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Marital status, health, and retirement wealth for middle aged and older women

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Abstract

We investigate the different impacts of health problems on wealth among unmarried and married women in their later years. We advance the literature by using a new health measure of a 22 year sequence of chronic diseases. Using data from 2,476 women age 50 or older from the 1992–2014 Health and Retirement Study, we find that unmarried women have more complicated and costly health sequences compared with married women, including multi-morbidity or co-morbidity. Over the 22 year period, retirement wealth for unmarried women with costly health sequences is reduced by approximately $3,600 to $5,400 annually. © 2017 Academy of Financial Services. All rights reserved.

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1. Introduction

Maintaining health and financial security is challenging for near-retirees (Laatsch & Klein, 2010; Yuh, Hanna, & Montalto, 1998). With limited financial resources in retirement, health problems threaten the financial security of many Americans (Smith, 1999, 2003). Significant differences in health and financial security between married and unmarried women have been suggested (Institute for American Values, 2011; Joyce, 2007; Kim, 2006).

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Of particular concern are the financial and health conditions of middle-aged and older unmarried women relative to their married peers. The financial status of unmarried older women is low and uncertain considering income (68%) and net worth (31%) compared with married women (Joyce, 2007; Kim, 2006). Many unmarried women (36%) over age 65 rely solely on Social Security benefits for income, whereas only 21% of married women are as financially restricted (National Women's Law Center, 2015). Recent studies have shown that one's wealth becomes substantially lower when marital status changes from married to single in later years (Addo & Lichter, 2013; Zissimopoulos, 2009).

The health status of unmarried older women is also worse than their married peers: the self-rated health of unmarried women (65% of women with a median age of 48) worsen over time (1972–2003) relative to that of married women (Liu & Umberson, 2008), middle-aged individuals (51–61) who have spent more years divorced or widowed exhibit more chronic conditions and mobility limitations (Hughes & Waite, 2009), marital disruption leads to a higher prevalence of cardiovascular diseases (Maselko, Bates, Avendano, & Glymour, 2009), and higher mortality rates (Henretta, 2010).

These previous studies have examined differences in either health or financial status separately by marital status; however, studies have rarely investigated how health problems affect financial situations differently according to marital status in the later years. One study articulate different impacts of health events on wealth depletion between married and unmarried older women (Kim, 2006). Kim (2006) reports severe chronic conditions cause 4% to 10% less wealth accumulation for unmarried women than for married women.

Considering a 22 year period (1992–2014) from the Health and Retirement Study, we investigate the differences between unmarried and married women in the potential impacts of health problems on wealth in the later years. We expand the previous study in two distinct ways: first, we use a measure of health status as a 22 year term trajectory of chronic health conditions rather than the current health status; second, we use a nationally representative sample of American women aged 50 and over, in contrast to Kim (2006), who considers a population of age 70 and older. This period of life is important in that chronic health conditions tend to begin in one's 50s, and the impacts of such conditions on household finance emerge over the following 20 to 30 years. The findings from this study may provide more comprehensive information on long-term relationships between middle-aged and older women's health and retirement wealth according to marital status.

1.1. Health measures and sequences of chronic conditions

Chronic diseases are important health measures related to financial security in the later years. The prevalence and incidence of these conditions have been used to measure health: the occurrence of these conditions (Adams, Hurd, McFadden, Merrill, & Ribeiro, 2003), the number of chronic conditions (Zajacova & Burgard, 2013), and comorbidities (Schoenberg, Kim, Edwards, & Fleming, 2007).

These health measures document health conditions primarily at a single point in time or over a short period of time; however, they are limited in the ability to track health status over the course of a person's life. To understand the long-term and cumulative impact of health on financial outcomes, we need to consider a sequence of chronic diseases over time. Let us assume potential sequences of chronic disease for a 10 year period in the following example: one may have a sequence of no (N) chronic disease for 10 years (symbolized by NNNNNNNNNN); some may have a sequence that begins with high blood pressure (H) for the first 6 years, followed by arthritis (A) in the seventh year that is maintained until the 10^{th} year (symbolized by HHHHHHAAAA). We measure and compare such health sequences in this study.

Measuring health as a sequence has notable advantages in understanding health problems from a longitudinal perspective. This sequence measure allows us to capture a comprehensive picture of health evolution over time. The prevalence, events, and sequences of health problems are complex and cannot be described and examined as a whole by existing measures (e.g., single diseases or comorbidity). The sequence approach enables us to simultaneously analyze a series of health problems over time as a whole. Thus, the sequence measures can directly answer important questions regarding what typical sequences of health problems people have over time, whether patterns of health sequences differ by marital status, and how specific sequences are related to financial outcomes in these two populations.

1.2. Marital status impact of health on wealth

Despite the fact that prior research has been useful in terms of determining the influence of marriage dissolutions on health status or economic status, few studies have investigated the link between marital disruptions, health status, and economic outcomes except Kim (2006).

Kim (2006) summarizes conceptual mechanisms and their empirical supports, through which marital status affects health and wealth. Kim presents three channels through which the unmarried state may affect health: losing protective or regulatory effects deriving from spouses, producing stress effects from marital dissolution, or generating selective effects with more healthy people being married. Based on these mechanisms and previous empirical findings, we hypothesize as follows:

H_1: Unmarried women have more severe and costly sequences of chronic diseases than their married peers do.

The disadvantages that unmarried women face in retirement wealth accumulation are more straightforward than the health disadvantages. In general, unmarried women have lower levels of earning and lower financial resources in their later years. Health problems negatively affect retirement wealth regardless of marital status. However, given that unmarried women have more severe and costly health conditions and fewer available financial resources, their medical expense burden is relatively higher than that of married women. This heavier burden can lead to less accumulated wealth.

Based on these mechanisms and previous empirical findings, we hypothesize as follows:

H_2: Any sequence of chronic diseases has a more negative impact on retirement wealth for unmarried women than for their married peers.

2. Method

2.1. Data

We use data from 12 waves of the Health and Retirement Study (HRS) 1992, 1994, 1996, 1998, 2000, 2002, 2004, 2006, 2008, 2010, 2012, and 2014. The HRS is a longitudinal study of middle-aged and older Americans sponsored by the U.S. National Institute on Aging (NIA). The HRS provides comprehensive information regarding the prevalence of major chronic conditions and financial status.

To examine the sequential patterns of individuals' health conditions, we restrict our sample to female respondents who were aged 51 to 61 in 1992 and who participated in all 12 waves of the survey, with complete information available on the health variables. Of the 12,652 respondents interviewed in the 1992 HRS, 6,785 are women, and 5,074 are age-eligible. After excluding data as a result of attritions or missing respondents for a 22 year period, we use a sample of 2,476 women (976 married and 1,500 unmarried) for our analyses.

This study focuses on women alive in their later life. Currently, the average life expectancy of an American woman is age 86.6 and 25% of women live past age 90. Women's increased longevity can lead women at higher risk of managing health and financial resources. To minimize and better cope with financial risk from living too long with lingering health problems, women need more comprehensive health information in their later years. Thus, we focus on age 50 or older women who are still alive in 2014 with our selected sample.

This sample selection in our study can lead to selection biases. To address the concerns related to attrition and associated sample construction, we conduct sensitivity tests by applying inverse probability weights to correct for differential sample loss. To create the inverse probability weights, we follow the method used in previous studies (Baulch & Quisumbing, 2011; Watson & Wooden, 2009). We use the baseline data with all women respondents who responded in 1992 whether or not they are dropped out after 1992. The dependent variable is a binary variable coded as 1 if they are included in our sample and 0 for otherwise. We include basic demographics, asset, income, and a variety of health status that greatly affect attrition as predictor variables consistent with previous studies. Probability to be observed in our sample for each person is estimated by fitting a logistic regression (available upon request). The weighting adjustment is set to the inverse of the probability so that observations that have less probability being included in our sample contribute more to the analysis. The pseudo R^2 in our logistic regression is 0.145, which is higher than the previous research (0.133 in Baulch & Quisumbing, 2011; 0.090 in Watson & Wooden, 2009). Characteristics of sample and statistics applying inverse probability weights are in Appendix A, highlighting that the results with adjusting selection bias are also qualitatively consistent and quantitatively similar with our main results.

2.2. Measures

2.2.1. Health: Sequences of chronic diseases

The HRS collects data on seven physical chronic diseases that commonly occur later in life: cancer, lung disease, heart condition, stroke, diabetes, high blood pressure, and arthritis.

To identify common sequences of health conditions over a 22 year period, we adopt a three-step approach that is newly introduced in recent studies (Kim, Shin, & Zurlo, 2015; Salmela-Aro, Kiuru, Nurmi, & Eerola, 2011). First, we categorize the diseases into three groups based on the degree of threat to life and the related treatment costs (Smith, 1999, 2003). Smith's original classification is severe (heart condition, stroke, cancer, or lung disease) and mild (high blood pressure, arthritis, or diabetes). In this study, we include diabetes in severe conditions because it is one of the top ten causes of death (Heron, 2015) and has a similar prevalence distribution to the rest of severe conditions unlike high blood pressure or arthritis (available upon request). We subdivide severe conditions into cardiovascular and non-cardiovascular conditions based on the common disease classifications in previous medical studies. Cardiovascular disease is one of the most common causes of death in the advanced countries including the United States. Previous studies have commonly classified cardiovascular disease as one group and the rest of the diseases as another group for the comparison of mortality (de Jager et al., 2009), health care use (Christiansen et al., 2013; Kim et al., 2011), risk factors (Lloyd-Jones et al., 2007; Stamler et al., 1999), and comorbidities (Gerber et al., 2013). In our study, we adopt the following classifications: (1) cardiovascular diseases (heart condition or stroke; hereafter, C), (2) non-cardiovascular diseases (cancer, lung disease, or diabetes; hereafter, O), and (3) mild diseases (high blood pressure or arthritis; hereafter, M). This categorization allows us to determine eight exhaustive disease types that each individual can experience in a given wave, such as C, O, M, combinations of the three (i.e., MC, MO, CO, or MCO), and N (no diseases).

Second, each individual's sequences are identified from eight disease types by chronologically recoding the health states for each wave. Some examples of the sequences for 12 waves are N/N/N/N/N/N/N/N/N/N/N/N (e.g., no disease sequence) or M/M/M/M/M/M/M/MC/MC/MC/MC/MC (e.g., mild and cardiovascular sequence: having mild diseases until the seventh wave, newly experiencing cardiovascular diseases (C) in the eighth wave and maintaining an MC state until the 12th wave).

Third, many individuals have similar sequences but not identical sequences. An attempt to analyze too many unique sequences makes analyses complicated or infeasible. Thus, we group similar sequences into several homogeneous groups with low within-group heterogeneity but high between-group heterogeneity (Piccarreta & Billari, 2007). To classify groups or patterns with similar sequences, we use an optimal matching algorithm (OMA) introduced in social sciences by Abbott (1995). OMA is a set of techniques that measures sequence resemblance. The basic idea behind OMA is to measure the dissimilarity of two sequences by considering how much effort (e.g., insert, delete , or substitute heath status) is required to transform one sequence into the other, whereby the two sequences can belong to the same sequence pattern (Barban, 2013). OMA do not directly answer questions about sequence pattern; rather, they generate interval-level measures of resemblance between sequences. These measures, taken over a sequence data set, are then input to clustering, scaling, or grouping algorithms, which in turn generate information on typical patterns of sequences (Abbott & Hrycak, 1990).

Then, we use Ward's method, which is the best available method for clustering the identified individuals' sequential patterns (Hair, Black, Babin, & Anderson, 2006). Ward's method is a criterion applied in hierarchical cluster analysis, which minimizes the total within-cluster variance. This method begins with each respondent having a distinct pattern. Then, in a step-wise process, two pairs of patterns are merged. The two pairs are selected to minimize any increase in the within-pattern variance. This merging process continues until we select an appropriate number of patterns.

Unfortunately, there is no standard and objective selection procedure available to determine the number of sequences. One suggested criterion is the extent of change (i.e., a sudden decrease) in explanatory power (e.g., R^2) by an additional sequence (Hair et al., 2006). We conduct a pseudo-analysis of variance (ANOVA) test to determine the number of sequences (Salmela-Aro et al., 2011). We select four sequence patterns because after these four patterns, the explanatory power (R^2) of an additional sequence decreases by 50% to 0.05 from 0.1 for each of the four patterns (available on request). As a result, we use five common sequence patterns in this study: the four sequences identified by sequence analysis along with a no disease sequence.

2.2.2. Marital status

We divide our sample into two subgroups: married or unmarried. Married is defined as maintaining a marriage for the 22 year period. Unmarried is defined as continuously single status or a change from married to single (widowed or divorced) in the 22 year period.[1] To examine differences within the unmarried women, we use two additional types of single status. One is a binary variable representing single status: 1 for a change from married to single and 0 otherwise (i.e., single for 22 years). The other is a continuous variable of the single period: the number of waves that a woman remains single.

2.2.3. Financial outcome

We use the rate of change in household net worth between 1992 and 2014 as a financial outcome variable. The household net worth in each year is equal to the sum of household assets minus household debts. Net worth is adjusted using the Consumer Price Index (2014 = 100). Because the same dollar amount of wealth changes represents a different magnitude depending on the wealth level, we use the rate of change of net worth rather than the dollar amounts, as in previous studies (Hurd & Kapteyn, 2003; Kim, 2006).

2.2.4. Other variables

Relevant demographic variables are included in the regressions: age (year) at 1992, race (non-White = 1 and White = 0), education (year), employment status (the number of waves at work), and dollar amount of accumulated household income (the sum of household income during the 22 years). We also include net worth in 1992 to control for wealth levels at baseline.

Health insurance is also included as a variable. The HRS asks respondents if they are currently covered by any health insurance, which falls into one of five categories: Medicaid, Medicare or other public health insurance programs, insurance provided by current or previous employers including the spouse's employers, other privately purchased health insurance, or no health insurance. We use the number of waves for which the respondents are covered by one of these health insurance types to represent the individuals' insurance status and changes over time.

2.3. Analysis

We use OLS regressions to estimate the impact of health sequence on the change in net worth over a 22 year period. We estimate the impacts for married and unmarried women separately. For this separate estimation, we first test to determine any differences in the coefficients of the health sequence patterns between the two groups. An F test is conducted using an interaction model with a binary variable of marital status, the sequences patterns of chronic diseases, and the interaction terms for marital status and sequence patterns. The null hypothesis is that each coefficient of the corresponding interaction terms between marital status and sequence patterns is not different from zero. Based on the result of the F test, this hypothesis is rejected ($F = 3.757$, $p < 0.000$). The test results indicate that the impact of health sequence on net worth change differs between unmarried and married women and separate estimations are needed to provide adequate results.

We use raw or untransformed data for our analysis. However, financial data tend to have a right-skewed distribution that can lead to biased estimates. Thus, we conduct sensitivity tests using natural logarithm to mitigate bias from the right-skewed distribution (see Appendix A). The results with transformed data are also qualitatively consistent and quantitatively similar with our main results.

3. Results

Relevant characteristics of the sample based on marital status are presented in Table 1. This table emphasizes that unmarried women are socioeconomically worse off than their married peers. Unmarried women are older, have lower levels of education attainment, income and wealth, and are more likely to lack health insurance. The circumstances of the unmarried women worsen after 22 years. The median wealth of unmarried women ($116,800) is only 42.6% of that of married women ($274,100) in 1992, and this level further decline to 26.8% ($84,000 vs. $313,100) in 2014.

The five sequence patterns used as health measures are present in Table 2: Multi-Morbidity, Co-Morbidity, Mild Disease, Late Event, and No Disease. Five components listed in the common patterns in Table 2 indicate the chronic condition states from 1–2 waves, 3–5 waves, 6–8 waves, 9–10 waves, and 11–12 waves, respectively. Approximately 21.8% of the respondents exhibit a Multi-Morbidity pattern. This pattern is a combination of mild (high blood pressure or arthritis), cardiovascular (heart disease or stroke) or non-cardiovascular diseases (cancer, lung disease, or diabetes), and it is the most complicated/costly among the five patterns. Co-Morbidity (22.7%) is a combination of mild diseases and non-cardiovascular diseases. This pattern features mild diseases at baseline and new non-cardiovascular diseases emerging later. Mild Disease is the most frequent pattern (36.7%), and it primarily includes mild diseases throughout the entire period. Late Event (15.6%) shows no disease for most of the time period, with some health events occurring at the end of the period. No Disease refers to only 3.3% of the population that have experienced no disease during the entire period.

Table 3 shows that the distribution of health sequence patterns differ significantly between married and unmarried women. Unmarried women are more likely to have poor health status

Table 1 Characteristics of the sample

	Married[a]	Unmarried[b]	Statistics[c]
N	976	1,500	
Age (Mean, SD) at 2014	76.5 (3.0)	77.4 (3.1)	−7.0**
Race (%)			
White	90.0	74.6	89.4**
Non-White	10.0	25.4	
Household net worth ($1,000)			
At 1992			
Mean (SD)	461.3 (610.3)	249.8 (431.2)	9.3**
Median	274.1	116.8	
At 2014			
Mean (SD)	603.5 (818.9)	250.4 (475.4)	12.1**
Median	313.1	84.0	
Household income ($1,000)[d]			
Mean (SD)	1,032.9 (786.3)	535.7 (488.9)	17.5**
Median	843.7	417.9	
Education years (Mean, SD)	12.6 (2.8)	12.1 (3.0)	4.7**
Working period (waves, Mean, SD)[e]	3.2 (3.1)	3.4 (3.2)	−1.4
Health insurance (waves, Mean, SD)[f]			
Medicare	6.5 (1.8)	6.9 (2.0)	−5.6**
Medicaid	0.3 (1.1)	1.2 (2.6)	−12.2**
Employer	7.0 (3.8)	5.3 (4.1)	10.6**
Others	2.3 (2.9)	2.1 (2.8)	1.3
No insurance	0.7 (1.4)	1.2 (1.8)	−8.4**

Household net worth and income were adjusted by CPI (2014 = 100).

[a]Married for the 22 year period.

[b]Single for the 22 year period or changed from married to single between 1992 and 2014.

[c]Statistics are t statistics for continuous variables and χ^2 for categorical variables, indicating the differences between married and unmarried women.

[d]Sum of household income for 22 years.

[e]The number of waves working for pay.

[f]The number of waves covered by Medicare, Medicaid, an employer-sponsored insurance plan, any other privately purchased health insurance plan or without health insurance for 22 years.

$*p < 0.05$, $**p < 0.01$.

than married women. In particular, more unmarried than married women have complicate and costly health sequences with either the Multi-Morbidity (23.1% vs. 19.8%) or Co-Morbidity (24.7% vs. 19.6%) patterns.

Table 4 shows that married and unmarried women exhibit differences in wealth levels, and the change according to health sequence patterns. In 1992, wealth disparities are substantial across health sequence patterns between these two groups. For example, unmarried women with a No Disease or Multi-Morbidity pattern have wealth levels of $140,443 or $87,302, respectively, constituting only 27.8% or 39.8% of the wealth of married ($506,100 or $219,310, respectively). Among unmarried and married groups, those with Multi-/Co-Morbidity patterns typically have lower wealth than women with other health patterns.

Table 4 also indicates that during the 22 year period, wealth disparities between the married and unmarried widen across the health sequence patterns. Unmarried women deplete

Table 2 Five common sequence patterns of chronic diseases across a 22 year period (12 waves)

Sequence patterns	*n* (% of Total)	Representative patterns[a]
Multi-morbidity		
Combination of multiple mild and severe diseases	539 (21.8)	M–MC–MCO–MCO–MCO
Co-Morbidity		
Combination of mild disease and non-cardiovascular disease	562 (22.7)	M–M–MO–MO–MO
Mild disease		
Mild disease during the period	908 (36.7)	M–M–M–M–M
Late event		
Mild or severe disease at the end of the period	386 (15.6)	N–N–N–X–X[b]
No disease		
No disease during the period	81 (3.3)	N–N–N–N–N
Total	2,476 (100)	

M = mild disease; C = cardiovascular disease; O = non-cardiovascular disease; N = no disease.

[a]Five components listed in the common patterns indicate the chronic condition states from 1–2 waves, 3–5 waves, 6–8 waves, 9–10 waves, and 11–12 waves, respectively.

[b]X represents any type of chronic condition or their combination.

more wealth than married women do. In the last column in Table 4, the wealth of unmarried women declines by 28%, whereas the wealth of married women increases by 14% between 1992 and 2014. Comparisons across the health sequence patterns reveal clearer differences. For the 22 year period, unmarried (68%) with the No Disease pattern show higher rates of wealth accumulation than married (22%); however, all of the sequences with health problems are more detrimental to wealth for the unmarried than for married women. The wealth levels of unmarried with Multi-/Co-Morbidity patterns decline by 41% and 26%, respectively, whereas those of married women decrease only by 7% for Multi-Morbidity and increase by 21% for Co-Morbidity. Furthermore, the relative wealth level (ratio) gaps between the two patterns and the No Disease pattern are wider for unmarried women (22% to 27% from 62%) than for the married women (33% to 46% from 43% to 47%).

Table 5 presents the results of regression analyses to estimate wealth change rates by marital status between 1992 and 2014. These results show that health sequence patterns have different impacts on wealth changes according to marital status. In particular, the heath sequence patterns lead to a disproportionately weaker increase in wealth for unmarried women.

Table 3 The distribution (%) of health sequence patterns by marital status

	Married	Unmarried
Multi-morbidity	19.8	23.1
Co-morbidity	19.6	24.7
Mild disease	41.1	33.8
Late event	15.2	15.9
No disease	4.4	2.5
All	100	100
χ^2	25.0 (p = .000)	

Table 4 Net worth (median) by marital status and health sequence patterns

	1992		2014		Change[b] (B-A)/A
	$(A)	Ratio[a]	$(B)	Ratio	
Married					
Multi-morbidity	219,310	0.43	204,000	0.33	−0.07
Co-morbidity	236,180	0.47	285,000	0.46	0.21
Mild disease	285,103	0.56	360,500	0.58	0.26
Late event	344,785	0.68	330,500	0.53	−0.04
No disease	506,100	1.00	619,100	1.00	0.22
Total	274,138		313,142		0.14
Unmarried					
Multi-morbidity	87,302	0.62	51,500	0.22	−0.41
Co-morbidity	86,881	0.62	64,150	0.27	−0.26
Mild disease	146,769	1.05	104,500	0.44	−0.29
Late event	155,541	1.11	135,750	0.58	−0.13
No disease	140,443	1.00	235,600	1.00	0.68
Total	116,825		84,000		−0.28

Net worth values were adjusted by CPI (2014 = 100).
[a]The ratio of each pattern to no disease pattern.
[b](net worth in 2014 - net worth in 1992)/net worth in 1992.

For unmarried women, the coefficients of the health sequence patterns range from −0.588 to −0.829 in Model 1. To better understand these differences, Table 6 shows the predicted dollar amount of the wealth gaps between those with the four health sequences and those with the No Disease pattern. The unmarried women with health problems save $117,953 (Multi-Morbidity), $106,657 (Co-Morbidity), $93,621 (Mild Disease), and $78,806 (Late Event) less than those with the No Disease pattern.

Model 2 in Table 5 includes additional two variables of single status and periods remaining single to control for the heterogeneous composition of the unmarried sample (i.e., continuously single vs. a change from married to single). The coefficients of the health sequence patterns in Model 2 are similar to those in Model 1; thus, demonstrating robustness.

In contrast to the impact on their unmarried peers, the effect of the health sequence patterns is minor or nonexistent for married women. The coefficients of the health sequence patterns for married women range from −0.048 to 0.207; however, these coefficients are not statistically significant.

Of the control variables, accumulated household income shows a positive effect on the wealth change, while the amount of net worth in 1992 shows a negative effect on changes in wealth for both married and unmarried women. Medicare coverage affect negatively changes in wealth for married women. Other control variables such as age, race, and education are not statistically significant.

4. Discussion

In this study, we advance the literature on marital status difference in the impact of health problems on women's retirement wealth in two distinct ways. First, we examine the impact

Table 5 Regression results for the net worth change rate between 1992 and 2014

	Married			Unmarried					
				Model 1			Model 2		
	B (SE)	β	p	B (SE)	β	p	B (SE)	β	p
Health sequence patterns									
Multi-morbidity	−.048 (.223)	−.014	.828	−.829 (.292)	−.212	.005	−.841 (.294)	−.213	.004
Co-morbidity	.131 (.223)	.037	.557	−.723 (.290)	−.189	.013	−.711 (.293)	−.185	.015
Mild disease	.207 (.210)	.072	.323	−.675 (.286)	−.194	.018	−.674 (.288)	−.193	.019
Late event	.028 (.228)	.007	.902	−.588 (.295)	−.130	.047	−.588 (.298)	−.130	.048
(No disease)									
Age (years) in 1992	−.035 (.023)	−.075	.128	.022 (.019)	.042	.244	.021 (.019)	.040	.266
Race									
Non-White	−.227 (.144)	−.048	.116	.011 (.103)	.003	.917	−.019 (.105)	−.005	.855
(White)									
Education (years)	.025 (.019)	.049	.186	.028 (.016)	.052	.084	.027 (.017)	.048	.113
Working period (waves)	.005 (.015)	.011	.739	.024 (.016)	.046	.127	.017 (.016)	.032	.301
Health insurance (waves)									
Medicare	.004 (.042)	.005	.924	−.069 (.034)	−.084	.043	−.071 (.034)	−.086	.040
Medicaid	.014 (.046)	.011	.766	.037 (.022)	.057	.095	.028 (.023)	.042	.222
Employer	.037 (.019)	.099	.053	.020 (.018)	.050	.262	.018 (.018)	.044	.327
Others	.016 (.021)	.034	.437	−.013 (.020)	−.022	.507	−.017 (.020)	−.029	.389
No Insurance	.040 (.044)	.039	.360	−.040 (.035)	−.043	.262	−.044 (.036)	−.047	.220
Household income ($1,000)	.001 (.000)	.365	.000	.001 (.000)	.314	.000	.001 (.000)	.324	.000
Net worth in 1992 ($1,000)	−.001 (.000)	−.365	.000	−.001 (.000)	−.252	.000	−.001 (.000)	−.249	.000
Single status									
Married to single[a]							−.151 (.134)	−.045	.260
(Single)									
Waves in single[b]							.002 (.015)	.005	.897
Intercept	1.347 (1.105)		.223	−.625 (1.005)		.534	−.426 (1.037)		.681
Adjusted R^2	.158			.132			.134		

[a]Changed from married to single.
[b]The number of waves in single.

Table 6 Predicted change in net worth gaps between 2014 and 1992 across health sequence patterns: Unmarried women

	Predicted change rate in net worth (A)	Net worth ($) at 1992 (B)	Predicted net worth ($) at 2014 (B+(A×B))	Difference in difference (DD) of net worth ($)[a]
Multi-morbidity	−0.003	87,302	87,040	−117,953[b]
Co-morbidity	0.127	86,881	97,915	−106,657
Mild disease	0.164	146,769	170,839	−93,621
Late event	0.250	155,541	194,426	−78,806
No disease	0.838	140,443	258,134	Reference

[a]DD = [(NW2014 HS = 1,2,3 or 4) − (NW1992 HS = 1,2,3 or 4)] − [(NW2014 HS = 5) − (NW1992 HS = 5)], where NW is net worth and HS is health sequences with 1 = multi-morbidity; 2 = co-morbidity; 3 = mild disease; 4 = late event; 5 = no disease.

[b](87,040–87,302) − (258,134–140,443) = −117,953.

of long-term chronic health sequences on changes in wealth. This health measure is a new and innovative approach compared with the traditional method of considering current health status. The second contribution stems from our investigation of a population of women aged 50+. This period of life is important in that chronic health conditions tend to begin in one's 50s, and the impacts of such conditions on household finance emerge over the following 20 to 30 years.

We test two hypotheses. First (H_1), unmarried women have more severe and costly sequences of chronic diseases than married women. The results shown in Table 3 support this hypothesis. These findings are new and informative in that the results indicate potential paths of health problems in women from their 50s to their 80s. Second (H_2), any sequence of chronic diseases has a more negative impact on the retirement wealth of unmarried women than on married women. The results reported in Tables 4 and 5 also support this hypothesis.

These findings confirm the disadvantages for unmarried women in terms of their financial security in their later years. The retirement wealth of unmarried women further decreased as a result of specific health sequences that they experienced. Decreased retirement wealth ranged from $78,806 to $117,953 over the 22 years of the study period. This amount is equivalent to a less annual accumulation of $3,582 to $5,362 than those with No Disease. Previous studies estimated $905 to $5,240 of annual wealth depletion as a result of chronic diseases: $905 to $4,211 for adults aged 51–61 with new mild diseases or new severe diseases (1992–1996 HRS data), or $5,240 for adults aged 70 or older with any new chronic diseases (1993–1995 AHEAD data; Smith, 1999); $3,140 to $4,170 for unmarried women aged 70 or older with new severe chronic diseases (1993–2002 AHEAD data; Kim, 2006). All of these estimations for middle-aged and older adults were based on differences in age, marital status, health measures, or estimated periods. Nevertheless, our estimates are between the minimum and maximum estimates from other studies. This result could be a good benchmark for understanding the quantitative magnitude of the financial impact of long-term health sequences on unmarried older women.

These findings have important implications for health management and retirement savings for middle-aged and older women and practitioners. The finding that middle-aged and older women have five common health sequences in their 50s to 80s can enable them to predict potential health trajectories they may encounter and prepare for an appropriate health management plan. For example, when middle-aged women have high blood pressure in their early 50s, approximately 27% (24.6% for the married and 28.3% for the unmarried) of them will likely experience heart disease or stroke in their late 50s or early 60s (i.e., Multi-Morbidity sequence).

Based on these predictable health sequences in the later years, middle-aged or older women can assess their current health issues and potential health status. Women can also take preventive actions to minimize the consequences of health problems and to remain healthy. These actions include managing risk factors related to expected diseases, such as smoking, drinking, diet, or exercise factors. Financial practitioners may weave these issues into financial planning by actively engaging health conversations with their clients. For example, high blood pressure is very common in older women. To control this disease, some lifestyle changes are recommended such as salt reduction, and limiting alcohol. People can also better control blood pressure by taking medication about the same time everyday. Changes in lifestyle and timing of taking medication can lead to a better control of blood pressure. Better control results in fewer doctor visits, which reduce the cost of care (McClanahan, 2014) and improve financial security. In particular, unmarried women are at greater risk for costly and complicated health sequences; hence, they need to pay more attention to these health sequences and the associated preventive actions. Health educators and practitioners can use this information to make and provide specific behavioral or dietary guidelines for middle-aged or older women.

Another implication for unmarried women is that individual health management should be incorporated into retirement planning to minimize financial insecurity in their later years. Without any health problems, unmarried and married older women alike have similar financial stability in terms of wealth accumulation rates. Once health problems occur, however, any health sequences are substantially detrimental to retirement wealth accumulation for unmarried women but not necessarily for married women. This finding can be interpreted as a lack of financial buffer from marital benefits. In particular, for unmarried women, the most influential factor for long-term retirement savings in this study is health sequences whose magnitude of influence exceeds even that of income or baseline wealth. This result strongly indicates that good health management by unmarried women can minimize the need for retirement savings and accordingly represent an alternative to retirement savings.

The other major finding can provide practical knowledge for retirement savings plans related to health issues. Many previous studies and financial planners have suggested the need for adequate retirement savings to maintain a preretirement living standard (e.g., 6–8 times the last five years annual salary); however, most suggestions do not consider health care costs. Our finding suggests that middle-aged and older unmarried women with health problems spend $3,582 to $5,362 more annually than those with No Disease. This figure can provide a potential guideline for appropriate health care savings for unmarried women based on their expected health sequences. Additionally, this study can add credence for professionals to help their clients assess the impact of lifestyle on future financial projections, including paying attention to health-related factors. For example, financial planners may be encouraged to do more on the personal side of financial planning, rather than focusing mainly on the technical side. For another example, financial advisors can incorporate longevity planning into this study with their clients. The life expectancy of a woman aged 65 in 2014 is about 87 years old.[2] Based on the estimation of this study, practitioners may advise that she needs $78,804 to $117,964 (i.e., $3,582 × 22 to $5,362 × 22) for health care costs unless she has no disease during the rest of her life.

Despite new findings and important implications, this study has some limitations suggesting the need for further studies. Our sample includes only women who have lived during the 22 year period and participated in all 12 waves. Women who have been excluded because of death or lack of contact may follow different patterns of health sequences and wealth accumulation. Although we use the conventional classification of cardiovascular and non-cardiovascular diseases within sever chronic conditions, non-cardiovascular group includes three diseases with different etiologies, organ-systems, and probabilities of co-occurrence. More refinement and improvement of disease classification are needed for understating comprehensive sequences of each chronic condition. We did not adjust household net worth for household size because of the methodological issue for women whose marital status changed from married to single. We also did not consider spouses' health status for the married group because of the data limitations. For married women, the impacts of their spouses' health status can be an important factor on household net worth changes. A more refined adjustment considering family characteristics are needed in future studies.

Notes

1 Other types of marital status changes, such as changes from single to married, are not included in analysis.
2 https://www.ssa.gov/planners/lifeexpectancy.html

Appendix A. Sensitivity tests to check potential biases
(A) Characteristics of the sample applying inverse probability weight

	Married	Unmarried
Age at 2014 (Mean, SD)	76.0 (2.9)	76.9 (3.1)
Race (%)		
White	89.0	72.1
Non-White	11.1	27.9
Education years (Mean, SD)	12.3 (2.9)	11.7 (3.2)
Household income[a] ($1,000, Mean, SD)	963.2 (741.9)	495.0 (459.5)
Household net worth ($1,000)		
At 1992		
Mean (SD)	395.0 (538.5)	210.3 (387.7)
Median	227.1	86.6
At 2014		
Mean (SD)	531.1 (761.8)	212.4 (422.9)
Median	275.0	64.4

[a]Sum of household income for 22 years.

(B) Regression results applying inverse probability weight and Ln transformation

	Adopting weight				Ln (net worth change rate)			
	Married		Unmarried		Married		Unmarried	
	B (SE)	*p*	*B* (SE)	*p*	*B* (SE)	*p*	*B* (SE)	*p*
Health sequence patterns								
Multi-morbidity	.012 (.239)	.959	−.852 (.304)	.005	−.006 (.036)	.864	−.144 (.047)	.002
Co-morbidity	.147 (.241)	.542	−.706 (.303)	.020	.020 (.036)	.583	−.124 (.047)	.008
Mild disease	.262 (.230)	.254	−.705 (.299)	.018	.027 (.034)	.424	−.131 (.046)	.005
Late event	.143 (.248)	.564	−.610 (.309)	.048	.005 (.037)	.897	−.114 (.048)	.017
(No disease)								
Control variables included	Yes		Yes		Yes		Yes	
Intercept	1.484 (1.103)	.179	−.400 (1.080)	.712	1.739 (.179)	.000	1.808 (.169)	.000
Adjusted R^2	.156		.103		.150		.127	

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