

THE EFFECT OF LIFE SATISFACTION ON HEALTH CARE
UTILIZATION IN RETIREMENT AGE AMERICANS:
A LATENT TRANSITION ANALYSIS

by

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ABSTRACT

Retirement is often celebrated as an important milestone in life. It is also a time when health concerns may increase as retirees enter the early stages of old age. The purpose of this study is to determine whether there is evidence for distinct patterns of excessive health care use and life satisfaction in the immediate post-retirement period. The role theory of retirement states that individuals may experience psychological distress during the retirement transition due to the loss of a work identity (Wang, 2007). This psychological vacuum created by the loss of work identity may manifest itself as low life satisfaction. The vacuum may be filled by increased health care utilization among older adults post-retirement. While high life satisfaction has been linked to less health care utilization, there has been no systematic search for subgroups of retirees who show more health care use. (E.S. Kim, Park, Sun, Smith & Peterson, 2014; Gorry, 2015). The present study used a large longitudinal database of older adults, the Health and Retirement Study, to analyze membership in different life satisfaction and health care use trajectories from the pre- to post-retirement measurement waves. A latent transition analysis was utilized to identify classes of retirees that show differences in self-reported life satisfaction and health care use over time and found three distinct trajectories (low down-tick, moderate up-tick, high stable) of life satisfaction and four distinct trajectories (as distinguished by low, moderate, high levels of illness and HCU) of health care use. There was a significant, albeit weak association between one's membership in a given life satisfaction trajectory and health care use trajectory.

LIST OF ABBREVIATIONS AND SYMBOLS

n	Number
p	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
χ^2	Chi squared
=	Equal to
<	Less than
\$	Dollar value
%	Percent

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INTRODUCTION

In our work-centric culture, individual identity is often characterized by one's professional work (Fryers, 2006). The question, "What do you do?" is often one of the first questions asked when trying to get to know someone new. We are quick to categorize others and ourselves into work and career schemas. We spend a third of each day working within our work environment, and presumably focused on our work identity.

For many people, work provides the psychological benefits of structure, meaning, purpose, and identity throughout adulthood (Fryers, 2006). When work ends due to retirement, we must redefine how we spend nearly a third of our time, and redefine who we are in this work-free context. According to the role theory of retirement, individuals may be vulnerable to stress following the loss of the employment identity in retirement (Ashforth, 2000; Wang, 2007). At retirement, employment identity ends and some individuals may not cope well with the loss of this identity. The vacuum of meaning and purpose resulting from the loss of the work role may be reflected in low life satisfaction following retirement. This study considers the possibility that this vacuum may be filled by excessive illness behavior for some individuals, and eventually lead to the development of an illness identity.

Older adults participate in the health care system to a greater extent than younger adults. While much of this is due to age-related declines in health, some of the increase in health care use may reflect an increase in excessive or unnecessary use (Uscher-Pines et al, 2013; Blazer, Landerman, Fillenbaum, & Horner, 1995; Jang, Kim, & Chiriboga, 2005). Excessive health care use may be driven by psychological factors related to the way people perceive and interpret their

physical condition, or to their needs for social contact or activities to fill their days. Using the role theory of retirement, I consider the possibility that for some retirees, a vacuum in meaning, purpose, and role engagement emerges in the retirement period, which may be filled by excessive health care use.

Although people generally think of participation in health care system as a good thing, engaging in the health care system poses risks (Brownlee, 2010). Medical treatment puts patients at risk for medical errors, surgical complications, medication side effects, and pain or discomfort (Brownlee, 2010). In addition, medical care increases financial burden for patients and the health care financing systems in which they participate (Ray, Chari, Engberg, Bertolet, & Mehrotra, 2015). Excessive or unnecessary use of health care increases these risks while providing no health benefits to the patient. This is of particular concern for older adults, for whom failing health is both a biological reality and a cultural expectation. Thus, for elderly people it may be more difficult to recognize when health care utilization is excessive.

Excessive health care use has been understood through the study of illness behavior, which encompasses the psychological, interpersonal, and social reactions and experiences that occur when people experience disease or injury (Mechanic, 1962). Health care use (HCU) is one type of illness behavior. Research in the areas of illness behavior and HCU attempts to understand the causes of excessive illness behavior. Research on HCU tends to focus on systemic causes, whereas research on illness behavior focuses on individual psychological causes.

Illness behavior is any behavior related to how individuals monitor their bodies, identify and understand their symptoms, respond to perceived illness or injury, seek treatment or assistance from medical providers, and present themselves to others as ill and in need of support.

All of these forms of illness behavior are expressions of the sick role (Parsons, 1975). Parsons (1975) states that the features of the sick role free the individual from social roles or responsibilities; remove personal responsibility for the cause of the illness; require the person to try to get well, which includes seeking appropriate medical help; and adhere to treatment recommendations in order to get well. The sick role is a social contract that provides the patient with the benefits of relief from societal responsibilities or obligations while recovering from illness or injury. The patient's family, friends, and medical caregivers are thus obliged to help the patient get well; the patient is obliged to relinquish the sick role as soon as possible (Parsons, 1975).

At times, however, some individuals may not relinquish the sick role when their health improves, or the presentation of their health problems is exaggerated to exploit the benefits of the sick role. These individuals may continue to engage with the health care system for the benefit of caring support from others in an attempt to ease psychological distress they may be experiencing. By violating societal expectations of the sick role and seeking more health care, these patients put themselves at risk for excessive medical interventions, further psychological distress, and impaired function. There are fewer normative expectations about relinquishing the sick role for older adults and thus they may be more at risk of engaging in excessive illness behavior.

The sick role defines a set of behaviors (Mechanic, 1977). Illness behavior and the sick role can be comprised of talking about one's illness, going to the pharmacy, managing one's medications, using assistive devices (i.e., canes, walkers, etc.), scheduling doctors appointments, monitoring one's vital signs and physical parameters (i.e., insulin levels, blood pressure, etc.), engaging in physical therapy or rehabilitation, or receiving home nursing care. These behaviors

take time and can consume a significant portion of a person's waking hours. In some cases, the sick role may become central to one's identity, similar to how one's employment activities can contribute to one's identity.

A review of the empirical studies considering the effects of retirement on life satisfaction does not provide a simple answer (Coe, 2015; Gorry, 2015; Wang, 2007). Individuals respond to the vacuum of meaning and purpose in different ways; some may try to fill the vacuum and mitigate the negative effects of retirement by finding bridge employment, engaging in volunteer work, or taking up new hobbies and activities (Wang, 2007; Kim & Feldman, 2000). Free to pursue personal interests without the bonds of employment, these individuals may experience higher life satisfaction in retirement. Other individuals may attempt to fill the vacuum of meaning and purpose in less adaptive ways; for example, by being drawn into excessive health care use and illness behaviors. This may not be an intentional process or effortful on the individual's part; retirees may be vulnerable to adopting the sick role due to the vacuum left by retirement and subsequently replace their employment identity with the patient identity.

Retirement has been associated with increased life satisfaction in some studies (Gorry, 2015). Other studies, however, show that effects of retirement on life satisfaction and well-being are not always consistent (J. E. Kim & Moen, 2002). These inconsistencies may be due to methodological differences between studies, such as populations studied or measures used. Importantly, these differences might be related to the time period covered by the studies, as psychological reactions in the immediate post-retirement period may not accurately reflect long-term adjustment (Kim & Moen, 2002; Gorry, 2015). The different patterns of life satisfaction in retirement may also suggest that there are different trajectories of adjustment. Complicating matters further, any short or long-term effects of retirement occur against a backdrop of

normative, age-related changes in life satisfaction that may be related to diminishing health or the loss of family and friends who die or become unavailable for emotional or social support due to disability.

Indeed, there is research to suggest that subjective well-being in retirement can be organized into distinct patterns of change: life satisfaction can remain stable over time, or it can increase or decrease at retirement, then resume the original positive or negative trend following retirement (Pinquart & Schindler, 2007). Pinquart and Schindler (2007) studied changes in life satisfaction in 1,456 German retirees with latent growth mixture modeling. They identified three groups of people who experienced retirement differently, as seen in Figure 1. The first group showed a slight increasing trajectory of life satisfaction pre-retirement then a sharp decrease in life satisfaction at retirement and in the post-retirement period life satisfaction trajectories resumed an increasing trajectory. The second group showed decreasing trend of life satisfaction pre-retirement, an increase in life satisfaction at retirement, then life satisfaction resumed a downward trajectory post-retirement. The third group had stable life satisfaction over the retirement period.

Consistent with the role theory, life satisfaction may decrease at the time of retirement due to the loss of employment identity, as seen through group one of Pinquart and Schindler's study (Richardson & Kilty, 1991; Wang 2007). Retirement may also provide a reprieve from unpleasant employment situations, which may explain the life satisfaction pattern of group two. From a life-span perspective, retirement also coincides with a period of time marked by an increased risk of loss of spouses, partners, family or friends to disease or death, which may contribute to decreased life satisfaction and well-being and contribute to the vacuum of meaning and purpose (Wang, 2007). Social roles and responsibilities are in flux during this time, adding

to the potential decrease in life satisfaction. Decreased life satisfaction, challenging life events, and personal losses can exacerbate the vacuum left by retirement which may result in increased health care use.

Generally, the research supports the idea that higher life satisfaction is associated with less health care use. Kim, Park, Sun, Smith and Peterson (2004) report that higher self-reported life satisfaction was associated with fewer doctor visits. They found that for every point increase in life satisfaction (on a 6-point Likert scale), there was a 10.57% decrease in number of doctor visits. When they controlled for 17 demographic covariates, they found a 3.6% decrease in doctor visits for every point increase in life satisfaction. The researchers also factored in chronic disease status and found that the association between life satisfaction and health care use was of greater magnitude for individuals with two or fewer chronic diseases. This indicates that those with legitimate health concerns and chronic illnesses will seek medical care, irrespective of their life satisfaction.

Another study by Kim, Kubzansky, and Smith (2015) examined the link between life satisfaction and the use of preventative health care services. This study found that higher life satisfaction was associated with higher use of preventative health services such as flu shots, cholesterol tests, pap smears, and mammograms. Clearly, life satisfaction is connected with health care use and we are just beginning to understand the relationship between the two. Understanding the effect of life satisfaction on health care use at the time of retirement is especially important as engaging in the health care system consumes an individual's time, effort, and financial resources (Ray et al., 2015).

Engaging in the medical care system has financial costs, as well as time and opportunity costs (Ray et al., 2015). Our current health care system makes increasing demands on the patient.

There is an increased responsibility placed on the patient and their caregivers to manage his or her health care services and manage one's own symptoms in the case of chronic illness (May, 2014). The burden of illness already requires a high level of self-management and regulation. Additionally, patients are required to manage their health care use: communicating information among their health care providers, understanding their symptoms, reaching out for appropriate support from caregivers, and engaging in preventative health care behaviors to mitigate potential future, though often minimal, health risks (May, 2014). Taken together, this can be considered the burden of treatment (May, 2014). The self-efficacy required by the burden of treatment may have positive effects for the patient, but these benefits could be easily outweighed by the heavy burden felt by the patient as he or she may be overwhelmed by the cumulative burden of the illness and treatment responsibilities (May, 2014). Thus, the burden of treatment over time may contribute to poorer health care outcomes and decreased quality of life.

Cumulatively, the burdens of illness, treatment, and financial cost can be significant for retired individuals while not improving their overall health and well-being (Brownlee, 2010). The higher incidence of chronic illnesses in older adulthood practically demands that older adults participate in health care services more. Interestingly, Coe and Zamaro (2015) found a decrease in health care use in retirement when they analyzed data from the US Health and Retirement Study (HRS) and Europe's Survey of Health, Aging, and Retirement in Europe (SHARE) study. The study defined health care utilization as specialist doctor visits, visits to a general practitioner, nights spent in the hospital, and preventative care use. They found that overall health care utilization decreased after retirement, and there were fewer specialist doctor visits reported, but nights in the hospital remained constant. In contrast, Gorry, Gorry, and Slavov (2015) did not find an association between retirement and health care utilization when examining the HRS. The

two studies operationalized retirement differently. Whereas Gorry, Gorry, and Slavov (2015) used self-report data on retirement status to identify their sample, in the analysis they created an instrument as a proxy for retirement, using an individual's eligibility for Social Security and employer sponsored pensions to avoid possible confounds of retirement decisions (i.e. retirement due to health concerns). The contrasting conclusions of the effect of retirement on health care utilization could be due to a variety of reasons, most notably individual differences in retirement. Some people may adjust to retirement well and thus may show a decrease in health care use behaviors, or no change. Others may experience a vacuum of meaning and purpose in their retirement period and respond to it with increased health care use.

To examine if there are distinct patterns of health care utilization and life satisfaction as a function of retirement status, I analyzed data from the United States Health and Retirement Study (HRS). The HRS collects extensive health, economic, and demographic data from a nationally representative sample of Americans 50 years or older in an effort to understand retirement and aging. The longitudinal data has been collected biannually, since 1992, with new age cohorts being added to the study every six years. It provides unprecedented information about how Americans age.

The current study examined HRS data from 2004 to 2016. Over this twelve-year period, seven survey waves were conducted. The available data enabled me to abstract data on the participants' retirement time, affective functioning at each wave, self-reported number of doctor visits, and stays in the hospital every two years, and life satisfaction every four years. I performed a latent transition analysis to identify distinct groups of participants defined, separately, by patterns of different patterns of life satisfaction and health care utilization over the retirement period. Once these groups were identified, I analyzed the relationship between the

participants' membership in their life satisfaction group and their membership in their health care use group (i.e., does one pattern of life satisfaction correspond to a specific pattern of health care utilization). I also analyzed each group's demographic characteristics.

I hypothesized that there will be distinct trajectories for both health care use and life satisfaction, and that some classes will be defined by changes related to retirement status. Individuals who show an increase in health care use post-retirement would be distinguished by loss of meaning and purpose in the immediate post-retirement period, participation in work that may have provided a significant employment identity, and the presence of at least one health problem in the immediate pre-retirement period. The people who experience a vacuum of meaning and purpose in the post-retirement period--who already have on-going health concerns and relationships with health care providers—were predicted to be especially vulnerable to using excessive illness behavior to fill the void left by retirement.

METHOD

Design

The study employed multi-wave longitudinal mixture modeling applied to data from the US Health and Retirement Study. The US Health and Retirement Study (HRS) is a longitudinal study with a representative sample of approximately 22,000 US adults aged 50 and older. It has been collecting data every two years since 1992. The HRS is conducted by the University of Michigan and is sponsored by the US Department of Health and Human Services, the National Institute on Aging and the National Institute on Health (grant number NIA U01AG009740). As the proposed study used deidentified, publicly available data, the Institutional Review Board at the University of Alabama exempted it from review.

Participants

HRS data collection began in 1992, and the first group of subjects was limited to individuals born between 1931 and 1941. In 1993 and 1995, data from individuals born before 1923 were collected as part of the Assets and Health Dynamics among the Oldest of the Old (AHEAD) study. In 1998, the AHEAD cohort was merged with the original HRS data, and two more cohorts were added to fill in the age gaps. The individuals born during the depression (1924-1930) and individuals born during WWII (1942-1947) were included in the study. It was decided that a new cohort would be added every six years, and in 2004, the Early Baby Boomers (born 1948-1953) were included. In 2010, individuals born 1954-1959 (Middle Baby Boomers) were included. In 2016, the Late Baby Boomers (1960-1965) were added to the data set.

Many of the participants (three of the five cohorts) were recruited for participation through screening of 69,337 household units. The sample was generated by a multi-staged, clustered area probability model ensuring geographic diversity representative of the population. Eligible individuals were then interviewed and asked if they would like to participate in the study. For example, in the 2006 wave of data there were a total of 18,469 participants. The HRS defines the observational unit as household financial units. Within each household, the financial unit it can either be a single, unmarried, age-eligible person, a married couple where both individuals are age-eligible, or a married person where one spouse is age-eligible. Participants are community dwelling when baseline is collected, and they are kept in the study if they relocate to nursing homes or assisted living facilities. For the current study, I have used data from the respondents only.

I selected a subset of HRS participants for the current study. Participants who had reported a change in work status, indicating they had transitioned from full-time work to retirement from 2008 to 2014 were included in this study. The resultant group had 1241 participants. For this group, the average age at retirement was 65.85 years. 58% of the participants identified as female and 90.6% identified as non-Hispanic. The sample was predominately white (75.9%), with 17.4% identifying as African American, and 6.7% “other”. In the wave immediately preceding retirement, 41.8% of the participants reported a household income greater than \$50,000, and in the wave following retirement, this proportion of the participants decreased to 26.8% of the sample. 90% of participants completed high school or attained their GED, with 26.9% completing college or advanced degrees.

Measures

The core content collected in the surveys falls within seven areas: Health, Health Services, Labor Force, Economic Status, Family Structure, Expectations, and Experimental Modules. For the present study, data from the Health, Health Services, and Labor Force content areas from the core HRS was analyzed. Within the Health area, subjects complete a self-report of physical and psychological health and report health conditions or disabilities. In the Health Services data area, the subjects' health care utilization, perceptions of their use, and insurance. Labor Force information is collected regarding the subjects' employment status and history, retirement status, earnings, disability, and type of work. The HRS has a high standard of validity and reliability for the measures it uses.

Life satisfaction. The HRS introduced an assessment of life satisfaction in 2006 using the Satisfaction with Life Scale (SWLS) (Smith et al, 2013). The scale has five items, which are “1. In most ways my life is close to my ideal, 2. The conditions of my life are excellent, 3. I am satisfied with my life, 4. So far I have gotten the important things I want in life, 5. If I could live my life over, I would change almost nothing” (Diener, Emmons, Larsen, & Griffin, 1985). When the SWLS was first used in the HRS the scale was adapted from a 7-point Likert scale to a 6-point Likert scale to standardize and streamline the measures for the HRS (Smith et al, 2013). Respondents indicated the degree to which they agreed with the various statements (1=strongly disagree to 6=strongly agree, with no neutral or “neither agree or disagree” rating option). However, in 2008 and in subsequent waves, the HRS utilized the SWLS's original 7-point Likert scale (1=strongly disagree to 7=strongly agree). I recoded the 2006 data (i.e., a 4 “slightly agree” in 2006 was recoded to a 5) to be consistent with the 7-point scaling and allow for

comparisons across the waves. I ran analyses to assess the effects of this change on the variable's distribution, and found no significant divergences in this distribution.

The SWLS has excellent psychometric properties. Before it was added to the HRS, the measure was piloted in the 2004 Pilot SAQ (alpha reliability=.90) (Smith et al, 2013). When the SWLS was included in the HRS the alpha reliabilities were 2006 alpha=0.89, 2008 alpha=0.88, and 2010 alpha=0.89 (Smith et al, 2013). The SWLS has been used in international comparative studies, establishing its versatility across cultures and suggesting it can be readily used with diverse populations (Pavot & Diener, 1993).

Health care utilization. The HRS collects extensive health care utilization data, and the primary variable of health care use in this study is the number of times participants reported seeing a physician over the last two years. Respondents were asked “Aside from any hospital stays or outpatient surgery, how many times have you seen or talked to a medical doctor about your health, including emergency room or clinic visits in the last two years?” The validity of using self-report as an accurate estimate of doctor visits has been established (Cleary & Jette, 1984). Studies have shown that self-report doctor visits show high agreement with both administrative insurance claims and medical records (Ritter et al, 2001). I also analyzed the participants' self-reported number of stays in the hospital for the past two years. The HRS also collects data about nights spent in a hospital, number of times they were in a nursing home, and number of nights spent in a nursing home over the past two years.

Retirement. The HRS collects extensive data about the working status of the participants. Within each wave, a participant's retirement status is listed as not retired, completely retired, partly retired, or question irrelevant. In a separate variable derived from employment status, the participants also say if they are fully retired, retired and another status

(working part-time), or not retired at this time. In this study, I define retirement as a transition from full-time work to full retirement, as it is in this transition people may be most susceptible to the putative vacuum in meaning and purpose. Using these two variables (i.e., retirement status and employment status), I selected participants who responded “not retired” (i.e., working) in Wave X and “retired” in Wave X+1. During the study window, 1,241 participants met these criteria. There are four retirement cohorts in this sample: in 2008, 291 respondents reported they had retired; in 2010, 334 respondents retired; in 2012, 296 respondents retired; and in 2014, 320 respondents retired.

Demographics and covariates. I examined the respondents’ demographic variables (age at retirement, gender, race, socioeconomic status, education) as well as indicators of psychosocial functioning and health status. I assessed participant chronic illness through self-report of doctor’s diagnosis of eight medical conditions: high blood pressure, diabetes, cancer, lung disease, heart attack or other heart problems, psychiatric problems, arthritis or rheumatism, and stroke. As with other self-report measures of health in the HRS data set, subject self-report of chronic conditions has been rigorously assessed for reliability and validity by crosschecking Medicare claims and chart review (Ritter, et al, 2001).

Procedure

The data has been collected biennially since 1992, with interviews on the core data done in person to collect baseline data and follow-up interviews done in person or by phone. In 2006, the HRS began an enhanced face-to-face interview with a half of the participants selected randomly. In 2008, the remaining half of participants was given the enhanced interview, and it thus alternates each half of the sample for every wave of data collected; a participant will have an enhanced interview every four years. The enhanced interview includes physical measures

such as grip strength, timed walk, lung function, balance, height and weight, waist circumference, and blood pressure. Participants were given a psychosocial self-administered questionnaire to mail-back which contain the life satisfaction questions of interest in the present study. Each participant completed the life satisfaction questionnaire every four years.

The RAND Corporation provides a complete data set of all of the current waves of the HRS. The RAND data file includes the core HRS data cleaned and synchronized from 1992 to 2014. To compile the data set for the current study, I merged participant responses from the Leave Behind Questionnaires from 2006 to 2014, as well as the core HRS data from 2016 to the RAND data file.

Once the retirement cohorts were identified, I centered the remaining variable names around retirement for each cohort of retirees. This allowed me to identify the number of doctor visits, life satisfaction, and stays in the hospital in the waves preceding retirement and in the waves following retirement for each retirement cohort. I then combined the data sets for the X cohorts into a single file with pre- and post- waves centered around retirement. With the variables renamed and centered around retirement for all retiree cohorts, I merged all variables together to complete the data set.

Further merging and data management was required for the life satisfaction variable, as it was collected every four years from each participant. At any given wave half of the participants were given the leave-behind survey. To satisfy covariance coverage required by the latent transition modeling procedure, I merged the two earliest waves of life satisfaction prior to retirement into one variable and repeated this procedure merging A & B groups into one measure as illustrated in Figure 2. As a result, I had two waves of data for life satisfaction prior to retirement, and two waves of life satisfaction data following the participant's retirement.

For the doctor visits variable, I removed participants who indicated they had more than 100 doctor visits at any wave, regarding these as outliers. The models would not run when these outliers were included but did so when they were excluded. The procedure led to the exclusion of 22 participants.

RESULTS

Preliminary Analysis

Confirmatory factor analyses were performed on the constructs of interest, life satisfaction and health care utilization, to determine if the constructs could be estimated as latent variables. For the health care utilization, no unitary factor emerged from the CFA of the number of doctor visits, visits to the hospital, times moved in to a nursing home, and nights spent respectively in either a nursing home or hospital. For this reason, I used the count variables for doctor visits and stays in the hospital, separately, for subsequent latent transition analyses. For life satisfaction, the five items could be estimated by a single latent variable, however, when these latent variables were analyzed in the latent transition analysis, too few degrees of freedom were left to estimate the latent trajectory model. As a result, I used the mean of the life satisfaction variables as the original measure was designed for the latent transition analyses.

Missing data. The HRS has a high response rate, with each wave having at least 85% of participants responding (Health and Retirement Study, 2016). Although the response rate is high for this data set, individual participants may have missing data for individual questions or sections of the survey, resulting in missing data patterns within the data set. Other studies that have utilized the Health and Retirement Study have addressed missing data in several different ways, ultimately using various strategies to impute missing data and preserve the sample size. For example, Kim and colleagues (2014) found for the HRS data they used the overall non-response rate for the items was relatively low with 1.71% of data missing, however, when list-wise deletion was implemented, 25.69% of the sample was eliminated. The missing data was

small in their study, but significant when deleted list-wise. The current study utilized MPlus, a statistical package that allows for the analysis of incomplete data by using the full information maximum likelihood parameter estimates without imputing or deleting data (Muthén & Muthén, 2012). For each latent transition analysis, individuals who had missing data for all waves of the variable of interest were excluded from the modeling procedure.

Main Data Analysis

Latent transition analyses (LTA) were used to identify groups defined by two indicators: trajectories of health care use (HCU) and life satisfaction (LS) from the pre- to post-retirement period, as shown in Figure 3. The LTA analysis identifies distinct groups of people that have a similar pattern of change in the variable of interest over time (Jung & Wickrama, 2008). It performs this analysis by examining a variable's trajectory and using the change in slope and intercept to identify groups or classes. To begin, the overall (one-class) trajectory is established under the assumption that one trajectory adequately explains the observed change over time for the whole sample. Additional class solutions (two, three, and four-class, etc.) are tested to determine if there are a respective number of trajectories that better explain the change over time. Several model fit statistics are used to determine the best model. The best model will have the lowest Bayesian information criteria (BIC), entropy approaching 1, a significant a Lo, Mendell, and Rubin likelihood ratio test (LMR-LRT), and a significant bootstrap likelihood ratio test (BLRT) (Jung & Wickrama, 2008). The model fit statistics for all models are included in Table 1.

For life satisfaction, I tested one, two, three, and four-class solutions in the LTA and analyzed the model fit for each solution. Simply put, I wanted to know if a two-class model (i.e., two groups of participants with distinct patterns of changing life satisfaction) accounts for the

differences better than a one-class model. Likewise, if a two-class solution is significantly different than the one-class, I tested whether a three-class solution would improve model fit over the two-class model, and so on. For the life satisfaction LTA, I found the three-class solution explained the data better than the two or four-class models; indicating that there are three distinct patterns of change in life satisfaction over the course of the retirement period for the participants. Figure 4 shows the changes in mean of life satisfaction (maximum value=7) over time in relation to retirement for each life satisfaction class. For LS Class 1 “Low Down-Tick”, $n=179$, these participants have the lowest life satisfaction prior to retirement (mean=3.30) and experience a further decrease following retirement (mean=2.71), and their mean life satisfaction increases as they move further away from retirement. LS Class 2 “Moderate Up-Tick”, $n= 389$ displays an increase in life satisfaction from pre- to post-retirement (mean=4.37 to mean=4.87), and endorse a moderate level of life satisfaction during this time period. LS Class 3 “High Stable” comprises a large portion of the sample with $n=550$, and this group maintained the highest level of life satisfaction (mean ranges from 6.00 to 6.16) over the retirement period with no distinct change during the transition from pre- to post-retirement.

For health care utilization, two independent LTAs were run for self-reported doctor visits and number of hospital stays over the past two years. As one’s health status has significant implications for health care utilization, at each data wave I correlated the patient’s number of reported health conditions with the respective HCU variable within the model. For both doctor visits and stays in the hospital, the four-class solution was significant, indicating there are four distinct patterns of HCU over time when the participant’s health status was accounted for. A chi-square test for association was conducted between category memberships for the two HCU variables. All expected cell frequencies were greater than five. There was a statistically

significant association between doctor visits and stays in the hospital, $\chi^2(9) = 3622.83, p < 0.001$. There was an extremely strong association between the HCU variables, Cramer's $V = 0.988, p < .001$. The results indicated high convergence of these variables, as participants with one distinct pattern of doctor visits over the past two years also had a corresponding distinct pattern of hospital stays. Figures 5 and 6 illustrate the changes in mean number of doctor visits and stays in the hospital over a two-year period for each HCU class. Figure 7 shows the changes in the mean number of health conditions per HCU class.

Each HCU class is named with descriptive traits of the number of health conditions or illnesses reported and low, moderate, and high levels of health care utilization. HCU Class 1 "Low Illness—Moderate HCU" ($n=382$) reported relatively low levels of chronic conditions, mean 1.72 prior to retirement, and reported a slight decrease in visits to the doctor following retirement, mean 8.95 pre-retirement to mean 7.96 post-retirement, and low levels of hospital utilization. HCU Class 2 "Low Illness—Low HCU" ($n=461$) reported the least number of chronic conditions, visits to the doctor and stays in the hospital. When HCU Class 3 "High Illness—High HCU" ($n=100$) is compared to the other HCU classes, it displays the highest number of chronic conditions, with a mean of 4.29 chronic conditions prior to retirement, the highest increase in doctor visits from pre to post-retirement, means 12.77 and 15.08 respectively, and a sharp increase in number of stays at the hospital post-retirement: with a mean of 0.89 visits immediately following retirement to a mean of 2.16 visits two years after retirement, likely due to their poor health status. HCU Class 4 "Moderate Illness—Moderate HCU" ($n=296$) also displayed several health conditions, with a mean of 2.83 conditions prior to retirement, and higher number of doctor visits, mean 10.74 following retirement, but generally low levels of hospital utilization, mean 0.46 following retirement.

A chi-square test for association was conducted between health care utilization (specifically doctor visits) and life satisfaction trajectories to determine if there is a significant relationship between the two grouping structures in the retirement period. All expected cell frequencies were greater than five. There was a statistically significant association between doctor visit classes and life satisfaction classes $\chi^2(6) = 26.648, p=0.001$. There was a slight association between HCU and life satisfaction trajectories, Cramer's $V=0.101, p=0.001$. Table 2 shows the chi-square distribution for life satisfaction and HCU classes.

Of all of the HCU classes, the “High Illness—High HCU” class contains a relatively even distribution of the life satisfaction classes, with the “Moderate Up-Tick” class comprising 42%, $n=37$. 55.7% of the healthiest the “Low Illness—Low HCU” class was comprised by the “High Stable” class in which the participants responded with the highest levels of life satisfaction. Given the weak association between life satisfaction trajectories and health care utilization trajectories, however, interpretations drawn about the relationship between these variables and class memberships may not apply to all observed classes.

DISCUSSION

The hypothesis that there are distinct classes of health care use and life satisfaction trajectories as defined by the retirement period was supported by the data. However, individuals who show an increase in health care use post-retirement were not clearly distinguished by a decrease in life satisfaction in the immediate post-retirement period as I had predicted. Interestingly, those that demonstrated the highest increase in health care use post-retirement (“High Illness—High HCU”) were more likely to have experienced a slight increase in life satisfaction (“Moderate Up-Tick,” 42%) which is contrary to what I hypothesized. While the data do show a slight association between different patterns of health care use and life satisfaction, there is much left to be understood. As Kim, Park, Sun, Smith and Peterson (2004) found higher life satisfaction was associated with fewer doctor visits, the current study supports the idea of lower level of health care utilization among the most highly satisfied in life. The individuals with the highest level of life satisfaction (“High Stable”) were less likely to be in the “High Illness—High HCU” class, with only 5.1% of participants in the “High Stable” class also falling in the “High Illness—High HCU” class.

Of the 1115 participants that were classified in both HCU and LS classes, 88 displayed substantial HCU (“High Illness—High HCU”) and 178 reported a decrease in life satisfaction from pre- to post-retirement (“Low Down-Tick”), and the 23 participants that were characterized by both of these patterns represented 2.1% of the overall sample. Similarly, 422 participants reported the lowest HCU over time (“Low Illness—Low HCU”) and 549 reported high levels of life satisfaction (“High Stable”), with 235 individuals or 21.1% of the sample was characterized

by both high life satisfaction and low HCU. For these two groups of individuals (“Low Down-Tick—High Illness—High HCU” or “High Stable—Low Illness—Low HCU”), it is important to understand what drives their membership into a particular subgroup. I am most interested in the events that preceded membership in the low life satisfaction and high health care use and if any interventions can aid in preventing this transition. Individual health status plays an important role in this situation, as these individuals are more likely to have more chronic health conditions, but this could also be a byproduct of their patienthood as continued engagement in the health care system may necessitate additional diagnoses.

Retirement is a complicated time with individual differences in how health care use and life satisfaction are approached and managed. The findings did not provide sufficient clarity to determine if participation in work may provide a significant employment identity, and thus when retirement arrives, significant psychological preparation is required to successfully make the transition.

Limitations. The complex nature of retirement is a complicating factor in this study. I chose self-reported retirement status as the indicator of retirement. Other studies of retirement--particularly economic studies--use instrumental variables (e.g. an individual’s eligibility for Social Security and employer sponsored pensions) to determine retirement status in an attempt to avoid endogeneity, which is the correlation of retirement (the explanatory variable) with error. Some individuals may retire due to health concerns, and thus their retirement is correlated with health care use and may affect the analysis. As I am interested in personal differences in retirement, I used the self-reported retirement status rather than an instrumental variable that determines retirement based on institutional indicators.

The Health and Retirement Study offers an unparalleled database of information on how American's age. Secondary data, however, is far from perfect. Several factors unique to this database contributed to limited scope of this study. One example is the life satisfaction variable being collected every four years instead of every two years. The analysis of the life satisfaction trajectories may lack sensitivity due to the increased time interval between measurement of the participant's life satisfaction. Having to further consolidate the life satisfaction data into four waves rather than eight waves also may have decreased the ability to detect different patterns over time, as well as introducing error related to variability in the time between the collection of the life satisfaction measure and retirement.

Implications. Understanding the different health care utilization and life satisfaction trajectories over the retirement period will help us understand health care consumption of older adults. I identified different patterns of life satisfaction and health care utilization over the course of retirement, yet much is left to be understood about how these constructs interact with each other. By further understanding the relationship between life satisfaction and health care use, we can target interventions to improve life satisfaction in older adults and decrease excessive illness behaviors in this population.

Health care costs grow exponentially in retirement, and the cost in the United States is prohibitively expensive while not delivering better health. US citizens spent an average of \$4,571 annually out of pocket, and the total amount spent per year, including government expenditures, was \$8,985. This significant cost does not guarantee a longer life, as the average life expectancy of 78.8 years for US citizens is about standard among developed countries (Brownlee, 2010). The average total amount spent on healthcare by other countries analyzed in the Organization for Economic Development and Cooperation study was \$3,633, with some

countries achieving estimated life expectancies of 83 years. By understanding a potential cause of higher health care use in retirement, we may be able to target interventions to address the psychological, health, and economic implications of retirement.

Individuals with high levels of excessive illness behavior consume a high volume of health care services, and as “High Illness-High HCU” class illustrated, these individuals often have the most chronic conditions. If we are able to determine what excessive illness behavior looks like in the older adult population, and taking into consideration the muddiness of one’s chronic conditions, we may be able to create interventions to decrease unnecessary health care use. While the number of individuals with excessive illness behavior may be small, their consumption of health care services is not insignificant. Identifying these individuals and targeting interventions to address excessive illness behavior will enable us to drastically cut down on health care cost and improve quality of life.

Ultimately, it is the human factor that necessitates this type of research. Retirement and the associated lifestyle of relaxation and enjoyment represents an ideal that individuals strive for in their working years. When retirement arrives, however, some individuals may be ill prepared for the transition and vulnerable to psychological suffering or distress which may lead to increased use of health care services. Who wants to spend their retirement at the doctor? By further investigating the interaction between retirement, life satisfaction, affective functioning, and health care use, we may be able to identify those most vulnerable to distress during this life transition and intervene to mitigate this risk.

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APPENDIX

Table 1. *Fit Indices and Entropy of the Latent Trajectory Analyses*

Model	BIC	ENTROPY	<i>P</i> (LMR-LRT*)	BLRT
<i>LIFE SATISFACTION</i>				
One class	62180.868			
Two classes	56697.174	0.932	0.0000	0.000
Three classes	55041.304	0.912	0.0173	0.000
Four classes	54123.194	0.908	0.1147	0.000
<i>HEALTH CARE USE WITH HEALTH STATUS</i>				
<i>Doctor Visits</i>				
One Class	66585.131			
Two Classes	62810.403	0.878	0.0086	0.000
Three Classes	60905.424	0.941	0.0100	0.000
Four Classes	59911.839	0.933	0.0178	0.000
Five Classes	58655.569	0.997	0.7138	0.000
<i>Stays in Hospital</i>				
One Class	35259.429			
Two Classes	31526.147	0.879	0.0165	0.000
Three Classes	29608.344	0.944	0.0081	0.000
Four Classes	28619.103	0.933	0.0308	0.000
Five Classes	27146.149	0.996	0.7394	**
*Lo, Mendell, Rubin-Adjusted LRT Test				
**bootstrapping procedure did not produce a reliable <i>p</i> value, thus it is not reported here				

Table 2. *Chi-square distribution of participants as determined by class membership in life satisfaction and health care use trajectories*

	LS Class 1 Low Down-Tick	LS Class 2 Moderate Up-Tick	LS Class 3 High Stable	HCU Totals
HCU Class 1 Low Illness—Moderate HCU	58	115	166	339
% within HCU Group	17.1%	33.9%	49%	100%
% within LS Group	32.6%	29.6%	30.2%	30.4%
% of Total	5.2%	10.3%	14.9%	30.4%
HCU Class 2 Low Illness—Low HCU	56	131	235	422
% within HCU Group	13.3%	31%	55.7%	100%
% within LS Group	31.5%	33.8%	42.80%	37.8%
% of Total	5%	11.7%	21.1%	37.8%
HCU Class 3 High Illness—High HCU	23	37	28	88
% within HCU Group	26.10%	42.00%	31.80%	100%
% within LS Group	12.90%	9.50%	5.10%	7.9%
% of Total	2.10%	3.30%	2.50%	7.9%
HCU Class 4 Moderate Illness—Moderate HCU	41	105	120	266
% within HCU Group	15.4%	39.5%	45.1%	100%
% within LS Group	23%	27.1%	21.9%	23.9%
% of Total	3.7%	9.4%	10.80%	23.9%
LS Totals	178	388	549	Total <i>n</i> =1115 100%
% within HCU Group	16%	34.8%	49.2%	
% within LS Group	100%	100%	100%	
% of Total	16%	34.8%	49.2%	

Table 3. *Life satisfaction demographics*

Life Satisfaction Classes			
	LS Class 1 Low Down-Tick	LS Class 2 Moderate Up-Tick	LS Class 3 High Stable
Gender	55.9% female	59.9% female	57.6% female
Hispanic	91.6% non-Hispanic	91.8% non-Hispanic	90.9% non-Hispanic
Race	75.4 % White, 19.6 % African American/Black, 4.5% Other	73% White, 19.5% African American/Black, 6.9% other	83.6% White, 10.2% African American/Black, 6.2%other
Highest Education Degree Attained	14.4% no degree, 64.6% HS/GED, 20.9% AA or higher	9.8% no degree, 62.9% HS/GED, 27.3% AA or higher	7.3% no degree, 50.2% HS/GED, 42.5% AA or higher

Table 4. *Health care use demographics*

Health Care Use Classes				
	Low Illness-- Moderate HCU	Low Illness-- Low HCU	High Illness-- High HCU	Moderate Illness-- Moderate HCU
Gender	61% female	57 % female	60% female	55.1% female
Hispanic	91.9% non-Hispanic	88.7% non-Hispanic	93% non-Hispanic	91.2% non-Hispanic
Race	74.1% White, 19.4% African American/Black, 6.5% Other	76.7% White, 15.3% African American/Black, 8.1% Other	77% White, 18% African American/Black, 5% Other	77% White, 17.6% African American/Black, 5.4% Other
Highest Education Degree Attained	10.2% no degree, 56% HS/GED, 33.8% AA or higher	8.7% no degree, 53% HS/GED, 38.3% AA or higher	15% no degree, 61% HS/GED, 24% AA or higher	10.1% no degree, 61.2% HS/GED, 28.7% AA or higher

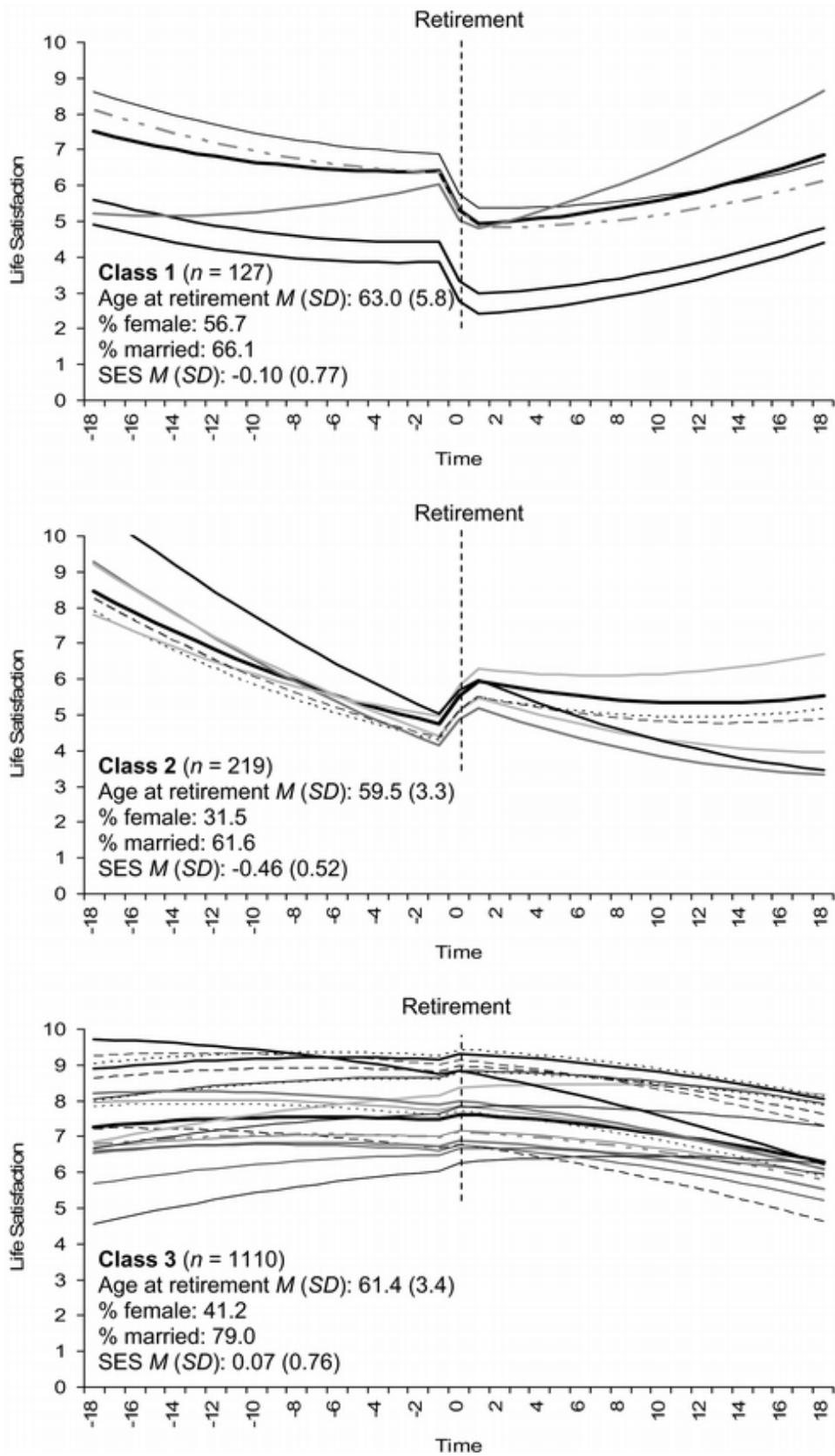


Figure 1. Pinquart and Schindler's latent class analysis of life satisfaction in retirement

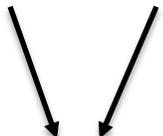
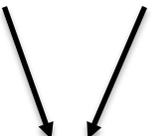
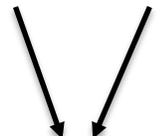
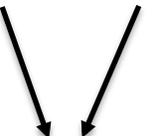
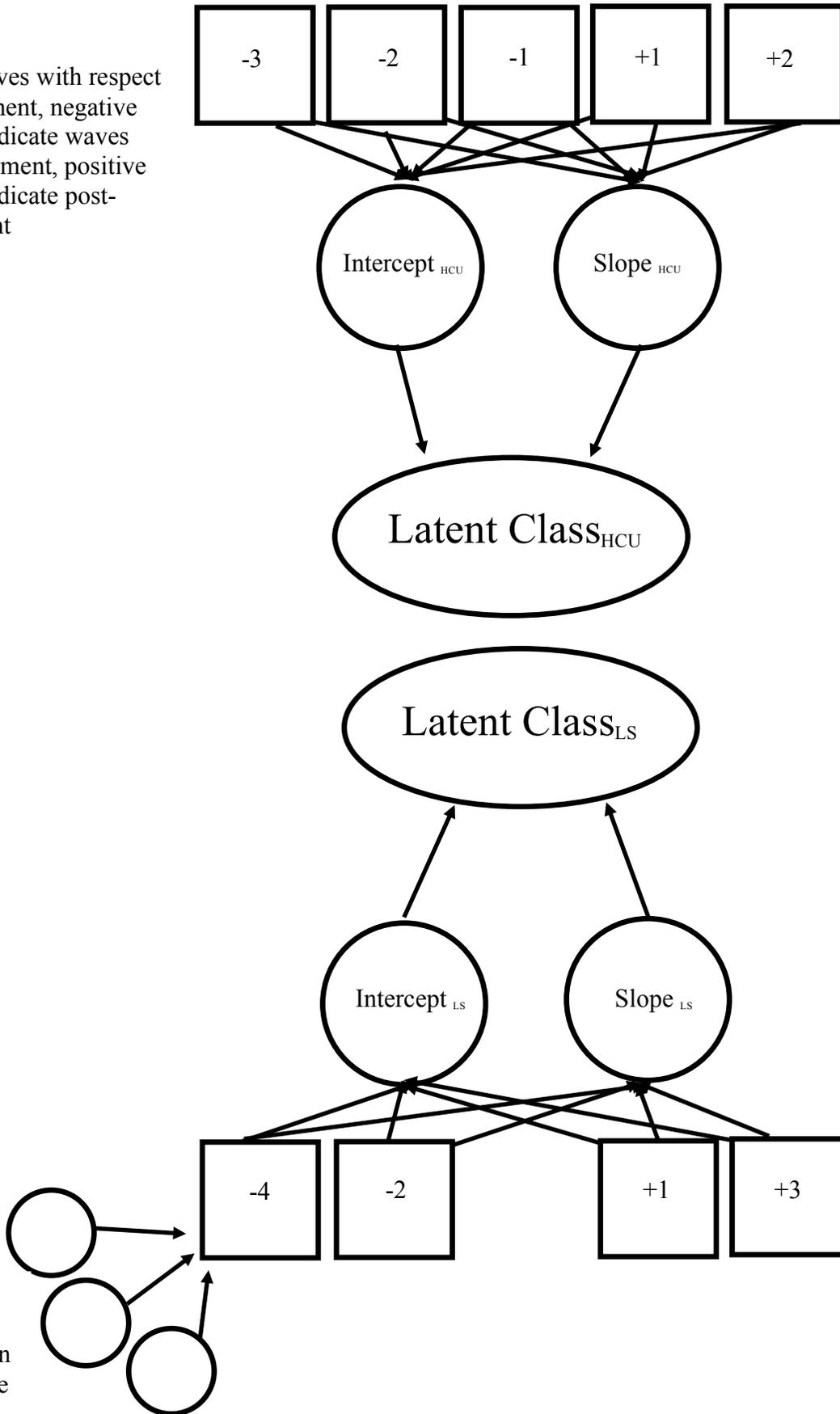
Original data distribution	-4	-3	-2	-1	Retirement.	+1	+2	+3	+4
Group 1	X		X			X		X	
Group 2		X		X			X		X
									
Merged data distribution	-4		-2			+1		+3	
Group 1 Group 2	X X			X X		X X			

Figure 2. Life Satisfaction data consolidation across waves to aid in covariance coverage

Data Waves with respect to retirement, negative values indicate waves pre-retirement, positive values indicate post-retirement



Individual responses on the Satisfaction with Life Scale

Figure 3. Illustration of mixture model

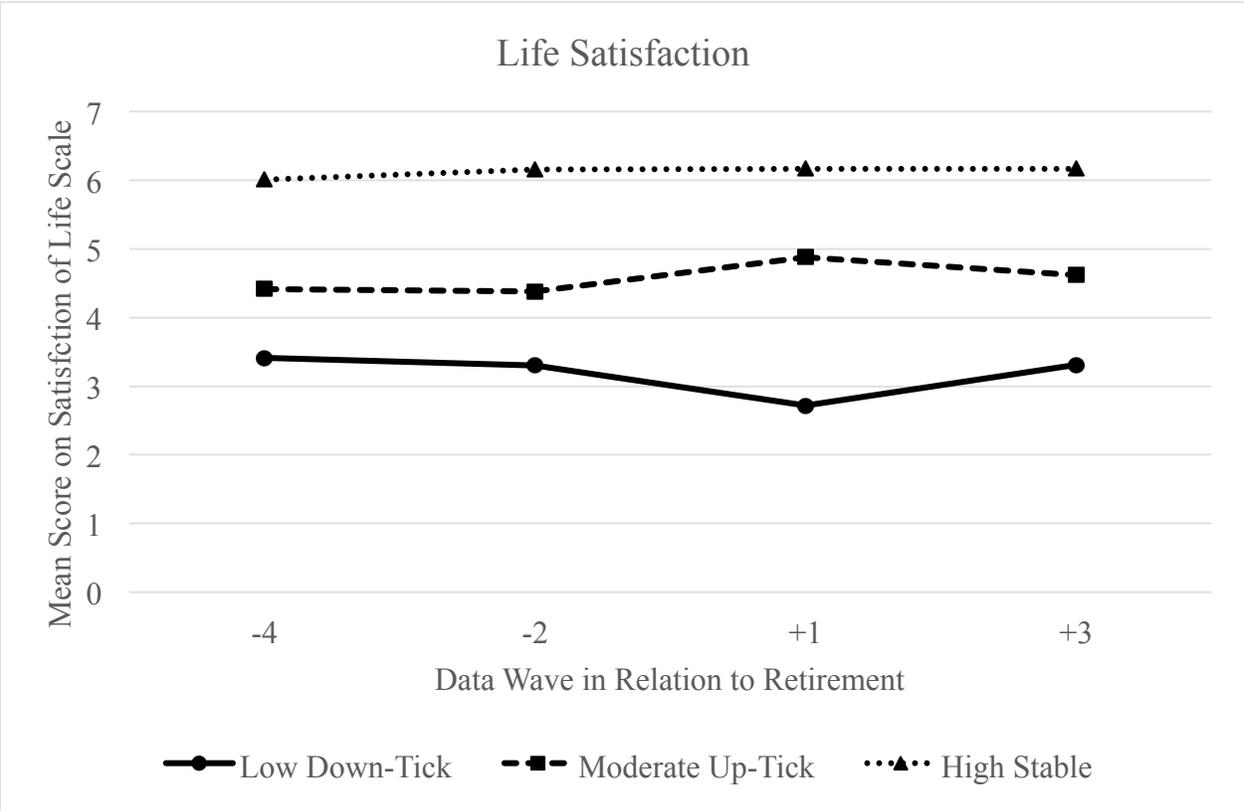


Figure 4. Life satisfaction trajectories

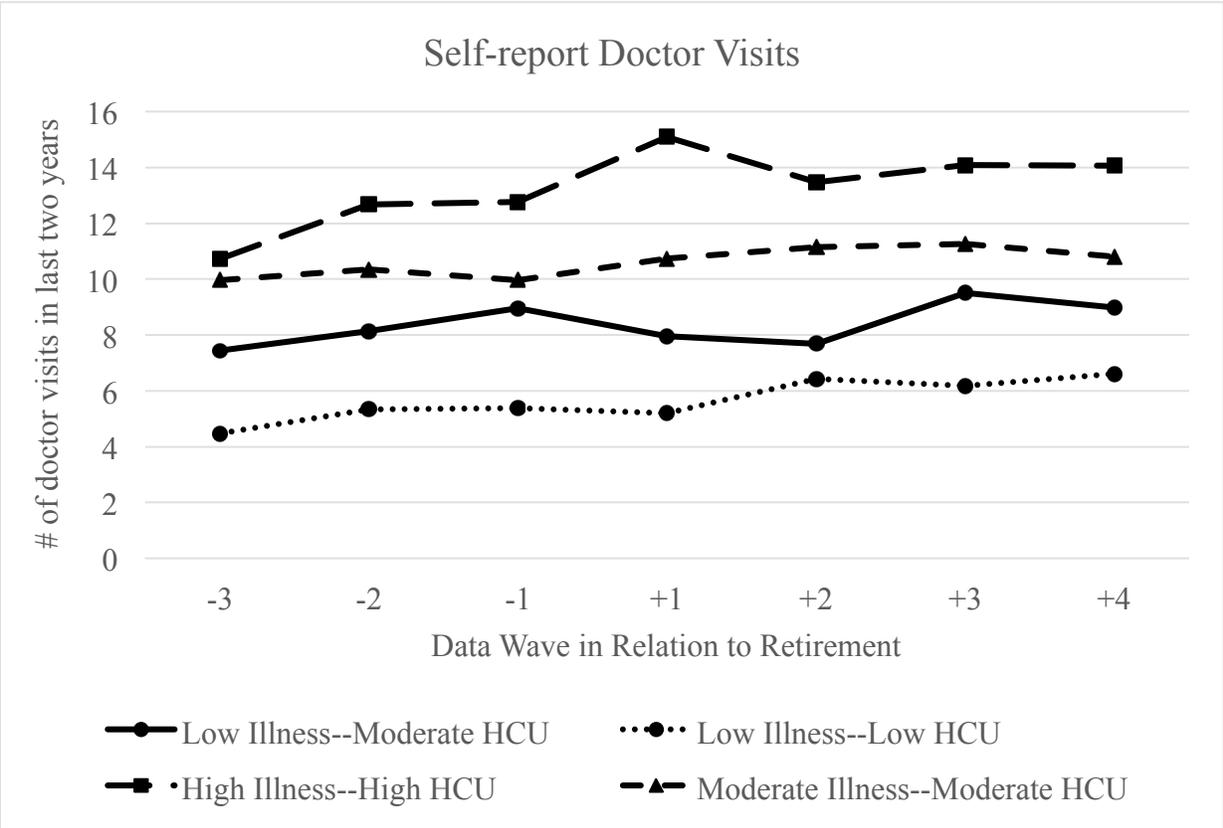


Figure 5. Mean number of doctor visits in past two years by HCU class

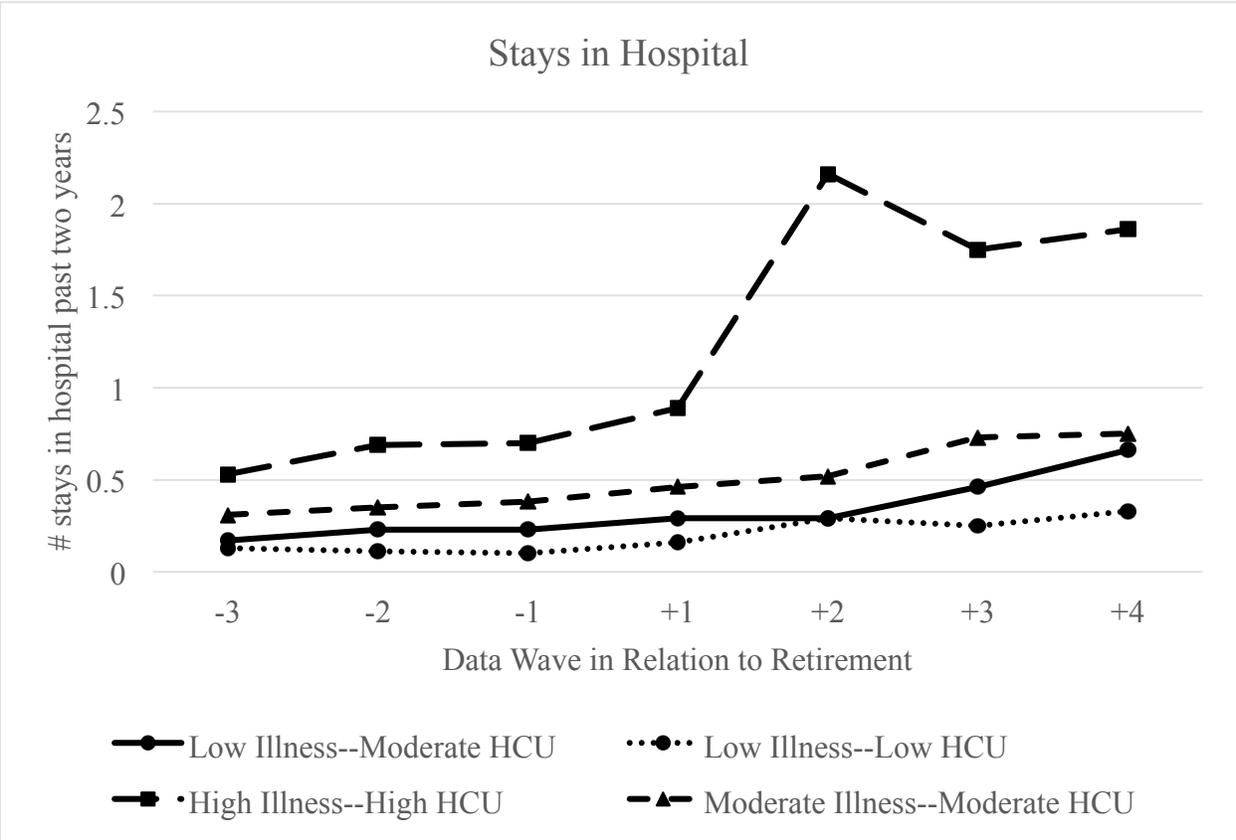


Figure 6. Mean number of stays in the hospital over past two years by HCU class

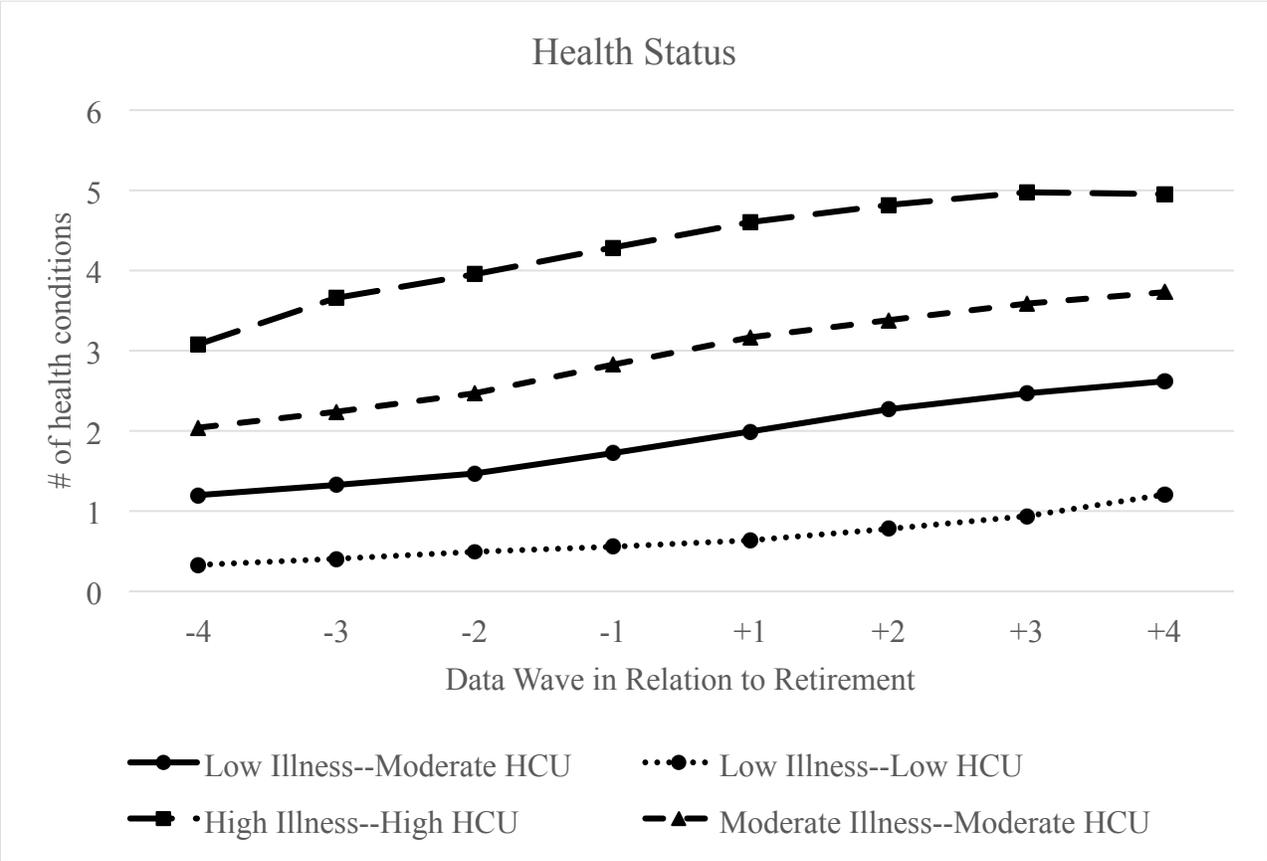


Figure 7. Health Status by number of health conditions for each HCU class