	390-398	I00-I09
32	Hypertensive disease	400-404	401-405	I10-I15
33	Other Ischemic heart diseases	410-414	410-414	I20-I25
34	Other heart diseases	420-429	415-429	I26-I52
35	Cerebrovascular diseases	430-438	430-438	I60-I69, G45
36	Other circulatory diseases	440-458	440-459	I70-I99
37	Influenza	470-474	487-488	J09-J11
38	Pneumonia	480-486	480-486	J12-J18
39	Other acute respiratory infections	460-466	460-466	J00-J06, J20-J22, U04
40	Other chronic obstructive pulmonary disease	490-493, 518	490-494, 496	J40-J47
41	Other diseases of the respiratory system	500-517, 519	470-478, 495, 500-519	J30-J39, J60-J99
42	Gastric and duodenal ulcer	531-534	531-534	K25-K28
43	Liver diseases	570-573	570-573	K70-K77
44	Other digestive diseases	520-530, 535-569, 574-577	520-530, 535-569, 574-579	K00-K23, K29-K67, K80-K93
45	Diseases of skin and subcutaneous tissue	680-709	680-709	L00-L99
46	Diseases of the musculoskeletal system and connective tissue	710-738	710-739	M00-M99
47	Diseases of genitourinary system	580-629, 792	580-629	N00-N99
48	Complications of pregnancy, childbirth, and puerperium	630-678	630-679	O00-O99
49	Certain conditions originating in the perinatal period	760-779	760-779	P00-P96
50	Congenital malformations, deformations, and chromosomal abnormalities	740-759	740-759	Q00-Q99
51	Transport accidents	E800-E845	E800-E848	V01-V99
52	Other accidents	E850-E949	E850-E949	W00-W99, X00-X59, Y40-Y98
53	Suicide and self-inflicted injury	E950-E959	E950-E959	X60-X84
54	Assault	E960-E978, E990-E999	E960-E978, E990-E999	X85-Y09, Y35, Y36
55	Event of undetermined intent	E980-E989	E980-E989	Y10-Y34
56	Senility	794	797	R54
57	Other ill-defined and unspecified causes of death	780-791, 793, 795-796	780-796, 798-799	R00-R53, R55-R99
58	COVID-19	NA	NA	U07

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