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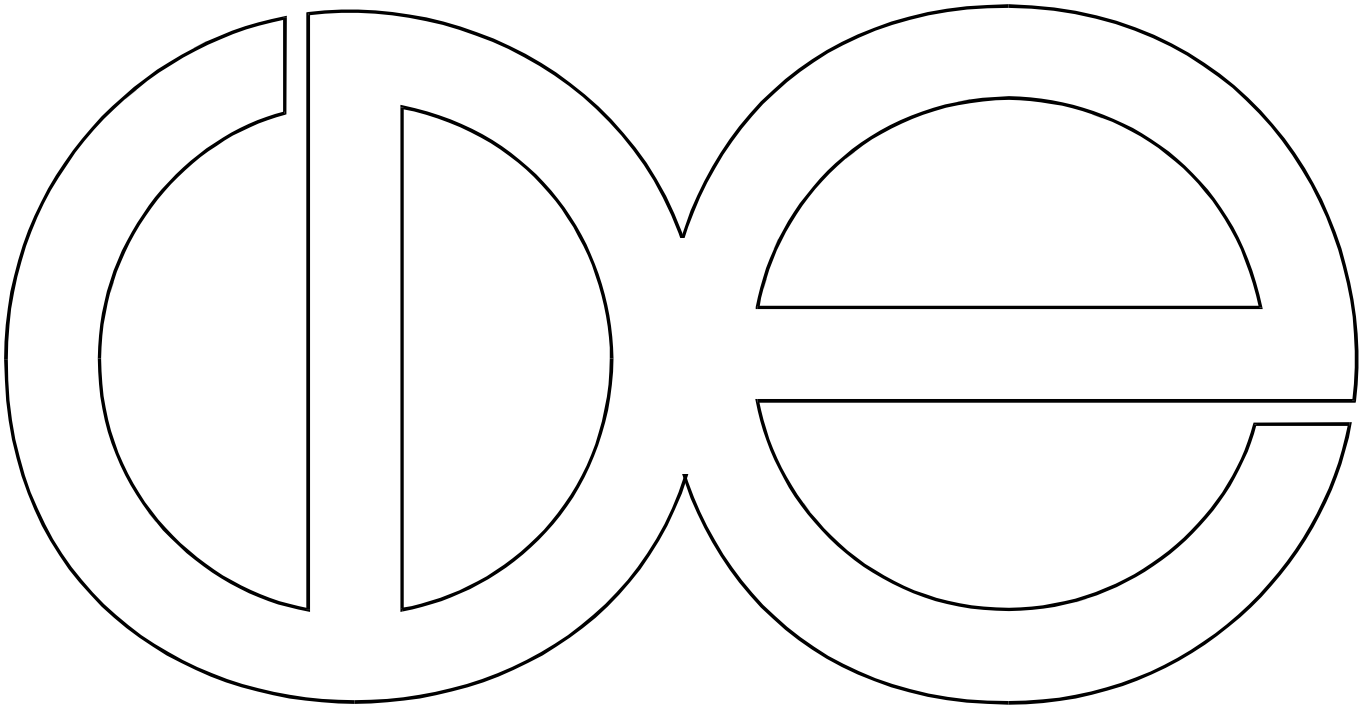

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What Do We Learn from Detailed Employment History Data?

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Abstract

Our understanding of career influences on mortality is limited by reliance on relatively old data, use of surveys that contain only partial employment histories, and lack of consensus about how to best summarize detailed life history data. In this article, we address these limitations using data from the Wisconsin Longitudinal Study (WLS), a unique data source that contains mortality information through age 72 for one of the first cohorts exposed to growth in unstable employment and "bad jobs" for much of their adult lives. Results of parametric survival models show that less favorable employment histories are associated with a higher risk of death, but the nature of this relationship differs for men and women. The relationship is indirect for men and thus provides no support for the life course hypothesis that trajectories of employment experience should matter above and beyond employment characteristics and other correlates of mortality observed in late mid-life. For women, however, we find that inconsistent labor force participation across mid-life and loss of access to employer-provided health insurance in mid-career remain associated with a relatively high risk of mortality, net of temporally proximate correlates of death. These gender differences are unexpected in light of the theorized centrality of employment in men's lives and provide an empirical basis for further efforts to advance our understanding of the pathways through which employment histories shape later-life well-being.

Introduction

The relationship between careers and mortality is of long-standing interest to social scientists. Evidence that mortality risk is positively associated with lower occupational status, downward occupational mobility, and job loss (e.g., Gregorio, Walsh, and Paturzo 1997; Pavalko, Elder, and Clipp 1993) provides important insights into the ways in which stratification and inequality in employment experiences across the life course culminate in unequal chances of survival. However, three important limitations of existing research hamper our understanding of this relationship. First, previous studies are based on data from earlier cohorts with limited exposure to the major changes in employment circumstances that have unfolded since the mid-1970s. Second, because detailed life-history data are not widely available, researchers have typically measured employment "trajectories" as a series of point-in-time status measures (e.g., employment status at a few discrete ages), simple summary indicators (e.g., "total number of jobs held across the career"), or characteristics of the longest job only. Third, even when full employment histories are available, there is no consensus regarding how to best summarize that information in the form of employment trajectories.

Given these limitations, it seems safe to say that we know little or nothing about recent relationships between employment trajectories and mortality. A life course perspective (Elder, Johnson, and Crosnoe 2004) suggests that employment trajectories, which represent the timing and sequencing of transitions, cumulative exposure, and unanticipated "turning points," should contribute to variation in multiple dimensions of later-life well-being, including mortality. However, there is little evidence that such measures of complex life pathways are actually related to mortality net of proximate measures of employment circumstances and more easily collected summary measures of employment history. In light of the major efforts now being invested in the collection of detailed life history data, the theoretical elaboration of linkages

between life course trajectories and later-life outcomes, and the development and application of statistical techniques for summarizing life histories, there is substantial value in establishing if and how employment trajectories are empirically related to mortality (and other later-life outcomes).

To this end, we examine detailed life history data from one of the first cohorts of older Americans to experience the new employment environment for much of their working lives. Specifically, we use data from the Wisconsin Longitudinal Study (WLS) to address the following four research questions: First, are long-term trajectories of employment circumstances across the life course associated with mortality risk? Based on the results of earlier studies, we expect a relatively higher mortality risk among those who experienced careers characterized by greater instability (e.g., intermittent employment) and longer exposure to bad jobs. Second, are employment trajectories associated with mortality risk net of employment, health, and economic circumstances observed in late mid-life and simple, easily-collected retrospective measures of employment history? That is, are observed associations between long-term trajectories of employment experiences and mortality risk indirect or direct, both, or neither? Third, we ask how these processes differ for women and men. This question is motivated by evidence of important gender differences in both mortality and the nature of employment trajectories across the life course (Moen and Roehling 2005). Fourth, we ask whether answers to these questions depend on the method used for summarizing employment history data. Following the approach advocated by Warren et al. (2013), we address each of the first three questions using four different methods for summarizing trajectories of employment experience across the life course.

Background

Theory and empirical evidence

A large body of research on linkages between employment circumstances and mortality has shown that intermittent employment across the life course, self-employment, experience of involuntary job loss, downward occupational mobility, and other aspects of unstable careers are associated with higher mortality relative to careers characterized by stable employment and upward occupational mobility (Hayward, Grady, Hardy, and Sommers 1989; Kitagawa and Hauser 1973; Moore and Hayward 1990; Moriyama and Guralnick 1956; Pavalko et al. 1993). These relationships between career experiences and mortality appear to be stronger for men than for women (Krueger and Burgard 2011; Macintyre and Hunt 1997).

Related research also suggests that career influences on mortality are, to a large extent, indirect—working through more proximate correlates of mortality. For example, a large and growing body of literature focusing on employment trajectories and health outcomes at older ages shows that time spent in the labor force is positively associated with health (Pavalko and Smith 1999; Schnittker 2007), that earlier job loss is associated with worse health (Burgard, Brand, and House 2007; Gallo et al. 2006; Strully 2009), and that exposure to temporary employment is negatively associated with later health (Virtanen et al. 2005). Other work highlights relationships between careers and economic resources—a strong predictor of mortality (Kueger and Burgard 2011). Intermittent employment across the life course, involuntary job loss, and careers characterized by part-time or nonstandard employment are thought to contribute to higher rates of mortality via lower levels of income and wealth, and lack of health insurance coverage at older ages (Burgard, Brand, and House 2007; Price and Burgard 2008; Quinlan, Mayhew, and Bohle 2001). Other work highlights linkages between job quality across the life

course and mortality, suggesting that variation in mortality reflects differences in exposure to work-related stress and dangerous working conditions, in access to pension and health care benefits, and in lifestyles associated with specific types of employment (Elo and Preston 1996; Marmot 2004).

Importantly, however, there are also compelling theoretical reasons to believe that employment trajectories contribute to variation in mortality risk in more direct ways. The life course perspective in general, and theories of cumulative dis/advantage in particular, emphasize the importance of considering full histories of experience and posit that such histories should be relevant for understanding variation in well-being at older ages above and beyond more temporally proximate correlates of the measure of well-being in question (mortality in our case). For example, simple models of mortality that include only temporally proximate measures of employment status ignore the possibility that individuals who have been consistently employed throughout their adult lives may face different mortality risks than other currently-employed individuals who first entered the labor force later in the life course. Similarly, they ignore the possibility that employment trajectories and associated experiences across the life course may contribute to variation in key late-life correlates of mortality that are not typically observed in survey data. Extended exposure to bad jobs across the life course, for example, may contribute to variation in health characteristics that impact the risk of mortality but are not captured by the basic health indicators available in most data sets.

Although these ideas underlie a general theoretical consensus that "health disparities in old age cannot be understood without linking them to people's experiences in early and mid life" (Herd 2009), empirical evidence to support this claim is rather limited. It thus seems safe to say that rich theory regarding the importance of cumulative exposure to different employment

circumstances (e.g., low status employment), turning points (e.g., involuntary job loss), and the direction of employment changes (e.g., career advancement vs. career unraveling) outstrips the available data. Because surveys commonly used to study mortality (e.g., HRS/AHEAD) do not contain full employment histories, most previous efforts to evaluate career influences on mortality rely on simple measures of employment histories (e.g., characteristics of longest job), thus limiting our ability to understand if and how full trajectories of experience, including the duration of exposure to specific employment characteristics and the number, timing, and direction of transitions, are associated with mortality above and beyond temporally proximate correlates. The fact that we do not know whether life trajectories actually matter for mortality, net of the work, family, health, and economic characteristics commonly collected in aging surveys, raises important questions about the insights to be gained from efforts to take advantage of detailed life histories collected in long, prospective panel surveys of Americans now approaching older ages (e.g., PSID, NSLY79), and about the potential payoff from expensive and complex efforts to collect full life histories retrospectively.

The changing nature of employment

Much of what we know about relationships between employment histories and mortality is based on information about careers experienced in an era that was quite different from that which has characterized the working lives of cohorts now reaching ages at which the risk of mortality rises rapidly. Earlier studies (e.g., Hayward et al. 1989; Moore and Hayward 1990; Pavalko, Elder, Clipp 1993) were based on birth cohorts that were either retired or approaching retirement in the mid-1970s, just prior to the emergence of the long-term increase in unstable employment and the concurrent growth in "bad jobs."

Declining job security is a key feature of the changing nature and quality of employment since the mid-1970s (Hacker 2008), with layoffs becoming a basic component of employers' restructuring strategies and precarious employment spreading from unskilled, less-educated segments of the labor force to all sectors of the economy (Kalleberg 2009). Closely related to the increase in precarious employment is growth in "bad jobs." The quality of jobs can be evaluated in a variety of ways, but bad jobs are frequently defined as those that do not offer private pension plans or health insurance benefits and are characterized by low wages (Hacker 2008; Kalleberg, Reskin, and Hudson 2000; Mishel, Bernstein, and Allegretto 2007). Recent studies show that 21% of employed Americans did not have private health insurance coverage in 2008 (Turner, Boudreaux, and Lynch, 2009) and that half did not have private pension coverage in 2004 (Munnell and Perun 2006). In their tabulations of data from the 1995 Current Population Survey, Kalleberg, Reskin, and Hudson (2000) show that 60% of American workers had a job that was bad on at least one indicator (no pension, no health insurance, or low wages) and that 1 in 7 had a job that was bad on all three indicators.

The work summarized in the previous section suggests different ways in which exposure to these employment circumstances across the life course may contribute to variation in the risk of mortality. First, unstable employment and bad jobs have been linked to a range of well-established correlates of mortality, including health, economic circumstances, and retirement (e.g. Ferber and Waldfogel 1998; Price and Burgard, 2008; Raymo et al. 2011). Second, it is possible that career histories influence mortality in more direct ways, as suggested by theories of cumulative dis/advantage. Clearly, these mechanisms are not mutually exclusive and careful documentation of their relevance is important for understanding how the changing nature of employment may contribute to variation in mortality risk among current and future cohorts of

older Americans. Is less stable employment across the life course associated with higher rates of mortality? Is longer exposure to bad jobs across the life course associated with higher rates of mortality? If so, which aspects of bad jobs (e.g., low pay, no health insurance, no private pension coverage) are most important? Do these relationships differ for men and women? Importantly, do employment trajectories matter above and beyond measures of these same employment characteristics later in life? Do they matter above and beyond other temporally proximate correlates of mortality? Do full trajectories of employment experience across the life course provide more (or different) information than simple summary measures that can be easily collected retrospectively (e.g., number of different jobs held, ever leave a job involuntarily)? In this article, we address each of these important questions.

Summarizing employment history data

In order to answer these questions, it is necessary to choose some method of summarizing the potentially large number of observations on employment circumstances across the life course. Fortunately, there are a number of easily-implemented methods for concatenating multiple observations of a particular variable(s) into a discrete number of trajectory groupings that can then be used as regressors in survival models. Perhaps the most commonly used trajectory measures are those derived from some common-sense "rules of thumb" specified by the investigator. For example, one might construct a four-category measure of employment across the life course in which the categories are: always employed, never employed, employed more than half of the time, employed less than half of the time. Simple, or naïve, classification schemes such as this are attractive in being easy to construct and easy to interpret (because the investigator defines the categories a priori). They are problematic however in having no statistical justification.

The statistical limitations of ad hoc methods have motivated the development and use of a range of other methods for summarizing trajectory data. One of the most widely used is group-based modeling techniques popularized by Nagin and colleagues in the criminology literature (see e.g., Nagin 1999). These, and other statistically motivated, approaches (e.g., latent class analysis, optimal matching, grade of membership) allow the researcher to let the data determine the appropriate number and shape of life trajectories and to assign individual respondents to mutually exclusive and exhaustive trajectory groups. In addition to their statistical justification, such models are attractive in providing insights into the direction and timing of transitions across the life course.

One critical question that has rarely been addressed is which approach is the most appropriate. Most studies that examine life trajectories use one technique for generating the trajectory groups and typically provide little or no rationale for the choice of that method and pay no attention to the extent to which findings may be sensitive to that choice. In a recent paper, Warren et al. (2013) demonstrated the potential problems associated with the arbitrary use of a single method for summarizing trajectory data. They used simulated life history data to demonstrate that six different methods for summarizing those data typically fail to produce the same number of trajectories, often produce the wrong number of trajectories, and frequently assign individual respondents to the wrong trajectory. We therefore follow their suggestion to use multiple methods of summarizing life history data and to compare results across the different methods. If we find that conclusions are similar across the multiple methods for generating trajectory measures, we can have more confidence in those results. If we find that results are highly sensitive to the choice of method, we need to be more cautious in making any conclusions.

Data

The Wisconsin Longitudinal Study (WLS) is a long-term study of a random sample of 10,317 men and women who graduated from Wisconsin high schools in 1957. WLS "graduates" were interviewed in 1957, 1975, 1993, and 2004.[1] The WLS graduate sample is broadly representative of white, non-Hispanic Americans who have completed at least a high school education—a group that includes about two-thirds of all Americans of this generation (Hauser and Roan 2006). Response rates to WLS telephone and mail surveys have been consistently high. In 1993, when surviving graduates were age 53-54, 87% responded to the telephone survey and 71% responded to the mail survey.[2] In 2004, 78% of surviving graduates responded to the telephone survey and 76% responded to the mail survey.

Deaths to graduates have been ascertained in two, complementary ways. The first is via informant reports obtained at each survey. Family members or friends who report the death of a graduate in the process of pre-survey tracing or at the time of initial survey contact were asked to provide information about the date and cause of death. This information was then confirmed by matching available information with the Social Security Death Index (SSDI). The second method of identifying graduate deaths is periodic searches of SSDI, in which the social security numbers of all graduates are checked against the death index. Data from the most recent SSDI check in January 2012 show that 1,498 (17%) of the graduates who were alive at the time of the 1993 survey died before the end of 2011. Our analyses do not include 598 graduates (6% of the

[1] Data from a new wave collected in 2010-2012 will soon be available for analysis.

[2] Differences in age at high school graduation and the timing of the 1993 survey mean that not all graduates were age 53-54 at the time of the survey. Respondents ranged from age 51-57 with 87% aged 53-54 and an additional 10% aged 55.

original sample) who died before the 1993 survey because these deaths occurred prior to the collection of the information required to construct trajectories of employment experiences across mid-life. Of the post-1993 deaths, 507 cannot be included in our analyses because they did not respond to the 1993 survey (n=264), have missing data on employment histories or other covariates (n=240), or their year of death cannot be ascertained (n=3).[3]

Our analyses are thus based on 991 deaths occurring to 7,057 graduates who survived until 1993 and responded to the survey in that year. The age at death in this analytic sample ranges from 52-73, with a mean of 65. A comparison of survival curves beyond age 52 shows these WLS graduates to be very similar to the larger population of white, high school-educated Americans (results available upon request). The fact that we are focusing on relatively early deaths (before age 72) can be seen as either a limitation or a strength of the study. It is a limitation in that a large proportion of our sample has yet to experience the event of interest (i.e., is right censored). It is a strength in that early death is valuable indicator of disadvantage and thus of particular interest for evaluating the long-term implications of exposure to instability and bad jobs across the life course.

Employment trajectories

The 1993 telephone survey obtained essentially complete employment histories for graduates covering the period 1975 through 1993 (ages 36 through 54 for most graduates). These employment histories are comprised of multiple employment spells–uninterrupted periods of time working for the same employer, including self-employment, with detailed information on

[3] The proportion of 1993 non-respondents who were alive at the time of the 1993 survey period and have since died is 0.22, which is higher than for 1993 survey respondents (0.15).

employment status and the characteristics of each job held. This information includes the years that respondents started and stopped working for that employer; the reason for ending that employment spell; whether they worked full- or part-time; the industry and occupation when they began working for that employer; access to employer-provided health insurance; and private pension coverage. Based on these data, we produce measures of employment status, full-time employment, occupational earnings, and access to private pension and health insurance coverage at six-month intervals. Because the WLS does not contain individual wage histories, we follow the measurement strategy employed by Raymo et al. (2011) in using information on occupation-specific average wages. We define low-wage jobs as those that fall below the median value of occupational earnings–the percentage of people in a given occupation who reported hourly wages of at least $14.30 in the 1990 census (Warren and Hauser 1997).

Because different techniques for summarizing trajectories of experience typically result in different numbers of distinct trajectories, often misclassify individual respondents, and are generally sensitive to the nature of the data being modeled, we follow Warren et al.'s (2013) suggestion to compare results across multiple methods. In particular, we employ four different methods for summarizing employment history data–naïve classification, latent class analysis, group-based trajectory models, and grade of membership models.

As noted, naïve trajectories are produced using some ad hoc allocation procedure guided by the observed distribution of the life history data, the researcher's insight, and "common sense." Latent class analysis (LCA) is a widely used method of classifying individual units of observation into statistically and substantively meaningful latent groups based on observed values on multiple measures of some construct (Clogg 1995). Extension to the estimation of latent trajectories based on repeated observations of the same measure across multiple time

points is straightforward (Warren et al. 2013). Group-based trajectory models (GBTM)–sometimes referred to as latent class growth models–have been widely used to identify groups of individuals who are following similar "developmental trajectories" or categorically similar patterns on some outcome over time (Jones, Nagin, and Roeder 2001; Nagin 1999). Grade of membership (GoM) models were originally developed to summarize multiple measures of health status into a small number of empirically and statistically meaningful groups or "pure types" and to identify the extent to which individuals belong to each of those groups (Manton, Woodbury and Tolley 1994; Woodbury and Manton 1982); and extension to trajectories of repeated measures of a given characteristic are straightforward. For more detail on each of these methods see Warren et al. (2013).

Other correlates of mortality

Because our primary objective is to evaluate the extent to which trajectories of employment experience are related to mortality net of more temporally proximate correlates, as posited by the life course framework, models must account for established correlates of mortality that may also be related to employment histories. These include a broad range of work, health, and family characteristics measured at the time of the 1993 survey. Our research questions do not ask whether relationships between employment trajectories and morality are causal, so models do not include "pre-treatment"characteristics such as educational attainment, IQ, or family background that were established prior to age 35–the starting point for respondents' employment trajectories.

Sex: Given large gender differences in both employment trajectories and mortality risk in late mid-life, we estimate models separately for men and women.

Age: The WLS is a cohort study so age variation is limited but, as noted earlier, there is some variation in the age at which respondents were interviewed in the 1993 survey (which was

fielded between July 1992 and January 1994). To account for this, we estimate models in which exposure to the risk of death begins at the month of the 1993 interview and differences in age at initial exposure are controlled. We expect the risk of death to be higher for those who were older at the time of the 1993 survey.

Current occupational characteristics: To ascertain whether measures of employment experiences across mid-life are associated with mortality above and beyond contemporaneous, easily-collected measures of employment circumstances, we include 1993 values of the characteristics represented in our trajectory measures–dichotomous indicators of private pension coverage and health insurance coverage, and a categorical indicator of current employment status (not employed, employed part-time, employed full-time). We also include a 0-10 measure of the respondent's subjective probability of losing his/her job completely in the next two years. Ideally, we would like to observe these (and other) correlates of mortality prospectively beyond the 1993 survey rather than static measures at the time of the survey. However, this prospective, time-varying information is not available for respondents who died prior the subsequent round of data collection in 2004.

Income and wealth: There is a strong and well-documented negative relationship between economic resources and mortality. We measure income as the per capita value of total couple income. For respondents who were not married in 1993, this includes income from all sources (wages, pension, social security, disability payments, investment income, and other income) in the year prior to the 1993 survey. For married respondents, it is one-half of the respondent's and spouse's income from all sources in the previous year. To reflect differences in income sources between men and women and between those who are and are not currently employed, we also include a measure of the respondent's annual wages in the year prior to the 1993 survey.

Respondents' net worth at the time of the 1993 survey is constructed as the reported value of home equity, real estate, business or farm, motor vehicles, savings, and investments owned by the respondent and his/her spouse minus their reported debt. A non-trivial proportion of respondents have missing values on income, wages, or wealth so we standardize these measures to have a mean of zero and a standard deviation of one, recode missing values to equal zero (i.e., the mean), and include dichotomous indicators of missingness for each.

Marital status: Several studies have shown that marriage is associated with lower mortality so we include a four-category measure of marital status – currently married, widowed, divorced or separated, and never married. Because marital transitions are associated with mortality (e.g., Elwert and Christakis 2008), a time-varying measure of marital status would be preferable but again this is not possible given that the necessary information is unavailable for those who died prior to the 2004 survey or did not respond to the 2004 survey.

Health status: Given established linkages between employment circumstances and health, it is important to control for graduates' health in 1993. We use three measures. The first is a dichotomous indicator of the self-reported presence of any physical or mental condition, illness, or disability which limits what the respondent is able to do, or is likely to limit his/her activities in the future. The second is a dichotomous indicator of whether the respondent received personal care for a period of one month or more during the past 12 months from a family member or friend because of a health condition, illness, or disability. The third is a measure of cognitive ability based on the Weschler Adult Intelligence Scale (WAIS). Comprised of questions such as "In what way are an egg and a seed alike?", this measure ranges from 0-15 with higher scores indicating greater cognitive ability (Krahn et al. 2003).

Simple employment history measures: To address our questions about the added value of collecting detailed employment history data and efforts to summarize complex employment trajectories, we include several indicators of employment history that may be related to mortality risk and can be easily collected via retrospective questions. These indicators include a measure of the number of different jobs held since age 35, whether the respondent ever left a job involuntarily, whether s/he ever left a job for health reasons, and two dichotomous variables distinguishing those who never had access to employer-provided health insurance or private-pension coverage from those who did have jobs that provided access to these benefits.

The distribution of the sample, by sex, with respect to these correlates of mortality measured in 1993 is summarized in Table 1.

Method

We estimate a series of parametric survival models with the shape of the mortality hazard assumed to follow a Gompertz distribution between the month of the 1993 survey and December 2011, when most of the graduates were 71-72 years old. To address our research questions, we estimate a series of three models. The first model, which includes one trajectory measure and age in 1993, describes bivariate relationships between employment trajectories and mortality risk. In Model 2, we add employment circumstances and the other correlates of mortality measured in 1993. Evidence that relationships observed in Model 1 remain statistically significant, net of a wide array of established temporally proximate correlates of mortality, would be consistent with a central tenet of the life course framework. Model 3 adds the simple retrospective measures of employment history, allowing for an assessment of whether more statistically sophisticated trajectory measures based on detailed life history data provide insights not available from life history measures that can be easily collected in retrospective surveys.

We estimated these three models for all combinations of sex (two groups), employment characteristics (five variables), and trajectory method (four methods), for a total of 120 different models. For the sake of brevity and simplicity, we present only the estimated hazard ratios associated with the measures of employment trajectories (tables presenting all estimated coefficients are available upon request). To facilitate interpretation, the reference trajectory in all models is that associated with stable employment and access to better pay and benefits (i.e., stable employment, full-time employment, higher-paying occupations, and access to health insurance and private pension coverage). To minimize repetition, we present results only from the models using trajectories generated by latent class analysis. Although results from the four different approaches we used differed in terms of the number of trajectories and the nature of those trajectories (consistent with the findings of Warren et al. 2013), conclusions were largely consistent across methods. Below, we highlight the few findings that did depend on the approach used to produce the employment trajectories.

Results

Table 2 presents the distribution of the sample with respect to the latent class employment trajectories, separately by sex, with trajectory groups ordered from highest to lowest prevalence.[4] In some cases, membership in employment trajectory groups is very uneven–for example, the trajectories for men's employment classify 86% as "consistently employed" and the remainder as either "early exit from employment" or "not consistently employed." In other cases, group membership is more evenly distributed–for example, each of the three trajectories identified for women's access to private pension coverage includes at least 18% of the respondents. To

[4] Appendix Table 1 presents corresponding figures for the other three methods used to generate trajectory measures.

facilitate understanding of the employment trajectory measures, we present one set of categories graphically in Figure 1 as an illustrative example. These are the latent class trajectories of employment status for women, with age on the horizontal axis and the probability of being employed at each age on the vertical axis. This figure clearly shows that individuals in the same status in late mid-life may have very different employment histories. For example, women who were employed at age 53 include those who worked throughout mid-life (solid black line) and those who entered employment in their thirties and forties (dashed black line). Similarly, women with a relatively low likelihood of being employed at age 53 include those who never worked (solid gray line) and those who left employment in mid-life (dashed gray line).[5]

Table 3 presents the estimated hazard ratios for the categorical trajectory measures. Results are presented separately for 30 models (3 models for each combination of the 5 different sets of trajectories and 2 sexes). Based on the results of Model 1, the answer to our first research question appears to be "yes." In most cases, trajectory membership is significantly associated with the risk of mortality and these relationships indicate higher mortality for those with greater exposure to unstable employment and employment in "bad jobs." For example, mortality is higher for men and women who were not consistently employed, were not consistently employed full-time, and who lost access to employer-provided health insurance in late mid-life. Men who did not always have access to private pension coverage also have a relatively higher risk of mortality but the same pattern is not observed for women. Trajectories of employment in low-paying occupations are not related to mortality for either men or women although a relatively high risk of mortality for women who were always in a low-paying occupation approaches statistical significance ($p = 0.08$). Interestingly, the mortality risk of women who were never

[5] Graphical representations of all trajectory measures are available upon request.

employed does not differ from those who were consistently employed – it is only women who entered or exited employment that have a higher risk of mortality.

The answer to our second question appears to be "no" – at least for men. After accounting for temporally proximate measures of employment circumstances (in 1993) and other correlates of mortality in Model 2, none of the trajectory measures are associated with men's mortality. However, women's trajectories of employment and access to employer-provided health insurance continue to be associated with mortality even after controlling for temporally proximate correlates of mortality (including employment circumstances in 1993) in Model 2, and simple employment history measures in Model 3. Women who either entered or exited employment in late mid-life have a higher risk of death prior to age 72 relative to women who were consistently employed, and women who lost their health insurance coverage in mid-life have a higher risk of death than women who were consistently covered. For other measures, women's employment trajectories, like men's, are unrelated to mortality.

The general pattern of results in Table 3–relationships between employment trajectories and mortality that work through temporally proximate characteristics for men but remain significant for women net of a wide range of controls–does not depend on the method used to generate the trajectory measures. Findings based on naïve trajectory classification, group-based trajectory models, and grade of membership models are very similar (see Appendix Tables 2-4 for results). The differences observed across trajectory methods are as follows. Results based on naïve classification indicate a lower mortality risk (in all models) for women who were not always employed full-time (relative to those who were always employed full-time) and in both the naïve classification and group-based trajectory models, the higher risk of mortality among women not consistently covered by health insurance is not statistically significant in Model 2 or Model 3. In

the models using trajectories generated from grade of membership models, the most notable difference is strong evidence that inconsistent employment across mid-life is associated with relatively higher mortality for men net of temporally proximate correlates (Model 2) and simple employment history measures (Model 3). Relative to men who were consistently employed across mid-life, the risk of dying was over twice as high for those with an inconsistent employment history and nearly six times higher for those who exited the labor force in late mid-life. For women, we also see that a trajectory not captured by the other methods–exiting a low-paying occupation in late mid-life – is associated with a relatively high risk of mortality.

Discussion

Despite strong theoretical and substantive motivations for understanding relationships between employment experiences across the life course and mortality, relevant empirical evidence is limited in several ways. Most studies to address the topic are based on the experiences of older cohorts with limited exposure to increasing employment uncertainty and the rise of bad jobs since the mid-1970s. Importantly, most research has been based on relatively limited information on lifelong trajectories of employment experience and has paid no attention to the potential sensitivity of results to the choice of method used to summarize the life history data that are available. In light of these limitations, it is safe to say that we have little evidence consistent with, or contrary to, theoretical expectations that employment trajectories should matter for the risk of death above and beyond more temporally proximate predictors of mortality.

In this paper, we employed four different approaches to summarize rich employment history data across the adult lives of a large cohort of older Americans and examined the extent to which these alternative measures of employment trajectories are associated with the risk of death through age 72. Our decision to use multiple approaches to summarize the bi-annual employment

history data is motivated by simulation-based evidence that alternative methods rarely generate the same number of distinct trajectories and often allocate individuals to the "wrong" group (Warren et al. 2013). While this is perhaps not a surprising finding, it does call into question conclusions based on analyses that rely on a single, perhaps arbitrarily chosen, method for generating trajectories and highlights the importance of carefully evaluating the consistency of evidence across multiple methods.

Despite differences in the number and nature of trajectories generated by the four different methods, our substantive conclusions are largely similar across methods. Models based on trajectories generated by all four methods provide a clear answer of "yes" to our first question– trajectories of employment experience are related to mortality risk in models that include only baseline age. Importantly, the nature of these relationships is generally consistent with expectations that employment instability and inconsistent access to employer-provided pension and health insurance coverage should be associated with a higher risk of mortality.

The answer to our second question differs both by sex and by method. For men, after controlling for employment circumstances, income and wealth, health status, and marriage measured in 1993, none of the trajectory measures remain associated with mortality for three of the four methods used to generate the trajectories (the trajectories that we estimated using grade of membership models are the one exception). The bivariate relationships observed in Model 1 are thus indirect; employment trajectories are associated with established, temporally proximate predictors of mortality and, net of those predictors, are not associated with mortality. The same is *not* true for women. For this group, the significant differences in mortality risk across categories of employment status and health insurance coverage trajectories are robust to the inclusion of temporally proximate correlates of mortality in Model 2 and simple employment history

measures in Model 3, and are generally consistent across the four methods used to generate the trajectory measures.

This paper makes three important contributions to the literature on life course influences on later-life well-being and lays an empirical foundation for subsequent work in this area. First, we found no evidence in our analyses of male mortality to support the central life course tenet that trajectories of experience across the life course should contribute to variation in mortality risk above and beyond more temporally proximate correlates. It will be important to confirm this finding using different data sources and other measures of later-life well-being given widespread acceptance of the idea that life-long employment histories matter above and beyond later-life characteristics and concern about the long-term implications of the changing nature of employment. Second, we found that detailed employment history data do provide information about women's mortality that is not captured in simpler, easily-collected, retrospective measures of employment experiences across the life course. The marked gender differences in our estimated relationships between employment trajectories and mortality through age 72 are not consistent with existing theory and empirical evidence suggesting that career experiences are more consequential for men's later-life well-being and should be explored further. Third, we demonstrated that, with one exception, conclusions are largely insensitive to the method used to summarize employment history data in the form of discrete trajectory measures. In light of the concerns about the inconsistent and inaccurate characterization of life trajectories across alternative methods (Warren et al 2013), the consistency of our results is reassuring. Continued efforts to assess the extent to which findings are sensitive to the choice of method for constructing trajectory measures and the circumstances under which this choice is consequential

will be of increasing value as sources of detailed life history data to study well-being at older ages proliferate.

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Table 1: Descriptive statistics for mortality and temporally proximate correlates, by sex

Variable	Men (n = 3,494)	Women (n = 3,563)
Died before Jan. 2012[a]	0.16	0.12
Age	53.76	53.65
(s.d.)	(0.71)	(0.68)
Per capita couple income (standardized)	0.06	-0.05
(s.d.)	(1.30)	(0.42)
Income missing[a]	0.07	0.16
Annual wages (standardized)	0.12	-0.09
(s.d.)	(1.43)	(0.10)
Wages missing[a]	0.06	0.09
Net worth (standardized)	0.05	-0.05
(s.d.)	(1.14)	(0.82)
Net worth missing[a]	0.02	0.04
Marital status		
Married	0.85	0.79
Widowed	0.01	0.04
Divorced/separated	0.1	0.12
Never married	0.04	0.05
Has an activity limiting health condition[a]	0.17	0.16
Has received health care in the past year[a]	0.02	0.03
WAIS score (range: 0-15)	7.81	7.76
(s.d.)	(1.30)	(2.71)
Current/last job offers private pension coverage[a]	0.78	0.58
Current/last job offers health insurance[a]	0.82	0.53
Chances of losing current job in next two years (range: 0-10)	1.69	1.34
(s.d.)	(1.30)	(2.28)
Employment status		
Full-time	0.91	0.63
Part-time	0.03	0.22
Not employed	0.07	0.15
Number of jobs held since age 35		
Ever left a job involuntarily[a]	0.16	0.16
Ever left a job for health reasons[a]	0.03	0.05
Never had private pension coverage[a]	0.16	0.33
Never had employer-provided health insurance[a]	0.08	0.27

Notes:
Standard deviations for continuous measures are given in parentheses.
a indicates 0-1 (yes-no) variables.

Table 2: Distribution of latent class employment trajectories, by sex

Men		**Women**	
Employment status		*Employment status*	
Consistently employed	0.86	Consistently employed	0.56
Early exit from employment	0.10	Enter employment	0.17
Not consistently employed	0.05	Never employed	0.17
		Exit employment	0.11
Full-time employment			
Always employed full-time	0.80	*Full-time employment*	
Usually employed full-time	0.12	Always employed full-time	0.37
Enter full-time employment late	0.08	Never employed full-time	0.36
		Enter full-time employment	0.16
Low-paying occupation		Exit full-time employment	0.11
In a low-paying occupation later	0.42		
Never in a low-paying occupation	0.41	*Low-paying occupation*	
In a low-paying occupation earlier	0.09	Always in a low-paying occupation	0.41
Always in a low-paying occupation	0.08	Never in a low-paying occupation	0.37
		In a low-paying occupation earlier	0.13
Access to health insurance		In a low-paying occupation later	0.10
Always covered by health insurance	0.73		
Never covered by health insurance	0.13	*Access to health insurance*	
Lost health insurance coverage	0.08	Always covered by health insurance	0.38
Gained health insurance coverage	0.06	Never covered by health insurance	0.38
		Gained health insurance coverage	0.16
Access to private pension coverage		Lost health insurance coverage	0.09
Always covered by private pension	0.60		
Never covered by private pension	0.23	*Access to private pension coverage*	
Occasionally covered private pension	0.17	Never covered by private pension	0.46
		Always covered by private pension	0.37
		Covered by private pension later	0.18

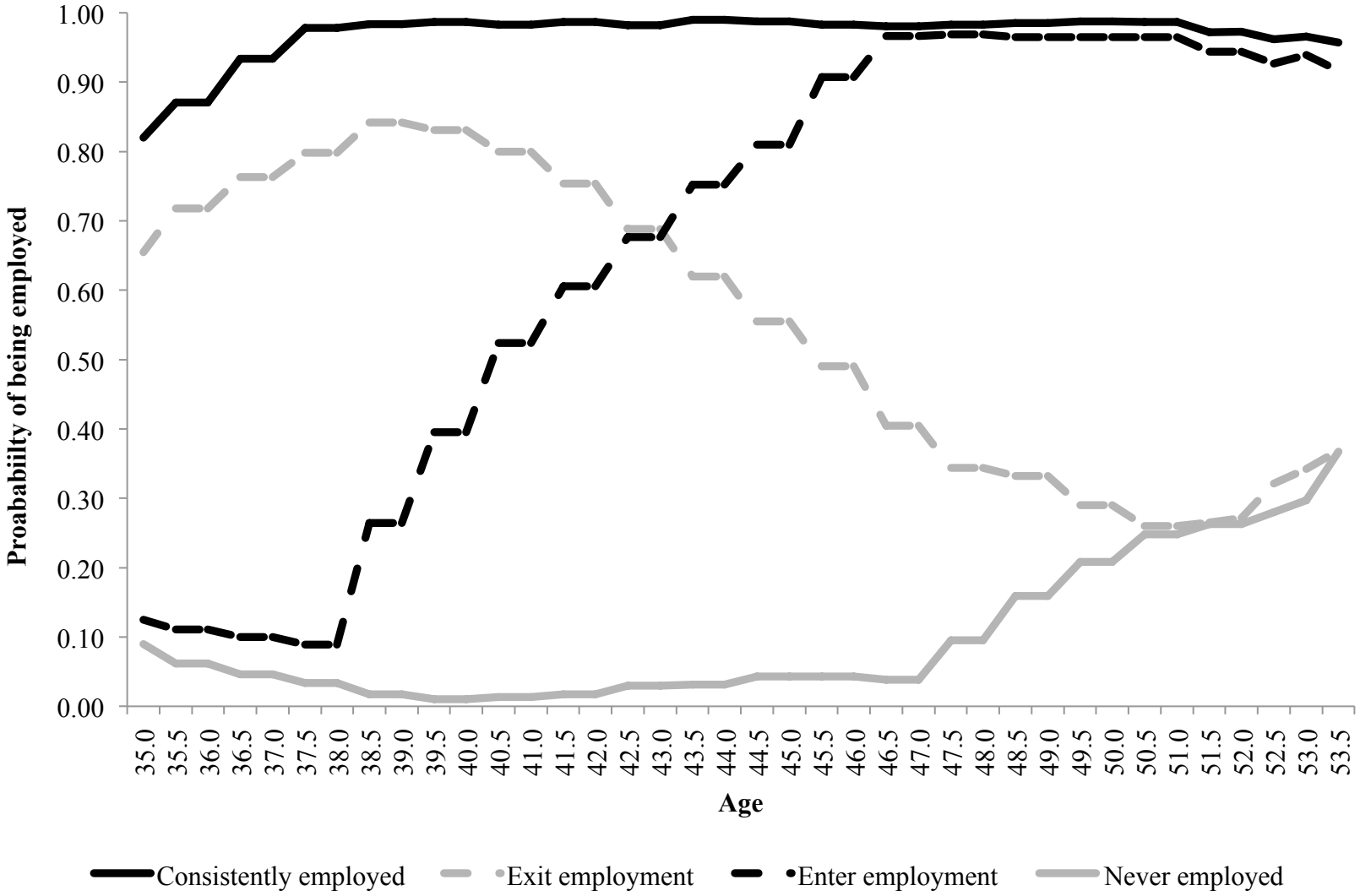
Note: Some of the proportions do not sum to 1.0 due to rounding.

Table 3: Estimated hazard ratios for models using latent class trajectory measures

Men	**Model 1**	**Model 2**	**Model 3**
Employment status			
Consistently employed (ref)	1.00	1.00	1.00
Early exit from employment	1.50**	1.07	1.00
Not consistently employed	1.62**	1.32	1.23
Full-time employment			
Always employed full-time	1.00	1.00	1.00
Usually employed full-time	1.38**	1.07	0.98
Enter full-time employment late	0.97	1.01	0.99
Low-paying occupation			
In a low-paying occupation later	0.93	0.86	0.82
Never in a low-paying occupation (ref)	1.00	1.00	1.00
In a low-paying occupation earlier	1.15	1.07	1.01
Always in a low-paying occupation	1.17	1.00	0.99
Access to health insurance			
Always covered by health insurance (ref)	1.00	1.00	1.00
Never covered by health insurance	1.00	0.82	0.86
Lost health insurance coverage	1.50**	1.25	1.20
Gained health insurance coverage	1.08	0.99	0.95
Access to private pension coverage			
Always covered by private pension (ref)	1.00	1.00	1.00
Never covered by private pension	1.17	0.93	1.11
Occasionally covered private pension	1.26*	1.08	1.03
Women	**Model 1**	**Model 2**	**Model 3**
Employment status			
Consistently employed (ref)	1.00	1.00	1.00
Enter employment	1.34*	1.35*	1.35*
Never employed	1.27	1.30	1.26
Exit employment	2.14**	1.95**	1.92**
Full-time employment			
Always employed full-time (ref)	1.00	1.00	1.00
Never employed full-time	1.08	0.97	0.95
Enter full-time employment	0.99	1.01	1.00
Exit full-time employment	1.48**	1.08	1.06
Low-paying occupation			
Always in a low-paying occupation	1.21#	1.06	1.06
Never in a low-paying occupation (ref)	1.00	1.00	1.00
In a low-paying occupation earlier	1.16	1.09	1.06
In a low-paying occupation later	0.83	0.74	0.73#
Access to health insurance			
Always covered by health insurance (ref)	1.00	1.00	1.00
Never covered by health insurance	1.22#	1.30	1.07
Gained health insurance coverage	0.98	1.01	1.00
Lost health insurance coverage	1.87**	1.61**	1.60**
Access to private pension coverage			
Never covered by private pension	1.18	1.15	1.21
Always covered by private pension (ref)	1.00	1.00	1.00
Covered by private pension later	0.90	0.90	0.88

Notes: Model 1 includes only age in 1993, Model 2 includes health, marital status, and economic circumstances in 1993, Model 3 includes employment characteristics in 1993, Model 4 includes simple employment history measures. ** p<.01, * p<.05, # p<.10.

Figure 1: Latent class trajectories for women's employment status



Appendix Table 1: Distribution of employment trajectories, by sex and trajectory method

Naïve trajectory measures	Men	Naïve trajectory measures	Women
Employment status		*Employment status*	
Consistently employed	0.78	Consistently employed	0.61
Not consistently employed	0.22	Not consistently employed	0.39
Full-time employment			
Always employed full-time	0.97	*Full-time employment*	
Not always employed full-time	0.03	Always employed full-time	0.55
		Not always employed full-time	0.45
Low-paying occupation			
Always in low-paying occupation	0.38		
Never in low-paying occupation	0.37	*Low-paying occupation*	
		In low-paying occupation more than 75% of	
In low-paying occupation 1-99% of time	0.25	time	0.35
		In low-paying occupation 25-75% of time	0.34
Access to health insurance		In low-paying occupation less than 25% of time	0.31
Always offered health insurance	0.62		
Not always offered health insurance	0.38	*Access to health insurance*	
		Offered health insurance 1-99% of time	0.45
		Never offered health insurance	0.33
Access to private pension coverage		Always offered health insurance	0.21
Always covered by private pension	0.51		
Covered by private pension 1-99% of			
time	0.32	*Access to private pension coverage*	
Never covered by private pension	0.16	Covered by private pension 1-99% of time	0.42
		Never covered by private pension	0.39
		Always covered by private pension	0.18

(Continued)

Appendix Table 1 (continued): Distribution of employment trajectories, by sex and trajectory method

Group-based Trajectory Models	**Men**	**Group-based Trajectory Models**	**Women**
Employment status		*Employment status*	
Consistently employed	0.91	Consistently employed	0.56
Not consistently employed	0.09	Enter employment	0.17
		Never employed	0.15
Full-time employment		Exit employment	0.12
Always employed full-time	0.90		
Not always employed full-time	0.10	*Full-time employment*	
		Always employed full-time	0.40
Low-paying occupation		Never employed full-time	0.36
Never in a low-paying occupation	0.42	Enter full-time employment	0.25
Always in a low-paying occupation	0.41		
Occasionally in a low-paying occupation	0.17		
		Low-paying occupation	
Access to health insurance		Always in a low-paying occupation	0.40
Always covered by health insurance	0.72	Never in a low-paying occupation	0.37
Never covered by health insurance	0.14	In a low-paying occupation earlier	0.12
Usually covered by health insurance	0.14	In a low-paying occupation later	0.11
Access to private pension coverage			
Always covered by private pension	0.70		
Occasionally covered private pension	0.30	*Access to health insurance*	
		Always covered by health insurance	0.39
		Never covered by health insurance	0.38
		Occasionally covered by health insurance	0.23
		Access to private pension coverage	
		Never covered by private pension	0.45
		Always covered by private pension	0.34
		Covered by private pension later	0.21

(Continued)

Appendix Table 1 (continued): Distribution of employment trajectories, by sex and trajectory method

Grade of Membership Models	**Men**	**Grade of Membership Models**	**Women**
Employment status		*Employment status*	
Consistently employed	0.81	Consistently employed	0.57
Not consistently employed	0.10	Enter employment early	0.17
Reduced employment later	0.09	Enter employment late	0.10
		Exit employment	0.09
Full-time employment		Never employed	0.06
Always employed full-time	0.84		
Never employed full-time	0.10	*Full-time employment*	
Usually employed full-time	0.06	Always employed full-time	0.40
		Never employed full-time	0.25
Low-paying occupation		Enter full-time employment early	0.15
Never in a low-paying occupation	0.47	Enter full-time employment late	0.11
Always in a low-paying occupation	0.36	Exit full-time employment	0.08
In a low-paying occupation earlier	0.09		
In a low-paying occupation later	0.08	*Low-paying occupation*	
		Never in a low-paying occupation	0.41
Access to health insurance		Always in a low-paying occupation	0.20
Always covered by health insurance	0.72	Enter a low-paying occupation early	0.13
Never covered by health insurance	0.20	Enter a low-paying occupation late	0.11
Occasionally covered by health insurance	0.08	Exit a low-paying occupation late	0.09
		Exit a low-paying occupation early	0.07
Access to private pension coverage			
Always covered by private pension	0.59	*Access to health insurance*	
Never covered by private pension	0.26	Always covered by health insurance	0.34
Lose pension coverage	0.08	Never covered by health insurance	0.32
Gain pension coverage	0.06	Gained access early	0.15
		Lost health insurance	0.10
		Gained access late	0.07
		Access to private pension coverage	
		Never covered by private pension	0.40
		Always covered by private pension	0.37
		Gained pension coverage	0.16
		Lost pension coverage	0.07

Note: GoM figures refer to the mean value of grade of membership scores rather than the proportion of respondents assigned to each category.

Appendix Table 2: Estimated hazard ratios for models using naive trajectory measures

Men	**Model 1**	**Model 2**	**Model 3**
Employment status			
Consistently employed (ref)	1.00	1.00	1.00
Not consistently employed	1.42**	1.17	1.08
Full-time employment			
Always employed full-time (ref)	1.00	1.00	1.00
Not always employed full-time	0.67	0.92	0.97
Low-paying occupation			
Always in low-paying occupation	1.21#	1.03	1.03
Never in low-paying occupation (ref)	1.00	1.00	1.00
In low-paying occupation 1-99% of time	1.09	1.05	0.99
Access to health insurance			
Always offered health insurance (ref)	1.00	1.00	1.00
Not always offered health insurance	0.82*	0.97	0.98
Access to private pension coverage			
Always covered by private pension (ref)	1.00	1.00	1.00
Covered by private pension 1-99% of time	1.33**	1.14	1.10
Never covered by private pension	1.15	0.88	0.95

Women	**Model 1**	**Model 2**	**Model 3**
Employment status			
Consistently employed (ref)	1.00	1.00	1.00
Not consistently employed	1.39**	1.25*	1.24#
Full-time employment			
Always employed full-time (ref)	1.00	1.00	1.00
Not always employed full-time	0.77**	0.66**	0.63**
Low-paying occupation			
Always in low-paying occupation	1.14	0.99	0.98
In low-paying occupation 1-99% of time	0.96	0.87	0.83
Never in low-paying occupation (ref)	1.00	1.00	1.00
Access to health insurance			
Offered health insurance 1-99% of time	1.30*	1.21	1.21
Never offered health insurance	1.29#	1.18	1.02
Always offered health insurance (ref)	1.00	1.00	1.00
Access to private pension coverage			
Covered by private pension 1-99% of time	1.21	1.13	1.12
Never covered by private pension	1.30#	1.21	1.16
Always covered by private pension (ref)	1.00	1.00	1.00

Notes: Model 1 includes only age in 1993, Model 2 includes health, marital status, and economic circumstances in 1993, Model 3 includes employment characteristics in 1993, Model 4 includes simple employment history measures. ** p<.01, * p<.05, # p<.10.

Appendix Table 3: Estimated hazard ratios for models using group-based trajectory measures

Men	**Model 1**	**Model 2**	**Model 3**
Employment status			
Consistently employed (ref)	1.00	1.00	1.00
Not consistently employed	1.57**	1.10	1.01
Full-time employment			
Always employed full-time (ref)	1.00	1.00	1.00
Not always employed full-time	1.45*	1.36	1.29
Low-paying occupation			
Never in a low-paying occupation (ref)	1.00	1.00	1.00
Always in a low-paying occupation	1.15	0.98	0.98
Occasionally in a low-paying occupation	0.99	0.93	0.87
Access to health insurance			
Always covered by health insurance (ref)	1.00	1.00	1.00
Never covered by health insurance	1.00	0.80	0.85
Usually covered by health insurance	1.28*	1.07	1.01
Access to private pension coverage			
Always covered by private pension (ref)	1.00	1.00	1.00
Occasionally covered private pension	1.24*	1.10	1.25#
Women	**Model 1**	**Model 2**	**Model 3**
Employment status			
Consistently employed (ref)	1.00	1.00	1.00
Enter employment	1.38#	1.37	1.33
Never employed	1.32*	1.36*	1.35*
Exit employment	2.04**	1.84**	1.79**
Full-time employment			
Always employed full-time (ref)	1.00	1.00	1.00
Never employed full-time	1.05	0.90	0.89
Enter full-time employment	1.09	0.96	0.95
Low-paying occupation			
Always in a low-paying occupation	1.22#	1.06	1.06
Never in a low-paying occupation (ref)	1.00	1.00	1.00
In a low-paying occupation earlier	1.18	1.12	1.09
In a low-paying occupation later	0.82	0.73#	0.71#
Access to health insurance			
Always covered by health insurance (ref)	1.00	1.00	1.00
Never covered by health insurance	1.14	1.00	0.80
Occasionally covered by health insurance	1.22#	1.13	1.12
Access to private pension coverage			
Never covered by private pension	1.22#	1.18	1.34
Always covered by private pension (ref)	1.00	1.00	1.00
Covered by private pension later	0.99	0.95	0.93

Notes: Model 1 includes only age in 1993, Model 2 includes health, marital status, and economic circumstances in 1993, Model 3 includes employment characteristics in 1993, Model 4 includes simple employment history measures. ** p<.01, * p<.05, # p<.10.

Appendix Table 4: Estimated hazard ratios for models using grade of membership trajectory measures

Men	**Model 1**	**Model 2**	**Model 3**
Employment status			
Consistently employed (ref)	1.00	1.00	1.00
Not consistently employed	1.89**	2.10**	2.11**
Reduced employment later	3.51**	5.76**	5.91**
Full-time employment			
Always employed full-time (ref)	1.00	1.00	1.00
Never employed full-time	1.28	1.35	1.22
Usually employed full-time	1.78**	1.31	1.11
Low-paying occupation			
Never in a low-paying occupation (ref)	1.00	1.00	1.00
Always in a low-paying occupation	1.07	0.96	0.98
In a low-paying occupation earlier	1.52*	1.17	1.06
In a low-paying occupation later	0.89	0.86	0.79
Access to health insurance			
Always covered by health insurance (ref)	1.00	1.00	1.00
Never covered by health insurance	1.09	0.91	1.06
Occasionally covered by health insurance	1.47*	1.08	1.01
Access to private pension coverage			
Always covered by private pension (ref)	1.00	1.00	1.00
Never covered by private pension	1.22#	1.00	1.37
Lose pension coverage	1.64**	1.30	1.19
Gain pension coverage	1.14	1.10	1.01

(Continued)

Appendix Table 4 (continued): Estimated hazard ratios for models using grade of membership trajectory measures

Women	**Model 1**	**Model 2**	**Model 3**
Employment status			
Consistently employed (ref)	1.00	1.00	1.00
Enter employment early	1.10	1.12	1.12
Enter employment late	1.53*	1.73**	1.70**
Exit employment	2.90**	2.65**	2.59**
Never employed	1.42	1.38	1.31
Full-time employment			
Always employed full-time (ref)	1.00	1.00	1.00
Never employed full-time	1.11	0.92	0.91
Enter full-time employment early	0.95	0.95	0.93
Enter full-time employment late	1.05	1.16	1.13
Exit full-time employment	1.64*	1.00	1.00
Low-paying occupation			
Never in a low-paying occupation (ref)	1.00	1.00	1.00
Always in a low-paying occupation	0.86	0.81	0.82
Enter a low-paying occupation early	0.94	0.83	0.84
Enter a low-paying occupation late	1.06	1.04	1.04
Exit a low-paying occupation late	1.97**	1.65*	1.65*
Exit a low-paying occupation early	1.05	0.92	0.92
Access to health insurance			
Always covered by health insurance (ref)	1.00	1.00	1.00
Never covered by health insurance	1.26#	1.21	1.10
Get health insurance early	1.02	1.05	1.05
Lose health insurance	2.04**	1.60*	1.62*
Get heatlh insurance late	1.26	1.39#	1.39
Access to private pension coverage			
Never covered by private pension	1.34*	1.36#	1.38
Always covered by private pension (ref)	1.00	1.00	1.00
Gain pension coverage	1.15	1.14	1.14
Lose pension coverage	1.93**	1.52#	1.49

Notes: Model 1 includes only age in 1993, Model 2 includes health, marital status, and economic circumstances in 1993, Model 3 includes employment characteristics in 1993, Model 4 includes simple employment history measures. ** p<.01, * p<.05, # p<.10.

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