



Adult temporal mobility (2002-2010) in material wealth and physical health, self-perceived health, sociality, and use of addictive substances: Insights from an observational exploratory panel study among Tsimane' Indigenous People in the Bolivian Amazon

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ABSTRACT

Changes in relative socioeconomic rank during adulthood (intragenerational mobility) are increasingly recognized as important determinants of health and other well-being indicators. Quantitative studies in high-income countries find that mobility in rank generally correlates with these outcomes, but the direction and mechanisms remain unclear. Evidence from small-scale societies is scarcer due to limited panel data. We examine the correlation between mobility and well-being indicators among 350 Tsimane' adults (age ≥ 16y: women = 184; men = 166) in the Bolivian Amazon, using nine consecutive years of panel data (2002–2010). Guided by four theories (dissociation [any mobility harms], socialization [people adapt to any new rank], “falling from grace” [extreme downward mobility harms], and set-point [“effects” are temporary]) we assess how changes in quintile rank of material wealth correlate with four aspects of well-being in 2010: physical health, perceived health, sociality, and use of addictive substances. Results showed partial support for each theory and revealed that upward and downward mobility each correlated with a mix of favorable (e.g., lower likelihood of being overweight, greater food satisfaction) and unfavorable (e.g., increased anger) indicators. Importantly, mobility was not associated with most outcomes, lending support to set-point theory and highlighting that any mobility could correlate with tradeoffs in health and other well-being indicators. In sum, as in high-income countries, our findings reveal heterogeneity and ambiguities, and the need for a new theory that acknowledges the simultaneous gains and losses that correlate with socioeconomic mobility.

1. Introduction

This article builds upon two facts of high-income countries. First, material wealth and occupation, two cornerstones of socioeconomic status, correlate positively with each other. Second, both correlate positively with better standards of living (Asadullah, 2012; Meschede

et al., 2016; Steckel, 1990; Varghese et al., 2021). From there, we ask whether moving up or down in socioeconomic rank during adulthood correlates with adults' health and well-being. Some evidence suggests it does. Upward mobility in an adult's wealth rank is positively associated with better physical health (Machado et al., 2021), while occupational intragenerational mobility among adults is associated with changes in

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perceived well-being (Houle, 2011), self-rated health (Khairuddin et al., 2021), and markers of physical health such as mortality (Billingsley, 2012; Billingsley and Böckerman, 2019; Claussen et al., 2005) and allostatic load (Prag et al., 2022). Thus, intragenerational mobility may have implications for health. The associations, however, appear to be context-specific. The rapidly growing body of quantitative research on the association between changes in adult socioeconomic rank and their well-being comes mostly from high-income countries (Shi and Gugushvili, 2025). We know little about these associations in different socioeconomic contexts, particularly in rural areas of low- and middle-income countries (hereafter *Global South*) (Khan et al., 2022; Varghese et al., 2021).

We have two goals for this article. First, we examine how intragenerational changes in wealth rank relate to different dimensions of well-being, which, here and in an earlier publication, we defined broadly to include physical health (e.g., anthropometric indices), perceived health (e.g., emotions, self-reported morbidity), sociality or pro-social behavior, and use of addictive substances but excludes total life satisfaction (Godoy et al., 2024). So defined, health is part of the broader concept of well-being. For the analysis we use yearly panel data among adults (age $\geq$ 16y) covering nine consecutive years (2002–2010) from a small-scale, nature-dependent, highly autarkic society of native Amazonian Indigenous People in Bolivia (Tsimane’). Second, we compare our findings to those from high-income countries.

Like any cross-cultural comparison, careful consideration is needed for at least three reasons. First, there is no universally accepted metric for socioeconomic rank that applies across societies. In high-income countries, mobility in economic rank is measured with changes in occupation or monetary income, and seldom with wealth (Fisher and Johnson, 2020; Shiro et al., 2022). Occupational differentiation among Tsimane’ is minimal beyond gender, and income measurement is problematic given the sporadic circulation of money. Most economic activities involve subsistence production and consumption. We therefore use material wealth as our measure of economic status and changes in wealth rank as our measure of economic mobility among Tsimane’. In the “Contextual information” section of the supplementary material we discuss why we did not use other markers of socioeconomic status among Tsimane’ (e.g., hunting skills). Second, we focus on adults’ (age $\geq$ 16y) intragenerational mobility in privately owned durable material assets or goods for a couple of reasons discussed in supplementary material. Unlike income, material wealth is less susceptible to recall errors. In addition, in our sample wealth can be split into distinct quintiles because all adults owned the material assets we measured, whereas not everyone earned money. For instance, 41% of adults earned no cash in the first year of the panel study (2002). Dividing an economic resource into quintiles facilitates comparisons with studies from high-income countries, where this practice is common. A nine-year observation period is relatively well-suited to capture structural or lasting mobility instead of stochastic fluctuations in mobility that could happen over shorter time spans (Berman, 2022; Jantti and Jenkins, 2015; Naschold and Barrett, 2011), but we recognize that nine years is a fraction of an adult’s total working life. The third reason why the comparison has to be interpreted with caution is because measures of wealth and some outcomes differ between countries of the Global North and Tsimane’. To guide the analysis, we build on theories and quantitative studies of occupational or status mobility in high-income countries.

In an earlier publication (Godoy et al., 2025), we documented patterns of intragenerational rank change in material wealth among Tsimane’ adults (age $\geq$ 16years [y]) that resembled and differed from high-income countries. In both settings, a high share of those in the top quintile did not change rank; 54% of Tsimane’ adults in the top wealth quintile in 2002 remained there in 2010. In the USA (1987–2007), about 60% of those in the top quintile did not move down (Auten et al., 2013). Nevertheless, upward mobility was more common among Tsimane’. Twenty-seven percent of those in the bottom quintile

in 2002 remained at the bottom quintile by 2010. In the USA from 1987 until 2007, half of those in the bottom quintile did not move upward (Auten et al., 2013). Outside the top quintiles, Tsimane’ moved more in the wealth ladder than people in high-income countries. Among Tsimane’, within-person correlation coefficients of wealth rank between 2002 and 2010 were 0.5 for men and 0.3 for women. In the USA, within-person correlations of initial and endline rank in different economic outcomes exceeded 0.8 (Fisher and Johnson, 2020). Furthermore, mobility did not correlate with age among Tsimane’ but did in the USA, where it peaked during the prime working years (Shiro et al., 2022). Here, we build on our prior findings by asking how far wealth mobility among Tsimane’ adults correlates with multiple dimensions of health and well-being.

1.1. Theories and hypotheses about the relation between mobility and health and well-being

We draw on four theories from the behavioral sciences and public health that have emerged over the past century to explain the association between adults’ intragenerational occupational or class mobility and their health and other aspects of their well-being (Breen and Ermisch, 2024; Houle, 2011; Jonsson et al., 2017). In addition to mobility, conditions at origin (baseline) and destination (endline) can also predict outcomes (Shi and Gugushvili, 2025), but we foreground what the theories say about mobility itself. Given the association between wealth and occupational status, we use the theories to frame hypotheses about the association between adults’ intragenerational wealth mobility during the study (2002–2010) and their health and other aspects of well-being at the end of the observation period (2010). Importantly, though distinct, the theories are not mutually exclusive.

1.1.1. Dissociation theory

Dissociation theory predicts that any mobility will harm health and other aspects of well-being. First formulated by Sorokin (1927 [1st edition], 1959), the theory argues that any mobility disrupts social ties and imposes psychological stress as individuals cope with unfamiliar norms and behaviors.

The evidence. Houle (2011) and Breen and Ermisch (2024) reviewed studies on dissociation theory and concluded that tests were hampered by the difficulties of showing causality as they could not untangle the simultaneous associations of origin and destination class, mobility between the two classes, and baseline confounders like health and personality. Several methods have been advanced to overcome the hurdle (see section *Estimation strategy*). A recent study by Prag et al. (2022) using a short panel of nurses in the UK (2010–2012; $n = 4123$) found mixed support. Occupational changes bore no significant correlation with self-reported health but did correlate with stress biomarkers. Downward mobility correlated with worse biomarker profiles, consistent with the theory, while upward mobility correlated with improved biomarker profiles, which is inconsistent with the theory. Hadjar and Samuel (2015) used UK and Swiss panel data spanning ~ 10 years and found no correlation between any mobility and general life satisfaction.

1.1.2. Socialization theory

First formulated by Blau (1956), socialization theory posits that adults learn to cope with new conditions. Upwardly or downwardly mobile people adapt to their new setting and end up with scores in well-being resembling scores of peers in the destination rank more than scores of peers in the origin rank (Jonsson et al., 2017). The theory predicts that health and other well-being indicators will change in opposite directions for upwardly and downwardly mobile people (Claussen et al., 2005).

The evidence. Houle (2011) tested the socialization hypothesis using panel data on subjective well-being that included distressful events and total life satisfaction from 4992 men followed in 1957, 1975, and 1992–1993. He found that upwardly and downwardly mobile adults

coped with their new class and had scores in subjective well-being that fell between the scores of their origin and destination classes. A meta-analysis of the psychological “effects” of mobility lends support to the socialization hypothesis (Islam and Jaffee, 2024); upwardly mobile individuals had less psychological distress than downwardly mobile individuals, yet they had more distress than non-mobile people in the destination group, while downwardly mobile individuals had less distress than non-mobile individuals in the lower destination rank.

1.1.3. Falling from grace

Falling from grace theory predicts that downward mobility, as happens with involuntary unemployment in high-income countries, predicts resentment, depression, self-blame, envy, and can lead to unhealthy behaviors like alcohol misuse (Newman, 1999). The theory does not address the consequences of upward mobility.

The evidence. Newman (1999) interviewed middle-class workers in the USA who had lost their jobs and documented different negative responses to downward mobility, with adverse associations mitigated by community support. Studies by Präg et al. (2022), Houle (2011), Islam and Jaffe (2024), and Dooley et al. (2000) support the correlation between forced downward mobility and worse health and general well-being, at least in the short run. However, a recent nine-year panel of 1568 elder men (age > 70y) in Australia showed that downwardly mobile men had lower mortality risks than those with stable low social mobility, leading the authors to conclude that, at least for mortality outcomes, long-term deprivation may matter more than mobility itself (Tran et al., 2024).

1.1.4. Set-point theory

Set-point theory argues that mobility will not affect health or subjective well-being because these outcomes are hard wired by genes and early life experiences. Although mobility or major life events may temporarily disrupt health and other indicators of well-being, individuals will revert back to their baseline level (Anusic et al., 2014; Headey, 2008; Lucas, 2007; Rzeszutek et al., 2025).

The evidence. Hadjar and Samuel (2015) found no correlation between mobility and general life satisfaction, supporting set-point theory. Zhou et al. (2024) used more than 10 years of panel data from the UK and Australia, and found that job changes correlated with short-term increases in job satisfaction, followed by a return to pre-mobility level after a “honeymoon period.”

1.1.5. Conclusions

First, though we have discussed them separately, the theories are not mutually exclusive. For instance, falling from grace theory could be seen as a special case of downwardly mobile individuals in dissociation or socialization theories. Second, the theories disagree on predictions. For example, dissociation theory predicts that any mobility will harm health and other aspects of well-being but set-point theory says that any mobility will have no lasting effects. Third, all theories find some support, but none find full support. Fourth, with some exceptions (Houle, 2011; Jonsson et al., 2017; Tran et al., 2024), we do not know how well the theories explain results relative to each other because they have been tested individually and using different outcomes. Fifth, few studies have examined whether mobility has offsetting associations with health and other aspects of well-being, such as improvements in one domain (e.g., nutrition) alongside declines in another (e.g., emotional distress). Lastly, none of the theories have been tested in small-scale societies.

This study offers a relevant context for evaluating competing hypotheses about intragenerational mobility and health. By examining adult changes in relative wealth rank over nine years in a setting where material wealth is mostly individually owned, socially visible, and increasingly differentiated in market-integrated goods, the analysis directly engages the mechanisms emphasized by dissociation, socialization, falling-from-grace, and set-point theories. The availability of longitudinal data on multiple dimensions of health and well-being

allows us to assess whether mobility is associated with systematic gains, losses, tradeoffs, or largely null associations, as predicted by these perspectives.

1.2. Tsimane’: health, wealth, and well-being

At the time of our research, Tsimane’ numbered ~17,000 people (INE, 2015) and lived in ~125 villages, mostly along the banks of the river Maniqui, department of Beni, Bolivia (Fig. 1). Our panel included all Tsimane’ living in 13 villages along the Maniqui. The villages varied in proximity to two rural towns (San Borja, Yucumo) (Fig. 1). Tsimane’ livelihood is based on farming, fishing, hunting, and gathering wild forest plants. Tsimane’ are one of the best documented (Godoy, 2025, p. 12) and, at the time of our study, one of the most economically self-sufficient small-scale societies in the rural Global South (Henrich et al., 2010). Since the culture and society of Tsimane’ have been extensively discussed in several books (Godoy, 2025; Huanca, 2008; Reyes-García and Huanca, 2014; Ringhofer, 2010) and in numerous articles, we focus on two aspects directly relevant to this article: health and other aspects of well-being and on wealth. In the section titled “Contextual information” in the supplementary materials, we describe several aspects of the study’s context to better understand the statistical results of the analysis.

1.2.1. Health and other aspects of well-being

Tsimane’ view their well-being as centering on health, food consumption, and sociality (Reyes-García and TAPS Team, 2012). During five quarterly surveys (2002–2003) and the 2004 yearly survey of the panel, we asked all adults an open-ended question about all the events that had made them happy the past week, and, separately, about all the events that had made them sad the past week (Godoy et al., 2024). We did not ask about perceived causes of other emotions (e.g., anger). Respondents could list as many events as they wished. Among the causes of sadness, poor health topped the list (31% of responses), followed by food concerns (21%), and strained social relationships (17%). The leading trigger of happiness was sociality (28%), including events like having visitors or commensal drinking of a home-brewed beverage known as *chicha*, followed by adequate food (24%). Later studies found that poor health correlated with lower total life satisfaction (Reyes-García et al., 2021).

1.2.2. Wealth

The first written record of Tsimane’ material wealth refers to the early twentieth century and comes from observations by the anthropologist Nordenskiöld (1999 [orig. 1926], pp. 107, 175; 2003 [orig. 1922], p. 155). He saw that Tsimane’ material wealth comprised commercial goods (e.g., metal tools), small livestock (e.g., hens), and goods they made (e.g., dugout canoes). He noted that individuals owned assets but had no desire to accumulate them (Nordenskiöld, 2001 [orig. 1924], p. 157). Reyes-García and TAPS Team (2012) found somewhat similar attitudes, but in a study during 2012–2013 (after our panel) of 101 Tsimane’ adults, Schultz (2019) found an increasing interest in material wealth. During our study, there was marked inequality in the ownership of durable assets (Fig. 2). For instance, few adults owned livestock (other than hens), firearms, or wristwatches, but at least 70% owned mosquito bed nets, cotton carrying bags, knives, and cutlasses.

No respondent said they felt happy or sad about owning durable material goods, yet material wealth supports food consumption and sociality, two pillars of Tsimane’ health and well-being. Livestock provides meat and eggs, and the sale of livestock or animal products provides cash to pay for health services. Durable assets like fish nets, fishhooks, firearms, and bows and arrows permit the capture of animal wildlife. Tools like axes and cutlasses facilitate farming, including the cultivation of manioc that is used to brew *chicha* and consumed in public to display sociality (Rosinger and Bethancourt, 2019; Zyberman, 2015). In this setting, material wealth contributes indirectly to health

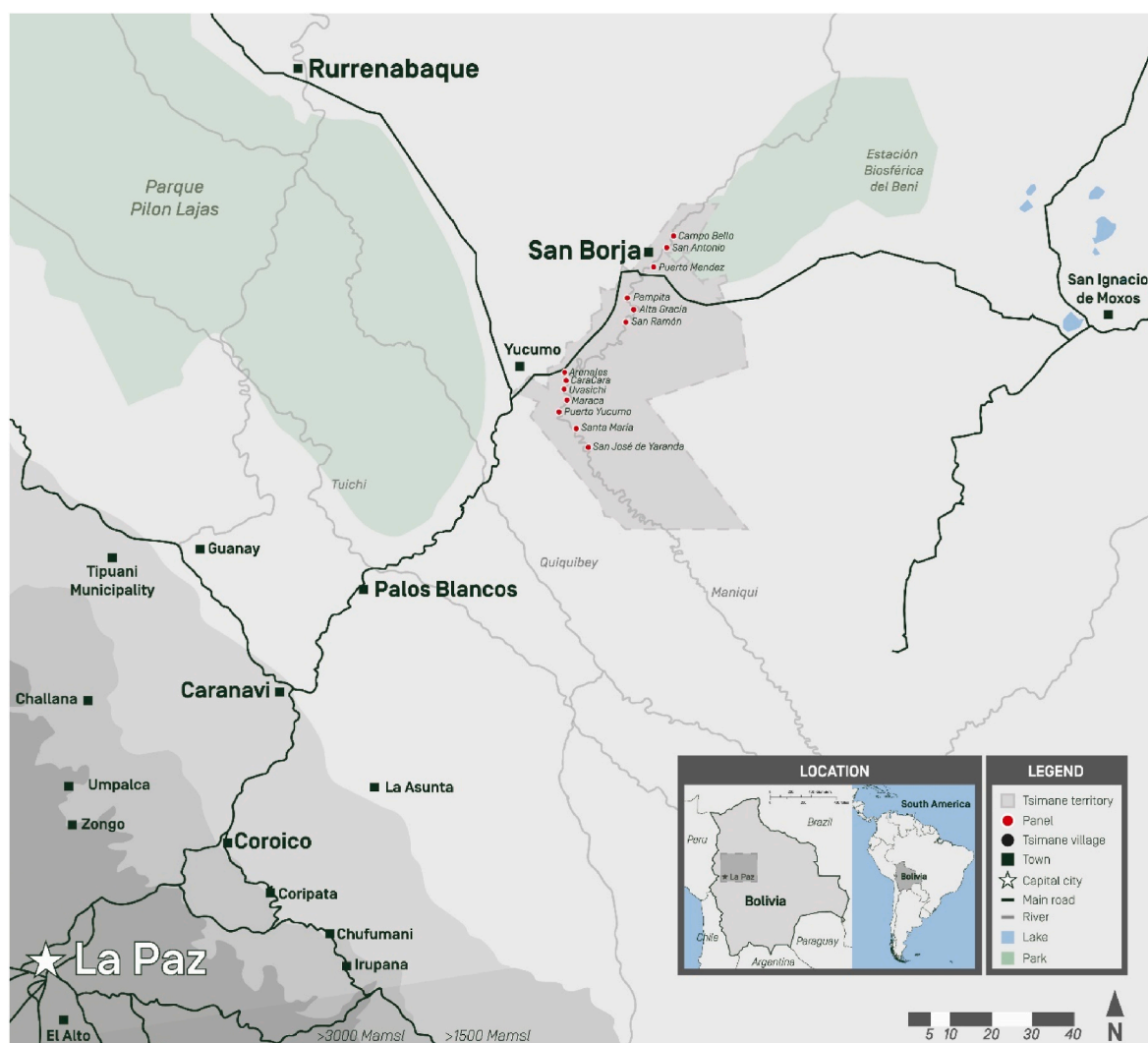


Fig. 1. Map showing location of 13 Tsimane' villages of the nine-year (2002–2010) annual longitudinal study along the Maniquí River, department of Beni, Bolivia. Notes. The shading of the territory denotes elevation (meters above sea level). The square symbols and letters in each town are approximately proportional in size to the population of the town. The 'Tsimane' territory shown in the figure is an administrative division and does not capture all the lands inhabited by Tsimane'.

and well-being by enabling subsistence activities and supporting key domains such as nutrition and social participation.

2. Methods

We analyze temporal trends of individuals rather than of households for two reasons. First, tracking households is harder because households fuse and split (Dasré et al., 2019; Witoelar, 2013). Second, Tsimane' adults in a household own assets individually (Godoy et al., 2006), particularly livestock and market goods (Undurraga et al., 2014). In the supplemental materials section "Contextual information" we expand on the rationale for focusing on individuals. Table 1 contains variable definitions and Table 2 presents summary statistics for the baseline year (2002).

2.1. Definition and measurement of variables

2.1.1. Health and other aspects of well-being

These outcomes were assessed in six ways: (1) physical health measured with anthropometric indicators of short-run nutritional status, (2) self-perceived health measured with morbidity, (3) hedonic dimensions of well-being or feelings experienced in the past week (e.g., general anger, sadness), (4) evaluative measures of well-being or ratings

of how respondents felt about aspects of their life (e.g., diet), (5) sociability, and (6) use of two addictive substances (cigarettes and commercial alcohol). A broad approach is warranted because the literature suggests that mobility affects different aspects of health and well-being, impacts might vary by whether the information comes from self-reports or from physical measurements (Präg et al., 2022), it permits assessing whether mobility in either direction simultaneously correlates with improvements and erosion of different outcomes, and it concurs with the growing consensus that well-being is a multifaceted concept (Alkire et al., 2022; UNDP, 2021).

2.1.2. Wealth

Several studies before the nine-year panel started were used to identify the durable material assets that were measured annually. We inquired about assets commonly owned (e.g., cutlasses) and assets owned by only a small minority (e.g., cattle). Some assets (e.g., TVs) were excluded from the set of assets measured because they were extremely rare at the start of the study. The assets finally chosen included those owned by better-off and less well-off women and men. Assets were grouped into four categories: articles made by Tsimane' from local plants, assets from the marketplace, livestock, and the sum of the monetary value of the first three categories. In the yearly surveys, we recorded the quantity of each asset owned by an adult and multiplied it

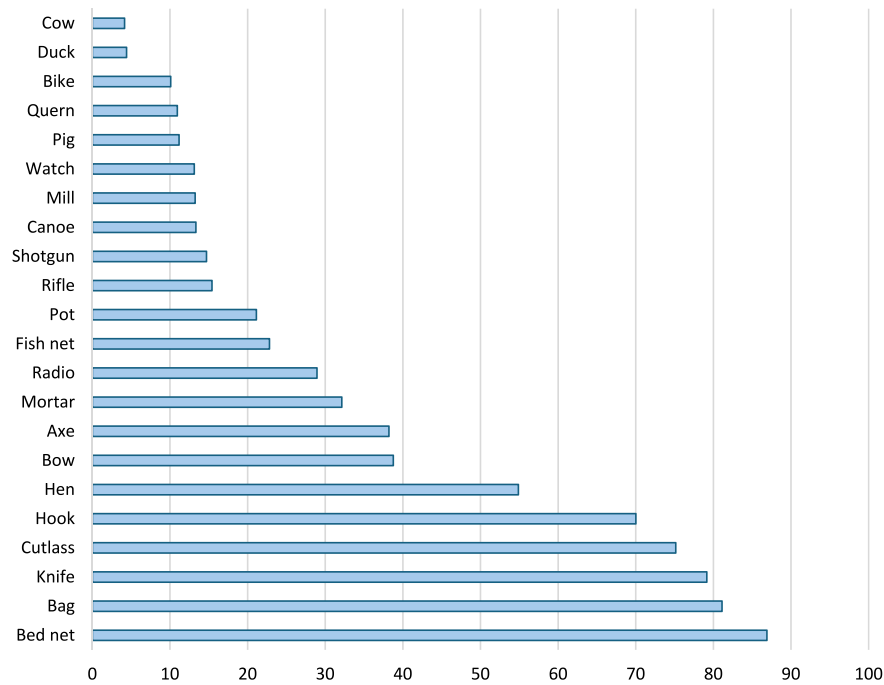


Fig. 2. Percentage of Tsimane' adults who owned each of the 22 assets measured during the yearly surveys, 2002–2010. $N = 5452$ observations. See Table 1 for the definition of material assets and Table 2 for the summary statistics of wealth at baseline (2002).

by the village-specific price of the asset to compute the current nominal value of the asset. We included both durable and productive goods (e.g., firearms, tools) that underpin household food production and monetary income.

2.2. Estimation strategy

Estimates of the association between intragenerational mobility and the outcomes are questioned because it is difficult to rein in the effects of mobility from the effects of origin rank, destination rank, unobserved baseline traits, and structural societal changes in the labor market or public services (Duncan, 1966; Houle, 2011; Shi and Gugushvili, 2025). Two broad approaches are used to address the challenge (Houle, 2011), neither entirely satisfactory with our data. The first approach includes linear regressions and is used to estimate the association between mobility and outcomes while controlling for confounders (Khairuddin et al., 2021). In one variant, a set of three mobilities (up, down, none) is used as predictors, alongside either baseline or endline rank. The approach is limited because baseline rank, endline rank, and mobility are collinear (Houle, 2011). To overcome collinearity, researchers have turned to the Diagonal Reference Model, which compares outcomes of mobile individuals with a weighted sum of outcomes for non-mobile individuals in both baseline and endline ranks (Houle, 2011, p. 765). While this model addresses collinearity, it works poorly with small samples (like ours) and does not overcome the lack of exogenous determinants of mobility needed to estimate causal effects (Shi and Gugushvili, 2025; Tran et al., 2024). Given these constraints, we use the first approach and leave aside attempts to identify determinants of mobility or causality. We sometimes use the word "effect" as a shorthand for associated with or correlated with.

For the main analysis, we estimate the parameters of the linear regression in Eq. [1], which we run with individual adults as the unit of observation and household fixed-effect:

$$WB_{iht=2010} = \alpha + \beta_1 \cdot Up_{ih\Delta t2010-02} + \beta_2 \cdot Down_{ih\Delta t2010-02} + \theta \cdot BR_{iht=2002} + \pi \cdot Control_{iht=2002} + \varepsilon_{iht} \quad (1)$$

The outcome variable *WB* stands for health and well-being in 2010. The variables *Up* and *Down* are binary variables equal to 1 if the individual experienced upward or downward mobility in quintile wealth rank between 2002 and 2010, and equal to 0 if not. *BR* stands for baseline (2002) wealth rank, and *Control* includes sex and baseline age, baseline measure of the outcome, and baseline household size. Subscripts stand for individuals (*i*), dimension of health and other aspects of well-being (*j*), household (*h*), and time (*t*) or year (t2002 or $\Delta t2010-02$). ε is the error term. Non-mobile individuals are the excluded comparison group against which the "impact" of upward (β_1) or downward (β_2) mobility are measured. Standard errors are clustered by households to account for intra-household correlation.

If variables for health and other aspects of well-being were scored such that higher values reflected improvements in outcomes, then the four theories would predict the following:

Dissociation: $\beta_1 < 0$ and $\beta_2 < 0$.

Socialization: $\beta_1 > 0$ and $\beta_2 < 0$.

Falling from grace: $\beta_2 < 0$.

Set-point: $\beta_1 = 0$ and $\beta_2 = 0$.

Although testing all but the falling from grace theory requires joint significance tests for β_1 and β_2 , we focus on the size, sign, and individual significance of each coefficient, as our primary interest lies in the link between mobility and the outcomes. This approach still informs theory; for instance, if $\beta_1 > 0$ and $\beta_2 < 0$, and each was statistically significant, one could reject dissociation theory and accept socialization theory without needing a joint test.

With 20 outcomes, we run the risk of false positives. While principal components analysis could lower the risk by reducing the number of outcomes tested, it has two drawbacks: it diminishes the ability to capture how mobility correlates with specific outcomes and it biases results toward set-point theory, which predicts null associations. In the online Supplementary Material, we report p-values adjusted for multiple hypothesis testing (Appendix A False Discoveries).

Table 1
Definition of variables.

Name	Definition
Outcomes [well-being]	
<i>Health-physical: anthropometric indices (excludes pregnant people)^a</i>	
BMI	Body-mass index (kg/m ²)
Z2SKF	Age-sex Z-score of the sum of 2 skinfolds (triceps and subscapular, mm)
SKF4	Sum of 4 skinfolds (triceps, biceps, subscapular, suprailiac, mm)
ZAM	Age-sex Z-score of mid-arm muscle area (cm ²)
<i>Health-perceived or self-rated (variables are binary [1/0]; 1=name of variable)</i>	
Bed	Adult was bed-ridden in the past 2 weeks
Morbidity	Adult reported being sick or having an illness symptom in the past 2 weeks
Wellness	Current health is good, as opposed to OK or poor
<i>Subjective well-being, Hedonic (variables are binary [1/0]; 1=name of variable). In the past week:</i>	
Happy	Person reported being happy at least once
Sad	Person reported being sad at least once
Anger	Person reported feeling angry at non-family members at least once
Anger-f	Person reported feeling angry at family at least once
Smile	Person laughed and smiled many times during the interview
<i>Subjective well-being, evaluative (variables are binary [1/0]; 1=name of variable). Adult says:</i>	
Clothes	They have enough or plenty of clothing at present
Fish	Respondent says they ate fish sometimes or often in the past week
Food	Respondent says they ate well in the past week, as opposed to OK or poorly
Plots	Current farm plots are in good condition, as opposed to OK or in poor condition
<i>Sociality</i>	
Visit	In past month, adult was visited sometimes or often, as opposed to never visited
Chicha	Adult consumed chicha at least once in past week
<i>Addictive substances</i>	
Alcohol	Adult consumed commercial alcohol in past week (excludes chicha)
Smoke	Person smoked cigarettes in past week
Predictor, wealth (monetary real value of different bundles of material assets)^b	
Total	The sum of 22 assets comprised of Local, Marketplace, and Livestock assets. This is the variable used to measure mobility in most analyses.
Local	5 goods made by Tsimane' women or men from local plants: canoe, mortar, cotton bag, wooden quern, set of bow and arrows
Marketplace	13 goods from the marketplace: axe, bicycle, cooking pot, cutlass, hook (fishing), knife, mill (hand), mosquito bed net, fishing net, radio, rifle, shotgun, wristwatch
Animal	4 domesticated animals raised at home: cow (or bull), duck, hen (or chicken), pig
Controls	
Age	Person's self-reported age (participants were ≥ 16y unless household head)
Male	1 = male; 0 = female
Household	Size of household measured with a head count at baseline

Notes.

^a Byron (2003) and Rosinger et al. (2013) describe the methods used to collect anthropometric data among Tsimane' adults.^b Monetary values are in bolivianos. 1 USD ≈ 7 bolivianos. Nominal monetary values were converted to inflation-adjusted (real) values using Bolivia's Consumer Price Index, retrieved from the World Bank on May 1, 2022: <https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=BO>.

3. Results

Fig. 3 shows mobility across wealth quintiles between 2002 and 2010 for the 350 adults who had wealth data in both years (women = 184; men = 166). Forty one percent (41%) of adults did not change rank, but when they did, more moved up (38%) than down (21%). The level of mobility in either direction was not extreme; 71% of movers shifted by only one quintile. Few adults journeyed from the top to the bottom quintile or vice versa. Fewer than 2% dropped 3-4 quintiles (women = 1.1%; men = 2.4%) and a mere 2.5% rose 3-4 quintiles (women = 1.6%; men = 3.6%). Although the share of men who moved up (39%) was slightly higher than the share of women who moved up (35%), a much larger percentage of women (28%) than men (14%)

Table 2

Baseline (2002) summary statistics for adults (age ≥ 16y) who were also present at endline (2010).

Variable	N	Mean	SD	Median
Outcomes [well-being]				
<i>Health-physical: anthropometrics</i>				
BMI	308	23.26	2.53	23.00
Z2SKF	332	-0.63	0.59	-0.73
SKF4	332	43.81	19.98	39
ZAM	331	-0.63	0.87	-0.62
<i>Health-perceived (self-rated)</i>				
Bed	365	31%		
Morbidity	365	64%		
Wellness	365	33%		
<i>Perceived well-being: Hedonic</i>				
Happy	337	89%		
Sad	337	75%		
Anger	337	41%		
Anger-f	337	41%		
Smile	331	53%		
<i>Perceived well-being: Evaluative</i>				
Clothes	337	36%		
Fish	337	85%		
Food	337	49%		
Fields	334	74%		
<i>Sociality</i>				
Visit	337	59%		
Chicha	334	36%		
<i>Use of addictive substances</i>				
Alcohol	333	22%		
Smoke	334	21%		
Predictor, wealth (in real bolivianos)				
Total	350	1717	1871	1101
<i>By quintiles</i>				
1 (bottom)	69	268	89	280
2	68	574	106	548
3	72	1066	146	1090
4	67	1983	344	2019
5 (top)	74	4509	2237	3861
Controls				
Age	365	34	15	32
Male	365	49%		
Household	142	5.87	2.52	6

moved down. Women have far fewer economic resources than men, fewer years of schooling, lower proficiency speaking Spanish (the national language) (Godoy et al., 2006) and, depending on where women reside, they might not enjoy greater kin support (Martin et al., 2025). These reasons could explain why the share of women facing downward mobility was greater than the share of men.

Table 3 contains the main regression results. Most coefficients capture the percentage-point (pp) probability of a change in the outcome from moving up or down in quintile rank between 2002 and 2010 compared with adults who did not change rank during the same period. The interpretation of the coefficients for anthropometric outcomes (columns 1-4) is different and requires additional information which we provide later.

Four findings stand out. First, mobility was not statistically associated with 15 of the 20 health and well-being outcomes, which is a pattern consistent with set-point theory. Joint significance tests for the mobility variables were also non-significant (bottom of Table 3). Second, we found partial support for dissociation and falling from grace theories. As predicted by dissociation theory, BMI declined for adults who moved up (-0.69, $p = 0.04$) or down (-0.72, $p = 0.06$), and anger at non-family members increased among adults who moved up (0.13 pp, $p = 0.02$) or down (0.19 pp, $p = 0.01$). Limited support for the falling-from-grace theory came from adverse associations of three outcomes among downwardly mobile individuals: BMI (-0.72, $p = 0.06$), anger at non-family members (0.19 pp, $p = 0.01$), and anger at family members (0.12 pp, $p = 0.06$). These emotional responses may reflect psychosocial stress, which has been linked to poorer health in other settings (Staicu

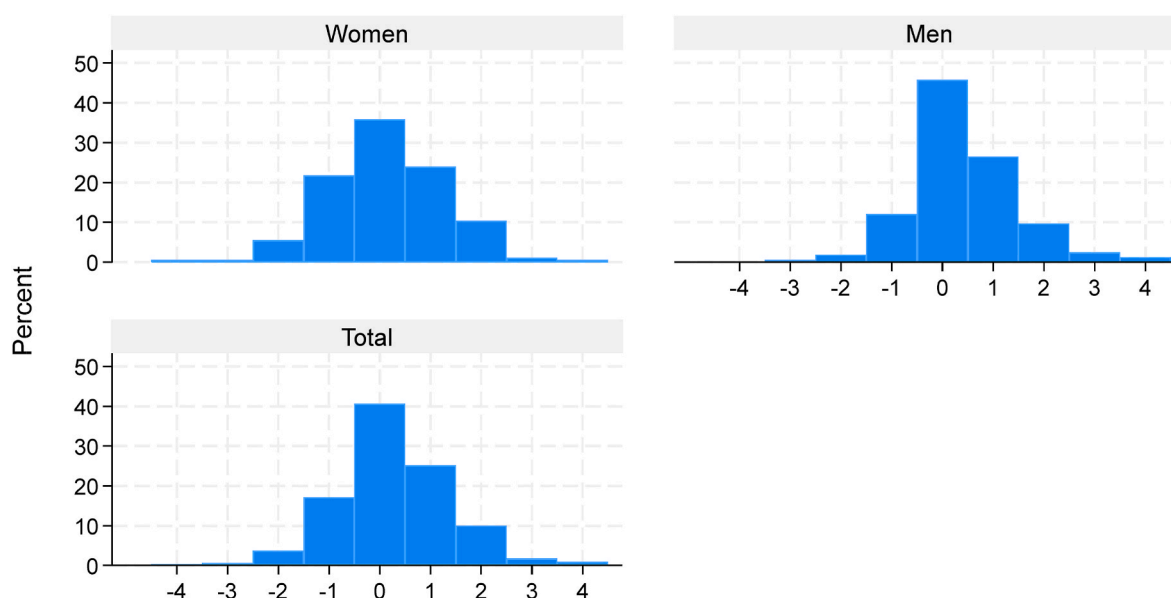


Fig. 3. Change in the number of quintiles in the wealth rank of adults between 2002 and 2010. Total number of adults present in both years: 350 (women = 184; men = 166). X-axis = number of quintiles an adult moved up (+) or down (-).

Table 3

Main regression results (Eq. [1]): Effects of quintile wealth mobility (2002 & 2010) on adult (age $\geq$ 16y) health and well-being.

Variables:	Health: anthropometrics (1-4)				Health: self-rated (5-7)			Hedonic (8-10)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	BMI	Z2SKF	SKF4	ZAM	Bed	Morbidity	Wellness	Happy	Sad	Anger
Up	-0.692** (0.345)	-0.149* (0.089)	-3.196 (2.767)	-0.094 (0.089)	-0.043 (0.070)	-0.009 (0.080)	0.062 (0.074)	0.023 (0.069)	0.073 (0.057)	0.131** (0.056)
Down	-0.729* (0.396)	-0.116 (0.095)	-2.608 (2.679)	-0.067 (0.103)	0.094 (0.076)	0.038 (0.090)	-0.006 (0.066)	0.045 (0.078)	0.075 (0.068)	0.199*** (0.066)
Constant	-1.646 (2.585)	-0.248 (0.229)	14.105 (9.230)	-0.160 (0.296)	0.858*** (0.300)	0.826** (0.398)	-0.224 (0.246)	0.217 (0.363)	0.195 (0.229)	0.008 (0.140)
Observations (# adults)	289	322	322	321	350	350	350	330	330	330
R-squared	0.724	0.522	0.736	0.786	0.056	0.025	0.067	0.060	0.068	0.124
Number of households	177	183	183	183	191	191	191	184	184	184
Up and down (set-point), <i>p</i>	0.019	0.134	0.330	0.499	0.336	0.897	0.687	0.822	0.278	0.003
Variables:	Hedonic (11-12)		Evaluative (13-16)		Sociality (17-18)		Addiction (19-20)			
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
	Anger-f	Smile	Clothes	Fish	Food	Plots	Visit	Chicha	Alcohol	Smoke
Up	0.059 (0.050)	0.055 (0.075)	-0.008 (0.052)	-0.007 (0.026)	-0.002 (0.032)	0.059** (0.029)	0.047 (0.034)	0.057 (0.064)	0.091 (0.071)	-0.006 (0.075)
Down	0.122* (0.066)	-0.061 (0.079)	-0.023 (0.060)	-0.023 (0.037)	0.070 (0.045)	0.026 (0.060)	0.018 (0.059)	0.062 (0.068)	0.123 (0.076)	-0.063 (0.077)
Constant	0.015 (0.231)	0.163 (0.336)	0.272** (0.114)	0.916*** (0.094)	0.100 (0.215)	0.041 (0.196)	0.582*** (0.132)	-0.302 (0.330)	-0.066 (0.248)	-0.135 (0.279)
Observations (# adults)	330	324	330	330	330	318	330	327	326	327
R-squared	0.086	0.069	0.055	0.077	0.111	0.067	0.067	0.295	0.428	0.409
Number of households	184	181	184	184	184	176	184	182	182	182
Up and down (set-point), <i>p</i>	0.039	0.495	0.896	0.826	0.284	0.104	0.374	0.497	0.156	0.715

Notes. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Regressions are household fixed effects with robust standard errors (in parenthesis) clustered by households. The coefficients for “Up” and “Down” represent changes compared with adults who did not change rank. The following variables were included but not shown: sex and baseline values of outcome, age, baseline quintile wealth rank, and household size. The row “Up and down” shows the results of a test of joint significance of the two predictors, which are used to evaluate set point theory. Set-point theory predicts the two coefficients should be non-significant.

and Cuțov, 2010). Importantly, none of the results in Table 3 were statistically significant at conventional levels after adjusting for false discovery rates (Appendix A False Discoveries).

Third, when they occurred, effect sizes were larger for self-reported outcomes than for physical measurements of health. For instance, interpreting BMI changes on a log scale suggests that upward and downward mobility were associated with a 2% or 3% drop in BMI, a difference unlikely to be biologically meaningful at the individual level. Because most (79%) adults had a healthy BMI at baseline

(underweight = 1.6%, overweight = 18%, obesity = 1.2%), we explored whether mobility was linked to the likelihood of underweight (BMI < 18.5), overweight (25 $\leq$ BMI < 30), or obesity (BMI $\geq$ 30). Analyses in the Supplementary Material (Appendix B) show that mobility did not correlate with being underweight or obese, but downward mobility was associated with a 22-percentage point ($p = 0.03$) lower likelihood of overweight; in Appendix B we offer a possible reason for why downward mobility correlates with a lower chance of being overweight. While these individual-level changes appear modest, they can matter at the

population level. In a population with a mean BMI of 23.26 (SD = 2.53), a 0.7-unit shift (~ 0.28 SD) could alter the proportion of individuals crossing into the overweight or underweight categories. Such shifts may reflect changes in diet, physical activity, stress, or economic conditions and have implications for public health.

Lastly, in contrast to physical measures of anthropometry, perceived indicators of health and other dimensions of well-being showed stronger associations with mobility. Moving down was linked to a 19 percentage-point increase in the probability of being angry at non-family members ($p = 0.01$) and a 12 percentage-point increase ($p = 0.06$) in the likelihood of feeling angry at family members.

In additional analyses (Supplementary Material), we checked for the robustness of the main results by testing for attrition bias (Appendix C), sex differences (Appendix D), and interaction associations between mobility and baseline rank (Appendix E). We found small, generally non-significant association. We also extended the analysis by using different types and measurements of wealth (Extension A) and by using monetary income instead of asset wealth to assess economic status and found mostly non-significant results (Extension B). To exploit the full panel, we tested if rank changes from period t to $t+1$ correlated with indicators of well-being in period $t+1$ and found non-significant results (Extension C). To examine dose response, we expanded the analysis of Extension C to assess if the amount of change in rank was a better predictor of outcomes than the binary up or down movement. We found no significant dose response. Lastly, we found almost no interaction associations between age and wealth rank (Extension D).

4. Discussion

We measured the association between intragenerational wealth mobility and indicators of well-being in a small-scale rural society of the Global South and related findings to four leading theories and hypotheses from high-income countries: dissociation, socialization, falling from grace, and set point. To summarize and structure the discussion, we created Table 4, which shows a 2x2 matrix with all the statistically significant results ($p < 0.10$), unadjusted by false discovery rates, from

the main and supplementary analyses about the direct associations between mobility and outcomes. (Interaction associations are excluded from the table). The matrix is organized into (a) two super-rows representing outcomes that improved (top) or worsened (bottom) over the study period, and (b) two super-columns indicating the direction of mobility (upward or downward). Coefficients across cells are not directly comparable, as they may come from different types of regressions.

4.1. Correlation between mobility and health

Two findings stood out. First, moving up or down in quintile rank was associated with a mix of favorable health outcomes (e.g., lower likelihood of being overweight) and unfavorable health outcomes (e.g., more anger). However, most associations of mobility with health suggested an erosion of good health. We stress this point by putting in bold the statistically significant correlations of mobility on health itself in Table 4. BMI and perception of being in overall good health decreased, and the likelihood of having been recently bed-ridden increased. Second, anger consistently surfaced among those who changed rank, both upward and downward; this finding did not depend on the sex of the adults (Appendix D; Table D5, columns 7-8, coefficient Male*Down). The emotional response of anger may reflect psychosocial stress linked to status change, with potential implications for mental health and interpersonal functioning (Sapolsky, 2004).

4.2. Results in relation to theories

Our analyses provide partial support for each of the four theories and do not allow us to reject any of them. The lack of sharp results is not unique to this study. Several case studies and a recent meta-analysis of 12 intragenerational mobility studies also report many null and conflicting conclusions (Shi and Gugushvili, 2025). One reason may be that mobility does not correlate uniformly with health and other aspects of well-being. Rather, upward and downward mobility each correlated with a mixture of favorable and unfavorable outcomes, suggesting

Table 4

Summary of all analyses of the association between adult intragenerational wealth mobility between 2002 and 2010 and outcomes (health and other well-being indicators) in 2010^a.

Well-being	Intragenerational mobility					
	Up			Down		
	Outcome	Coefficient	Source ^b	Outcome	Coefficient	Source ^b
Improves	Plots	0.083*	Table EB2	Z2SKF	0.22**	Table EB1
		0.059**	Table 3	Sad	-0.148**	Table EA7
	Clothes	0.120**	Table EA7	<i>Chicha</i>	0.135*	Table EB2
	Fish	0.096**	Table EB2	Food	0.094*	Table EA6
Worsens	Food	0.072*	Table EA4	Visits	0.85*	Table EA2
	Anger-f	0.062*	Table EA7	Anger-f	0.122*	Table 3
		0.044*	Table EC2		0.098**	Table EA1
	Anger	0.131**	Table 3		0.067***	Table EC2
	BMI	-0.692**	Table 3	Anger	0.199***	Table 3
		-0.866**	Table EA5		0.149*	Table EA5
	Z2SKF	-0.149*	Table 3		0.121*	Table EA7
	<i>Chicha</i>	-0.148**	Table EA2	BMI	-0.729*	Table 3
	Food	-0.071***	Table EC2	Bed	0.175**	Table EB2
				Alcohol	0.149*	Table EA4
				Smile	-0.140*	Table EA3
				Food	-0.071**	Table EB2
				Fish	-0.051*	Table EC2
				Wellness	-0.049**	Table EC2

Notes. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Outcomes in bold indicate statistically significant self-rated and physical measures of health; outcomes in regular font indicate measures of subjective well-being; Table 1 has detailed definitions of each outcome. For anthropometric outcomes, the terms “improves” or “worsens” should be read with care; they stand for an increase or a decrease in the measurement, not necessarily for an improvement. For instance, an “increase” in BMI could worsen the outcome if it pushes people into having obesity.

^a Table 4 excludes results from appendices D and E of interaction terms of mobility with sex (D) or baseline wealth rank (E).

^b The first letter E stands for Extension in the online supplementary material, and the second letter after E refers to the section. The number refers to the table number.

tradeoffs across domains of well-being. The theories appear to capture different facets of the relation between mobility and well-being. Dissociation, socialization, and falling-from-grace theories each help explain some of the statistically significant associations, whereas the predominance of null associations is most consistent with set-point theory.

Dissociation. If dissociation theory were correct, only the bottom half of Table 4 would be filled, but this is not so. Mobility in either direction was associated with costs and benefits. Notably, downward or upward mobility were associated with many adverse mental health outcomes, like a greater likelihood of feeling angry, as would have been predicted by dissociation theory. Nevertheless, mobility up or down was also associated with positive changes in other indicators of well-being, such as greater food satisfaction, a central component of Tsimane' well-being. These mixed associations suggest that mobility may disrupt psychosocial stability while also enabling improvements in perceived material conditions.

Socialization. Results in the top left and bottom right quadrants provide support for socialization theory. Aspects of health and well-being correlated with improvements among those who moved up and correlated with worsening among those who moved down, although no indicator consistently improved and worsened with upward and downward mobility. But the theory posits that we should find no results in the other two quadrants, which we do. For instance, the bottom left quadrant shows that those who moved up had worse anthropometric indicators, and were also angrier, less satisfied with their meals, and less likely to drink commensally. The results in the top right and bottom left quadrants suggest that changes in wealth rank did not systematically mean accommodating to better or worse conditions. Rather, stepping on a new rung in the wealth ladder entailed gains and losses, with indicators of physical and perceived health mostly worsening. This is shown starkly in Fig. 4; 11 of the 16 positive and negative health and other well-being outcomes in the figure moved in the same direction for people who moved up or down.

Falling from grace. The theory deals with the bottom right quadrant of Table 4, which shows that downward mobility correlated with a

worsening of many outcomes, most notably an increase in the likelihood of being angry at family and non-family members. A drop from the top to the bottom half of the income distribution also correlated with lower self-reported overall health and lower food satisfaction. The anger emotional response may reflect psychosocial stress linked to perceived loss of status or unmet expectations. Importantly, downward mobility was associated with a lower likelihood of being overweight, as discussed earlier (Appendix B). These results highlight the importance of considering psychological and physiological dimensions of health when evaluating the correlates of economic mobility. Rather than correlating with unequivocal harm, downward mobility involved tradeoffs that vary across domains of health and other aspects of well-being.

Set point. As noted when discussing Table 3, mobility was not associated with 15 of the 20 outcomes, and effect sizes were modest. Mobility never correlated in a statistically significant way with five outcomes in any of the other analyses (SKF4, ZAM, Happy, Morbidity, Smoke). The conclusion that mobility did not correlate with health and with other indicators of well-being is even stronger once we correct for false positives; no statistically significant associations appeared after adjusting for false positives. That said, interpreting these null results requires caution. While the overall pattern supports set-point theory, the presence of consistent associations with BMI and anger suggests that mobility may still correlate with specific dimensions of health, particularly emotional and nutritional status. Rather than indicating a complete absence of associations, the findings point to selective sensitivity: some domains of health and other aspect of well-being appear more likely than others to correlate with mobility.

Several possibilities could explain the prevalence of null findings. First, there were technical limitations, including a small sample size, possible random measurement errors in self-reported health outcomes (Präg et al., 2022), and modest variation in mobility as 71% of adults who changed rank moved only one quintile. However, consistent associations with objective measures (e.g., BMI) and self-reported emotional states (e.g., anger) suggest that technical limitations are not an entirely satisfactory explanation. Second, regional economic changes could have

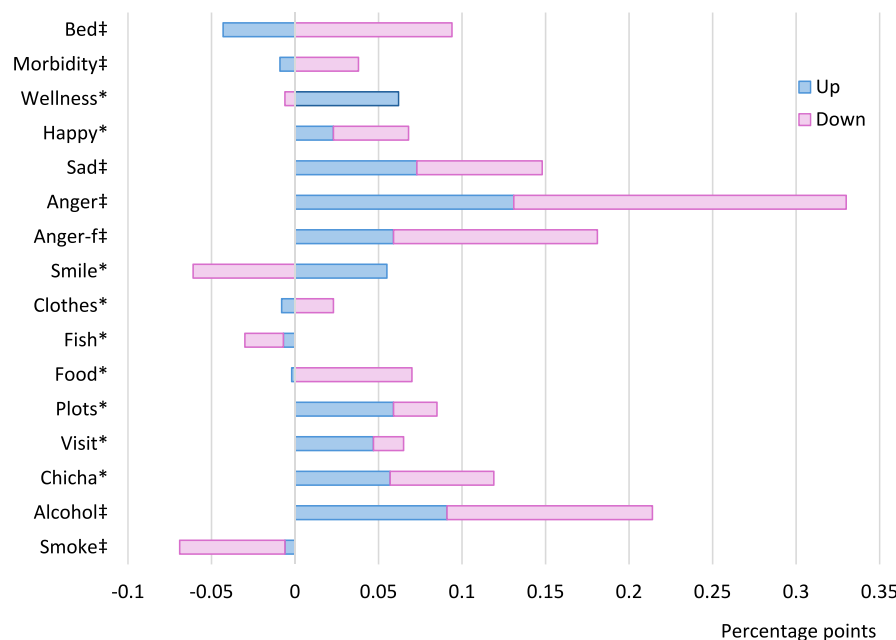


Fig. 4. Effect of mobility between 2002 and 2010 on perceived health and subjective well-being indicators in 2010: comparison between upward and downward mobile people. The figure stacks the coefficients from Table 3 for people who moved up or down in wealth rank between 2002 and 2010. We limit the graph to coefficients expressed in percentage points (X-axis) to facilitate comparison between outcomes. *A higher value indicates a better outcome; ‡A higher value indicates a worse outcome. Only five outcomes moved in different directions for people who moved up or down, consistent with socialization theory: Bed, morbidity, wellness, and satisfaction with clothes and food.

mutated the impact of mobility (Shi and Gugushvili, 2025). For instance, the spread of several government cash transfer programs and health services could have facilitated asset buildup and softened the blow of downward mobility. Third, the social context of mobility probably played a role. Unlike high-income countries, where mobility in occupation or class often changes residence, values, and membership in social groups, during our study among Tsimane' there was minimal occupational differentiation (other than teaching), limited emigration, and strong endogamy. A person who moved up or down in wealth rank remained surrounded by largely the same kin and community members. Fourth, norms of sharing assets could dampen the associations of mobility (Reyes-García et al., 2016). Elsewhere we show that Tsimane' who lacked assets were more likely to borrow them (Godoy, 2025, pp. 167–168). For further discussion of these points see “Contextual information” in the Supplementary Material. Though reasonable, sharing and group relatedness are not entirely convincing explanations because downwardly mobile adults were more likely to feel angry, even if they were surrounded by kin and lenders. One reason for this anomaly could be that adults used different reference groups besides villagers to judge their quality of life. Other reference groups could include Tsimane' living in towns or Bolivian nationals visiting their lands. Such comparisons may correlate with psychosocial stress independent of local material conditions. Another reason for why sharing and anger could go together is that the degree of sharing varies by asset type. Traditional tools and subsistence-related goods are more easily borrowed or shared than modern, expensive, or personally identifiable assets (e.g., wrist watches, shotguns). Consequently, sharing may mitigate absolute deprivation while leaving intact relative differences in visible wealth, which are more relevant for psychosocial responses such as anger.

Much of the evidence linking intragenerational mobility to subjective well-being comes from national-level studies in high-income countries, where upward mobility is often associated with improvements in self-reported health and life satisfaction, and downward mobility with psychological distress. In contrast, our results show predominantly weak or null associations across multiple domains of well-being, with limited evidence of consistent gains or losses following rank changes. This suggests that mechanisms emphasized in the national-level literature (e.g., status anxiety) may be attenuated in small-scale societies characterized by high social proximity, kin support, and shared access to resources. The presence of domain-specific responses (e.g., anger or anthropometric outcomes) suggests partial alignment with existing theories, while underscoring the need to consider context when extrapolating findings beyond industrial nations.

5. Conclusions

Anger may be a sensitive barometer of rank change, although the statistical significance of results on anger do not survive multiple hypotheses corrections. The result aligns with cross-cultural studies, which find that anger arises even in the midst of reciprocity both in giving and receiving material items like water (Wutich et al., 2022) and point to a new approach to the study of intragenerational mobility. Taken together, our findings suggest that theories of subjective well-being, largely developed using national-level populations in high-income countries, may place too much emphasis on unidirectional or uniform responses to socioeconomic mobility. In this small-scale society, mobility is associated with domain-specific and sometimes offsetting changes in well-being, indicating that disruption, adaptation, and set-point mechanisms may operate simultaneously rather than competitively. Recognizing such tradeoffs may help refine theories of subjective well-being so they better account for contexts characterized by high social proximity, visible material differences, and partial market integration.

New approaches would need to address three conceptual and methodological challenges. First, the theories would need to be framed so they are testable not only in small-scale rural societies but also across

societies in the Global North. Second, methods would have to be developed to measure outcomes and economic resources in comparable ways so they produce cross-culturally valid conclusions. Lastly, to test the theories will require panel data on economic resources and outcomes. Panel datasets have expanded worldwide, but thus far have made modest inroads in small-scale societies of the rural Global South (Bauchet et al., 2026).

CRedit authorship contribution statement

Jonathan Bauchet: Conceptualization, Formal analysis, Writing – review & editing. **Ricardo Godoy:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Writing – original draft, Writing – review & editing. **William R. Leonard:** Conceptualization, Data curation, Funding acquisition, Methodology, Writing – review & editing. **Victoria Reyes-García:** Data curation, Formal analysis, Investigation, Writing – review & editing. **Asher Y. Rosinger:** Conceptualization, Formal analysis, Investigation, Methodology, Writing – review & editing. **Eduardo A. Undurraga:** Conceptualization, Formal analysis, Investigation, Methodology, Visualization, Writing – review & editing.

Ethical statement

The studies received IRB approval from Northwestern and Brandeis University. The study also obtained approval from the Tsimane' Council (the governing body of Tsimane' along the river Maniqui), village authorities, and informed consent was obtained from respondent.

Declaration of competing interest

The authors declare no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.socscimed.2026.119696>.

Data availability

The processed and coarse panel data are available at several digital public repositories (Appendix A in Godoy, 2025). In Mendeley Data we will archive the processed Stata file and the two Stata computer files (do files) with the codes that generated the statistical results of the article.

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