Change in Self-Rated Health and Mortality among the U.S. Elderly

Eric M. Vogelsang

Center for Demography and Ecology, University of Wisconsin-Madison

Brief Abstract:

Existing research that establishes relationships between self-rated health (SRH) and mortality often operationalizes SRH as a two- or five-category time-invariant indicator of health. This can be problematic since these relationships have been shown to be stronger for shorter-term mortality and individual values of SRH may vary across time. In addition, very little work has considered the impact of SRH change on mortality, especially among the U.S. elderly. Using the oldest-old portion of the Health and Retirement Study over 13 years, I evaluate four different measures of SRH and SRH change—baseline SRH, dynamic SRH, reported SRH change and computed SRH change. The analyses suggest that all four measures are associated with mortality and three were independently associated with mortality. I also found that the identified relationships were slightly stronger for those with higher levels of education.

The relationship between self-rated health (SRH) and mortality is well established, with Idler and Benyamini's influential summary of 27 studies (Idler and Benyamini 1997) cited in over 2,500 subsequent papers. Recent research, including a meta-analysis of 22 studies, has shown similar results (DeSalvo et al. 2006). While SRH is often included in surveys as a five-category response of current "general health status" (i.e., "excellent", "very good", "good", "fair", "poor"), it can be modeled in many ways (e.g., as a dichotomous variable of fair/poor versus all others; as an interval measure with five values). Even a time-constant measure of SRH can be operationalized at baseline, at a particular wave, or at the most recent observation. Modeling SRH as time-constant predictor of mortality, however, can be problematic as its relationship may be stronger for mortality in the 'shorter-term' (e.g. within 4 years, (Benyamini et al. 2003)) and respondents' SRH responses often change over time. If three or more waves of data are available, SRH can also be modeled as a time-dependent (or "dynamic") covariate where each SRH observation in the study is included as a covariate of mortality.

Idler and Benyamini posited that SRH's dynamic properties are one theoretical reason for its relationship with death (Benyamini 2008; Idler and Benyamini 1997). This "trajectory hypothesis" posits that respondents incorporate information about health trajectories when evaluating their SRH. In doing so, they reflect on the past and speculate about their future (Miller and Wolinsky 2007). If the relationship between SRH and mortality can be partially explained by mechanisms reflected in the trajectory hypothesis, then perhaps models of mortality should also include measures of SRH change. For example, incorporating a measure of SRH decline may independently predict mortality above the mortality risk of "poor" baseline SRH. This would be the case if SRH decline (or improvement) is a result of prior health shocks (or improvement from those health shocks) that are themselves related to a greater risk of death. Unfortunately, measures of SRH change have rarely been incorporated in longitudinal studies of mortality. The few studies that have included a measure of SRH change have mostly not focused explicitly on the elderly, did not compare various measures of SRH change, and have been limited in their geographic scope. There is also increased evidence that the relationships between SRH and mortality may differ by gender (Benyamini 2008; Benyamini et al. 2003), and SES (Dowd and Zajacova 2007)—and these differences could apply to SRH change as well.

This paper has three objectives: (a) identify how the relationship between SRH and mortality differs by the operationalization of SRH and SRH change; (b) identify whether SRH change measures have an association with mortality independent of SRH, and (c) ascertain whether the relationships identified in (a) and (b) differ by gender or educational attainment.

Data come from the Health and Retirement Study (HRS). For this study, I only used the AHEAD (study of Asset and Health Dynamics of the oldest old) portion of the data set. The AHEAD survey was first administered in 1993 to a nationally representative sample of 7,444 non-institutionalized elderly adults born in 1923 or earlier (and thus at least 70 years old during the first year of the survey). I used seven waves of data covering the period 1993-2006. During this time, approximately two thirds of first wave respondents (4,922 or 66.1%) died. Those who were lost to survey attrition are right censored subsequent to their last response. I estimated

mortality hazards using parametric event history models assuming Gompertz proportional hazards.

In order to accomplish objectives (a) and (b), I operationalized SRH in four ways. The first two are standard SRH measures —at baseline (time constant); and as a time-dependent covariate (dynamic SRH). The latter two incorporate SRH change between two time points—reported SRH change and computed SRH change. Reported SRH change refers to a specific survey question about a respondent's opinion of his or her personal health change since the previous survey. Computed SRH change compares a respondent's current SRH response to his or her previous SRH response. Both measures result in a simple trichotomy—better health, worse health or no change since previous survey. Similar to one study (Benitez-Silva and Ni 2008) examining perceived life expectancy, the direction (i.e. improvement, decline or no change) of computed and reported SRH changes matched in less than half (46%) of all cases.

My analytic strategy involves estimating eight different models. The first was a baseline model consisting of only three established covariates of mortality—gender, education, and the respondent's current number of chronic conditions. The second model added baseline SRH, the most commonly used operationalization of SRH. In the third model, I incorporated dynamic SRH into Model 2. Model 4 contains both measures of SRH change in order to determine whether either (or both) predicts mortality above and beyond baseline SRH. Despite issues of collinearity between dynamic SRH and computed SRH change, previous research indicates that computed SRH decline may increase the hazard of death, independent of dynamic SRH (Ciftci, van Doorslaer and Bago 2010). As such, Model 5 is a combination of 3 and 4, including dynamic SRH and computed SRH change. Model 6 is a "full model", and includes both measures of SRH and both measures of SRH change. Because the relationship between SRH change and mortality may differ by gender and SES, I estimated "full models" by sex and educational attainment for Models 7 and 8.

Results from Models 2 and 3 indicate that baseline SRH and dynamic SRH were both associated with subsequent mortality. Although SRH is sometimes dichotomized into "good or better" and "fair or worse" health, I found the hazard ratios of dying for "fair" and "poor" SRH—both relative to "good" and relative to each other—substantively different. For example, in Model 3, the dynamic SRH mortality hazard ratios for "fair" and "poor" SRH (relative to "good") were 1.45 and 2.40, respectively. I also found that the dynamic SRH hazard ratios for "excellent" (HR=0.67) and "very good" (HR=0.75) were significantly different from "good" (HR=1.00, the reference category). When both baseline SRH and dynamic SRH are included in the same model, only dynamic SRH was statistically significant. In addition, the hazard ratios between different levels of baseline SRH and mortality (from Model 2) were lesser in magnitude to those between dynamic SRH and mortality (from Model 3). This provides further indication that while SRH may have relationships with mortality in the longer-term; the relationships are stronger in the shorter-term.

Included with baseline SRH in Model 4, both computed and reported declines in SRH were independently associated with an increased risk of mortality (HR=1.29 and 1.57, respectively). These hazard ratios are similar in magnitude to the independent risk of poor baseline SRH

(HR=1.30). Compared to model two, my results provide strong indication that their omission would understate the risk of death for those elderly that report fair or poor health at baseline and are also experiencing or assessing health decline.

In Model 6—when all measures of SRH and SRH change are included—dynamic SRH is still associated with mortality, as is a reported decline in health (HR=1.23). In addition, computed SRH improvement (HR=1.39) was also related to greater mortality. Although this appears counterintuitive and there are obvious collinearity issues, it does provide a possible indication that elderly with more variable health may have an increased risk of death. It is also important to note that even with this increased hazard, those who respond "excellent" or "very good" SRH would still have hazard ratios less than 1.0 (i.e., a lower risk of death than those in "good" health).

Models 7 and 8 address objective (c)—whether the relationships ascertained above differ by gender and educational assessment. Unlike previous studies, I did not find that the relationships between the four measures of SRH and mortality differed by gender. Similar to previous studies, however, I found that relationships between SRH and mortality were greater in magnitude for the more highly educated. In the case of dynamic SRH, the hazard ratio of death for those reporting "poor" was 2.88 for those who attended at least some college; as opposed to 2.10 for those who did not. Similar comparable differences by education were found for reported worse SRH change (HR=1.37 for the more highly educated compared to HR=1.20 for all others).

Four important conclusions about the relationship between SRH and mortality can be drawn from this study of U.S. elderly adults. One, the relationships between dynamic SRH and mortality were stronger in magnitude than that of baseline SRH and mortality. Further, when both measures are included in the model, baseline SRH is not statistically significant. Two, even with the inclusion of a dynamic measure of SRH, a retrospectively reported decline in SRH since the prior wave was independently associated with an additional risk of mortality. Three, I found evidence that the associations between SRH and mortality (as well as the associations between SRH change and mortality) were somewhat stronger for the more highly educated. Although not a main focus of my study, I found substantive differences in mortality hazards between SRH categories. In particular, my results indicate that at least four (out of five) SRH categories should be used when modeling elderly mortality—"poor", "fair", "good", and "very good or excellent".

My work to date provides some impetus for future research; some of which I plan to investigate in subsequent extensions of this paper. One, I would like to examine interactions between "matched" computed and reported SRH changes (i.e., are mortality outcomes different for those people whose computed SRH change matched reported SRH change?). I would also like to consider longer-term (i.e. greater than one wave) changes in computed or reported SRH and whether these trajectories provide any refinement to the relationships between SRH change and elderly mortality identified above. Lastly, I also want to further consider the issues of collinearity in the models summarized above. Part of this can be accomplished by examining different magnitudes and types of computed SRH change. For example, in my study a one-

category improvement from “very good” to “excellent” SRH had the same value as a two-category improvement from “poor” to “good”).

SRH is a commonly used covariate in mortality research. Without some consideration of SRH change, however, both static and dynamic SRH measures may limit our understanding of the linkages between SRH and mortality. For example, those elderly reporting fair or worse health and have experienced or report a health decline may be at a much higher risk of death than those experiencing long-term morbidity. This may have interpretation implications for some formal (e.g. survey) or informal (e.g. doctor visits) self-assessments of elderly health, especially if a question regarding SRH change has not been asked. The mortality consequences of elderly having, for example, “fair” health, may very well depend on the overall variability of their health and the context of both their recent past and their assessment of that past.

CITATIONS

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