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Social vulnerability and psychological resources in aging: the role of index weighting and attrition bias

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To the Editor

We read with interest the article by Lahti and colleagues, which examines the moderating role of optimism and self-efficacy in the association between social vulnerability and physical and emotional functioning in older adults [1]. However, two methodological considerations warrant further attention, a pattern that may be influenced by measurement biases and sample attrition.

Equal weighting in social vulnerability index construction

The authors employed a cumulative deficit approach to construct their social vulnerability index, combining 14 social indicators with equal weighting to create a summary measure. While this method offers practical simplicity, it raises important questions about the validity of treating diverse social factors as equally influential on health outcomes [1, 2].

Evidence from the study itself highlights this concern. The correlations between individual indicators and the overall index vary substantially, from 0.207 for family contact

to 0.598 for income. This wide range suggests that different social factors contribute unequally to the overall construct of social vulnerability, challenging the assumption that they should carry identical weight.

The literature on social vulnerability measurement has consistently demonstrated that methodological choices, including weighting schemes, significantly influence index outcomes [3]. A comparative study of social vulnerability index construction methods found that results are sensitive to weighting decisions, with hierarchical models showing particular sensitivity to the selection of weighting schemes [4]. The same research revealed that different construction approaches can produce substantially different rankings of vulnerability, indicating that the choice between equal and weighted aggregation is not merely technical but has meaningful implications for which populations are identified as most vulnerable [5].

The implications of this limitation extend beyond measurement. Studies examining the predictive validity of social vulnerability indices have found that equal weighting may fail to capture the differential effects of subcomponents on specific outcomes [2]. Research on disaster recovery demonstrated that different subcomponents of social vulnerability influence various recovery outcomes in different directions and magnitudes, suggesting that a single aggregated score with equal weights may mask important distinctions [6].

We respectfully suggest that future research employing social vulnerability indices should consider more sophisticated weighting approaches. Methods such as Principal Component Analysis or factor analysis, which derive weights empirically based on the underlying structure of the data, may provide more accurate representations of social vulnerability. Sensitivity analyses examining how different weighting schemes affect results would also strengthen the validity of findings [4]. By refining measurement approaches, we can better identify those most in need of

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intervention and design more targeted health policies for socially vulnerable older adults.

A level-slope paradox

The study reveals a notable pattern: social vulnerability is significantly associated with the level of emotional functioning, yet it shows no association with the decline in emotional functioning over the five-year follow-up [1]. This dissociation between level and change presents a substantive methodological challenge that warrants careful examination. The finding that emotional functioning significantly declined overall while social vulnerability did not predict this decline raises questions about whether the data fully capture the trajectory of decline in the most vulnerable populations.

Several methodological explanations may account for this paradox. One possibility involves measurement bias introduced by self-reported emotional functioning. Research on self-rated health has demonstrated that the influence of physical health on self-ratings declines with age, while social and psychological factors increase in importance [7]. This suggests that older adults may systematically recalibrate their standards for what constitutes good emotional health when facing decline. Studies have shown that after serious health events, older adults adjust their internal standards and expectations, maintaining stable self-ratings despite objective deterioration. If socially vulnerable individuals similarly recalibrate their expectations over time, self-reported measures may fail to capture true decline.

Daltroy and colleagues demonstrated that self-reports of physical function are significantly influenced by recent health problems, depression, and dissatisfaction with function, factors that are more prevalent among socially vulnerable individuals [8]. Their findings showed that recent functional decline, illness in the past week, and pain on the day of examination all elevated self-reports of disability, consistent with recalibration-type response shift. If socially vulnerable individuals experience more health problems, they may develop lower expectations for their emotional well-being, creating a perception of stability that masks actual decline.

The attrition analysis further complicates interpretation. Those who dropped out had lower physical and emotional functioning and were less optimistic. Research on longitudinal studies of older adults has demonstrated that dropout does not occur randomly and can introduce substantial bias [8, 9]. Andreescu and colleagues found that simply ignoring attrition can bias study results, and shared parameter models revealed that the strength of associations differed widely between models that treated non-response as random and

those that accounted for nonrandom dropout [8]. If the most vulnerable individuals, those experiencing steeper declines, disproportionately left the study, this could obscure true decline patterns and artificially flatten the trajectory for the remaining sample [1]. Some studies have found that those who dropped out had lower cognitive function and more distress, suggesting systematic attrition of those with poorer outcomes. This represents a fundamental limitation: the sample may be too healthy to capture the full spectrum of vulnerability-related decline.

We suggest that future research address this level-slope paradox through several approaches. Utilizing objective measures alongside self-reports would help distinguish true functional decline from altered perception and response shift effects [8]. Statistical methods such as shared parameter models that jointly model outcome and dropout could address attrition-related bias [9]. Longer follow-up periods beyond five years may also be necessary to observe the cumulative effects of social vulnerability on emotional decline. Until these methodological limitations are addressed, the finding that social vulnerability does not predict emotional decline may reflect measurement artifacts rather than a genuine absence of effect.

In summary, while the study by Lahti and colleagues makes a valuable contribution to understanding the role of psychological resources in moderating the effects of social vulnerability, two methodological considerations warrant attention. The equal weighting of diverse social indicators may mask differential contributions to health outcomes, and the level-slope dissociation in emotional functioning may reflect measurement artifacts including response shift and attrition bias rather than a genuine absence of decline. We suggest that future research employ empirically derived weighting methods, incorporate objective measures alongside self-reports, and utilize statistical approaches that account for non-random dropout. These refinements would enhance the validity of findings and better inform interventions aimed at reducing health disparities in socially vulnerable older adults.

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Declarations

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