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Healthy eating in life course context: Asymmetric implications of socioeconomic origins and destinations

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ABSTRACT

Though extensive research links childhood and adult socioeconomic status (SES) to various dimensions of physical and mental health, little of it has examined diet quality, a key health behavior with implications for chronic disease and longevity. Drawing from life course and social mobility perspectives, we investigate how different configurations of SES origin and destination explain variations in the diet quality of American adults. Results from linear regression analyses using the Midlife in the United States (MIDUS) Study indicate that higher SES in both childhood and adulthood is associated with elevated diet quality, while low SES at both time points predicts lower quality. Downward mobility is linked to poorer diet quality only for those who fall to the lowest rung of adulthood SES. Upward mobility, on the other hand, shows no discernible benefits, even for those who rise to the highest SES quartile. Most remarkably, we identify an enduring benefit of early SES advantage that persists despite downward mobility, suggesting the importance of class-based health dispositions cultivated in the family, neighborhood, and peer groups of one's youth. We discuss these origin and destination asymmetries in light of life course theory and health lifestyles, emphasizing how early advantage interacts with broader social forces—such as the 'default American lifestyle'—to shape diet quality across adulthood.

1. Introduction

Nearly 50% of American adults suffer from one or more chronic diseases linked to poor-quality diet (M. M. Wilson et al., 2016). An unhealthy diet significantly contributes to risk factors such as obesity, cardiovascular disease, type 2 diabetes mellitus, and certain types of cancer (Mann, 2002; Wirt and Collins, 2009). Adopting a high-quality diet that is rich in vegetables, fruits, and whole grains is important to prevent adverse health outcomes and optimize wellbeing (Post et al., 1997).

Though the many chronic health problems influenced by diet are understood to have origins early in life, surprisingly little research has investigated how socioeconomic status (SES) from childhood and adulthood jointly shape diet quality. Studies from multiple countries consistently report that adults disadvantaged in education, income, or occupational prestige score lowest on healthy eating indexes (Atkins et al., 2015), while those growing up in higher socioeconomic gradient households go on to report healthier diets (J. E. Wilson et al., 2022). Broadly speaking, common explanations for these associations center on the financial cost differences between nutritious and energy-dense foods (Drewnowski and Darmon, 2005), or on how class-based cultural distinctions guide eating choices (Wills et al., 2011). Still, only a handful of studies shed light on how different configurations of socioeconomic origin and destination influence what people eat.

Patterns of socioeconomic stability and transition from childhood to the adult years raise several important puzzles for the life course study of diet. Childhood dis/advantage is said to exert a "long arm" on future health (Haas, 2008; Hayward and Gorman, 2004); yet the conditions for which early life exposures are determinative—independently of subsequent life circumstances—appear to be outcome-specific, likely differing from one health behavior to the next. That is, we still lack a clear picture of the extent to which poor diet is a truly "modifiable" risk factor for disease; for instance, whether upwardly mobile people come to embrace a salubrious health lifestyle improved from their point of origin. Are the long-term diet problems associated with early low socioeconomic standing canceled out by later high socioeconomic attainment? Are the dietary advantages associated with socioeconomic advantage realized only when such privilege is maintained from childhood onward?

While arguably all health behavior—exercise, smoking, drug use, disease screening, sexual behavior—is structured by socioeconomic

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conditions, diet is unique as a universal feature of daily life experienced from life's outset. Food has a habitual, direct, and sensory-rich pathway to the brain's reward systems and emotional circuitry (Alonso-Alonso et al., 2015; Nicklaus, 2020), and taste profile preferences begin well before conscious internalization, indeed in utero (Mennella et al., 2001). As such, the early socioeconomic patterning of eating may be relatively durable, even amidst eventual life course changes in material allowances and constraints.

Drawing from life course and social mobility perspectives, the present study investigates how different configurations of SES origin and destination explain variations in American adults' diet quality. Our analysis pursues the following research questions: 1) during childhood and/or adulthood, what is more consequential for American adults' diet quality, being in an advantaged or disadvantaged socioeconomic position? and 2) what is the relative importance of socioeconomic origin vs. destination on diet quality? We use publicly available longitudinal data from the Midlife in the United States (MIDUS) study to investigate socioeconomic transitions from childhood to adulthood and their associations with diet quality. To our knowledge, this is the first study to investigate these questions in the US context across diverse age-groups. Further, our analysis of SES transitions features a more expansive set of origin and destination categories than in existing studies, allowing us to understand the independent role of socioeconomic conditions at childhood and at mid-to older-adulthood.

2. Background

2.1. Life course perspectives on health and health behaviors

Life course scholars demonstrate that childhood factors, including socioeconomic status, have lasting effects on various aspects of adult health, including health behaviors. Researchers emphasize four key models to explain the link between childhood SES and later health outcomes. The critical period model suggests that early life has long-term, possibly irreversible effects on health (Barker, 1999). Meanwhile, the accumulation of risks model posits that lifelong exposure to adverse conditions additively increases health risks at each life stage (Ben-Shlomo and Kuh, 2002). The pathway model highlights the significance of the childhood environment in shaping life trajectories, which elicit distinct profiles of health-related risks and benefits (Haas, 2008), while the social mobility model asserts that adulthood circumstances can alter the impacts of childhood experiences and vice versa. For instance, upward mobility can improve adult health by mitigating early disadvantages, whereas downward mobility can heighten health risks despite a favorable start in life (Hallqvist et al., 2004; Yang et al., 2017).

These four models are best seen as overlapping and complementary, unable to be disentangled in a statistical model, but together implying that both childhood and adulthood periods must be considered as health inputs. We incorporate the life course framework chiefly through the lens of mobility, the predominant life course model currently used in existing nutrition research to understand how childhood conditions shape adult nutrition in existing research.

2.2. Mobility and health

Though only a handful of studies on healthy eating have given attention to mobility over the life course, a longer tradition of research in the sociology of health has considered such processes. Briefly, we organize theoretical explanations of social mobility and health into a two-way scheme. The first dimension of this scheme is the *explanatory emphasis*, namely whether mechanisms invoked rest primarily on social origin, social destination, or the process of going from one to another. The second dimension is *explanatory valence*, wherein the focus is on either health advantage or disadvantage.

One of the most common origin-focused explanations is based on Bourdieu's concept of the *habitus*. This theory emphasizes that early life experiences, including family background, social context, and neighborhood, shape an individual's behavior in multifaceted ways. These early experiences establish taste preferences that persist throughout one's lifetime, remaining deeply ingrained and resistant to change (Mennella et al., 2001; Wills et al., 2011). Habitus operates without conscious deliberation, reflecting the social and cultural contexts that influence individuals' behaviors (Bourdieu, 1984). This concept applies to both advantaged and disadvantaged childhood socioeconomic situations, affecting lifestyle behaviors such as smoking, drinking, exposure to secondhand smoke, nutrition, and medical care (Bulczak et al., 2022; Wills et al., 2011). Thus, habitus illustrates how early life imprints endure and continue to influence behavior despite changes in social conditions throughout life.

Destination-focused theories portray adulthood conditions as pulling people toward the norms of their acquired social position or forcing them to reckon with a mismatch between their present and their past. The most common expression of this idea is *acculturation theory* which suggests that mobile individuals adapt to the social expectation of their socioeconomic position, experiencing minimal challenges to assimilation (Präg et al., 2022). As with habitus, this theory's explanatory valence applies to endpoints of both socioeconomic advantage and disadvantage. The implication is that upwardly mobile individuals will enjoy benefits of improved health behavior, while those downwardly mobile will succumb to worsening health behavior. *Disassociation theory*, by contrast, points to scenarios where someone's SES destination is misaligned with their starting point, producing a struggle for adjustment to the normative expectation of the destination class (Sorokin, 1927). The end product in this process would be psychological maladjustment and poor mental health (Houle and Martin, 2011).

Finally, we recognize two process-oriented theories, namely *falling from grace* and *rising from rags*. These theories, opposite in explanatory valence, emphasize the journey of social mobility more so than the destination itself. The former theory posits that downward mobility, particularly in success-driven societies, can lead to self-blame and distress due to involuntary status loss like job loss or demotion (Newman, 1999). The latter proposes that upward mobility is psychologically empowering, as boosts in personal confidence and a sense of control accompany a trajectory of growth and improvement, thereby enhancing well-being (Gugushvili et al., 2019). Notably, our review of the literature reveals that these two process-oriented theories primarily focus on mental health and psychological well-being, with uncertain application to health behaviors.

One of the perennial analytic challenges of mobility models is the difficulty of separating the process of mobility from the contribution of origin and destination, both of which may have an additive and accumulating impact on health outcomes, as recognized in the life course framework. We give focus to both origin and destination, namely distinct combinations of them. In other words, we are not merely interested in knowing whether someone experienced a fall or rise in SES. Rather, we aim to understand specific transitions, such as whether individuals drop from a position of advantage to a middle SES rung, or shift downwards into disadvantage from somewhere higher up the SES hierarchy. Likewise, we seek to account for circumstances where there is no apparent transition; i.e., origin and destination position are identical.

In undertaking this approach, we hypothesize that childhood SES plays an integral part in explaining how mobility transitions are linked to healthy eating. Unlike smoking or drinking, health behaviors which typically crystalize in or around the transition to adulthood (Cockerham, 2005), dietary intake is a universal feature of human life—and one whose patterns take shape before children have much agency over their own choices (Wills et al., 2011). For instance, mothers whose diets are low in salt and sugar and high in vegetables steer the taste profiles of infants in healthy directions through biological mechanisms involving amniotic fluid and breastmilk. These, along with other early feeding practices, imprint lifelong taste preferences (Mennella 2014). As such,

healthy eating may be especially tethered to socioeconomic origins in a way more fundamental than many other health behaviors.

Our hypothesis regarding the overriding role of socioeconomic origins would be supported in either of the following scenarios: (a) if early life SES continues to have an impact regardless of subsequent SES positioning; or (b) if early life SES is essential for adult SES-related healthy eating (dis)advantages to fully manifest (in other words, if consistent SES is necessary to observe SES gradients in healthy eating).

2.3. Gaps in prior research and goals of current study

Prior research on social mobility and healthy eating has produced mixed results, with some studies suggesting that movement between SES categories significantly impacts diet quality, while others emphasize the importance of life course continuity. One study using a non-probability sample from Northeast England showed that any movement from adolescence to adulthood was inversely related to bread, cereal, and potato intake but was not significantly related to other aspects of diet quality (Lake et al., 2006). However, the study did not address the impact of stability in SES. These findings contrast with another analysis from England, which tracked adults into their 60s and 70s and found that people in a stable non-manual occupational category reported healthier eating compared to those in a stable manual category. This study, however, revealed no significant improvement or decline associated with any form of mobility (manual to non-manual or vice versa) (Atkins et al., 2015). A similar conclusion was reached by an earlier British study that also used a bifurcated social class transition scheme (Mishra et al., 2004).

A more recent analysis expanded the conceptualization of socioeconomic position to include five categories, encompassing stability along a wider SES continuum across the life course (stable low, stable intermediate, stable high), while also documenting any shift upwards or downwards across SES quartiles from childhood to young adulthood in Australia (J. E. Wilson et al., 2022). Contrasting with earlier studies, the authors found that the stably highest SES participants had better eating quality compared to other stable groups, while those who experienced a drop across SES quartiles from childhood to adulthood had lower eating quality. Upward changes were not conclusive. While this study attempted to disentangle origin and destination effects from mobility processes per se, it only partially achieves this goal because it traced socioeconomic changes without specifying the exact nature of the shifts (where someone falls *from* or rises *to*).

In addition to more comprehensively detailing the configurations of SES origin and destination, the present study offers two significant contributions to the existing literature. First, prior studies are constrained by age-restricted samples, resulting in an incomplete understanding of SES transitions and diet. This study addresses this limitation by utilizing data on adults spanning five decades. Second, despite the higher prevalence of diet-related health risks, such as obesity and cardiovascular disease in the US compared to other developed countries (Janssen et al., 2020), this national context remains underexplored. The widespread availability of energy-dense foods and the limited access to healthy options in the US underscore the necessity of examining diet quality in relation to socioeconomic status (Otero et al., 2015).

3. Data and methods

3.1. Data and sample

We analyze data from the Midlife in the United States (MIDUS) study, a nationally representative longitudinal study examining the health and well-being of middle-aged and older adults. MIDUS I (1995–1996) recruited 7108 non-institutionalized, English-speaking adults aged 25–74 from the 48 contiguous US through a national random-digit-dial sampling method (Brim et al., 2004; Love et al., 2010). The study also included selected sibling pairs (n = 950), twins (n = 1914), and city oversamples (n = 757) to facilitate additional comparisons. For this analysis, we merged data from the publicly available MIDUS I core survey with the MIDUS II biomarker study (2004–2009), which contains detailed dietary information, resulting in an analytic sample of 1054 participants.

In the baseline survey, all respondents were recruited by telephone to participate in the study. These respondents completed a telephone interview and a self-administered questionnaire. The response rate for the telephone interview was 70% and among these individuals, about 87% completed the self-administered questionnaire. About 75% of surviving respondents from the baseline survey participated in a follow-up wave (Miller et al., 2020). Biomarker data were collected from a sub-sample of the core longitudinal survey respondents. Participants in this MIDUS II biomarker branch of the study travelled to a general clinical research center for a hospital visit (Love et al., 2010). Dietary data were collected during this visit, taking place between 2004 and 2009 (Ryff et al., 2022).

MIDUS is the most appropriate data source for our analysis because it is the only major American longitudinal study with comprehensive life course socioeconomic measures to thoroughly assess dietary intake. Nutrition-focused surveys, such as the Nutritional Health and Nutrition Examination Survey (NHANES), lack detailed information about childhood socioeconomic status, while other major longitudinal studies tracking people's socioeconomic origins from childhood to adulthood offer only cursory, if any, coverage of diet and nutrition.

3.2. Dependent variable

We evaluate the overall quality of dietary intake, using the MIDUS-Healthy Eating Index (MIDUS-HEI), obtained from information collected in the MIDUS II biomarker study (Berkowitz et al., 2023). Participants completed a medical history questionnaire that included questions about their dietary habits, specifying serving sizes and the frequency of consuming various foods and beverages on an average day or week. Participants were asked about 10 food items, each of which was assigned a separate score. These items included vegetables and fruits (combined), whole grains, oily fish, lean meat, non-meat protein food, beef or high-fat meat, sugared beverages, fast food, alcohol, and fermented dairy. Participants received a higher score for more frequent intake of the first five items, while moderate intake yielded maximum score for alcohol and fermented dairy. Frequent intake of beef or high-fat meat, sugared beverages, and fast food resulted in a lower score. Daily servings were reported for vegetables and fruit, whole grains, sugared beverages, and fermented dairy products, while weekly consumption was reported for oily fish, lean meat, non-meat protein, beef or high fat meat and fast food. Alcohol intake was reported in terms of frequency and quantity. A composite score was derived from the 10 food items, theoretically **ranging from 0 to 11 (a higher score indicates better diet quality)**. A detailed scoring guide for MIDUS-HEI is provided in the Appendix, Table A1.

3.3. Childhood and adult SES measures

To characterize socioeconomic origins and destinations, we modify the procedure outlined in Yang et al. (2020), which generates SES scores for childhood (asked retrospectively) and adulthood from a set of questions included in MIDUS I. Childhood SES is determined by parental education (selecting father or mother's maximum value, from the categories < high school, high school graduate, some college, college graduate and higher), parental occupational socioeconomic index (SEI; a score combining occupational earnings and education, calculated by matching recalled parental jobs to three-digit Census Occupational Codes, see Hauser and Warren, 1997, and using the higher score of father or mother), recollected financial wellbeing while growing up (reverse-coded from 1 to 7 so that higher score correspond to better financial wellbeing), and whether the family was on welfare during the

respondent's childhood (reverse-coded so that receiving welfare = 0, not on welfare = 1). These four measures were then normalized to a scale of 0–1 and summed. Subsequently, we divided participants into four quartiles based on their composite childhood SES score.

Similar to the approach for childhood SES, respondents' current educational attainment in MIDUS I was classified into four categories. We also incorporated current reports of household income, respondent SEI, and household assets to create a composite measure of adult SES. Respondent SEI was again calculated using the total occupational socioeconomic index based on three-digit Census Occupational Codes. Household assets account for both wealth and debt, with respondents estimating their net worth by considering all assets (e.g., savings, real estate, possessions) and debts (e.g., mortgage, loans, credit cards). For those reporting negative net worth, estimates were used to quantify debt (Glei et al., 2022). All four measures—education, SEI, income, and assets—were normalized to a 0–1 scale and summed to create the composite adult SES score. As above, we sum up the normalized components of adult SES and then divide scores into quartiles.

To cross-classify socioeconomic origins and destinations, we assign respondents into seven distinct categories based on childhood and adulthood SES scores. For visual reference, see Fig. 1 (Sankey diagram), which illustrates all possible interquartile shifts, and Table 1 which outlines the categories in our simplified coding scheme.

As depicted in Table 1, individuals who remained in the first quartile in both childhood and adulthood were grouped into a 'permanent low' group. Conversely, individuals who remained in the fourth quartile throughout were included into 'permanent high' group. Upward SES change included interquartile movement from lowest quartile in childhood to the second and third quartile in adulthood, a pattern we describe as 'rise low to middle' group. Likewise, individuals transitioning from any of the bottom three quartiles during their childhood to the top quartile in adulthood are included into the 'rise to high' group. Those who were in the top three quartiles during childhood but dropped into the bottom quartile in adulthood were grouped as 'drop to low'. The 'drop high to middle' group comprises individuals starting in the top quartile during childhood but falling to the middle 50% in adulthood. The 'permanent middle' group includes individuals who remained in either the second or third quartile from childhood to adulthood.

Table 1
Intergenerational transition categories.

Childhood SES	Adult SES			
	Q1	Q2	Q3	Q4
Q1	Permanent Low	Rise Low to Middle		Rise to High
Q2	Drop to Low	Permanent Middle		
Q3		Drop High to Middle		
Q4				Permanent High

3.4. Covariates

Multiple aspects of the childhood family environment overlap with SES and could confound the life course processes we investigate. To address this, we account for two aspects of parenting style, parental warmth and parental discipline. These measures are part of the battery of retrospective questions included in MIDUS I. The six-item parental support scale assesses maternal and paternal warmth separately, considering aspects such as understanding of problems, confiding, love and affection, and time investment (Chen et al., 2019). We coded the items so that higher scores indicate greater parental warmth and averaged items for maternal and paternal parenting to create an overall parental warmth scale ranging from 1 to 4 ($\alpha = 0.91$). Parental discipline is operationalized with a three-item measure assessing strictness, consistency with rules, and frequency of intervention. Higher score reflected more stringent parenting discipline. Averaging across mother and father scores yielded a final measure ranging from 1 to 4 ($\alpha = 0.80$). We also account for childhood residential setting, differentiating rural areas from other types such as small towns, medium-sized towns, suburbs, cities (and also including as non-rural those who moved around as children). Finally, we grouped respondents based on whether or not they grew up with two biological parents.

Analyses also adjust for sex, race/ethnicity, age (in years), marital status, currently working (vs. not), currently smoking (vs. not), and number of health conditions. Race/ethnicity is categorized as White or Non-White, this is because of a relatively small number of Black, Latino, and "other race" adults in the MIDUS sample. Marital status is a binary measure where individuals were grouped into married or others, with the latter including those who are never married, divorced, separated or

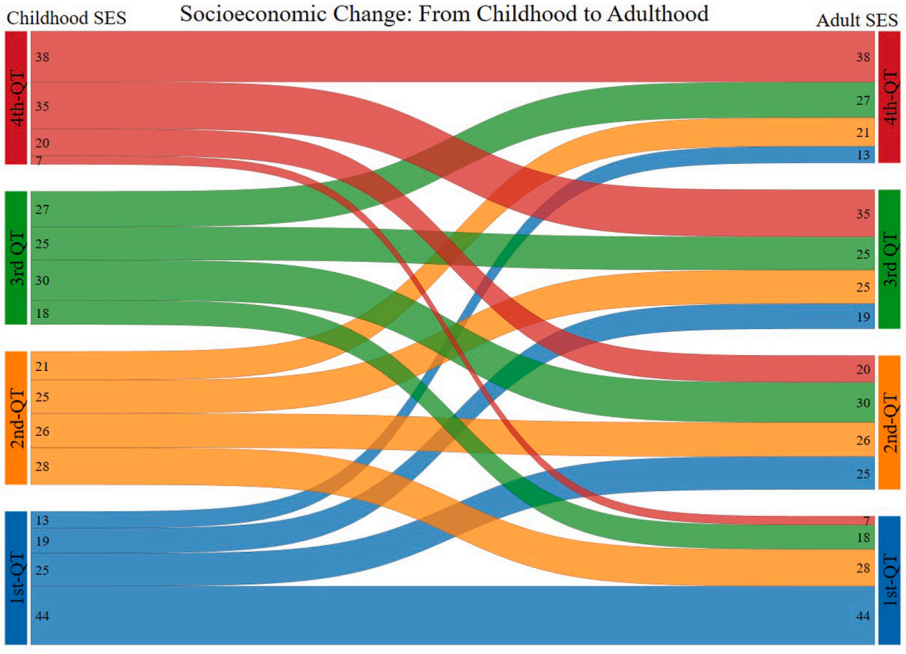

Fig. 1. Sankey diagram showing socioeconomic change in percentage: Childhood to adulthood (N = 961). Numbers quantify the prevalence of each socioeconomic transition.

widowed. Chronic health conditions is a count variable of 31 diseases the participant may have "experienced or been treated for" in the past 12 months (e.g., asthma, tuberculosis, thyroid diseases, heart trouble, cancer, arthritis, piles, etc.) (Brim et al., 2020).

3.5. Analytical approach

We use multivariable linear regression to examine the association between SES transition categories and MIDUS-HEI, net of childhood and demographic covariates. In estimating that model, we adopt Freese and Johfre's (2022) binary contrast approach to facilitate the comparison of different SES origin and destination configurations. The binary contrast technique, appropriate when groups are non-overlapping, compares the covariate-adjusted mean of a particular SES transition group against the estimated conditional mean of all other SES groups combined. This is an alternative to the practice of setting one category of a polytomous variable as the "reference category" and comparing the coefficients from multiple dummy variables to that excluded group (Johfre and Freese, 2021).

The binary contrast technique is well-suited to our research question as it avoids the arbitrary selection of a single SES transition group—upward, downward, or stable—as the point of reference. For example, when examining how a fall from middle SES in childhood to low SES in adulthood may affect diet, it is unclear whether the relevant comparison should be with those maintaining a stable middle SES position, those rising out of low SES, or those consistently low in SES from childhood to adulthood. Using the binary contrast method allows us to gain a wholistic understanding of how socioeconomic origins and destinations—whether high, low, or in the middle—work in concert to shape adult eating. We present unstandardized coefficients from this modeling approach in graphical form, indicating which groups are statistically different from all other groups on the basis of an alpha level of $p < 0.05$. A full regression table with all included covariates is presented in the Appendix (Table A2).

All regression analysis uses cluster robust standard errors to account for the non-independence of siblings/twins. We use listwise deletion to account for missing cases (including seven missing values for the MIDUS-HEI, 66 missing values for either childhood or adulthood SES, and 20 missing values for other covariates), bringing the final sample to 961 for our main analyses. A comparison of model coefficients using this approach to one using multiple imputation with chained equations (not shown, available upon request) produced essentially identical results.

4. Results

Table 2 presents unweighted descriptive statistics on MIDUS-HEI and different markers of childhood and adult socioeconomic conditions. The MIDUS-HEI score is fairly normally distributed among the sample with an average diet score of 5.88 on a **scale of 0–11 (higher indicates better diet quality).** The seven transition categories provide a snapshot of interquartile shifts from childhood to adult SES. As indicated in Table 2, staying permanently in the low SES group accounts for 10.9% of the sample, which is more prevalent than those maintaining a high SES position, which comprises 9.5% of the sample. The permanent middle group is the largest among all seven transition categories, consisting of a quarter of the total sample. Individuals who rise to the top from bottom three quartiles consists of 15.3% of the sample, while dropping from top three to bottom represents 13.3% of the sample. Similarly, those who rise to middle from the bottom account for 10.6% of the sample, while drop to the middle from top make up 14.2% of the sample. This information on socioeconomic origins and destinations can be enhanced by returning to Fig. 1. Overall, the pattern in that figure indicates that individuals in the lowest and highest socioeconomic quartiles are most likely to retain their relative positions into adulthood. When mobility does occur, it is typically limited to movement between adjacent quartiles, with large-scale shifts across three or four quartiles being exceedingly rare.

Table 2
Unweighted sample characteristics from childhood to adulthood: MIDUS I (baseline) & II (biomarker).

Characteristics	N	%/mean	std.	Min	Max
MIDUS-HEI	981	5.90	1.59	1	11
Parent's Education	985				
Less than high school	214	21.73			
High school graduate	333	33.81			
Some college	177	17.97			
College graduate or more	261	26.50			
Parent's SEI	952	0.42	0.20	0	1
Welfare Status	982				
Yes	47	4.79			
No	935	95.21			
Subjective Financial Status	986	0.51	0.21	0	1
Childhood SES (Composite score)	988	0.60	0.18	0	1
Current Education	987				
Less than high school	42	4.26			
High school graduate	214	21.68			
Some college	282	28.57			
College graduate or more	449	45.49			
Household Income	988	0.28	0.21	0	1
Household Assets	950	0.38	0.17	0	1
Adult SES (Composite score)	988	0.45	0.16	0	1
SES Transition Categories	988				
Permanent Low	108	10.93			
Drop to Low	131	13.26			
Rise Low to Middle	105	10.63			
Permanent Middle	259	26.21			
Drop High to Middle	140	14.17			
Rise to High	151	15.28			
Permanent High	94	9.51			
Lived with biological parents	988				
Yes	791	80.06			
No	197	19.94			
Parental discipline	988	2.95	0.65	1	4
Parental warmth	988	2.97	0.63	1	4
Number of Chronic Diseases	987	2.20	2.22	0	12
Area Raised	977				
Rural	234	23.95			
Others	743	76.05			
Smoking Status	988				
Smokers	143	14.47			
Non-Smokers	845	85.53			
Marital Status	988				
Married	713	72.17			
Others (div/wid/sep/never married)	275	27.83			
Age	988	45.94	11.58	25	74
Sex	988				
Male	451	45.65			
Female	537	54.35			
Working Status	986				
Currently Working	681	69.07			
Not working	305	30.93			
Race	982				
White	922	93.89			
Others	60	6.11			

Of the total sample, 46% were male and 54% were female. The majority of the sample identified as White (approximately 94%), and the remaining 6% represented other racial categories including Black, Hispanic, and Asian.

4.1. Socioeconomic changes and healthy eating

Fig. 2 summarizes how socioeconomic changes from childhood to adulthood are associated with MIDUS-HEI, shedding light on the relative importance of origin and destination. Overall, we find strong support for the hypothesis that socioeconomic origins continue to matter for healthy eating as an adult. Nevertheless, the importance of childhood SES versus its adulthood counterpart reveals significant asymmetries related to advantage and disadvantage.

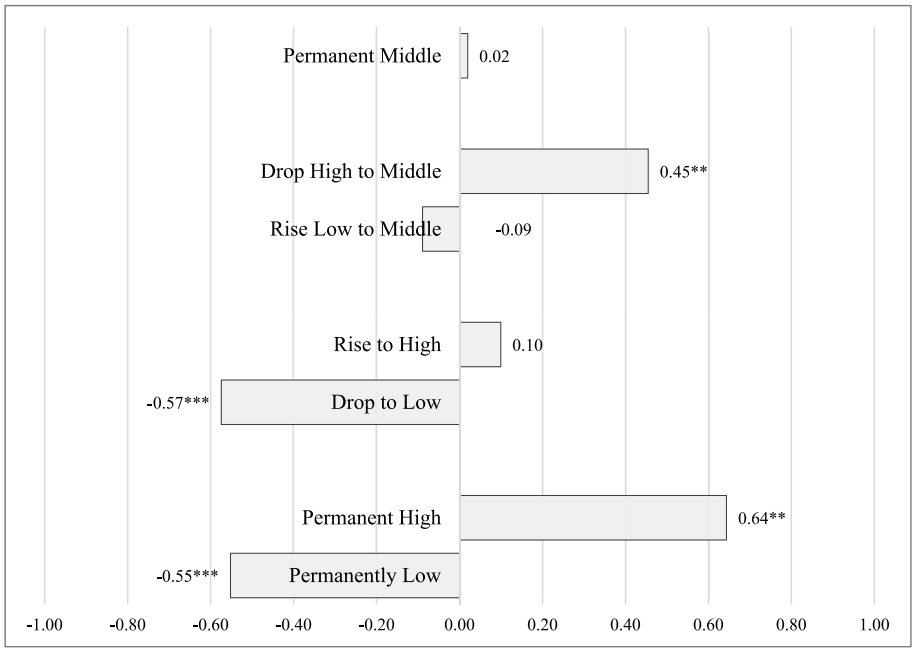

Fig. 2. Socioeconomic changes from childhood to adulthood and MIDUS-HEI [N = 961].
Note: Unstandardized coefficient from a multivariable linear regression with binary contrasts, comparing non-overlapping groups – specifically, the 'mean' of one group against the 'mean' of all other groups combined. Model adjusts for all covariates in Table A2 and applies cluster robust standard errors to account for the non-independence of siblings.
$p < 0.05$ (*), $p < 0.01$ (**), $p < 0.001$ (***).

First, the strongest prediction of adult eating habits—toward the healthy and unhealthy side of the spectrum alike—comes from occupying a stable position in the SES hierarchy. The unstandardized coefficients are similar in size and in opposite directions (b = 0.64 and b = −0.55; $p < 0.01$ and $p < 0.001$ respectively). This indicates that relative to the rest of the sample, stably advantaged people score over 40% of a standard deviation higher on the healthy eating index (and approximately 35% lower for the stably disadvantaged).

Second, rising out of the lowest rung of SES does not appear to have an equivalent role in moving the dial of healthy eating as does falling from the highest rung of SES. Specifically, while starting from the high SES quartile and shifting to the middle is associated with a relatively healthy level of eating compared to all others (b = 0.45, $p < 0.01$), there does not appear to be a corresponding dietary detriment for starting in the bottom quartile and moving up (b = −0.09, $p > 0.05$).

Third, attaining the highest level of SES advantage confers no discernible healthy eating advantage for people who did not start from the highest SES quartile (b = 0.10, $p > 0.05$). Conversely, individuals starting outside the bottom SES quartile as children but reaching that level of disadvantage as adults show substantially poorer dietary habits compared to all other participants in the sample (b = −0.57, $p < 0.001$).

4.2. Supplementary analysis

One of the shortcomings of the analysis depicted in Fig. 2 is that it fails to account for the widest possible origin-destination gaps. Jumping from the bottom SES quartile to the top or falling all the way from the top to the bottom is rare—accounting for 3.2% and 2% of the sample, respectively—and so such cases were simply consolidated with others moving to the SES poles from the middle. But pronounced mobility shifts may have unique consequences for people's diets distinct from more modest ones. To consider this possibility, we generated an alternative SES origin-destination coding scheme to account for every possible quartile shift and re-estimated the regression model shown in Fig. 2. Essentially, this approach, presented in the Appendix (Figure A1), sacrifices statistical power to attain exhaustiveness. All the same, it mainly reproduces the primary findings. For instance, respondents rising from the bottom SES quartile to the top showed modest, though non-significant, improvement in healthy eating relative to other groups (b = 0.22, $p < 0.43$). Individuals falling from the highest SES quartile to the bottom scored had a binary contrast score similar in size and also positive in direction, and this was a differently signed coefficient from that characterizing people who ended up in the lowest SES destination quartile from other starting points (i.e., Q1, Q2, Q3 origin quartiles). We note, however, that the p-value for the 4th quartile to 1st quartile binary contrast comparison is > 0.05, likely due to the limited statistical power. By contrast, individuals falling from 3rd quartile to 1st quartile (b = −0.52, $p < 0.05$) and 2nd quartile to 1st quartile (b = −0.71, $p < 0.001$) showed significant negative scores in healthy eating compared to other groups, whereas people shifting upwards from the middle two quartiles to the 4th quartile had no discernible healthy eating advantages.

We also conducted several additional analyses (not shown, available upon request) to assess the robustness of our results to analytic decisions and sample inclusion criteria. First, we re-estimated regression models using only the nationally representative Random Digit Dialing (RDD) sample, excluding the sibling/twin and city over-samples. We replicated Fig. 2 with the RDD sample, obtaining results consistent with the initial analysis. To account for the potential shifts in SES characteristics between working and retired individuals (e.g., lower income but higher assets), we re-estimated all models excluding currently retired respondents. The results showed minimal differences from the original analysis.

Finally, we undertook a series of analyses to more closely examine potential age/cohort differences. Education levels and occupations differed over the past century in the United States, and so we computed group-specific childhood and adulthood composite SES measures among four cohorts of MIDUS respondents (those aged 25–39 years, 40–54 years, 55–64 years, and 65–74 years at baseline). This aims to ensure that our analysis accurately reflects potentially unique experiences and context of age group/cohort. We then re-created the seven mobility categories in Table 1 based on these new age/cohort-specific SES measures and re-performed our central regression analysis. Results were

entirely consistent with our initial findings, reenforcing the robustness of our original conclusions. Next, we considered a series of interaction analyses to probe for age heterogeneity, specifically considering (a) age x each socioeconomic mobility category, (b) both age and age-squared x each mobility category, and (c) age categories (same as mentioned above) x each mobility category. In brief, evidence was mixed. While some indication of age heterogeneity emerged—specifically, potentially unique patterns for individuals aged 40–54 and 55–64 in the permanent middle or rise-to-high mobility groups—most permutations of the interaction analyses produced null results. Additionally, information criteria statistics from these expanded specifications gave no indication of model fit improvement and suggested potential overfitting, cautioning against over-interpretation. Further research is needed to better understand the role of age and cohort effects in socioeconomic transitions and healthy eating.

5. Discussion

What people eat is stratified by socioeconomic status (Martikainen et al., 2003), and gaps in healthy eating between advantaged and disadvantaged Americans go a long way in explaining many other health disparities in this country (Drewnowski, 2009). The current study incorporated a life course perspective on SES and diet, building from a small handful of studies outside of the US that have sought to document how patterns of social mobility track with healthy eating. By giving careful attention to people's particular origin and destination points—not merely whether they moved upwards or downwards on the SES gradient—our findings reveal a complex asymmetry in the operation of life course health inequality.

Consistent with the idea that childhood conditions exert lasting impacts on health, we found that people starting from a position of SES advantage scored higher on healthy eating than others—if they remained in a high SES position into adulthood, but crucially, *also if they regressed to lower levels of the SES distribution* (notwithstanding the rare case of ending up in the very lowest quartile). This pattern of durable influence is commonly represented by the critical period model of the life course, and underscores imagery of childhood having a "long arm" or "long shadow" (Dannefer et al., 2016; Hayward and Gorman, 2004). That imagery, however, evokes the foreboding. The long arm we detect is more favorable, reflecting an enduring *benefit* that persists despite downward mobility. We surmise that healthy eating is, in part, a function of the dispositions cultivated within families, peer groups, and neighborhoods during one's youth. Class, of course, structures the transmission of dietary standards, preferences, and tastes in these contexts, which are internalized through the *habitus* into deep-seated, unconscious habits and modes of health behavior. Supporting such an intergenerational process, ample research demonstrates how parental resources—such as income, education, and assets—translate into the health behaviors and lifestyle of children, adolescents, and young adults (Christensen, 2004; Mollborn et al., 2014).

However, this 'generous long arm' we observe also underscores that early SES advantage is necessary to ensure dietary benefits, as high SES in adulthood alone does not suffice. Absent an auspicious start, even the attainment of high SES in adulthood does not appear sufficient to boost scores on the healthy eating index.

Our results also confirm that healthy eating is not only a function of dispositional seeds sown in childhood; it also depends on current resources for furnishing nutritious foods. This is suggested in the strong association of lower healthy eating scores among those who end up in a low SES position as adults, even if not starting from disadvantage. This pattern accords with the acculturation model of social mobility and health, in which health behaviors fit one's socioeconomic endpoint (Präg et al., 2022). We surmise that financial strain, difficulty accessing fresh groceries, the necessity of working multiple—often inflexible—jobs to make ends meet, pose significant challenges for procuring, preparing, and consuming nutrient-rich foods. Critically, however, the marks of disadvantage are destination-focused, not origin-focused—that is, there was no noticeable penalty for starting from a position of SES disadvantage and rising higher. So there is the good news that upward mobility out of disadvantage leaves no discernably indelible "scars" on adult nutrition, even while sustained disadvantage is of course a detriment.

To understand these patterns of asymmetry—early SES advantage is good for diet quality, but mobility to the top is not decisively beneficial; mobility to SES disadvantage is bad for diet quality, but starting off low SES is not in itself a discernible snare—we turn to Mirowsky and Ross's (2015) articulation of the "default American lifestyle." These authors argue that American society is organized in such a way that eating unhealthfully comes most easily, that resources and capabilities are needed to overcome the default choice-sets. In their words, "The industrial production of food products provides an excess of cheap calories always ready at hand. The food is engineered for production, transportation, marketing, and convenience rather than for nutrition …. *This [unhealthy pattern] remains in effect unless canceled or overridden by the operator*" (pg. 298, emphasis added). This default lifestyle, shaped by broad societal and economic forces, interacts with the dispositional tendencies cultivated in childhood, particularly for those who begin with SES advantage, further amplifying the disparities in healthy eating. Clearly, people who end up disadvantaged in adulthood have the fewest resources to push back and are most susceptible to the nutritional dangers of the default American lifestyle. But from what health lifestyles and the life course perspective together teach us about how people form and enact health behaviors, we also conclude that to most comprehensively push upstream against this default lifestyle requires early exposure to socioeconomic advantage (though a sustained position of privilege across the life course helps most of all).

This account of our findings reveals several important limitations and directions for future research. Most critically, the present study did not test any of the mechanisms implied by existing theory. Regarding the potential mechanisms of sustained or adult-destination socioeconomic disadvantage, it would be informative to know whether financial strain, neighborhood context, schedule inflexibility, or other factors are primarily responsible for the link to unhealthy eating. Just as importantly, it is crucial to understand the pathways through which early and sustained socioeconomic advantage contributes to the healthiest diets. Mirowsky and Ross (2015) point to socioeconomic advantage providing several competencies crucial for sustaining a healthy lifestyle—among them "insight, knowledge, critical analysis, long-range strategic thinking, personal agency, and self-direction" (pg. 298). Understanding which of these traits are most nurtured by contexts of childhood socioeconomic advantage, and which have the greatest impact on adult healthy eating, should be another priority for future research.

Second, the retrospective data we use to characterize childhood socioeconomic conditions is susceptible to recall bias. However, there is evidence that people can reconstruct their past with reasonable accuracy in survey settings (Smith, 2009). Moreover, we are not aware of any prospective data collection efforts that measure both childhood SES and detailed dietary information in later life.

Third, the MIDUS sample has several important limitations, including its racial homogeneity and lack of representation of recent cohorts. A more racially and ethnically diverse sample would allow for an exploration of potential variations in the current findings, specifically examining whether changes in socioeconomic standing—either upward or downward—have distinct implications for minority Americans compared to White Americans. We also anticipate that eating patterns in the US have changed significantly since 2004–2009, with more recent birth cohorts exhibiting less healthy eating patterns compared to the earlier cohorts featured in our analysis.

Finally, the absence of detailed life course geographic information limits our ability to explore regional variation in dietary patterns. While these data allow for a basic distinction between rural and non-rural childhoods, identifying specific regions of residence during early life

could offer deeper insights into how geography shapes lifelong eating behaviors.

6. Conclusion

Despite these limitations, our study advances understanding of how socioeconomic conditions across the life course shape diet quality in American adults. By examining both childhood and adult SES, we demonstrate that early-life socioeconomic advantage exerts a lasting influence on healthy eating, even in most cases of downward mobility. Conversely, adult SES disadvantage poses a significant barrier to maintaining a healthy diet, highlighting the persistent challenges faced by those with limited resources. Our findings underscore the importance of investigating the asymmetry in life course health inequalities—where early socioeconomic advantage has distinct implications from early disadvantage. This form of asymmetry is a promising theoretical direction for future research on health lifestyles and the life course, and may inform the development of targeted policy interventions tailored to individuals at different life stages.

CRediT authorship contribution statement

James S. Malo: Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation. **Markus H. Schafer:** Writing – review & editing, Writing – original draft, Supervision, Formal analysis, Conceptualization. **April J. Stull:** Writing – review & editing, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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APPENDIX

Table A1
MIDUS-Healthy Eating Index

MIDUS-HEI Component		Minimal Score (0 points)	Intermediate Score (0.5 points)	Maximal Score (1 points)	Maximal Score (2 points) *Only for vegetables and fruits*
	Examples of Foods or Beverages	Frequency			
Vegetables and fruits (servings/day)	Fruits, vegetables, 100% fruit juice	None	1–2	3–4	≥5
Whole grains (servings/day)	Oatmeal, wholegrain bread or bagels, whole wheat cereal, brown rice, whole wheat pasta	None	1–2	≥3	
Oily fish (servings/week)	Tuna, salmon, mackerel	None	<1	≥1	
Lean meat (servings/week)	White meat chicken or poultry, lean beef or pork	None	0–2	≥3	
Non-meat protein food (servings/week)	Eggs, tofu, seiten, soy, other bean/legumes, nuts, or nut butters	<1	1–2	≥3	
Beef or high fat meat (servings/week)	Fried chicken, ribs, sausage	≥3	1–2	<1	
Sugared beverages (servings/day)	Soda, sports drinks, bottled drinks, fruit drinks	≥4	1–3	None	
Fast food (times/week)	Fast food restaurant or order food for takeout or delivery	≥1	<1	None	
Fermented dairy (servings/day)	Yogurt and Cheese	<1 or ≥5	(1 to <2) or (4 to <5)	≥2 and < 4	
Alcohol (frequency: days/week and quantity: drinks/day)	Beer, wine, wine coolers, liquor	Non-drinker or Quantity: Men: >2 and Women: >1	Frequency: <3 and Quantity: Men: 1–2 and Women: 1	Frequency: ≥3 and Quantity: Men: 1–2 and Women: 1	
Overall MIDUS-HEI Score		0		11	

Adapted from Berkowitz et al. (2023).

Table A2
Unstandardized coefficient from Ordinary Least Squares Regression (OLS) of Healthy Eating Index by Early and Adult Socioeconomic Status. MIDUS I & II (N = 961)

	Coefficients	Standard Errors
SES Transitions		
Permanently Low	−0.55***	(0.15)
Drop to Low	−0.57***	(0.15)
Rise Low to Middle	−0.09	(0.15)
Permanent Middle	0.02	(0.11)

(*continued on next page*)

Table A2 (*continued*)

	Coefficients	Standard Errors
Drop High to Middle	0.45**	(0.13)
Rise to High	0.10	(0.13)
Permanent High	0.64**	(0.21)
Parental Discipline	−0.10	(0.08)
Parental Warmth	0.00	(0.08)
Married (reference: others)	0.08	(0.11)
Living with biological parents (reference: no)	0.20	(0.12)
Non-White (reference: White)	−0.24	(0.18)
Female (reference: Men)	0.67***	(0.10)
Non-Rural (reference: Rural)	0.17	(0.12)
Smokers (reference: Non-smokers)	−0.59***	(0.15)
Number of Diseases	0.00	(0.02)
Currently working (reference: Not working)	0.02	(0.11)
Age	0.02***	(0.00)
Constant	4.23	(0.43)
R-Squared	0.14	

Note: Unstandardized coefficient from a multivariable linear regression with binary contrasts, comparing non-overlapping groups – specifically, the 'mean' of one group against the 'mean' of all other groups combined. Cluster robust standard errors account for the non-independence of siblings.
$p < 0.05$ (*), $p < 0.01$ (**), $p < 0.001$ (***).

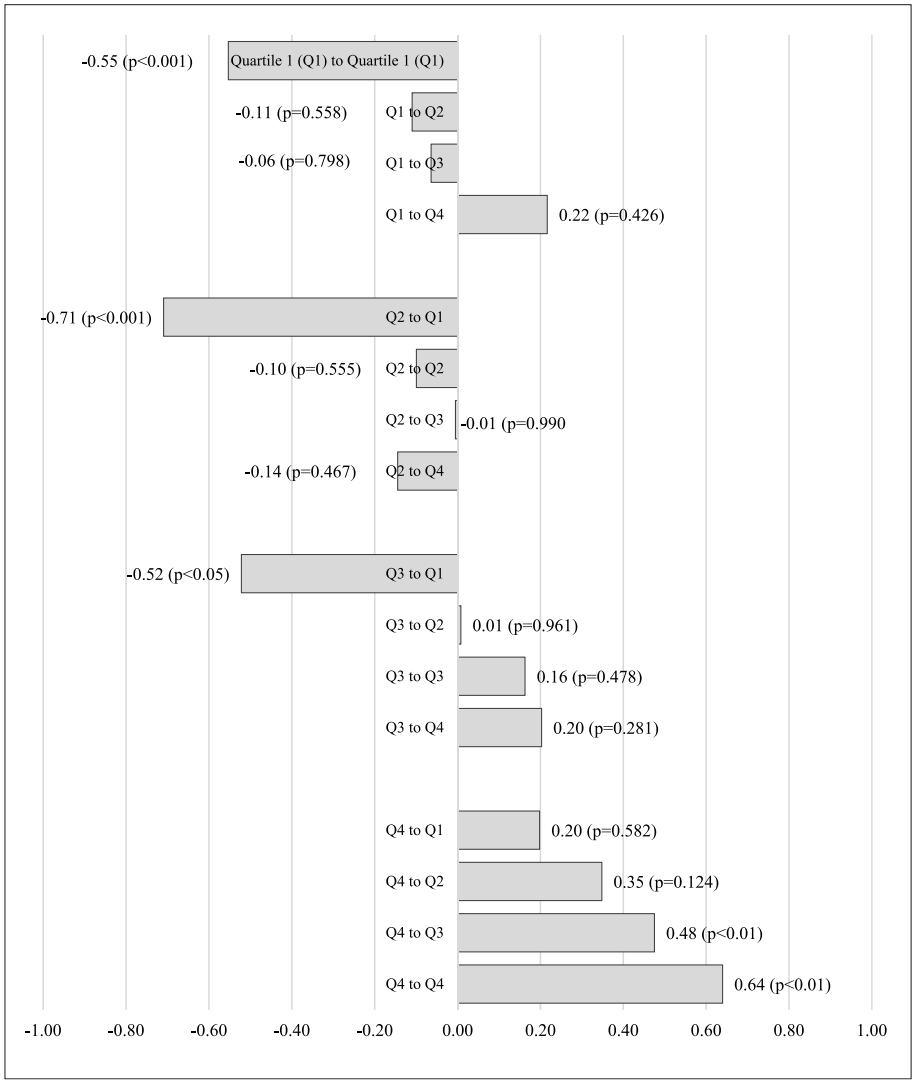

Fig. A1. Alternative approach for examining socioeconomic changes from childhood to adulthood and MIDUS-HEI (N = 961). Exact p-value in parenthesis. Note: Unstandardized coefficient from a multivariable linear regression with binary contrasts, comparing non-overlapping groups – specifically, the 'mean' of one group against the 'mean' of all other groups combined. Model adjusts for all covariates included in Table A2 and applies cluster robust standard errors to account for the non-independence of siblings. $p < 0.05$ (*), $p < 0.01$ (**), $p < 0.001$ (***)

Data availability

MIDUS data are publically available through the Inter-universtiy Consortium for Political and Science Research (https://www.icpsr.umich.edu/web/pages/NACDA/midus.html). Codes are available upon request.

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