AREA-LEVEL INDICATORS AS PROXIES FOR INDIVIDUAL SOCIOECONOMIC STATUS IN PEOPLE WITH AND WITHOUT HIV

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MWCCS
MACS/WIHS COMBINED COHORT STUDY

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Montefiore

BACKGROUND

- Socioeconomic status (SES) is a key determinant of health outcomes for people with HIV (PWH)
- Many cohort studies collect individual-level indicators of SES, while others (e.g., electronic health record-based cohorts) rely on area-level indicators as proxies
- However, it is unclear which area-level indicators or geographic units best represent individual-level SES among PWH

METHODS

Study population and inclusion criteria

- 2,883 participants seen in Visit 104 (2023-2024) of the MACS/WIHS Combined Cohort Study (MWCCS), a longitudinal cohort study of PWH and demographically and behaviorally similar people without HIV (PWoH) at 13 clinical research sites in the United States
- We included any participant with complete data on individual-level and area-level SES measurements

Individual-level SES measures

- Annual household income (IND1): Derived from "What is the average monthly income, before taxes, of your household? Your household includes family members or other people who live with you and depend on that money. Include pay or money from all sources … legal or illegal", multiplied by 12.
- Education level (IND2): "What is the highest grade or year of school you have completed?"

Area-level SES measures at census tract and census block group levels, based on 2023 American Community Study 5-Year Estimates

- Median annual household income (CBG1 and CT1): Derived from sum of each household member's total income during past 12 months, in 2023 inflation-adjusted dollars
- % of population living below the federal poverty level (CT2): Derived based on poverty status of the householder. Households are classified as poor when the total income of the householder's family in the last 12 months is below the federal poverty level for a given year.
- Area deprivation index (CBG3): Validated measure of adverse social exposome (i.e., neighborhood disadvantage) by the University of Wisconsin-Madison. Range 1-100, higher index denotes greater deprivation.

Statistical analysis

- We evaluated Spearman correlations between individual and area-level SES
- Among PWH, we compared associations between these indicators and HIV virologic non-suppression (≥200 copies/mL), via multivariable logistic regression

Studies of PWH should use caution when area-level SES is the only available measure of socioeconomic context, given limited correlations between area- and individual-level SES measures and weaker associations with virologic non-suppression

RESULTS

Study population characteristics (N=2,883)

	% or median (IQR)
Demographic characteristics	
Sex at birth	
Male	51
Female	49
Race/ethnicity	
Black (non-Hispanic)	45
Hispanic	15
White (non-Hispanic)	27
Multi-racial	11
Other/missing	2
Age, years	58 (47, 64)
Living with HIV	62
HIV-related variables (among PWH)	
Current ART use	98
Current CD4+ count/μL	732 (519, 979)
Nadir CD4+ count/μL	262 (122, 425)
Viral load ≥200 copies/mL	6
History of AIDS	16

	%
Individual-level SES	
Annual household income (IND1)	
$6,000 or less	6
$6,001-$12,000	15
$12,001-$18,000	16
$18,001-$24,000	9
$24,001-$30,000	6
$30,001-$36,000	6
$36,001-$75,000	20
$75,001-$100,000	7
$100,001-$150,000	7
$150,001-$200,000	4
More than $200,000	4
Education level (IND2)	
Less than high school	15
Completed high school	22
Some college	30
Attended 4-year college	13
Attended graduate school	20

	Median (IQR)
Census block group-level SES	
Annual household income, $ (CBG1)	67,400 (44,300, 98,200)
Area deprivation index (CBG3)	39 (16, 65)
Census tract-level SES	
Annual household income, $ (CT1)	68,100 (46,100, 96,500)
% of population below federal poverty level (CT2)	15.2 (8.2, 25.5)

ART = antiretroviral therapy, IQR = interquartile range, SES = socioeconomic status

NEXT STEPS

- Compare findings to ZIP code-level indicators
- Examining associations with other health outcomes

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RESULTS

Correlations among SES indicators

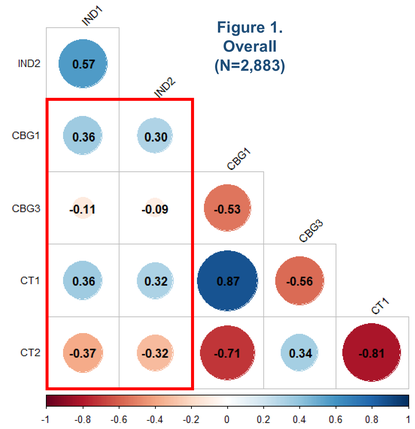


Figure 1. Overall (N=2,883)

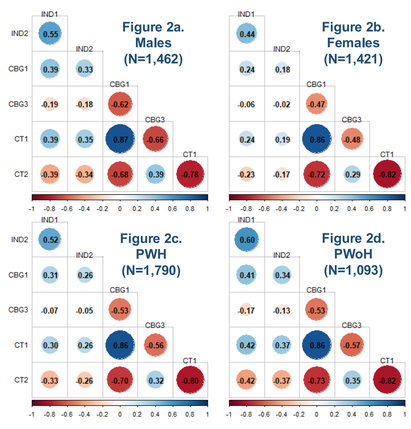


Figure 2a. Males (N=1,462)

Figure 2b. Females (N=1,421)

Figure 2c. PWH (N=1,790)

Figure 2d. PWoH (N=1,093)

- Correlations between individual- and area-level SES indicators were weak to moderate, ranging from 0.09 to 0.37 (**Fig. 1, red box**)
- Census tract-level indicators had similar or better correlations with individual-level indicators (0.32-0.37) than census block group-level indicators (0.09-0.36) (**Fig. 1**)
- Individual-level indicators were more highly correlated with area-level indicators among males (**Fig. 2a**, range 0.18-0.39) than females (**Fig. 2b**, 0.02-0.24), and among PWoH (**Fig. 2d**, range 0.13-0.42) than PWH (**Fig. 2c**, 0.05-0.33)

Association of selected SES indicators with virologic non-suppression (≥200 copies/mL)

	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Individual-level SES: any college or greater (vs. HS or less)	0.47 (0.32-0.70)	0.49 (0.31-0.79)
Census tract-level SES: % of population below FPL (vs. quintile 1)		
Quintile 2	1.29 (0.62-2.70)	0.80 (0.35-1.85)
Quintile 3	1.30 (0.63-2.68)	0.94 (0.42-2.12)
Quintile 4	1.79 (0.91-3.51)	1.02 (0.47-2.22)
Quintile 5	2.09 (1.07-4.08)	1.06 (0.48-2.35)

Adjusted models include sex at birth, race/ethnicity, age, current and nadir CD4+ count, current ART use, history of AIDS.
CI=confidence interval, FPL=federal poverty level, HS=high school, OR=odds ratio.
Higher quintiles represent more people living below the FPL.

- Comparing associations of different SES indicators with virologic non-suppression, we found the most pronounced association for individual-level education (adjusted OR 0.49 for any college or greater vs. high school or less, 95% CI 0.31-0.79)
- In contrast, associations between census tract-level SES (% of population below FPL) and virologic non-suppression were attenuated in adjusted models (Table)