Rethinking how we measure older adults' physical and mental health

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Introduction

- Personal and social circumstances, such as race and income, can influence how older adults interpret and respond to questions about their physical and mental health
- Ignoring diversity when analyzing health surveys can lead to biased measurements of older adults' health
- Equitable measurement methods, such as the use of mixture item response theory (IRT), can account for heterogeneity in responses

Aim: To examine heterogeneity in older adults' responses to questions about their physical and mental health and potential measurement bias resulting from ignoring heterogeneity.

Methods

- Older adults (≥ 65 years) across Canada participated in online surveys, which included:

1. The Veterans Rand 12-item health survey (VR-12): a questionnaire about physical and mental health (Kazis et al., 2004; Kazis et al., 2006)
2. Screening for Poverty and Related social determinants to improve Knowledge of and links to resources (SPARK) tool: a questionnaire capturing social determinants of health (SDOH) (i.e., demographics, social needs, and disabilities) (Adekoya et al., 2023)

We used a 4-step approach to examine heterogeneity and potential measurement bias:

Specifying the IRT model
- A 2-factor IRT model was specified to reflect both the physical and mental health dimensions of the VR-12

Applying mixture IRT
- Mixture IRT was applied to examine heterogeneity by allowing measurement model parameters (factor loadings & thresholds) to vary across latent classes

Calculating bias
- Potential measurement bias = factor scores obtained from conventional IRT measurement (assuming homogeneity) – Mixture IRT (accommodating heterogeneity)

Explaining variance in bias
- Multivariable linear regression models were used to examine associations between SDOH and positive and negative measurement bias in physical and mental health

Diverse older adults **do not** interpret and respond to questions about their health in the same way.

For more information about the project, please visit our webpage: www.healthyqol.com/emac

If you have any questions, please email Ava.Mehdipour@twu.ca.

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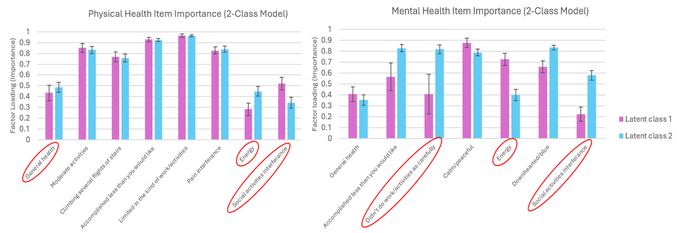
Results

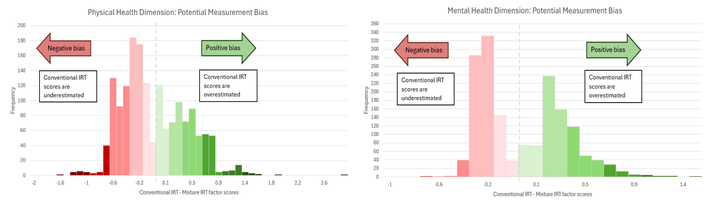
Responses on the health surveys were found to be heterogeneous and best represented by a 2-class model:

- Class 1: N=733 (44%); Class 2: N =916 (56%)
- This was supported by the Vuong-Lo-Mendell-Rubin likelihood ratio test (1 vs. 2 class: $p < 0.0001$; 2 vs. 3 class: $p=0.2921$)

The following graphs indicate differences in the relative importance of the health questions for each class *(red circles indicate top 3 biggest difference in importance)*:

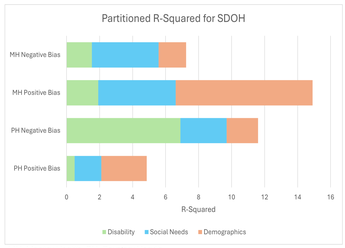


If heterogeneity is ignored, potential positive bias occurs in the measurement of physical and mental health when scores based on conventional methods are overestimated, and potential negative bias occurs when scores are underestimated:



SDOH explained 4.9-14.9% of variance in measurement bias.

Variance was explained by disabilities (e.g., difficulty walking, difficulty communicating), social needs (e.g., food security, housing, social support), and demographics (e.g., age, religion, race):



MH=Mental Health, PH=Physical Health

Conclusions

When using conventional measurement methods:

- Relatively higher physical and mental health scores may not indicate better health
- Relatively lower scores may not indicate poorer health
- We have found these potential biases to be partly associated with SDOH

Researchers and analysts can consider applying equitable measurement methods (e.g., mixture-IRT) to mitigate for potential biases when analyzing health surveys in heterogeneous populations.

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