



Social Determinants of Health Enable Early Identification of Premature Mortality Risk

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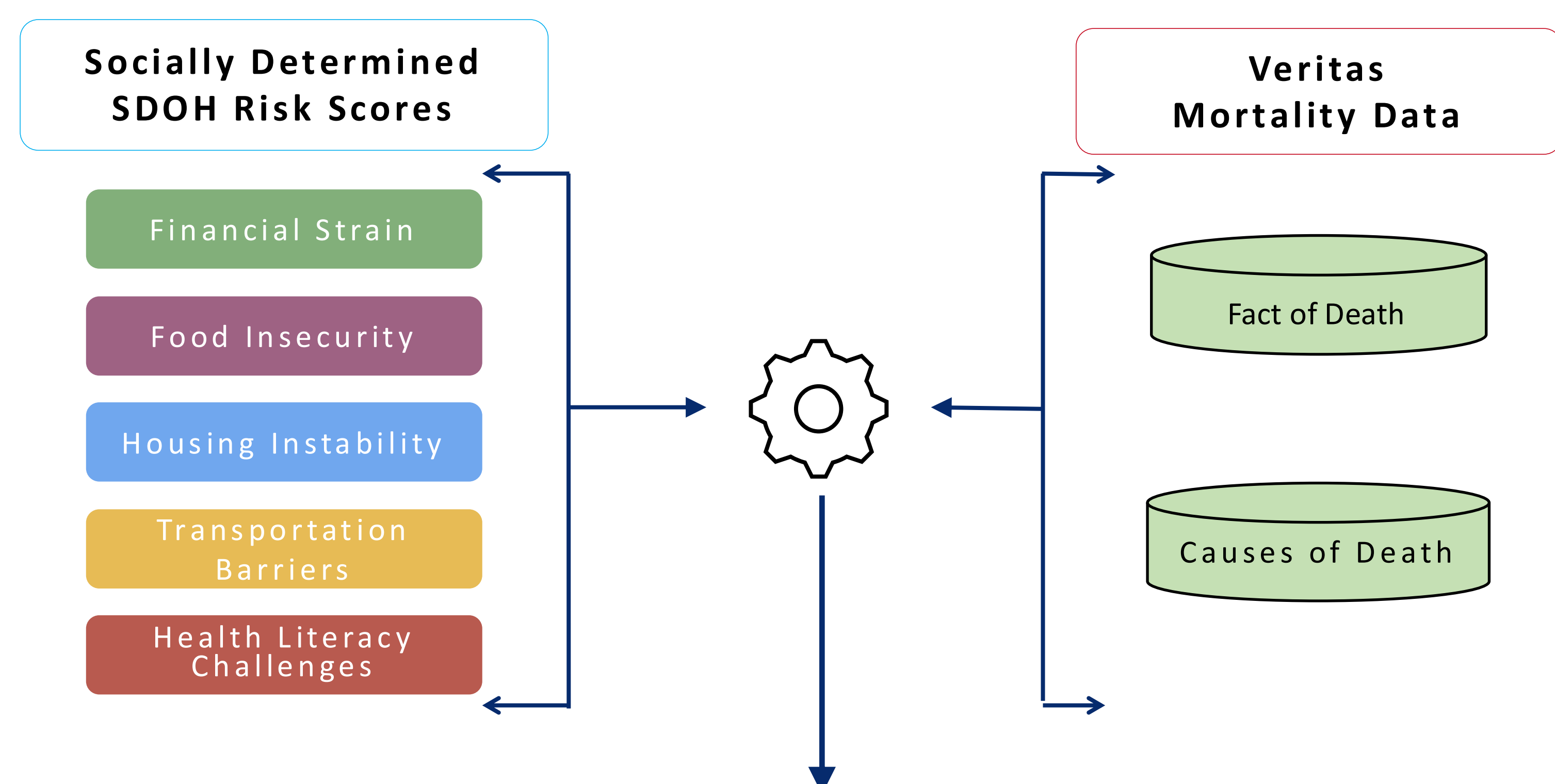
WHY THIS MATTERS

Research Question
Before disease ever appears, can the burden of Social Determinants of Health (SDOH) identify who is on a path to premature mortality?

The Gap in Mortality Research
Most mortality analyses focus on **what** people die from. But SDOH may explain **when** they die and by how much their life expectancy is lowered. While prior research establishes that SDOH influence premature mortality,^{1,2} limited work has quantified **how** SDOH concentrate Years of Life Lost across populations.³ Furthermore, SDOH effects are systematically under-recognized when analyzed through the lens of cause-of-death attribution.

DATA & METHODS

SDOH data (150+ indicators across 5 domains) was linked with mortality and cause-of-death data (45K+ sources) to create a validated person-level dataset for premature mortality analysis.



Dataset	The dataset drew on approximately 1 million de-identified mortality records from 2025. The analytical cohort included 594,663 individuals with complete linkage of age at death, cause of death, and person-level SDOH risk scores.
Definition	Premature mortality was defined as death before age 75 and quantified using Years of Life Lost (YLL). ³
Model	The model fit a logistic regression with SDOH risk scores and the count of elevated SDOH domains as predictors, adjusted for age and gender. The model achieved an AUC of 0.85.
Priority	Individuals were ranked by SDOH risk and grouped into 10 deciles. D1 represents the highest-risk group and D10 the lowest.
Effect Estimation	Differences in age at death (YLL) between high (≥2 domains) and low (0 domains) SDOH burden groups were estimated, with 95% bootstrap confidence intervals.

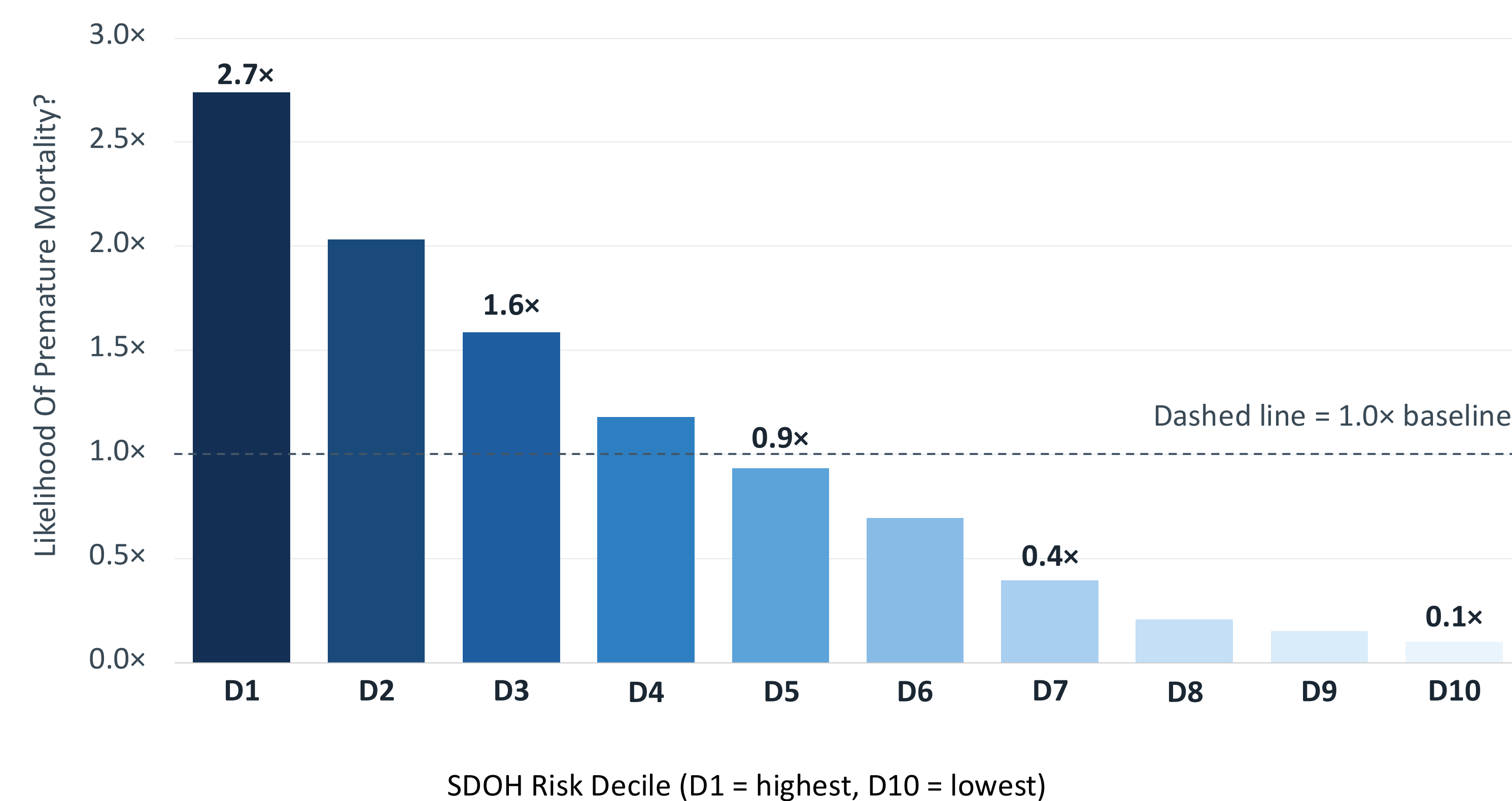
Premature mortality is not evenly distributed. It concentrates in populations with high SDOH risk.

≈ 600K
Individuals Analyzed

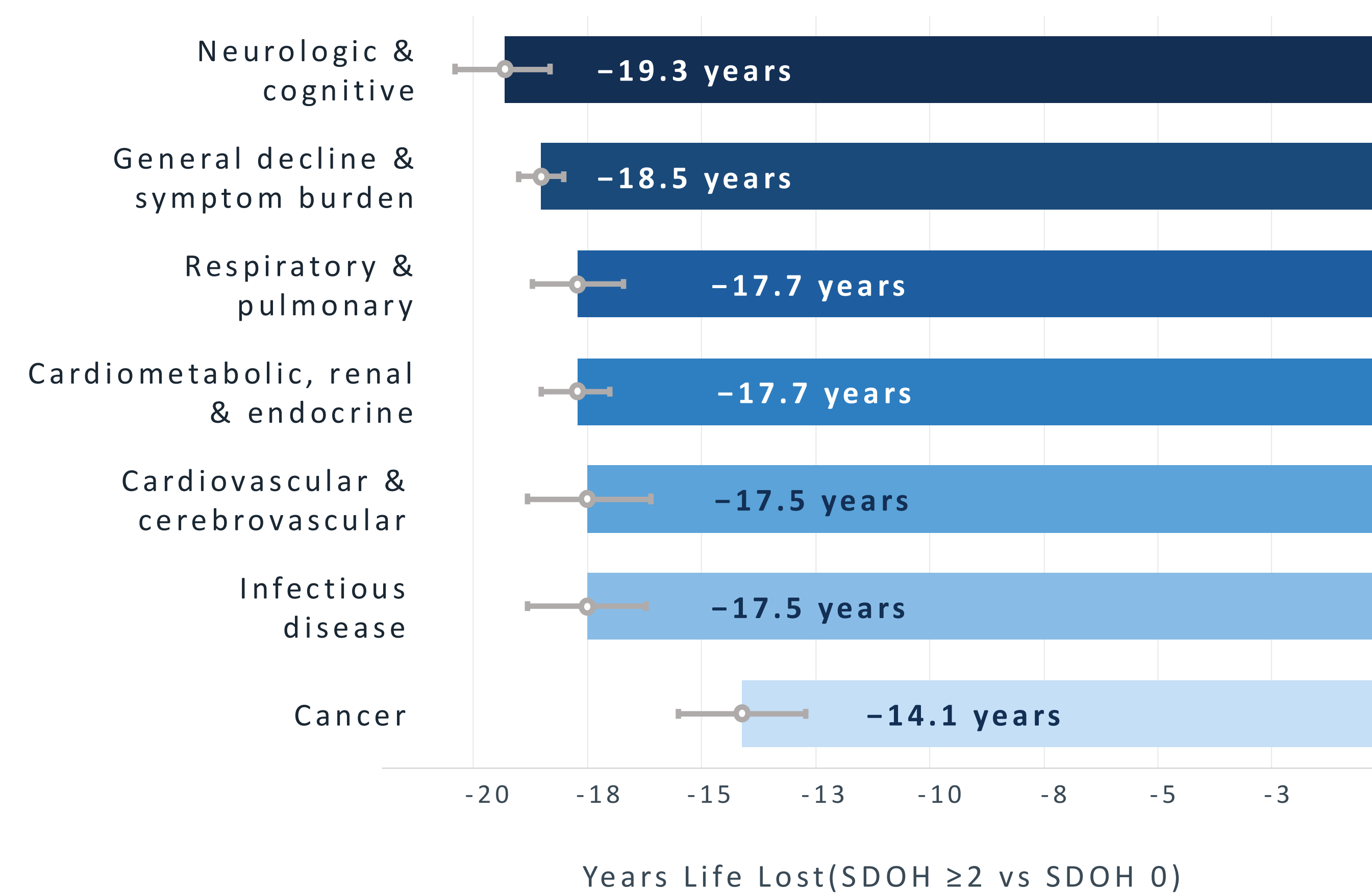
SDOH Burden → Premature Mortality
Years Life Lost Estimation Model

AUC = 0.85
Model Performance

2.7x higher concentration of premature mortality in the highest SDOH risk decile versus random prioritization



10-20 years life lost in high SDOH risk group across the prevailing leading causes of death



IMPLICATIONS

Population prioritization	Identify highest-YLL individuals early
Targeted interventions	Leverage upstream SDOH factors before disease onset
HEOR analytics	Integrate SDOH scores with claims data

RISK PROFILES

Two contrasting decile personas, drawn from the SDOH risk prioritization model, illustrate how SDOH burden, driver profiles, comorbidities, and age at death vary across the cohort.

	HIGHEST-RISK PERSONA (D1)	LOWEST-RISK PERSONA (D10)
Mean (median) age-at-Death, Years	51.8 (55)	84.9 (87)
Demographics	Male (60%)	Female (76%)
Top Housing Driver	Quality (49%) Adverse	Quality (60%) Protective
Top Food Driver	Accessibility (48%) Adverse	Accessibility (72%) Protective
Top Financial Driver	Assets (49%) Protective	Assets (43%) Protective
Top Causes of Death	Alcohol & liver related, Respiratory, Cancer	Alzheimer's & dementia, Essential hypertension, General decline
Median Comorbidities at Death	~7	~3

Driver direction describes the observed relationship between a given driver and premature mortality, based on driver-level analysis. A driver classified as Adverse is associated with earlier death, and those classified as Protective with later death.

LIMITATIONS

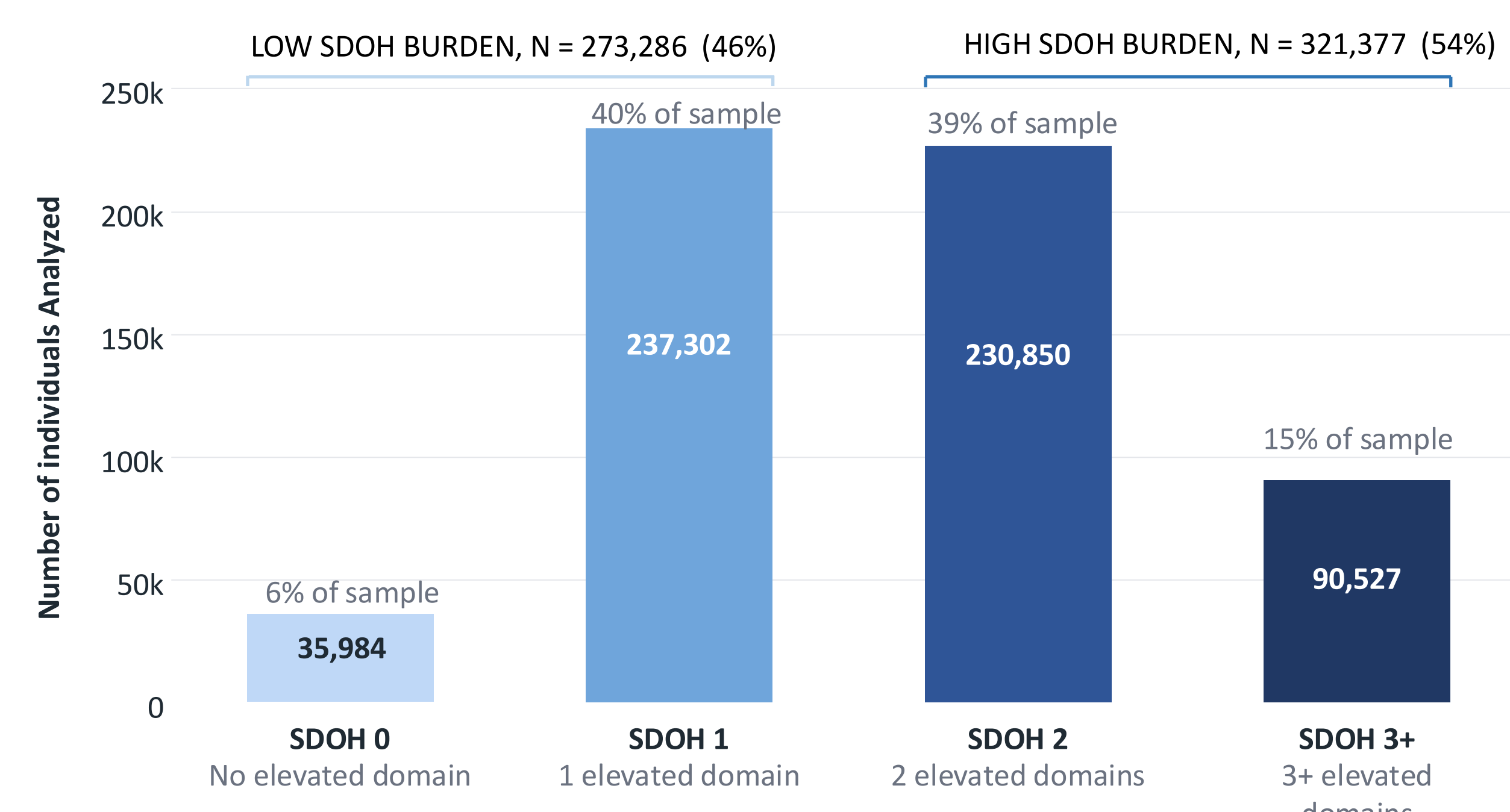
- SDOH risk, age, and cause of death are observed only at the time of death, limiting inference on disease progression and causal pathways.
- The study population is limited to individuals from Florida, Maryland, Virginia, West Virginia, and Washington, DC.

REFERENCES

1. World Health Organization. Closing the Gap in a Generation: Health Equity Through Action on the Social Determinants of Health. Geneva: WHO; 2008.
2. Chetty R, Stepner M, Abraham S, et al. The association between income and life expectancy in the United States, 2001–2014. JAMA. 2016;315(16):1750–1766.
3. Murray CJL, Lopez AD. The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability. Boston: Harvard School of Public Health; 1996.

STUDY POPULATION BY SDOH BURDEN

Study population is balanced and well powered across SDOH burden levels, with sample size N = 594,663.



Additionally, high SDOH burden (≥2 elevated domains) was also balanced across every cause-of-death group and age band.