THE LAST DECADE: LONGEVITY EXPECTATIONS, DEATH ATTITUDES, AND HEALTH CARE USE

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ABSTRACT

Death becomes exponentially more probable with each year of aging. Acknowledging this when making health care decisions has important consequences for quality of life, as the benefits of care may not outweigh the costs if little time remains to enjoy those benefits. Death expectations across the lifespan influence how people prepare for and experience death, but little is known about the trajectories of death expectations in the final years of life and how those trajectories relate to health care use. Using biennial subjective survival probability (SSP) ratings gathered over the decade prior to death from participants ages 65 and older in the Health and Retirement Study (HRS), latent profile analyses (LPA) were used to identify profiles of participants using meaningful subgroups. The optimal solution included four distinct profiles of SSP trajectories labeled realists, non-commitals, pessimists, and optimists. A series of t-test, chi-square, one-way ANOVA, and repeated measures ANOVA analyses were then conducted to identify characteristic features of the groups and assess for any differences in health care behaviors and death attitudes. Results demonstrated that two of four profiles had a significant increase in SSP from wave four to wave five: the optimists and non-committals. The pessimists were older at death than non-committals and realists, and were more likely to have had a final illness duration of more than a year than the full sample; pessimists had worse self-perceptions of health than optimists and realists; optimists were less likely to have a living will than the full sample and more likely to identify as African American than their representations in the full sample; and optimists reported fewer depressive symptoms and health conditions than pessimists. I also hypothesized that SSPs during the last decade of life would predict health care

use in the same period and that optimists and realists would use more health care health care than pessimists; these hypotheses were not confirmed.

LIST OF ABBREVIATIONS AND SYMBOLS

a-BIC	Adjusted Bayesian information criterion
ANCOVA	Analysis of covariance
ANOVA	Analysis of variance
BIC	Bayesian information criterion
BLRT	Bootstrapped likelihood ratio test
CES-D	Center for Epidemiologic Studies Depression Scale
CESD-8	Center for Epidemiologic Studies Depression Scale 8-item HRS adaptation
CFA	Confirmatory factor analysis
CFI	Comparative fit index
EFA	Exploratory factor analysis
F	F-ratio
g	Hedge's effect size statistic
GLM	Generalized linear model
HRS	Health and Retirement Study
KMO	Kaiser-Meyer-Olkin Test for Sampling Adequacy
LPA	Latent profile analysis
M	Mean
MSA	Measure of sampling adequacy
N	Number
p	Probability

r	Pearson's correlation coefficient
RMSEA	Root mean square error of approximation
SD	Standard deviation
SE	Standard error
SSP	Subjective survival probability
t	T-test statistic
TICS	Telephone Interview for Cognitive Status
X^2	Chi-square statistic
=	Equal to
<	Less than
%	Percent

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

As individuals enter their sixth or seventh decade of life, death becomes exponentially more probable with each year that passes (Fries, 1980). The extent to which people understand, appreciate, and accept that fact may have important consequences for their quality of life. Although we reflexively associate more health care use and behaviors with expectations of longer and better lives, the cost-benefit tradeoffs of health care use may be qualitatively different for those approaching the last decade of their lives. For example, the benefits of a knee replacement may outweigh the costs in early older adulthood, while the benefits of that surgery for someone with few years remaining, in the context of other health problems, may no longer be worth the costs.

Making wise decisions about health care in later life requires a realistic acceptance, or at least acknowledgment, of the amount and quality of life remaining. However, current patterns of health care expenditure in the United States may suggest generally poor death acceptance in the population. Estimates of health care spending after age 65 range from 34% to nearly 50% of lifetime health care spending (De Nardi, French, Jones, & McCauley, 2016; Alemayehu & Warner, 2004). More than one-quarter of Medicare expenditures are used by individuals in their last year of life, and spending in the last month of life accounts for 40% of spending during the last year of life (Lubitz & Riley, 1993; Riley & Lubitz, 2010).

In their analysis of medical spending among Medicare beneficiaries, De Nardi, French, Jones, and McCauley (2016) included out-of-pocket expenses, Medicaid, and other insurance payments in addition to Medicare spending. While they found that expenses more than doubled from ages 70 to 90, they also found this effect was largely due to nursing home costs. Home care, hospice, medication, and hospital spending remained stable from age 70 to death. However, the trajectory of these expenses was plotted by age instead of years remaining until death (De Nardi et al., 2016). Unfortunately, increased health care expenditures do not necessarily lead to improved well-being. In at least one study, increased spending at the end of life has been associated with worsened quality of life and worse quality of death (Zhang et al., 2009).

Understanding one's remaining amount and quality of life can improve medical decision-making but also necessitates some medical literacy, and therefore can be difficult without guidance from medical care providers. Open discussions about end-of-life care with trusted health care providers can influence the quality, quantity, and mode of care received, as well as subsequent quality of life. Unsurprisingly, patients who discuss end-of-life care with a physician are more likely to receive care consistent with their preferences than those who do not (Mack, Weeks, Wright, Block, & Prigerson, 2010). In patients with incurable cancer, end-of-life discussions that occurred more than 30 days before death were associated with less aggressive care and greater use of hospice (Mack et al., 2012). Patients with advanced cancer who discussed end-of-life with their physicians experienced greater quality of life and death in the last week of life, and spent less on health care, than those who did not have similar discussions with their physicians. The reduced spending was a function of patients using fewer intensive interventions, which suggests patients who discussed end-of-life care with their physicians adjusted their cost-benefit analysis to be more realistic than those who did not have the discussion, thereby making better-informed decisions and improving their quality of life (Zhang et al., 2009).

Whether these discussions occur or not depends on patient willingness and ability to discuss the end of life. Death attitudes, whether characterized by acceptance or anxiety, influence how individuals approach and experience death (Lynn, Curtis, & Lagerwey, 2016). Those with high death anxiety may avoid conversations and other reminders of their own death, leading to little or no preparation for end-of-life care, and they may also seek excessive medical care in the hopes of delaying death. On the other hand, those with high death acceptance may be more likely to discuss their own death and communicate their desires for end-of-life care. They may also engage in less medical care at the end of life, giving considerations to the quantity and quality of life remaining. In a sample of chronically ill older adults, those with less fear of death were more likely to have discussed advanced care planning with a physician than those with greater fear of death (Dobbs, Emmett, Hammarth, & Daaleman, 2012).

What constitutes a good death is a matter of personal opinion, both among laypersons and professional care providers. Research involving patients, family members of the dying and dead, and health care providers has identified numerous common themes characterizing good deaths. The most common themes across all groups include communicating preferences for the dying process (e.g., how, when, and where death occurs), being pain-free, and having emotional well-being (Meier et al., 2016). For patients, themes include managing symptoms, not prolonging death, having a sense of control, alleviating family burdens, and bolstering relationships (Detering, Hancock, Reade, & Silvester, 2010). Each of these themes necessitates conversations and open communication with care providers and family members about issues related to death and dying; avoiding or denying one's death would undermine each.

Much of the research on the correlates of death attitudes across the lifespan has been conducted using cross-sectional descriptive survey research and self-report measures, with some qualitative research exploring death attitudes at the end of life (Kurlychek, 1979; Neimeyer, Wittkowski, & Moser, 2004). There has been little longitudinal research on how death attitudes progress from early- to later-elderly years and how these attitudes influence health care use in the years leading up to death. Large-scale surveys have suggested that death anxiety peaks in early adulthood (Russac, Gatliff, Reece, & Spottswood, 2007), decreases from middle- to older-age (Kalish & Reynolds, 1977; Fortner & Neimeyer, 1999), and stabilizes in the last few decades of life (Fortner, Neimeyer, & Rybarczyk, 2000; Fortner & Neimeyer, 1999). For older adults, correlates of greater death anxiety include more physical health problems, residing in a care institution as compared to not, and more symptoms of depression (Fortner & Neimeyer, 1999; Moreno, de la Fuente Solana, Rico, & Fernández, 2008). Lower death anxiety in older adults has been linked to stronger self-efficacy and more social support (Fry, 2003; Chopik, 2017). In a qualitative study on death attitudes among the oldest old, those age 95 and older, participants reported a heightened awareness of death, as most of their contemporaries had died. While death is a regular part of their lives and therefore highly salient, the participants varied widely on preferences for end-of-life care, readiness to die, death acceptance, and outlook on their remaining lives (Fleming et al., 2015). This result suggests that mere exposure to death does not necessarily improve or lead to death acceptance.

Cella and Tross (1987) found greater death anxiety in adults more recently diagnosed with a serious illness, while Smith, Nehemkis, and Charter (1983-1984) found relatively low levels of death anxiety in terminally ill patients. These findings may suggest that receiving a diagnosis of terminal illness introduces or increases thoughts of one's death and thereby begins a process that leads to improved death acceptance. In a better world, one would not need terminal illness to improve death acceptance.

Conceptual Models

Why do people use health services? Several models have been developed in attempts to better understand the factors underlying health-related behaviors, or the lack thereof. Rosenstock (1965) developed the Health Belief Model using social-psychological theory and Lewin's work emphasizing the role of the individual's subjective perception of reality over any objective assessment: whether a behavior occurs depends on readiness to take action and perceiving that action to be potentially effective (Lewin, 1935). When applied to health behavior, readiness to take action is conceptualized as an individual's perception of their susceptibility to an undesired health state and of the seriousness of that state. Perceiving an action as effective or ineffective depends on perceptions of possible benefits and of barriers to the action. Finally, a "cue" is required for the individual to initiate action, whether internal—sensing acute pain, for example—or external—receiving a reminder message from a medical provider. Individual characteristics, such as culture, structure, and demographics, are indirectly included in the model by assuming such characteristics shape perceptions (Rosenstock, 1965).

Numerous studies—prospective, retrospective, correlational, and experimental—have provided evidence for the influences of perceived susceptibility, perceived seriousness, perceived benefits, and perceived barriers on health care behaviors. However, these psychosocial factors cannot account for all variance in health behaviors. For instance, this model does not directly address the influence of the external environment, such as health care policy, or economic factors (Janz & Becker, 1984).

The Health Belief Model takes into consideration any potential drawbacks resulting from a given action. An individual could believe that an action will be effective and beneficial to their health, but fail to take action due to the perception the action will be costly, painful, or distressing (Rosenstock, 1965). Including consideration for quality of life is key for positive outcomes, as prioritizing physical health without regard for quality of life can undermine what is presumably a common goal: to have the highest quality of life for the amount of life that remains. This model does not explicitly state that potential drawbacks should be considered in light of the amount of life remaining, but doing so is necessary to maximize overall quality of life in that which remains.

The Behavioral Model of Health Services Use (Andersen & Newman, 1973) was developed to predict and explain why people use health services, and to measure and improve access to services. The initial model conceptualized health service use as a function of individual predisposition to use services, resources that enable or inhibit use, and individual need for services. Predisposing characteristics include demographic characteristics (e.g., age, sex), social structure (e.g., community status, access to resources, health of environment), and health beliefs, defined as “attitudes, values, and knowledge that people have about health and health services that might influence their subsequent perceptions of need and use of health services” (Andersen, 1995, p.2). Resources that influence health service use include the availability and accessibility of services (e.g., presence of facilities and providers, health insurance, transportation), and individual need includes both perceived need (i.e., the perception that illness is present or likely) and evaluated need (i.e., need determined by professional judgment) (Andersen & Newman, 1973). A second iteration of this model added the health care system as a determinant of use and consumer satisfaction as an outcome measure for use, and a third iteration simplified the model to primary determinants of health behavior (population characteristics, health care system, environment), health behaviors, and health outcomes (perceived and evaluated health status, satisfaction) (Andersen, 1995).

The Behavioral Model of Health Services Use has been applied to health care use research in a wide range of care settings and for a variety of diseases. A systematic review of studies using the Behavioral Model as the primary theoretical background found most research used the fourth revision of the model, which incorporates feedback loops to illustrate that health outcomes affect later predisposing characteristics, needs, and health behaviors (Andersen, 1995; Babitsch, Gohl, & von Lengerke, 2012). The studies reviewed varied widely in which and how many indicators were investigated, and the assessed strength and direction of associations between indicators and services used varied as well. These findings speak to the varied study designs and analyses, as well as the scope and complexity of Andersen's Behavioral Model (Babitsch, Gohl, & von Lengerke, 2012). The Behavioral Model's generally poor accuracy in predicting health service use has been attributed to underdeveloped measurement methods for health service use (e.g., measuring formal vs. informal services), the limitations of frequently used cross-sectional data, and difficulties inherent to complex models (Wolinsky & Johnson, 1991). In short, the baby should not be thrown out with the bathwater; instead, we should continue investigating and improving this complex model.

The Behavioral Model takes into consideration an individual's perception of the seriousness of their condition and of their need for medical care, as well as any professional opinions on their need. Similar to the Health Belief Model, the Behavioral Model does not explicitly state that amount of life remaining should be considered when assessing individual need, or when professions are assessing need. The benefits and risks of medical care, as well as the benefits and risks of abstaining from medical care, should be considered in light of just how much time one has left to benefit or to suffer.

The Health and Retirement Study

Whereas some researchers have investigated health care and death acceptance use in the elderly generally, most samples are limited to those nearing the end of life. Less is known about the trajectory and nature of death acceptance in younger-elderly populations, as well as the relation between death attitudes and engagement in health behaviors as individuals approach death. In order to investigate such topics, longitudinal data collected from older adults is needed.

The Health and Retirement Study (HRS) is a longitudinal biennial survey of a nationally representative sample of over 37,000 adults 50 years of age and older that has collected a wide range of data since it began in 1992 (Sonnega et al., 2014). Each wave of data collection includes questionnaires addressing current and past physical and mental health; health care-related behaviors; functioning, lifestyle, and psychosocial factors; and expectations and preparations for the future. Individual data has been linked to records from the National Death Index, Social Security, Medicare, and the Veteran's administration (Sonnega et al., 2014).

Of particular interest to the present study, participants were asked to provide subjective survival probabilities (SSP), also termed subjective survival forecasts and subjective life expectancy. In each wave, participants were asked to estimate the percent chance they will live to be 10-15 years older than their current age. As the sample consists of older adults and data were collected over a 20 year span, many participants died during the course of data collection, which allows for the calculation of the accuracy of SSPs, and how forecasts change as death approaches ("RAND HRS," 2018).

Expectations for the future can influence current decision-making and subsequent behaviors. Expectations for the amount of life remaining have been shown to predict a variety of behaviors, including spending and saving behavior, exercising, and retirement decision-making

(Salm, 2010; Ziegelmann, Lippke, & Schwarzer, 2006; Van Solinge & Henkens, 2010). Somewhat surprisingly, expectations for the amount of life remaining have also been linked to the actual amount of life remaining: we may be better at predicting our deaths than we know. Longitudinal research has demonstrated that greater subjective life expectancy (i.e., expecting to life longer) was significantly associated with lower mortality 10 years following the initial assessment of subjective life expectancy, even after controlling for socio-demographic characteristics, physical health, and psychological health (van Solinge & Henkens, 2018). Similarly, older adults who reported feeling close to death at baseline were significantly more likely to have died at a 16-year follow up than those who did not report feeling close to dying (Kotter-Gruhn, Gruhn, & Smith, 2010). While predicting the future is still outside our capabilities, we may be more perceptive about our own upcoming deaths than would be expected.

Another approach to better understand SSPs and their utility is to compare the subjective probabilities with population life table estimates. Past research using HRS data has explored the accuracy of subjective survival forecasts as compared to forecasts based on life tables (Biró, 2016; Elder, 2012; Hurd & McGarry, 1995; Hurd & McGarry, 2002), as well as the accuracy of subjective survival forecasts as compared to actual survival (Elder, 2012; Hurd & McGarry, 2002; Romo, Lee, Miao, Boscardin, & Smith, 2015; Smith, Taylor, & Sloan, 2001). In a sample from the first four waves of HRS data collection, subjective survival probabilities offered by individuals were found to be reasonably good predictions of their future mortality (Smith et al., 2001); however, in a sample from the first eight waves of HRS data collection, life table predictions of mortality were found to be more accurate predictors of actual mortality than subjective survival probabilities (Elder, 2012). In a sample from the first two waves of HRS data collection, those who were living in wave two reported wave one survival probabilities that were 50% higher than those who died before wave two (Hurd & McGarry, 2002). In a sample from the 2000 wave, SSPs were moderately accurate for 64-69-year-olds but were no better than chance for those age 70 and older (Romo et al., 2015). These varied findings underscore the need for further investigation on who is more accurate when predicting their own deaths, and how those individuals arrived at such realistic projections.

Using data on subjective survival expectations from 920 respondents in the Retirement Plans and Retirement Incomes: Pilot Survey and population survival curves, Wu, Stevens, and Thorp (2015) found that people overestimate the chance they will live to older ages and underestimate the chance they will live to nearer ages. Additionally, younger participants tended to underestimate survival and older participants tended to overestimate survival. Those aged 50-54 underestimated life expectancy by over eight years; males aged 70-74 overestimated by one year, and women aged 70-74 underestimated by one year (Wu, Stevens, & Thorp, 2015).

Taken as a whole, there is no clear consensus on which psychological and demographic factors are associated with over- or under-estimating time to death. As the results varied depending on the time frame analyzed, age groups analyzed, and cohorts analyzed, there is a need for further and more detailed investigation of individual accuracy of death estimates, as well as of any patterns of change in accuracy of death estimates over time. No researchers have used these forecasts as proxies for death acceptance; an ancillary goal of the current research is to identify any patterns in forecast change in the years leading to death, and how these relate to death acceptance.

The relation of subjective survival forecasts and preventive care use has been investigated using samples from various HRS waves. Biró (2016) investigated the relation between survival forecasts and preventive care use in a sample from HRS waves 1992-2012. In order to separate the effects of health misperception and individual health information from the effects of survival probability on preventive care use, Biró (2016) labeled individuals' perceptions of survival probabilities as positive or negative and justified or unjustified. Perceptions were considered positive when people believed they would live longer than life table projections by 10% or more, and negative when their expectations were less than life table projections by 10% or more. When respondents had a positive perception and reported having a newly diagnosed heart problem, stroke, or died in the 10 years following their reported perception, they were labeled as unjustified; otherwise the positive respondents were labeled as justified. When respondents had a negative perception, they were labeled as unjustified if they survived the next 10 years and did not report a newly diagnosed heart problem or stroke; otherwise the negative respondents were labeled as justified (Biró, 2016).

Having justified or unjustified positive perceptions, and having unjustified negative perceptions were not significant predictors of preventive care use. Those with justified negative perceptions were slightly less likely to receive mammograms, prostate screenings, and PAP smears. When justification status was based on 10-year survival only, excluding the heart problem and stroke criteria, those with justified negative perceptions were slightly less likely to receive mammograms, prostate screenings, and PAP smears. Those with unjustified positive perceptions were slightly less likely to receive mammograms and prostate screenings. When subjective 10-year survival probability was used as a predictor in models of preventive care use, those with higher SSPs were more likely to receive mammograms, PAP smears, and prostate screenings (Biró, 2016). However, this analysis did not control for past compliance with these screenings, suggesting individuals who regularly receive these screenings may expect the screenings to extend their lives.

These findings introduce the question: what causes individuals with both unjustified positive perceptions and justified negative perceptions to be less likely to engage in preventive care? Is the reduced use of preventive care fueled by denial of the truth or by overconfidence in those with unjustified positive perceptions? In those with justified negative perceptions, is the reduced use driven by the use of realistic forecasts or any cost/benefit analysis? This further illustrates the possibility of subtypes of individuals who use health care differentially depending on their perception of their mortality.

Using data from the first three HRS waves, Picone, Sloan, and Taylor (2004) found that women who value present well-being more than future well-being were less likely to receive mammography than those with a preference for future well-being, and those value future well-being more than present well-being were more likely to receive PAP smears than those who value present well-being more. Women with greater subjective expected longevity were significantly more likely to receive PAP smears, mammography, and conduct breast self-exams than those with lesser subjective expected longevity (Picone, Sloan, & Taylor, 2004).

Little is known about the trajectories of SSPs, or about the trajectories of death attitudes in the decade prior to death, and practically nothing is known about how these trajectories relate to general health care use in the young-elderly and elderly in the years prior to death. In order to investigate these topics, I plan to build a model of the relations between health care use, health perception, SSPs, and death attitudes in a sample of HRS respondents during the last decade of life.

HYPOTHESES

Subjective Survival Probabilities and Health Care Use

I hypothesize that a latent profile analysis will reveal three clusters of participants when grouped on SSP: realists, whose trajectory of SSPs change reflects their life expectancy; pessimists, whose SSPs are less than their life expectancy; and optimists, whose SSPs are greater than their life expectancy. Further, I hypothesize that the clusters will differ significantly on health care use, health perception, and death attitudes. Optimists and realists will engage in more health care than pessimists. Pessimists will have lower ratings of perceived health than realists and optimists, and optimists will have greater ratings of perceived health than realists and pessimists. Optimists will engage in fewer death preparation behaviors, indicating less death acceptance, than pessimists and realists.

Change in Subjective Survival Probabilities and Health Care Use Approaching Death

I hypothesize that change in SSPs during the last decade of life will predict health care use in the same time period, such that individuals whose SSPs are more closely aligned to life expectancy, thereby reflecting higher death acceptance, will engage in less health care than individuals whose SSPs are less closely aligned to life expectancy.

METHOD

Dataset

The data used in this study were collected from the Health and Retirement Study (HRS), which was established to provide individual- and population-level data on the economic and health changes associated with ageing. Data collection via phone interviews began in 1992 and has continued biennially since; information on income, health, cognition, retirement, and family connections has been collected from over 37,000 adults (Sonnega et al., 2014). HRS used a national multi-stage area probability sample of households in the United States for recruitment of adults age 51-61, and oversampled African Americans, Hispanic Americans, and Florida residents. Individuals living in institutions, including prisons, jails, long-term or dependent care facilities, and nursing homes, were excluded (Heeringa & Connor, 1995).

Recruitment has continued since the first wave, with new respondents participating in each wave. Once enrolled, participants are interviewed every two years. If the participant died between waves, their designated secondary respondent is contacted to complete an exit interview during the subsequent wave. The exit interview covers topic areas similar to the respondent interviews, with additional items addressing the events leading up to time of death, cause of death, medical interventions near and at the time of death, etc.

Fourteen complete cohorts from the core HRS study are available from 1992-2016. The present data set was compiled from the RAND HRS Longitudinal File, which includes cleaned and processed variables from all HRS waves, and the HRS Exit files, which were matched to the RAND data by participant number and household ID. Due to changes in the phrasing and content of some questionnaire items after Wave 1 of data collection in 1992, Wave 1 was excluded from the current data set.

Participants under age 65 were removed from the sample due to coding differences in the primary variable of interest, the percent chance one will live 10-15 more years. Participants under age 65 were asked the percent chance they will live to be 85 years old, whereas participants age 65 and older were asked the percent chance they will live to be 10-15 years older than their current age (see *Table 6*). As the difference between participant age at the time of the interview and the age used in the question will vary from 11 to 15 years among participants, the discrepancy between age at interview and age used in the question will be included as a covariate when identifying profiles of participants.

According to preliminary analyses, 1,147 respondents in the Health and Retirement Study died during the course of the study after having participated in at least five waves of data collection in the decade prior to their deaths, had complete SSP data, met the aforementioned age criteria, and met mental status criteria (see *Measures* below). Of this sample, 48.0% of those respondents are female and 52.0% male; 90.0% are Caucasian, 8.3% are African American, and 1.7% indicated their race as other. 4.1% of participants identified as Hispanic. The mean age of respondents at death is 82.66 years old (*SD* = 4.85 years).

For the present study, participants are grouped into death cohorts according to the 2-year period in which they died (see *Table 7*). For each participant, data are included from the five waves prior to death and the subsequent exit interview that was completed by the participants' next of kin (see *Table 8*). For example, participants in death cohort 6 died between 2012-2014, and will have self-report data from Waves 7-11 and other-report exit data from Wave 12.

Centering participants by wave of death and collapsing across different years of death has both advantages and disadvantages. This approach allows for a greater number of subjects per group, increasing the power of statistical analyses to be performed. However, this approach also collapses participants across cohort, obscuring potential differences across the decade of data collection. To address any possible cohort effects, differences in age will be assessed in post-hoc analyses.

Measures

Mental status. Participants reporting a diagnosis of dementia and/or Alzheimer's disease were removed from the study. This was done because significant cognitive impairment is likely to make responses to complex questions, such as question about longevity expectations, untrustworthy. Additionally, it is unlikely that those with significant cognitive impairments were able to make their own decisions about health care use, which was another primary concept of interest for this project. The HRS cognition measure, with scores ranging from 0 (*severely impaired*) to 35 (*high cognitive functioning*), was adapted from the Telephone Interview for Cognitive Status (TICS; Brandt, Spencer, & Folstein, 1998). Herzog and Wallace (1997) suggested that scores of 8 or less indicated cognitive impairment, and 8 has been used as the cut-point indicating cognitive impairment in several other studies using the HRS (Lièvre, Alley, & Crimmins, 2008; Crimmins, Kim, Langa, & Weir, 2011). Participants with cognition measure total scores of 8 or less were removed from the sample.

Depression. Depressive symptoms were measured using the CESD-8, an 8-item adaptation of the 20-item Center for Epidemiologic Studies Depression Scale (CES-D). The CES-D was created to measure symptoms of depression in a non-clinical population (Radloff, 1977). The CES-D has been used in many other large-scale surveys and epidemiologic studies, and the CESD-8 has been shown to have good reliability in studies like the HRS (Steffick et al., 2000; Mroczek & Kessler, 1994). Items ask about whether respondents felt depressed, felt everything was an effort, had restless sleep, felt happiness (reverse-scored), felt loneliness, were enjoying life (reverse-scored), felt sad, and had trouble getting going over the past week.

For the CES-D and CESD-8, greater scores indicate more depressive symptoms. Unlike the CES-D, which allows respondents to report the frequency of these items on a scale from zero to three and has a maximum score of 60, the CESD-8 asks respondents to report whether they did or did not experience the aforementioned items and has a maximum score of 8 (Radloff, 1977; Bugliari et al., 2018). Comstock and Helsing (1976) identified the optimal cut point indicating likely clinical depression for the CES-D as 16 or higher, which represents the 80th percentile of scores in their survey. Ideal cut-points for the CESD-8 varied in previous research. Steffick et al. (2000) reported that 12.8% - 17.3% of participants in four waves from the HRS and AHEAD studies scored 4 or higher on the CESD-8. At least one study using HRS data used 4 as the CESD-8 cut point based on Steffick et al.'s (2000) finding, another study using HRS data used 6 as the cut point, and another identified 3 as a cut-point (Zivin et al., 2013; Turvey, Wallace, & Herzog, 1999). For this study, the more conservative cut point of 4 will be considered indicative of depression.

ANALYSES

The focal purpose of this study is to develop a model of the trajectory of death estimates as it relates to change in health care use and death attitudes in the decade preceding death. All analyses were conducted using a random half of the sample, and the final models were validated on the remaining half. The sample was split into halves according to whether birth months were odd-numbered (January, March, etc.) or even-numbered (February, April, etc.).

Data analysis proceeded in three steps. First, exploratory factor analysis (EFA) was used to create measures representing the latent constructs of health care use and death acceptance, by identifying the items that best represented each construct. As the EFA results were not interpretable, confirmatory factor analyses (CFA) were not conducted as planned to confirm the constructs. Second, latent profile analysis (LPA) was used to identify latent profiles of death expectations using SSPs using meaningful subgroups in half of the sample. The optimal solution was then applied to the second half-sample for validation, then to the full sample after being validated. The initial data analysis plan was to analyze differences between profiles on constructed measures of health care use and death acceptance. As this was not possible due to EFA results, the third step then used chi square, one-way ANOVA, and repeated measures ANOVA analyses to describe the characteristics and psychologies of the distinct groups of subjects who shared similar profiles of SSP, which will be referred to as profiles.

RESULTS

Equivalency of Samples

Chi-square tests of independence were performed to determine whether the two half-samples were similar in distribution of gender and race (see *Table 9*). The two halves of the sample were neither significantly different for gender, X^2 (1, *n* = 1147) = 0.15, *p* = 0.70, nor for race, X^2 (2, *n* = 1147) = 3.47, *p* = 0.18. An independent samples t-test was performed to determine whether the two samples were similar in age at death. The odd birth month sample (*M* = 82.51, *SD* = 4.83) was not significantly different in death age from the even birth month sample (*M* = 82.81, *SD* = 4.88), *t*(1145) = -1.06, *p* = 0.29.

Independent samples t-tests were performed to determine whether the two half-samples were similar in SSP estimates, age used in the SSP item, discrepancy between age and age used in SSP item, number of health conditions per wave, ratings of health at each wave, ratings of health change at each wave, number of doctor visits per wave, BMIs at each wave, doctor visits at each wave, and CESD-8 scores per wave. The odd birth month sample was not significantly different from the even birth month sample for all SSP ratings; all ages used in SSP items; all discrepancies between age and age used in SSP items; numbers of health conditions; all ratings of health, all ratings of health change; all BMIs; all numbers of doctor visits; and all CESD-8 scores.

Chi-square tests of independence were used to determine whether there were significant differences between the two half-samples regarding whether participants took prescription drugs, engaged in preventive care, received outpatient surgery, received home health care, received specialized health services, and were hospitalized or not at each wave; and whether participants had a written and witnessed will, had a durable power of attorney for health care, provided written instructions for end-of-life care, and discussed end-of-life treatment or not. There were no significant associations between the two half samples for whether each took prescription drugs at all waves; engaged in preventive care at all waves; received outpatient surgery at waves one, two, four, and five; received home health care at all waves; received specialized health services at all waves; were hospitalized or not at waves four through five; had a written and witnessed will; had a durable power of attorney for health care; provided written instructions for end-of-life care; and discussed end-of-life treatment or not.

There was a significant difference between the two half-samples for outpatient surgery during wave three, X^2 (1, N = 1146) = 3.93, p = 0.047. Those with odd birth months were less likely to have had no outpatient surgeries (70.2%) than the full sample (72.7%), and those with even birth months were more likely to have had no outpatient surgeries (75.4%) than the full sample. There was also a significant association between the two half-samples for hospital stays at wave one, X^2 (1, N = 1146) = 11.11, $p < 0.01$. Those with odd birth months were less likely (64.7%) than the full sample to have had no hospital stays (69.0%), and those with even birth months were more likely (73.8%) than the full sample to have had no hospital stays.

While there were significant associations for outpatient surgery and hospital stays, these variables were not excluded due to the large sample sizes of the groups and the sensitivity of chi-square analysis to sample size. Additionally, the significant associations between half samples for the two variables occurred at one of five waves, suggesting there is no meaningful difference between half-samples for the variables overall. Therefore I concluded that the two half-samples were similar enough to support my replication strategy.

Exploratory Factor Analysis

My initial approach to analyzing differences in the health care use and death attitudes of the SSP trajectory groups was to use EFA to create measures representing the latent constructs of health care use and death acceptance by identifying combinations of the items that best represent each construct. SSP trajectory groups would then be compared on latent scores from each of the two measures. Even though the sample is large, there was some attrition related to missing data; therefore it was important to keep the model degrees of freedom low. By testing latent constructs using composite measures, I would be able to exclude non-related construct items and minimize the model degrees of freedom. I also planned to use maximum likelihood estimation which is robust against non-normality of standard errors.

Health care use construct. An EFA was conducted using the following variables: regularly taking prescription medication(s), number of doctor visits and/or communications, number of hospital stays, receiving outpatient surgery, receiving home health care, receiving specialized health services, self-report of health, receiving a flu shot, receiving a cholesterol check, and engaging in gender-specific preventive care (see *Table 1)*. The mean inter-item correlation values (*r*) for the following variables did not exceed |0.3|, so they were removed from the analysis: number of doctor visits, taking prescription drugs, having outpatient surgery, receiving specialized health services, self-report of health, and having received a flu shot. The EFA results using the remaining four variables indicated the data is not acceptable for factor analysis (KMO = 0.510; Individual Measures of Sampling Adequacy (MSA) < 0.6), so the EFA results were not interpreted and the CFA was not conducted.

Death attitudes construct. An EFA was conducted using the following variables: having a written and witnessed will, having a durable power of attorney for health care, providing written instructions for end-of-life care, or discussing end-of-life treatment (see *Table 2*). The variable of whether or not an individual has a will had zero variance, so it was removed from the analysis. The EFA results using the remaining three variables indicate the data is not appropriate for factor analysis (KMO = .507; individual MSAs < 0.6). Considering this, the EFA results were not interpreted and the CFA was not conducted.

Alternative measurement approach. Given that I was not able to create statistically acceptable latent constructs measuring health care use and death attitudes, variables representing these constructs were analyzed in a series of post-hoc statistical analyses after profile membership was determined. To assess factors related to health indicators, statistical analyses were conducted to determine whether profiles differed in having stayed in the hospital since the previous wave or not, the number of new health problems developed from wave 1 to wave 5, the sum of health problems per wave, perceived health, and perceived health change since the previous wave. To assess factors related to health care use, statistical analyses were conducted to determine whether profiles differed in use of preventive care (e.g., cholesterol check, flu shot) and number of doctor visits after covarying out number of health conditions at each wave.

To assess factors related to death and death attitudes, analyses were conducted to determine whether there were significant differences among profiles for widow status, duration of final illness, having a living will, having written end-of-life instructions, having an end-of-life legal care arrangement, having discussed end-of life care, age at death, age of participant mother at death or age at wave 5 if still living, and age of participant father at death or age at wave 5 if still living. Health insurance status was not assessed because the entire sample reported having at least one type of health insurance, which included Medicare and Medicaid. SSP ratings at waves four and five were also compared for each profile to determine whether groups had significant changes in SSP in their final years leading to death.

Latent Profile Analysis

Analyses were performed in Mplus, Version 8.1, in two steps. First, latent profile analyses were used to identify profiles of participants based on five ratings of SSP, each of which were collected every two years, using participants born in odd-numbered months. The number of profiles for this solution was determined by model fit indexes, including the bootstrapped likelihood ratio test, Bayesian information criterion (BIC), and the adjusted Bayesian information criterion (a-BIC; see *Table 10* and *Table 13*), as well as the interpretability and replicability of the derived profiles (Geary et al., 2009) (see *Figures 1-4*). The discrepancy between the age used in the question about SSP and the actual age of the participant at the time of the question (see *Table 6*) was regressed on SSP ratings in order to control for differences in the amount of time participants were asked to estimate they would live for in the future. This was done because the difference between the participant's current age and the death target age used in the question to ranges from 11-15 years due to the categorical nature of determining the age used in the question (see *Table 6*).

Second, a latent profile analysis using the number of profiles derived from the first half-sample was then applied to the second half-sample to determine if the profiles found using the first group were replicable. In both steps, cases with any missing SSP data were excluded from the analyses.

Identification and description. Models with one to five classes were tested and compared. Models with greater than five profiles were not considered because the best loglikelihood values were not able to be replicated despite increasing the number of random starts; additionally, models with greater number of profiles were considered theoretically unwieldy and uninterpretable. AIC, BIC, and a-BIC values decreased as the numbers of profiles in the solution increased. Entropy (a measure of how many respondents were unequivocally captured by one of the groups) ranged from 0.85 (2-profile model) to 0.98 (5-profile model). The BLRT values had significant *p*-values for each model, demonstrating that each model was a better fit than the model with one fewer profile. The 1- and 2-profile solutions were ruled out given their relatively larger AIC, BIC, and a-BIC values, as well as the 2-profile solution's smaller entropy value. Models with 3, 4, and 5 profiles were statistically justifiable, and were further evaluated, considering profile distinctiveness, theoretical interpretability, and the sizes of the classes.

One profile in the 3-profile solution (n = 83, 13.9%) had much smaller group membership than the other profiles in this solution (e.g., n = 154, 25.8%). Two profiles in the 4-profile solution (e.g., n = 83, 13.9%) had much smaller group memberships than the other two profiles (e.g., n = 135, 22.6%). Three profiles in the 5-profile solution also had much smaller group membership (e.g., n = 43, 7.2%) than the other two profiles (e.g., n = 133, 22.2%). It has been suggested that profiles containing less than 5% of the sample may be artifacts; using this guideline, no solutions could not be ruled out on group membership alone (Collins & Lanza, 2010; see *Table 11*).

Three profile trajectories appeared to be replicated from the 3- to 4- profile solutions, and four profile trajectories appeared to be replicated from the 4- to 5- profile solutions (see *Figures 1-3*). The additional profile in the 5- profile solution appears to closely mirror the trajectory of another profile from that solution, indicating little distinctiveness and poor theoretical interpretability for this additional profile (see profiles 1 and 3 in *Figure 3*). Considering this, the 5-profile solution was ruled-out. The profile unique to the 4-profile solution appears to have good theoretical interpretability. Considering this and the better fit statistics of the 4-profile solution as compared to the 3-profile solution, the 4-profile solution was selected as the optimal model.

In the 4-profile solution, profile one has the lowest wave one mean SSP (*M* = 34.50%), and this profile's SSPs decrease across waves until ending at the lowest wave five mean SSP (*M* = 3.12%). The mean SSPs for profile two remain near the median SSP of 50% from wave one (*M* = 54.89%) to wave five (*M* = 48.74%). For profile three, the mean SSPs decrease slightly from wave one (*M* = 44.50%) to wave four (*M* = 36.08%) then decrease to a greater extent from wave four to wave five (*M* = 23.58%). Profile four SSP ratings were the greatest across all waves and increase from wave four (*M* = 66.82%) to wave five (*M* =88.01%; see *Table 12*).

Replicability. The 4-class LPA was applied to the second half of the sample (even birth months). The four profile trajectories appeared very similar to those found using the first half of the sample. For both solutions, the SSPs of profile one begin around 34% at wave one and end around 3% at wave five. Profile two SSPs begin around 52% at wave one and end around 49% at wave five. Profile three SSPs begin around 46% at wave one and end around 23% at wave five. Finally, profile four SSPs begin around 68% at wave one and end around 89% at wave five (see see *Table 12*, *Figure 2* and *Figure 4*). Given the similarity of profiles, the 4-class LPA results from the first half-sample are considered replicated in the second half-sample. When the 4-class LPA was applied to the entire dataset, similar profiles were found again (see *Table 12* and *Figure 5*). Each participant with complete SSP data was assigned a profile membership.

Analyzing Group Differences

The 4-class LPA was applied to the entire dataset to conduct exploratory analyses in order to characterize the four profiles and elucidate any group differences related to SSP trajectories, and similar profile patterns were found again (see *Table 13*). Given that profile one has the lowest wave one means and the SSPs decrease across waves until ending at the lowest wave five mean SSPs, this group will be labeled “pessimists.” Profile two mean SSPs remain near the median SSP of 50% from wave one to wave wife, so this profile will be labeled “non-committals.” For profile three, the mean SSPs decrease slightly from wave one to wave four then decrease to a greater extent from wave four to wave five. This profile will be labeled “realists,” as the decrease in average SSP ratings near the end of life may reflect an acknowledgment of the nearness of death. Profile four SSP ratings were the greatest across all waves and increase from wave four to wave five; this profile will be labeled “optimists.” (see *Table 12*).

The SSPs of optimists and non-committals increased during their last few years of life, while the SSPs of pessimists and realists decreased during their last few years of life. To determine whether these changes in SSPs were significant, a paired samples t test was used to evaluate whether each profile’s average SSP ratings at wave four were significantly different from those at wave five.

To elucidate any differences in demographics and psychological characteristics between the profiles, chi-square tests of independence were used to explore any significant differences among the four profiles in gender, race, marital status, and poverty status. ANOVA was used to identify whether profiles differed in age at death, year of death, and years of education. Profiles were screened for differences in having ever had psychological problems, having current psychological problems at wave one, and having current psychological problems at wave five using chi-square tests of independence. Repeated measures and follow-up one-way ANOVAs were used to identify whether profiles differed in the patterns of mean change for CESD-8 scores per wave.

To identify any differences in health status between the profiles, chi-square tests of independence were used to identify whether there were any significant differences among the four profiles in having smoked over the lifetime, being an active smoker at wave one, being an active smoker at wave five, and duration of final illness. ANOVA was used to identify whether profiles differed in BMI at waves 1 and 5, and number of new health problems developed from wave 1 to wave 5. Repeated measures and follow-up one-way ANOVAs were used to identify whether profiles differed in the patterns of mean change for the sum of health problems per wave, perceived health, and perceived health change since the previous wave.

In order to explore differences in health care use between the profiles, chi-square tests of independence were used to identify whether there were any significant differences among the four profiles in having engaged in preventive care, having health insurance, and having stayed in the hospital since the previous wave. ANCOVA was used to explore whether profiles differed in number of doctor visits after covarying out number of health conditions at each wave.

To determine whether the profiles differed in factors related to death attitudes, chi-square tests of independence were used to identify whether there were any significant differences in widow status, having a living will, having written end-of-life instructions, having an end-of-life legal care arrangement, and having discussed end-of life care. ANOVA was used to identify whether profiles differed in age of participant’s mother at her death or age at wave 5 if she was still living and age of participant father at the father’s death or age at wave 5 if he was still living.

For the ANOVAs described above, all variables were entered in one step and pairwise comparisons using the Bonferroni procedure were interpreted to identify which groups were significantly different for which levels of each variable.

Change in SSP near the end of life. Paired-sample t-test results demonstrated that wave four SSP ratings were significantly different from wave five SSP ratings for all groups. For pessimists, wave five SSP ratings (M = 3.08, SD = 4.39) were significantly less than wave four SSP ratings (M = 21.21, SD = 26.34), $t(576) = 16.46$, $p < 0.01$, $d = -0.69$. For non-committals, wave five SSP ratings (M = 49.09, SD = 5.48) were significantly greater than wave four SSP ratings (M = 41.31, SD = 25.83), $t(257) = -4.81$, $p < 0.01$, $d = 0.30$. For realists, wave five SSP ratings (M = 25.63, SD = 4.33) were significantly less than wave four SSP ratings (M = 35.36, SD = 28.02), $t(138) = 4.78$, $p < 0.01$, $d = -0.41$. For optimists, wave five SSP ratings (M = 88.43, SD = 10.59) were significantly greater than wave four SSP ratings (M = 66.74, SD = 29.74), $t(172) = -9.59$, $p < 0.01$, $d = 0.73$. As the LPA revealed two subgroups distinguished by increases in SSPs occurring in the wave preceding their actual death, I was in a position to evaluate whether this belief about their prospects of continued living relates to their health care use.

A one-way ANOVA demonstrated a significant difference between groups in the discrepancy between the age used in the question asking participants to rate the percent chance they would live 10-15 more years in wave 5 and the age used in wave 4, $F(3, 1144) = 3.59$, p = 0.01. Multiple comparisons demonstrated that the discrepancy in age used in the questions asked to pessimists (M = 2.14, SD = 2.48) was significantly greater than the discrepancy in age used in the questions asked to realists (M = 1.51, SD = 2.30), $t = 2.72$, $p = 0.04$. In other words, the average pessimist reacting to the question of whether they would live to be 10-15 years older was projecting ahead by roughly 9 more months than was the average realist. It makes logical sense that those asked to estimate the percent chance that they would live to an older age would give lower ratings than those asked to estimate the percent chance that they would live to a younger age. However, this effect was only significant when pessimists and realists were compared, the two groups with the lowest mean SSP ratings across all waves. Because this effect was limited to these two groups, it is possible that this finding is an artifact.

Demographics. To better understand and define each profile, I conducted a series of analyses exploring demographic and psychological characteristics. Chi-square tests of independence demonstrated that there were not significant associations between the profile membership and gender, X^2 (3, N = 1147) = 3.17, p = 0.37; poverty status at wave one, X^2 (3, N = 834) = 0.97, p = 0.81; poverty status at wave five, X^2 (3, N = 1147) = 2.70, p = 0.44; marital status at wave one, X^2 (9, N = 1146) = 8.73, p = 0.37; or marital status at wave five, X^2 (9, N = 1147) = 17.59, p = 0.05. ANOVA demonstrated no significant differences between profiles for years of education, F(3, 1146) = 1.64, p = 0.18; or for year of death (i.e., the year in which people died irrespective of their age), F(3, 1146) = 1.44, p = 0.23 (see *Table 14*).

Chi-square tests of independence demonstrated that there was a significant association between participant race and profile membership, X^2 (6, N = 1147) = 49.88, p < 0.01 (see *Table 14*). Pessimists were more likely to identify their race as Caucasian (92.5%) compared to their representation in the full sample (89.5%), and less likely to identify their race as African American (5.8%) compared to their representation in the full sample (8.7%). Optimists were more likely to identify their race as African American (17.8%) compared to their representation in the full sample (8.7%), and more likely to identify their race as “other” (4.0%) compared to their representation in the full sample (1.7%). Optimists were less likely to identify their race as Caucasian (79.6%) compared to their representation in the full sample (89.5%). There were no significant associations between participant race and profile membership for realists and non-committals.

ANOVA yielded significant relations between profile membership and age at death $F(3, 1143) = 9.52$, $p < 0.01$ (see *Table 15*). Levene's test indicated equal variance for age at death ($F = 0.93$, $p = 0.42$), so results using the Bonferroni procedure were interpreted for post hoc comparisons in order to control for overall error rate. Pessimists ($M = 83.34$, $SD = 4.81$) were significantly older at death than non-committals ($M = 81.61$, $SD = 4.62$), and significantly older at death than realists ($M = 82.00$, $SD = 4.89$; see *Table 16*).

Chi-square tests of independence demonstrated no significant association between profile membership and currently having psychological problems at wave one, X^2 (3, $N = 1147$) = 2.15, $p = 0.54$; currently having psychological problems at wave five, X^2 (3, $N = 1147$) = 7.64, $p = 0.054$; or having ever had psychological problems, X^2 (3, $N = 1147$) = 6.94, $p = 0.07$ (see *Table* 14).

A repeated measures ANOVA was used to test for interaction effects between profile membership and CESD-8 scores taken across five waves. Mauchly's Test of Sphericity was significant, $X^2(9) = 167.89$, $p < 0.01$, so sphericity was not assumed; the Greenhouse-Geisser correction was interpreted for tests of within-subjects effects. Results indicated no significant effects for the interaction between wave and profile membership, $F(11.09, 4221.16) = 1.65$, $p = 0.08$. However, results indicated a significant main effect for wave, $F(3.70, 4221.16) = 18.19$, $p < 0.01$, and a significant main effect for profile membership, $F(3, 1142) = 6.97$, $p < 0.01$ (see *Table* 17).

Pairwise comparisons for the main effect of wave indicate that CESD-8 scores at wave five ($M = 1.75$, $SE = 0.07$) were significantly greater than mean CESD-8 scores at waves one (M

= 1.26, *SE* = 0.06), two (*M* = 1.35, *SE* = 0.06), three (*M* = 1.35, *SE* = 0.06), and four (*M* = 1.52, *SE* = 0.07). Mean CESD-8 scores at wave four (*M* = 1.52, *SE* = 0.07) were also significantly greater than those at wave one (*M* = 1.26, *SE* = 0.06). Participants appeared to endorse more symptoms of depression over time as they approached death (see *Table 18*).

Pairwise comparisons for the main effect of profile membership indicate that mean CESD-8 scores for pessimists (*M* = 1.73, *SE* = 0.06) were significantly greater than mean CESD-8 scores for non-committals (*M* = 1.32, *SE* = 0.09) and optimists (*M* = 1.30, *SE* = 0.11; see *Table 22* and Figure *6).*

Overall, few of the analyzed variables appeared to vary between the profiles, but some key differences were found. Optimists were more likely to identify their race as African American or "other" than were those in the full sample and pessimists were more likely to identify their race as Caucasian than were those in the full sample. Pessimists were older than non-committals and realists but not older than optimists; pessimists also reported more symptoms of depression than non-committals and optimists. However, there were no differences in profiles current report of having psychological problems and historical occurrence of psychological problems.

Health status. To understand group differences in health that might account for differences in health care use, I tested health-related factors. ANOVA demonstrated no significant differences between profiles for BMI at wave 1, $F(3, 1141) = 0.79$, $p = 0.50$; BMI at wave 5, $F(3, 1141) = 1.11$, $p = 0.34$; or number of new health conditions developed over the course of the study $F(3, 1146) = 1.71$, $p = 0.16$ (see *Table 15*). Chi-square tests of independence demonstrated no significant association between profile membership and smoking over the lifetime, X^2 (3, $N = 1139$) = 2.75, $p = 0.43$; being a current smoker at wave one, X^2 (15, $N =$

1142) = 1.71, $p = 0.63$, or being a current smoker at wave five, X^2 (3, $N = 1138$) = 0.77, $p = 0.86$ (see *Table 14*).

Chi-square tests of independence demonstrated a significant association between the duration of the final illness leading to death and profile membership, X^2 (15, $N = 1116$) = 33.15, $p < 0.01$ (see *Table 14*). Pessimists were more likely to have a final illness duration of more than a year (25.5%) than those in the full sample (22.3%) and less likely to have a final illness duration of less than a month (14.5%) than those in the full sample (17.6%).

A repeated measures ANOVA was used to test for interaction effects between profile membership and wave for number of health conditions. Mauchly's Test of Sphericity was not significant so sphericity was assumed. Results indicated no significant interaction effect, $F(12, 4572) = 1.23$, $p = 0.25$. However, results indicated a significant main effect of wave, $F(4, 4572) = 547.19$, $p < 0.01$, and a significant main effect of profile membership, $F(3, 1143) = 3.57$, $p = 0.01$ (see *Table 17*).

Pairwise comparisons for the main effect of number of conditions indicate that the number of conditions at wave one ($M = 2.27$, $SE = 0.05$), wave two ($M = 2.48$, $SE = 0.05$), wave three ($M = 2.72$, $SE = 0.05$), wave four ($M = 3.01$, $SE = 0.05$), and wave five ($M = 3.31$, $SE = 0.05$) were all significantly different from each of the others (see *Table 20*).

Because pairwise comparisons did not indicate any significant differences between the four profiles for number of health conditions, deviation contrasts were interpreted to further illustrate the significant main effect found for profile membership. Pessimists ($M = 2.95$, $SE = 0.06$) reported significantly more health conditions than the entire sample ($M = 2.83$, $SE = 0.02$), $F(3, 1143) = 3.57$, $p < 0.01$.

This finding demonstrates that optimists and non-committals did not become more optimistic in their SSPs near the end of life as a reaction to improved health. In other words, their perceptions of an increased chance of greater longevity do not appear to be driven by better health, as measured by numbers of conditions.

Health perception. Given the likelihood that perceptions of wellness or illness may influence both health care use and longevity expectations, differences in perceived health between profiles were explored. A repeated measures ANOVA was used to test for interaction effects between profile membership and wave for self-report of health. Responses ranged from one to five, with greater values indicating better health and lesser values indicating worse health. Mauchly's Test of Sphericity was not significant so sphericity was assumed. Results indicated a significant main effect of wave, $F(4, 4648) = 81.88$, $p < 0.01$; a significant main effect of profile membership, $F(3, 1137) = 27.04$, $p < 0.01$; and a significant interaction between wave and profile membership, $F(12, 4548) = 2.23$, $p < 0.01$ (see *Table 17*).

Pairwise comparisons for the main effect of wave indicated that the participants generally perceived their health as becoming worse from wave one to wave five. Ratings at wave one (M = 3.17, SE = 0.04), wave two (M = 3.04, SE = 0.03), wave three (M = 2.92, SE = 0.04), wave four (M = 2.81, SE = 0.04), and wave five (M = 2.60, SE = 0.04) were all significantly different from each of the others (see *Table 21*).

Pairwise comparisons for the main effect of profile membership indicated that pessimists self-reported worse health (M = 2.60, SE = 0.03) than non-committals (M = 3.00, SE = 0.05), realists (M = 2.92, SE = 0.07), and optimists (M = 3.11, SE = 0.06; see *Table 19*).

A series of one-way ANOVAs was used to interpret interaction effects between wave and profile membership for self-report of health. There were significant main effects of profile membership for self-report of health at waves one, $F(3, 1143) = 13.37$, $p < 0.01$; two, $F(3, 1142) = 16.30$, $p < 0.01$; three, $F(3, 1140) = 16.69$, $p < 0.01$; four, $F(3, 1143) = 13.71$, $p < 0.01$; and five, $F(3, 1141) = 31.14$, $p < 0.01$ (see *Table 15*). Levene's test indicated equal variance in self-report of health at waves one, ($F = 1.34$, $p = 0.24$); two, ($F = 0.93$, $p = 0.43$); three, ($F = 1.32$, $p = 0.27$); and four, ($F = 1.06$, $p = 0.37$), so results from these waves using the Bonferroni procedure were interpreted to control for overall error rate. Levene's test indicated unequal variance in self-report of health at wave five ($F = 2.78$, $p = 0.04$), so wave five results using the Dunnett C procedure were interpreted, given the large sample sizes of the profiles.

In wave one, pessimist self-ratings of health ($M = 2.92$, $SD = 1.01$) were significantly lower than those of non-committals ($M = 3.25$, $SD = 1.00$) and optimists ($M = 3.4$, $SD = 1.01$; see *Table 23*). In wave two, pessimist self-ratings of health ($M = 2.74$, $SD = 0.97$) were significantly lower than those of non-committals ($M = 3.15$, $SD = 1.02$), realists ($M = 3.08$, $SD = 0.99$), and optimists ($M = 3.20$, $SD = 1.02$; see *Table 24*). In wave three, pessimist self-ratings of health ($M = 2.62$, $SD = 1.01$) were significantly lower than those of non-committals ($M = 2.99$, $SD = 1.05$), realists ($M = 2.94$, $SD = 0.97$), and optimists ($M = 3.13$, $SD = 1.04$; see *Table 25*). In wave four, pessimist self-ratings of health ($M = 2.53$, $SD = 1.00$) were significantly lower than those of non-committals ($M = 2.86$, $SD = 1.09$), realists ($M = 2.85$, $SD = 1.03$), and optimists ($M = 3.01$, $SD = 1.04$; see *Table 26*). In wave five, pessimist self-ratings of health ($M = 2.18$, $SD = 1.01$) were significantly lower than those of non-committals ($M = 2.72$, $SD = 1.12$), realists ($M = 2.57$, $SD = 1.07$), and optimists ($M = 2.93$, $SD = 1.09$; see *Table 27*).

A repeated measures ANOVA was used to test for interaction effects between profile membership and wave for self-report of health change since the last wave/over the past two years, taken across five waves. Responses ranged from one to five, with greater values indicating improved health and lesser values indicating worsened health. Mauchly's Test of Sphericity was significant, $X^2(9) = 32.67$, $p < 0.01$, so sphericity was not assumed; the Greenhouse-Geisser correction was interpreted for tests of within-subjects effects. Results yielded significant main effects for wave, $F(3.94, 4469.26) = 20.83$, $p < 0.01$, and profile membership, $F(3, 1134) = 14.00$, $p < 0.01$, as well as a significant interaction effect, $F(11.82, 4469.26) = 0.70$, $p = 0.01$ (see *Table 17*).

Pairwise comparisons for the main effect of wave showed that self-report of health change was significantly lower at wave five (*M* = 2.62, *SE* = 0.21) than at waves four (*M* = 2.74, *SE* = 0.02), three (*M* = 2.78, *SE* = 0.02), two (*M* = 2.79, *SE* = 0.02), and one (*M* = 2.85, *SE* = 0.02). Self-report of health change at waves four (*M* = 2.74, *SE* = 0.02) and three (*M* = 2.78, *SE* = 0.02) was significantly worse than self-report of health change at wave one (*M* = 2.85, *SE* = 0.02; see *Table 28*).

Deviation contrasts were interpreted to further illustrate the significant main effect found for profile membership because pairwise comparisons did not indicate any significant differences between the four profiles for self-report of health change. Pessimists (*M* = 2.63, *SE* = 0.02) reported significantly lower change in health than the entire sample reported (*M* = 2.72, *SE* = 0.01), $F(3, 1134) = 14.00$, $p < 0.01$.

A series of one-way ANOVAs was used to interpret interaction effects between profile membership and wave for self-report of health change. There were significant main effects of profile membership for self-report of health change at waves one, $F(3, 1140) = 2.83$, $p = 0.04$; three, $F(3, 1146) = 12.10$, $p < 0.01$; four, $F(3, 1142) = 5.37$, $p < 0.01$; and five, $F(3, 1144) = 11.87$, $p < 0.01$. There was not a significant main effect of profile membership for self-report of health change at wave two, $F(3, 1145) = 0.84$, $p = 0.47$ (see *Table 15*). Levene's test indicated unequal variance in self-report of health change at waves one ($F = 26.95$, $p < 0.01$), three ($F = 8.45$, $p < 0.01$), and four ($F = 7.97$, $p < 0.01$), so results using the Dunnett C procedure were interpreted for these waves, given the large sample sizes of the profiles. Levene's test indicated equal variance in self-report of health change at wave five ($F = 1.59$, $p = 0.19$), so results from this wave using the Bonferroni procedure were interpreted to control for overall error rate.

In wave one, pessimist ratings of health change ($M = 2.78$, $SD = 0.68$) were significantly lower than those of non-committals ($M = 2.92$, $SD = 0.60$; see *Table 29*). In wave three, pessimist ratings of health change ($M = 2.62$, $SD = 0.59$) were significantly lower than those of non-committals ($M = 2.82$, $SD = 0.60$), realists ($M = 2.78$, $SD = 0.64$), and optimists ($M = 2.88$, $SD = 0.58$; see *Table 30*). In wave four, pessimist ratings of health change ($M = 2.63$, $SD = 0.62$) were significantly lower than those of optimists ($M = 2.81$, $SD = 0.62$; see *Table 31)*. In wave five, optimist ratings of health change ($M = 2.80$, $SD = 0.63$) were significantly greater than those of non-committals ($M = 2.60$, $SD = 0.61$), realists ($M = 2.59$, $SD = 0.59$), and pessimists ($M = 2.49$, $SD = 0.59$; see *Table 32*).

Overall, participants appeared to perceive their health as worse and as increasingly worse as they aged and grew closer to death. Of note, pessimists—the group with the lowest SSPs—reported both lower levels of perceived health and worsened health to a greater degree than many other profiles.

Post-Hoc Tests of the Main Hypothesis

Health care behaviors. A primary construct of interest for this project, a series of analyses were used to explore various activities related to health and health care A one-way ANCOVA was conducted to determine the relation of profile membership to wave for the number of doctor visits after controlling for number of health conditions at each wave. For all waves, profile membership was not significantly related to number of doctor visits after controlling for number of health conditions. Chi square tests of independence demonstrated no significant associations between profile membership and having had a flu shot, having had a cholesterol check, and having engaged in gender-related preventive care (i.e., prostate exam, pap smear, mammogram) or not at each wave.

Chi square tests of independence demonstrated that there were no significant associations between profile membership and having had at least one hospital stay for waves one X^2 (3, N = 1146) = 5.07, p = 0.17; two, X^2 (3, N = 1143) = 5.34, p = 0.15; four, X^2 (3, N = 1137) = 7.29, p = 0.06; and five X^2 (3, N = 1135) = 9.17, p = 0.30. Chi square tests of independence yielded a significant association between profile membership and having had at least one hospital stay at wave three, X^2 (3, N = 1142) = 12.17, p < 0.01 (see *Table 14*). Pessimists were more likely to have had at least one hospital visit (44.6%) than those in the full sample (40.4%). Optimists were more likely to have had no hospital visits (69.2%) than those in the full sample (59.6%). These results seem to indicate that participants in the different profiles do not go to the doctor at different rates after accounting for number of health conditions.

Death attitudes. Another construct of interest for this project is death acceptance. I tested for differences between the profiles on the available indicators of death acceptance and death avoidance. Chi-square tests of independence demonstrated that there were not significant associations between the profiles membership and widow status, X^2 (3, N = 1147) = 7.01, p = 0.07; having written end-of-life instructions, X^2 (3, N = 1122) = 6.75, p = 0.08; having an end-of-life legal care arrangement, X^2 (3, N = 1108) = 4.14, p = 0.25; or having ever discussed end-of-life care X^2 (3, N = 1131) = 6.78, p = 0.08 (see *Table 14*). ANOVA demonstrated no significant differences between profiles for mother age at death or current age if still alive in wave 5, F(3,

1123) = 0.39, $p = 0.76$; and father age at death or current age if still alive in wave 5, $F(3, 1118) = 0.36$, $p = 0.78$ (see *Table 15*).

Chi-square tests of independence yielded a significant association between living will status and profile membership, X^2 (3, $N = 1127$) = 8.17, $p = 0.04$ (see *Table 14*). Optimists were less likely to have a will (62.4%) than those in the full sample (71.3%), perhaps reflecting their expectations to live much longer than is realistic or probable.

DISCUSSION

We often get the message that Americans tend to be death-avoidant and use excessive health care in an effort to prolong life. In a country with an advanced, albeit flawed, health care system, numerous treatment options can be available to patients regardless of the amount of value provided when considering the costs of recovery and amount of time remaining to enjoy the benefits. Some research has found that Americans spend excessively on health care in the final years of life (Riley & Lubitz, 2010), while others have demonstrated that this excessive spending can be explained by age-related costs such as caregiving and hospice (De Nardi, French, Jones, & McCauley, 2016). Having frank conversations with physicians about preferences for end-of-life care can reduce the frequency of intensive interventions and thereby reduce costs (Zhang et al., 2009). However, those who experience anxiety about death may avoid these conversations altogether, and research has demonstrated that chronically ill older adults with less fear of death were more likely to have discussed end-of-life care with a physician than those with greater fear of death (Dobbs, Emmett, Hammarth, & Daaleman, 2012). This is troubling, as those who have conversations about the end-of-life with physicians tend to experience greater quality of life in their final days (Zhang et al., 2009).

Health status is also known to influence death anxiety. For instance, death anxiety may be greater upon initial diagnosis of a serious illness than later in its progression, and death acceptance may be greater in the terminally ill than the general population (Cella & Tross, 1987; Smith, Nehemkis, & Charter, 1983-1984). This could indicate that the initial diagnosis of an illness may make thoughts of death more salient and cause increased anxiety, which decreases as individuals habituate to these thoughts and their health status.

Trajectories of death anxiety have been studied with cross-sectional descriptive research and self-report measures, and less often with longitudinal research. Some surveys show that death anxiety is the greatest in early adulthood, then decreases until stabilizing in the last few years of life (Russac, Gatliff, Reece, & Spottswood, 2007; Kalish & Reynolds, 1977; Fortner & Neimeyer, 1999; Fortner, Neimeyer, & Rybarczyk, 2000). This project sought to advance understanding of SSP trajectories, death attitudes, and health care use in the young-elderly and elderly in the years leading to death. Do those who have unrealistic expectations of longevity tend to be death-avoidant or death-anxious, and also use excessive health care possibly as an attempt at coping? Do those with more realistic expectations of longevity tend to be more death-accepting and thereby engage in more death preparation behaviors?

I hypothesized a simple model of three profiles grouped on SSPs: optimists, who expect to live longer than their actuarial life expectations; pessimists, who expect to live shorter lives than their actuarial life expectations; and realists, whose expectations are a near match for their actuarial life expectations. This hypothesis was partially confirmed by the LPA results, the best model for which included the three predicted profiles and one additional profile.

Of the profiles identified, one had much greater mean SSPs than the other profiles across waves as well as a significant increase in mean SSP from wave four (67%) to wave five (88%) despite the proximity of death; this profile was labeled optimists. The SSPs of two profiles decreased significantly from waves four to five, indicating more realistic expectations of longevity in their final years. Of these two profiles, one had lower SSPs across all waves and a wave five SSP near zero (3%); this profile was labeled pessimists. The other profile was labeled realists. The final profile had SSPs ranging from about 50% to 40% over the first four waves, then a significant increase to about 50% at the last wave. This profile was labeled non-committals, as they seemed to hover around a 50/50 chance that they would live another 10-15 years despite their approaching deaths.

I also hypothesized that the profiles would differ significantly on health care use, health perception, and death attitudes. More specifically, I hypothesized that optimists and realists would engage in more health care than pessimists; pessimists would have lower ratings of perceived health than realists and optimists; optimists would have greater ratings of perceived health than realists and pessimists; and optimists would engage in fewer death preparation behaviors, indicating less death acceptance, than pessimists and realists.

Some of the profiles identified by LPA appeared to potentially be good candidates for the purpose of this research: the optimists seemed like they could be death-anxious, or at least death-deniers, as their SSPs indicated unrealistic longevity expectations that actually increased during the wave prior to death; the pessimists seemed like they could be death-accepters, as their SSPs were the most realistic and decreased during the wave prior to death. The initial data analysis plan of constructing measures representing the underlying concepts of health care use and death attitudes was unsuccessful, so these concepts were not able to be evaluated as latent constructs. Instead, a piecemeal approach to data analysis was used in an attempt to glean any factors differentiating profiles.

There was no evidence found that the optimists were using health care irrationally or excessively, or that they engaged in fewer death preparation behaviors (excepting their lesser incidence of having wills). There was no evidence that the pessimists engaged in less health care or in more behaviors indicative of possible death acceptance. This could have been the case because the optimists and pessimists engaged in the same amount of health care and death preparation behaviors as the other profiles. However, it could also be because the measures used were insufficient. Some hypotheses were confirmed: pessimists did seem to have worse perceptions of their health than some other profiles, and optimists had better perceptions of their health than some others. This makes sense, given the likelihood that perceiving one's health as relatively good would increase one's perception of longevity, and perceiving one's health as poor would decrease one's perception of longevity.

Health Factors

All profiles were similar in number of new health conditions over the course of the study, number of doctor visits after controlling for health conditions, and use of preventive care. Almost the entire sample also reported having some type of health insurance, including Medicare and Medicaid, and profiles were similar in rates of poverty. These findings seem to suggest that the profiles cannot be differentiated by access to health care, and that they tend to see the doctor at similar rates given each participant's number of health conditions. This seems to contradict the hypothesis that optimists would use more health care than pessimists and realists. It does not appear that greater expectations of longevity drive excessive—or even heightened—rates of health care use as measured by doctor visits.

All profiles were also similar in rates of past and present smoking, and in BMIs. Smoking cigarettes and high BMIs are commonly known risk factors for poor health outcomes and shortened life spans. In this sample, however, these variables do not appear to differentiate those with unusually high SSPs from those with the lowest SSPs, or any other profiles. This may be attributable to the lack of salience of these factors when considering one's longevity. However, previous research using samples not exclusively consisting of the elderly has demonstrated that both smoking and greater BMI are associated with lower longevity expectations (O'Brien, Fenn, & Diacon, 2005; Steffen, 2009; Falba & Busch, 2012). It is possible that those with greater BMIs and those who smoked were distributed among the two or three groups with the lowest SSPs, or that this older sample weighed other factors more heavily when rating their SSPs.

The realists reported that their health had worsened to a greater extent from wave four to wave five than did optimists. Given that both groups died within two years after participating in the fifth wave, it is likely that both groups experienced some degree of worsened health. Yet, there were no significant differences between the two in number of health conditions or number of doctor visits. This could indicate that optimists noticed signs of declining health to a lesser degree than realists, optimists are in denial of declining health to a greater degree than realists, optimists take signs of declining health less seriously or perceive them as less grave than realists, or that optimists misinterpret signs of declining health while realists recognize their approaching deaths and inevitably worsening health. This could also indicate none the aforementioned factors, and instead could be an artifact caused by the poor sensitivity of the measures of health conditions or health care use available in the HRS.

Results demonstrated that at wave three, pessimists were more likely to have had at least one hospital visit than those in the full sample, and less likely to have had zero hospital visits than those in the full sample. These experiences may have had delayed effects and influenced later longevity forecasts, as the SSPs of pessimists decreased significantly in their final years. On the other hand, the number of health conditions was not able to be taken into account for this analysis, and pessimists reported significantly more health conditions than the entire sample, so it is possible that the greater frequency of at least one hospital visit for pessimists can be explained by greater health needs rather than excessive care-seeking in response to lower expectations of survival probability.

Pessimist self-perceptions of health were worse than optimist self-perceptions of health in five waves, and worse than realist self-perceptions of health in four waves. Pessimists also had worse self-perceptions of health than did non-committals in five waves. Naturally, the reverse was also true: optimists perceived their health as better than pessimists in five waves. However, the health ratings for optimists were not significantly different from those of realists. Pessimists were also more likely to have had a final illness duration of more than a year than was the case for the full sample. This could partly be explained by their older age—the greater likelihood of illnesses at older ages and more opportunity for greater duration of illnesses—and may also contribute to lower SSP ratings.

The pessimists appear to be older, have more health conditions, perceive their health as worse, and have been sick for longer than many of the other profiles. They also perceived their health as having worsened to greater extents since the previous wave during waves four and five, which corresponds with a significant decrease in SSP from wave four to five. These findings suggest that pessimist death expectations are informed by realistic appraisals of their health statuses and recognition of their ages. Despite the apparent worsened health of this group, they do not have doctor visits at greater rates than would be expected, given their numbers of health conditions. While pessimists seem to perceive themselves as having little life remaining relative to the other profiles, they do not appear to be engaging in excessive health care use in an attempt to prolong life. The pessimists may be more death accepting than the other profiles, given their more realistic SSPs, especially in wave five, and the lack of evidence for attempting to prolong life via excessive health care use. This seeming recognition and possible acceptance of the nearness of their deaths does not necessarily lead to greater psychological well-being, as evidenced by their greater CESD-8 scores over the last three waves when compared to non-committals and optimists.

Death Attitude Proxies

All profiles were similar in age of parents at death or their current age if still alive, widow status, having written end-of-life instructions, having an end-of-life legal care arrangement, and having ever discussed end-of-life care.

Optimists were less likely to have a will than the full sample, which could indicate lower levels of death acceptance—and/or greater levels of denial—than those in the full sample.

Demographics

All profiles were similar in gender, poverty status, marital status, education, year of death, past and present psychological problems.

Pessimists were older at death than non-committals and realists, which may explain the lower SSP ratings of pessimists as compared to non-committals and realists. This is consistent with previous research findings that older adults tend to underestimate their actuarial survival probabilities (Elder, 2013). However, pessimists were not different in age at death from optimists, who had the greatest SSP ratings across all waves. This seems to indicate that older age does not necessarily lead to more realistic longevity expectations, although it appears to do so for a portion of the population.

Optimists were more likely to identify their race as African American and as “other” compared to their representations in the full sample, while pessimists were more likely to identify their race as Caucasian than their representation in the full sample. The finding that the group with the greatest SSP ratings across all waves, optimists, was more likely to identify their race as African American than the full sample, is consistent with previous research that has demonstrated that African Americans tend to expect to live longer than Caucasians, even after controlling for factors such as age, health, socioeconomic status, and health behaviors (Bulanda & Zhang, 2009; Hurd & McGarry, 1995).

Optimists reported significantly fewer symptoms of depression as measured by the CESD-8 than did pessimists during the final three waves. This introduces a chicken-or-the-egg dilemma: are optimists less depressed because they are in denial or are blissfully ignorant of their approaching deaths, or are their unrealistic perceptions of longevity protective against depressive symptoms? On the other hand, this trend may also be explained by the finding that optimists reported significantly fewer total health conditions than pessimists. For older adults, correlates of greater death anxiety include more physical health problems, residing in a care institution as compared to not, and more symptoms of depression (Fortner & Neimeyer, 1999; Moreno, de la Fuente Solana, Rico, & Fernández, 2008).Coping with health conditions varies among individuals, but coping can become exponentially more difficult as the number of health problems increases along with related symptoms, considerations of treatments, potentially more complex medication management and side effects, and perceived burdensomeness to caregivers.

Overall Trends

In addition to the differences in profiles discussed above, trends in depressive symptoms, health conditions, and perceived change in health were identified for the sample as a whole. CESD-8 scores and numbers of health conditions increased as participants grew closer to death, indicating more depressive symptoms and worsening health. Ratings of perceived health change were lower at wave five than all previous waves, indicating participants perceived their health as having worsened to a greater degree during the two years prior to wave five than during the two years prior to each earlier wave. Similar effects have been found in other studies; Liang et al. (2010) found that older adults perceived their health as worsening at a greater rate than middle-aged adults in the HRS over six waves. That participants reported more health conditions as they aged and as they grew closer to death is unsurprising, as is the greater worsening of perceived health during the wave closest to death. All deaths have a cause, and in an elderly sample, the majority of deaths are likely to be related to aging bodies and health problems.

The increase in CESD-8 scores as death approaches could be related to a multitude of factors: stress/suffering associated with increasing health conditions and perceptions that health is worsening at a greater rate; decreased independence and other limitations caused by poor health/aging bodies; the perception of oneself as burdensome caused by increased reliance on others due to age-related limitations and illness; dissatisfaction with the amount of life remaining; and/or generally poor death acceptance or some amount of death anxiety. Having had a medical illness has been associated with increased risk of psychiatric illness over the lifetime, and many participants in the study reported having multiple medical conditions (Cassem, 1995). Estimates of the prevalence of depressive disorders in older adults nearing the end of life vary widely, and much of the research has been conducted using samples of older adults with advanced diseases or in palliative care (Hotopf & Addington-Hall, 2002; Wilson et al., 2007). However, the feelings of sadness, fear, grief, loneliness, and despair are frequently experienced by those at the end of life and can be conflated with depressive disorders (Block, 2006; Widera & Block, 2012). The CESD-8 asked about factors that could be influenced by these feelings as well as by depressive disorders: feeling lonely, feeling sad, not enjoying life, and feeling that everything is an effort.

Limitations

The HRS dataset is comprehensive and includes data taken biennially over nearly three decades. Dozens, if not hundreds, of individuals have contributed to the project, and their work merits commendation. Few longitudinal datasets of this depth and breadth exist, and the HRS has allowed countless contributions to the fields of psychology, gerontology, behavioral medicine, nursing, health policy, disability policy, economics, and genetics, among many others.

Working with the HRS dataset presented some complications during this project. Because changes were made to the wording of questionnaire items, questionnaire contents, and the response options over the course of the study, certain waves of data—particularly earlier waves—had to be excluded in order to provide consistency within the subset of data extracted for this project. For instance, participants were asked the percent chance they would live to be 10-15 years older than their current age from waves in 2000 onward. Prior to 2000, participants were simply asked the percent chance they would live to be age 75 and 85.

The initial data analysis plan did not proceed as expected. Creating statistically acceptable latent constructs measuring health care use and death attitudes seemed like a reasonable approach to data analysis, given the number of HRS items that appeared to tap into these two concepts. However, the statistical analyses revealed that this was not feasible. Why this occurred is difficult to determine. Perhaps the motivations underlying taking prescription drugs, visiting the doctor, and having outpatient surgery, for example, are qualitatively different and not driven by an individual's drive to engage in health care. The Behavioral Model of health care use had generally had poor accuracy when predicting health service use. This has been attributed to underdeveloped measurement methods for health service use (e.g., measuring formal vs. informal services), the limitations of frequently used cross-sectional data, and difficulties inherent to complex models (Wolinsky & Johnson, 1991). The difficulties operationalizing factors underlying health care use in this project may parallel the difficulties of the Behavioral Model in identifying predictors of health service use. There are so many potential factors to consider that vary substantially by individuals and situations that expecting to create one model accounting for all scenarios may not be realistic.

Perhaps the reasons people create a will, provide written end-of-life instructions, and create a durable power of attorney, for example, are qualitatively different and not largely influenced by death attitudes.

Many topics of interest for this project related to death preparations (e.g., whether participants had ever discussed preferences for end-of-life care) were only addressed during the exit interview, which was conducted after the death of the participant with their designated secondary respondent. Participants identified their preferred respondent, many of whom were spouses, siblings, and children. Depending on the closeness of the participant with their respondent and the contexts of their time spent together, the respondent may or may not have been aware of the participant's engagement in these behaviors. While these variables were assessed in this project and limited conclusions drawn, it is possible that items related to these topics are not wholly representative of participant behaviors.

While I am disappointed the HRS data I compiled did not allow for the investigation of my hypotheses as planned, further exploration of my research questions could yield valuable information. With less than two years of life remaining, the optimists believed there was an 88% chance they would live another 10-15 more years, and the non-committals believed on average that there was a 49% chance they would live another 10-15 years. Additionally, both of these profiles had a significant increase in the percent chance they believed they would live another

10-15 years from wave four (within four years of their deaths) to wave five (within two years of their deaths). Are these findings reflective of poor consideration given to the question, not remembering the response given in the previous wave, or do some people genuinely believe they have a greater chance of living 10-15 more years right before their death? If this is the case, what differentiates that group from those whose SSPs become significantly more realistic within two years prior to their deaths? What is it that drives longevity expectations, and are there relations between death attitudes and health care use at the end of life? It is difficult to imagine that this mistaken belief has no important consequences for people in the few remaining years, and months, of life.

There is still much to learn about the interactions between death estimates, death acceptance, and health care use. This study sought to describe profiles of SSP trajectories in the decade leading to death, and found that some consistently and greatly overestimate their survival; some seem to not have strong opinions and guess near the median value without change despite their approaching deaths; some are more realistic and report lower SSPs as death approaches; and some have generally low ratings across time that drop to a realistic near-zero in their final year or two. It seems clear that, simply put, some seem to understand that they are going to die, and others do not. Future research may examine more closely how death attitudes and health care use interact with longevity expectations.

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Appendix

Table 1

Health care Use Items

HRS Item	Wave(s)
How many different times were you a patient in a hospital overnight since previous interview / in the last two years?	1994-2014
How many times have you seen or talked to a medical doctor about your health, including emergency room or clinic visits since the previous interview / in the last two years?	1994-2014
In the last two years / Since previous interview, did you use any special facility or service which we haven't talked about, such as: an adult care center, a social worker, an outpatient rehabilitation program, or transportation or meals for the elderly or disabled?	1994
Since previous interview / In the last two years, has any medically-trained person come to your home to help you?	1996-2014
Do you regularly take prescription medications?	1994-2014
Since previous interview / In the last two years, not counting overnight hospital stays, have you had outpatient surgery? (1996-2014)	1996-2014
Would you say your health is excellent, very good, good, fair, or poor?	1994-2014
Preventive Care	
Since we last talked to you / In the last two years, have you had a flu shot?	1996-2014
Since we last talked to you / In the last two years, have you had a blood test for cholesterol?	1996-2014
Did you have a mammogram or x-ray of the breast to search for cancer since the last interview / in the last two years?	1996-2014
Since we last talked to you / In the last two years, have you had a PAP smear?	1996-2014
Since we last talked to you / In the last two years, have you had an examination of your prostate to screen for cancer?	1996-2014

Table 2

Death Attitudes Items

HRS Item	Exit Interview Wave(s)
Did [respondent] make any legal arrangements for a specific person or persons to make decisions about (his/her) care or medical treatment if (he/she) could not make those decisions (himself/herself)? This is sometimes called a Durable Power of Attorney for Health care.	1996, 2000-2014
Did [respondent] provide written instructions about the treatment or care (he/she) wanted to receive during the final days of (his/her) life?	2000-2014
Did [respondent] ever discuss with you or anyone else the treatment or care (he/she) wanted to receive in the final days of (his/her) life?	2000-2014
Did [respondent] have a will that was written and witnessed?	2000-2014

Table 3

Known Predictors of Mortality Items

HRS Item	Wave(s)
Since we last talked to you, has a doctor told you / Has a doctor ever told you that you have high blood pressure or hypertension?	1994-2014
Do you have high blood pressure or hypertension at the present time?	1994-2014
Do you smoke cigarettes now?	1994-2014
Do you ever drink any alcoholic beverages such as beer, wine, or liquor?	1994-2014
Body mass index (BMI) calculated from self-reported height and weight	1994-2014

Table 4

Health Status Items

HRS Item	Wave(s)
Since we last talked with you, has a doctor told you / Has a doctor ever told you that you have diabetes or high blood sugar?	1994-2014
Do you have diabetes now?	1994-2014
Since we last talked to you, has a doctor told you / Has a doctor ever told you that you have cancer or a malignant tumor, excluding minor skin cancers?	1994-2014
Since the previous interview, has a doctor told you that you had a new cancer or malignant tumor, excluding minor skin cancer?	1994-2014
Since we last talked with you, has a doctor told you / Has a doctor ever told you that you have chronic lung disease such as chronic bronchitis or emphysema? *Do not include asthma*.	1994-2014
Since your last interview has a doctor told you / Has a doctor ever told you that you had a heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems?	1994-2014
Since your last interview has a doctor told you/ Has a doctor ever told you that you had a stroke?	1994-2014
Since your last interview have you had or has a doctor told you that you have / Have you ever had, or has a doctor ever told you that you have arthritis or rheumatism?	1994-2014

Table 5

Subjective Survival Probability Items

HRS Item	Wave(s)
What is the percent chance that you will live to be 75 or more?	1994-2014
What is the percent chance that you will live to be 85 or more?	1994-1998
What is the percent chance you will live to be 80/85/90/95/100 or more?	2000-2014
About how old was [your mother] when she died?	1994-2014
About how old was [your father] when he died?	1994-2014

Table 6

Ages used for SSP Item "What is the percent chance you will live to be 80/85/90/95/100 or more?"

Respondent Age at Interview	Age Used in Item
Less than 65	85
65-69	80
70-74	85
75-79	90
80-84	95
85-89	100

Table 7

HRS Cohorts and Corresponding Death Cohorts

Year	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016
HRS Wave	2	3	4	5	6	7	8	9	10	11	12	13
Death Cohort						1	2	3	4	5	6	7

Table 8

Death Cohorts with Corresponding HRS Waves

Death Cohort	1	2	3	4	5	6	7
HRS Waves	2-6	3-7	4-8	5-9	6-10	7-11	8-12
HRS Exit Interview Wave	7	8	9	10	11	12	13

Table 9

Demographics of Two Random Samples

	Odd birth month sample		Even birth month sample	
Variable	*n*	%	*n*	%
Gender				
Male	308	51.5	289	52.6
Female	290	48.5	260	47.4
Race				
White	546	91.3	486	88.5
Black	45	7.5	50	9.1
Other	7	1.2	13	2.4
	M	*SD*	*M*	*SD*
Age at death	82.51	4.83	82.81	4.88

Note. *n* = number of participants within specified group, *M* = mean, *SD* = standard deviation.

Table 10

Model Fit Information With Half-Sample 1 (Odd Birth Months)

No. of profiles	Log-likelihood	No. of parameters estimated	AIC	BIC	a-BIC	Entropy	BLRT *p*-value
1	-13959.58	25	27969.15	28078.99	27999.63	-	-
2	-13871.51	31	27805.02	27941.22	27842.80	0.85	<0.001
3	-13709.69	37	27493.38	27655.95	27538.48	0.96	<0.001
4	**-13665.67**	**43**	**27417.35**	**27606.27**	**27469.76**	**0.95**	**<0.001**
5	-13584.50	49	27267.00	27482.29	27326.72	0.98	<0.001

Note. AIC Akaike information criterion, *BIC* Bayesian information criterion, *a-BIC* sample size adjusted BIC, *BLRT* bootstrapped likelihood ratio test. Chosen model designated by bold data.

Table 11

Count of Participants per Group Within 3-, 4-, and 5-Profile LPA Solutions With Half-Sample 1 (Odd Birth Months)

No. of profiles	Group 1 *n* (% within profile)	Group 2 *n* (% within profile)	Group 3 *n* (% within profile)	Group 4 *n* (% within profile)	Group 5 *n* (% within profile)
3	361 (60.37)	154 (25.75)	83 (13.88)	-	-
4	306 (51.17)	135 (22.58)	74 (12.37)	83 (13.88)	-
5	133 (22.24)	77 (12.88)	304 (50.84)	43 (7.19)	41 (6.86)

Note. n number of participants within group for the specified profile solution, - indicates no data available, as the number of groups was limited by the specified profile solution.

Table 12

Average SSP Values by Wave in 4-Profile Solution for Half-Sample 1 (Odd Birth Months), Half-Sample 2 (Even Birth Months), and the Whole Sample

Profile	Sample (*n*)	Wave 1 *M* (*SD*)	Wave 2 *M* (*SD*)	Wave 3 *M* (*SD*)	Wave 4 *M* (*SD*)	Wave 5 *M* (*SD*)
1 ("Pessimists")	Half 1 (306)	34.50 (29.74)	30.20 (27.10)	25.60 (27.24)	21.43 (26.79)	3.12 (4.44)
	Half 2 (270)	34.24 (30.16)	29.79 (29.26)	23.98 (28.18)	20.84 (25.85)	2.99 (4.29)
	Whole (577)	34.38 (29.89)	30.06 (28.11)	24.87 (27.66)	21.21 (26.34)	3.08 (4.39)
2 ("Non-commitals")	Half 1 (135)	54.89 (27.84)	50.78 (27.72)	44.70 (27.43)	41.40 (25.13)	48.74 (5.56)
	Half 2 (127)	49.24 (28.66)	50.39 (27.90)	46.30 (30.32)	41.90 (27.53)	49.84 (6.30)
	Whole (258)	52.55 (28.28)	50.60 (27.75)	45.17 (28.87)	41.31 (25.84)	49.09 (5.48)
3 ("Realists")	Half 1 (74)	44.50 (29.21)	39.82 (28.73)	39.05 (26.94)	36.08 (27.70)	23.58 (4.42)
	Half 2 (65)	47.69 (28.22)	43.05 (27.42)	45.37 (30.95)	35.29 (28.32)	23.38 (4.16)
	Whole (139)	45.81 (28.81)	40.97 (28.15)	42.08 (28.96)	35.36 (28.02)	23.63 (4.33)
4 ("Optimists")	Half 1 (83)	66.65 (29.07)	68.77 (28.55)	70.10 (29.08)	66.82 (29.08)	88.01 (10.30)
	Half 2 (87)	70.29 (26.85)	62.69 (33.73)	62.99 (31.86)	66.09 (30.54)	89.47 (10.48)
	Whole (173)	67.84 (28.25)	65.62 (31.19)	66.52 (30.46)	66.74 (29.74)	88.43 (10.59)

Note. n number of participants per profile in the specified sample, *M* mean, *SD* standard deviation.

Table 13

Model Fit Information in the 4-Profile Solution Using the Full Sample

No. of profiles	Log-likelihood	No. of parameters estimated	AIC	BIC	a-BIC	Entropy	BLRT *p*-value
4	-26357.49	43	52800.98	53017.91	52881.32	0.95	<0.001

Note. No. number, *AIC* Akaike information criterion, *BIC* Bayesian information criterion, *a-BIC* sample size adjusted BIC, *BLRT* bootstrapped likelihood ratio test.

Table 14

Chi-Square Tests of Independence Evaluating Associations Between Profile Membership and the Following Variables

Criterion	X^2	*df*	*N*	*p*
Gender	3.17	3	1147	0.37
W1 poverty	0.97	3	834	0.81
W5 poverty	2.7	3	1147	0.44
W1 marital status	8.73	9	1146	0.37
W5 marital status	17.59	9	1147	0.05
Race	49.88	6	1147	< 0.01
W1 psych problems	2.15	3	1147	0.54
W5 psych problems	7.64	3	1147	0.054
Psych problems ever	6.94	3	1147	0.07
Smoking ever	2.75	3	1139	0.43
W1 smoking	1.71	15	1142	0.63
W5 smoking	0.77	3	1138	0.86
Final illness duration	33.15	15	1116	< 0.01
W1 hospital stay	5.07	3	1146	0.17
W2 hospital stay	5.34	3	1143	0.15
W3 hospital stay	12.17	3	1142	< 0.01
W4 hospital stay	7.29	3	1137	0.06
W5 hospital stay	9.17	3	1135	0.30
Widow status	7.01	3	1147	0.07
EOL instructions	6.75	3	1122	0.08
EOL legal	4.14	3	1108	0.25
Discussed EOL care	6.78	3	1131	0.08
Living will	8.17	3	1127	0.04

Note X^2 chi square test value, *df* degrees of freedom, *N* sample size, *p* probability.

Table 15

One-way ANOVA Results Evaluating Differences between Profiles

Variable	*F*	*df* (between, total)	*p*
Education	1.64	(3, 1146)	0.18
Year of death	1.44	(3, 1146)	0.23
Death age	9.52	(3,1143)	< 0.01
W1 BMI	0.79	(3,1141)	0.5
W5 BMI	1.11	(3,1141)	0.34
New Conditions	1.71	(3,1146)	0.16
W1 health self-report	13.37	(3,1143)	< 0.01
W2 health self-report	16.3	(3,1142)	< 0.01
W3 health self-report	16.69	(3,1140)	< 0.01
W4 health self-report	13.71	(3,1143)	< 0.01
W5 health self-report	31.14	(3,1141)	< 0.01
W1 health change self-report	2.83	(3,1140)	0.04
W2 health change self-report	0.84	(3, 1145)	0.47
W3 health change self-report	12.1	(3,1146)	< 0.01
W4 health change self-report	5.37	(3,1142)	< 0.01
W5 health change self-report	11.87	(3,1144)	< 0.01
W5 mother death/current age	0.39	(3,1123)	0.76
W5 father death/current age	0.36	(3,1118)	0.78

Note. F F-ratio, *df* degrees of freedom, *p* probability.

Table 16

Pairwise Comparisons for Age at Death Across Profiles

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	4.91	0.36	< 0.01	0.37
	Realists	3.04	0.45	0.02	0.29
	Optimists	2.49	0.42	0.08	0.22
Non-committals	Realists	-0.77	0.50	1.00	-0.08
	Optimists	-1.55	0.47	0.74	-0.15
Realists	Optimists	-0.62	0.55	1.00	-0.07

Note. df degrees of freedom = 3, 1142. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Table 17

Repeated Measures ANOVA Results

Outcome	Predictor	*F*	*df* (between, total)	*p*
CESD-8	Wave x profile	1.65	(11.09, 4221.16)	0.08
	Wave	18.19	(3.70, 4221.16)	< 0.01
	Profile	6.97	(3, 1142)	< 0.01
No. health conditions	Wave x profile	1.23	(12, 4572)	0.25
	Wave	547.19	(4, 4572)	< 0.01
	Profile	3.57	(3, 1143)	0.01
Health self-report	Wave x profile	2.23	(12, 4548)	< 0.01
	Wave	81.88	(4, 4548)	< 0.01
	Profile	27.04	(3, 1137)	< 0.01
Health change self-report	Wave x profile	0.70	(11.82, 4469.26)	0.01
	Wave	20.83	(3.94, 4469.26)	< 0.01
	Profile	14.00	(3, 1134)	< 0.01

Note. *F* F-ratio, *df* degrees of freedom, *p* probability.

Table 18

Pairwise Comparisons for CESD-8 Scores Across Waves

Wave	Wave	*t*	Standard Error	*p*-value	*g*
1	2	-1.47	0.06	1.00	-0.06
	3	-1.47	0.06	1.00	-0.06
	4	-3.75	0.07	< 0.01	-0.18
	5	-6.62	0.07	< 0.01	-0.35
2	3	-0.07	0.06	1.00	0.00
	4	-2.66	0.06	0.08	-0.12
	5	-5.72	0.07	< 0.01	-0.29
3	4	-2.72	0.06	0.07	-0.12
	5	-5.91	0.07	< 0.01	-0.29
4	5	-3.62	0.07	< 0.01	-0.17

Note. df degrees of freedom = 3, 1142. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Table 19

Pairwise Comparisons for CESD-8 Scores Across Profiles

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	3.78	0.11	< 0.01	0.28
	Realists	2.08	0.14	0.23	0.20
	Optimists	3.37	0.13	0.01	0.29
Non-committals	Realists	-0.81	0.15	1.00	-0.09
	Optimists	0.11	0.14	1.00	0.01
Realists	Optimists	0.85	0.17	1.00	0.10

Note. df degrees of freedom = 3, 1142. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Table 20

Pairwise Comparisons for Number of Health Conditions Across Waves

Wave	Wave	*t*	Standard Error	*p*-value	*g*
1	2	-13.19	0.02	< 0.01	-0.30
	3	-19.91	0.02	< 0.01	-0.64
	4	-25.72	0.03	< 0.01	-1.05
	5	-29.86	0.04	< 0.01	-1.47
2	3	-13.67	0.02	< 0.01	-0.35
	4	-20.54	0.03	< 0.01	-0.75
	5	-26.03	0.03	< 0.01	-1.17
3	4	-16.00	0.02	< 0.01	-0.41
	5	-21.74	0.03	< 0.01	-0.83
4	5	-14.95	0.02	< 0.01	-0.42

Note. df degrees of freedom = 3, 1143. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Table 21

Pairwise Comparisons for Self-Rating of Health Across Waves

Wave	Wave	*t*	Standard Error	*p*-value	*g*
1	2	4.66	0.03	< 0.01	0.18
	3	7.97	0.03	< 0.01	0.35
	4	10.40	0.04	< 0.01	0.50
	5	14.62	0.04	< 0.01	0.78
2	3	4.00	0.03	< 0.01	0.16
	4	6.94	0.03	< 0.01	0.31
	5	11.76	0.04	< 0.01	0.59
3	4	3.52	0.03	< 0.01	0.15
	5	8.51	0.04	< 0.01	0.43
4	5	5.89	0.04	< 0.01	0.28

Note. df degrees of freedom = 3, 1134. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Table 22

Pairwise Comparisons for Self-Rating of Health Across Profiles

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	-6.65	0.06	< 0.01	-0.49
	Realists	-4.22	0.08	< 0.01	-0.40
	Optimists	-7.35	0.07	< 0.01	-0.65
Non-committals	Realists	0.92	0.09	1.00	0.10
	Optimists	-1.54	0.08	0.73	-0.15
Realists	Optimists	-2.18	0.09	0.18	-0.25

Note. df degrees of freedom = 3, 1134. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Table 23

Pairwise Comparisons for Self-Rating of Health At Wave 1

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	-4.43	0.08	< 0.01	-0.32
	Realists	-2.16	0.10	0.19	-0.20
	Optimists	-5.57	0.09	< 0.01	-0.47
Non-committals	Realists	1.21	0.11	1.00	0.13
	Optimists	-1.53	0.10	0.77	-0.15
Realists	Optimists	-2.43	0.12	0.09	-0.27

Note. df degrees of freedom = 3, 1134. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Table 24

Pairwise Comparisons for Self-Rating of Health At Wave 2

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	-5.51	0.08	< 0.01	-0.41
	Realists	-3.63	0.09	< 0.01	-0.34
	Optimists	-5.27	0.09	< 0.01	-0.45
Non-committals	Realists	0.69	0.11	1.00	0.07
	Optimists	-0.41	0.10	1.00	-0.04
Realists	Optimists	-0.98	0.11	1.00	-0.11

Note. df degrees of freedom = 3, 1134. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Table 25

Pairwise Comparisons for Self-Rating of Health At Wave 3

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	-4.88	0.08	< 0.01	-0.36
	Realists	-3.35	0.10	< 0.01	-0.31
	Optimists	-5.82	0.09	< 0.01	-0.50
Non-committals	Realists	0.43	0.11	1.00	0.05
	Optimists	-1.45	0.10	0.88	-0.14
Realists	Optimists	-1.64	0.12	0.60	-0.19

Note. df degrees of freedom = 3, 1134. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Table 26

Pairwise Comparisons for Self-Rating of Health At Wave 4

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	-4.30	0.08	< 0.01	-0.32
	Realists	-3.34	0.10	< 0.01	-0.31
	Optimists	-5.46	0.09	< 0.01	-0.47
Non-committals	Realists	0.07	0.11	1.00	0.01
	Optimists	-1.53	0.10	0.76	-0.15
Realists	Optimists	-1.39	0.12	1.00	-0.16

Note. df degrees of freedom = 3, 1134. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Table 27

Pairwise Comparisons for Self-Rating of Health At Wave 5

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	-6.69	0.08	-	-0.52
	Realists	-3.90	0.10	-	-0.37
	Optimists	-8.25	0.09	-	-0.72
Non-committals	Realists	1.34	0.11	-	0.14
	Optimists	-1.97	0.11	-	-0.20
Realists	Optimists	-2.98	0.12	-	-0.34

Note. df degrees of freedom = 3, 1134. *t* test statistic, *g* Hedge's effect size statistic. These results were computed using Dunnett's C test, which does not yield *p*-values.

Table 28

Pairwise Comparisons for Self-Report of Health Change Across Waves

Wave	Wave	*t*	Standard Error	*p*-value	*g*
1	2	2.18	0.03	0.26	0.11
	3	2.79	0.03	0.049	0.14
	4	4.25	0.03	< 0.01	0.21
	5	8.14	0.03	< 0.01	0.42
2	3	0.62	0.03	1.00	0.03
	4	2.11	0.03	0.32	0.10
	5	6.21	0.03	< 0.01	0.31
3	4	1.58	0.03	1.00	0.07
	5	5.85	0.03	< 0.01	0.28
4	5	4.50	0.03	< 0.01	0.21

Note. df degrees of freedom = 3, 1143. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Table 29

Pairwise Comparisons for Self-Report of Health Change At Wave 1

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	-2.96	0.05	-	-0.21
	Realists	-1.20	0.06	-	-0.12
	Optimists	-1.35	0.06	-	-0.12
Non-committals	Realists	0.90	0.07	-	0.09
	Optimists	0.89	0.07	-	0.09
Realists	Optimists	-0.05	0.08	-	0.00

Note. df degrees of freedom = 3, 1134. *t* test statistic, *p* probability, *g* Hedge's effect size statistic. These results were computed using Dunnett's C test, which does not yield *p*-values.

Table 30

Pairwise Comparisons for Self-Report of Health Change At Wave 3

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	-4.38	0.05	-	-0.33
	Realists	-2.66	0.06	-	-0.27
	Optimists	-5.06	0.05	-	-0.43
Non-committals	Realists	0.62	0.07	-	0.07
	Optimists	-1.05	0.06	-	-0.10
Realists	Optimists	-1.46	0.07	-	-0.17

Note. df degrees of freedom = 3, 1134. *t* test statistic, *p* probability, *g* Hedge's effect size statistic. These results were computed using Dunnett's C test, which does not yield *p*-values.

Table 31

Pairwise Comparisons for Self-Report of Health Change At Wave 4

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	-2.26	0.05	-	-0.16
	Realists	-2.30	0.06	-	-0.23
	Optimists	-3.70	0.05	-	-0.29
Non-committals	Realists	-0.52	0.07	-	-0.07
	Optimists	-1.42	0.06	-	-0.13
Realists	Optimists	-0.70	0.07	-	-0.07

Note. df degrees of freedom = 3, 1134. *t* test statistic, *p* probability, *g* Hedge's effect size statistic. These results were computed using Dunnett's C test, which does not yield *p*-values.

Table 32

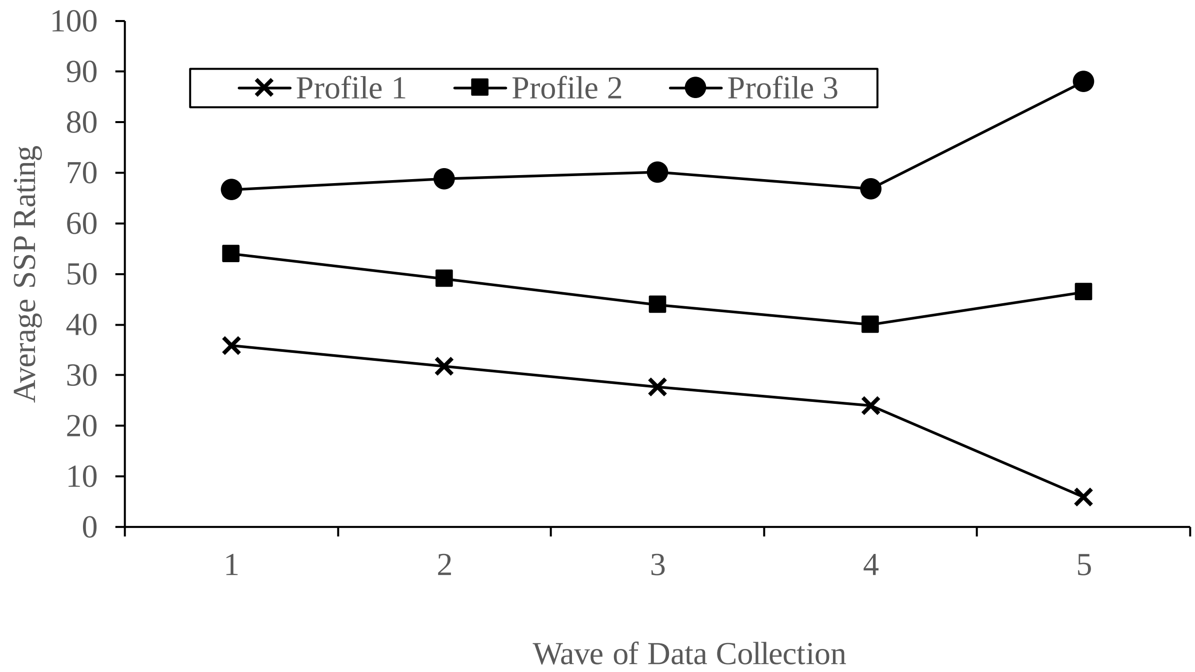
Pairwise Comparisons for Self-Report of Health Change At Wave 5

Profile	Profile	*t*	Standard Error	*p*-value	*g*
Pessimists	Non-committals	-2.44	0.05	0.09	-0.18
	Realists	-1.74	0.06	0.48	-0.17
	Optimists	-5.90	0.05	< 0.01	-0.52
Non-committals	Realists	0.17	0.06	1.00	0.02
	Optimists	-3.34	0.06	0.01	-0.33
Realists	Optimists	-3.01	0.07	0.02	-0.35

Note. df degrees of freedom = 3, 1134. *t* test statistic, *p* probability, *g* Hedge's effect size statistic.

Figure 1

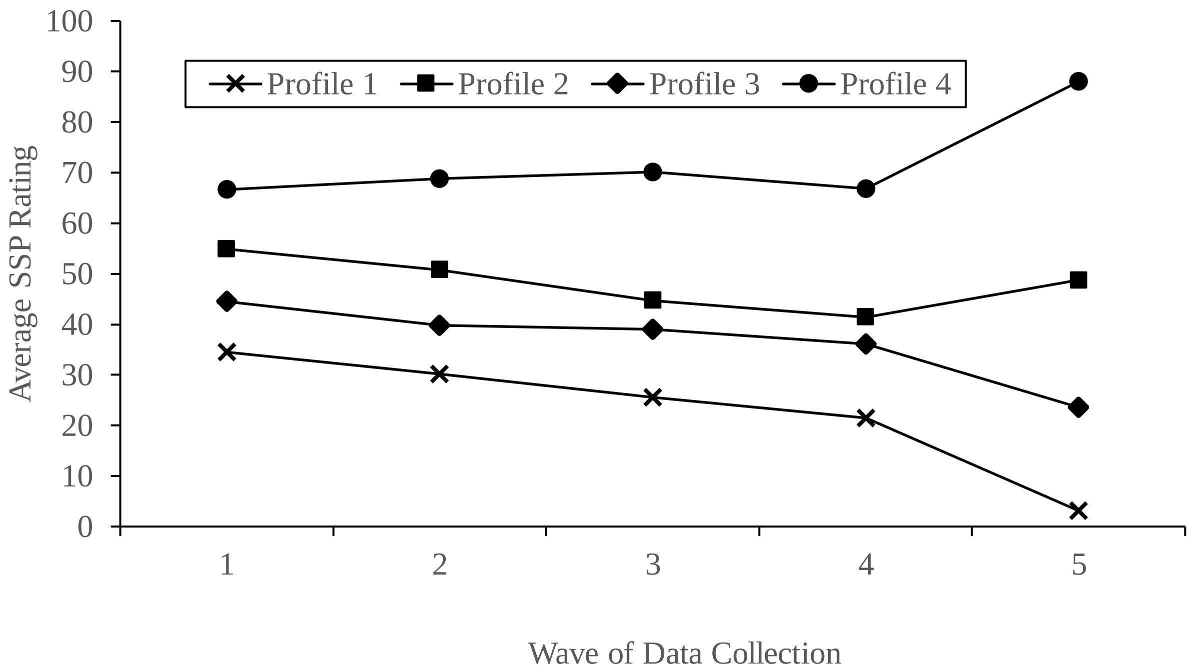
Average SSP Ratings by Profile in the 3-Profile Solution Using Participants in Half-Sample 1 (Odd Birth Months)



Note. This figure illustrates the average subjective survival probability (SSP) rating by wave for each of the four profiles in the 3-profile LPA analysis using half-sample one and demonstrates the differences in trajectories of SSP for each profile.

Figure 2

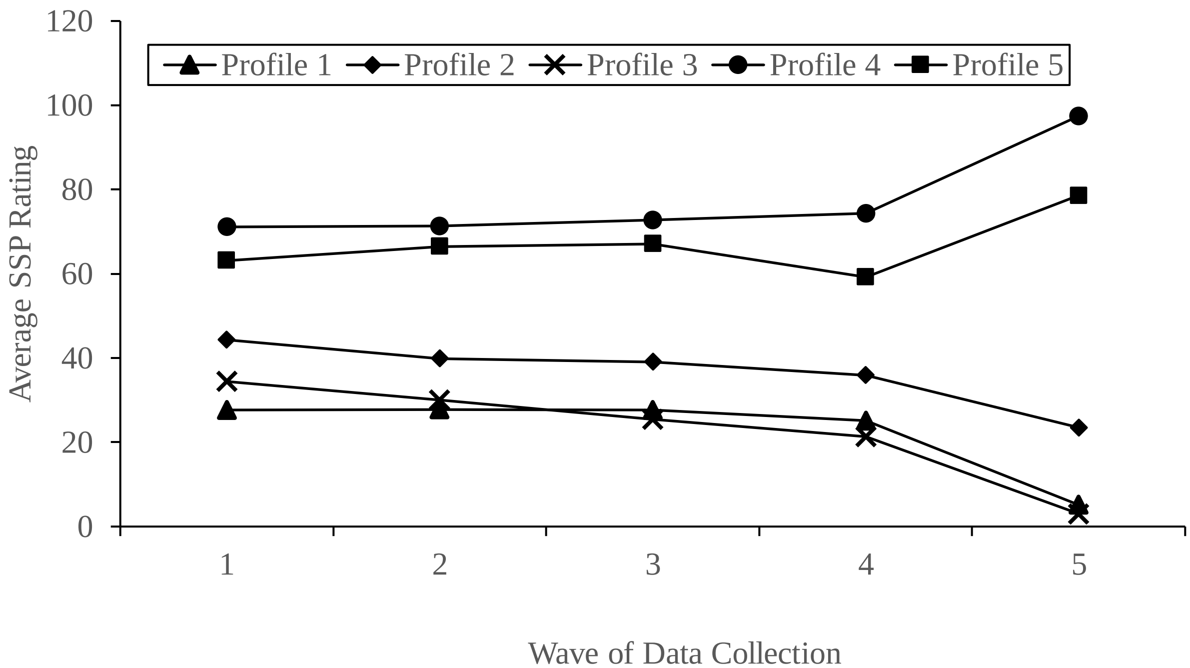
Average SSP Ratings by Profile in the 4-Profile Solution Using Participants in Half-Sample 1 (Odd Birth Months)



Note. This figure illustrates the average subjective survival probability (SSP) rating by wave for each of the four profiles in the 4-profile LPA analysis using half-sample one and demonstrates the differences in trajectories of SSP for each profile. Profile 1 was labeled "pessimists," profile 2 was labeled "noncommitals," profile 3 was labeled "realists," and profile 4 was labeled "optimists."

Figure 3

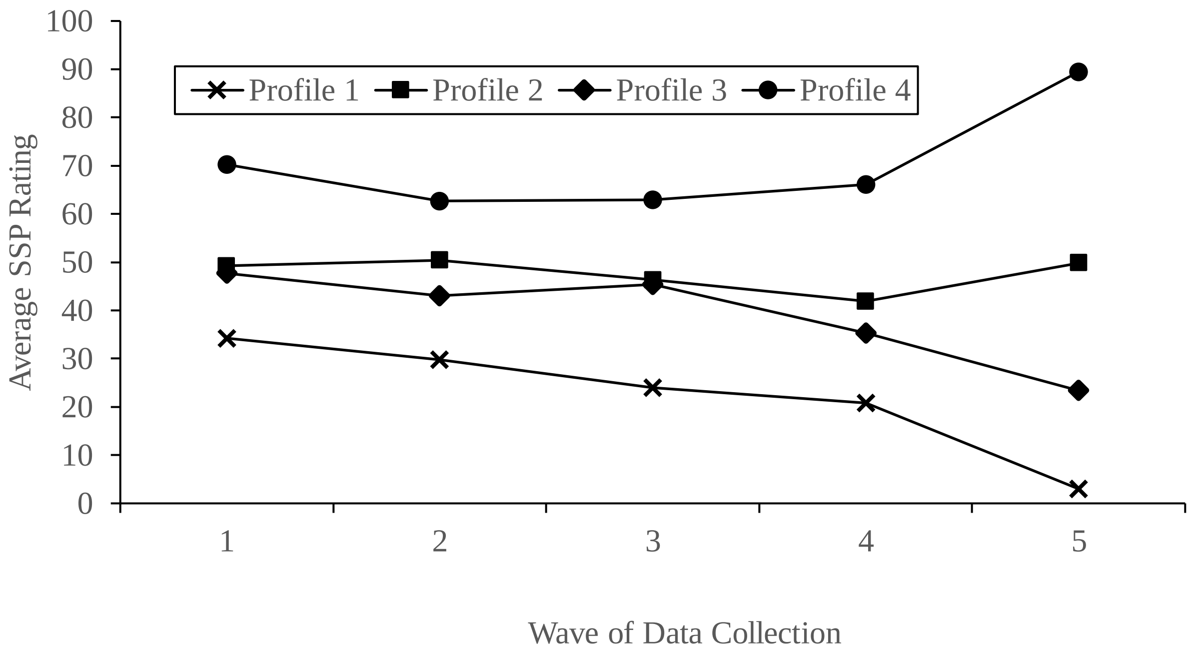
Average SSP Ratings by Profile in the 5-Profile Solution Using Participants in Half-Sample 1 (Odd Birth Months)



Note. This figure illustrates the average subjective survival probability (SSP) rating by wave for each of the five profiles in the 5-profile LPA analysis using half-sample one and demonstrates the differences in trajectories of SSP for each profile.

Figure 4

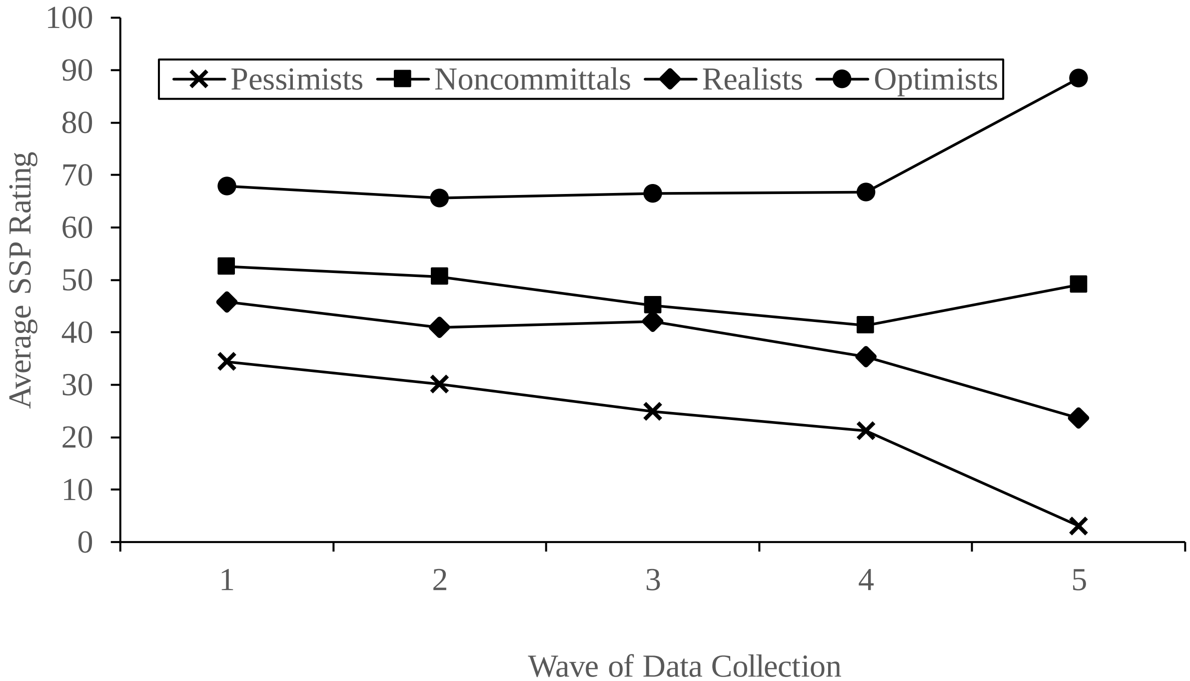
Average SSP Ratings by Profile in the 4-Profile Solution Using Participants in Half-Sample 2 (Even Birth Months)



Note. This figure illustrates the average subjective survival probability (SSP) rating by wave for each of the four profiles in the 4-profile LPA analysis using half-sample two and demonstrates the differences in trajectories of SSP for each profile. Profile 1 was labeled "pessimists," profile 2 was labeled "noncommitals," profile 3 was labeled "realists," and profile 4 was labeled "optimists."

Figure 5

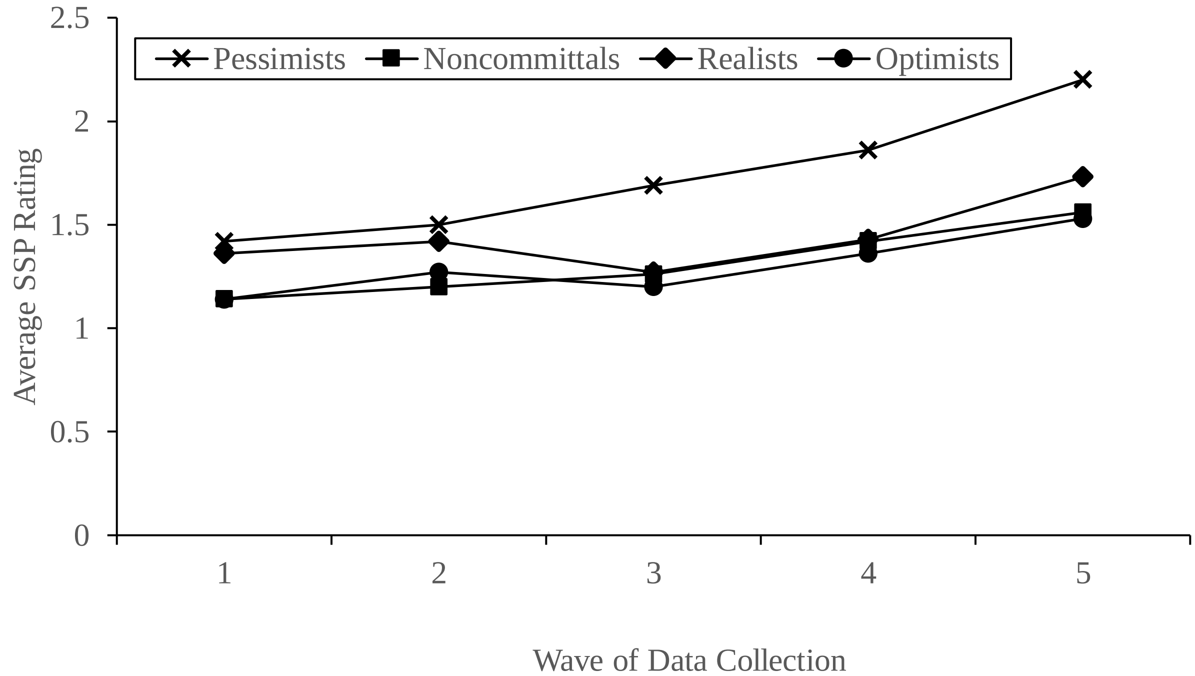
Average SSP Ratings by Profile in 4-Profile Solution Using All Participants



Note. This figure illustrates the average subjective survival probability (SSP) rating by wave for each of the four profiles in the 4-profile LPA analysis using the total sample and demonstrates the differences in trajectories of SSP for each profile.

Figure 6

Average CESD-8 Scores by Profile



Note. This figure illustrates the average CESD-8 score by wave for each of the four profiles in the 4-profile LPA analysis using the total sample.