Patterns of Social and Biological Risk Factors in People with HIV and Risk of Cardiovascular Disease

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BACKGROUND

- Despite extensive research, reasons for the elevated burden of cardiovascular disease (CVD) in people with HIV remain unclear.
- One potential explanation is that elevated CVD risk is the result of the combined effect of social and biological factors, consistent with syndemic models of disease risk.
- Our study objective was to examine how different social and biological factors are related to the risk of Major Adverse Cardiovascular Events (MACE) occurrence for people with HIV.

METHODS

- **Study population**: Adult (≥18 years) people with HIV with at least 1-year of continuous membership enrolled in Kaiser Permanente (KP) Northern California and KP Mid-Atlantic States between 1/1/2000 – 12/31/2022 and no prior history of MACE.
- **Exposure**: Classification of people with HIV into latent classes based on patterns of **healthcare access**, **social vulnerability***, **mental health (MH)/substance use (SU)**, and **CVD risk factors**.
  - **Calculated using CDC's Social Vulnerability Index, a census-based measure designed to assess communities' vulnerability to disasters across four major areas: socioeconomic status (e.g., unemployed), household characteristics (e.g., single-parent household), racial and ethnic minority status (e.g., Black, Hispanic or Latino), and housing type and transportation (e.g., multi-unit structures, no vehicle). Scores above 75% in each category indicate high social vulnerability for people who live in that census block.*
- **Outcome**: MACE, defined as the earliest occurrence of myocardial infarction, ischemic stroke, peripheral artery disease, urgent coronary revascularization, heart failure, atrial fibrillation.
- **Covariates**: Age, race and ethnicity, sex, start of follow up year, years of prior enrollment, and KP region.
- **Statistical Analysis**: Latent class analysis (LCA) was used to identify classes of people with HIV with similar patterns of healthcare access, social vulnerability, MH (depression or anxiety diagnoses) and SU (smoking status and SU disorder diagnoses), and CVD risk factors.
- Bayesian information criterion was used to determine model complexity and fit.
- Cox proportional hazard models were used to estimate the hazard ratio (HR) of incident MACE by LCA class, adjusting for covariates.

People with HIV with higher prevalence of CVD risk factors who live in areas with high social vulnerability may be at increased risk of Major Adverse Cardiovascular Events. Targeted efforts are needed to reduce the CVD burden in high-risk groups among people with HIV.

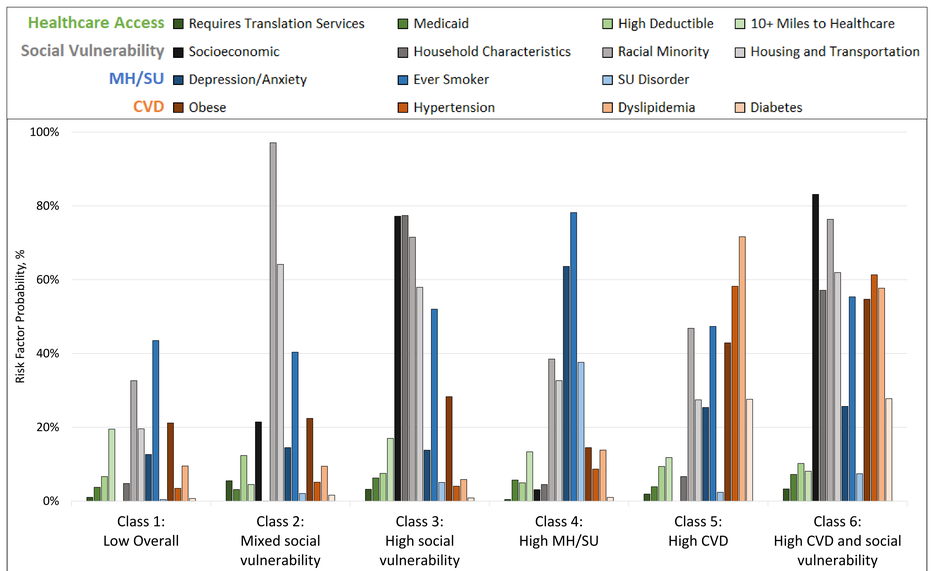
RESULTS

Participant demographics and baseline characteristics for latent class groups

The study sample included 25,510 people with HIV, 35% of whom were White, 84% male, with a mean age of 42, and 68% enrolled in KPNC health plans.

Health care access, n (%)		MH/SU, n (%)	
Need interpreter	566 (2.2)	Depression/anxiety	4933 (19.3)
Medicaid	1102 (4.3)	Ever smoker	12239 (48.0)
High deductible	1789 (7.0)	SUD (drug or alcohol)	1348 (5.3)
10+ miles to medical center	3641 (14.3)		
Census-based Social Vulnerability Index, n (%)		**CVD risk factors, n (%)**	
Higher vulnerability in census block due to:		Obese	3912 (15.3)
Socioeconomic status	4434 (17.4)	Hypertension	2588 (10.2)
Household characteristics	4096 (16.1)	Dyslipidemia	3927 (15.4)
Minority status	12838 (50.3)	Diabetes	953 (3.7)
Housing type and transportation	8833 (34.6)		

LCA classes defined by healthcare access, social vulnerability, MH/SU, and CVD risk factors



	Class 1: Low Overall	Class 2: Mixed social vulnerability	Class 3: High social vulnerability	Class 4: High MH/SU	Class 5: High CVD	Class 6: High CVD and social vulnerability
Total, n (%)	14,084 (55%)	3,590 (14%)	1,734 (7%)	1,544 (6%)	4,064 (16%)	494 (2%)
HR (CI)	Ref	1.11 (0.95-1.31)	1.16 (0.99-1.36)	1.22 (0.99-1.51)	1.90 (1.57-2.30)	2.62 (1.94-3.52)

SUMMARY

- People with HIV were grouped into 6 classes:
  - Class 1: Low overall
  - Class 2: Mixed social vulnerability
  - Class 3: High social vulnerability
  - Class 4: High MH/SU
  - Class 5: High CVD risk factors
  - Class 6: High CVD and social vulnerability
- In adjusted models, Class 5 [HR: 1.90; 95% CI 1.57-2.30] and Class 6 [2.62; 1.94-3.52] had a higher risk of incident MACE compared with Class 1.
- Class 2 [1.11; 0.95-1.31], Class 3 [1.16; 0.99-1.36], and Class 4 [1.22; 0.99-1.51] also had a higher, but not statistically significant, risk of incident MACE compared with the low overall risk class.

STRENGTHS AND LIMITATIONS

- Strengths include the LCA design, large sample size, and uncovering latent subgroups with increased risk of MACE in a diverse sample of people with HIV.
- The main limitation was reduced generalizability to non-integrated healthcare settings.

CONCLUSIONS

- We identified 2 classes with increased risk of MACE, both of which included people with HIV with a higher prevalence of CVD risk factors.
- What distinguished these classes was that one had a high prevalence of social vulnerability risk factors (class 6) while the other did not (class 5), suggesting a relationship between social vulnerability, particularly socioeconomic status, and high CVD risk factors in people with HIV that should be further explored.
- Our findings suggest that distinct targeted efforts may be needed to close the CVD gap among people with HIV.

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