Heterogeneity in Multidimensional Health Trajectories of Late Old Years and Socioeconomic Stratification: A Latent Trajectory Class Analysis

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Objectives. This study examines (a) the heterogeneity in individual multidimensional health trajectories and (b) the socioeconomic stratification of individual multidimensional health trajectories during the late older years.

Method. This study used prospective data from 1,945 adults, 75 to 85 years old, collected over an 8-year period from the Health and Retirement Study. To examine inconsistent findings in the research literature, a latent trajectory class analysis was performed.

Results. Multidimensional overall health trajectories showed three heterogeneous latent classes (maintaining, persistently high, and deteriorating), and profiles of ascribed and achieved socioeconomic characteristics of multidimensional health trajectory classes showed a significant social and racial/ethnic stratification in late older years.

Discussion. Past adverse socioeconomic circumstances, including childhood and adulthood adversity, are potential sources of unobserved heterogeneity of multidimensional health trajectories even in late older years. The identification of members of latent trajectory health classes and the associated antecedents linked to health class membership are consistent with a life-course conceptual framework. Thus, multidimensional health capturing the full range of health problems needs to be investigated for proper examination of socioeconomic correlates of health. This facilitates the understanding of the associations between life-course experiences and health in late old age that ultimately have implications for prevention and intervention.

Key Words: Life course—Multidimensional health—Social stratification—Trajectories.

Consistent with the cumulative disadvantage/advantage (CAD) perspective (Dannefer, 2003), a growing volume of empirical research has documented that within-cohort socioeconomic health inequalities widen over adult years (House, Lantz, & Heard, 2005). However, some researchers find that this diverging health trend ceases and socioeconomic health inequalities decline in late older age, most likely as a consequence of the “selection of the healthy” process and the diminishing influence of socioeconomic factors in this stage of life (Crimmins, Kim, & Seeman, 2009; Ferraro & Shippee, 2009). The life stage greater than 75 years of age (the average life expectancy in the United States) is considered as late older age, during which the risks for health problems increase more rapidly (American Psychological Association; http://www.apa.org/pi/aging/).

Other researchers find that despite the general decline in health inequality during late old age, a significant socioeconomic health inequality still persists (Luo & Waite, 2005). A clearer understanding of these important aging and health issues is further complicated because relatively few studies of late old age have had these relationships as a focus (Luo & Waite, 2005), and the examination of specific or limited health outcomes has been the norm, rather than investigating broader health outcomes (Moody-Ayers, Lindquist, Sen, & Covinsky, 2007).

Methodological Shortcomings

These inconsistent research findings may partly be attributed to the limited analytical ability of previous studies. First, prior research has rarely examined the multidimensionality of health that may reflect stronger health consequences of cumulative life experiences compared with specific health problems (Aneshensal, 2005). Second, the use of analytical techniques that are sensitive to intraindividual change in health (individual trajectories of health) in older adults is still relatively rare (George, 2009; Liang et al., 2010). This is important because older individuals may be particularly different in terms of the rate of change (deterioration) in health. Finally, only a handful of studies have examined the unobserved heterogeneity of health trajectories (clustering of trajectories) in older years (Liang et al., 2010; Taylor & Linch, 2011). This is important because between-group variance may still exist despite a decrease in individual variance in health during this life stage (O’Rand & Hamil-Luker, 2005).
Our analytical approach addresses some of these limitations by

(1) focusing on multidimensional health trajectories in late old age
(2) identifying unobserved heterogeneity (latent classes [LCs]) of multidimensional health trajectories and estimating trajectories of different health dimensions (e.g., physical illnesses, depression, physical impairment, and memory problems) within these classes
(3) examining social and racial/ethnic stratification of multidimensional health trajectories.

Socioeconomic Disadvantage and Health over the Life Course

Ascribed disadvantages.—Race/ethnic minority health disadvantage (Williams & Collins, 2001) may be partially attributed to the cumulative health effect of greater exposure to chronic social and environmental stressors over the life course (Carroll, 1995) that includes systematic and day-to-day discrimination. Women also show higher morbidity and greater functional impairment in late old age although they live longer. This may be attributed to their continued high-level exposure to stressful circumstances and the cumulative effect of maternal depletion that persists into late older years (Verbrugge, 1989). We expect that being women and being a racial/ethnic minority member will be associated with adverse health trajectories during late old years.

Childhood socioeconomic disadvantages.—According to the fetal and early childhood origin hypothesis, ineffective neonatal and postnatal care, ineffective child rearing, and lack of material and social resources of socioeconomically disadvantaged parents adversely influence fetal growth, including utero, and children’s health (Marmot & Wadsworth, 1997). Thus, early disadvantages may make permanent or latent health damages that directly increase the susceptibility to health risks that can continue into later life (McEwen, 2004).

In addition, according to the CAD perspective, early socioeconomic adversities initiate the accumulation of exposure to resource limitations, negative events, and stressors across the life course influencing health outcomes in later years (Ferraro & Shippee, 2009). Thus, the association between early disadvantage and health in older years may reflect the totality of indirect and direct influences.

Adulthood Socioeconomic Conditions and Health

Studies have documented that the lack of proper nutrition, limited access to educational, recreational, and health services/information, poor housing, and an adverse community environment over the life course contribute to poor cognitive, mental, and physical health that may persist into later years (Bodnar & Wisner, 2005; Miech, Caspi, Moffitt, Wright, & Silva, 1999). The incidence and prevalence of these health problems are expected to accelerate with advancing age (Reynolds, Gatz, & Pedersen, 2002; Taylor & Lynch, 2004).

In this study, rather than delineating this web of direct and indirect health influences of disadvantages in different life stages, we will examine how multidimensional (overall) health trajectories in late old years are associated with socioeconomic adversities in different stages over the life course.

Health Multidimensionality

Our primary focus of this study is to investigate the multidimensional health trajectories in late old age. In the single health problem–specific models, people with health problems other than the one specific problem are implicitly identified as in good health (Aneshensel, 2005). Thus, single health problem–specific models may not be appropriate when investigating the consequences of various socioeconomic disadvantages over the life course because their consequences are typically nonspecific and not limited to one particular health problem. Consequently, the impact of social disadvantage is underestimated (Aneshensel, 2005). Thus, we contend that multidimensional health capturing the full range of health problems needs to be investigated rather than investigating the social etiology of a particular health problem.

Furthermore, the health problems progress as an interrelated dynamic health process with cross-domain proliferation over the adult years and into the later years (Wickrama et al., 2010), suggesting an increase in multidimensionality of health in late old age. Earlier research provides evidence for bidirectional associations between physical illness and impairment and poor mental health (Steptoe & Marmot, 2003) and between cognitive performance (e.g., attention difficulties, psychomotor slowing, and motivational impairment) and several aspects of health (e.g., stroke, hypertension, and diabetes, depression, and physical impairment) (Baune, Suslow, Engelien, Arolt, & Berger, 2006) in the late adulthood.

METHOD

Sample

The overall response rate for each of the follow-up waves is higher than 80%. Of nearly 20,000 participants in 1998 who were more than 50 years old, just more than 14,000 participated in the reinterview conducted in 2006. Our analyses are based on HRS respondents who were between 75 and 85 years of age in 1998. Sample size is 1,945. About
two-thirds of older adults in this sample were women (64%, \( n = 1,257 \)), and 36% were men (\( n = 688 \)). The mean age in 1998 was 78.65 years (SD = 2.86). More than 81% were non-Hispanic whites (\( n = 1,575 \)), 11.61% were blacks (\( n = 226 \)), and 5.83% were Hispanics (\( n = 113 \)). Just less than 60% of older adults were married (\( n = 1,167 \)) in 1998. The mean years of education was 11.50 years (SD = 3.49). The mean yearly household income was $29,876 (SD = $14,728).

The sample from HRS 1998 survey consisted of 1,945 older adults, of these, 190 cases were dropped out (primarily due to mortality) from 1998 to 2006. Full-Information Maximum Likelihood (FIML) procedures were used to account for mortality attrition and other missing data. FIML allowed individuals to be included in the analysis even if they dropped out (e.g., death) of the sample. That is, FIML models attrition during the observation period by calculating the likelihood at each time point among those individuals contributing to that time point Therefore, individuals who have limited data were allowed to contribute to the estimation of the portion of trajectories until they dropped out (not after dropping out or death) (Taylor, 2008).

**Measures**

**Physical illness.**—Respondents were asked whether a doctor had ever told them that they had any of the following health problems: (a) high blood pressure or hypertension, (b) diabetes or high blood sugar, (c) cancer, (d) chronic lung disease, (e) heart problems, (f) a stroke, and/or (g) arthritis or rheumatism. The physical illness index was computed by counting the number of chronic physical illnesses with scores ranging from 0 (none) to 5 (five or more illnesses).

**Depressive symptoms.**—The short version of the Center for Epidemiologic Studies Depression measure (Radloff, 1977) was used to access depressive symptoms. The depressive symptom scale was computed by summary scores of those eight items (e.g., felt lonely, sad, and low energy during the last year). Scores ranged from 0 (no symptoms) to 25 (eight symptoms). (Alpha was between .74 and .76 across the study years.)

**Physical impairment.**—Respondents were asked whether because of a health or memory problem they had any difficulty with (a) dressing, (b) walking across a room, (c) bathing or showering, (d) eating such as cutting up food, (e) getting in or out of bed, and (f) using the toilet. Scores ranged from 0 (no difficulty) to 6 (highest difficulty). (Alpha was between .68 and .79 across the study years.)

**Memory problems.**—Memory has two subdimensions: immediate memory and delayed memory (McArdle, Fisher, & Kadlec, 2007). To assess immediate memory, respondents were asked to recall a 10-word list. One of four word lists was randomly assigned to be read to the respondent. Each word list consisted of 10 words. To assess delayed memory, after respondents had conducted immediate recall tests and other cognitive performance tests of the survey, they were asked to recall the same word list performed for the immediate recall as many words as they can. The summed free recall scores ranged from 0 (no word) to 10 (all words). This scale was reverse coded to create a scale for memory problems (high scores, greater memory problems).

**Demographic and Socioeconomic Variables**

**Age, gender, race/ethnicity, and marital status.—** Respondents reported their actual age and gender. A dichotomous variable indicated whether the respondent was married or not (1 = married, 0 = not married) in 1998. This study uses three ethnic groups: non-Hispanic whites, African Americans (AAs), and Hispanics.

**Adult socioeconomic conditions.—** We measured achieved adult socioeconomic condition using both years of education and household income. Years of education ranged from 0 to 17. Yearly household income was categorized into six groups: less than $10,000, less than $20,000, less than $35,000, less than $50,000, less than $75,000, and more than $75,000 dollars.

**Childhood socioeconomic conditions.—** We captured childhood socioeconomic characteristics by father’s occupation, father’s years of education, and mother’s years of education. Occupation categories were coded based on occupational prestige (Nakao & Treas, 1990), which ranges from 57.80 (managers/administrators/professional) to 25.41 (manual workers). A higher score indicates more prestigious occupations.

**Statistical Analyses**

Using Mplus software (version 6), we examined the change in multiple health outcomes (physical illnesses, depressive symptoms, physical impairments, and memory problems) by estimating latent growth curves (LGCs) with initial levels and slopes as latent constructs. The linear shape of trajectories provided the better fit with the data than did a quadratic shape. Then, using the growth parameters of all these dimensions, we used Growth Mixture Modeling (GMM; Jung & Wickrama, 2007; Muthén, 2003) to identify LCs of multidimensional overall health. Trajectory class membership is not known but inferred from the data based on posterior class membership probability (Muthén, 2003).

Indicators of LCs may be categorical or continuous variables. The growth parameters (i.e., the initial level and slope for linear trajectories) of health outcomes trajectories (e.g.,
depressive symptoms) can be used as LC indicators. These are continuous latent variables. Using the same approach, we can use growth parameters of several health outcome trajectories (e.g., depressive symptoms, ADL, etc.) simultaneously as indicators of LCs. Thus, all growth parameters of multidimensional health outcomes contribute conjointly to the empirical identification of LCs (Jackson, Shew, and Schulenberg, 2005; Olino, Klein, Lewinsohn, Rodle, & Seeley, 2010). This approach affords us to take the associations among growth parameters of multiple health dimensions (severity levels and deteriorations) into account simultaneously when identifying LCs. We believe that these multidimensional or conjoint LCs may capture comorbidity of different health problem trajectories in a longitudinal context and, thus, reflect stronger association with cumulative life experiences compared with LCs of specific health problems.

Finally, in order to examine the association of socioeconomic disadvantage and multidimensional health trajectory classes, we prepared profiles of childhood and adult socioeconomic conditions and racial/ethnic minority status for each of multidimensional LCs using the same multivariate analysis of variance (MANOVA) analysis. We also prepared mean trajectories of each health dimension within each LC of multidimensional health.

**Results**

Table 1 presents descriptive statistics of all study variables. We estimated LGC for all health dimensions. For all health dimensions, the LGC with linear slopes provided good fit with the data (better than quadratic shape). Results indicated that the initial levels of physical illness, depressive symptoms, physical impairment, and memory problems from 1998 to 2006 vary significantly across individuals. For all health dimensions, the average rate of change in health problems during late older years did differ significantly from zero, indicating average declines in all health dimensions.

Next, we examined whether we could identify qualitatively different trajectory classes for multidimensional health using the growth parameters (the initial levels and rates of change) of all four health dimensions. To identify the optimal number of trajectory classes, for multidimensional health, we tested LC models with 1, 2, 3, and 4 classes. Model-fit results (Bayesian Information Criteria; BIC) indicated steady improvement in fit from the 1-class through the 3-class models (BIC = 138,309, 133,051, and 129,738). The 4-class model showed a small improvement in model fit (BIC = 128,109), but it had a very small class (less than 5%). Therefore, we chose the 3-class model (class percentages

<table>
<thead>
<tr>
<th>Study variable</th>
<th>Mean</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (female)</td>
<td>0.6461</td>
<td>0.00</td>
<td>1.00</td>
<td>0.47831</td>
</tr>
<tr>
<td>Marital status—1998</td>
<td>0.5567</td>
<td>0.00</td>
<td>1.00</td>
<td>0.49566</td>
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<td>Formal education—1998</td>
<td>11.5065</td>
<td>0.00</td>
<td>17.00</td>
<td>3.48878</td>
</tr>
<tr>
<td>Household income—1998</td>
<td>2.9876</td>
<td>1.00</td>
<td>6.00</td>
<td>1.47281</td>
</tr>
<tr>
<td>Memory problems—1998</td>
<td>6.1609</td>
<td>0.00</td>
<td>10.00</td>
<td>7.91279</td>
</tr>
<tr>
<td>Memory problems—2000</td>
<td>6.4226</td>
<td>0.00</td>
<td>10.00</td>
<td>8.00955</td>
</tr>
<tr>
<td>Memory problems—2002</td>
<td>6.5241</td>
<td>0.00</td>
<td>10.00</td>
<td>8.09173</td>
</tr>
<tr>
<td>Memory problems—2004</td>
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<td>0.00</td>
<td>9.00</td>
<td>8.08726</td>
</tr>
<tr>
<td>Memory problems—2006</td>
<td>7.2977</td>
<td>0.00</td>
<td>8.00</td>
<td>8.11951</td>
</tr>
<tr>
<td>Activity of daily living—1998</td>
<td>0.4236</td>
<td>0.00</td>
<td>6.00</td>
<td>1.00900</td>
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<tr>
<td>Activity of daily living—2000</td>
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<td>0.00</td>
<td>6.00</td>
<td>1.09957</td>
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<tr>
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<td>0.00</td>
<td>6.00</td>
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<tr>
<td>Activity of daily living—2004</td>
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<td>0.00</td>
<td>6.00</td>
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</tr>
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<td>1.1997</td>
<td>0.00</td>
<td>6.00</td>
<td>1.79063</td>
</tr>
<tr>
<td>Chronic illness—1998</td>
<td>1.8348</td>
<td>0.00</td>
<td>5.00</td>
<td>1.16371</td>
</tr>
<tr>
<td>Chronic illness—2000</td>
<td>1.9806</td>
<td>0.00</td>
<td>5.00</td>
<td>1.16261</td>
</tr>
<tr>
<td>Chronic illness—2002</td>
<td>2.2220</td>
<td>0.00</td>
<td>5.00</td>
<td>1.20390</td>
</tr>
<tr>
<td>Chronic illness—2004</td>
<td>2.3487</td>
<td>0.00</td>
<td>5.00</td>
<td>1.21731</td>
</tr>
<tr>
<td>Chronic illness—2006</td>
<td>2.4791</td>
<td>0.00</td>
<td>5.00</td>
<td>1.24404</td>
</tr>
<tr>
<td>CESD—1998</td>
<td>1.6052</td>
<td>0.00</td>
<td>8.00</td>
<td>1.78687</td>
</tr>
<tr>
<td>CESD—2000</td>
<td>1.5791</td>
<td>0.00</td>
<td>8.00</td>
<td>1.79136</td>
</tr>
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<td>CESD—2002</td>
<td>1.6038</td>
<td>0.00</td>
<td>8.00</td>
<td>1.83958</td>
</tr>
<tr>
<td>CESD—2004</td>
<td>1.6118</td>
<td>0.00</td>
<td>8.00</td>
<td>1.82577</td>
</tr>
<tr>
<td>CESD—2006</td>
<td>1.7524</td>
<td>0.00</td>
<td>8.00</td>
<td>1.93809</td>
</tr>
<tr>
<td>Age—1998</td>
<td>78.65</td>
<td>75</td>
<td>85</td>
<td>2.859</td>
</tr>
<tr>
<td>Mothers’ education</td>
<td>2.5924</td>
<td>0.00</td>
<td>5.00</td>
<td>0.59585</td>
</tr>
<tr>
<td>Fathers’ education</td>
<td>8.0020</td>
<td>0.00</td>
<td>17.00</td>
<td>1.00122</td>
</tr>
<tr>
<td>Father occupation prestige</td>
<td>38.04</td>
<td>25.41</td>
<td>57.80</td>
<td>7.04</td>
</tr>
<tr>
<td>White</td>
<td>0.8142</td>
<td>0.00</td>
<td>1.00</td>
<td>0.38901</td>
</tr>
<tr>
<td>Black</td>
<td>0.1161</td>
<td>0.00</td>
<td>1.00</td>
<td>0.32043</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.0583</td>
<td>0.00</td>
<td>1.00</td>
<td>0.23438</td>
</tr>
</tbody>
</table>
were 55.43%, 36.13%, and 7.83%) as the most likely representation of trajectory patterns for multidimensional overall health. Furthermore, 3-class classification was theoretically more meaningful than 4-class classification (Jung & Wickrama, 2007). As expected, the most adverse health class showed a higher attrition rate than other classes (19%, 10%, and 9% for persistently high, deteriorating, and maintaining classes, respectively).

Consistent with heterogeneity of multidimensional overall health, the majority of old aged adults belonged to the largest class 1 (Class 1, \( n = 1,076, 55.43\% \)), reflecting the expected normative (low-to-medium, slow deteriorating, or maintaining) pattern of multidimensional health, whereas the remaining adults belonged to smaller nonnormative classes (Class 2, \( n = 713, 36.73\% \); Class 3, \( n = 152, 7.83\% \)). Figure 1 presents the means of chronic illness, physical impairment, depressive symptoms, and memory problems corresponding to each LC of multidimensional overall health. On average, older adults in the largest Class 1 (low-to-medium, slow deteriorating, or maintaining class) showed low to medium initial levels of illness, physical impairment, depressive symptoms, and memory problems with small but significant increases in health problems providing approximately parallel mean trajectories of health dimensions (please note that units of each dimension are different). In general, this largest class maintained relatively better health than the other two classes. On average, older adults in the Class 2 (deteriorating class) showed lower initial levels of all health dimensions than persistently high class and had faster increases in all health dimensions compared with the maintaining class providing approximately parallel mean trajectories. Finally, on average, older adults in Class 3 started with extremely high average initial levels of health problems that maintained or increased throughout late old years (persistently high class).

In order to examine socioeconomic and racial/ethnic stratification of multidimensional health trajectories of late old adults, we prepared profiles of background socioeconomic characteristics of the respondents. We tested differences in means of all socioeconomic characteristics (childhood, ascribed, adulthood) together in a MANOVA across three identified LCs of overall health (MANOVA takes the correlations among different socioeconomic characteristics into account) after controlling for respondent age. As shown in Table 2, the results indicated that (a) late old adults who had fathers with less prestigious occupations (e.g., manual work) were more likely to fall into persistently high and deteriorating classes compared with the maintaining class (on average, 3.35 occupation prestige units difference between maintaining class and persistently high class), (b) late old adults who had less educated fathers were more likely to fall into deteriorating and persistently high classes compared with the maintaining class (on average, 20-year difference in mean value between maintaining class and persistently high class), and (c) late old adults who had less educated mothers were more likely to fall into deteriorating and chronically high classes compared with the maintaining class (mean values for mother’s years of education were 2.62, 2.47, and 2.47 for maintaining, deteriorating, and persistently high classes, respectively). It should be noted that although some of the observed differences are relatively small, they are important and statistically significant. In addition, AA late old adults were more likely to fall into deteriorating (21%) and persistently high (26%) classes rather than the maintaining class (10%). Hispanic late old adults were more likely to fall into the deteriorating (7%) and persistently high (15%) classes compared with the maintaining class (5%).

As shown in Table 2, the results also indicated that late old adults who had fewer years of education, lower household income, and who were unmarried were more likely to fall into deteriorating health and persistently high classes rather than the maintaining class. Results also showed that women late old adults were more likely to fall into the deteriorating (70%) and chronically high (83%) classes rather than the maintaining class (63%). The MANOVA analysis controlled for respondent’s age in 1998 (mean ages were not significantly different): 78.53, 79.81, and 78.65 for maintaining, deteriorating, and chronically high classes, respectively. F values (MANOVA) showed that there are differences in the socioeconomic characteristics.

<table>
<thead>
<tr>
<th>Overall health trajectory group</th>
<th>Father occupation prestige</th>
<th>Father’s education</th>
<th>Mother’s education</th>
<th>African American</th>
<th>Hispanic</th>
<th>Adult years of education</th>
<th>Adult household income</th>
<th>Married in adulthood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relatively low maintaining (1)</td>
<td>38.20</td>
<td>8.02</td>
<td>2.61</td>
<td>0.10 (10%)</td>
<td>0.05 (5%)</td>
<td>11.70</td>
<td>3.08</td>
<td>0.59 (p)</td>
</tr>
<tr>
<td>((n = 1,076, 55.43%))</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Deteriorating (2)((n = 713, 36.73%))</td>
<td>37.35 (p)</td>
<td>7.85</td>
<td>2.47</td>
<td>0.21 (21%)</td>
<td>0.07 (7%)</td>
<td>10.43 (p)</td>
<td>2.45 (p)</td>
<td>0.43 (p)</td>
</tr>
<tr>
<td>Initially and persistently high (3)</td>
<td>34.85 (p)</td>
<td>7.79 (p)</td>
<td>2.47</td>
<td>0.26 (26%)</td>
<td>0.15 (15%)</td>
<td>8.97 (p)</td>
<td>1.82 (p)</td>
<td>0.32 (p)</td>
</tr>
<tr>
<td>((n = 152, 7.83%))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total ((n = 1,945))</td>
<td>38.04</td>
<td>8.00</td>
<td>2.59</td>
<td>0.12 (12%)</td>
<td>0.06 (6%)</td>
<td>11.50</td>
<td>11.50</td>
<td>0.57 (p)</td>
</tr>
<tr>
<td>(F(\text{MANOVA}))</td>
<td>3.96 (p)</td>
<td>2.99 (p)</td>
<td>4.06 (p)</td>
<td>11.51 (p)</td>
<td>3.72 (p)</td>
<td>15.50 (p)</td>
<td>23.15 (p)</td>
<td>18.80 (p)</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01.
across three groups. As shown in Table 1, most means of socioeconomic characteristics for the maintaining group were significantly different from those for the deteriorating and persistently high groups ($1,180 difference in average income between maintaining and persistently high classes).

**Discussion**

In this study, we focused on the investigation of unobserved heterogeneity (LCs) of multidimensional health trajectories. Our systematic group-based trajectory class analyses (GMM) focused more on the structure of cases rather than on the structure among variables that may lead to imprecise conclusions when applied to clustered populations. Our GMM analysis of multidimensional health trajectories allowed us to gain a better understanding as to how background factors contribute to comorbidity between trajectories of different health problems and severity of overall health over late old years, that is, to identify differential associations of classes of multidimensional or conjoint health trajectories with life-course experiences.

![Figure 1. Mean trajectories of health dimensions for multidimensional latent classes.](https://academic.oup.com/psychsocgerontology/article-abstract/68/2/290/573244)
Then, we prepared profiles of ascribed, childhood, and adulthood socioeconomic characteristics of multidimensional health trajectory classes. Consistent with our expectation, the results provided evidence for significant social and racial/ethnic stratification of multidimensional overall health even in late old years. Past adverse socioeconomic circumstances are direct or indirect potential sources of unobserved heterogeneity (clustering) of multidimensional health trajectories in late old years.

The mean profiles for background (context) variables in each of the identified groups provided information about ascribed, childhood, and adulthood socioeconomic characteristics. By so doing, our study revealed associations that are unique to each group and would have otherwise been obscured. This analysis goes beyond the current knowledge about how individual background factors influence health in older years. For example, as shown in Table 2, much of the differences in socioeconomic factors occur between the maintaining and persistently high trajectory classes; there are significant differences in both adult and early background variables (father’s occupation, father’s education, AA race/ethnic status, Hispanic race/ethnic status, adult education, and income and marital status) between persistently high and maintaining classes. There were few differences in background characteristics between deteriorating and maintaining classes. Similar patterns were observed in relation to early and ascribed characteristics. Figure 1c depicts higher initial levels (severity) and comorbidity of different health problems in a longitudinal context within the most adverse class. This suggests that individuals in the persistently high health-problem class may have experienced an early onset of chronic illnesses and comorbidity of trajectories of different health problems over later years due to experiences in ascribed, childhood, and adulthood disadvantages.

The current findings show that family-of-origin characteristics are associated with the pattern of multidimensional health trajectories. That is, only a portion of older adults who come from socioeconomically disadvantaged families of origin (e.g., lower years of parents’ education and father’s occupational prestige) and are racial/ethnic minorities would have escaped from the “socioeconomic adversity trap.” In addition, older adults who experienced adverse socioeconomic circumstances during their adulthood as reflected by their lower years of education, household income, and unmarried status were more likely to belong to adverse trajectory classes of overall health in late old years. The findings of this study show that, in general, significant health inequalities exist even in late old years despite demographic processes such as “selection of the healthy.” More specifically, comorbidity between trajectories of different health problems within the persistently adverse class may be in part due to family-of-origin and adulthood common risk factors.

It is arguable that chronically ill individuals may be selected into lower socioeconomic status. The long-term health history begins in childhood. Accordingly, the observed association between the “chronically poor health” LC of older adults and their social disadvantage circumstances may suffer from potential reverse causation (social selection). However, the findings minimize the possibility of such reverse causation as childhood (family of origin) socioeconomic disadvantages are most likely temporary prior to the chronic health problems experienced by older adults.

Although the findings from this study are generally consistent with our expectations, several factors potentially limit the scope and the generalizability of the results. First, in the present analysis, we used linear growth form for all health dimensions (based on model-fit statistics), which assign linear trajectories for the individuals. There could have been individuals who had nonlinear health dimension trajectories who were still assigned the linear shape. Thus, there is a possibility that use of linear growth parameters to examine multidimensional health may have not revealed potentially more complex trajectory shapes of multidimensional health classes. Second, there is a possibility that different health dimensions may interact differentially providing more complicated patterns. However, this study uses the growth parameters of each health dimensions to examine the multidimensionality of health. This may not reveal such complex patterns of associations among health dimensions, but it is likely to reveal the simple patterns of associations among health dimensions.

Third, this study largely used self-reported measures. Replication using clinical health measures would alleviate concerns regarding potential self-report biases related to the measures used in this study. Fourth, this study used traditional socioeconomic status markers, such as occupation and education, to capture disadvantage. Replication using real-life experiences (e.g., childhood difficulties, stressful work experiences, economic hardship, and discrimination) would likely provide even stronger socioeconomic stratification of health trajectories in late old years. Fifth, the results may be influenced by unique cohort characteristics. The study cohort members, who were 75 years of age or more in 1998, may have experienced extreme family hardships and unique health consequences associated with the Great Depression in the United States during their childhood and adolescence. Sixth, given the small number of Black and Hispanic respondents, the observed race/ethnic group effects may be less reliable. Finally, the associations between parents’ social disadvantage and respondents’ health disadvantage may represent a shared genetic liability, which contrasts with the hypothesized association.

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