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RESEARCH ARTICLE

Association of Life-Course Social Mobility With Cardiovascular Disease and Modifiable Risk Factors: Evidence From the Longitudinal Aging Study in India

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Introduction: Assessing cardiovascular disease risk in relation to life-course socioeconomic position may provide insights into social mobility patterns; however, to the authors' knowledge, this association remains unexplored in India. Whereas studies from high-income countries demonstrate an inverse association between life-course socioeconomic position and cardiovascular disease, results from lower-income countries are heterogeneous. This study examines the association between life-course social mobility, cardiovascular disease, and modifiable risk factors among middle-aged and older Indians.

Methods: This study utilized data from the Longitudinal Aging Study in India (2017−2018), a nationally representative cross-sectional study of adults aged ≥45 years. On the basis of socioeconomic position during childhood (family financial position) and adulthood (monthly per-capita expenditure; household assets), life-course social mobility was classified into 4 categories: consistently high, upward mobility, downward mobility, and consistently low. Associations were examined using regression models.

Results: The analytical sample included 65,364 respondents. Social mobility patterns indicated that 40.29% remained in consistently high socioeconomic position, 19.32% in consistently low socioeconomic position, whereas 19.57% experienced upward mobility, and 20.82% experienced downward mobility. Compared with those with consistently low socioeconomic position, those in consistently high socioeconomic position were associated with greater odds of congestive heart failure (AOR=1.80; 95% CI=1.21, 2.69), heart attack (AOR=1.70; 95% CI=1.35, 2.16), abnormal heart rhythm (AOR=1.43; 95% CI=1.05, 1.94), heart diseases (AOR=1.37; 95% CI=1.15, 1.63), and composite cardiovascular disease (AOR=1.23; 95% CI=1.07, 1.42). Furthermore, upward social mobility was associated with higher odds of all cardiovascular disease outcomes except abnormal heart rhythm and stroke. Life-course social mobility also showed a graded association with hypertension, BMI, central adiposity, and diabetes. The positive associations persisted when using adult asset-based social mobility, coarsened exact matching, and multiple sensitivity analyses with various socioeconomic position indicators.

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Conclusions: The findings suggest that in settings undergoing rapid epidemiologic transition, such as India, life-course social mobility may confer increased cardiovascular disease risk, underscoring the importance of considering country-specific life-course socioeconomic processes in cardiovascular disease prevention strategies.

INTRODUCTION

Research consistently demonstrates that socioeconomic position (SEP), assessed through various objective and subjective measures, is associated with adverse cardiovascular outcomes.[1,2] However, considerable heterogeneity exists across countries at various levels of economic development. Whereas studies from high-income countries (HICs) have reported an inverse trend between SEP and cardiovascular outcomes,[2,3] findings from low- and middle-income countries (LMICs) have been mixed, reporting an inverse association, as seen in HICs, or linking higher SEP to greater cardiovascular disease (CVD) risk.[1−8] A large body of work has documented that later-life CVD risk is influenced by life-course SEP,[9] defined as the movement between different SEPs over the life course.[10] SEP in early life has been found to either uniquely affect CVD during adulthood or have a cumulative effect throughout the life course, impacting cardiometabolic outcomes in a dose−response manner.[11] A scientific statement from the American Heart Association concluded that there is limited evidence regarding the impact of upward or downward social mobility on CVD disparities.[12] Social mobility across the life course is crucial to explaining differences in CVD prevalence and risk factors.

LMICs experience a disproportionate burden of CVD morbidity and mortality compared with HICs.[13] Both CVD and modifiable risk factors are found to have a substantial social gradient, but considerable heterogeneity exists within and across economic developments. Most studies from HICs have demonstrated that early-life low SEP (compared with high SEP) positively predicts adverse cardiovascular outcomes in adulthood, even after adjusting for adulthood SEP and cardiovascular risk factors.[14−16] Multiple cohort studies, including the Framingham Offspring Study[17]; English Longitudinal Study of Ageing[18]; and Health, Alcohol and Psychosocial factors In Eastern Europe,[19] show that consistently low SEP across the life course is linked to higher CVD incidence and mortality than consistently high SEP. Studies from HICs also show that upward mobility offers protection against CVD and modifiable risk factors[19,20]; however, the results are inconsistent.[21,22] Examining life-course social mobility, especially in growing economies such as those in LMICs, is essential to understanding how life-course SEP drives cardiovascular health inequalities.

Today, CVD continues to be the leading cause of death and disability.[23] It accounted for 28.1% of total deaths in India in 2016, largely from ischemic heart disease and stroke.[24] Concurrently, India is undergoing drastic socioeconomic and epidemiologic transitions, thus creating a unique setting for investigating the impact of life-course social mobility on cardiovascular health. A limited number of studies have suggested that the burden of CVD and risk factors is shifting toward lower SEP in India.[25,26] However, large national data show that CVD and its risk factors remain concentrated among higher-SEP individuals.[8,9] Hence, understanding how life-course social mobility influences CVD and risk factors is crucial to tackle the burden in India; yet, this association has seldom been investigated, and the few existing studies have integrated only childhood and adulthood SEP and not their transition across the life course.[27−29] Evaluating the association of CVD risk with SEP across the life course may provide an opportunity to observe the influence of social mobility effects.[30] Moreover, life-course social mobility may influence CVD by affecting metabolic and behavioral risk factors. Thus, this study aimed to explore whether life-course social mobility is associated with CVD events and modifiable risk factors among middle-aged and older Indians.

METHODS

Study Population

The study utilized cross-sectional data from the Longitudinal Aging Study in India (LASI) Wave-1. LASI employed multistage cluster sampling in both rural and urban areas, collecting comprehensive data on health, social, and economic indicators.[31,32] The survey achieved a 95.8% household and an 87.3% individual response rates. Importantly, to represent LASI indicators at the national level and reduce underrepresentation, survey weights were created, adjusting for nonresponse rates and poststratified to match national population benchmarks.[31,32]

Among 73,408 respondents, the study included individuals aged ≥45 years (*n*=66,619 [91%]). After excluding missing data on independent variables (*n*=755) and covariates (*n*=500), the final analytical sample included 65,364 respondents. Complete case analyses for each outcome were performed separately (sample size range=59,020−65,358). The study used publicly accessible LASI Wave-1 data without respondent identifiers and was thus exempt from institutional ethics review.

Measures

Study outcomes were CVD and modifiable risk factors. CVD was self-reported and included ever-diagnosed heart attack, congestive heart failure, and abnormal heart rhythm, grouped as any heart diseases. Any heart disease or stroke were combined as composite CVD. The reliability of the outcome measures is discussed in Appendix Text 1 (available online). Cardiometabolic risk factors included hypertension, high BMI, central adiposity (waist circumference and waist-to-hip ratio), and self-reported diabetes. Behavioral risk factors included current excessive alcohol use, tobacco use (smoked/smokeless), and physical inactivity. Definitions were provided previously[6] (outlined in Appendix Text 2, available online).

Primary exposure was life-course social mobility, defined by participants' SEP in their childhood and adulthood periods.[33] Using respondents' family financial position during their childhood (*Now, think about your family when you were growing up, from birth to age 16. Compared to other families in your community, would you say your family during that time was pretty well-off financially, about average, or poor?*), the responses *pretty well-off financially* and *average* were grouped as high SEP, and the response *poor* was grouped as low SEP during childhood. Retrospectively reported childhood family financial position has demonstrated predictive validity comparable with prospective measures[34] and reflects meaningful long-term socioeconomic stratification.[35]

Adulthood SEP was determined using the monthly per capita expenditure (MPCE) quintile on the basis of household consumption data. The original MPCE included healthcare expenditures, which were excluded from the present calculation of MPCE to avoid reverse causation by current health status. The top 3 quintiles of MPCE were classified as high SEP, whereas the lower 2 were classified as low SEP. Adulthood SEP was also determined on the basis of household assets. A previous Indian study examining the socioeconomic gradient demonstrated a weak association between consumption-based (MPCE) and wealth-based (assets) measures, with differential associations across health outcomes.[36] The method for capturing household assets is detailed in Appendix Text 3 (available online). The top 3 quintiles of assets were classified as high SEP, whereas the lower 2 were classified as low SEP.

Life-course social mobility was constructed on the basis of the above-mentioned childhood and adulthood SEPs as follows: consistently high, indicating high SEP in both childhood and adulthood; upward mobility, referring to low SEP in childhood but high SEP in adulthood; downward mobility, referring to high SEP in childhood but low SEP in adulthood; and consistently low, indicating low SEP in both periods.[33]

As a sensitivity analysis, alternative measures of childhood and adulthood SEP were used to construct life-course social mobility. Parental education, defined by whether either parent attended school, was used to indicate childhood SEP. Respondent's education and dichotomized MPCE/assets were used to indicate adulthood SEP. Education provides a human capital dimension distinct from family finances/consumption/assets; dichotomized MPCE/assets (median) reduces extreme quintile instability when constructing social mobility (Appendix Text 4, available online). Five alternative life-course social mobility measures were constructed: parental education with MPCE, parental education with household assets, parental education with own education, family financial position with dichotomized MPCE, and family financial position with dichotomized assets. Associations between life-course social mobility and cardiometabolic risk factors were also examined among CVD-free individuals because these contemporaneously measured factors are less prone to survival bias and may reduce concerns about reverse causation between lifetime CVD and SES.

In terms of covariates, age and total household members were included as continuous variables. Sex (male/female), religion (Hindu/Muslim/Christian/others), place of residence (rural/urban), and caste were included as categorical variables. Caste was categorized as scheduled castes, scheduled tribes, other backward classes, and others. Scheduled castes, scheduled tribes, or other backward classes are constitutionally recognized as historically marginalized and socioeconomically disadvantaged groups in India.

Statistical Analysis

Participant characteristics are presented using descriptive statistics. CVD and risk-factor prevalence across life-course social mobility were computed and reported with a 95% CI. In primary and sensitivity analyses, the association of life-course social mobility with CVD and risk factors was assessed using logistic regression in Model 1 and adjusting for covariates and including state/union territories (UTs) as fixed effects to account for state-level variation in Model 2. Concordance between primary and alternative SEP measures was evaluated using pairwise correlation and Cohen's κ. All analyses incorporated LASI survey weights to produce nationally representative estimates and reduce bias from unequal selection probabilities and differential participation across sociodemographic strata, including SEP. Coarsened exact matching (CEM) was applied to reduce covariate imbalance across 3 exposure comparisons: consistently high versus consistently low, upward mobility versus consistently low, and downward mobility versus consistently low. The matching solution was restricted to a k-to-k match, pruning observations within each stratum until treated and control units were equal across covariates. Balance was assessed using multivariate and univariate L1 measures, with values <0.1 indicating negligible imbalance.[37] Using the matched sample, CEM-weighted logistic regression with robust SEs and states/UTs as fixed effects examined the association between life-course social mobility and CVD. All analyses were conducted using STATA, Version 14; $p<0.05$ was considered significant.

RESULTS

The analytical sample included 65,364 respondents (mean age of 59.73±10.66 years) with 53.45% female. Childhood SEP was high for 61.11% and low for 38.89% of respondents. MPCE-based adulthood SEP was high for 59.86% and low for 40.14%. The life-course social mobility pattern indicated that 40.29% remained in high SEP and 19.32% remained in low SEP; 19.57% experienced upward mobility, whereas 20.82% experienced downward mobility (Table 1). CVD and risk factors were most prevalent in the consistently high-SEP group, followed by upward and downward mobility, and lowest in the consistently low-SEP group. Behavioral risk factors were higher in the consistently low and upwardly mobile groups, except for physical inactivity (Appendix Table 1, available online).

Individuals with consistently high SEP, on the basis of childhood family financial position and adulthood MPCE, had higher odds of CVD except stroke in Model 1 than those with consistently low SEP. Adjustment for covariates in Model 2 attenuated the strength of the association; however, the level of statistical significance remained consistent. In Model 2, the magnitude of the association was strongest for congestive heart failure (OR=1.80; 95% CI=1.21, 2.69), followed by heart attack (OR=1.70; 95% CI=1.35, 2.16), abnormal heart rhythm (OR=1.43; 95% CI=1.05, 1.94), heart disease (OR=1.37; 95% CI=1.15, 1.63), and composite CVD (OR=1.23; 95% CI=1.07, 1.42). Upward mobility was also associated with higher odds of CVD except abnormal heart rhythm and stroke in both models. Downward mobility was associated with increased odds of heart attack in Model 2 (OR=1.44; 95% CI=1.12, 1.86). On the basis of childhood family financial position and adulthood assets, the positive associations between consistently high SEP persisted for all outcomes except for congestive heart failure in Model 2 (Table 2).

Estimates from the CEM sample-weighted adjusted models were consistent with those of the main analyses and additionally showed higher odds of stroke among individuals with consistently high SEP, an association that was not observed in the primary analysis (Figure 1; Appendix Figure 1, available online; and Appendix Table 4, available online). After exact matching, the multivariate L1 distance was zero for all exposure groups, indicating perfect balance across covariates. Univariate L1 values for individual covariates confirmed the identical distributions of covariates between treatment and control groups (Appendix Tables 2 and 3, available online).

Life-course social mobility showed a graded association with hypertension, BMI, central adiposity, and diabetes, being strongest in consistently high-SEP group, followed by upward and downward mobility, in both Model 1 and Model 2 (Figure 2; Appendix Figure 2, available online; and Appendix Table 5, available online). Consistently high SEP and downward mobility were inversely associated with alcohol intake, smoking, and smokeless tobacco use, while being positively associated with physical inactivity in both Model 1 and Model 2 (Appendix Table 5, available online).

Multiple sensitivity analyses supported the study's robustness. Results were largely consistent with those from the primary analysis, showing similar patterns of association and maintaining statistical significance. Childhood family financial position and parental education showed a negative correlation (r= −0.18) and poor agreement (κ=0.01), indicating that these capture distinct childhood SEP dimensions and supporting the use of parental education in sensitivity analysis. Social mobility using parental education with adulthood MPCE, assets, or education showed similar results for CVD and risk factors. Consistently high SEP and upward mobility were linked to higher odds for most outcomes, while downward mobility was associated with stroke and composite CVD when education was used as the metric in both periods (Appendix Tables 6 and 7, available online). Adulthood SEP based on MPCE and assets median values (bisection) and childhood financial position were aligned with the main results (Appendix Tables 8 and 9, available online). Restricting analyses to individuals without prior CVD yielded robust and consistent associations between social mobility and cardiometabolic risk factors across all life-course specifications

Table 1. Participant Characteristics

Variables	Overall (N=65,364) *n* (%), mean (SD), median (IQR)
Age (years)	59.73 (10.66)
Sex	
Male	30,429 (46.55)
Female	34,935 (53.45)
Religion	
Hindu	47,881 (73.25)
Muslim	7,620 (11.66)
Christian	6,457 (9.88)
Others	3,406 (5.21)
Social groups	
Scheduled caste	10,859 (16.61)
Scheduled tribe	11,734 (17.95)
Other backward caste	24,894 (38.09)
Others	17,877 (27.35)
Place of residence	
Rural	42,580 (65.14)
Urban	22,784 (34.86)
Number of household members, median (IQR)	5 (3–6)
Childhood socioeconomic position	
High	39,943 (61.11)
Low	25,421 (38.89)
Adulthood socioeconomic position (MPCE)	
High	39,124 (59.86)
Low	26,240 (40.14)
Adulthood socioeconomic position (household asset)	
High	39,214 (59.99)
Low	26,150 (40.01)
Life course social mobility (with adulthood SEP based on MPCE)	
Consistently high	26,335 (40.29)
Upward mobility	12,789 (19.57)
Downward mobility	13,608 (20.82)
Consistently low	12,632 (19.32)
Life course social mobility (with adulthood SEP based on household asset)	
Consistently high	26,020 (39.81)
Upward mobility	13,194 (20.19)
Downward mobility	13,923 (21.30)
Consistently low	12,227 (18.71)

MPCE, monthly per capita expenditure; SEP, socioeconomic position.

(Appendix Table 10, available online), supporting the validity of the observed patterns independent of potential selective survival.

DISCUSSION

In a nationally representative sample of middle-aged and older Indians, this study found a positive association of life-course social mobility with CVD and cardiometabolic risk factors. The associations were robust across CEM and multiple sensitivity analyses. Findings suggest a dual influence of the cumulative effect of socioeconomic advantage across the lifespan and upward social mobility. However, these patterns contrast with the social mobility model in relation to CVD as previously proposed[38] and evidence from HICs that linked consistently low SEP to adverse CVD outcomes.[17,39] The Whitehall-II study revealed a clear dose−response relationship between cumulative life-course socioeconomic adversity and adult CVD incidence.[39] Chronic exposure to psychosocial stress throughout life may promote subclinical atherosclerosis, leading to clinical CVD.[40] Upward mobility also exhibited a positive association with CVD, possibly supporting the mismatch hypothesis, which posits that a mismatch between early-life and later-life environments can lead to cardiovascular outcomes.[41] This mismatch may occur owing to improvements in living standards[42] and changing food environments,[43] as has been observed in India, leading to a greater burden of hypertension, obesity, and diabetes.

Furthermore, the association between life-course social mobility and CVD may be driven by its association with modifiable risk factors. A graded association with metabolic risk factors was observed, corroborating previous findings from LMICs.[28] The Indian Migration Study found that high SEP in both childhood and adulthood was strongly associated with abnormal blood pressure, body fat, and insulin resistance.[29] Walsemann et al.[44] observed that upwardly mobile individuals exhibited the higher CVD risk score than those with consistently low SEP. Early-life socioeconomic deprivation followed by affluence in adulthood may elevate CVD risk, partly through increased adult metabolic risk factors.[45,46] Possible mechanisms may include thrifty phenotype mismatch and stress-mediated biological programming. Developmental origins research suggests that early-life undernutrition (partly because of socioeconomic disadvantage) can induce long-term metabolic and endocrine adaptations (the thrifty phenotype) that become maladaptive in adulthood with caloric abundance, promoting hyperinsulinemia, obesity, dyslipidemia, and hypertension.[41,47] In addition, early-life stressors may lead to long-term dysregulation of the hypothalamic−pituitary−adrenal axis and inflammatory pathways, further increasing cardiometabolic vulnerability.[48,49] Together, these mechanisms provide a plausible biological basis for the higher CVD risk observed among individuals experiencing upward mobility.

Other nonmutually exclusive mechanisms may also underlie the observed associations. First, the findings may partially reflect selection or survival bias.

Table 2. Association of Life-Course Social Mobility With Cardiovascular Diseases

Regression models	Life-course social mobility[a]			Life-course social mobility[b]		
	Consistently high OR (95% CI)	Upward mobility OR (95% CI)	Downward mobility OR (95% CI)	Consistently high OR (95% CI)	Upward mobility OR (95% CI)	Downward mobility OR (95% CI)
Heart diseases						
Model 1	**1.75***** (1.50, 2.05)	**1.52***** (1.27, 1.81)	**1.25*** (1.05, 1.50)	**1.59***** (1.36, 1.86)	**1.34**** (1.12, 1.60)	**1.26**** (1.05, 1.52)
Model 2	**1.37***** (1.15, 1.63)	**1.25*** (1.04, 1.51)	1.16 (0.96, 1.40)	**1.25*** (1.06, 1.49)	1.13 (0.94, 1.36)	1.15 (0.94, 1.40)
Heart attack						
Model 1	**2.12***** (1.71, 2.62)	**1.81***** (1.43, 2.30)	**1.51**** (1.18, 1.92)	**1.79***** (1.46, 2.20)	**1.41***** (1.11, 1.78)	**1.40**** (1.09, 1.78)
Model 2	**1.70***** (1.35, 2.16)	**1.45**** (1.12, 1.86)	**1.44**** (1.12, 1.86)	**1.41**** (1.13, 1.76)	1.11 (0.87, 1.42)	1.28 (0.99, 1.66)
Congestive heart failure						
Model 1	**2.79***** (1.96, 3.98)	**2.32***** (1.56, 3.46)	**1.58*** (1.04, 2.39)	**1.84**** (1.30, 2.60)	1.40 (0.95, 2.08)	**1.55*** (1.04, 2.32)
Model 2	**1.80**** (1.21, 2.69)	**1.79**** (1.17, 2.72)	1.27 (0.82, 1.96)	1.33 (0.92, 1.93)	1.25 (0.83, 1.88)	1.14 (0.75, 1.74)
Abnormal heart rhythm						
Model 1	**1.44**** (1.10, 1.89)	1.03 (0.75, 1.43)	1.12 (0.82, 1.54)	**1.67***** (1.26, 2.22)	**1.39*** (1.00, 1.93)	1.34 (0.96, 1.88)
Model 2	**1.43*** (1.05, 1.94)	1.01 (0.72, 1.42)	1.13 (0.82, 1.57)	**1.50*** (1.09, 2.05)	1.29 (0.92, 1.80)	**1.52*** (1.07, 2.17)
Stroke						
Model 1	1.04 (0.85, 1.27)	1.15 (0.91, 1.44)	1.07 (0.85, 1.34)	1.18 (0.96, 1.44)	1.22 (0.97, 1.54)	0.94 (0.73, 1.20)
Model 2	1.07 (0.85, 1.35)	1.12 (0.88, 1.42)	1.11 (0.88, 1.41)	1.17 (0.93, 1.46)	1.14 (0.90, 1.45)	0.98 (0.76, 1.28)
Composite CVD						
Model 1	**1.43***** (1.26, 1.62)	**1.36***** (1.18, 1.57)	**1.17*** (1.01, 1.35)	**1.41***** (1.24, 1.61)	**1.30***** (1.13, 1.51)	1.14 (0.98, 1.32)
Model 2	**1.23**** (1.07, 1.42)	**1.19*** (1.02, 1.38)	1.12 (0.96, 1.31)	**1.21**** (1.05, 1.39)	1.14 (0.98, 1.33)	1.08 (0.92, 1.27)

Note: Boldface indicates statistical significance (*p<0.05, **p<0.01, and ***p<0.001).
ORs are reported with 95% CIs. Survey weights were applied in all models. The reference category for life-course social mobility is consistently low. Model 1 is unadjusted. Model 2 is adjusted for age, sex, religion, social group, place of residence, number of household members, and state/UTs as fixed effects.
[a]Life-course social mobility: childhood SEP is based on family financial position; adulthood SEP is based on MPCE.
[b]Life-course social mobility: childhood SEP is based on family financial position; adulthood SEP is based on household assets.
MPCE, monthly per capita expenditure; SEP, socioeconomic position; UT, union territory.

Individuals experiencing consistently low SEP across the life-course are likely to face higher competing risks of mortality, including earlier fatal CVD events,[50] reducing their probability of surviving into older age. However, this bias is partially addressed through the application of extensively constructed survey weights. Moreover, lifetime CVD prevalence may reflect events before adult SEP measurement, raising reverse causation concerns. To minimize this bias, healthcare expenditure was excluded from MPCE, and analyses with MPCE and asset-based indicators yielded similar results. Sensitivity analyses restricted to individuals without prior CVD assessed the links between social mobility and contemporaneously measured cardiometabolic risk factors, minimizing survival bias or reverse causation. Consistent socioeconomic gradients in this CVD-free population suggest that the associations seen in the full sample are unlikely to be driven by selective survival or retrospective outcome measurement.

Second, the results should be viewed in light of epidemiologic transition. Because LMICs such as India undergo socioeconomic advancement, disease patterns shift from infectious and nutritional disorders to noncommunicable diseases, including cardiometabolic conditions.[24] Improved living standards lower infectious disease−related mortality and extend lifespan, increasing exposure to cardiovascular risk factors.[51] Extensions of epidemiologic transition theory also recognize that

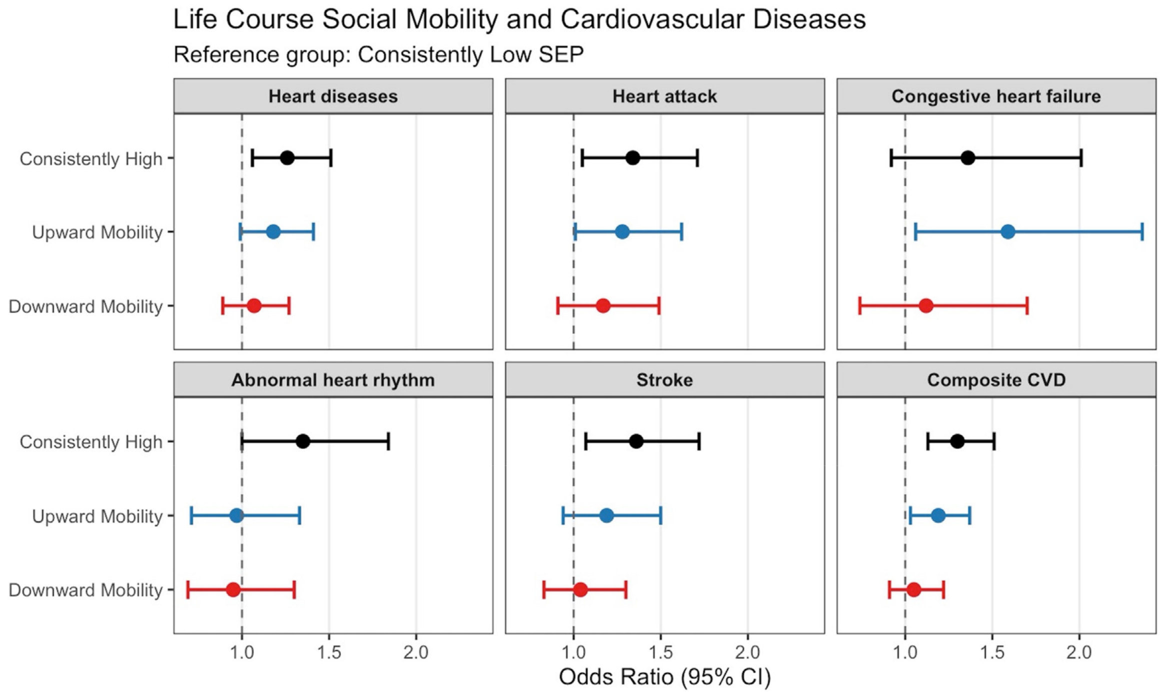

Figure 1. Association of life-course social mobility, defined by childhood family financial position and adult monthly per-capita expenditure as socioeconomic position indicators, with cardiovascular disease after coarsened exact matching.
Note: Each regression model is adjusted for the coarsened exact matched weights and state/UTs with robust SEs, given in Appendix Table 4 (available online). Matching was performed using all covariates: age (45–54, 55–64, ≥65 years), sex (male, female), religion (Hindu, Muslim, Christian, others), social groups (scheduled caste, scheduled tribe, other backward caste, others), place of residence (rural, urban), and household members (lower or equal to median household size, greater than median household size).
SEP, socioeconomic position; UT, union territory.

life-course infections contribute to chronic diseases.[52] The transition may especially affect consistently high-SEP and upwardly mobile individuals, who face a lower infectious disease burden but higher cardiometabolic risk owing to lifestyle changes.[28]

Interpreting these findings also requires considering India's social structure and the nature of social mobility. Higher CVD risk among those with consistently high or upward mobility may reflect broader structural changes. National initiatives that expand access to education, including the Sarva Shiksha Abhiyan and the Rashtriya Madhyamik Shiksha Abhiyan, together with rapid economic growth, may have enabled educational attainment and socioeconomic upliftment. However, these gains have occurred alongside a labor market dominated by informal employment, long working hours, job insecurity, and limited social protection.[53] Such conditions may increase chronic stress and constrain healthy behaviors, potentially contributing to elevated cardiometabolic risk.

The study adds to evidence linking socioeconomic disparities and cardiovascular health in the Indian context. Even as the CVD burden rises among the disadvantaged,[25,26] it disproportionately affects higher socioeconomic groups.[54] If these associations are proven to be causal, early-life interventions could substantially reduce CVD risk and mitigate socioeconomic inequalities in CVD burden.

Limitations

Nonetheless, the findings should be interpreted considering several limitations. First, this cross-sectional study does not allow for causal conclusions. Unmeasured confounders, such as neighborhood deprivation/affluence[55] and selection bias from varying mortality across socioeconomic groups, may have influenced the association.[56] Second, childhood SEP was self-reported, which risks misclassification owing to recall bias.[57] Third, childhood family financial position and adulthood MPCE/assets differ in several aspects—retrospective versus contemporaneous reporting, subjective versus objective assessment, and financial position versus consumption/wealth. Variation in these measures may cause discrepancies in assessing life-course social mobility. However, multiple sensitivity analyses using objective and subjective SEP indicators yielded consistent results, including when social mobility was defined using parental and

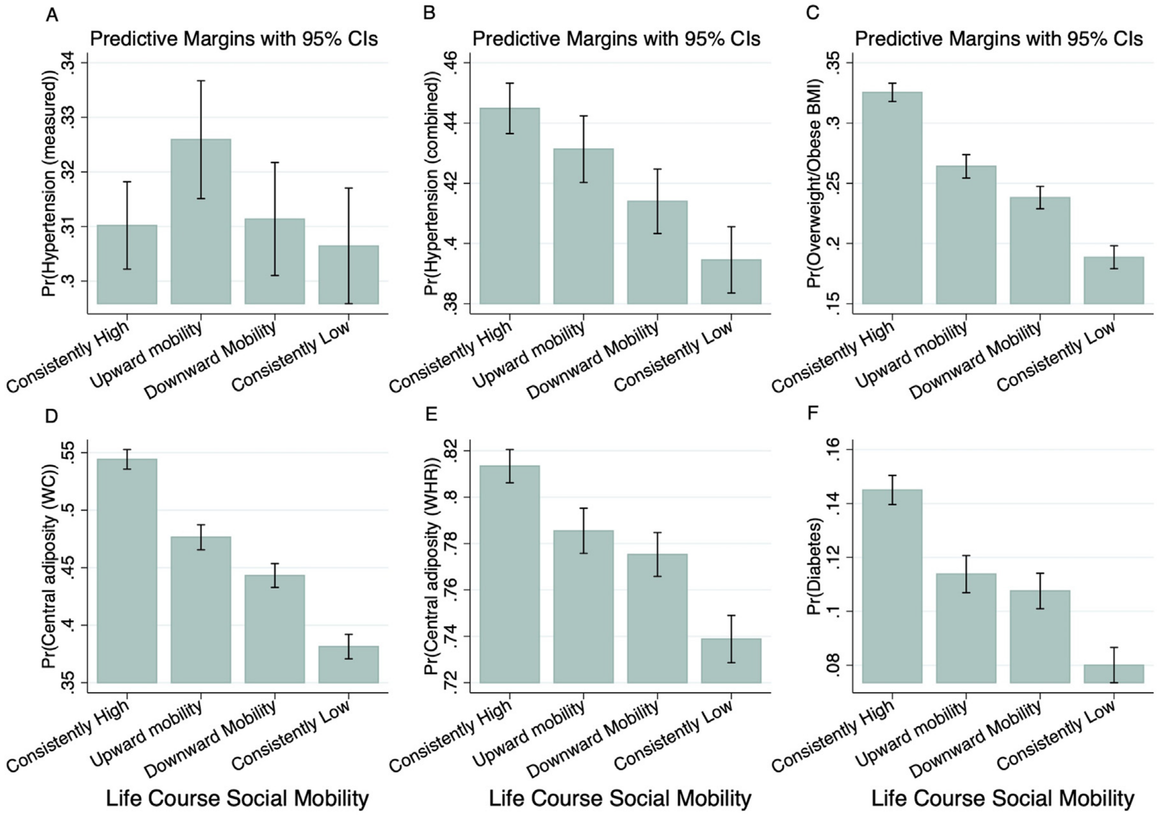

Figure 2. Predicted probabilities of cardiometabolic risk factors across life-course social mobility, defined by childhood family financial position and adult monthly per-capita expenditure as socioeconomic position indicators.

(A) Hypertension, measured. (B) Hypertension, combined. (C) Overweight/obese BMI. (D) Central adiposity, waist circumference. (E) Central adiposity, waist-to-hip ratio. (F) Diabetes.

Note: Marginal probabilities are estimated on the basis of the logistic regression Model 2, adjusted for survey weight, covariates, and state/UTs as fixed effects with robust SEs, given in Appendix Table 5 (available online).

UT, union territory.

self-education. These consistent results across various SEP indicators strengthen the study's robustness. Fourth, CVD conditions were self-reported, which may introduce bias because of socioeconomic differences in diagnosis rates.[30] However, studies from India[58] and HICs[59] indicate that CVD events are unlikely to be overlooked, supporting the reliability of self-reported data. Moreover, cardiometabolic risk factors were contemporaneously measured and showed a clear dose–response association with social mobility, even among the CVD-free population. This strengthens the observed association between social mobility and CVD because these risk factors are major contributors. Fifth, the use of 2 time periods to measure social mobility may miss important transitions and trajectories occurring over the life-course. Finally, because LASI Wave-1 represents the baseline of an ongoing cohort, future follow-up waves will enable prospective analyses of incident CVD and mortality, allowing a more robust assessment of SEP gradients while accounting for selective survival.

CONCLUSIONS

Life-course social mobility, particularly sustained socioeconomic advantage and upward mobility, is associated with higher CVD and cardiometabolic risk factors among middle-aged and older Indians. These patterns differ from those in HICs and underscore the importance of considering country-specific life-course socioeconomic processes. Consequently, public health policies could be complemented by microsocial preventive strategies that integrate early life interventions with adult-focused strategies addressing life-course social mobility to reduce the CVD burden.

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Gateway to Global Aging Data, 2023. https://doi.org/10.25549/h-lasi, produced and distributed by the University of Southern California with funding from the National Institute on Aging (R01 AG042778, 2R01 AG030153, and 2R01 AG051125). The authors do not have permission to share data. The study used publicly accessible data from LASI Wave-1, and the study team did not have access to respondent identifiers linked to the data. As such, the study did not meet the regulatory definition of human participant research, exempting the study from undergoing IRB review.

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CREDIT AUTHOR STATEMENT

Imnameren Longkumer: Writing — original draft, Investigation, Formal analysis, Data curation, Conceptualization. Soohyeon Ko: Writing — review & editing, Investigation, Formal analysis, Data curation. Rohit Bhatia: Writing — review & editing, Investigation. Rockli Kim: Writing — review & editing, Investigation, Supervision. S.V. Subramanian: Writing — review & editing, Supervision, Investigation, Conceptualization.

SUPPLEMENTAL MATERIAL

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Appendix Material

Title

Association of Life-Course Social Mobility with Cardiovascular Disease and Modifiable Risk Factors: Evidence from the Longitudinal Aging Study in India

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American Journal of Preventive Medicine

Table 1: Prevalence of cardiovascular diseases and modifiable risk factors by life course social mobility status

Outcomes	Sample (n)	Total cases	Life course social mobility				p-value
			Consistently high	Upward mobility	Downward mobility	Consistently low	
		% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	
Heart diseases	65,358	3.61 (3.47-3.75)	4.26 (4.04-4.49)	3.87 (3.55-4.19)	3.08 (2.76-3.39)	2.56 (2.24-2.89)	<0.001
Heart attack	65,356	2.02 (1.91-2.13)	2.37 (2.20-2.54)	2.25 (2.01-2.49)	1.76 (1.53-2.00)	1.34 (1.09-1.58)	<0.001
Congestive heart failure	65,203	0.76 (0.69-0.82)	0.96 (0.85-1.06)	0.85 (0.70-1.00)	0.59 (0.44-0.73)	0.43 (0.28 -0.58)	<0.001
Abnormal heart rhythm	65,203	1.00 (0.92-1.08)	1.14 (1.02-1.26)	0.91 (0.74-1.08)	0.91 (0.73-1.07)	0.90 (0.73-1.08)	0.031
Stroke	65,357	1.79 (1.70-2.00)	1.87 (1.71-2.03)	1.99 (1.76-2.21)	1.66 (1.44-1.88)	1.55 (1.32-1.78)	0.051
Composite CVD	65,357	5.19 (5.02-5.36)	5.83 (5.57-6.10)	5.67 (5.28-6.05)	4.59 (4.22-4.96)	3.99 (3.60-4.38)	<0.001
Hypertension-measured	59,601	34.00 (33.62-34.38)	35.05 (34.45-35.65)	34.14 (32.28-35.00)	33.63 (32.80-34.46)	32.11 (31.25-32.97)	<0.001
Hypertension-combined	60,899	46.13 (45.73-46.53)	50.58 (49.96-51.21)	46.09 (45.20-46.98)	43.90 (43.04-44.77)	39.30 (38.40-40.19)	<0.001
Overweight/obese BMI	59,040	29.26 (20.89-29.63)	39.76 (39.19-40.32)	28.30 (27.49-29.11)	23.53 (22.75-24.32)	14.90 (14.08-15.71)	<0.001
WC	59,020	50.86 (50.46-51.27)	61.67 (61.25-62.50)	51.36 (50.47-52.25)	44.75 (43.89-45.61)	34.40 (33.51-35.29)	<0.001
WHR	59,014	79.88 (79.56-80.20)	83.85 (83.34-84.36)	80.34 (79.61-81.06)	77.75 (77.04-78.45)	73.58 (72.85-74.31)	<0.001
Diabetes	65,348	12.85 (12.59-13.10)	17.11 (16.71-17.51)	12.43 (11.86-13.01)	10.73 (10.17-11.29)	6.66 (6.08-7.24)	<0.001
Current excessive alcohol	65,061	7.31 (7.11-7.51)	6.49 (6.17-6.80)	8.72 (8.26-9.17)	6.29 (5.85-6.73)	8.72 (8.27-9.18)	<0.001
Current smoking	65,017	13.65 (13.38-13.91)	11.30 (10.89-11.72)	16.47 (15.87-17.06)	12.79 (12.21-13.37)	16.60 (16.00-17.20)	<0.001
Current smokeless tobacco	65,016	19.03 (18.73-19.33)	13.23 (12.75-13.70)	22.76 (22.08-23.43)	18.23 (17.58-18.89)	28.22 (27.54-28.90)	<0.001
Physical inactivity	65,027	74.94 (74.61-75.27)	77.91 (77.38-78.43)	72.65 (71.90-73.40)	77.13 (76.40-77.86)	68.73 (67.98-69.49)	<0.001

Table 2: Descriptive statistics of study participants stratified by exposure groups after coarsened exact matching – Exposure groups constructed based on childhood financial position and adulthood MPCE

Characteristics	Consistently low, n = 10199	Consistently high, n = 10199	Consistently low, n = 8985	Upward mobility, n = 8985	Consistently low, n = 10563	Downward mobility, n = 10563	L1 statistics[a]
Age							
45-54 years	3,548 (34.79)	3,548 (34.79)	3,150 (35.06)	3,150 (35.06)	3,566 (33.76)	3,566 (33.76)	<0.001
55-64 years	3,149 (30.88)	3,149 (30.88)	2,785 (31.00)	2,785 (31.00)	3,286 (31.11)	3,286 (31.11)	
≥65 years	3,502 (34.34)	3,502 (34.34)	3,050 (33.95)	3,050 (33.95)	3,711 (35.13)	3,711 (35.13)	
Sex							
Male	4,738 (46.46)	4,738 (46.46)	4,284 (47.68)	4,284 (47.68)	4,865 (46.06)	4,865 (46.06)	<0.001
Female	5,461 (53.54)	5,461 (53.54)	4,701 (52.32)	4,701 (52.32)	5,698 (53.94)	5,698 (53.94)	
Religion							
Hindu	7,632 (74.83)	7,632 (74.83)	6,905 (76.85)	6,905 (76.85)	8,009 (75.82)	8,009 (75.82)	
Muslim	1,348 (13.22)	1,348 (13.22)	1,107 (12.32)	1,107 (12.32)	1,340 (12.69)	1,340 (12.69)	<0.001
Christian	836 (8.20)	836 (8.20)	650 (7.23)	650 (7.23)	852 (8.07)	852 (8.07)	
Others	383 (3.76)	383 (3.76)	323 (3.59)	323 (3.59)	362 (3.43)	362 (3.43)	
Social groups							
Scheduled caste	2,090 (20.49)	2,090 (20.49)	2,006 (22.33)	2,006 (22.33)	2,087 (19.76)	2,087 (19.76)	
Scheduled tribe	1,932 (18.94)	1,932 (18.94)	1,630 (18.14)	1,630 (18.14)	2,145 (20.31)	2,145 (20.31)	<0.001
Other backward caste	4,208 (41.26)	4,208 (41.26)	3,546 (39.47)	3,546 (39.47)	4,438 (42.01)	4,438 (42.01)	
Others	1,969 (19.31)	1,969 (19.31)	1,803 (20.07)	1,803 (20.07)	1,893 (17.92)	1,893 (17.92)	
Place of residence							
Rural	7,953 (77.98)	7,953 (77.98)	6,911 (76.92)	6,911 (76.92)	8,442 (79.92)	8,442 (79.92)	<0.001
Urban	2,246 (22.02)	2,246 (22.02)	2,074 (23.08)	2,074 (23.08)	2,121 (20.08)	2,121 (20.08)	
Household members							
≤Median household size	5,775 (56.62)	5,775 (56.62)	5,635 (62.72)	5,635 (62.72)	5,210 (49.32)	5,210 (49.32)	<0.001
>Median household size	4,424 (43.38)	4,424 (43.38)	3,350 (37.28)	3,350 (37.28)	5,353 (50.68)	5,353 (50.68)	

Data presented as n (%).

Multivariate L1 distance after matching for each exposure groups – exposure group-1 (consistently low vs. consistently high), exposure group-2 (consistently low vs. upward mobility), and exposure group-3 (consistently low vs. downward mobility) – is 0 (perfect balance across all covariates).

[a]Univariate L1 statistics – Value 0 indicating perfect balance of respective covariate between each exposure groups (consistently low vs. consistently high; consistently low vs. upward mobility; consistently low vs. downward mobility).

Table 3: Descriptive statistics of study participants stratified by exposure groups after coarsened exact matching – Exposure groups constructed based on childhood financial position and adulthood household assets

Characteristics	Consistently low, n = 10666	Consistently high, n = 10666	Consistently low, n = 9891	Upward mobility, n = 9891	Consistently low, n = 10386	Downward mobility, n = 10386	L1 statistics[a]
Age							
45-54 years	4,052 (37.99)	4,052 (37.99)	3,721 (37.62)	3,721 (37.62)	4,007 (38.58)	4,007 (38.58)	<0.001
55-64 years	3,271 (30.67)	3,271 (30.67)	3,114 (31.48)	3,114 (31.48)	3,116 (30.00)	3,116 (30.00)	
≥65 years	3,343 (31.34)	3,343 (31.34)	3,056 (30.90)	3,056 (30.90)	3,263 (31.42)	3,263 (31.42)	
Sex							
Male	5,094 (47.76)	5,094 (47.76)	4,768 (48.21)	4,768 (48.21)	4,788 (46.10)	4,788 (46.10)	<0.001
Female	5,572 (52.24)	5,572 (52.24)	5,123 (51.79)	5,123 (51.79)	5,598 (53.90)	5,598 (53.90)	
Religion							
Hindu	7,872 (73.80)	7,872 (73.80)	7,750 (78.35)	7,750 (78.35)	7,694 (74.08)	7,694 (74.08)	<0.001
Muslim	1,319 (12.37)	1,319 (12.37)	1,210 (12.23)	1,210 (12.23)	1,141 (10.99)	1,141 (10.99)	
Christian	1,016 (9.53)	1,016 (9.53)	603 (6.10)	603 (6.10)	1,061 (10.22)	1,061 (10.22)	
Others	459 (4.30)	459 (4.30)	328 (3.32)	328 (3.32)	490 (4.72)	490 (4.72)	
Social groups							
Scheduled caste	2,241 (21.01)	2,241 (21.01)	2,144 (21.68)	2,144 (21.68)	2,358 (22.70)	2,358 (22.70)	<0.001
Scheduled tribe	2,150 (20.16)	2,150 (20.16)	1,892 (19.13)	1,892 (19.13)	2,059 (19.82)	2,059 (19.82)	
Other backward caste	4,303 (40.34)	4,303 (40.34)	3,947 (39.90)	3,947 (39.90)	4,117 (39.64)	4,117 (39.64)	
Others	1,972 (18.49)	1,972 (18.49)	1,908 (19.29)	1,908 (19.29)	1,852 (17.83)	1,852 (17.83)	
Place of residence							
Rural	7,943 (74.47)	7,943 (74.47)	7,315 (73.96)	7,315 (73.96)	7,812 (75.22)	7,812 (75.22)	<0.001
Urban	2,723 (25.53)	2,723 (25.53)	2,576 (26.04)	2,576 (26.04)	2,574 (24.78)	2,574 (24.78)	
Household members							
≤Median household size	6,980 (65.44)	6,980 (65.44)	6,186 (62.54)	6,186 (62.54)	7,370 (70.96)	7,370 (70.96)	<0.001
>Median household size	3,686 (34.56)	3,686 (34.56)	3,705 (37.46)	3,705 (37.46)	3,016 (29.04)	3,016 (29.04)	

Data presented as n (%).

Multivariate L1 distance after matching for each exposure groups – exposure group-1 (consistently low vs. consistently high), exposure group-2 (consistently low vs. upward mobility), and exposure group-3 (consistently low vs. downward mobility) – is 0 (perfect balance across all covariates).

[a]Univariate L1 statistics – Value 0 indicating perfect balance of respective covariate between each exposure groups (consistently low vs. consistently high; consistently low vs. upward mobility; consistently low vs. downward mobility).

Table 4: Association of life course social mobility after coarsened exact matching

Regression models	Life Course Social Mobility: Childhood SEP based on family financial position Adulthood SEP based on MPCE			Life Course Social Mobility: Childhood SEP based on family financial position Adulthood SEP based on household asset		
	Count	**OR (95% CI)**	**p-value**	**Count**	**OR (95% CI)**	**p-value**
Heart diseases						
Consistently low / Consistently high	10199 / 10199	1.26 (1.06–1.51)	0.009	10666 / 10666	1.26 (1.06–1.49)	0.008
Consistently low / Upward mobility	8985 / 8985	1.18 (0.99 –1.41)	0.063	9891 / 9891	1.18 (0.99–1.40)	0.066
Consistently low / Downward mobility	10563 / 10563	1.07 (0.89–1.27)	0.479	10386 / 10386	1.13 (0.94–1.35)	0.197
Heart attack						
Consistently low / Consistently high	10199 / 10199	1.34 (1.05–1.71)	0.019	10666 / 10666	1.23 (0.98–1.55)	0.078
Consistently low / Upward mobility	8985 / 8985	1.28 (1.01–1.62)	0.037	9891 / 9891	1.16 (0.92–1.46)	0.210
Consistently low / Downward mobility	10563 / 10563	1.17 (0.91–1.49)	0.216	10386 / 10386	1.17 (0.91–1.50)	0.214
Congestive heart failure						
Consistently low / Consistently high	10199 / 10199	1.36 (0.92–2.01)	0.123	10666 / 10666	1.08 (0.76–1.54)	0.661
Consistently low / Upward mobility	8985 / 8985	1.59 (1.06–2.36)	0.023	9891 / 9891	1.23 (0.85–1.77)	0.278
Consistently low / Downward mobility	10563 / 10563	1.12 (0.74–1.70)	0.591	10386 / 10386	1.00 (0.68–1.48)	0.999
Abnormal heart rhythm						
Consistently low / Consistently high	10199 / 10199	1.35 (1.00–1.84)	0.053	10666 / 10666	1.37 (1.00–1.88)	0.050
Consistently low / Upward mobility	8985 / 8985	0.97 (0.71-1.33)	0.845	9891 / 9891	1.25 (0.90–1.72)	0.181
Consistently low / Downward mobility	10563 / 10563	0.95 (0.69–1.30)	0.754	10386 / 10386	1.43 (1.03–1.98)	0.033
Stroke						
Consistently low / Consistently high	10199 / 10199	1.36 (1.07–1.72)	0.012	10666 / 10666	1.21 (0.97–1.51)	0.097
Consistently low / Upward mobility	8985 / 8985	1.19 (0.94–1.50)	0.152	9891 / 9891	1.04 (0.83–1.29)	0.750
Consistently low / Downward mobility	10563 / 10563	1.04 (0.83–1.30)	0.714	10386 / 10386	0.97 (0.77–1.23)	0.825
Composite CVD						
Consistently low / Consistently high	10199 / 10199	1.30 (1.13–1.51)	<0.001	10666 / 10666	1.23 (1.07–1.42)	0.003
Consistently low / Upward mobility	8985 / 8985	1.19 (1.03–1.37)	0.021	9891 / 9891	1.12 (0.97–1.29)	0.110
Consistently low / Downward mobility	10563 / 10563	1.05 (0.91–1.22)	0.467	10386 / 10386	1.07 (0.92–1.24)	0.393

Note: Each regression model is adjusted for the coarsened exact matched weights and state/UTs. Matching was performed using all covariates as: age (45-54 / 55-64 / ≥65 years), sex (male / female), religion (Hindu/ Muslim/ Christian/ Others), social groups (Scheduled caste/ Scheduled tribe/ Other backward caste/ others), place of residence (rural/ urban), and household members (≤Median household size/ >Median household size). Count = number of matched individuals

For life course social mobility based on childhood financial position and adulthood MPCE: Number of observations discarded during pruning was as follows: group-1 – consistently low (2433) and consistently high (16136), group-2 – consistently low (3647) and upward mobility (3804), and group-3 – consistently low (2069) and downward mobility (3045).

For life course social mobility based on childhood financial position and adulthood household assets: Number of observations discarded during pruning was as follows: group-1 – consistently low (1561) and consistently high (15354), group-2 – consistently low (2336) and upward mobility (3303), and group-3 – consistently low (1841) and downward mobility (3537).

Table 5: Association of life course social mobility with cardiovascular risk factors

Regression models	Life Course Social Mobility[a]			Life Course Social Mobility[b]		
	Consistently High OR (95% CI)	Upward Mobility OR (95% CI)	Downward Mobility OR (95% CI)	Consistently High OR (95% CI)	Upward Mobility OR (95% CI)	Downward Mobility OR (95% CI)
Hypertension (measured BP)						
Model 1	1.21*** (1.14–1.29)	1.21*** (1.13–1.29)	1.08* (1.01–1.16)	1.01 (0.95–1.07)	0.93* (0.86–0.99)	1.04 (0.97–1.11)
Model 2	1.02 (0.95–1.09)	1.10* (1.02–1.18)	1.02 (0.95–1.10)	0.92* (0.87–0.99)	0.91* (0.85–0.98)	0.93 (0.86–1.00)
Hypertension (combined)						
Model 1	1.66*** (1.56–1.75)	1.36*** (1.27–1.45)	1.21*** (1.14–1.29)	1.34*** (1.26–1.42)	1.04 (0.97–1.11)	1.23*** (1.15–1.31)
Model 2	1.25*** (1.17–1.33)	1.18*** (1.10–1.26)	1.09* (1.02–1.17)	1.11** (1.04–1.18)	0.98 (0.91–1.05)	1.01 (0.91–1.09)
Overweight/Obese BMI						
Model 1	3.77*** (3.50–4.05)	2.16*** (1.99–2.35)	1.73*** (1.59–1.88)	2.92*** (2.72–3.14)	1.65*** (1.52–1.79)	1.88*** (1.74–2.04)
Model 2	2.27*** (2.09–2.46)	1.62*** (1.48–1.77)	1.39*** (1.27–1.52)	2.03*** (1.88–2.20)	1.45*** (1.32–1.58)	1.33*** (1.22–1.45)
Central adiposity (waist circumference)						
Model 1	3.13*** (2.95–3.32)	1.92*** (1.80–2.05)	1.58*** (1.48–1.68)	2.66*** (2.51–2.82)	1.59*** (1.59–1.70)	1.62*** (1.51–1.73)
Model 2	2.20*** (2.05–2.36)	1.59*** (1.48–1.72)	1.36*** (1.26–1.46)	1.99*** (1.85–2.13)	1.41*** (1.31–1.52)	1.27*** (1.17–1.37)
Central adiposity (waist-to-hip ratio)						
Model 1	1.83*** (1.71–1.95)	1.38*** (1.28–1.49)	1.31*** (1.21–1.41)	1.70*** (1.59–1.82)	1.21*** (1.13–1.31)	1.25*** (1.16–1.35)
Model 2	1.57*** (1.45–1.70)	1.31*** (1.21–1.42)	1.23*** (1.14–1.33)	1.51*** (1.40–1.63)	1.21*** (1.11–1.31)	1.15** (1.06–1.25)
Diabetes						
Model 1	3.06*** (2.78–3.37)	1.86*** (1.67–2.08)	1.74*** (1.55–1.94)	2.47*** (2.24–2.71)	1.49*** (1.34–1.67)	1.93*** (1.74–2.15)
Model 2	2.01*** (1.81–2.24)	1.50*** (1.34–1.69)	1.40*** (1.25–1.58)	1.79*** (1.62–1.90)	1.34*** (1.20–1.50)	1.39*** (1.24–1.56)
Current excessive alcohol						

Model 1	0.83*** (0.75–0.92)	1.08 (0.96–1.21)	0.71*** (0.63–0.80)	0.46*** (0.42–0.51)	0.59*** (0.52–0.66)	0.85*** (0.77–0.95)
Model 2	0.75*** (0.66–0.86)	1.12 (0.98–1.28)	0.65*** (0.56–0.74)	0.49*** (0.43–0.55)	0.70*** (0.61–0.80)	0.70*** (0.62–0.80)
Current smoking						
Model 1	0.63*** (0.58–0.68)	1.02 (0.94–1.11)	0.72*** (0.66–0.79)	0.58*** (0.54–0.63)	0.89*** (0.82–0.97)	0.69*** (0.63–0.75)
Model 2	0.67*** (0.61–0.73)	1.03 (0.93–1.14)	0.74*** (0.67–0.82)	0.56*** (0.51–0.61)	0.80*** (0.72–0.88)	0.72*** (0.65–0.80)
Current smokeless tobacco						
Model 1	0.39*** (0.36–0.42)	0.81*** (0.76–0.8)	0.56*** (0.52–0.60)	0.38*** (0.35–0.41)	0.72*** (0.67–0.77)	0.50*** (0.46–0.53)
Model 2	0.65*** (0.60–0.71)	1.02 (0.94–1.11)	0.69*** (0.64–0.75)	0.54*** (0.50–0.59)	0.82*** (0.75–0.88)	0.71*** (0.65–0.77)
Physical inactivity						
Model 1	1.52*** (1.43–1.62)	1.13*** (1.06–1.21)	1.55*** (1.44–1.66)	1.55*** (1.46–1.64)	1.19*** (1.11–1.27)	1.64*** (1.53–1.76)
Model 2	1.26*** (1.17–1.35)	1.07 (0.99–1.15)	1.43*** (1.32–1.54)	1.25*** (1.16–1.33)	1.06 (0.99–1.14)	1.50*** (1.39–1.62)

Note: Odds ratios reported with 95% confidence intervals. Survey weights applied in all models.
Model 1: Unadjusted. Model 2: Adjusted for age, sex, religion, social groups, place of residence, number of household members, and state as fixed effects.
Reference category for life course social mobility is Consistently Low.
[a]Life course social mobility: Childhood SEP based on family financial position; adulthood SEP based on MPCE.
[b]Life course social mobility: Childhood SEP based on family financial position; adulthood SEP based on household assets.
p<0.05*, p<0.01**, p<0.001***

Table 6: *Sensitivity analysis:* Association of life course social mobility with cardiovascular diseases

Regression models	Life Course Social Mobility: Childhood SEP based on parental education Adulthood SEP based on MPCE			Life Course Social Mobility: Childhood SEP based on parental education Adulthood SEP based on household asset			Life Course Social Mobility: Childhood SEP based on parental education Adulthood SEP based on own education		
	Consistently High OR (95% CI)	Upward Mobility OR (95% CI)	Downward Mobility OR (95% CI)	Consistently High OR (95% CI)	Upward Mobility OR (95% CI)	Downward Mobility OR (95% CI)	Consistently High OR (95% CI)	Upward Mobility OR (95% CI)	Downward Mobility OR (95% CI)
Heart diseases									
Model 1	2.02*** (1.75–2.34)	1.42*** (1.24–1.63)	1.55*** (1.27–1.90)	1.89*** (1.64–2.19)	1.19* (1.04–1.37)	1.31* (1.05–1.63)	1.93*** (1.70–2.20)	1.40*** (1.21–1.63)	1.23*** (1.02–1.48)
Model 2	1.61*** (1.36–1.91)	1.21* (1.04–1.40)	1.39** (1.13–1.71)	1.48*** (1.26–1.74)	1.02 (0.88–1.19)	1.18 (0.94–1.47)	1.68*** (1.44–1.96)	1.29** (1.09–1.52)	1.19 (0.99–1.44)
Heart attack									
Model 1	2.21*** (1.83–2.67)	1.56*** (1.30–1.87)	1.61*** (1.24–2.11)	1.99*** (1.65–2.41)	1.30** (1.08–1.56)	1.50** (1.14–1.97)	2.11*** (1.79–2.48)	1.60*** (1.33–1.93)	1.19 (0.93–1.53)
Model 2	1.74*** (1.39–2.16)	1.29** (1.07–1.57)	1.47** (1.12–1.94)	1.53*** (1.24–1.89)	1.09 (0.90–1.33)	1.39* (1.05–1.84)	1.76*** (1.45–2.15)	1.35** (1.09–1.66)	1.20 (0.93–1.55)
Congestive heart failure									
Model 1	3.08*** (2.25–4.22)	1.80*** (1.32–2.46)	1.61* (1.02–2.53)	2.20*** (1.63–2.98)	1.08 (0.80–1.47)	1.44** (0.90–2.30)	2.64*** (2.02–3.44)	1.87*** (1.36–2.57)	1.47 (0.96–2.23)
Model 2	2.14*** (1.47–3.10)	1.46* (1.06-2.02)	1.36 (0.85–2.18)	1.68** (1.19–2.38)	1.04 (0.75–1.43)	1.16 (0.71–1.90)	1.92*** (1.37–2.70)	1.50* (1.05–2.15)	1.36 (0.87–2.12)
Abnormal heart rhythm									
Model 1	1.58*** (1.22–2.04)	1.06 (0.83–1.35)	1.05 (0.73–1.53)	1.73*** (1.34–2.23)	1.19 (0.93–1.53)	1.05 (0.68–1.61)	1.64*** (1.31–2.07)	1.15 (0.87–1.53)	1.03 (0.75–1.43)
Model 2	1.41* (1.04–1.90)	1.08 (0.83–1.40)	0.96 (0.65–1.41)	1.34* (1.00–1.78)	1.03 (0.79–1.35)	0.95 (0.62–1.47)	1.43* (1.08–1.89)	1.14 (0.84–1.55)	0.99 (0.71–1.39)
Stroke									
Model 1	1.09 (0.88–1.34)	1.04 (0.87–1.24)	1.12 (0.83–1.50)	1.28* (1.03–1.58)	1.25* (1.04–1.50)	1.08 (0.79–1.48)	1.06 (0.86–1.29)	1.36** (1.12–1.66)	1.32* (1.03–1.70)
Model 2	1.09 (0.86–1.39)	1.03 (0.85–1.25)	1.12 (0.83–1.52)	1.23 (0.97–1.56)	1.19 (0.97–1.45)	1.13 (0.82–1.55)	1.04 (0.82–1.31)	1.33* (1.07–1.66)	1.41** (1.10–1.82)
Composite CVD									
Model 1	1.61*** (1.43–1.82)	1.25*** (1.12–1.40)	1.36*** (1.14–1.62)	1.65*** (1.46–1.87)	1.21** (1.08–1.36)	1.22* (1.02–1.47)	1.57*** (1.41–1.76)	1.37*** (1.21–1.55)	1.27** (1.09–1.48)
Model 2	1.40*** (1.22–1.62)	1.12* (1.00–1.27)	1.28** (1.07–1.53)	1.40*** (1.22–1.61)	1.08 (0.95–1.22)	1.16 (0.96–1.41)	1.44*** (1.26–1.64)	1.29*** (1.13–1.49)	1.28** (1.09–1.50)

Note: Odds ratios reported with 95% confidence intervals. Survey weights applied in all models.
Model 1: Unadjusted. Model 2: Adjusted for age, sex, religion, social groups, place of residence, number of household members, and state as fixed effects. Reference category for life course social mobility is Consistently Low.
p<0.05*, p<0.01**, p<0.001***

Table 7: *Sensitivity analysis:* Association of life course social mobility with cardiovascular risk factors

Regression models	Life Course Social Mobility: Childhood SEP based on parental education Adulthood SEP based on MPCE			Life Course Social Mobility: Childhood SEP based on parental education Adulthood SEP based on household asset			Life Course Social Mobility: Childhood SEP based on parental education Adulthood SEP based on own education		
	Consistently High OR (95% CI)	**Upward Mobility OR (95% CI)**	**Downward Mobility OR (95% CI)**	**Consistently High OR (95% CI)**	**Upward Mobility OR (95% CI)**	**Downward Mobility OR (95% CI)**	**Consistently High OR (95% CI)**	**Upward Mobility OR (95% CI)**	**Downward Mobility OR (95% CI)**
Hypertension (measured BP)									
Model 1	1.22*** (1.15–1.30)	1.15*** (1.09–1.21)	1.02 (0.94–1.12)	1.05 (0.98–1.11)	0.94* (0.89–0.99)	1.05 (0.96–1.14)	1.17*** (1.10–1.24)	1.16*** (1.08–1.24)	1.03 (0.95–1.11)
Model 2	1.08* (1.00–1.16)	1.02 (0.96–1.08)	1.02 (0.93–1.12)	1.00 (0.93–1.07)	0.94* (0.89–1.00)	1.04 (0.95–1.14)	1.14*** (1.07–1.23)	1.18*** (1.10–1.27)	1.03 (0.95–1.11)
Hypertension (combined)									
Model 1	1.59*** (1.50–1.69)	1.36*** (1.29–1.43)	1.14** (1.05–1.24)	1.32*** (1.24–1.40)	1.06* (1.01–1.12)	1.19*** (1.10–1.30)	1.40*** (1.32–1.48)	1.26*** (1.18–1.34)	1.13** (1.05–1.21)
Model 2	1.33*** (1.24–1.42)	1.14*** (1.08–1.20)	1.13** (1.03–1.23)	1.20*** (1.12–1.29)	1.03 (0.98–1.09)	1.18*** (1.08–1.29)	1.39*** (1.30–1.49)	1.35*** (1.26–1.45)	1.12** (1.04–1.20)
Overweight/ Obese BMI									
Model 1	3.95*** (3.70–4.23)	2.08*** (1.96–2.21)	1.81*** (1.64–1.99)	3.18*** (2.97 –3.39)	1.58*** (1.49 –1.68)	2.02*** (1.84–2.21)	3.19*** (3.00–3.39)	2.13*** (1.99–2.28)	1.65*** (1.53–1.79)
Model 2	2.42*** (2.24–2.62)	1.56*** (1.46–1.67)	1.43*** (1.29–1.59)	2.28*** (2.11–2.46)	1.49*** (1.39–1.59)	1.54*** (1.39–1.71)	2.48*** (2.30–2.68)	2.03*** (1.87–2.20)	1.37*** (1.26–1.49)
Central adiposity (waist circumference)									
Model 1	3.29*** (3.10–3.50)	1.90*** (1.80–2.00)	1.71*** (1.57–1.86)	2.95*** (2.77–3.14)	1.64*** (1.56–1.72)	1.87*** (1.72–2.03)	2.53*** (2.38–2.68)	1.50*** (1.41–1.60)	1.57*** (1.46–1.69)
Model 2	2.44*** (2.27–2.63)	1.56*** (1.47–1.65)	1.51*** (1.37–1.66)	2.31*** (2.15–2.49)	1.50*** (1.42–1.59)	1.62*** (1.47–1.78)	2.71*** (2.51–2.93)	2.06*** (1.91–2.23)	1.29*** (1.19–1.40)
Central adiposity (waist-to-hip ratio)									
Model 1	2.01*** (1.86–2.18)	1.32*** (1.24-1.40)	1.32*** (1.19–1.46)	1.94*** (1.79–2.10)	1.23*** (1.16–1.31)	1.33*** (1.20–1.47)	2.14*** (1.98–2.32)	1.61*** (1.48–1.75)	1.17*** (1.08–1.28)
Model 2	1.61*** (1.48–1.76)	1.25*** (1.17–1.33)	1.17** (1.05–1.30)	1.60*** (1.47–1.75)	1.20*** (1.13–1.29)	1.12* (1.01–1.24)	1.78*** (1.63–1.96)	1.53*** (1.40–1.67)	1.08 (0.98–1.18)
Diabetes									
Model 1	2.86***	1.84***	1.74***	2.34***	1.37***	1.70***	2.44***	1.91***	1.51***

	(2.62–3.11)	(1.70–1.99)	(1.53–1.97)	(2.15–2.54)	(1.26–1.48)	(1.51–1.91)	(2.26–2.63)	(1.76–2.08)	(1.36–1.67)
Model 2	2.05*** (1.86–2.26)	1.48*** (1.36–1.61)	1.51*** (1.32–1.72)	1.89*** (1.71–2.08)	1.32*** (1.21–1.44)	1.43*** (1.26–1.62)	2.00*** (1.82–2.19)	1.71*** (1.56–1.89)	1.40*** (1.26–1.56)
Current excessive alcohol									
Model 1	0.79*** (0.71–0.89)	1.13** (1.03–1.24)	0.68*** (0.56–0.81)	0.44*** (0.39–0.50)	0.57*** (0.52–0.62)	0.79** (0.68–0.92)	0.73*** (0.65–0.82)	0.99 (0.89–1.10)	0.67*** (0.58–0.79)
Model 2	0.82** (0.71–0.95)	1.14* (1.03–1.27)	0.71** (0.58–0.87)	0.53*** (0.46–0.61)	0.69*** (0.62–0.77)	0.77*** (0.65–0.90)	0.53*** (0.46–0.61)	0.58*** (0.51–0.65)	0.83* (0.69–0.99)
Current smoking									
Model 1	0.62*** (0.56–0.67)	0.98 (0.91–1.04)	0.74*** (0.65–0.83)	0.54*** (0.50–0.59)	0.92* (0.86–0.98)	0.86** (0.76–0.96)	0.59*** (0.54–0.64)	0.90* (0.83–0.98)	0.75*** (0.67–0.84)
Model 2	0.63*** (0.57–0.71)	1.01 (0.93–1.09)	0.74*** (0.65–0.85)	0.50*** (0.45–0.56)	0.82*** (0.76–0.89)	0.83** (0.73–0.95)	0.39*** (0.35–0.44)	0.50*** (0.46–0.55)	0.96 (0.85–1.09)
Current smokeless tobacco									
Model 1	0.58*** (0.54–0.63)	0.73*** (0.69–0.77)	0.89* (0.81–0.98)	0.56*** (0.52–0.61)	0.68*** (0.64–0.72)	0.82*** (0.74–0.90)	0.68*** (0.63–0.73)	0.83*** (0.77–0.90)	0.88** (0.80–0.95)
Model 2	0.76*** (0.69–0.83)	1.02 (0.95–1.10)	0.86** (0.78–0.96)	0.63*** (0.57–0.68)	0.76*** (0.71–0.82)	0.80*** (0.72–0.89)	0.62*** (0.57–0.68)	0.71*** (0.65–0.77)	0.87** (0.79–0.96)
Physical inactivity									
Model 1	1.23*** (1.16–1.32)	1.10** (1.04–1.16)	1.11* (1.01–1.22)	1.25*** (1.17–1.34)	1.10** (1.04–1.16)	1.09 (0.99–1.19)	1.18*** (1.11–1.26)	1.00 (0.93–1.07)	1.08 (1.00–1.17)
Model 2	1.13** (1.05–1.22)	0.98 (0.92-1.04)	1.15** (1.04–1.27)	1.12** (1.03–1.21)	0.95 (0.90–1.01)	1.12* (1.02–1.24)	1.30*** (1.20–1.41)	1.20*** (1.11–1.29)	1.08 (0.99–1.18)

Note: Odds ratios reported with 95% confidence intervals. Survey weights applied in all models.
Model 1: Unadjusted. Model 2: Adjusted for age, sex, religion, social groups, place of residence, number of household members, and state as fixed effects. Reference category for life course social mobility is Consistently Low.
p<0.05*, p<0.01**, p<0.001***

Table 8: *Sensitivity analysis:* Associations of life course social mobility with cardiovascular disease

Regression models	Life Course Social Mobility: Childhood SEP based on family financial position Adulthood SEP based on dichotomized MPCE			Life Course Social Mobility: Childhood SEP based on family financial position Adulthood SEP based on dichotomized household asset		
	Consistently High OR (95% CI)	**Upward Mobility OR (95% CI)**	**Downward Mobility OR (95% CI)**	**Consistently High OR (95% CI)**	**Upward Mobility OR (95% CI)**	**Downward Mobility OR (95% CI)**
Heart diseases						
Model 1	1.79*** (1.54–2.07)	1.61*** (1.35–1.92)	1.27** (1.08–1.49)	1.57*** (1.36–1.82)	1.35** (1.13–1.61)	1.26** (1.07–1.48)
Model 2	1.43*** (1.22–1.69)	1.37** (1.14–1.64)	1.19* (1.00–1.41)	1.21* (1.03–1.43)	1.11 (0.92–1.33)	1.16 (0.97–1.38)
Heart attack						
Model 1	2.12*** (1.74–2.58)	1.83*** (1.45–2.31)	1.42** (1.14–1.76)	1.76*** (1.46–2.14)	1.38*** (1.10–1.74)	1.34** (1.08–1.66)
Model 2	1.75*** (1.41–2.17)	1.51** (1.18–1.92)	1.38** (1.10–1.73)	1.35** (1.09–1.66)	1.04 (0.8–1.32)	1.25 (0.99–1.58)
Congestive heart failure						
Model 1	3.08*** (2.20–4.30)	2.75*** (1.87–4.05)	1.58* (1.08–2.30)	1.92*** (1.39–2.66)	1.62* (1.10–2.38)	1.64** (1.15–2.34)
Model 2	2.09*** (1.43–3.06)	2.20*** (1.46–3.31)	1.29 (0.87–1.92)	1.36 (0.95–1.94)	1.38 (0.92–2.06)	1.23 (0.84–1.81)
Abnormal heart rhythm						
Model 1	1.44** (1.11–1.87)	1.16 (0.84–1.60)	1.31 (0.99–1.73)	1.58** (1.21–2.06)	1.25 (0.91–1.72)	1.24 (0.92–1.68)
Model 2	1.42* (1.07–1.90)	1.15 (0.82–1.60)	1.32 (0.99–1.78)	1.40* (1.04–1.89)	1.18 (0.84–1.64)	1.39* (1.01–1.91)
Stroke						
Model 1	0.99 (0.82–1.20)	1.01 (0.80–1.28)	0.99 (0.80–1.21)	1.11 (0.91–1.34)	1.14 (0.90–1.44)	0.95 (0.76–1.18)
Model 2	1.02 (0.82–1.28)	0.99 (0.77–1.26)	1.02 (0.83–1.26)	1.08 (0.87–1.34)	1.04 (0.82–1.33)	1.00 (0.79–1.26)
Composite CVD						
Model 1	1.42*** (1.26–1.60)	1.34*** (1.16–1.55)	1.13* (1.00–1.29	1.37*** (1.22–1.55)	1.28** (1.11–1.47)	1.13 (0.99–1.29)
Model 2	1.24** (1.09–1.42)	1.19* (1.02–1.39)	1.10 (0.96–1.26)	1.15* (1.01–1.31)	1.08 (0.93–1.26)	1.09 (0.94–1.25)

Note: Odds ratios reported with 95% confidence intervals. Survey weights applied in all models.
Model 1: Unadjusted. Model 2: Adjusted for age, sex, religion, social groups, place of residence, number of household members, and state as fixed effects. Reference category for life course social mobility is Consistently Low.
p<0.05*, p<0.01**, p<0.001***

Table 9: *Sensitivity analysis:* Associations of life course social mobility with cardiovascular risk factors

Regression models	Life Course Social Mobility: Childhood SEP based on family financial position Adulthood SEP based on dichotomized MPCE			Life Course Social Mobility: Childhood SEP based on family financial position Adulthood SEP based on dichotomized household asset		
	Consistently High OR (95% CI)	**Upward Mobility OR (95% CI)**	**Downward Mobility OR (95% CI)**	**Consistently High OR (95% CI)**	**Upward Mobility OR (95% CI)**	**Downward Mobility OR (95% CI)**
Hypertension (measured BP)						
Model 1	1.21*** (1.14–1.29)	1.22*** (1.14–1.31)	1.07* (1.01–1.14)	1.04 (0.98–1.10)	0.94 (0.88–1.01)	1.04 (0.98–1.11)
Model 2	1.02 (0.95–1.09)	1.12** (1.04–1.20)	1.01 (0.95–1.08)	0.94 (0.88–1.00)	0.91* (0.84–0.98)	0.93* (0.87–1.00)
Hypertension (combined)						
Model 1	1.66*** (1.57–1.75)	1.37*** (1.28–1.47)	1.22*** (1.15–1.29)	1.37*** (1.30–1.45)	1.08* (1.01–1.15)	1.24*** (1.17–1.32)
Model 2	1.25*** (1.18–1.34)	1.20*** (1.12–1.29)	1.10** (1.03–1.17)	1.12*** (1.05–1.19)	0.98 (0.92–1.06)	1.03 (0.97–1.10)
Overweight/ Obese BMI						
Model 1	3.72*** (3.48–3.98)	2.12*** (1.96–2.30)	1.71*** (1.59–1.84)	2.98*** (2.78–3.18)	1.74*** (1.61–1.89)	1.87*** (1.74–2.01)
Model 2	2.25*** (2.08–2.42)	1.59*** (1.46–1.74)	1.37*** (1.27–1.49)	2.04*** (1.89–2.19)	1.47*** (1.35–1.61)	1.35*** (1.24–1.46)
Central adiposity (waist circumference)						
Model 1	3.16*** (2.98–3.34)	1.91*** (1.79–2.05)	1.57*** (1.48–1.66)	2.70*** (2.55–2.86)	1.65*** (1.55–1.77)	1.63*** (1.53–1.72)
Model 2	2.22*** (2.08–2.38)	1.59*** (1.48–1.72)	1.35*** (1.26–1.44)	1.98*** (1.86–2.12)	1.42*** (1.31–1.53)	1.29*** (1.21–1.39)
Central adiposity (waist-to-hip ratio)						
Model 1	1.83*** (1.71–1.96)	1.38*** (1.27–1.50)	1.31*** (1.22–1.40)	1.73*** (1.62–1.85)	1.24*** (1.15–1.34)	1.27*** (1.18–1.36)
Model 2	1.57*** (1.46–1.70)	1.31*** (1.20–1.43)	1.23*** (1.14–1.32)	1.52*** (1.41–1.64)	1.22*** (1.12–1.33)	1.17*** (1.08–1.26)
Diabetes						
Model 1	2.92*** (2.67–3.18)	1.76*** (1.58–1.95)	1.70*** (1.54–1.87)	2.44*** (2.24–2.66)	1.53*** (1.38–1.71)	1.90*** (1.73–2.09)
Model 2	1.93***	1.43***	1.38***	1.74***	1.32***	1.40***

	(1.75–2.13)	(1.28–1.60)	(1.25–1.53)	(1.58–1.92)	(1.18–1.48)	(1.27–1.55)
Current excessive alcohol						
Model 1	0.84** (0.76–0.93)	1.14* (1.01–1.28)	0.74*** (0.66–0.82)	0.47*** (0.42–0.52)	0.55*** (0.48–0.63)	0.82*** (0.74–0.90)
Model 2	0.76*** (0.67–0.86)	1.16* (1.01–1.33)	0.67*** (0.59–0.76)	0.50*** (0.44–0.57)	0.67*** (0.58–0.77)	0.67*** (0.59–0.75)
Current smoking						
Model 1	0.61*** (0.56–0.66)	1.03 (0.94–1.12)	0.72*** (0.67–0.78)	0.57*** (0.53–0.62)	0.85*** (0.78–0.93)	0.68*** (0.62–0.73)
Model 2	0.65*** (0.59–0.71)	1.02 (0.93–1.13)	0.74*** (0.67–0.81)	0.56*** (0.51–0.61)	0.79*** (0.71–0.87)	0.71*** (0.65–0.78)
Current smokeless tobacco						
Model 1	0.37*** (0.35–0.40)	0.81*** (0.75–0.87)	0.56*** (0.52–0.59)	0.38*** (0.36–0.41)	0.72*** (0.67–0.78)	0.51*** (0.47–0.54)
Model 2	0.63*** (0.58–0.68)	1.01 (0.93–1.10)	0.70*** (0.65–0.75)	0.56*** (0.52–0.60)	0.84*** (0.77–0.91)	0.70*** (0.65–0.76)
Physical inactivity						
Model 1	1.51*** (1.42–1.60)	1.13** (1.05–1.21)	1.52*** (1.43–1.62)	1.55*** (1.46–1.64)	1.22*** (1.14–1.31)	1.59*** (1.49–1.69)
Model 2	1.25*** (1.17–1.34)	1.08* (1.00–1.17)	1.40*** (1.31–1.49)	1.22*** (1.14–1.30)	1.05 (0.98–1.14)	1.45*** (1.35–1.55)

Note: Odds ratios reported with 95% confidence intervals. Survey weights applied in all models.
Model 1: Unadjusted. Model 2: Adjusted for age, sex, religion, social groups, place of residence, number of household members, and state as fixed effects. Reference category for life course social mobility is Consistently Low. p<0.05*, p<0.01**, p<0.001***

Table 10: *Sensitivity analysis:* Associations of life course social mobility with cardiometabolic risk factors – analyses restricted to individuals without ANY prior cardiovascular disease event

Regression models		**Hypertension (measured)**	**Hypertension (combined)**	**Overweight/ obese BMI**	**Central adiposity (WC)**	**Central adiposity (WHR)**	**Diabetes**
		OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Life Course Social Mobility: Childhood SEP based on family financial position Adulthood SEP based on MPCE	Consistently High	1.02 (0.95–1.10)	1.25*** (1.17–1.33)	2.27*** (2.09–2.47)	2.18*** (2.03–2.35)	1.55*** (1.44–1.68)	2.01*** (1.80 –2.26)
	Upward Mobility	1.10* (1.02–1.19)	1.18*** (1.09–1.26)	1.60*** (1.46–1.75)	1.57*** (1.45–1.69)	1.29*** (1.19–1.41)	1.51*** (1.33–1.71)
	Downward Mobility	1.02 (0.95–1.10)	1.08* (1.01–1.16)	1.38*** (1.26–1.52)	1.35*** (1.25–1.45)	1.23*** (1.13–1.33)	1.41*** (1.25—1.60)
	Consistently Low	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Life Course Social Mobility: Childhood SEP based on family financial position Adulthood SEP based on household asset	Consistently High	0.95 (0.88–1.01)	1.12** (1.05–1.19)	2.04*** (1.89–2.21)	1.97*** (1.84–2.11)	1.52*** (1.40–1.64)	1.73*** (1.57–1.92)
	Upward Mobility	0.91* (0.85–0.99)	0.98 (0.91–1.06)	1.45 *** (1.32–.59)	1.40*** (1.30–1.52)	1.23*** (1.12–1.34)	1.33*** (1.18–1.50)
	Downward Mobility	0.93* (0.87–0.99)	1.03 (0.96–1.10)	1.35*** (1.24–1.46)	1.29*** (1.20–1.38)	1.17*** (1.08–1.26)	1.42*** (1.27-1.58)
	Consistently Low	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Life Course Social Mobility: Childhood SEP based on parental education Adulthood SEP based on MPCE	Consistently High	1.10* (1.02–1.18)	1.32*** (1.23–1.42)	2.44*** (2.25–2.64)	2.43*** (2.25–2.62)	1.60*** (1.46–1.75)	2.05*** (1.85–2.28)
	Upward Mobility	1.03 (0.97–09)	1.14*** (1.08–1.21)	1.55*** (1.45–1.67)	1.55*** (1.46–1.64)	1.23*** (1.15–1.32)	1.48*** (1.35–1.63)
	Downward Mobility	1.03 (0.94–1.14)	1.13* (1.03–1.23)	1.42*** (1.28–1.59)	1.51*** (1.37–1.66)	1.16** (1.04–1.30)	1.50*** (1.30–1.72)
	Consistently Low	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Life Course Social Mobility: Childhood SEP based on parental education Adulthood SEP based on household asset	Consistently High	1.04 (0.96–1.12)	1.20*** (1.12–1.29)	2.26*** (2.09–2.45)	2.25*** (2.08–2.43)	1.60*** (1.46–1.76)	1.81*** (1.64–2.00)
	Upward Mobility	0.94* (0.88–1.00)	1.02 (0.96–1.08)	1.50*** (1.40–1.60)	1.50*** (1.41–1.59)	1.21*** (1.13–1.30)	1.28*** (1.17–1.40)

	Downward Mobility	1.01 (0.93–1.10)	1.14** (1.05–1.23)	1.56*** (1.42–1.71)	1.63*** (1.49–1.77)	1.16*** (1.05–1.28)	1.45*** (1.29–1.63)
	Consistently Low	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Life Course Social Mobility: Childhood SEP based on parental education Adulthood SEP based on own education	Consistently High	1.16*** (1.08–1.25)	1.38*** (1.29–1.48)	2.50*** (2.31–2.70)	2.71*** (2.50–2.93)	1.77*** (1.61–1.95)	1.97*** (1.79–2.18)
	Upward Mobility	1.20*** (1.11–1.29)	1.34*** (1.25–1.44)	2.01*** (1.85–2.19)	2.07*** (1.91–2.24)	1.54*** (1.40–1.68)	1.66*** (1.50–1.84)
	Downward Mobility	1.04 (0.96–1.13)	1.11** (1.03–1.20)	1.37*** (1.26–1.49)	1.30*** (1.20–1.41)	1.08 (0.99–1.19)	1.37*** (1.22–1.54)
	Consistently Low	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.

Note: Odds ratios reported with 95% confidence intervals. Survey weights applied in all models. *WC* waist circumference, *WHR* waist-to-hip ratio. Regression model adjusted for age, sex, religion, social groups, place of residence, number of household members, and state as fixed effects. Reference category for life course social mobility is Consistently Low.
p<0.05*, p<0.01**, p<0.001***

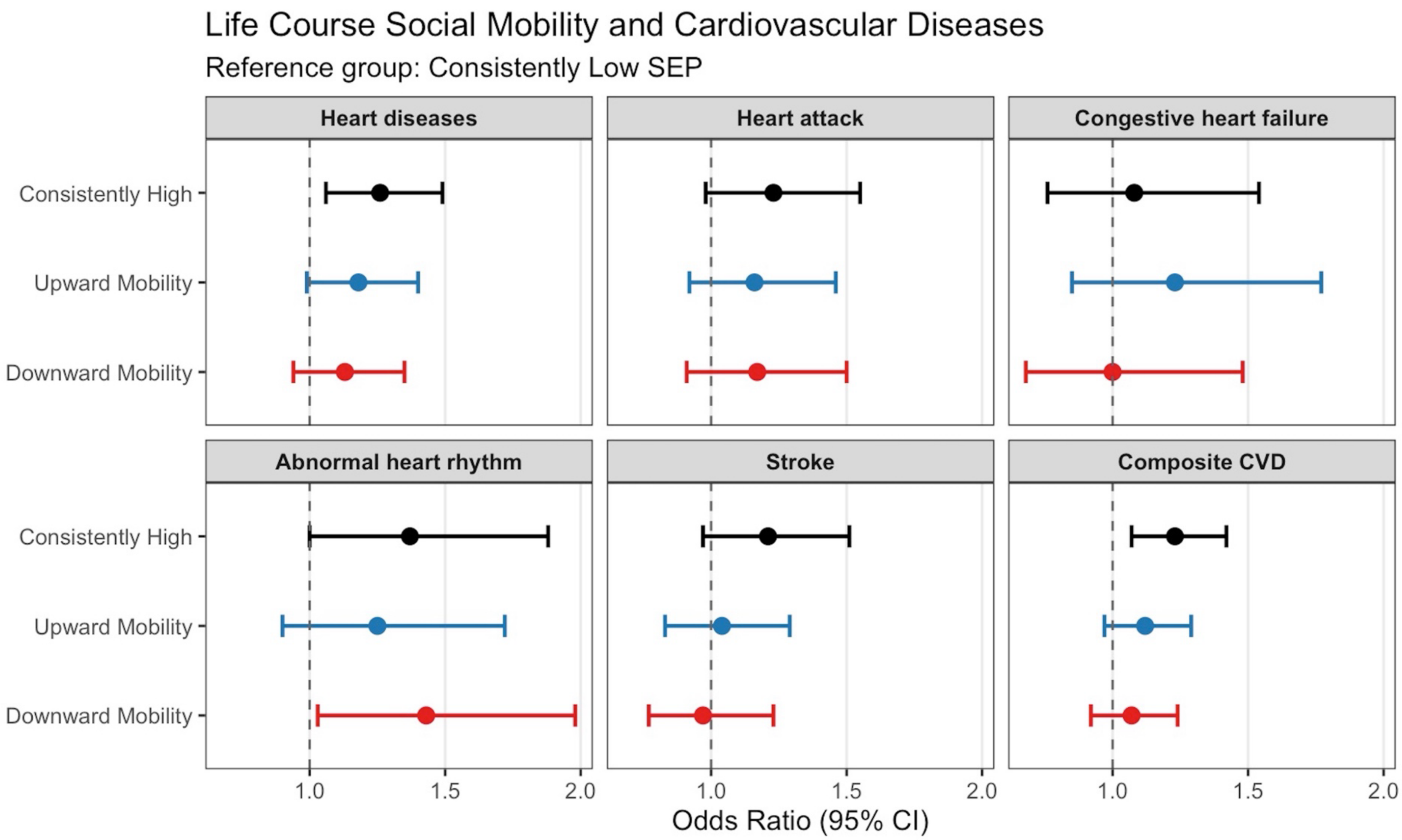

Figure 1: Association of life course social mobility, defined by childhood family financial position and adult household assets as socioeconomic position indicators, with cardiovascular disease after coarsened exact matching. *Note:* Each regression model is adjusted for the coarsened exact matched weights and state/UTs with robust standard errors, given in Table S4. Matching was performed using all covariates as: age (45-54 / 55-64 / ≥65 years), sex (male / female), religion (Hindu/ Muslim/ Christian/ Others), social groups (Scheduled caste/ Scheduled tribe/ Other backward caste/ others), place of residence (rural/ urban), and household members (≤Median household size/ >Median household size).

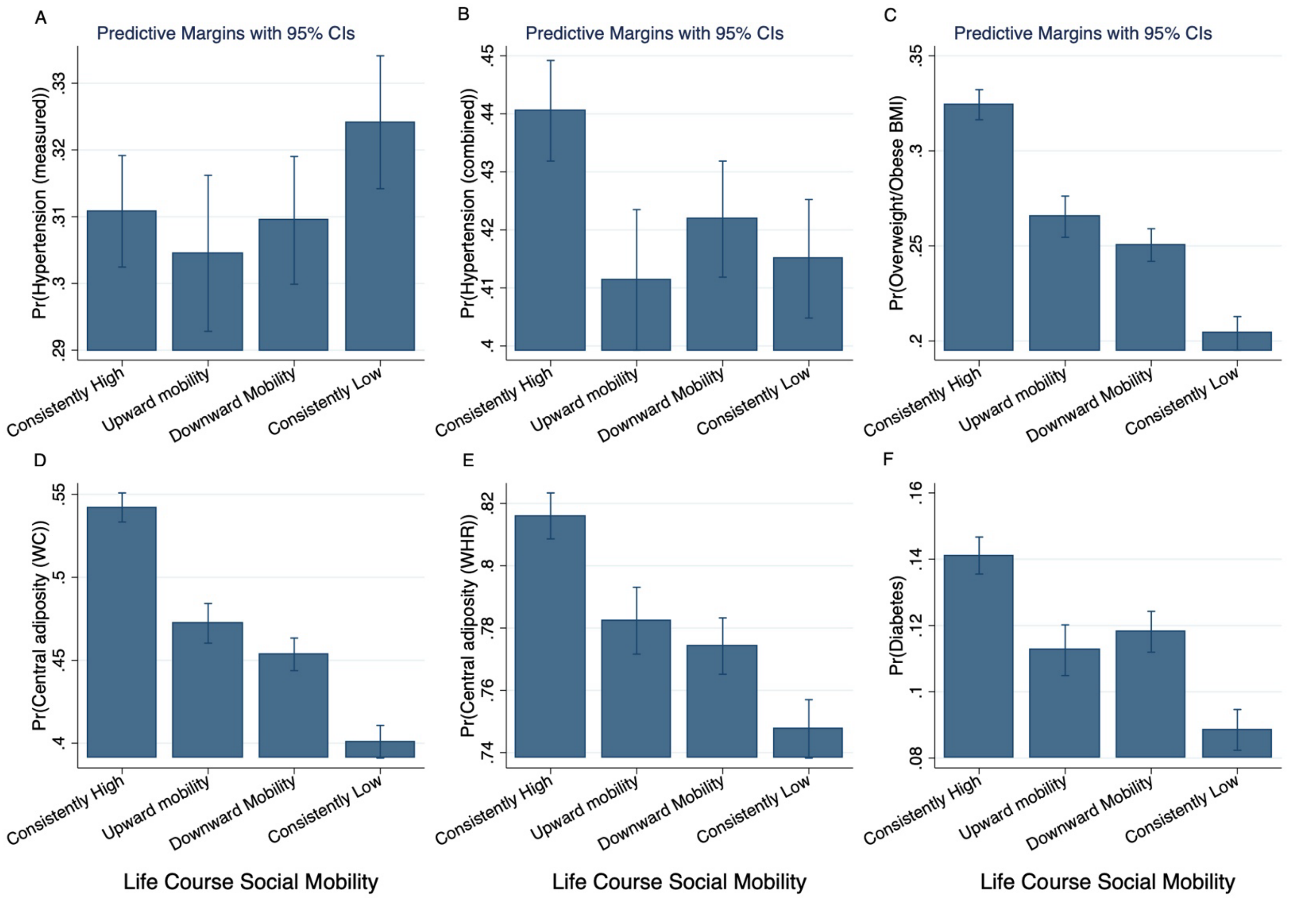

Figure 2: Predicted probabilities of cardiometabolic risk factors across life course social mobility, defined by childhood family financial position and adult household asset as socioeconomic position indicators. (A) Hypertension – measured (B) Hypertension – combined (C) Overweight/obese body mass index (D) Central adiposity – waist circumference (E) Central adiposity – waist-to-hip ratio (F) Diabetes. *Note:* Marginal probabilities are estimated based on the logistic regression model, adjusted for survey weight, covariates and state/UT as fixed effects with robust standard errors, given in Table S5.

Text 1: Validity and Reliability of CVD Outcome Measures

The outcome measures in the Longitudinal Aging Study in India (LASI) Wave 1 (2017-18) were based on self-reported doctor diagnoses, including any heart attack or myocardial infraction, congestive heart failure, abnormal heart rhythm, any heart diseases, and stroke. In large-scale epidemiological studies, CVD events are often defined using self-reported information, as assessment based on self-reported history is cost-effective as well as efficient.[1] A study involving a multi-ethnic Asian population found that the sensitivity of self-reported CVD prevalence was moderate, with higher sensitivity for stroke than acute myocardial infarction. On the other hand, the specificity was high for both stroke and acute myocardial infarction, suggesting self-reported data can effectively rule out CVD events.[2] Another study found a high agreement between self-reporting and health insurance data recorded International Statistical Classification of Diseases-10 codes (Germany) for stroke, atrial fibrillation, and myocardial infarction except for heart failure. Moreover, self-reporting of CVD events was associated with greater underreporting compared to health insurance data record.[3]

Although there are variations across studies assessing the reliability of self-reported CVD events, they continue to remain a vital tool used in large-scale epidemiological study. Previous studies conducted in India,[4] as well as in high-income country settings,[5] suggest that CVD events are unlikely to be overlooked, thereby supporting the reliability of self-reported CVD status in epidemiological study. Therefore, in the worst-case scenario, CVD cases in LASI Wave 1 may have been underreported, resulting in an underestimation of the true prevalence of cardiovascular events.

[1] Saczynski, J. S., McManus, D. D., & Goldberg, R. J. (2013). Commonly used data-collection approaches in clinical research. The American journal of medicine, 126(11), 946-950.

[2] Sabanayagam, C., He, F., Chee, M. L., & Cheng, C. Y. (2024). Validity and Reliability of Self-Reported Prevalent and Incident Cardiovascular Disease Among Asian Adults. Journal of Cardiovascular Development and Disease, 11(11), 350.

[3] Zeynalova, S., Worringen, P., Bassler, S., Martin, A., Czech, K., Greulich, L., ... & Stegmann, T. (2025). A comparison between the self-report of chronic cardiovascular diseases with health insurance data: insights from the population-based LIFE-Adult study. Archives of Public Health, 83(1), 124.

[4] Joshi, R., Chow, C. K., Raju, P. K., Raju, R., Reddy, K. S., MacMahon, S., ... & Neal, B. (2009). Fatal and nonfatal cardiovascular disease and the use of therapies for secondary prevention in a rural region of India. Circulation, 119(14), 1950-1955.

[5] Barr, E. L., Tonkin, A. M., Welborn, T. A., & Shaw, J. E. (2009). Validity of self-reported cardiovascular disease events in comparison to medical record adjudication and a statewide hospital morbidity database: the AusDiab study. Internal medicine journal, 39(1), 49-53.

Text 2: Definition of Modifiable Risk Factors[6]

Hypertension (measured) – An individual was identified has having high blood pressure (hypertension) if the mean of three measurements of systolic blood pressure was above 140 HG/mm^3 or diastolic blood pressure was 90 Hg/mm^3 or above.

Hypertension (combined) – LASI assessed hypertension based on average of three blood pressure measurements; a new variable combining measured hypertension with self-reported use of antihypertensive medication was created.

Overweight and Obesity – An individual was identified as overweight and obese if their body mass index (calculated as weight in kilograms divided by height in meters squared) exceeded 25 kg/m^2 and 30 kg/m^2 respectively.[7]

Central adiposity – Identified using two metrics – waist hip ratio (measured as waist circumference divided by hip circumference in centimetres exceeded 0.9 for males and 0.85 for females) and waist circumference (waist circumference exceeds 90 cm for men and 80 cm for females).[8]

Diabetes – Measure for high blood glucose was self-reported based on the question "Has any health professional ever diagnosed you with diabetes or high blood glucose?". Identification of high blood glucose were restricted to those who were diagnosed by a doctor [MBBS degree or AYUSH (Ayurvedic, Unani, Homeopathy or Siddha)].

Excessive alcohol consumption – Individuals responding 'yes' for at least two of the CAGE questions[9] was considered to consume excessive alcohol. The four CAGE questions are: "Have you ever felt the need to cut down your drinking?", "Have you ever felt annoyed by criticism of your drinking?", "Have you ever had guilty feelings about drinking?", "Have you ever taken a morning eye-opener?".

Current smoking and smokeless tobacco use – An individual was identified as currently "smoking" or using "smokeless tobacco" based on the questions "Do you currently smoke any tobacco products (cigarettes, bidis, cigars, hookah, cheroot, etc.)?" and "Do you currently consume any smokeless tobacco products such as chewing tobacco, gutka, or pan masala?"

Physical inactivity – Based on the ACC/AHA recommendation of engaging in 150 min of moderate intensity aerobic physical activity or at least 75 min of vigorous-intensity activity or an equivalent

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[6] Ambade, M., Kim, R., & Subramanian, S. V. (2023). Socio-economic distribution of modifiable risk factors for cardiovascular diseases: An analysis of the national longitudinal ageing study in India. Preventive Medicine, 175, 107696.

[7] Arnett, D. K., Blumenthal, R. S., Albert, M. A., Buroker, A. B., Goldberger, Z. D., Hahn, E. J., ... & Ziaeian, B. (2019). 2019 ACC/AHA guideline on the primary prevention of cardiovascular disease: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Journal of the American College of cardiology, 74(10), e177-e232.

[8] World Health Organization, 2011. Waist circumference and waist-hip ratio: report of a WHO expert consultation. Geneva, 8-11 December 2008. https://doi.org/10.1038/ejcn.2009.139.

[9] Ewing, J. A., & Rose, B. A. (1970). Identifying the hidden alcoholic [W:] paper read at the 29th International Congress on alcoholism and drug dependence. Australia Butterworth, Sydney.

combination of both in a week, questions on frequency of moderate and vigorous physical activity were administered. Those who reported the frequency as "once a week", "one to three times a month" and "hardly ever" were identified as "physically inactive".[7]

Text 3: Definition of Adulthood SEP

Adulthood SEP based on Monthly Per Capita Expenditure

Monthly Per Capita Expenditure (MPCE) was calculated by considering total household consumption expenditures, encompassing food consumption, non-food consumption, and other non-food consumption.

Adulthood SEP based on Household Asset

We also used overall household asset dichotomized to denote adulthood SEP. The asset module in LASI Wave 1 was answered by the financial respondent on behalf of him/herself, his/her spouse/partner, and other household members, if any. It is defined as the total value of household wealth, which is the sum of all wealth components less all debt components.

Total household asset = (rental security deposits paid + primary residence + other real estate + land + agricultural equipment + livestock + businesses + personal loans + household durables and valuables + financial assets) – (other security deposits received + debt + rental security deposits received)

Text S4: Alternative measures of childhood and adulthood socioeconomic position (SEP)

Alternative measure of childhood SEP

- **Mother's education –** Mother's educational status was classified as no formal education (89.32%) and at least attended primary level school (10.68%)

- **Father's education –** Father's educational status was classified as no formal education (72.90%) and at least attended primary level school (27.10%)

- **Parental education –** Classified based on whether either parent attended school, with high SEP defined as at least one parent having attended school (28.61%) and low SEP defined as neither parent having attended school (71.39%).

Alternative measure of adulthood SEP

- **Educational status –** Self educational status was classified as no formal education (47.05%) and at least attended primary level school (52.95).

- **Dichotomized MPCE –** We dichotomized monthly per capita expenditure (MPCE) using its median value to denote alternate adulthood SEP.