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Low Social Support as a Source of Marginalization-Related Diminished Returns of Income on Health and Wellbeing

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Research Article

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Abstract

Background. Two resources shape health: socioeconomic status (SES), indexed here by education, income, employment, and marital status, and social support. Whether they interact, and in which direction, is unclear. Social support could buffer the harm of low SES, so that the SES gap is smaller among adults with adequate support. Alternatively, low social support could erode the return to SES, so that the SES gap is smaller among adults with low support.

Objective. To test whether the association of SES with 32 outcomes depends on social support, using four SES indicators.

Methods. We used the 2025 Behavioral Risk Factor Surveillance System (n = 105,536 adults in the jurisdictions that asked about emotional support; 9.6% reported receiving needed social and emotional support rarely or never). Social support was measured as receiving needed social and emotional support. The four SES indicators were a college degree, household income of $50,000 or more, being employed rather than out of work, and being married or partnered. The 32 outcomes covered life dissatisfaction, daily function, health behaviors, chronic conditions, depression, and frequent mental distress. For each of 128 combinations we fit a weighted model adjusted for age and sex and tested whether the SES difference differed by social support. We call a smaller difference among adults with low support a diminished return, and a larger difference a buffering pattern. We checked the ratio scale and mutual adjustment of the four SES indicators. Tests used $p < .05$ without correction, and we report how many to expect by chance (6.4).

Results. Low social support, a potential source of marginalization, was associated with diminished returns of SES (MDRs). Seven interactions showed this pattern, six of them for income: higher income was linked to less obesity, physical inactivity, diabetes, frequent mental distress, and short sleep among adults with adequate support, but much less or not at all among adults with low support (for obesity, −6.6 vs 2.4 percentage points). All seven held on the ratio scale. In all, 22 of 128 interactions had $p < .05$, more than the 6.4 expected by chance. The other 15 showed a buffering pattern, mostly for daily function, cost barriers to care, and life dissatisfaction with education, income, employment, or marriage, but none was confirmed on the ratio scale and five reversed, which indicates that they reflect higher baseline prevalence among adults with low support.

Conclusions. Low social support was not a general buffer of low SES. It was associated with MDRs of SES, mainly a smaller return to income for several health behaviors, conditions, and mental distress, a pattern that held on both scales and is consistent with low support, as a source of marginalization, removing part of the advantage that income brings. The estimates are cross-sectional and exploratory and need replication in longitudinal data.

Introduction

Health improves with each step up in socioeconomic status (SES), and not only at the bottom of the scale [1]. One account of why this gradient persists is that SES embodies an array of resources, including money, knowledge, prestige, power, and beneficial social connections, that protect health whatever the specific mechanism at a given time [2, 3]. Social relationships are themselves linked to survival, with an effect size comparable to well-established influences on mortality [4]. Emotional support, the sense that someone is there to provide sustenance when it is needed, is one of the ways relationships may act on health [5].

This paper concerns two resources, SES and social support, and how they combine is not settled. Two opposite hypotheses are plausible, and we set them out at the end of this introduction.

Studies that examine SES and social relationships have mostly asked the reverse question, whether SES changes the link between relationships and health [6], or whether SES groups differ in vulnerability to stressful events [7]. Marginalization-related diminished returns (MDRs) describe a different pattern: marginalized groups gain less health from the same SES indicators than socially privileged groups. MDRs have been reported where marginalization is defined by race [8, 9], ethnicity [10, 11], sexual orientation [12], and immigration status [13, 14], by rural residence [15], by living in a poor neighborhood [16], and, in a protocol for India, by caste [17]. In each case the proposed mechanism is that prejudice, discrimination, and fewer resources outside the individual limit the ability to turn SES resources into health. Low social support may be a further source of marginalization, because adults who lack needed emotional support have fewer people who can help them convert income, education, or a job into good health. To our knowledge, no study has tested whether low social support is itself linked to diminished returns of SES indicators, and this paper does so.

Two competing hypotheses

Hypothesis 1

social support buffers the harm of low SES. The buffering hypothesis holds that support protects people from the harm of stress [18], and a review of psychosocial resources suggested that positive social relationships may buffer individuals against the adverse effects of stress related to low SES [19]. Adults with low income, little education, no job, or no partner face more of the stress that support is thought to buffer. If support compensates for these disadvantages, adults with low SES and adequate support should do better than adults with low SES and low support, while adults with high SES, who have less to buffer, should differ little by support. The difference in outcomes between higher- and lower-SES adults should therefore be smaller among adults with adequate support and larger among adults with low support. In this view social support substitutes for the resources that SES would otherwise supply [20].

The case for social relationships as a determinant of health rests on prospective studies of mortality. House and colleagues reported that adults with fewer social relationships and activities were more likely to die over 9 to 12 years in the Tecumseh Community Health Study [21], and their review in Science concluded that low quantity, and sometimes low quality, of social relationships raises the risk of death from many causes, with evidence from prospective, experimental, and quasi-experimental studies [22]. House also described social support as having several types, usually emotional, instrumental or tangible, informational, and appraisal support [23]. Studies of social support and depression and health by Taylor, Chatters, and colleagues in national samples of Black Americans found that support from church members and family was inversely associated with depressive symptoms and psychological distress among older African Americans [24], that extended family and friendship networks were protective but, when interactions were negative, also risk factors for major depressive disorder and depressive symptoms [25], that social support, traumatic events, and depressive symptoms were linked in ways that depended on the quality of social interaction [26], and that social isolation from family and friends was associated with poorer mental health [27]. Krause reported in older adults that specific types of support buffered specific stressors, such as bereavement, crime, and social network crises, but not a global measure of stressful events [28], that informational support and providing support to others buffered the effect of chronic financial strain on depressive symptoms while tangible and emotional support were less effective [29], that anticipated support offset the effect of economic stress on depressive symptoms [30], that support was associated with better sleep [31], and that church-based support was linked to mortality [32]. Krause and Markides described four dimensions of support, informational support, tangible help, emotional support, and integration, and showed that they buffer the stress of bereavement [33]. The buffering idea has a long record. Cohen and Wills reviewed the evidence and distinguished a main effect of support, which helps people regardless of stress, from a buffering effect, in which support protects people mainly when stress is high [18]. Tests of buffering have since been reported for stress and quality of life in couples coping with early-stage dementia [34], stress and mental health among adolescent athletes [35], functional support and ambulatory blood pressure [36], discrimination and depressive symptoms among immigrant groups [37], and the effect of SES on cognition among older adults in China, where emotional and financial support moderated the SES association [38]. In a survey of Armenian immigrants in the United States, higher support was associated with less depression, which the authors interpreted as buffering of acculturative stress [39]. Not all tests have agreed. Among bariatric surgery patients, support gave only partial support for the stress-buffering model [40], and in a study of marital and community support, protective (buffering) effects appeared for some strains but not others, with community support compensating mainly when spousal support was absent [41]. Work by Zimmerman and colleagues on urban adolescents applied resiliency theory to separate compensatory effects, in which a resource helps at every level of risk, from protective effects, in which it weakens the harm of risk. They found that natural mentors had compensatory but not protective effects on problem behaviors [42], and that promotive factors were compensatory in a longitudinal study of substance use, whereas the protective model seen cross-sectionally was not supported over time [43]. This distinction matters here, because an association of support with an outcome is a main effect, and buffering requires that support change the strength of the association of SES with the outcome.

Hypothesis 2

low social support erodes the return to SES. The opposite prediction follows from the fundamental-cause account, in which SES pays off because it embodies resources, including beneficial social connections [2, 3]. Resources can also multiply, so that one matters more when another is present [20]. If so, adults with high SES but low support would receive less from income, education, employment, or marriage, and the difference in outcomes between higher- and lower-SES adults should be smaller among adults

with low support. This is the pattern called minorities' diminished returns (MDRs), in which SES indicators are linked to smaller gains among marginalized groups [9, 11]. If low support is a source of marginalization, as when it reflects exclusion from the people and settings through which resources are turned into health, then low support would be linked to diminished returns of SES.

There is a further reason to expect that low support matters. Support and its opposite are not the two ends of one scale. Social undermining, meaning criticism, conflict, and other negative behavior from close others, had its own adverse effect on mental health among 1,087 recently unemployed adults, independent of the effect of support, and its effects were stronger but less stable than those of support [44]. In a national study of older adults, stable negative social exchanges predicted lower self-rated health, more functional limitations, and more health conditions over two years [45], and negative exchanges predicted more depressive symptoms over time in older adults, while positive exchanges did not [46]. If adults who report low support also tend to experience undermining, they would carry an additional source of stress that SES does not remove, and this could weaken the link between SES and health. The BRFSS item measures whether needed support is received, not whether undermining occurs, so we cannot separate the two; we use low support as a marker of weak or harmful social connection.

The two hypotheses make opposite predictions about the same interaction, and they can be told apart by the pattern of cells. Under buffering, the gap between low and adequate support should be larger among lower-SES adults. Under diminished returns, it should be larger among higher-SES adults, so that higher-SES adults with low support look like lower-SES adults. Because additive and ratio scales answer different questions [47, 48], a convincing pattern should also be seen on the ratio scale. These hypotheses have rarely been compared across many outcomes and indicators.

We used the 2025 Behavioral Risk Factor Surveillance System (BRFSS) to ask, for four SES indicators (a college degree, household income of $50,000 or more, being employed, and being married or partnered) and 32 outcomes, whether the association of SES with each outcome depends on emotional support and, if it does, whether the direction fits buffering (Hypothesis 1) or diminished returns (Hypothesis 2). We examined which direction the interactions took, whether they held on the ratio scale as well as the additive scale [47, 48], and whether they held when the four SES indicators were adjusted for one another.

Methods

Data and design

The BRFSS is an annual telephone survey of U.S. adults run by state health departments and the Centers for Disease Control and Prevention; its measures have been reviewed for reliability and validity [49]. We used the 2025 public-use file. Emotional support was asked in the social determinants module, which was fielded in 19 jurisdictions, and we included adults with valid age group and sex who answered this item (n = 105,536). The analysis used the final survey weight, strata, and primary sampling units.

Measures

All measures came from the 2025 BRFSS questionnaire and calculated variables [50]. Self-reported items of this kind have been used widely in BRFSS analyses cited below.

Social support

Emotional support was measured with the item "How often do you get the social and emotional support you need?" (always, usually, sometimes, rarely, never), asked in 19 jurisdictions that fielded the social determinants module, an item used in earlier BRFSS reports [51, 52]. In House's scheme, which distinguishes emotional, instrumental or tangible, informational, and appraisal support [23], this item measures emotional support only, so our results apply to that type and not to practical or informational help; in older adults the types of support have been shown to differ in whether they buffer financial strain [29, 33]. Low emotional support was a response of rarely or never; always, usually, or sometimes was adequate support.

Socioeconomic status (SES)

We use SES as an umbrella term for four SES indicators, which we analyzed separately, each coded so that 1 is the advantaged category. Education was the highest grade completed (college graduate or more vs less). Household income was the annual household income category ($50,000 or more vs under $50,000), a measure also used in BRFSS studies of depression [53]. Employment was the current employment category (employed or self-employed vs out of work). Marital status was married or a member of an unmarried couple vs divorced, widowed, separated, or never married [53, 54].

Outcomes

All outcomes were coded in the undesired direction, so that 1 (or a higher count) means the worse outcome: for example, difficulty doing errands alone indicates a limitation in independent function, and no leisure-time physical activity indicates inactivity. Outcomes are listed with the BRFSS item and our coding. We cite a BRFSS study that used the same or a closely related variable. Where we found none, we rely on the BRFSS documentation [50].

Mental health and well-being. Life dissatisfaction: "In general, how satisfied are you with your life?" with dissatisfied or very dissatisfied coded 1 [51, 52]. Frequent mental distress: 14 or more of the past 30 days with mental health not good [51]. Depression diagnosis: ever told by a health professional that one has a depressive disorder [51, 53]. Serious difficulty concentrating, remembering, or making decisions: a yes to the BRFSS cognitive disability item [50].

Function and general health. Days of limited activity: the number of the past 30 days that poor physical or mental health kept the respondent from usual activities (a count of 0 to 30, also coded 14 or more days). Difficulty dressing or bathing, doing errands alone, and walking or climbing stairs: yes to each disability item, and the combined indicator of either difficulty dressing, bathing, or doing errands [50, 55]. Fair or poor self-rated health: general health rated fair or poor [56]. Frequent physical distress: 14 or more of the past 30 days with physical health not good [50].

Health behaviors. Current cigarette smoking: at least 100 lifetime cigarettes and now smoking every day or some days [57, 58]. E-cigarette use and smokeless tobacco use: current use every day or some days [57]. Binge drinking: five or more drinks (men) or four or more (women) on one occasion in the past 30 days, and heavy drinking: more than 14 (men) or 7 (women) drinks per week [56]. No leisure-time physical activity: no physical activity or exercise other than the regular job in the past 30 days [59]. Short sleep: an average under 7 hours per 24 hours [59].

Body weight, chronic conditions, and care. Obesity: calculated BMI of 30 or more from self-reported height and weight [59]. Individual conditions were self-reported ever being told by a health professional of: hypertension [60], high cholesterol, diabetes, coronary heart disease or heart attack [61], stroke, current asthma, chronic obstructive pulmonary disease, kidney disease [55], non-skin cancer, and arthritis [58]. Multiple chronic conditions was having two or more of 11 conditions (the ten above and depression) [62]. Cost barrier: a time in the past 12 months when the respondent needed to see a doctor but could not because of cost [52]. Outcomes that are themselves the SES indicators (for example, being out of work) were not analyzed.

Statistical analysis

For each of the 128 combinations of four SES indicators and 32 outcomes we fit one weighted linear probability model that included the indicator, low emotional support, their product, and age in 5-year groups and sex, with all terms interacted with low support. This is equivalent to fitting the model separately in adults with adequate and low support while estimating their joint covariance. We report the adjusted difference in the outcome between higher- and lower-SES adults within each support group (percentage points, or days for the count outcome) and the difference between the two groups (low support minus adequate support), which is the interaction. Variances used Taylor linearization with the strata and primary sampling units. Race and ethnicity were not included in the models.

Reading the interaction

The interaction can be read in two ways that are two views of one number. We used the following rule. When the difference between higher- and lower-SES adults was smaller (closer to zero, or reversed) among adults with low support than among those with adequate support, we called the result a diminished return: SES advantage was linked to less of a difference when support was low. Here the outcome gap between low and adequate support is larger among higher-SES adults, which means that low support

removes part of the advantage that higher SES would otherwise bring. When the difference was larger among adults with low support, we called the result a buffering pattern: the gap between low and adequate support is then larger among lower-SES adults, which is what a buffering role of support would produce. To show which cells drive each result, we report the unadjusted outcome gap between low and adequate support separately among lower- and higher-SES adults.

Checking whether apparent buffering is real

An additive interaction can look like buffering without being buffering. Adults with low support have a higher prevalence of many undesired outcomes at every SES level. When an SES advantage lowers the outcome by the same proportion in both groups, the same proportional benefit is a larger number of percentage points where prevalence is higher, so the additive difference is larger among adults with low support even though support has not changed the relative benefit of SES. We therefore did not accept a buffering pattern from the additive interaction alone. For every interaction with $p < .05$ in the buffering direction we (1) refitted the model on the ratio scale with weighted Poisson regression and robust variances and estimated the ratio of prevalence ratios (low support vs adequate support), where a value below 1 means that the relative benefit of SES is larger with low support, which is what buffering predicts, and a value above 1 means that it is smaller; (2) called the pattern confirmed buffering only if the ratio of prevalence ratios was below 1 with $p < .05$; (3) called it apparent buffering if it was not confirmed, and further called it reversed if the ratio of prevalence ratios was above 1 with $p < .05$; (4) repeated the test with the other three SES indicators as covariates; and (5) compared the cells, reporting the gap between low and adequate support separately in lower- and higher-SES adults. The Results show the additive interaction before the check and the ratio of prevalence ratios after it [47, 48].

Multiple testing. We tested 128 interactions and used $p < .05$ without correction, in line with the argument that routine adjustment for multiple comparisons can hide real associations [63, 64]. To avoid over-reading, we state the number of interactions expected by chance (6.4) and treat the findings as exploratory. As a sensitivity analysis we also report how many remained after Benjamini-Hochberg correction. Because the additive and ratio scales answer different questions [47, 48], we repeated the analysis on the ratio scale with weighted Poisson models (prevalence ratios) and robust variances, and we noted whether the ratio-scale interaction had the same direction and $p < .05$. Finally, we repeated each test with the other three SES indicators added as covariates.

Results

Sample

The analytic sample had 105,536 adults, of whom 9,156 (9.6% weighted) reported low emotional support. Adults with low support were more often men, less often college graduates, and less often in the highest income group; they were more often unable to work, never married, and without health care coverage or a personal provider, and a cost barrier to care was more than twice as common (Table 1). Low support was about twice as common among adults with a less advantaged status on each SES indicator. Women made up 53% of adults with adequate support and 40% of adults with low support.

Table 1
Characteristics of adults overall and by emotional support.

Characteristic, weighted %	Overall (n = 105,536)	Adequate support (n = 96,380)	Low support (n = 9,156)
Age group			
18–44	43.2	42.9	46.1**
45–64	30.5	30.5	31.4
65 or older	26.3	26.7	22.4***
Sex			
Women	51.9	53.2	40.2***
Men	48.1	46.8	59.8***
Education			
Did not graduate high school	9.1	8.4	16.0***
High school graduate	29.5	28.6	38.2***
Some college or technical school	29.7	29.8	28.9
College graduate	31.8	33.3	16.9***
Annual household income			
Under $25,000	14.2	12.8	27.1***
$25,000 to under $50,000	23.6	22.9	29.7***
$50,000 to under $100,000	30.2	30.6	26.2***
$100,000 or more	32.1	33.7	17.0***
Employment			
Employed or self-employed	56.3	56.6	54.0*
Out of work	4.8	4.4	8.2***
Homemaker	5.3	5.4	4.1*
Student	4.1	4.2	2.6**
Retired	23.3	23.8	18.5***
Unable to work	6.2	5.5	12.5***
Marital status			
Married	51.1	53.0	33.1***
Member of an unmarried couple	5.1	5.1	5.3
Divorced	10.8	10.2	16.9***
Widowed	7.5	7.5	8.1
Separated	2.3	2.0	4.6***
Never married	23.2	22.3	31.9***
Health care			

Note. * p < .05, ** p < .01, *** p < .001 for the difference between low and adequate support (design-based test). Weighted column percentages from the BRFSS final weight; each characteristic is shown among adults with data on it. Low support: rarely or never receiving needed social and emotional support. Health care items: coverage, a personal health care provider, a routine checkup in the past year, and a cost barrier to seeing a doctor in the past 12 months.

Characteristic, weighted %	Overall (n = 105,536)	Adequate support (n = 96,380)	Low support (n = 9,156)
Has health care coverage	93.2	93.9	85.9***
Has a personal health care provider	86.1	87.2	75.6***
Routine checkup in the past year	80.6	81.7	70.5***
Could not see a doctor because of cost	11.3	9.9	24.8***

Note. * p < .05, ** p < .01, *** p < .001 for the difference between low and adequate support (design-based test). Weighted column percentages from the BRFSS final weight; each characteristic is shown among adults with data on it. Low support: rarely or never receiving needed social and emotional support. Health care items: coverage, a personal health care provider, a routine checkup in the past year, and a cost barrier to seeing a doctor in the past 12 months.

How many interactions were found, and in which direction

Of 128 interactions, 22 (17%) had p < .05, compared with 6.4 expected by chance (Table 2). Seven were diminished returns and 15 were buffering patterns. The diminished returns were almost all for income (six of seven), and the buffering patterns were for education (six), marriage (five), income (three), and employment (one). After Benjamini-Hochberg correction across the 128 tests, 7 interactions remained at q < .05. Table 3 lists all 22 interactions with p < .05, and Fig. 1 plots them with confidence intervals; all 128 are in Supplementary Table S1.

Table 2
Interactions with p < .05, by SES indicator and direction.

Indicator	Tests	p < .05	Diminished return	Outcomes	Buffering pattern	Outcomes
College degree	32	6	0	—	6	days usual activities limited; usual activities limited 14 + days; difficulty doing errands alone; difficulty dressing, bathing, or errands; current cigarette smoking; cost barrier to care
Household income of $50,000 or more	32	9	6	binge drinking; no leisure-time physical activity; short sleep (under 7 hours); obesity (BMI 30+); diabetes; frequent mental distress (14 or more days)	3	life dissatisfaction; days usual activities limited; cost barrier to care
Employment (vs out of work)	32	2	1	stroke	1	life dissatisfaction
Married or partnered	32	5	0	—	5	life dissatisfaction; days usual activities limited; usual activities limited 14 + days; cost barrier to care; depression diagnosis
All	**128**	**22**	**7**		**15**	

Note. Diminished return: the difference between higher- and lower-SES adults was smaller with low emotional support. Buffering pattern: it was larger with low support. p-values are not corrected for multiple testing.

Diminished returns: income and health behaviors, conditions, and mental distress

Among adults with adequate emotional support, a household income of $50,000 or more was linked to 6.6 percentage points less obesity, but among adults with low support to 2.4 points more (difference between groups 9.0, 95% CI 3.8 to 14.2, p < .001). The same weakening was seen for physical inactivity (− 16.6 vs − 10.0; p = .005), diabetes (− 7.1 vs − 2.3; p = .035), frequent mental distress (− 8.1 vs − 2.4; p = .036), and short sleep (− 7.8 vs − 2.0; p = .037). Higher income was linked to more binge drinking among adults with adequate support (4.4 points) and little difference among those with low support (0.9; p = .047), (for binge drinking the

income difference was in the unfavorable direction, so this is a smaller difference and not a smaller benefit), and being employed was linked to fewer strokes with adequate support (− 1.7) but not with low support (0.1; p = .035).

Note

Each row is one interaction with p < .05. Circles: adults with adequate emotional support; squares: adults with low support. Bars are 95% confidence intervals. Top: the difference is smaller with low support (diminished return). Bottom: it is larger with low support (buffering pattern); none of these held on the ratio scale. Three interactions for days of limited activity (a count) are in Table 3. p-values are not corrected for multiple testing.

The cells show where the difference comes from (Fig. 2). For obesity, low emotional support was linked to 6.8 points more obesity among higher-income adults but to no difference (− 0.5 points) among lower-income adults. For frequent mental distress, the gap between low and adequate support was 27.2 points among higher-income adults and 22.4 among lower-income adults, so higher-income adults with low support looked much like lower-income adults. These are the patterns expected if low support removes part of the advantage of income, and not the pattern expected if adequate support lifts lower-income adults. All seven diminished returns kept the same direction on the ratio scale with p < .05 (7 of 7). When the four indicators were adjusted for one another, 4 of the 7 remained at p < .05 in the same direction (short sleep, frequent mental distress, binge drinking, and stroke); the interactions for obesity, physical inactivity, and diabetes weakened (p = .181, .092, and .621).

Note

Percentages are weighted prevalences without covariate adjustment. In the first two panels, low support is linked to more of the outcome mainly among higher-income adults, which removes the income advantage (diminished return). In the last two panels, low support is linked to much more life dissatisfaction at both levels, and the difference is larger among lower-SES adults, but this reflects a higher baseline.

Figure 3 summarizes the seven diminished returns as a radar plot. On both the absolute and the relative scale, the polygon for adults with low support lies inside the polygon for adults with adequate support, which means a smaller SES difference for every one of the seven, and the radius of each spoke is the size of the difference and not its direction.

Note

All outcomes are undesired (higher values are worse). Each spoke is one interaction with p < .05 in which the SES difference was smaller with low support. The radius shows the size of the difference between higher- and lower-SES adults without its sign: the farther a point is from the center, the larger the SES difference, and a polygon that lies outside another shows the larger difference. Left: absolute difference (percentage points). Right: relative difference (% difference in prevalence). Signs: the difference is negative (higher SES, less of the undesired outcome) for every spoke except three. Binge drinking was positive with adequate support (higher income, more binge drinking), and obesity and stroke were positive with low support (higher SES, slightly more of the outcome). The low-support polygon lies inside the adequate-support polygon on both scales. Values are unadjusted gaps shown for pattern; p-values are not corrected for multiple testing

Apparent buffering patterns: daily function, cost barriers, and life dissatisfaction

The larger group of interactions went the other way. Among adults with low emotional support, being married or partnered was linked to 14.1 fewer points of life dissatisfaction, against 4.2 among adults with adequate support (difference − 9.9, 95% CI − 13.6 to − 6.1, p < .001), and similar patterns were seen for employment (− 9.6 vs − 19.8; p = .010) and for depression with marriage (− 5.6 vs − 13.3; p < .001). A college degree was linked to a larger difference in limited activity for 14 or more days (− 5.7 vs − 11.8; p = .001) and in a cost barrier to care (− 5.3 vs − 10.9; p = .002). In these cells the gap between low and adequate support was larger among lower-SES adults (for life dissatisfaction with marriage, 25.3 vs 15.1 points), but it was also large among higher-SES adults, and the prevalence of these outcomes was high among adults with low support at both levels (Fig. 2).

Figure 4 shows the 12 apparent buffering patterns with binary outcomes in the same way. On the absolute scale the polygon for adults with low support lies outside the polygon for adults with adequate support, which is the apparent buffering, but on the relative

scale the two polygons are much closer and for most spokes the low-support polygon lies inside.

Note

The three interactions for the count of days of limited activity are in Table 3 and Fig. 5. All outcomes are undesired (higher values are worse). Each spoke is one interaction with $p < .05$ in which the SES difference was larger with low support. The radius shows the size of the difference between higher- and lower-SES adults without its sign: the farther a point is from the center, the larger the SES difference, and a polygon that lies outside another shows the larger difference. All differences are negative (higher SES, less of the undesired outcome) in both support groups. Left: absolute difference (percentage points). Right: relative difference (% lower prevalence), where the low-support polygon lies mostly inside the adequate-support polygon, so most of the apparent buffering is not seen on the relative scale

The apparent buffering was not confirmed on the ratio scale

After the ratio-scale check, none of the 15 apparent buffering patterns was confirmed (Fig. 5). Of these, 10 had no ratio-scale interaction (ratio of prevalence ratios not different from 1), and 5 were reversed: on the ratio scale the relative benefit of the SES advantage was significantly smaller, not larger, among adults with low support. The reversed patterns were life dissatisfaction with income, employment, and marriage, and difficulty dressing, bathing, or doing errands and current smoking with a college degree. Their larger additive differences therefore reflect the higher prevalence of these outcomes among adults with low support, which makes the same relative benefit a larger absolute one, and for the reversed patterns the ratio scale points to a diminished return instead. With mutual adjustment, 7 of the 15 still had a larger additive difference (marriage with life dissatisfaction, limited-activity days, limited activity for 14 or more days, and depression, and education or income with a cost barrier to care and, for education, smoking), but this does not change the ratio-scale result. Adjusting for one another also produced 5 buffering patterns and 4 diminished returns that were not found in the main analysis (Supplementary Table S1). By contrast, all seven diminished returns held on the ratio scale.

Note

Each row is one of the 15 interactions with $p < .05$ in the buffering direction. Left: additive interaction (percentage points, low minus adequate support) with 95% confidence intervals; negative values are the apparent buffering. Right: ratio of prevalence ratios with 95% confidence intervals on a log scale; values below 1 would show true buffering and values above 1 a diminished return. No pattern lies significantly below 1, and five (red) lie significantly above 1. p-values are not corrected for multiple testing.

Table 3 gives the estimates for each of the 22 interactions with $p < .05$. The two support-gap columns show which cell drives each result, and the arrow marks the 5 interactions whose ratio-scale interaction was in the opposite direction with $p < .05$.

Table 3
Interactions with p < .05 between emotional support and SES indicators.

DR	Indicator	Outcome	Adequate support	Low support	Difference (95% CI)	p	Ratio-scale p	Support gap, lower SES	Support gap, higher SES
	Employed	**Stroke**	**−1.7**	**0.1**	**1.8 (0.1 to 3.5)**	**.035***	**.015***	**−0.7**	**1.0**
DR	Income $50,000+	Obesity (BMI 30+)	−6.6	2.4	9.0 (3.8 to 14.2)	< .001***	< .001***	−0.5	6.8
DR	Income $50,000+	No leisure-time physical activity	−16.6	−10.0	6.6 (2.0 to 11.2)	.005**	< .001***	6.7	12.0
DR	Income $50,000+	Diabetes	−7.1	−2.3	4.8 (0.3 to 9.2)	.035*	.004**	1.8	5.7
DR	Income $50,000+	Frequent mental distress (14 or more days)	−8.1	−2.4	5.7 (0.4 to 11.0)	.036*	< .001***	22.4	27.2
DR	Income $50,000+	Short sleep (under 7 hours)	−7.8	−2.0	5.8 (0.3 to 11.2)	.037*	< .001***	17.8	22.4
DR	Income $50,000+	Binge drinking	4.4	0.9	−3.5 (−7.0 to 0.0)	.047*	.010*	3.7	1.1
B	College degree	Usual activities limited 14 + days	−5.7	−11.8	−6.1 (−9.9 to −2.4)	.001**	.447	14.8	9.1
B	College degree	Cost barrier to care	−5.3	−10.9	−5.6 (−9.2 to −2.0)	.002**	.443	15.1	9.3
B	College degree	Difficulty dressing, bathing, or errands	−7.2	−11.5	−4.3 (−7.5 to −1.1)	.008**	.031* ↓	10.8	6.6
B	College degree	Difficulty doing errands alone	−6.1	−9.8	−3.7 (−6.7 to −0.8)	.012*	.061	9.2	5.4
B	College degree	Current cigarette smoking	−9.9	−13.7	−3.8 (−7.3 to −0.4)	.030*	.005** ↓	9.5	6.5
B	College degree	Days usual activities limited	−1.6	−3.0	−1.4 (−2.7 to −0.1)	.038*	.423	4.1	3.1
B	Employed	Life dissatisfaction	−9.6	−19.8	−10.2 (−17.9 to −2.5)	.010**	< .001*** ↓	31.9	20.5
B	Income $50,000+	Cost barrier to care	−9.5	−17.4	−7.9 (−11.8 to −4.0)	< .001***	.090	17.4	9.3
B	Income $50,000+	Life dissatisfaction	−4.4	−10.7	−6.3 (−10.8 to −	.005**	< .001*** ↓	24.6	18.5

Note. * p < .05, ** p < .01, *** p < .001 (not corrected for multiple testing). Adequate support and low support: adjusted difference in the outcome between higher- and lower-SES adults, in percentage points (days for days of limited activity). Difference: low support minus adequate support. DR, diminished return; B, buffering pattern. Support gap: unadjusted difference in the outcome between adults with low and adequate support, within lower- or higher-SES adults. ↓, ratio-scale interaction in the opposite direction with p < .05. p-values are not corrected for multiple testing.

DR	Indicator	Outcome	Adequate support	Low support	Difference (95% CI)	p	Ratio-scale p	Support gap, lower SES	Support gap, higher SES
	Employed	**Stroke**	**−1.7**	**0.1**	**1.8 (0.1 to 3.5)**	**.035***	**.015***	**−0.7**	**1.0**
					1.9)				
B	Income $50,000+	Days usual activities limited	−2.7	−4.4	−1.6 (−3.0 to −0.3)	.018*	.087	4.7	2.9
B	Married/partnered	Life dissatisfaction	−4.2	−14.1	−9.9 (−13.6 to −6.1)	< .001***	< .001*** ↓	25.3	15.1
B	Married/partnered	Depression diagnosis	−5.6	−13.3	−7.7 (−12.2 to −3.2)	< .001***	.061	14.3	6.9
B	Married/partnered	Days usual activities limited	−1.3	−3.2	−1.9 (−3.1 to −0.7)	.003**	.499	4.7	2.8
B	Married/partnered	Usual activities limited 14 + days	−4.2	−10.3	−6.0 (−10.8 to −1.3)	.013*	.867	16.7	9.9
B	Married/partnered	Cost barrier to care	−3.7	−7.9	−4.2 (−7.9 to −0.5)	.026*	.755	16.4	10.4

Note. * p < .05, ** p < .01, *** p < .001 (not corrected for multiple testing). Adequate support and low support: adjusted difference in the outcome between higher- and lower-SES adults, in percentage points (days for days of limited activity). Difference: low support minus adequate support. DR, diminished return; B, buffering pattern. Support gap: unadjusted difference in the outcome between adults with low and adequate support, within lower- or higher-SES adults. ↓, ratio-scale interaction in the opposite direction with p < .05. p-values are not corrected for multiple testing.

Discussion

In this national survey, the difference in health between higher- and lower-SES adults depended on emotional support for 22 of 128 combinations, more than the 6.4 expected by chance. The two possible directions were not equally supported. The clearest pattern was a diminished return: among adults with low emotional support, higher income was linked to much less or no difference in obesity, physical inactivity, diabetes, frequent mental distress, and short sleep, and this held on both the additive and ratio scales. The more numerous buffering patterns, with larger differences in function, cost barriers, and life dissatisfaction among adults with low support, did not hold on the ratio scale and were largely a consequence of higher baseline prevalence. We therefore did not find that adequate support generally buffers the health cost of low SES.

The cells show that the diminished returns arise because higher-income adults with low support looked like lower-income adults, and not because lower-income adults with adequate support looked like higher-income adults. For obesity, low support was linked to more obesity among higher-income adults only, and for frequent mental distress the higher-income advantage largely disappeared when support was low. This reading fits the account in which SES pays off partly through beneficial social connections [2]. It also fits the view that emotional support operates through mechanisms such as belonging, a sense of control, and the sharing of coping assistance [5], and through influence on health behaviors [65], since the outcomes with diminished returns included physical inactivity, short sleep, and obesity. A related literature has described diminished returns of education, income, employment, and marriage across racial and ethnic groups [9, 11]; our finding suggests that the same pattern may also appear by emotional support, with low support acting as a marker of weaker social connection. We interpret this as consistent with, not as evidence for, low support being a source of marginalization.

Why the apparent buffering is not buffering

It is tempting to read the 15 additive patterns as buffering, because the SES difference in function, cost barriers, and life dissatisfaction was larger among adults with low support, which is what a buffering role of support would produce. We do not draw that conclusion. These outcomes are far more common among adults with low support at every SES level, and a fixed relative benefit of SES yields a larger absolute difference where the baseline is higher [47, 48]. When we removed that effect by using the ratio scale, none of the 15 patterns showed a larger relative benefit with low support. Five reversed and showed a smaller relative benefit, which is a diminished return. A buffering claim therefore depends on the scale used, and the additive result alone would have given a misleading picture of 15 apparent buffering patterns against seven diminished returns. We recommend that studies of support and SES report both scales before concluding that support buffers.

Relation to the buffering literature

Our results fit the distinction drawn by Cohen and Wills between a main effect of support and a buffering effect [18]. Adults with low support had more of many undesired outcomes at every SES level, which is a main effect, but an interaction in which support weakens the harm of low SES, which is buffering, was not confirmed on the ratio scale. This is similar to the Zimmerman studies of adolescents, in which promotive resources were compensatory but protective effects were not supported [42, 43], and to partial or mixed support for buffering in other populations [40, 41]. It also fits Krause's finding that emotional and tangible support were less effective than informational support in buffering the effect of financial strain on depressive symptoms [29], since our item measures emotional support only. It differs from reports of buffering for stress or SES in older adults, patients, and immigrants [34, 35, 36, 37, 38, 39]. Several things could account for the difference. Many of those studies measured a specific stressor, such as discrimination or illness, rather than SES indicators, used small or selected samples, tested the interaction on one scale, or reported an inverse association between support and an outcome, which does not by itself show buffering. Cross-sectional data cannot separate buffering from a lower reporting of support among adults who are doing poorly. Our results do not show that support never buffers; they show that, for these four SES indicators and 32 outcomes in a national sample, the buffering patterns were largely an artifact of the scale and the diminished returns of income were not.

The pattern was not uniform across indicators. Income showed most of the diminished returns, whereas education and marriage showed none, and the interactions that looked like buffering, for all four indicators, were additive only. We cannot say from these data why income differed. Low emotional support is more common among adults with lower income, and residual confounding may differ by indicator.

Implications

If these associations reflect a loss of return, programs that raise income may deliver less health gain among adults who also lack emotional support, and attention to support alongside income may be warranted. These are hypotheses for testing, not recommendations from this study.

Strengths and limitations

Strengths include a large national sample, a common framework for 128 interactions, design-based variances, a stated rule for reading the direction, and checks on the ratio scale and with mutual adjustment. The study has limitations. The design is cross-sectional, and neither the direction nor the cause of the associations can be established; poor health may reduce social contact and perceived support, and low support may be a consequence of outcomes such as depression or limited function. Emotional support was one self-reported item asked in 19 jurisdictions and covers emotional support only, not the instrumental, informational, or appraisal types, so the results may not apply to the whole country, and the sample of adults with low support was small for some outcomes. We tested 128 interactions without correction for multiple testing; 22 had $p < .05$ against 6.4 expected by chance, and 7 remained after Benjamini-Hochberg correction, so individual findings should be treated as exploratory. The four SES indicators overlap, and the results for obesity, physical inactivity, and diabetes weakened when they were adjusted for one another. Race and ethnicity were not in the models and may confound or modify the associations, and the file has no measure of gender identity. Because the diminished-return interpretation was formed after the results were seen, it requires testing in other data.

Future research

Future work should test whether emotional support changes the health return to income in longitudinal data, in which the order of support, income, and health can be established, and with validated support measures that separate the types of support described by House, namely emotional, instrumental or tangible, informational, and appraisal support [23]. Studies should test the mechanisms

suggested here, including health behaviors and stress, and should examine whether the pattern differs by sex, age, and race and ethnicity. Trials of income support and of social connection programs could test whether they act together.

Conclusion

Low emotional support did not act as a general buffer of low SES. The clearest finding was a diminished return: among adults with low emotional support, higher income was linked to a much smaller advantage in obesity, physical inactivity, diabetes, frequent mental distress, and short sleep. This held on both scales and is consistent with low support removing part of the advantage that income brings. The estimates are cross-sectional and exploratory and need replication.

Abbreviations

BMI, body mass index; BRFSS, Behavioral Risk Factor Surveillance System; CI, confidence interval; COPD, chronic obstructive pulmonary disease; MDR, marginalization-related diminished return; SES, socioeconomic status (the umbrella term for education, income, employment, and marital status).

Declarations

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Ethics

This secondary analysis used public-use, de-identified 2025 BRFSS data. The investigators had no interaction with living individuals and obtained no identifiable private information; the analysis is exempt from institutional review, and individual informed consent was not required.

Competing interests

The authors declare no competing interests.

Author contributions

Babak Najand: first draft, revision, and approval of the final draft. Shervin Assari: concept, AI supervision, analysis, contribution to the draft and revision, and approval of the final draft.

Use of artificial intelligence

Anthropic's Claude assisted with statistical programming, model estimation, tables and figures, and editing. The authors supervised all use, verified the analysis and the text, and take full responsibility for the content.

Data and code availability

The data are from the public 2025 BRFSS file, available from the Centers for Disease Control and Prevention (https://www.cdc.gov/brfss/annual_data/annual_2025.html). Analysis code is available from the author on request.

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Figures

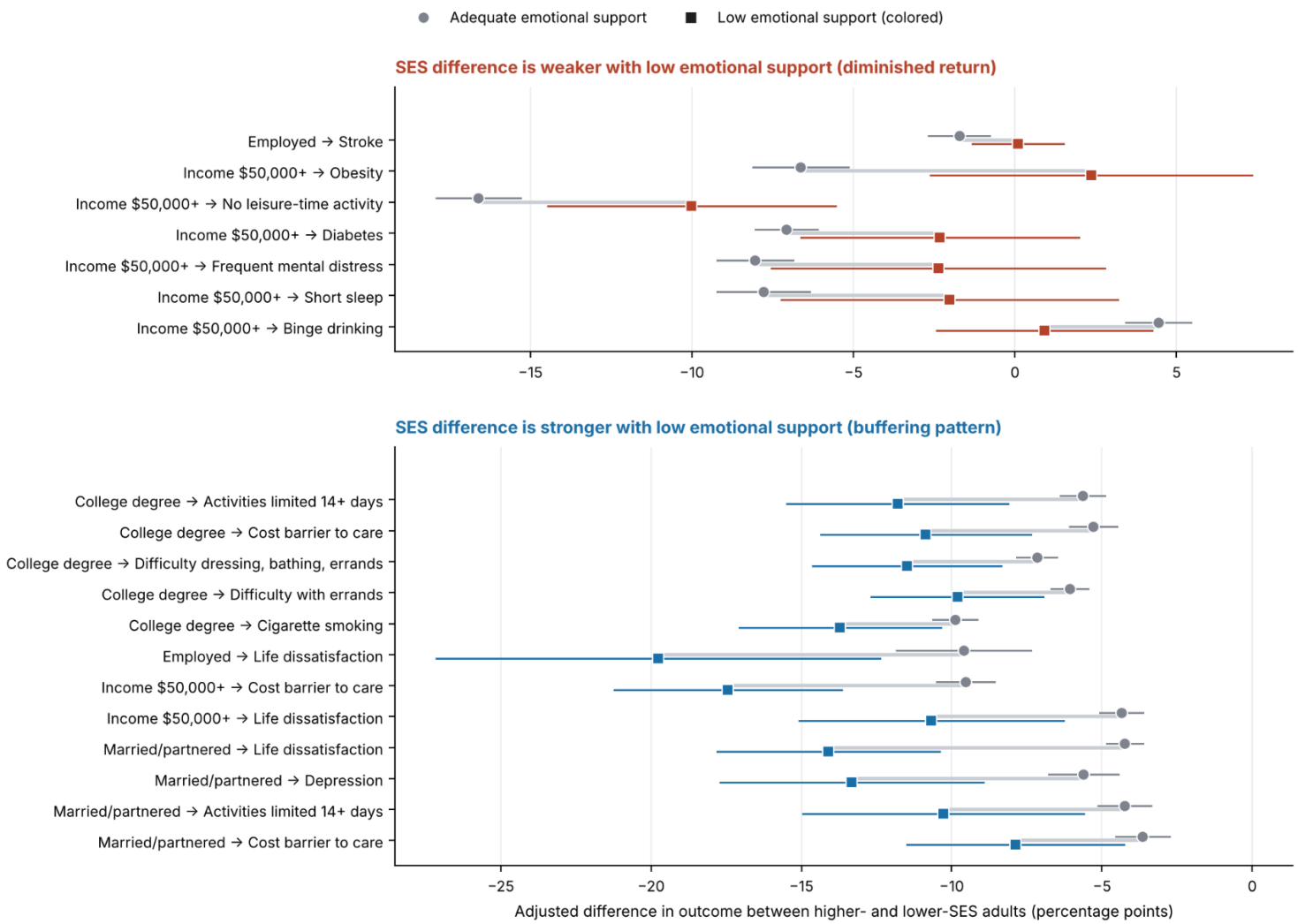

Figure 1

Difference in 19 outcomes between higher- and lower-SES adults, by emotional support.

Note. Each row is one interaction with p < .05. Circles: adults with adequate emotional support; squares: adults with low support. Bars are 95% confidence intervals. Top: the difference is smaller with low support (diminished return). Bottom: it is larger with low support (buffering pattern); none of these held on the ratio scale. Three interactions for days of limited activity (a count) are in Table 3. p-values are not corrected for multiple testing.

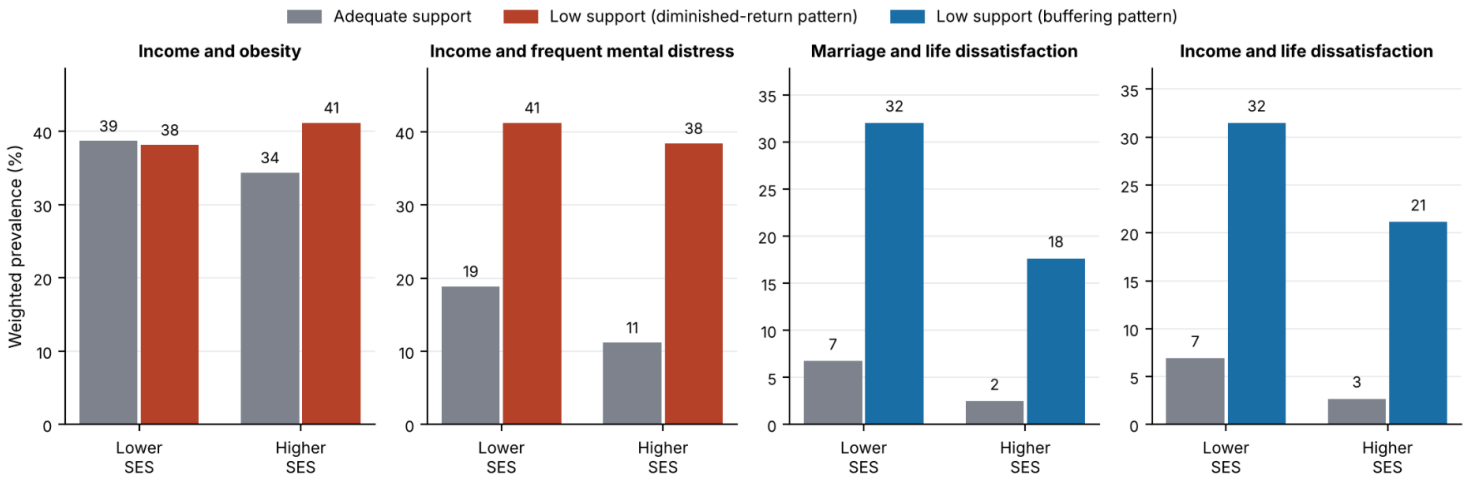

Figure 2

Outcome prevalence by SES and emotional support in four examples.

Note. Percentages are weighted prevalences without covariate adjustment. In the first two panels, low support is linked to more of the outcome mainly among higher-income adults, which removes the income advantage (diminished return). In the last two panels, low support is linked to much more life dissatisfaction at both levels, and the difference is larger among lower-SES adults, but this reflects a higher baseline.



Figure 3

Radar plot of the seven diminished-return patterns, by emotional support.

Note. All outcomes are undesired (higher values are worse). Each spoke is one interaction with $p < .05$ in which the SES difference was smaller with low support. The radius shows the size of the difference between higher- and lower-SES adults without its sign: the farther a point is from the center, the larger the SES difference, and a polygon that lies outside another shows the larger difference. Left: absolute difference (percentage points). Right: relative difference (% difference in prevalence). Signs: the difference is negative (higher SES, less of the undesired outcome) for every spoke except three. Binge drinking was positive with adequate support (higher

income, more binge drinking), and obesity and stroke were positive with low support (higher SES, slightly more of the outcome). The low-support polygon lies inside the adequate-support polygon on both scales. Values are unadjusted gaps shown for pattern; p-values are not corrected for multiple testing

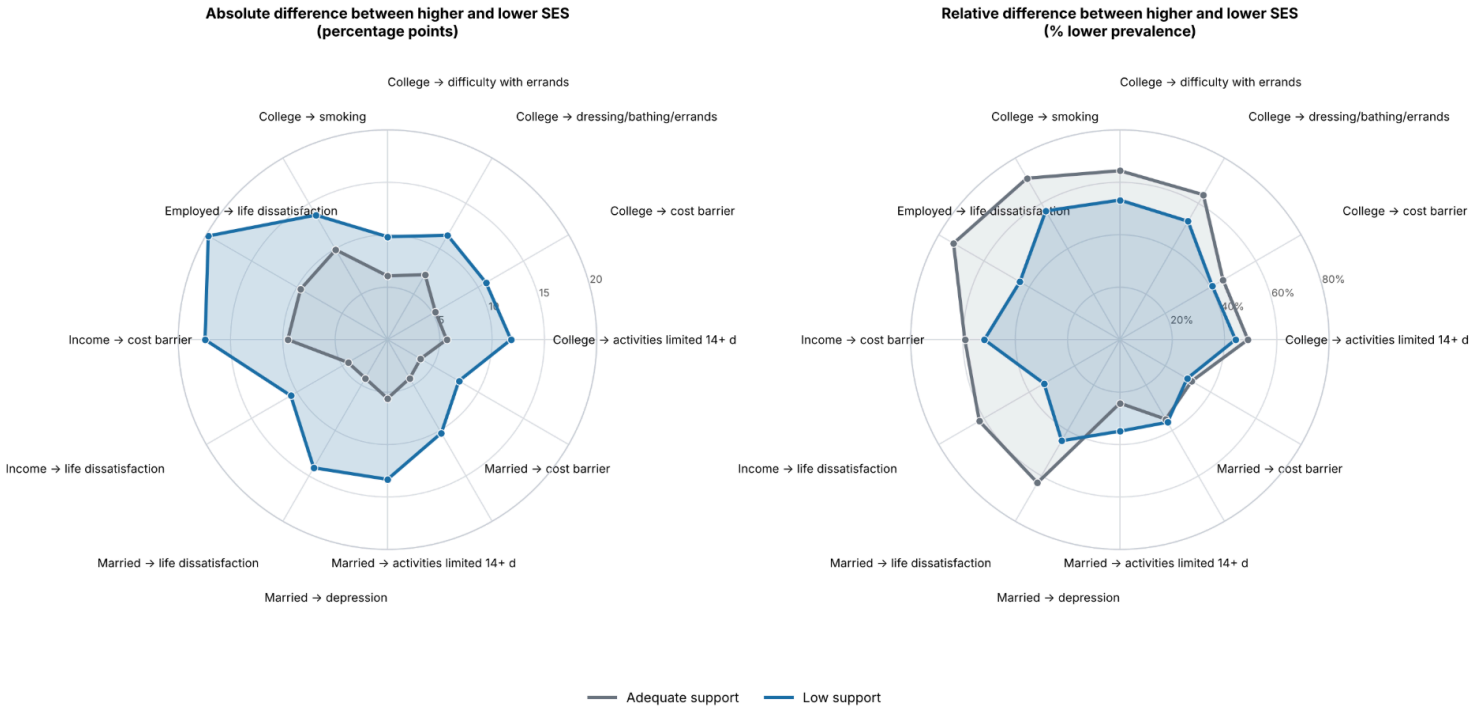

Figure 4

Radar plot of the 12 apparent buffering patterns with binary outcomes, by emotional support.

Note. The three interactions for the count of days of limited activity are in Table 3 and Figure 5. All outcomes are undesired (higher values are worse). Each spoke is one interaction with $p < .05$ in which the SES difference was larger with low support. The radius shows the size of the difference between higher- and lower-SES adults without its sign: the farther a point is from the center, the larger the SES difference, and a polygon that lies outside another shows the larger difference. All differences are negative (higher SES, less of the undesired outcome) in both support groups. Left: absolute difference (percentage points). Right: relative difference (% lower prevalence), where the low-support polygon lies mostly inside the adequate-support polygon, so most of the apparent buffering is not seen on the relative scale

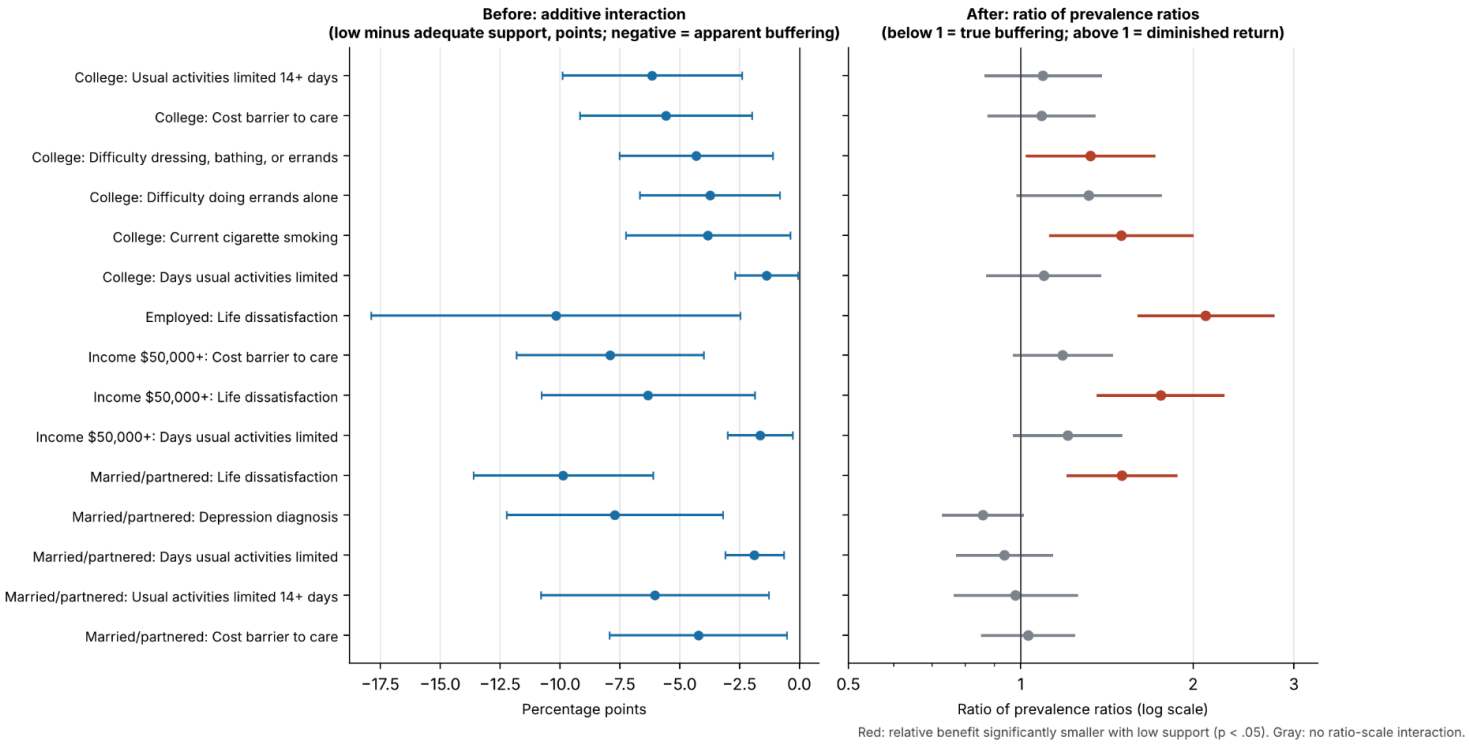

Figure 5

Apparent buffering before and after the ratio-scale check.

Note. Each row is one of the 15 interactions with p < .05 in the buffering direction. Left: additive interaction (percentage points, low minus adequate support) with 95% confidence intervals; negative values are the apparent buffering. Right: ratio of prevalence ratios with 95% confidence intervals on a log scale; values below 1 would show true buffering and values above 1 a diminished return. No pattern lies significantly below 1, and five (red) lie significantly above 1. p-values are not corrected for multiple testing.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Supplementarytables.docx