

# Development and Validation of a Prognostic Index for 4-Year Mortality in Older Adults

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## ABSTRACT

**Context** Both comorbid conditions and functional measures predict mortality in older adults, but few prognostic indexes combine both classes of predictors. Combining easily obtained measures into an accurate predictive model could be useful to clinicians advising patients, as well as policy makers and epidemiologists interested in risk adjustment.

**Objective** To develop and validate a prognostic index for 4-year mortality using information that can be obtained from patient report.

**Design, Setting, and Participants** Using the 1998 wave of the Health and Retirement Study (HRS), a population-based study of community-dwelling US adults older than 50 years, we developed the prognostic index from 11 701 individuals and validated the index with 8009. Individuals were asked about their demographic characteristics, whether they had specific diseases, and whether they had difficulty with a series of functional measures. We identified variables independently associated with mortality and weighted the variables to create a risk index.

**Main Outcome Measure** Death by December 31, 2002.

**Results** The overall response rate was 81%. During the 4-year follow-up, there were 1361 deaths (12%) in the development cohort and 1072 deaths (13%) in the validation cohort. Twelve independent predictors of mortality were identified: 2 demographic variables (age: 60-64 years, 1 point; 65-69 years, 2 points; 70-74 years, 3 points; 75-79 years, 4 points; 80-84 years, 5 points, >85 years, 7 points and male sex, 2 points), 6 comorbid conditions (diabetes, 1 point; cancer, 2 points; lung disease, 2 points; heart failure, 2 points; current tobacco use, 2 points; and body mass index <25, 1 point), and difficulty with 4 functional variables (bathing, 2 points; walking several blocks, 2 points; managing money, 2 points, and pushing large objects, 1 point). Scores on the risk index were strongly associated with 4-year mortality in the validation cohort, with 0 to 5 points predicting a less than 4% risk, 6 to 9 points predicting a 15% risk, 10 to 13 points predicting a 42% risk, and 14 or more points predicting a 64% risk. The risk index showed excellent discrimination with a cstatistic of 0.84 in the development cohort and 0.82 in the validation cohort.

**Conclusion** This prognostic index, incorporating age, sex, self-reported comorbid conditions, and functional measures, accurately stratifies community-dwelling older adults into groups at varying risk of mortality.

Full article

<http://jama.ama-assn.org/cgi/content/full/295/7/801>

## Prognostic Index

1. Age: 60-64 years, 1 point; 65-69, 2 points; 70-74, 3 points; 75-79, 4 points; 80-84, 5 points; 85 and older, 7 points.
2. Male or Female: Male 2 points.
3. Body-Mass Index: Less than 25 (normal weight or less), 1 point.\* (Calculate by multiplying height in inches times height in inches; then divide weight in pounds by that total; then multiply the total by 703.)
4. Diabetes: 2 points.
5. Cancer (excluding minor skin cancers): 2 points.
6. Chronic lung disease that limits activities or requires oxygen use at home: 2 points.
7. Congestive heart failure: 2 points.
8. Cigarette smoking in the past week: 2 points.
9. Difficulty bathing/showering because of a health or memory problem: 2 points.
10. Difficulty managing money, paying bills, keeping track of expenses because of a health or memory problem: 2 points.
11. Difficulty walking several blocks because of a health problem: 2 points.
12. Difficulty pushing or pulling large objects like a living-room chair because of a health problem: 1 point.

**Score:** 0 to 5 points, less than a 4 percent risk of dying within four years; 6-9 points, 15 percent risk; 10-13 points, 42 percent risk; 14 or more, 64 percent risk.

\* A 1-point penalty for having a body-mass index under 25 (normal weight or less) is based on findings that being underweight is a health risk for elderly people.