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**Socioeconomic Status, Daily Work Qualities, and Psychological Well-Being
Over the Adult Life Course:
Age Trajectories and the Mechanisms of Mental Health Divergence**

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Over the Adult Life Course:
Age Trajectories and the Mechanisms of Mental Health Divergence**

**by
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Dedication

This dissertation is dedicated to my parents, Hyogil Kim and Kyoungja Kim, for their unconditional love and support for me.

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**Socioeconomic Status, Daily Work Qualities, and Psychological Well-Being
Over the Adult Life Course:
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The cumulative advantage hypothesis suggests diverging SES-gaps in health with age. However, empirical research yields inconsistent results regarding the age-related pattern. Using two panel surveys of nationally representative samples of American adults, this study comprehensively examines the patterns of mental health disparity across the adult life span, taking into account not only various dimensions of socioeconomic status (SES), but also several aspects of daily work quality as a structural condition proximal to SES.

Results of the cross-sectional analyses indicate that SES and work quality factors generate diverging gaps in both depression and anxiety with age. The cumulative

advantage mechanism explains the mental health divergence through cumulative advantages which SES or work quality generates in two mediating factors, physical impairment and the sense of control. The resource substitution mechanism explains the age divergence through stronger effects of three mediating resources – work fulfillment, the sense of control, and social support – on mental health in non-employed status of which probability increases with age. The protective effects of these SES- or work-related mediating resources are greater among retirees and homemakers.

Consistent with the cross-sectional findings, results of the latent growth-curve models show that the age trajectories of depression between the better-educated and the less-educated diverge across successive life stages, but the income-based gap in depression shows convergence in old age, a pattern that supports the age-as-leveler hypothesis. According to an additional analysis utilizing aging-vector graphs, there are inter-cohort trends relatively favoring higher SES groups in terms of mental health, and it suggests that the impact of education on depression is stronger in more recent birth cohorts.

Additional analyses examine the dynamic relationship between work quality and psychological well-being. The results of latent growth-curve modeling demonstrate that stable, positive work quality produces divergence in both depression and anxiety across all adult ages, compared to the stable, negative work group. Persons who experience decline in work quality lose their advantage in mental health, and persons who experience improvement in work quality gain advantage. Fulfilling work is important for the psychological well-being of older adults, and nonroutine work is important for the psychological well-being of younger adults.

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CHAPTER 1: INTRODUCTION

1. STATEMENT OF THE PROBLEM AND PURPOSE OF THE STUDY

How the relationships between socioeconomic status or daily work quality and psychological well-being vary over the adult life span? Do the life-course patterns support consistent divergence or later-life convergence? What mechanisms can explain the life-course patterns or the possible age interactions? Those are my main research questions in this study.

Despite increased attention given to socioeconomic status (SES hereafter) as a fundamental cause of health disparities (Adler and Ostrove 1999; Haan, Kaplan, and Syme 1989; Link and Phelan 1995; Williams and Collins 1995), life-course variation in SES-based health disparity remains unclear. Moreover, the life-course perspective recently suggests the necessity of studying health inequality with taking into account temporality (Elder and Johnson 2002; George 2003; McDonough and Berglund 2003). Three aspects of temporality are examined in this study. First, a social status such as educational level which is attained in early adulthood might have a lifelong cumulative effect on health, so social conditions in earlier life need to be taken into consideration to fully understand health disparity in later life. Second, the effect of certain social condition on certain health outcome might be different by age or life stage - the effect of certain social condition might be stronger in certain life stage, compared to other ages. Third, if a social condition is time-variant, persistence (duration) or dynamic pattern of the condition needs to be taken into account to explain health change or trajectory over time (McLeod and Shanahan 1996).

Previous studies about age variation in SES-based health disparity yield inconsistent results regarding the life-course pattern (Ross and Wu 1996; Miech and Shanahan 2000; Aneshensel, Frerichs, and Huba 1984; Beckett 2000; House et al. 1994; Newacheck et al. 1980; Lauderdale 2001; Lynch 2003). This study intends to complement previous studies which have shown three characteristics – 1) they mainly focused on the life-course relationship between education and physical health; 2) the diverging SES-gaps in health with age have been explained by the cumulative advantage hypothesis; 3) methodologically, cross-sectional data or very short-term longitudinal data were frequently used. Based on the accomplishment from the previous studies, first, this study comprehensively examines patterns of mental health disparity over adulthood, taking into account not only various dimensions of SES, such as education, occupational prestige, and income, but also several dimensions of daily work quality (e.g., fulfillment and complexity) as a social structural condition proximal to SES. Therefore, this study extends the hypotheses of previous studies about physical health to mental health (depression and anxiety) and provides rich understanding about health disparity over the adult life-course, examining the possibly different patterns by different social factors.

The second aspect of this study to complement the existing research is to reveal another mechanism of health divergence over the adult life span. In addition to the cumulative advantage mechanism, the “resource substitution” mechanism is suggested to explain the stronger effects of certain social conditions or resources on psychological well-being in later life. Third, this study utilizes a latent growth-curve modeling approach to complement previous studies methodologically with two panel surveys of nationally representative samples of American adults. Growth-curve modeling reduces the possibility of mortality selection bias and resolves the confounding problem between the aging process and cohort difference, which is embedded in cross-sectional studies.

Especially, the synthetic cohort design of the aging-vector approach utilized in this study enables the examination of long-term life course with relatively short-term panel data. In addition, aging-vector graphs created from growth-curve models provide a graphical way to evaluate inter-cohort trends favoring certain groups such as college graduates in terms of health. In other words, it enables the evaluation of whether the effect of education on health is stronger in more recent birth cohorts as previous studies have suggested.

In sum, this study intends to provide theoretical base of effective social interventions to improve the psychological well-being of the U.S. adults, especially, lower SES adults, revealing 1) the roles of diverse social conditions for psychological well-being across adult life stages, 2) the mechanisms of mental health divergence by diverse social conditions, and finally, 3) the contemporary trends in the health disparity.

2. THREE SUB-TOPICS AND BACKGROUND OF THE STUDY

This study is composed of three sub-topics. The first one examines the age interactions of SES or work factors and psychological well-being, using cross-sectional method. One aim of this sub-topic is to confirm what kind of life-course pattern is prominent in this disparity of psychological well-being, and the other is to reveal the mechanisms of the life-course pattern such as divergence, taking into account several mediating factors. The second topic is to examine the longitudinal aging patterns of depression across levels of SES, utilizing a latent growth-curve modeling approach. This longitudinal method has several advantages to complement the cross-sectional analyses. The third topic is to examine dynamic relationships between temporal patterns of work quality and psychological well-being, also employing latent growth models. Work quality

is an important social condition proximal to SES to affect psychological well-being over the adult life course.

1) Cumulative Advantage and Resource Substitution: The Mechanisms of Mental Health Divergence with Age

The findings of previous studies on the life-course relationship between SES and health fall into two distinct patterns – one pattern of findings indicates a consistent diverging gap by SES over the life course, and the other indicates a diverging gap until early old age followed by convergence in later life. The results of previous studies indicating divergence over the life course are often explained by cumulative advantage, which is the result of the accumulation of various resources related to SES (Crystal, Shea, and Krishnaswami 1992; Dannefer 1987; O’Rand 1995). Using cross-sectional data, consistent SES-based divergence in health outcomes has been found for physical health by level of education (Ross and Wu 1996), depression by education (Miech and Shanahan 2000), and physical illness by income (Aneshensel, Frerichs, and Huba 1984). In contrast, the pattern of divergence followed by convergence in later life has been found for physical health by education (Beckett 2000; House et al. 1994), mortality by education (Elo and Preston 1996), and activity limitation by poverty status (Newacheck et al. 1980).

Using ASOC (Aging, Status, and the Sense of Control) national probability sample collected in 1995, this study also examines, with this cross-sectional data, the age interactions in the relationships between SES or work factors and psychological well-being. If the moderating effects of age exist, I examine the mechanisms of the changing mental health gap with respect to SES or work over the adult life course, using psychosocial resources or risk factors as mediators. In the study of Miech and Shanahan

(2000), only physical impairment out of a variety of mediating factors which link education to depression explained the divergence through the mechanism of cumulative advantage.

My study suggests “resource substitution” as a new mechanism to explain the age interaction (i.e., divergence) of a social condition and psychological well-being. The basic idea of this new mechanism started from the hypothesis that there might be impact difference of the mediating factors, which link SES to health, across ages (House et al 1994). Although the SES-gap in a mediating factor is constant across life-stages (implying no cumulative advantage in the mediators), the SES-gap in health can get greater in later life if the impact of the mediator becomes greater in older age. Why, then, is certain mediator’s impact on health different across life-stages? Here is the resource substitution mechanism introduced. Certain resources have stronger effect on health in certain disadvantaged status, and it is called the “resource substitution hypothesis” – certain resources effectively substitute other resources which are lacks in certain disadvantaged status (Mirowsky and Ross 2003; Ross and Mirowsky 1989, 2006). The alternative hypothesis is “resource multiplication” – certain resources have stronger effect on health in certain advantaged status.

This study applies this general theory of “resource substitution” to disadvantaged status related to age or life-stage. The mediating resources from SES might become more important for mental health in older age because older adults are more likely to have disadvantaged employment or marital status such as retired or widowed status. In non-employed or non-married status of which probability increases with age, certain SES-related resources might have stronger impact on mental health, and this might explain the greater SES-gaps in older ages. My study confirms the contribution of the resource substitution mechanism to the mental health divergence and discloses which mechanism

out of cumulative advantage and resource substitution plays a more dominant role in the divergence with respect to certain SES or work factor.

2) Socioeconomic Status and Age Trajectories of Health

In addition to cross-sectional approaches, several studies examined the SES-based health gaps in aging, using longitudinal approaches. Ross and Wu (1996) confirmed a significant effect of education on change in health, net of age at baseline, over a one-year period. Pooling 30 years of census samples, Lauderdale (2001) suggested the necessity to take into account birth cohort variation in the effect of education on survival. After controlling for cohort effects, the education-based gaps in survival increased with advancing age within each cohort. In contrast, House and colleagues (1994) found that the effect of education on change in health was smaller in older age groups than in middle age groups, using longitudinal data. Beckett (2000) found the same pattern using a different data source, even after adjusting for mortality selection bias – in which the least healthy, who are disproportionately of low SES, are more likely to have died or for other reasons such as disability, to not participate in a survey. Finally, a recent study (Lynch 2003) employed growth curve modeling, which reduces potential mortality selection bias, to examine the life-course relationship between education and self-rated health. The education-based gap diverged over the survey period of about 20 years in cohorts aged 20 to 46 at baseline (in 1971), but converged in cohorts aged 47 to 74 at baseline. Lynch explained the convergence in health to be the result of a relatively smaller effect of education on health among the older age cohorts.

In cross-sectional analysis, age effects cannot be disentangled from cohort differences – age inherently represents both life stage and cohort membership (Riley 1987). However, if processes related to life stage play a substantial role in the interaction

of age with SES, results from cross-sectional studies would be a valid reflection of the life-course health pattern by SES in general. Nevertheless, because of the confounding problem of age and cohort, we cannot be certain that age effects found using cross-sectional data are strictly the result of the aging process; longitudinal data must also be employed to complement cross-sectional studies. Although several previous studies have employed regression models to examine health change over time with using short-term longitudinal data, growth curve modeling using longer periods of data is better able to capture the aging process because such an approach enables the examination of health trajectories within a person over a substantial length of time, while reducing mortality selection bias to a certain degree (Lynch 2003).

An ideal method for studying life-course patterns in health would be to follow the same persons throughout their lives to examine their health trajectories. However, due to the significant investment of time and money required to carry out large-scale longitudinal surveys, the availability of long-term panel data spanning the life course is extremely limited. In addition, long-term panel data often involves severe sample attrition. Finally, those data sources that follow only a few birth cohorts over time have an additional problem of limited generalizability to other cohorts (Riley 1987).

This study uses a latent growth-curve modeling approach, to examine health trajectories over time for 1-year age groups or birth cohorts. The health trajectories for each age group are expressed in graphical form by a series of vectors (aging-vector graphs). This synthetic cohort design makes it possible to study the long-term life course using relatively short-term panel data – the graphical presentation provides a composite image of the entire life-course pattern, based on segmental aging patterns during a given survey period for a broad range of age groups at baseline (Nesselroade and Baltes 1979; Mirowsky and Kim forthcoming; Miyazaki and Raudenbush 2000).

In addition to the cumulative advantage hypothesis, another hypothesis to be examined in this study is that the effect of education on health might be stronger among more recent birth cohorts (Lauderdale 2001; Lynch 2003). For example, three factors may have contributed to growth in the effect of education on health over time. One, as a result of epidemiological transition, the effect of managing a healthy lifestyle on health might be increasing, and education plays an essential role in health behaviors and health lifestyle. Second, education-based disparities in accessibility to quality medical services may be increasing. Third, education-based inequalities in social institutions such as the labor market might be increasing. This study intends to evaluate and confirm the cohort trends such as favoring more-educated adults or disfavoring less-educated adults in terms of health. This evaluation is conducted with a graphical way in the aging-vector graphs mentioned above.

Using panel data (1986-1994) based on a national probability sample from the Americans' Changing Lives (ACL) survey, this study examines the effects of education and family income on trajectories of physical impairment as well as depression across the adulthood.

3) Temporal Patterns of Work Quality and Divergence in Psychological Well-Being

This study also has interests in work-based gap in psychological well-being over the adult life course or the dynamic relationships between daily work qualities and mental health trajectories over time. Are temporal patterns of work quality related to different trajectories of mental health? Do the mental health trajectories of those with higher work quality and those with lower work quality diverge across the adult life stages, as predicted by the cumulative advantage hypothesis? Dose the effect of work quality on psychological well-being differ across various age groups?

First of all, why does this study have interest in the effect of work quality – measured by how fulfilling or nonroutine their primary daily work is – on mental health? As Link and Phelan (1995) suggested, health researchers need to have interests in more distal or fundamental cause of health disparity. Quality of work or primary daily activity might be considered a social condition close to SES because work quality affects psychosocial mediators linked to mental health. Regardless of paid work or unpaid work, the characteristics of primary daily work - fulfillment and complexity – are closely related to their SES and have strong effects on mental health through mediating resources such as sense of control or social support (Link, Lennon, and Dohrenwend 1993; Loscocco and Spitze 1990; Ross and Willigen 1997; Wickrama et al 1997). Another aspect to highlight is that daily work operates itself as an essential mediator to connect SES and mental health. Although many previous studies examined the relationship between occupational characteristics and mental health, they frequently excluded works/activities of retirees or homemakers, and the dynamic relationships between work and mental health over time or the relationships over the life-course have rarely been examined (Erikson 1986; Holt 1982; Kohn and Schooler 1973, 1982, 1990; Pugliesi 1995; Reynolds 1997).

Next, this study examines dynamic patterns of work quality because work quality is not a static condition. The work quality in a single-time point might not represent the individual's work condition wholly. According to the life-course perspective, it is important to consider the timing and duration of a particular status (Elder and Johnson 2002). If it a status is time-variant, dynamic relationships need to be examined in the studies of health disparity over the life course. Previous studies in this direction examined the effect of income change (Benzeval, Michaela and Ken Judge 2001; Duncan 1996) or the effect of persistent poverty or economic hardship (Lynch, Kaplan, and Shema 1997;

McDonough and Berglund 2003; McLeod and Shanahan 1996; Mirowsky and Ross 2001) on health. This study considers work quality a structural condition proximal to SES and takes into account the symptomatology of depression and anxiety to examine the mental health disparity in aging, using a national probability sample (ASOC) collected in 1995, 1998, and 2001.

CHAPTER 2: OVERVIEW OF THEORY

1. SES, WORK AND PSYCHOLOGICAL WELL-BEING

1) Socioeconomic Status and Psychological Well-Being

The positive relationship between SES and health is well-established. Moreover, as a public health issue, health inequality is not solely a problem of the poor; there is a consistent relative gap in health across all SES groups. Behavioral factors proximal to health might be determined by distal SES factors (Link and Phelan 1995, 1996, 2002). A number of mechanisms have been suggested to explain the persistent relationship between SES and health. For example, SES affects health behaviors (such as smoking, exercise, and diet), medical care usage (quality of care as well as accessibility to care), psychosocial resources (such as the sense of control and social support), and community or residential environments (Adler and Ostrove 1999; Evans 1994; Haan, Kaplan and Camacho 1987; Haan, Kaplan and Syme 1989; Kaplan 1996; Lantz et al 2001; Mirowsky and Ross 1998; Mulatu 2002; Robert 1999; Ross and Wu 1995; Seeman and Crimmins 2001; Waitzman 1998; Williams and Collins 1995). Health researchers need to pay attention to the role of SES as the fundamental cause of health behind these various mediating factors.

This study considers three dimensions of SES – education, occupation and income. Mirowsky and Ross (2003) described the critical role of education in producing health, emphasizing the benefits that accrue from the acquisition of human capital obtained through education. Although many studies have examined the effects of education on health, recent work suggests the necessity to study other dimensions of SES, such as income and wealth, as different dimensions of SES might show different patterns

in their relationship with various health outcomes (Benzeval and Judge 2001; Smith and Kington 1997; Williams and Collins 1995).

Although previous studies in this area mainly focused on physical health, this study examines depression and anxiety as health outcomes. The World Health Organization (WHO) defines health as “a state of complete physical, mental, and social well-being...”, emphasizing the multidimensional nature of health. Considering mental health as well as physical health provides a more comprehensive understanding of the relationship between SES and health over the life course.

Various SES factors have showed substantial associations with a variety of mental health outcomes. Educational attainment had a negative relationship with diagnosis by psychiatrists, such as schizophrenia, depression, anxiety, antisocial personality, and substance use disorders (Dohrenwend et al 1992; Miech et al 1999). In a longitudinal study (Wheaton 1978), occupational status, measured by Duncan’s SEI, also displayed a negative relationship with psychological symptomatology such as anxiety or depression. Another study showed that lower occupational status resulted in decline in mental functioning (Martikainen et al 1999). Furthermore, income had a beneficial effect on psychological well-being (Kessler 1982; Mirowsky and Ross 2003).

The relationship between SES and psychological well-being is often explained using the stress paradigm, which posits that differences in stress exposure and stress responsiveness account for SES differences in psychological well-being (Wheaton 1978). Studies in the 1970s gave attention to the hypothesis that higher distress of lower class individuals results from their greater exposures to stressful experiences (Myer et al 1972). However, Kessler and Cleary (1980) suggested that SES-differences in responsiveness to stress as a main mechanism of mental health disparity- differences in stress exposure by SES explained only a minor part according to their study. For example, lower class

individuals might be disadvantaged in psychosocial resources, and the difference in coping ability would result in the difference in psychological distress (Pearlin and Schooler 1978; Pearlin 1989). Two important coping resources have been suggested as mediators which link SES to mental health, and they are sense of control and social support (Aneshensel 1992; Thoits 1995; Turner and Noh 1983). Especially, sense of control largely explained the effects of income and education on depression (Ross and Mirowsky 1989). Although the prevailing view has emphasized the differences in vulnerability to stress across social status, Turner and colleagues (1995) underscored that SES differences in stress exposure might account for more variability in depression than previous reports have suggested. Finally, Ross and Van Willigen (1997) identified four primary mediators to explain the effect of education on emotional well-being: work and economic conditions (factors corresponding to stress exposure), and social support and the sense of control (factors corresponding to psychosocial resources).

2) Work Quality as a Social Condition and Psychological Well-Being

This study examines work quality as a SES-related condition to confirm its role in mental health inequality. Persons with more desirable work quality are expected to have better psychological well-being, and higher SES can cause more desirable work quality, constructing work as a structural condition close to SES even after retirement. In previous studies, better educational attainment (Ross and Van Willigen 1997), income (Cutler Riddick and Daniel 1984), and occupation (Colley 1985) resulted in better work characteristics. SES factors such as education and occupational status influence or restrict daily work quality, and work quality affects psychological well-being through diverse mediators such as sense of control, social support, social integration, self-esteem, and sense of self, as presented in previous studies below.

According to Ross and Van Willigen (1997), education leads to non-alienated work characteristics, and the work characteristics affect emotional well-being through sense of control and social support. Regardless of paid work or unpaid work, more nonroutine work and work involving more learning benefited psychological well-being because more desirable work qualities fostered sense of control and enhanced social support (Ross and Wright 1998). Employment status also influenced work qualities (Ross and Drentia 1998). In measures of nonroutine work and socially integrated work, full-time employees showed better status than others. In terms of fulfilling work, the employed or retirees showed the best work quality, and the unemployed or homemakers showed the worst quality.

Several studies examined occupational work condition's effect on mental health. Link and colleagues (1993) suggested that occupational DCP (direction, control, and planning) mediated between SES and depression. That is, higher SES (education and occupational prestige) was connected to occupations involving DCP. Occupations characterized by DCP facilitated the development of personal control, and the personal control became a buffer against stress and prevented major depression or distress. According to Kohn and Schooler (1973, 1982), occupational conditions such as self-direction or job pressure affected psychological functioning or distress. Occupational quality such as self-directiveness or work demands also influenced physical health through social integration, psychological control, and health behavior (Wickrama et al 1997). Work complexity in paid job decreased psychological distress, and possible mediators were self-esteem and sense of self (Reynolds 1997). In another study, self-esteem and job satisfaction explained the effect of work complexity on psychological distress (Pugliesi 1995). Finally, work-related social support also mediated the effect of working conditions on well-being among factory workers (Loscocco and Spitze 1990).

As reviewed above, many existing studies about work and mental health focused on paid-work area, excluding retirees or homemakers who might be affected more from their daily work quality. This study encompassed characteristics of unpaid work to capture their importance for mental health of the non-employed. Another limitation in using occupational characteristics rather than work characteristics is that aggregated occupation-level characteristics might not appropriately capture the actual experience of workers. Although work characteristics are self-reported subjective measures, work characteristics exhibit strong positive correlations with objective measures such as DOT (Dictionary of Occupational Titles) scores for work complexity (Ross 2000).

According to previous studies, qualities of unpaid work also have significant associations with psychological resources or well-being. Homemakers and retirees had lower sense of control (Ross and Drentea 1998) and higher distress (Lennon 1994) than the employed because of their more routine works. Work fulfillment also influenced sense of control in unpaid work area (Bird and Ross 1993; Kobasa, Maddi and Courington 1981). One example of unpaid productive activity is volunteer work, and many previous studies examined its relationship with psychological well-being and the mediating mechanisms (Van Willigen 2000). Volunteer work fostered psychosocial resources such as social integration and self-esteem, so lowered depression among the elderly (Musick, Herzog and House 1999; Musick and Wilson 2003). Especially, prolonged exposure to volunteering benefited their psychological well-being regardless of age groups. According to another longitudinal study, volunteer work enhanced happiness, life satisfaction, self-esteem, personal control, physical health, and it reduced depression over time (Thoits and Hewitt 2001). Leisure activity as well as productive activity needs to be taken into account in the study of unpaid activity's influences on mental health. According to one study with older female homemakers and retirees (Cutler

Riddick and Daniel 1984), leisure activity played a role as the most important predictor for life satisfaction. Another study (Reitzes et al 1995) for fulltime workers aged 58 to 64, demonstrated that frequency of leisure activities had a positive effect on self-esteem.

Finally, as a causality issue, the association between work qualities and mental health might contain the possibility of social selection (Kohn and Schooler 1982). However, in a study about the reciprocal effect (Kohn and Schooler 1973), work complexity had a decidedly greater impact on psychological functioning than the reverse. Another study about occupational DCP and mental health (Link et al 1993) also supported a social causation model over a social selection model. However, to deal with this causality issue, the individuals who showed severe depression or anxiety at baseline will be excluded in my latent growth models, which examine the effect of work quality change on mental health trajectory.

2. SES, WORK, AND LIFE-COURSE PATTERNS IN HEALTH

1) SES-based Life-Course Patterns in Health

Health status can be considered a lifelong process because health outcomes in later life are related to earlier life stages (Clipp, Pavalko and Elder 1992; George 2003; Halfon and Hochstein 2002; Moen et al 1992). Health inequality among the elderly can be viewed in part as a consequence of “lifelong differential opportunities and achievements,” or a cumulative process occurring over the life course (O’Rand 1995: 203). Previous research on the life-course relationship between SES and health or mortality remains equivocal. Two contrasting hypotheses are used to explain the two distinct life-course patterns, especially those observed in later life – the cumulative advantage hypothesis and the age-as-leveler hypothesis (Lynch 2003). The cumulative

advantage hypothesis was originally developed to explain the diverging gap in occupational achievement observed over the professional careers of scientists (Merton 1968), and has been more recently applied to the study of health as described earlier (Ross and Wu 1996).

The importance of studying heterogeneity in aging has been suggested in the area of health. For example, House and colleagues (1990) argue that Fries' theory of "compressed morbidity" is applied to only the higher SES group – their morbidity is postponed to later-old age, so compressed morbidity is possible (Fries 1980). However, the lower SES group's morbidity might not be postponed and compressed (Ross and Wu 1996).

The shift to convergence in health in old age found in certain studies is typically explained with the age-as-leveler hypothesis, which holds that later-life convergence by SES is the result of universal biological frailty in old age and government support to the elderly, such as Social Security and Medicare, which narrows the gap in economic resources in old age (Beckett 2000; House et al 1990; House, Lantz and Herd 2005). Following this hypothesis, socioeconomic disadvantages in risk factors such as health behaviors, stress, sense of control, and social support accumulate throughout most of adulthood but diminish due to universal biological frailty, retirement, and government support in later life. However, Dannefer (1987) argued that the equalizing effect of social welfare was limited and did not overcome the SES-based inequality among the elderly. This argument was supported by the work of Crystal and colleagues (1992), who found that the effect of education on income did not diminish among the elderly.

Although previous studies have focused on physical health, the life-course pattern between SES and mental health should be examined in order to understand potential variations in health disparity across various health outcomes. Although several studies in

the stress paradigm explained the SES-based gap in mental health with differences in stressful life events (Turner et al 1995), only a few studies have examined the life-course pattern (i.e., an age interaction) between SES and mental health as their primary research topic. Using cross-sectional data, Miech and Shanahan's study (2000) found an education-based consistent diverging gap in depression over the life course, and Schieman's (2001) study also found a cumulative advantage of education in the sense of control over the life course. My study examines the life-course pattern in depression with respect to income as well as education, using a longitudinal framework.

Next, the explanations for the life-course pattern between SES and health can possibly be applied to the relationship between work quality and psychological well-being over the life-course. The present study expects the results of support for the consistent divergence pattern or the cumulative advantage hypothesis. Work quality as a structural condition can make accumulation of resources or risk factors such as sense of control, self-esteem, social support, and stress. In addition to the mechanism of cumulative advantage, work quality might also have interactions with later-life conditions such as retirement or widowhood. Work quality or its mediators to psychological well-being might become more important resources for their psychological well-being when they are in certain disadvantaged conditions such as non-employed or widowed status. That is, work quality might show stronger association with psychological well-being in later life because of the prevalence of non-employed or widowed status in older adults. This resource substitution hypothesis also supports the life-course divergence pattern over the later-life convergence pattern in the relationship between work quality and psychological well-being.

2) A Life-Course Perspective: Dynamic Relationship between Work Quality and Psychological Well-Being

The life-course perspective emphasizes the temporality of experiences (Elder and Johnson 2002; George 2003).

Our results illustrate more general usefulness of applying a life-course perspective to study the relationship between social structure and individual responses. The effects of structural conditions on individual well-being unfold in ways that may not be represented adequately by cross-sectional or traditional panel methods... The life-course conceptualization, which distinguishes the stable and dynamic components of both structures and responses, may have broader applicability in studies of stratification and life stress. (McLeod and Shanahan 1996: 216-217)

With following the suggestion of McLeod and Shanahan, my study examines the dynamic relationship between work and psychological well-being – persistent, rising, and falling work quality might generate different trajectories of depression or anxiety, respectively. Moreover, work qualities measured at one time point may be a poor marker for an individual's work condition in certain life stage. According to studies focusing on the dynamic nature of people's experiences with income or economic hardship, long-term income was more consequential to health than current income, and persistent economic hardship was more harmful to health than occasional one (Benzeval and Judge 2001; Duncan 1996; Lynch, Kaplan and Shema 1997). This study also takes into account persistence of work quality.

According to McDonough and Berglund (2003), the relationship between poverty and health remains poorly understood, partly because they are usually conceptualized in static terms. Both poverty and health need to be temporalized to examine the dynamic relationships such as falling into poverty, going through poverty, getting out of poverty, and changing health status. In the results of this dynamic approach, those who were persistently poor showed worse health or health change, compared to persons who

experienced transient poverty or no poverty (McDonough and Berglund 2003; McLeod and Shanahan 1996). Those who experienced persistent economic hardship or new economic hardship showed worse change in depression than those who experienced no hardship or resolved economic hardship (Mirowsky and Ross 2001). In addition to examining the dynamic relationship between work quality and psychological well-being, this study's another main interest is to examine the possible differential effect of the work change patterns on psychological well-being across different age groups. For example, do improvements in work quality benefit psychological well-being in all age groups or in only certain age groups? Likewise, do declines in work quality degrade psychological well-being in all age groups or more so in younger age groups? These questions should be answered in this study.

3. THE MECHANISMS OF LIFE-COURSE DIVERGENCE IN PSYCHOLOGICAL WELL-BEING

1) The Mechanism of Cumulative Advantage

This study intends to look at the lifelong effect of formal education, which is typically accomplished in early life-course, so it corresponds to “the principle of lifelong development and aging” in the life-course perspective. According to Elder and Johnson (2002), “behavior cannot be fully explained by restricting analysis to a specific life stage in question” (57). This principle suggests the necessity to study well-being in later life as linked to earlier life stages. According to Reynolds and Ross (1998), education has a positive effect on adult well-being through skills and knowledge learned in school as well as daily work characteristics and economic status. Schooling fosters psychological resources such as sense of control, cognitive flexibility, or general coping ability, and

these affects positively well-being in later life. Income as well as education might generate health divergence through cumulative advantage or disadvantage. Earlier experience of economic difficulty might also have negative cumulative effects on well-being in later life through changing current life-circumstances or through a direct effect which is not captured by current circumstances (Crosnoe and Elders 2002).

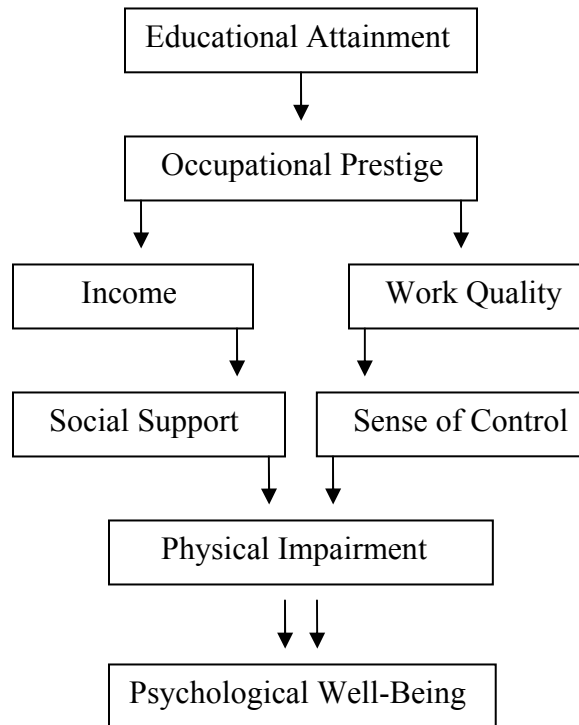
The changing relationship between SES and psychological well-being with age remains largely unexamined in previous research, but Miech and Shanahan (2000) confirmed the diverging gap in depression with respect to education over the adult life-course and examined several mediators. They took into consideration coping resources such as sense of control and social support, late life stressors such as retirement and widowhood, and chronic strains such as physical health problem and economic strain. They examined the exposure differences of the mediating factors, but they did not take into account the impact differences of the factors. In the results, physical impairment explained most of the diverging education-gap in depression. It implies that the diverging education-gap in physical impairment with age mainly explained the diverging gap in depression.

Additionally, as a causality issue, there might be mutually reinforcing relationship between physical impairment and depression (Mirowsky and Ross 2003). A study (Farmer and Ferraro 1997) showed the reciprocal relationship between physical health such as perceived health and psychological distress, which created a vicious cycle of deterioration in both mental and physical health outcomes. Physical disability increases the risk of depressive symptoms, and it represents a continuing chronic strain (Turner and Noh 1988).

Figure 2.1 arranges the factors examined in this study – from distal cause to proximal cause of mental health. One of the main interests in this study is to reveal the

mechanisms of diverging mental health gap over the life course, so the mediators in Figure 2.1 are also considered candidates to explain the age interaction (i.e., divergence).

Figure 2.1: Conceptual Model of SES, Work, and Their Mediators to Psychological Well-Being; Distal Cause to Proximal Cause of Psychological Well-Being.



Note: More distal cause (in higher position) is supposed to affect all the mediators (in lower position) and psychological well-being; for simplicity, many arrows which should represent causal relationships are omitted in this figure.

These mediators can influence the age interaction through two mechanisms. One is the mechanism of cumulative advantage. Social conditions such as SES and work affect mediators and generate diverging gaps in the mediators over the life course – higher socioeconomic status creates cumulative advantages in the mediators to mental health. The diverging gaps in mediators generate the diverging gap in mental health. For example, the difference in educational attainment might increase the difference in sense

of control or physical impairment through cumulative advantage over the life course. These diverging gaps in mediating resources or risk factors might explain the education-based mental health divergence over the life-course. The method to confirm this mechanism is to check how much the interaction effect is reduced when each mediator is added in each regression model. Miech and Shanahan (2000) used same method to reveal the contributions of five mediators for the age interaction between education and depression. In their results, only physical impairment explained the diverging gap in depression over the life course.

2) The Mechanism of Resource Substitution

Another mechanism, resource substitution, is introduced in this study with theoretical sophistication to explain the mental health divergence although House and colleagues (1994) employed a similar method. The mental health divergence with respect to a social condition might be explained by “impact difference” of each mediator across the life stages. The mediating resources might have stronger effects on health in certain disadvantaged status related to age or life stage. According to Mirowsky and Ross (2003), certain resources have stronger effects on health in certain disadvantaged status, and it is called the “resource substitution hypothesis”. Through providing bigger benefits on health, certain resources effectively substitute other resources in certain disadvantaged condition in which other resources lack. For example, education’s effect on depression is different between male and female. In female as a disadvantaged gender status, education as a resource had a stronger effect on mental health (Ross and Mirowsky 2006). This study applies this general theory of “resource substitution” to disadvantaged statuses related to life-stage such as employment status and marital status.

Two main disadvantaged statuses related to older ages or later life are non-employed status such as retired status, and non-married status such as widowed status. For example, the greater mental health gap in older ages with respect to occupational status might be the result of that the effect of personal control on mental health becomes stronger in older ages. And, the stronger effect of personal control in older ages might be explained by that the effect of personal control on mental health increases in retired or widowed status. Occupational status positively affects personal control, and age increases the probability of retired or widowed status, so the interaction of occupational prestige and age might be explained by personal control and retired/widowed status. The method to confirm this mechanism is to check how much the interaction effect between occupational prestige and age is reduced by adding the interaction between personal control and age, and the next step is to check how much the interaction of personal control and age is explained by adding the interactions between personal control and retired/widowed status. All other mediating resources in Figure 2.1 will be examined to confirm their roles in the resource substitution mechanism with the same procedure as above for each SES or work factor.

Work-based gap in mental health might also show divergence partially due to the resource substitution mechanism – stronger effect of certain work-related mediators in later life. According to Ross and Wright (1998), daily work characteristics strongly affect sense of control, an important buffering resource for mental health, and sense of control might play a more important role in later life- it has a large impact on physical and psychological well-being among the elderly (Rodin 1986).

In addition, retirees should substitute new roles and meaningful activities for those lost with occupation to maintain a positive sense of self (Herzog and House 1991; Passuth and Bengston 1988). Therefore, desirable daily activity after retirement might

have special importance in keeping a positive self-image and improving psychological well-being among the elderly. According to one study conducted by Cutler Riddick and Daniel (1984) on older female homemakers and retirees, leisure activity played a role as the most important factor to predict life satisfaction. Leisure activities as well as productive activities might be important for the psychological well-being of the elderly (Reitzes et al 1995). In sum, the effect of work quality on psychological well-being might become stronger in later life when retirement become prevalent because the work-related psychological resources such as sense of control, self-esteem and positive sense of self might play a more important role for psychological well-being in retire-hood.

4. AGING-VECTOR APPROACH AND INTER-COHORT TRENDS

1) Mortality Selection and Inter-Cohort Trends

Mortality selection bias may account for some of the later life convergence in health found in previous cross-sectional studies (Beckett 2000; House et al 1994). Because the most fragile or depressed elderly adults, a majority of whom are of lower SES, are more likely to die or to not participate in a survey, SES differences in health may appear smaller in later life. In growth curve modeling, individuals who die or drop out of a sample during the course of the study do not need to be omitted from growth curve analysis; their health trajectories can still be estimated using the available information (Lynch 2003). Therefore, growth curve modeling might reduce mortality selection bias although the possibility should still be assessed. At the end of chapter five, I will examine and evaluate the possibility of mortality selection bias and the potential influence on main findings in this study.

As noted earlier, this study's another hypothesis to be evaluated is that there might be inter-cohort trends in the effect of education on health. Studying the effect of education on mortality over thirty years from 1960 to 1990, Lauderdale's (2001) work indicated that each 10-year birth cohort demonstrates a larger effect of education on survival than do earlier cohorts of the same age, suggesting the increasing importance of education on survival in more recent cohorts. Additional studies also report this same cohort pattern in the relationship between education and health or mortality (Feldman et al. 1989; Lynch 2003).

Increasing structural inequality might explain the stronger effect of education on health in more recent cohorts through the increasing effects of educational credentials to produce inequalities in occupation, income, and access to health care (Lynch 2003; Williams and Collins 1995). In other words, the better educated recent cohort might have better social conditions and resources for health than did the better educated earlier cohorts. The increasing value of human capital derived from education might also explain the increasing importance of education in more recent cohorts. Moreover, differences in health or medical knowledge by level of education might be greater in more recent cohorts (Lauderdale 2001; Mirowsky and Ross 2003). The better-educated within recent cohorts may be both more knowledgeable and proactive in maintaining or improving their health than did the better-educated within earlier cohorts.

2) Hypothetical Aging-Vectors: The Example of Health Inequality

My latent growth-curve modeling and aging-vector graphs utilized in this study share some similarities with cohort sequential design (Nesselroade and Baltes 1979) or accelerated longitudinal design (Johnson and Raudenbush forthcoming; Miyazaki and Raudenbush 2000; Raudenbush and Chan 1992). Each approach utilizes multiple cohorts

to examine long-term patterns or trajectories of an outcome with relatively short-term panel data. Especially, accelerated longitudinal design has been developed to reveal pure aging patterns in certain developmental life-stage such as childhood, aggregating the overlapped trajectories of multiple birth cohorts. Bell (1953) originally developed the idea of linking together the changes observed for multiple cohorts. Within this approach, a lack of significant differences between cohorts at overlapped ages is called “convergence.” My approach to the study of SES-based trajectories in physical impairment and depression shares this idea although I have interest in much longer life-course patterns covering adulthood and there is a difference in the way to confirm the “convergence”.

In addition, I use vectors (linear approximations of the changes over follow-up time) to effectively demonstrate in graphical form (aging-vector graph) the patterns in health over the adult life span (McArdle, Ferrer-Caja, Hamagami and Woodcock 2002; Mirowsky and Kim forthcoming; Mirowsky and Reynolds 2000). Another advantage of the aging-vector design is that it provides a graphical means by which I may evaluate inter-cohort trends in health or other outcomes. The “convergence” between cohorts is not always guaranteed. For many topics, we might find different age-specific levels of a given outcome between cohorts, and the inter-cohort trend itself might be an important research topic (Mirowsky and Kim forthcoming). For example, in this study, I assess potential inter-cohort trends that favor the better-educated in health outcomes, as suggested by previous studies (House, Lantz, and Herd 2005; Lynch 2003).

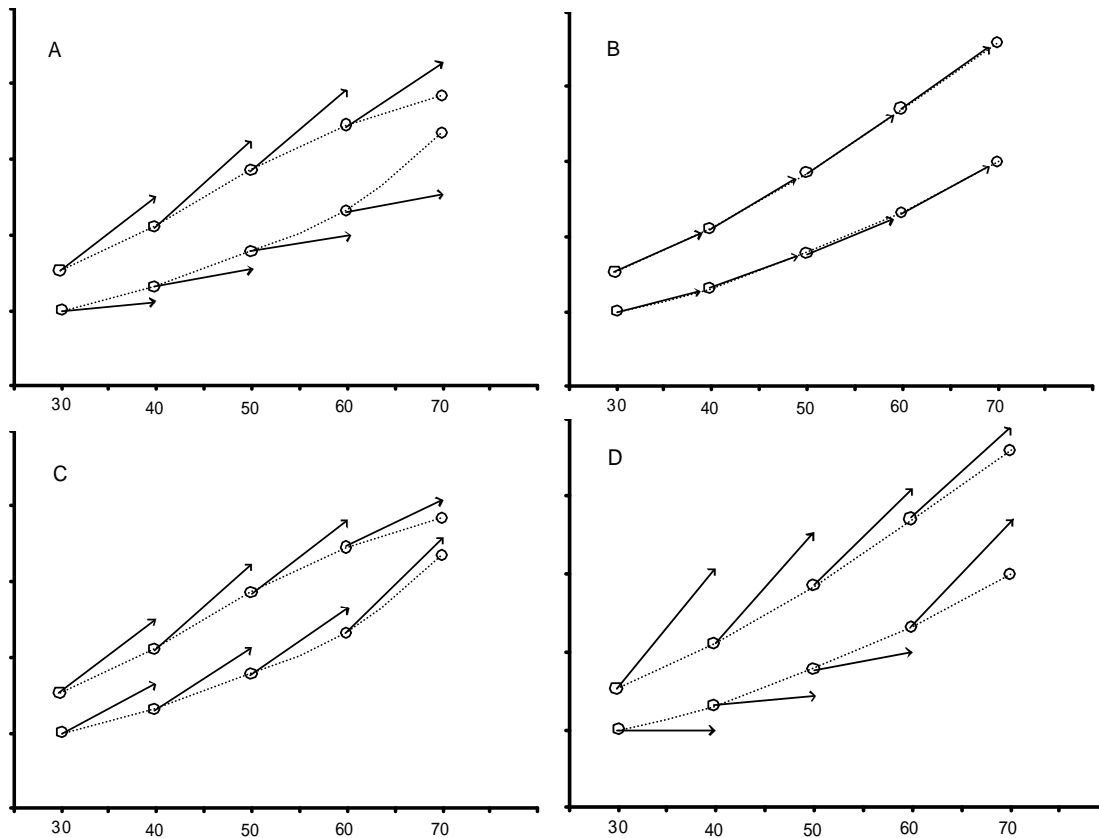
Figure 2.2 illustrates four hypothetical sets of aging vectors with the same set of origins on two types of cross-sectional curves. The vectors represent the predicted values from a hypothetical 10-year study. To simplify presentation, the graphs show only every 10th vector. Each graph shows the differences between two groups in aging vectors and

cross-sectional curves. Corresponding to this study's interest of SES differences in health over the life course, the Y-axes of the graphs represent physical impairment, the X-axes represent age, and the two groups in the graphs might represent college graduates (the lower vectors and the lower cross-sectional curve) and persons with less than a high school degree (the higher vectors and the higher cross-sectional curve). Consistent with previous research, both the cross-sectional curves and the aging vectors in these graphs illustrate a pattern of decline in functional health with increasing age.

Mathematically speaking, vectors of change need not correspond to the shape of a cross-sectional curve. Panel A shows an example of partial inconformity between the cross-sectional pattern and the pattern of aging-vectors. The cross-sectional results indicate a diverging to converging pattern, while the aging-vectors suggest diverging gaps across all adult age groups, supporting the cumulative advantage hypothesis. Inter-cohort trend differences between the two SES groups indicate that the high SES group enjoys a favorable trend across all age groups (the arrowheads are below the circles at all ages). For example, let's compare levels of the outcome between the cohort who is age 60 at baseline (marked by the circle) and the cohort who is age 60 at the end of the survey (marked by the arrowhead) among the high SES group located in the lower side. The 10-year newer cohort demonstrates a lower age-specific level of the outcome (i.e., better health) at the same age, implying a favorable trend for the old age group (the arrowhead is below the circle at age 60). In contrast, an unfavorable trend exists for the low SES group across all age groups (the arrowheads are above the circles at all ages).

In general, we can expect corresponding patterns between cross-sectional curves and aging-vectors because cross-sectional results tend to primarily reflect age difference as well as cohort fluctuation. Panel B shows an example of perfect conformity between cross-sectional curves and aging vectors (similar to Bell's convergence). The cross-

Figure 2.2. Aging-Vector Graphs by Social Status Illustrating Four Hypothetical Sets of Aging Vectors with the Same Set of Origins on Two Types of Cross-Sectional Curves over a 10-Year Followup.



Note: X-axis represents age, and Y-axis represents physical impairment in our study.

sectional curves are exactly overlapped with aging-vectors in all age groups, supporting consistent divergence over the life course. There is no trend (i.e., no cohort or period effects), so for the same age, there is no difference in health between two 10-year interval birth cohorts. If we find this kind of conformity, the trajectories represent pure aging process because there is no cohort or period effect – in this case, the age effect is disentangled from cohort or period effect. As mentioned earlier, one advantage of this design is to provide a composite image of long-term life-course patterns using relatively

short-term panel data. As shown in panel B, the connected aging-vectors provide the image of health trajectory over the entire adulthood due to pure aging process.

For many research topics, cross-sectional patterns are likely to have a certain degree of conformity with those of the aging-vectors, but not perfect conformity, reflecting a certain degree of inter-cohort trends. In panel C, although there is a trend effect, the cross-sectional life-course pattern (divergence to convergence) corresponds to that of the aging-vectors (diverging vectors to converging vectors). In this example, the direction of the trend effect is the same for all age-SES groups – an equivalent unfavorable trend for all the groups (the arrowheads are above the circles with the same distance). This case implies two things. First, the pattern of divergence to convergence over the adulthood supports the age-as-leveler hypothesis. Second, absolute level of health will decline even further in the future if the current trend disfavoring all the groups is sustained.

In panel D, the cross-sectional pattern shows consistent divergence, while the aging-vectors show a diverging to converging pattern. The cohort trend is different across age-SES groups – the trend disfavors the low SES group, particularly for young- and middle-aged adults, and favors the high-SES group for young- and middle-aged adults but not old adults. The trend favoring the high-SES group and disfavoring the low-SES group is consistent with recent studies that find that the effect of education on health is stronger in more recent cohorts. The phrase “more recent cohorts” should be distinguished from “young age groups” in this study. In this example, more recent cohorts refer to 10-year newer cohorts in all the age groups, and young age groups refer to young adults at baseline.

5. SUMMARY OF RESEARCH QUESTIONS

Chapter four, five, and six constitute the main analyses in this study. The analyses in chapter four have two specific aims. One is to confirm the relationship between various social factors and mental health over the adult life-course with a cross-sectional approach. The other is to reveal the mechanisms to explain the life-course pattern. I intend to answer four specific questions: (1) Does the life-course pattern of psychological well-being with respect to various social factors show consistent divergence? (2) What factor has the strongest age interaction (i.e., the most diverging pattern) out of three SES factors and three work quality factors? (3) Is the diverging gap over the life course explained by the two mechanisms of cumulative advantage and resource substitution? (4) Which mechanism out of cumulative advantage and resource substitution explains more dominantly the life-course pattern of each social factor, respectively?

The aim of chapter five is to examine the SES-based life course patterns in health with a longitudinal approach. Although this study's main interest is in mental health, the patterns of physical impairment will be also examined in this chapter because physical impairment is the most important mediating factor in the process of cumulative advantage in mental health. In the study of Miech and Shanahan (2000), the education-based divergence in depression was mostly explained by the divergence in physical impairment. I intend to answer four specific questions: (1) Does health diverge over the follow-up period across levels of education and income for all adult age groups, supporting the hypothesis of cumulative advantage? Or, does it diverge for the young- and middle-aged adults but converge for old adults, supporting the age-as-leveler hypothesis? (2) Are there different patterns for physical and mental health? (3) Do the patterns differ for education and income? (4) Is the overall trend pattern consistent with the notion that education is

becoming increasingly important to health outcomes (mental health as well as physical health) in more recent cohorts?

Chapter six's aim is to examine the effects of temporal patterns of work quality on individual's mental health trajectories over time, taking into consideration the age interaction in the dynamic relationships. I intend to answer five specific questions: (1) Does socioeconomic status positively affect paid/unpaid work quality? And, does more fulfilling or nonroutine work quality benefit mental health measured by depression and anxiety? (2) Does stable good work quality over time result in cumulative advantage (divergence) in mental health regardless of age or life-stage, compared to the stable bad work group? (3) Do persons who experience decline in work quality have increasing disadvantage in mental health? (4) Do persons who experience improvement in work quality have increasing advantage in mental health? (5) Finally, do the relationships between different health outcome (depression and anxiety) and different work quality (fulfillment and complexity) show different patterns?

CHAPTER 3: DATA, MEASURES, AND METHODS

1. DATA

1) Aging, Status and Sense of Control Survey

This study depends on data from the survey of Aging, Status, and the Sense of Control (ASOC). ASOC is a national telephone probability sample of 2,592 U.S. households. The first wave of interviews was completed at the beginning of 1995. Sampling, pretesting, and interviewing for the surveys were conducted by the Survey Research Laboratory of the University of Illinois (SRL-UI). A pre-screened random-digit dialing method was used in selecting respondents. The survey was limited to English-speaking adults, and interviews were completed with 71.6 percent of contacted and eligible persons.

ASOC survey has two subsamples designed to produce an 80 percent over-sample of people aged 60 or older at baseline. Of 2,592 respondents, ranging in age from 18 to 95 at baseline, 58 percent were under age sixty (N=1,496) and 42 percent were sixty years old or older (N=1,097). Tables, figures, and text report results for the entire unweighted sample, unless otherwise noted. The oversample of seniors does not bias results because age is an independent variable in all of my models (Winship and Radbill 1994). The demographic characteristics of the baseline ASOC sample match those for the U.S. adult householder population reasonably well (U.S. Bureau of the Census 1995).

For the cross-sectional analyses (chapter four), the data from 1995 survey are used. For the longitudinal analyses in chapter six, the three waves of ASOC data from 1995, 1998, and 2001 are used. Follow-up surveys inevitably lose cases for a variety of reasons. The ASOC survey utilized several procedures to reduce sample attrition. The

three waves of ASOC data can be classified exclusively with four groups by follow-up status. The first group is composed of 907 respondents (35.0 percent) who stayed in all the three waves, and the second represents 470 respondents (18.1 percent) who participated in the first and the second surveys. The third group is composed of 237 respondents (9.1 percent) who participated in the first and the third surveys, and the fourth represents 978 respondents (37.7 percent) who stayed in only the first wave. There were extra efforts to recover wave-2 dropouts. Of the persons not interviewed in the second wave, 19.4 percent were interviewed in the third wave. This helped increase the fraction of individuals who provided follow-up information to 62.3 percent overall (1,614 respondents).

All the latent growth-curve models (LGM hereafter) used in chapter six exclude the respondents who did not provide any follow-up information (the fourth group above). The models include the second and the third groups who have partial missingness in the outcome variables (depression or anxiety) of wave two or three. Structural equation modeling provides methods to deal with partial missingness (Duncan et al 1999). This study uses an effective correction method for sample attrition, multiple model-based imputation (MMBI hereafter) using Expectation Maximization (EM hereafter) algorithm (Allison 2001; Little and Rubin 2002).

Finally, to deal with the issue of reverse causality in the relationship between work quality and mental health, each LGM restricts the sample to individuals who were not in severe depression (whose depression level is less than four; 1,559 cases out of 1,614) or severe anxiety (whose anxiety level is less than six; 1,523 cases out of 1,614) at the time of their first interview, respectively.

2) Americans' Changing Lives Survey

The Americans' Changing Lives (ACL) survey provides a longitudinal data set based on a nationally representative sample of non-institutionalized adults aged 25 and older in 1986. Sampling, interviewing, and coding for the surveys were conducted by the Survey Research Center of the University of Michigan. Information was obtained through face-to-face interviews with each respondent or a proxy respondent. The overall response rate at baseline was 68 percent. The initial multistage stratified area probability sample contained 3,617 adults with 100 percent oversamples of blacks and those aged 60 or older. As recommended by the ACL study team, all analyses are adjusted by the final centered post-stratification weight, which takes into account non-response as well as the sample design. The weighted sample maintains the original sample size and corresponds to the July 1986 Bureau of the Census population estimates by sex, age, and geographic region.

This study utilizes three waves of data collected in 1986, 1989, and 1994. Attrition due to death ($n=177$ in Wave II and $n=542$ in Wave III) and non-response ($n=573$ in Wave II and $n=513$ in Wave III) may lead to differences between the sample and the population it is intended to represent. The three waves of ACL data can be classified with four exclusive groups by follow-up status. The first group is composed of the 2,348 respondents (65 percent) who participated in all the three waves. The second group represents 519 respondents (14 percent) who participated in the first and the second surveys. The third group is composed of 214 respondents (6 percent) who participated in the first and the third surveys, and the fourth represents 536 respondents (15 percent) who participated in only the first wave. Using an effective missing data imputation method (MMBI-EM), the LGM estimated in this study includes all the four groups.

2. MEASURES

1) ASOC Measures for Cross-Sectional Analyses

For psychological well-being, depression and anxiety are examined. *Depression* is measured with a form of the Center for Epidemiological Studies' Depression Scale (CES-D) reflecting depressed mood and physiological malaise (Radloff 1977). Respondents were asked, "On how many days in the past week have you" (1) "had trouble getting to sleep or staying asleep," (2) "felt you just couldn't get going," (3) "had trouble keeping your mind on what you were doing," (4) "felt that everything was an effort," (5) "felt sad," (6) "felt lonely," (7) "felt you couldn't shake the blues." The depression scale is the square root of the mean response to the seven items. *Anxiety* includes how many of the past seven days the respondent (1) worried a lot about little things, (2) felt tense or anxious, and (3) felt restless. The anxiety scale is the square root of the mean response to the three items.

For SES, *education*, *occupational prestige*, and *family income* are examined. Years of schooling is coded into a dummy variable representing individuals with a college degree. Occupational prestige variable is composed of two variables, prestige of current occupation and that of last occupation. 1,308 (50.5%) respondents reported their current occupation (full-time or part-time), and 1,111 (43.1%) respondents reported the most recent full-time job because they are not currently employed. Number of missing cases is 166 (6.4%). The occupational prestige variable (scores from NORC/GSS '89 codes) is coded into a dummy variable representing individuals over the mean prestige score. Family income variable represents one's total household income in 1993 before taxes. Seventy one percent reported their family income. The other 29% were asked a

series of questions which allowed an estimation of their income range within \$10,000 intervals. Then these respondents were assigned the income-range midpoint. Another 17% of sample was added with this procedure. Finally, number of missing case is 316 (12.2 percent). The income variable is coded into a dummy variable distinguishing individuals over the mean family income (\$42,427).

For the measures of work quality, *fulfilling work* is the mean response to two indicators. The first indicator is measured by agreement (4-scaled) with the statement for work or activity they mostly do in a day, “My work (daily activities) gives me a chance to do things I enjoy.” The second indicator is “My work gives me a chance to develop and to learn new things.” *Nonroutine work* variable is the sum of two indicators’ Z-scores. The first indicator is whether the work or daily tasks involve (1) “Doing the same thing in the same way repeatedly,” (2) “Doing the same thing in a number of different ways,” or (3) “Doing a number of different kinds of things.” The second indicator is “In my work (daily activities), I have to figure out how to solve problems.” Responses included (1) strongly disagree (2) disagree (3) agree (4) strongly agree. *Socially interactive work* is measured by “My work (daily activities) gives me a chance to interact with people I like.” Responses included (1) strongly disagree (2) disagree (3) agree (4) strongly agree.

For other variables to reveal the mechanisms of age interactions, *social support* is the mean response to four indicators representing emotional and instrumental support; (1) “I have someone I can turn to for support and understanding when things get rough” (2) “I have someone I can really talk to.” (3) “I have someone who would help me out with things.” (4) “I have someone who would take care of me if I were sick.” Responses are “strongly disagree” (coded 1), “disagree” (2), “agree” (3), and “strongly agree” (4). *The sense of control* is the mean response to eight indicators; a) claiming control about success- i) “I am responsible for my own success.” ii) I can do just about anything I really

set my mind to.” b) claiming control about failure- i) “My misfortunes are the results of mistakes I have made.” ii) I am responsible for my failure.” c) denying control about success- i) “The really good things that happen to me are mostly luck.” ii) There is no sense planning a lot-if something good is going to happen it will.” d) denying control about failure- i) “Most of my problems are due to bad breaks.” ii) I have little control over the bad things that happen to me.” Responses are coded so that -2 = strongly disagree, -1 = disagree, 0 = neutral (don’t know), 1 = agree, and 2 = strongly agree (Items in c and d are recoded reversibly). *Physical impairment* is measured by 7 items of “How much difficulty do you have: going up and down stairs? kneeling and stooping? lifting or carrying objects less than 10 pounds? using your hands or fingers? seeing, even with glasses? hearing? and walking?” I coded the responses 2 for a great deal of difficulty, 1 for some difficulty, and 0 for no difficulty. Physical impairment is the mean responses to all the seven items.

For disadvantaged status related to life stages, employment status and marital status are considered. The original employment status variable is coded into two dummy variables, *the retired and other non-employed* (homemakers, etc.). The reference category is the employed (full-time or part-time). The original marital status variable is coded into two dummy variables, *the widowed and other non-married* (the never-married, the divorced, etc.). The reference category is the married. For control variables, *female* (a dummy variable) and *white* (a dummy variable which indicates self-identified Caucasian) are used. Finally, *age* is measured by asking respondents their year of birth, and then calculating age as the interview year (1995) minus the birth year.

2) ASOC Measures for Longitudinal Analyses

For psychological well-being, depression and anxiety are examined. The seven items to measure *Depression* are same with those for the cross-sectional analyses. The

depression scale is the mean response to the seven items. The score represents the individual's average number of days per week per symptom. Alpha reliability of the scale is .82. The multi-indicator latent growth models for depression group the 7 items into two subscales: *sadness* is the mean response to items 5, 6 and 7; and *malaise* is the mean response to items 1, 2, 3, and 4. The three items to measure *Anxiety* are same with those for the cross-sectional analyses. The anxiety scale is the mean response to the three items. Alpha reliability of the scale is .78. The multi-indicator latent growth models for anxiety use each item as a subscale.

For work quality, fulfilling work and nonroutine work are examined. *Fulfilling work quality* is the mean response to three items. This measurement is based on existing studies which measured fulfillment in contrast with estrangement (Bird and Ross 1993; Lowe and Northcott 1988; Ross and Drentea 1998). The first item is measured by agreement (4-scaled) with the statement for work or activity they mostly do in a day, "My work gives me a chance to do things I enjoy." The second indicator is "My work gives me a chance to develop and to learn new things." and the third is "My work gives me a chance to interact with people I like." *Nonroutine work quality* is the sum of Z-scores of two items which measure work complexity and the degree of problem solving. This measurement is based on existing studies which measured nonroutine work characteristics (Bird and Ross 1993; Ross and Drentea 1998). The two items are same with those used for the cross-sectional analyses.

In order to classify the temporal patterns of work quality over 6 years of the survey, three dummy variables for each work quality dimension are generated in order to distinguish the stable good work quality, stable bad work quality, falling work quality, and rising work quality. The first dummy variable (*higher work quality*) represents respondents above the median fulfilling (or nonroutine) work quality at baseline. The

second variable (*rising work quality*) represents respondents who moved from below the median work quality at baseline to above the median work quality in the last valid wave. The third variable (*falling work quality*) represents respondents who moved from above the median at baseline to below the median in the last valid wave. The combinations of the first variable and the second or the third variable can specify the two stable work quality groups – the stable good work group represents respondents above the median at baseline and in the last valid wave, and the stable bad work group represents respondents below the median in the first wave and in the last valid wave as to how fulfilling (or nonroutine) their work is.

For control variables, *female* (a dummy variable), *white* (a dummy variable which indicates self-identified Caucasian), *education* (years of schooling or college degree), and *occupational prestige* of current or last occupation (scores from NORC/GSS '89 codes or a dummy variable which indicates respondents over the mean score) are considered. Finally, the relationship between *age* and depression is known as curvilinear (U-shaped curve), so age squared term will be added in relevant models (Haug et al 1984; Newmann 1989; Mirowsky and Ross 1992; Turner and Lloyd 1999; Schieman, Van Gundy and Taylor 2001). Each age term is modeled as the deviation from age 45, which is a value close to the mean age in the U.S. adults. This centering method reduces multicollinearity. This age variable (in the first interview) represents not only birth cohorts but also respondents' life stage at the starting point of health trajectories over 6 years in latent growth modeling of chapter six.

3) ACL Measures

For physical impairment, two functional health measures are examined. The multi-indicator LGM uses each measure as a subscale for a latent factor of physical

impairment. Respondents' *functional impairment* subscale is reconstructed from the 6 items: (4) Most severe level = respondents who are currently confined to bed or a chair or who have a lot of difficulty bathing or cannot bathe, (3) Moderately severe = respondents who have a lot of difficulty climbing stairs or cannot climb stairs or have a lot of difficulty walking or cannot walk but are not in the previously defined level, (2) Least severe level = respondents who have a lot of difficulty doing heavy housework or cannot do heavy housework but who are not in the two previously defined levels, (1) No functional impairment = respondents answered no to all of the functional impairment questions. For another subscale, *activity limitation*, respondents were asked to evaluate how much their daily activities are limited in any way by their health or health-related problems (5) a great deal, (4) quite a bit, (3) some, (2) a little, or (1) not at all. Cronbach's alpha of these two subscales is .798. The two subscales have very skewed distributions. If data are not normally distributed, EQS 6.1 provides the robust option that corrects the chi-square and standard errors for nonnormality in its maximum likelihood (ML) estimation (Bentler 2003; Yuan and Bentler 2000). My models for physical impairment employ this correction method in estimation.

Depression is measured with seven items from the Center for Epidemiological Studies' Depression Scale (CES-D) (Radloff 1977). Respondents were asked to evaluate how frequently in the past week they (1) felt depressed, (2) felt sad, (3) felt lonely, (4) had restless sleep, (5) had a poor appetite, (6) felt that everything was an effort, and (7) felt they could not get going. Items are coded from 1 to 3, with higher scores indicating greater frequency: (1) hardly ever (2) some of the time (3) most of the time. The multi-indicator LGM groups the items into two subscales: (1) *sadness* is the mean response to items 1, 2, and 3; (2) *malaise* is the mean response to items 4, 5, 6, and 7. Cronbach's alpha of these two subscales is .739.

Education indicates the highest year of formal schooling completed through 1986. The original variable is coded into two dummy variables representing respondents with a college degree (14%) and those with a high school degree but no college degree (49%), with those who did not complete high school (37%) serving as the reference group. *Family income*, which is one's total annual household income before taxes in 1986, was collapsed into a ten-point ordinal variable. The ACL team imputed values for 311 missing cases and recommended using the imputed income variable for most purposes. The ACL team conducted this imputation by matching cases with missing income to donor cases, based on education level, marital status, employment status, occupation, and homeownership status. The income variable is coded into two dummy variables representing respondents in the highest third (greater than \$25,000), the middle third (between \$10,000 and \$25,000), with the lowest third serving as the reference group.

Female is a dummy variable that equals 1 for females and 0 for males. *White* is coded 1 if the respondent self-identified as white or Caucasian and 0 otherwise. *Age* is modeled as the deviation from age 45, which is a value close to the mean age in the U.S. adults (in 1986). Any other values can also be chosen, depending on researcher's preference in interpretations, and a main purpose of this centering method is to reduce multicollinearity. This age variable at baseline represents not only birth cohort but also respondents' life stage at the starting point of health trajectories over 8 years. Because the relationship between age and physical or mental health might be curvilinear, age-squared terms are added to relevant models (Mirowsky and Ross 1999; Ross and Wu 1996).

3. METHODS

1) Methods for Cross-Sectional Analyses

The analyses in this study proceed in two steps. First, curvilinear multi-regression using an optimal model confirms the significance of moderating effect of age in the relationship between SES and mental health. The two mental health outcomes, depression and anxiety are variables positively skewed severely, so square-root transformation is used. The relationship between age and depression is known as curvilinear, so age squared and age cubic terms are taken into account in models. Each age term is modeled as the deviation from age 45, which is a value close to the mean for U.S. adults. It gives easy interpretation for the intercept, which represents the prediction for persons aged 45. This centering method also reduces multicollinearity. For each SES or work factor, three age interaction terms – e.g., $\text{age} \times \text{college}$, $\text{age}^2 \times \text{college}$, and $\text{age}^3 \times \text{college}$ – are considered to find an optimal model from the stepwise regression procedure. The interaction effects with respect to each SES factor are presented with graphs of predicted values from each regression. Three SES factors are coded into dummy variables because of two reasons: 1) for salient interaction effect, 2) for easier interpretation and effective graphical presentation.

The second step is to explain the possible significant interactions with the mechanisms of cumulative advantage and resource substitution. Among the three SES factors, if the age interactions of a factor are not significant at .05 level for both depression and anxiety, the factor is excluded in this second step of analysis. Female, white, and preceding social status variables are included in each model as control variables. Each interaction effect between a SES factor and age is explained by the mediators suggested in Figure 2.1. For example, to explain the age interaction of occupational prestige on depression, each mediator in Figure 2.1 is separately added in the optimal regression model, and this procedure can reveal important mediators

operating as pathways of cumulative advantage. To explain the same age interaction with the mechanism of resource substitution, each interaction term of each mediator and age is separately added in a previous regression model. If the interaction of a mediator and age substantially reduces the interaction effect of occupational prestige and age, it implies that the impact difference of the mediator across ages explains the age interaction of occupational prestige on depression such as divergence. Then, the interaction term of the mediator and non-employed status (or non-married status) is added to explain the interaction effect of the mediator and age. The possible stronger effect of the mediator in older ages might be explained by the higher probability of disadvantaged employment or marital status such as retired or widowed status in older ages. The mediator might have a stronger effect in disadvantaged employment or marital status. All the mediators corresponding to each SES factor are examined with the same procedure as above. To provide all the results from these complicated procedures requires too much space, so only the results with substantial importance are presented with the form of Tables.

2) Methods for Longitudinal Analyses: SES Models with ACL Data

A. Analytic Model

The LGM in this study predicts the constant and change in health over a followup period, with fixed effects that are functions of age at time zero (thus, the effect of aging t years depends on age at the time zero) and random effects that are linear functions of followup time. Equation 1 describes the within-person equation, in which the health outcome Y for person i at time t is a linear function of time plus an error term e_{it} that is random with respect to time:

$$Y_{it} = a_{i0} + a_{i1}t + e_{it} \quad (1)$$

Equations 2 and 3 describe the between-persons equations that correspond to Figure 3.1. The within-person coefficients of Equation 1 are functions of age at time zero (A_{i0}) centered on a reference age (k , 45 in this study), educational attainment ($C=1$ if college graduates and 0 if others, $H=1$ if high school graduates to some college and 0 if others), the interactions of age and education, of adjusted covariates ($F = 1$ if female and 0 if male, $W = 1$ if White and 0 if non-white), and of individual random deviations u_{i0} and u_{i1} from the expected constant and change with respect to time:

$$a_{i0} = b_{00} + b_{01}(A_{i0} - k) + b_{02}(A_{i0} - k)^2 + b_{03}C + b_{04}H + b_{05}(A_{i0} - k)C \\ + b_{06}(A_{i0} - k)H + b_{07}F + b_{08}W + u_{i0} \quad (2)$$

$$a_{i1} = b_{10} + b_{11}(A_{i0} - k) + b_{12}C + b_{13}H + b_{14}(A_{i0} - k)C + b_{15}(A_{i0} - k)H \\ + b_{16}F + b_{17}W + u_{i1} \quad (3)$$

Three characteristics distinguish this growth-curve model from other types of growth-curve models. First, this model's within-person equation has t rather than A_{it} on the right side. Thus the within-person equation describes the effect of aging t years rather than the effect of the differences in age at different times of observation. Second, this model has no powers of t other than t^0 and t^1 because vectors are utilized as linear approximations to the curve over each segment of the adult life course. Third, this model specifies functions of age at baseline as fixed-effect components of the two between-person equations. Thus, the effect of aging t years depends on age at the time of the study. The age functions can take any form, with any number of them appearing in any combination (Mirowsky and Kim forthcoming).

The health subscales used for this study are all subjective measures, so LGM with multiple indicators is used to adjust for possible measurement errors. Equation 4 and 5 describes the scores on two subscales as linear functions of the latent depression (D). Equation 4 has an intercept fixed to zero and a slope fixed to 1.0, which sets the metric of

the latent factor to that of sadness (S) subscale. By this assumption, a unit increase in the depression factor produces a unit increase in the sadness subscale. The slope “ λ_1 ” in equation 5 represents the ratio of the predicted increase in malaise (M) given a unit increase in sadness. Although the two subscales – S and M– are ordinal variables, the latent factor is assumed as continuous in this modeling.

$$S_{it} = D_{it} + e_{Sit} \quad (4)$$

$$M_{it} = \lambda_0 + \lambda_1 D_{it} + e_{Mit} \quad (5)$$

As illustrated in Figure 3.1, this model allows for a residual correlation between health change over time and the constant over time. It helps correct for apparent regression to the mean produced by random measurement error or by floor or ceiling effects- that is, when high scores can decline more than low scores can, and vice versa (Mirowsky and Kim forthcoming).

With this longitudinal framework, I can confirm whether SES-gap in health significantly diverges over followup time in every adult ages or not, statistically testing the cumulative advantage hypothesis. Significant positive effects of the age interaction of SES on the slope factor would indicate that the diverging health gap in earlier adulthood changes to a converging pattern in later life, supporting the age-as-leveler hypothesis.

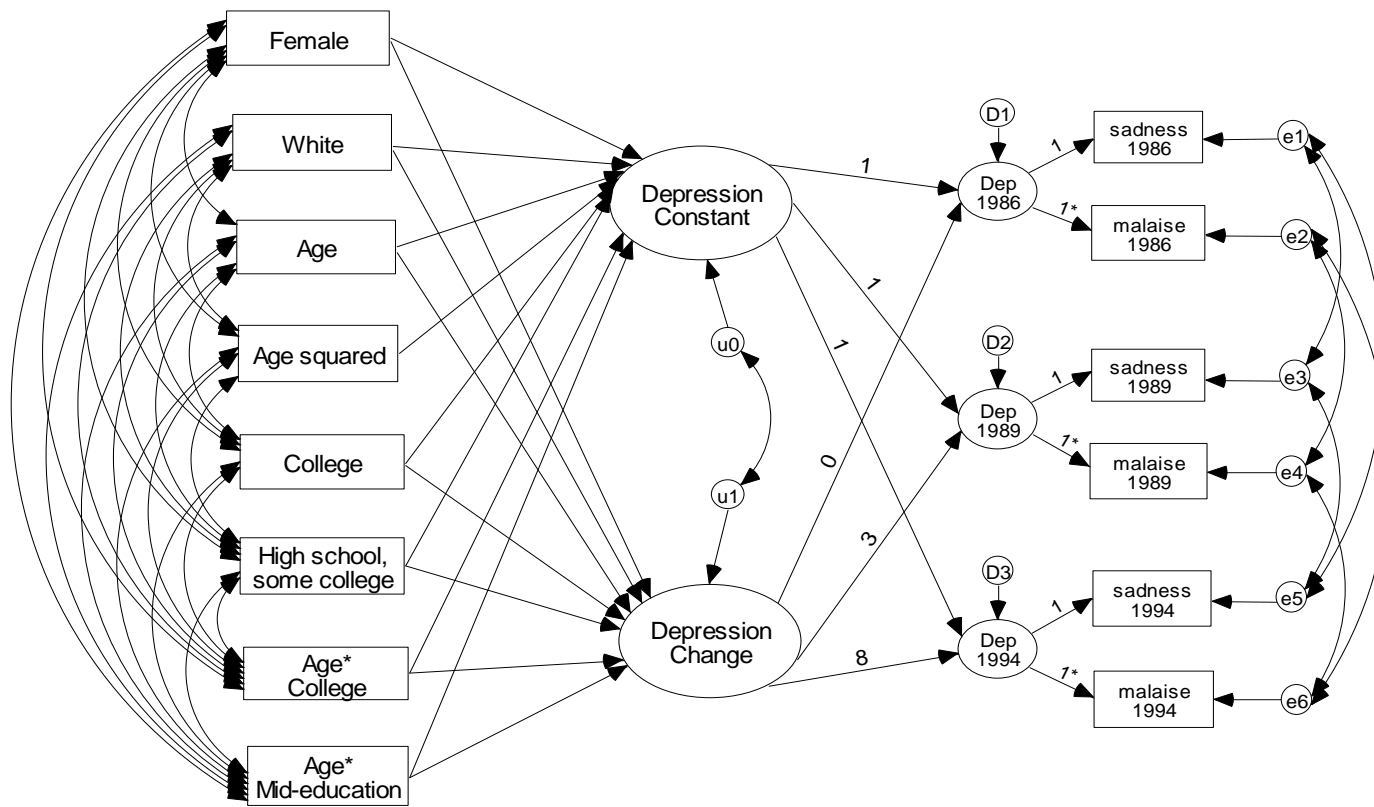
B. Age, Period, and Cohort Effect

Equation 6 defines age (A_{it}) as the difference between the calendar year of the survey (S_t) and individual i 's birth year (B_i). Equation 7 defines time (t) as the difference between age at the time of an observation and age in the reference year, which equals the difference between the calendar year of the survey wave and the calendar year of the wave designated as time zero.

$$A_{it} = S_t - B_i \quad (6)$$

$$t = A_{it} - A_{i0} = S_t - S_0 \quad (7)$$

Figure 3.1. LGM for Depression over Eight Years by Educational Attainment (Data: ACL)



As implied in equation 6, if one factor is fixed, the other two are linearly dependent – e.g., when survey year is fixed, age effect is confounded with cohort effect. As described in equation 7, in any panel design, age effect is confounded with period effect. This confounding problem is inherent, and there is no strict statistical solution for this problem (Glenn 2005).

Occasionally, as similar to the advantage of accelerated longitudinal design (the concept of convergence), this methodological design utilizing aging-vector graphs can resolve this confounding problem in specific cases in which cross-sectional age curve is mostly overlapped with aging-vectors because the pattern represents pure age effect without inter-cohort trends. The cases of perfect conformity imply no cohort effect and no period effect. For many other cases in which the perfect conformity is not apparent, the possibility of confounding problem always exist, and the interpretation (e.g., about which effect plays the dominant explanatory role out of age effect or cohort effect) must depend on relevant theory and previous empirical research (Firebaugh 1997).

C. Missing Imputation

This study uses an effective correction method for sample attrition, multiple model-based imputation (MMBI) using Expectation Maximization (EM) algorithm. The MMBI-EM method, which is implemented in EQS version 6.1 (Bentler 2003), uses an iterative procedure that imputes missing values, estimates the model using the filled data set, imputes revised values based on the results, re-estimates the model, and so on. This method assumes that the absence of values depends on a combination of random chance and tendencies predictable from the observed values. It assumes that the absence of values does not depend on the unobserved values themselves. With outcomes like physical impairment or depression, this last assumption is unlikely to be strictly true. However, the corrections are robust to the extent that absence is nearly random given the

observed values. A strong association between observed and unobserved values makes the corrections robust (Collins, Schafer and Kam 2001; Mirowsky and Kim forthcoming.) My models include baseline values and non-missing follow-up values that strengthen the corrections.

Latent grow-curve modeling with the imputation might also reduce mortality selection bias in two ways. First, the model includes the dropouts to predict their health trajectories rather than excluding them. This characteristic of latent growth-curve modeling is shared with hierarchical growth-curve modeling (Lynch 2003). Second, the MMBI-EM method of missing data imputation has the potential to reduce mortality selection bias because it utilizes the tendencies predictable from the observed values to correct for attrition.

I retain all cases, including those respondents who participated in only the first wave, in the LGM because using all cases eliminates attrition bias in the constant equation (e.g., equation 2). Using only complete cases, or only cases with some follow-up data, generally creates gross bias in the estimated effect of age on the constant factor of health (McArdle and Hamagami 1992). It distorts the intercepts (or origins) of the aging vectors, and it in turn distorts inter-cohort trends. Therefore, in order to evaluate the inter-cohort trends correctly, all baseline cases need to be included in a LGM.

3) Methods for Longitudinal Analyses: Work Models with ASOC Data

Figure 3.2 shows a LGM for a depression trajectory over 6 years predicted by temporal patterns of work quality. In this model, I can examine systematic variations in the depression trajectory within a person as a function of background variables including age and work quality patterns.

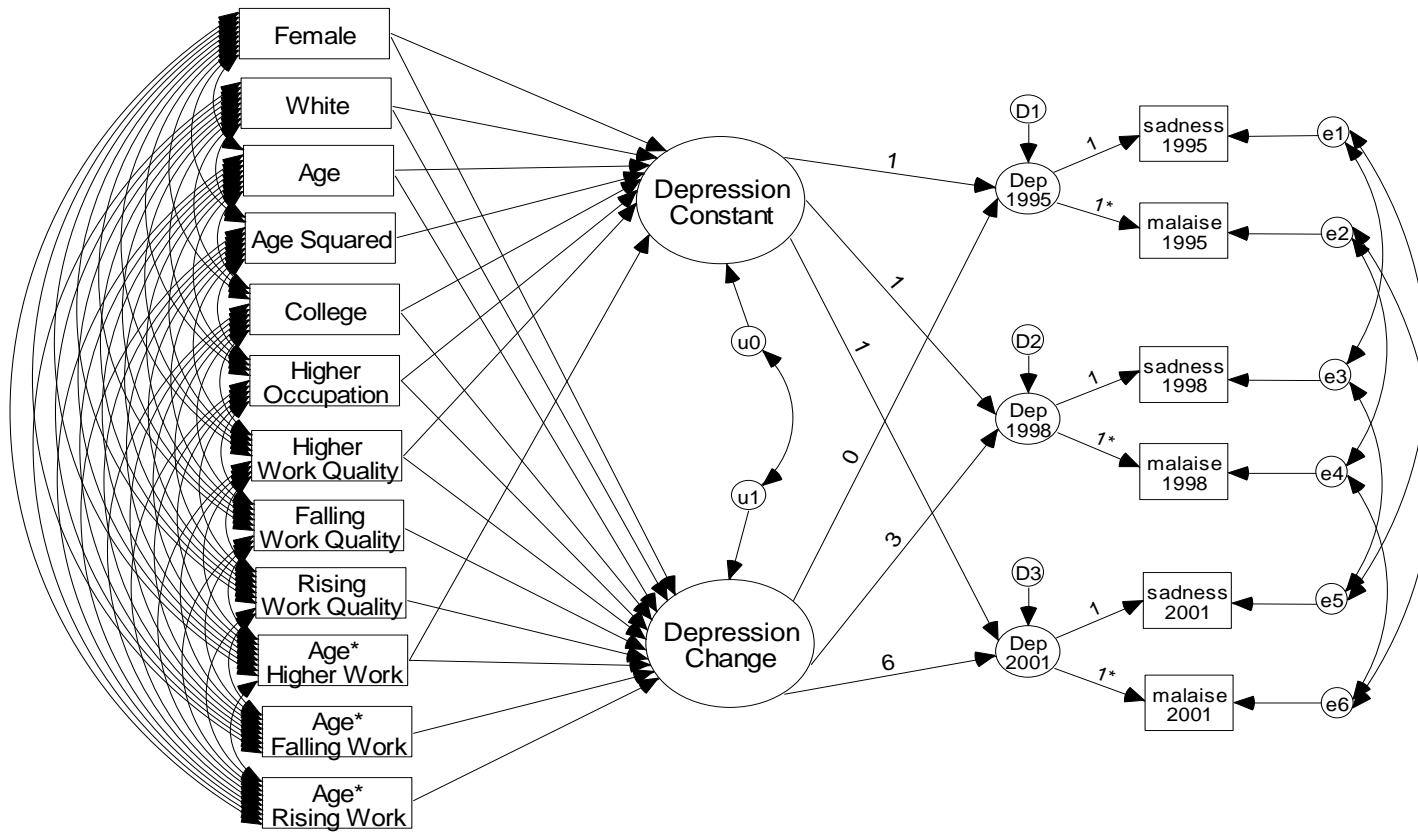
The main aims of this study are to examine the significant slope differences in depression (or anxiety) between the stable good work group and the stable bad work group, or those between the stable good work group and the falling work quality group, or those between the stable bad work group and the rising work quality group. The model in Figure 3.2 is specifically designed for these aims, resolving the causal order problem of dynamic models in previous studies (McLeod and Shanahan 1996) – work change variables are not supposed to predict depression constant at baseline for logical causal order. For illustrations, the two equations below show a simple form of the model with depression constant (C) and slope (S) regressed on dummy variables of work quality and their age interactions with omitting all control variables. HW indicates a dummy variable representing higher work quality (above the median work quality) at baseline, and FW indicates a dummy variable representing falling work quality over the follow-up time, and RW indicates a dummy variable representing rising work quality over time, and A implies $(age-45)/10$ in these equations.

$$\hat{C} = b_{00} + b_{01}HW + b_{02}(HW \times A) \quad (8)$$

$$\hat{S} = b_{10} + b_{11}HW + b_{12}FW + b_{13}RW + b_{14}(HW \times A) + b_{15}(FW \times A) + b_{16}(RW \times A) \quad (9)$$

As illustrated in equation (8), the predicted initial depression is same between the stable good work group and the falling work quality group, and it is same between the stable bad work group and the rising work quality group in this modeling. The value of HW for both the stable good work group and the falling work quality group equals 1 because their initial work quality levels are above the median by definitions in both groups (so, $\hat{C}_{SG} = \hat{C}_F = b_{00} + b_{01}(1) + b_{02}(1 \times A)$). The value of HW for both the stable bad work group and the rising work quality group equals 0 because their initial work quality

Figure 3.2. LGM for Depression over Six Years by Temporal Patterns of Work Quality (Data: ASOC)



levels are below the median (so, $\hat{C}_{SB} = \hat{C}_R = b_{00} + b_{01}(0) + b_{02}(0 \times A)$). The initial depression is predicted by initial work quality in this design, which has no logical problem in causal order.

From equation (9), the predicted depression slope of the stable good work group can be presented with substituting 1 for HW, 0 for FW, and 0 for RW by definition of the group, as illustrated in equation (10).

$$\begin{aligned}\hat{S}_{SG} &= b_{10} + b_{11}(1) + b_{12}(0) + b_{13}(0) + b_{14}(1 \times A) + b_{15}(0 \times A) + b_{16}(0 \times A) \\ &= b_{10} + b_{11} + b_{14}A\end{aligned}\quad (10)$$

From equation (9), the predicted depression slope of the falling work quality group can be calculated by substituting 1 for HW, 1 for FW, and 0 for RW by definition of the group, as illustrated in equation (11).

$$\begin{aligned}\hat{S}_F &= b_{10} + b_{11}(1) + b_{12}(1) + b_{13}(0) + b_{14}(1 \times A) + b_{15}(1 \times A) + b_{16}(0 \times A) \\ &= b_{10} + b_{11} + b_{12} + b_{14}A + b_{15}A\end{aligned}\quad (11)$$

With the same procedure, the predicted depression slope of the rising work quality group can be calculated by substituting 0 for HW, 0 for FW, and 1 for RW, as illustrated in equation (12).

$$\begin{aligned}\hat{S}_R &= b_{10} + b_{11}(0) + b_{12}(0) + b_{13}(1) + b_{14}(0 \times A) + b_{15}(0 \times A) + b_{16}(1 \times A) \\ &= b_{10} + b_{13} + b_{16}A\end{aligned}\quad (12)$$

Finally, the predicted depression slope of the stable bad work group can be calculated by substituting 0 for HW, 0 for FW, and 0 for RW, as illustrated in equation (13).

$$\begin{aligned}\hat{S}_{SB} &= b_{10} + b_{11}(0) + b_{12}(0) + b_{13}(0) + b_{14}(0 \times A) + b_{15}(0 \times A) + b_{16}(0 \times A) \\ &= b_{10}\end{aligned}\quad (13)$$

In equation (14), equation (13) is subtracted from equation (10). The expression in the right end of equation (14) represents the depression slope difference between the

stable good work group and the stable bad work group in a certain age – the difference in depression slope might vary by age.

$$\hat{S}_{SG} - \hat{S}_{SB} = b_{10} + b_{11} + b_{14}A - b_{10} = b_{11} + b_{14}A \quad (14)$$

After estimating this growth curve model, the results provide the coefficient values of equation (9) and their significance tests. In the slope difference between the stable good work group and the stable bad work group, $(b_{11} + b_{14}A)$, if b_{11} has a significant negative value and b_{14} is not significant with a negligible value, it implies that the depression gaps between the two groups diverge over the follow-up period in all ages (or regardless of ages), and the results support the cumulative advantage hypothesis. As long as the values of $(b_{11} + b_{14}A)$ are smaller than zero, the hypothesis of divergence is supported. If the values are greater than zero in certain age ranges, it implies that the depression change of the stable bad work group is better (i.e., smaller) than that of the stable good work group, and it implies patterns of convergence, cross-over, or reverse divergence, depending on the difference of initial depression level between the two groups.

In equation (15), equation (13) is subtracted from equation (12). The expression in the right end of equation (15) represents the depression slope difference between the stable bad work group and the rising work quality group in a certain age.

$$\hat{S}_R - \hat{S}_{SB} = b_{10} + b_{13} + b_{16}A - b_{10} = b_{13} + b_{16}A \quad (15)$$

In the estimation results of equation (9), $(b_{13} + b_{16}A)$ implies the depression slope difference between the stable bad work group and the rising work quality group. As long as the values of $(b_{13} + b_{16}A)$ are smaller than zero, the hypothesis of divergence is supported. If the values are greater than zero from certain age, it implies reverse divergence (i.e., better depression change in the stable bad work group) from certain age because the depression intercepts are modeled as same between the two groups. Setting

the left-hand side of equation (16) equal to 0 and solving for age reveals the critical transition age of reverse divergence as shown in equation (17).

$$b_{13} + b_{16}A = b_{13} + b_{16}(age-45)/10 \quad (16)$$

$$age = 45 - 10(b_{13}/ b_{16}) \quad (17)$$

Finally, in equation (18), equation (11) is subtracted from equation (10). The expression in the right end of equation (18) represents the depression slope difference between the stable good work group and the falling work quality group in a certain age.

$$\begin{aligned} \hat{S}_{SG} - \hat{S}_F &= b_{10} + b_{11} + b_{14}A - b_{10} - b_{11} - b_{12} - b_{14}A - b_{15}A \\ &= - b_{12} - b_{15}A \end{aligned} \quad (18)$$

As long as the values of $(b_{12} + b_{15}A)$ multiplied by -1 are smaller than zero, the hypothesis of divergence pattern (or cumulative advantage) between the stable good work group and the falling work quality group is supported. The model in equation (8) and (9) is expanded readily to include precursors of work patterns for adjustment – such as gender, race, education, and occupational prestige.

CHAPTER 4: CUMULATIVE ADVANTAGE AND RESOURCE SUBSTITUTION.

1. HYPOTHESES

Using ASOC 1995 survey data, I examine the age interactions between SES or work factors and psychological well-being in this chapter. If significant age interactions are found, I attempt to disclose the mechanisms of the age interactions with several mediating factors. The expected diverging life-course patterns might be explained by the two mechanisms of cumulative advantage and resource substitution through the mediating factors. Four hypotheses are tested.

Hypothesis 1: the age interactions between SES factors such as education, income, and occupational prestige and depression or anxiety support a consistent diverging pattern over the adult life course.

Hypothesis 2: the age interactions between work factors such as fulfilling work, nonroutine work, and socially interactive work and depression or anxiety support a consistent diverging pattern over the adult life course.

Hypothesis 3: the expected diverging pattern is explained by cumulative advantages which SES or work quality generates in several mediating factors.

Hypothesis 4: the expected diverging pattern is explained by resource substitution through several mediating factors, that is, stronger effects of mediating resources on depression or anxiety in disadvantaged employment or marital status more prevalent in older ages.

2. THE AGE INTERACTIONS OF SES/WORK AND PSYCHOLOGICAL WELL-BEING

Table 4.1 presents the interaction effects of SES factors and age on psychological well-being. As demonstrated in Figure 4.1, which is constructed from results in Table 4.1 (for control variables, the mean value of each variable is inserted in the prediction equations), the age interaction effects between depression and education or occupation imply diverging gap patterns, but education's interaction effect is not statistically significant in model 1. Income's age interaction also implies a diverging pattern in model 3.

For anxiety, interaction effects of age education or occupation are marginally significant in Table 4.1, implying diverging patterns, as also demonstrated in Figure 4.2. However, the effect of occupation itself was not significant, so it dropped out of the model 5 from the stepwise regression procedure. Income's significant interaction effect also implies a diverging pattern in later life, but the effect of income itself is not significant at controlling for education and occupation in model 6. Income's non-significant effect is related to the fact that it has been transformed into a dummy variable. When the original income variable is used, the effect becomes significant. However, occupation's effect is consistently not significant even when the original occupational prestige variable is used. In terms of anxiety, higher occupational status might be not so beneficial. These overall results support the hypothesis that the SES-gap in psychological well-being diverges with advancing age. The diverging patterns in all the three SES factors imply that SES determines more strongly the inequality in mental health in older ages.

Table 4.1. Depression (Square-Rooted) and Anxiety (Square-Rooted) Regressed on Socioeconomic Status Factors and Their Age Interactions: U.S., ASOC 1995.

Model	Depression			Anxiety		
	1	2	3	4	5	6
Constant	.735*** (.040)	.756*** (.042)	.804*** (.045)	1.027*** (.046)	1.031*** (.047)	1.077*** (.051)
Female	.141*** (.026)	.134*** (.026)	.122*** (.028)	.177*** (.031)	.174*** (.032)	.173*** (.034)
White	-.098** (.037)	-.082* (.038)	-.078† (.041)	.102* (.031)	.111* (.047)	.083† (.049)
Age	-.049*** (.009)	-.041*** (.011)	-.044*** (.011)	-.120*** (.009)	-.117*** (.012)	-.120*** (.011)
Age ²	1.383*** (.401)	1.582*** (.428)	.772 (.477)			
College ^a	-.188*** (.031)	-.150*** (.031)	-.115** (.034)	-.104** (.037)	-.113** (.036)	-.076† (.041)
Higher Occupation ^b		-.091** (.029)	-.092** (.030)			-.040 (.036)
Higher Income ^c			-.096** (.032)			-.029 (.038)
College×Age	-.021 (.017)			-.033† (.020)		
Higher Occupation ×Age		-.033* (.014)			-.030† (.016)	
Higher Income ×Age			-.032† (.018)			-.047* (.022)
N	2571	2410	2138	2554	2396	2127

Note : Metric coefficients with standard error in parentheses are shown. Age is modeled as $(\text{Age}-45) \times 10^{-1}$, Age² is modeled as $(\text{Age}-45)^2 \times 10^{-4}$

^a Compared to respondents less than college degree in educational attainment.

^b Compared to respondents with values less than the mean of occupational prestige score.

^c Compared to respondents with values less than the mean of annual family income.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

Figure 4.1. Depression Predicted by Age to Present Interaction Effects with SES or Work Factors.

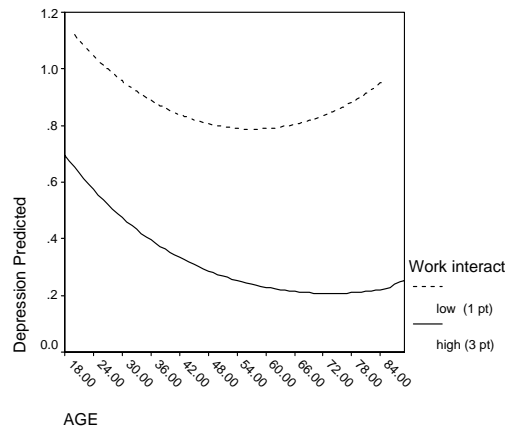
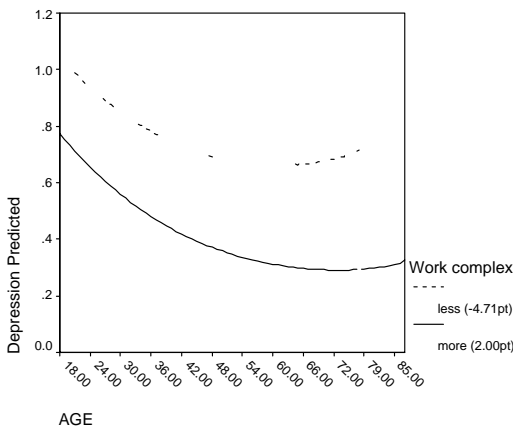
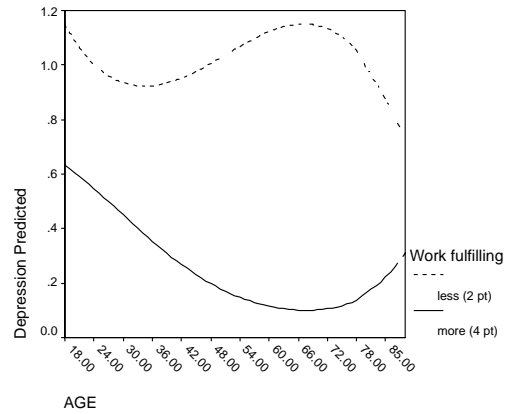
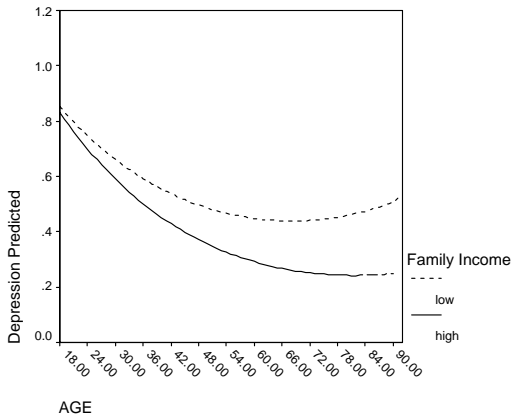
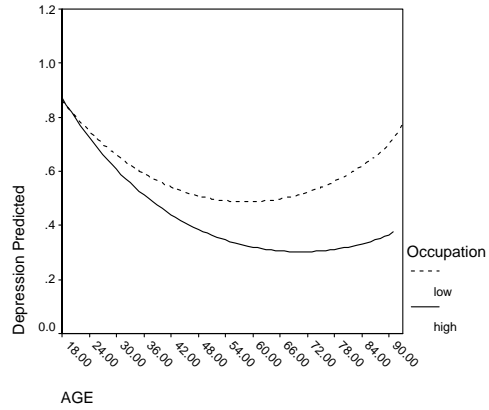
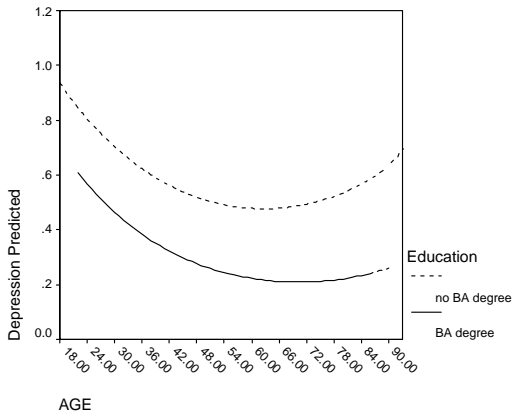
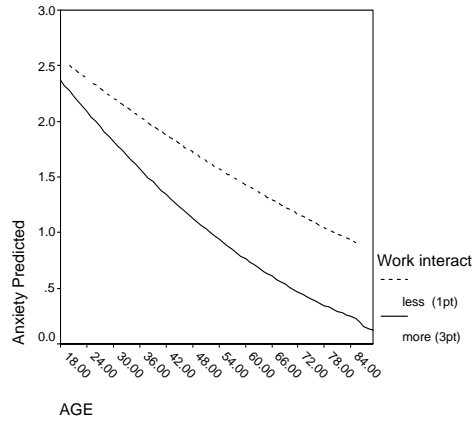
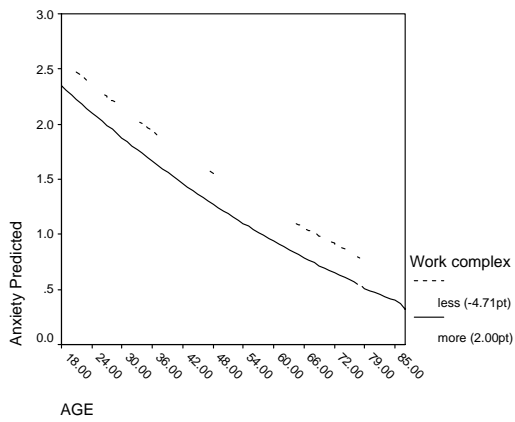
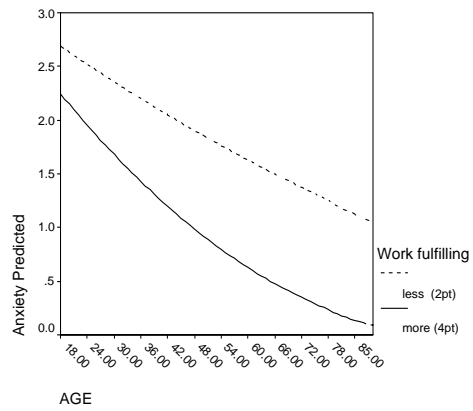
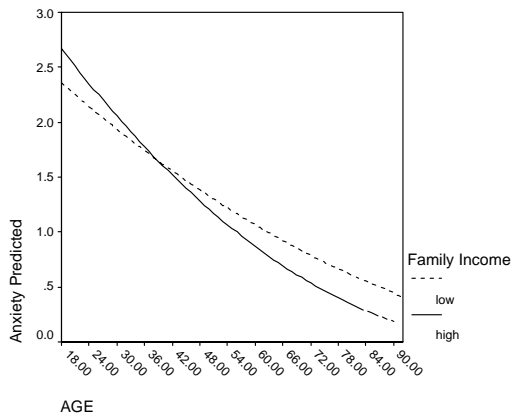
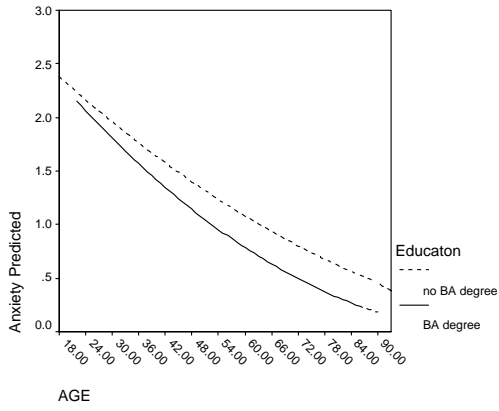


Figure 4.2. Anxiety Predicted by Age to Present Interaction Effects with SES or Work Factors.



To confirm the strongest age interaction effect out of the three SES factors, a full model which added up the model 1, 2, and 3 (or model 4, 5, and 6) in Table 4.1 was estimated. The results reveal that occupational prestige has a stronger effect on mental health inequality in later life than education and income. For depression, the interaction between current/last occupational prestige and age shows the largest value of standardized coefficient and only significant effect out of the three interactions in the full model. For anxiety, the interaction coefficient of occupational prestige and age also shows the largest standardized value in the full model. These results imply that the last occupation's prestige influences mental health inequality persistently even after retirement and plays the most important role for psychological well-being in later life out of the three SES factors.

Table 4.2 presents the interaction effects of work characteristics and age on psychological well-being. For depression, fulfilling work has significant age interactions, and it implies mainly diverging but a little converging pattern in later life as illustrated in Figure 4.1. Socially interactive work has a marginally significant interaction effect with age in model 3, implying divergence. Non-routine work does not have a significant interaction effect. For anxiety, fulfilling work shows a significant interaction effect in model 4 of Table 4.2, and it indicates the increasing importance of fulfilling work for psychological well-being in later life as demonstrated in Figure 4.2. Socially interactive work also has a significant interaction effect, implying divergence. Non-routine work does not have a significant interaction effect, and even non-routine work itself is not significantly beneficial to anxiety according to model 5. These overall results also support the divergence hypothesis that the effects of work quality on psychological well-being become stronger in later life.

Table 4.2. Depression (Square-Rooted) and Anxiety (Square-Rooted) Regressed on Work Factors and Their Age Interactions: U.S., ASOC 1995.

Model	Depression			Anxiety		
	1	2	3	4	5	6
Constant	.733*** (.041)	.758*** (.042)	.734*** (.042)	1.013*** (.048)	1.041*** (.049)	1.021*** (.048)
Female	.135*** (.025)	.138*** (.026)	.155*** (.026)	.166*** (.032)	.177*** (.032)	.185*** (.032)
White	-.075* (.037)	-.077* (.038)	-.074* (.038)	.120** (.046)	.111* (.047)	.117* (.046)
College ^a	-.111*** (.031)	-.124*** (.032)	-.125*** (.031)	-.077* (.038)	-.079* (.039)	-.087* (.038)
Higher Occupation ^b	-.062* (.027)	-.101*** (.028)	-.087** (.027)	.004 (.034)	-.035 (.035)	-.019 (.034)
Age	-.055*** (.009)	-.055*** (.009)	-.059*** (.009)	-.134*** (.009)	-.130*** (.009)	-.135*** (.009)
Age ²	1.250** (.419)	1.127*** (.441)	1.413** (.424)			
Fulfilling Work	-.250*** (.023)			-.181*** (.028)		
Nonroutine Work		-.032** (.009)			-.017 (.011)	
Interactive Work			-.182*** (.020)			-.115*** (.025)
Fulfilling×Age	-.083*** (.022)			-.041** (.015)		
Fulfilling×Age ³	5.393* (2.695)					
Nonroutine×Age		-.004 (.004)			-.002 (.005)	
Interactive×Age			-.020† (.011)			-.031* (.013)
N	2372	2316	2380	2359	2305	2370

Note : Metric coefficients with standard error in parentheses are shown. Age is modeled as $(Age-45) \times 10^{-1}$, Age² is modeled as $(Age-45)^2 \times 10^{-4}$, and Age³ is modeled as $(Age-45)^3 \times 10^{-6}$. Fulfilling, nonroutine, and interactive work are measured as deviation score from the mean, respectively.

^a Compared to respondents less than college degree in educational attainment.

^b Compared to respondents with values less than the mean of occupational prestige score.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

Work quality's different dimension might have different importance in later life. To confirm the strongest age interaction out of the three work quality variables, a full model was estimated. The results reveal that fulfilling work quality plays the most important role in mental health inequality in later life over nonroutine work and socially interactive work. For both depression and anxiety, the age interaction of fulfilling work shows the largest standardized coefficient and only significant effect in the full model. These results provide an implication for social intervention to reduce mental health disparity among the elderly. For the elderly population vulnerable in terms of mental health, it might be an effective policy intervention to support them to have more fulfilling daily activity.

These overall results support the diverging pattern in psychological well-being by SES or work factors with increasing age. Although education's age interaction also shows divergence, the interaction effects are not significant. In cross-sectional models, age represents both aging process and cohort difference. It is impossible to separate the cohort effect from the age effect in a cross-sectional analysis. However, previous studies (Lauderdale 2001; Lynch 2003; Feldman et al 1989) have consistently demonstrated that the effect of education on health or mortality is stronger in more recent cohort than in the earlier cohort. If the results and theories of previous research can be applied to mental health, it implies that the cohort effect might create the underestimation of the divergence with respect to education in my cross-sectional analyses. That is, the cohort trend might make the health gap in younger age cohorts appear bigger. Mortality selection bias is another potential problem in a cross-sectional analysis because it might make the mental health gap in later life appear smaller. Longitudinal modeling and analyses will complement these cross-sectional analyses in next chapters. I employ a latent growth

curve modeling approach to reduce mortality selection bias and to resolve the confounding problem between cohort effect and age effect.

3. THE MECHANISMS OF SES-BASED DIVERGENCE

Why does the mental health gap by social conditions diverge over the life course? Out of the three SES factors and three work factors, the age interaction of education and that of nonroutine work are not significant at .05 level, as presented in Table 4.1 and Table 4.2, respectively. Therefore, the two factors are excluded in this step of analysis to reveal the mechanisms of divergence. Table 4.3 demonstrates how occupation-gap in depression diverges through the two mechanisms of cumulative advantage and resource substitution. It is related to reduced sample size (N=2,292) that the interaction coefficient changes from -.033 in model 2 of Table 4.1 into -.031 in model 1 of Table 4.3 although they are the same models. To compare interaction coefficients between models (model 1 to 6) in Table 4.3, sample size should be same in every model, so any cases with a missing in all the variables are excluded in analyses.

First, to understand the divergence due to cumulative advantage, I check the change of interaction coefficient when I add each variable of income, daily work quality (this variable is an extended version of fulfilling work quality – composed of the two indicators of original fulfilling work and the indicator of socially interactive work), social support, personal control, and physical impairment, respectively. The occupation-based divergence in depression is not explained by the cumulative advantages in income, work quality, social support, and personal control over the life course. However, as presented in model 2 of Table 4.3, physical impairment reduces the interaction effect from -.031 to -.024 (23% reduced). It implies that the occupation-based diverging gap in depression is

Table 4.3. Depression (Square-Rooted) Regressed on Occupational Prestige and Age, Their Interaction, Potential Mediators, and Potential Mediating Interactions: U.S., ASOC 1995.

Model	1	2	3	4	5	6
High Occupation ^a	-.078*** (.030)	-.012 (.027)	-.028 (.029)	-.033 (.029)	-.029 (.029)	-.033 (.029)
Age	-.048*** (.011)	-.103*** (.011)	-.048*** (.011)	-.052*** (.011)	-.049*** (.012)	-.051*** (.012)
Age ²	1.816*** (.444)	.995* (.406)	1.654*** (.429)	1.565*** (.429)	1.605*** (.453)	1.722*** (.452)
High Occupation ^a × Age	-.031* (.015)	-.024† (.013)	-.033* (.014)	-.025† (.014)	-.024† (.014)	-.023† (.014)
Physical Impairment		.885*** (.041)				
Fulfilling Work			-.309*** (.024)	-.289*** (.025)	-.260*** (.025)	-.164*** (.033)
Fulfilling Work × Age				-.045** (.014)	-.046** (.014)	-.023 (.018)
Retired ^b					-.001 (.043)	.006 (.043)
Non-employed ^b					.191*** (.036)	.153*** (.038)
Fulfilling Work × Retired ^b						-.197* (.080)
Fulfilling Work × Non-employed ^b						-.281*** (.060)
Female	.132*** (.027)	.091*** (.024)	.135*** (.026)	.139*** (.026)	.110*** (.026)	.110*** (.026)
White	-.065† (.039)	-.033 (.035)	-.052 (.037)	-.054 (.037)	-.064† (.037)	-.072† (.037)
College	-.170*** (.032)	-.108*** (.029)	-.128*** (.031)	-.127*** (.031)	-.117*** (.031)	-.120*** (.031)
Constant	.729*** (.043)	.519*** (.040)	.686*** (.042)	.689*** (.042)	.672*** (.042)	.670*** (.042)
R ²	.059	.220	.122	.129	.140	.149

Note : N = 2,292. Metric coefficients with standard error in parentheses are shown. Age is modeled as $(\text{Age}-45) \times 10^{-1}$, Age² is modeled as $(\text{Age}-45)^2 \times 10^{-4}$.

^a Compared to respondents with values less than the mean of occupational prestige score.

^b Compared to respondents who are currently employed.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

partially explained by the occupation-based diverging gap in physical impairment – occupational prestige’s cumulative advantage in physical impairment. Nevertheless, even after taking into account physical impairment, the negative interaction still substantially exists. The interaction of divergence might be also explained by the resource substitution mechanism.

To check the resource substitution mechanism, when I added each interaction term of age and each mediator in Figure 2.1, only the interaction between fulfilling work and age reduced the diverging gap substantially. As presented in model 4 of Table 4.3, the interaction coefficient in model 3 (-.033) is reduced to -.025 (24% declined), implying that fulfilling work’s stronger impact on mental health in older ages. As presented in model 5 and 6, the interaction between fulfilling work and age is mainly explained by the interaction between fulfilling work and disadvantaged employment status (retired and other non-employed). The interaction coefficient (-.046) is reduced to -.023 (50% declined), and it partially explains the occupation-based divergence. Although occupational prestige does not create cumulative advantage in work quality as demonstrated in model 3 by little change of the interaction coefficient, better occupational prestige results in constantly more fulfilling work quality across life stages. And, the effect of fulfilling work on depression becomes stronger in later life because the later life is characterized by higher probability of disadvantaged employment status. Through the mechanism of resource substitution, work fulfillment plays a more important role for psychological well-being in disadvantaged employment status. That is, in non-employed status, the effect of daily activity quality on depression becomes stronger (as demonstrated in the significant effects, -.197 and -.281 in model 6), and it explains the stronger effect of occupational prestige on depression in later life. Both the mechanisms

of cumulative advantage and resource substitution appear to have similar contributions to the occupation-based divergence in depression.

With the exactly same procedure as above, the age interaction of occupation for anxiety might be explained by the two mechanisms. In model 1 of Table 4.4, the sample size is 2,283, and the interaction coefficient is $-.029$ (p -value = $.102$). As results of examining the cumulative advantage mechanism, only physical impairment explains the diverging interaction slightly (the interaction coefficient is reduced to $-.027$ in model 2).

Resource substitution mechanism partially explains the age interaction of occupation on anxiety, as presented in model 3 and 4. The interaction coefficient ($-.031$) in model 3 is reduced to $-.023$ (26% reduced) in model 4 when the interaction term between fulfilling work and age is added. The interaction between fulfilling work and age is mainly (44% reduced from $-.050$ to $-.028$) explained by the interaction between fulfilling work and disadvantaged employment status (retired and other non-employed) in model 5 and 6. Moreover, the interaction between personal control and age explains 19% (from $-.032$ to $-.026$) of the interaction between occupation and age in model 7 and 8. It implies that the two resources enhanced by last occupational prestige, daily work fulfillment and personal control, become more important at protecting anxiety in older ages, and it partially explains the occupational prestige's stronger effect on anxiety in later life. Especially, although they do not have an occupation currently, the prestige of last occupation influences their current daily work quality, and the resource, fulfilling daily work, plays an important role in preventing anxiety in non-employed condition more prevalent in older ages.

In Table 4.5, the interaction between income and age for depression has the coefficient value of $-.032$ in model 1. When physical impairment is added, the interaction coefficient changes into $-.008$ (75% reduced) in model 2. It implies that income's

Table 4.4. Anxiety (Square-Rooted) Regressed on Occupational Prestige and Age, Their Interaction, Potential Mediators, and Potential Mediating Interactions: U.S., ASOC 1995.

Model	1	2	3	4	5	6	7	8
High Occupation ^a	-.007 (.036)	.043 (.035)	.032 (.036)	.027 (.036)	-.030 (.036)	.025 (.036)	.017 (.036)	.011 (.036)
Age	-.118*** (.012)	-.166*** (.012)	-.120*** (.012)	-.125*** (.012)	-.112*** (.014)	-.113*** (.014)	-.128*** (.012)	-.133*** (.012)
High Occupation ^a × Age	-.029 (.018)	-.027 (.017)	-.031† (.017)	-.023 (.018)	-.020 (.018)	-.019 (.018)	-.032† (.018)	-.026 (.018)
Physical Impairment		.655*** (.053)						
Fulfilling Work			-.237*** (.030)	-.215*** (.031)	-.203*** (.032)	-.114** (.041)		
Fulfilling Work × Age				-.049** (.017)	-.050** (.017)	-.028 (.022)		
Retired ^b					-.079 (.051)	-.068 (.051)		
Non-employed ^b					.092* (.045)	.062 (.047)		
Fulfilling Work × Retired ^b						-.194† (.101)		
Fulfilling Work × Non-employed ^b						-.250** (.075)		
Sense of Control							-.194*** (.033)	-.163*** (.035)
Sense of Control × Age								-.048** (.018)

Female	.167*** (.032)	.136*** (.031)	.169*** (.032)	.174*** (.032)	.155*** (.033)	.156*** (.032)	.153*** (.032)	.146*** (.032)
White	.129** (.047)	.154*** (.046)	.139** (.047)	.137** (.047)	.131** (.047)	.123** (.047)	.159** (.047)	.160** (.047)
College	-.116** (.039)	-.067† (.038)	-.083* (.038)	-.082* (.038)	-.079* (.038)	-.082* (.038)	-.078* (.039)	-.076† (.039)
Constant	1.019*** (.049)	.846*** (.050)	.982*** (.049)	.982*** (.049)	.991*** (.050)	.991*** (.050)	.991*** (.049)	.988*** (.049)
R ²	.098	.155	.124	.128	.131	.136	.114	.117

Note : N = 2,283. Metric coefficients with standard error in parentheses are shown. Age is modeled as $(\text{Age}-45) \times 10^{-1}$, Age² is modeled as $(\text{Age}-45)^2 \times 10^{-4}$.

^a Compared to respondents with values less than the mean of occupational prestige score.

^b Compared to respondents who are currently employed.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

Table 4.5. Depression (Square-Rooted) Regressed on Family Income and Age, Their Interaction, Potential Mediators, and Potential Mediating Interactions: U.S., ASOC 1995.

Model	1	2	3	4
High Income ^a	-.094** (.032)	-.039 (.029)	-.062† (.032)	-.062† (.032)
Age	-.044*** (.011)	-.103*** (.011)	-.054*** (.011)	-.054*** (.011)
Age ²	.773 (.478)	.227 (.436)	.489 (.472)	.498 (.482)
High Income ^a × Age	-.032† (.018)	-.008 (.017)	-.024 (.018)	-.024 (.018)
Physical Impairment		.895*** (.043)		
Sense of Control			-.230*** (.028)	-.231*** (.029)
Sense of Control × Age				-.002 (.016)
Female	.124*** (.028)	.093*** (.025)	.114*** (.027)	.115*** (.027)
White	-.080* (.041)	-.059 (.037)	-.050 (.040)	-.050 (.040)
College	-.115*** (.034)	-.076* (.031)	-.080* (.034)	-.080* (.034)
High Occupation	-.089** (.030)	-.024 (.027)	-.068* (.029)	-.068* (.029)
Constant	.802*** (.045)	.575*** (.043)	.772*** (.045)	.772*** (.045)
R ²	.054	.216	.083	.087

Note : N = 2,132. Metric coefficients with standard error in parentheses are shown.

Age is modeled as $(\text{Age}-45) \times 10^{-1}$, Age² is modeled as $(\text{Age}-45)^2 \times 10^{-4}$.

^a Compared to respondents with values less than the mean of annual family income.

^b Compared to respondents who are currently married.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

Table 4.6. Anxiety (Square-Rooted) Regressed on Family Income and Age, Their Interaction, Potential Mediators, and Potential Mediating Interactions: U.S., ASOC 1995.

Model	1	2	3	4	5	6
High Income ^a	-.027 (.038)	.018 (.037)	-.000 (.038)	-.000 (.038)	.014 (.039)	.010 (.039)
Age	-.119*** (.011)	-.168*** (.011)	-.130*** (.011)	-.133*** (.011)	-.122*** (.013)	-.123*** (.013)
High Income ^a × Age	-.048* (.022)	-.028 (.021)	-.040† (.022)	-.033 (.022)	-.034 (.023)	-.035 (.023)
Physical Impairment		.656*** (.055)				
Sense of Control			-.170*** (.034)	-.151*** (.036)	-.152*** (.036)	-.102* (.046)
Sense of Control × Age				-.031† (.019)	-.033† (.019)	-.029 (.022)
Widowed ^b					-.030 (.059)	-.043 (.062)
Non-married ^b					.100* (.039)	.107** (.040)
Sense of Control × Widowed ^b						-.132 (.113)
Sense of Control × Non-married ^b						-.111 (.074)
Female	.174*** (.034)	.153*** (.033)	.167*** (.033)	.162*** (.033)	.167*** (.034)	.167*** (.034)
White	.082† (.049)	.097* (.048)	.105* (.049)	.106* (.049)	.118* (.049)	.116* (.049)
College	-.073† (.041)	-.045 (.040)	-.047 (.041)	-.047 (.041)	-.051 (.041)	-.052 (.041)
High Occupation	-.038 (.036)	.008 (.035)	-.022 (.036)	-.023 (.036)	-.024 (.036)	-.024 (.036)
Constant	1.076*** (.051)	.899*** (.052)	1.047*** (.051)	1.044*** (.051)	.998*** (.055)	.998*** (.055)
R ²	.097	.153	.107	.112	.115	.116

Note : N = 2,121. Metric coefficients with standard error in parentheses are shown. Age is modeled as $(\text{Age}-45) \times 10^{-1}$, Age² is modeled as $(\text{Age}-45)^2 \times 10^{-4}$.

^a Compared to respondents with values less than the mean of annual family income.

^b Compared to respondents who are currently married.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

cumulative advantage in physical impairment explains the diverging depression gap dominantly. Income's cumulative advantage in sense of control also explains the depression divergence (25% reduced), as presented in model 3. I did not find any contribution of the resource substitution mechanism in this income-based divergence in depression.

In model 1 of Table 4.6, the interaction between income and age for anxiety has the coefficient value of $-.048$. Consistent with the results for depression, the main mechanism of divergence in anxiety is the cumulative advantage through physical impairment (42% declined in model 2) and the sense of control (17% declined in model 3). The mechanism of resource substitution partially explains the anxiety divergence in model 4 through the interaction between personal control and age (18% declined from $-.040$ in model 3 to $-.033$ in model 4).

In sum, the cumulative advantage mechanism explains the SES-based mental health divergence through physical impairment and sense of control, and the resource substitution mechanism explains the interaction through stronger effects of work fulfillment in disadvantaged employment status more prevalent in older ages. This resource substitution mechanism is not so relevant to disadvantaged marital status. In the case of occupational prestige, both the mechanisms of cumulative advantage and resource substitution appear to have similar contributions to the mental health divergence, and in the case of income, cumulative advantage is the more dominant mechanism. Although the education's age interactions on psychological well-being are not significant, they also show diverging patterns. When I examined the mechanisms of the divergence, education's cumulative advantage in physical impairment (50% declined) and the sense of control (25% declined) partially explained the mental health divergence, and the

stronger effects of occupational prestige (76% declined) and work quality (47% declined) in later life (i.e., the resource substitution mechanism) partially explained the divergence.

4. THE MECHANISMS OF WORK-BASED DIVERGENCE

In model 1 of Table 4.7, the interaction between fulfilling work and age on depression has the coefficient value of $-.047$. When physical impairment is added, the interaction coefficient changes to $-.025$ (47% reduced). Fulfilling work creates the cumulative advantage in physical impairment. In the case of the resource substitution mechanism, the interaction between fulfilling work and age is explained (38% reduced from $-.048$ in model 3 to $-.030$ in model 4) by the interaction between fulfilling work and disadvantaged employment status, as already confirmed in Table 4.3 earlier. Fulfilling daily activity has a stronger effect on depression in later life because it has a stronger effect in retired or other non-employed status as confirmed again in the significant effects, $-.146$ and $-.271$ in model 4. As presented in model 6, the stronger effect of fulfilling activity in non-employed status is partially explained by the stronger effect of personal control in non-employed status (24% declined from $-.244$ in model 5 to $-.186$). Fulfilling activity maintains or fosters sense of control, and sense of control plays an important role for depression in other non-employed status except retired status.

In model 1 of Table 4.8, the interaction between fulfilling work and age for anxiety has the coefficient value of $-.044$. When physical impairment is added in model 2, the interaction coefficient changes to $-.030$ (32% reduced). As the results of model 3 and 4 demonstrate, the interaction between social support and age reduces 22% of the interaction effect of divergence. In the results of model 5 and 6, the divergence is also explained by the interaction between fulfilling work and disadvantaged employment status (34% declined). Similar to the results for depression, the fulfilling activity's

Table 4.7. Depression (Square-Rooted) Regressed on Fulfilling Work and Age, Their Interaction, Potential Mediators, and Potential Mediating Interactions: U.S., ASOC 1995.

Model	1	2	3	4	5	6
Fulfilling Work	-.234*** (.022)	-.169*** (.021)	-.211*** (.023)	-.127*** (.029)	-.106*** (.029)	-.113*** (.029)
Age	-.059*** (.009)	-.107*** (.009)	-.058*** (.010)	-.060*** (.010)	-.067*** (.010)	-.070*** (.010)
Age ²	1.374** (.423)	.752† (.391)	1.326** (.446)	1.454** (.445)	1.162** (.442)	1.166† (.442)
Fulfilling Work × Age	-.047*** (.012)	-.025* (.011)	-.048*** (.012)	.030† (.016)	-.029† (.016)	-.027† (.016)
Physical Impairment		.813*** (.040)				
Retired ^a			.024 (.043)	.029 (.043)	.027 (.042)	.045 (.043)
Non-employed ^a			.222*** (.036)	.183*** (.037)	.178*** (.037)	.182*** (.037)
Fulfilling Work × Retired ^a				-.146* (.071)	-.153* (.071)	-.155* (.071)
Fulfilling Work × Non-employed ^a				-.271*** (.054)	-.244*** (.053)	-.186** (.055)
Sense of Control					-.181*** (.026)	-.128*** (.034)
Sense of Control × Retired ^a						-.034 (.061)
Sense of Control × Non-employed ^a						-.241*** (.067)
Female	.134*** (.026)	.096*** (.024)	.102*** (.026)	.102*** (.026)	.093*** (.026)	.096*** (.026)
White	-.065† (.037)	-.038 (.035)	-.075* (.037)	-.077* (.037)	-.052 (.037)	-.052 (.037)
College	-.130*** (.031)	-.084** (.029)	-.117*** (.031)	-.120*** (.031)	-.091** (.031)	-.091** (.031)
High Occupation	-.057* (.027)	-.004 (.025)	-.051† (.027)	-.056* (.027)	-.041 (.027)	-.039 (.027)
Constant	.717*** (.041)	.529*** (.039)	.693*** (.041)	.689*** (.041)	.678*** (.041)	.669*** (.041)
R ²	.116	.247	.134	.144	.161	.166

Note : N = 2,314. Metric coefficients with standard error in parentheses are shown. Age is modeled as $(Age-45) \times 10^{-1}$, Age² is modeled as $(Age-45)^2 \times 10^{-4}$.

^a Compared to respondents who are currently employed.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

Table 4.8. Anxiety (Square-Rooted) Regressed on Fulfilling Work and Age, Their Interaction, Potential Mediators, and Potential Mediating Interactions: U.S., ASOC 1995.

Model	1	2	3	4	5	6	7	8
Fulfilling Work	-.184*** (.028)	-.137*** (.027)	-.153*** (.029)	-.157*** (.029)	-.172*** (.028)	-.099** (.036)	-.084* (.036)	-.097** (.036)
Age	-.134*** (.009)	-.175*** (.009)	-.142*** (.009)	-.142*** (.009)	-.121*** (.012)	-.121*** (.012)	-.128*** (.012)	-.132*** (.012)
Fulfilling Work × Age	-.044** (.015)	-.030* (.015)	-.045** (.015)	-.035* (.016)	-.044** (.015)	-.029 (.020)	-.028 (.020)	-.026 (.020)
Physical Impairment		.592*** (.053)						
Social Support			-.130*** (.033)	-.115** (.034)				
Social Support × Age				-.043* (.019)				
Retired ^a					-.068 (.051)	-.059 (.051)	-.068 (.050)	-.056 (.051)
Non-employed ^a					.115* (.045)	.082† (.046)	.076† (.046)	.086† (.046)
Fulfilling Work × Retired ^a						-.132 (.090)	-.136 (.089)	-.118 (.090)
Fulfilling Work × Non-employed ^a						-.233** (.067)	-.213** (.067)	-.154* (.070)
Sense of Control							-.136*** (.033)	-.046 (.043)
Sense of Control × Retired ^a								-.168* (.076)
Sense of Control × Non-employed ^a								-.259** (.084)

Female	.172*** (.032)	.145*** (.031)	.186*** (.032)	.185*** (.032)	.150*** (.032)	.150*** (.032)	.143*** (.032)	.143*** (.032)
White	.125** (.047)	.145** (.045)	.135** (.046)	.135** (.046)	.118* (.046)	.116* (.046)	.136** (.046)	.135** (.046)
College	-.082* (.038)	-.046 (.038)	-.072† (.038)	-.074† (.038)	-.077* (.038)	-.080* (.038)	-.057 (.036)	-.053 (.039)
High Occupation	-.007 (.034)	.045 (.033)	-.009 (.034)	.009 (.034)	.014 (.034)	.009 (.034)	.021 (.034)	.023 (.034)
Constant	1.001*** (.048)	.852*** (.049)	.987*** (.048)	.980*** (.048)	1.003*** (.050)	1.002*** (.050)	.989*** (.050)	.977*** (.050)
R ²	.122	.166	.127	.133	.129	.134	.140	.144

Note : N = 2,301. Metric coefficients with standard error in parentheses are shown. Age is modeled as $(\text{Age}-45) \times 10^{-1}$, Age² is modeled as $(\text{Age}-45)^2 \times 10^{-4}$.

^a Compared to respondents who are currently employed.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

stronger effect on anxiety in non-employed status is partially explained by the personal control's stronger effect in non-employed status, as presented in model 7 and 8.

Next, the interaction between socially interactive work and age for depression has the coefficient value of $-.020$ in model 1 of Table 4.9. The main mechanism of divergence is the cumulative advantage through physical impairment (70% declined). The mechanism of resource substitution reduces 68% of the divergence through the stronger effect of interactive work in non-employed status in model 3 and 4. The stronger effect of interactive work in non-employed status is partially explained by the stronger effect of personal control in non-employed status, as suggested in model 5 and 6. Additionally, the stronger effect of interactive work in non-employed status is explained by the stronger effect of social support in non-employed status, as suggested in model 7 and 8. These results of socially interactive work are similar to those of fulfilling work.

Finally, in model 1 and 2 of Table 4.10, the interaction between socially interactive work and age on anxiety is declined 29% through cumulative advantage in physical impairment. The mechanism of resource substitution reduces 26% of the interaction effect through the stronger effect of social support in older age (model 3 and 4) and 67% of the interaction effect through the stronger effect of socially interactive work in retired or other non-employed status (model 5 and 6). The results in model 7 and 8 suggests that the stronger effect of interactive work in retired or other non-employed status is explained by the stronger effect of social support in the disadvantaged employment status – 16% declined for retired status and 39% declined for other non-employed status.

In sum, the cumulative advantage mechanism explains the work-based mental health divergence through physical impairment, and the resource substitution mechanism explains the age interaction through stronger effects of work quality, social support, and

sense of control in retired or other non-employed status more prevalent in older ages. This resource substitution mechanism to explain the age interaction is not so relevant to the widowed or other non-married status. As other possible work-related mediating resources which are not taken into account in this study due to data availability, self-esteem or life-satisfaction might play important roles in disadvantaged employment status. Both the mechanisms of cumulative advantage and resource substitution appear to have similar contributions to the work-based mental health divergence.

Finally, as supplementary analyses for the resource substitution which is a new mechanism suggested in this study, I examined the effects of six resources (education, occupational prestige, income, work fulfillment, personal control, and social support) on depression in four disadvantaged statuses related to life-stages – retired, other non-employed, widowed, and other non-married status. In retired status compared to employed status, all the six resources had stronger effects on depression, and four of them (occupational prestige, work fulfillment, personal control, and social support) showed significant interaction effects at .05 level. In a full model including all the interaction terms of six resources, work fulfillment showed the strongest interaction effect, suggesting work fulfillment as the most effective resource for mental health in retired-hood. In other non-employed status compared to employed status, all the resources showed significantly stronger effects on depression. In a full model including all the six interaction terms, only work fulfillment and personal control showed still significant interaction effects, indicating them as the most effective substitution resources for mental health in other non-employed status. These results completely support the resource substitution hypothesis rather than the resource multiplication hypothesis for disadvantaged employment status.

In both widowed and other non-married status compared to married status, only work fulfillment showed a significantly stronger effect on depression although three other resources also showed negative interaction effects. In sum, the stronger effects of resources in later life are mainly related to the resource substitution in disadvantaged employment status. Work fulfillment becomes the most important resource for mental health of the elderly in non-employed or non-married status, and it provides an implication for effective social interventions to improve older population's psychological well-being.

5. SUMMARY

In summary, SES and daily work quality as a social condition conducive to SES have different effects on psychological well-being across adult life-stages. Education, income, occupational prestige (even if it is last job's prestige), fulfilling and interactive work have stronger effects on psychological well-being in later life. It supports the hypothesis of consistent divergence or increasing mental health disparity over the adult life course.

The life-course divergence in depression or anxiety with respect to SES or work factors is explained by the two mechanisms of cumulative advantage and resource substitution. In all the SES or work factors, the cumulative advantage mechanism contributes to the age interaction of divergence through physical impairment. Especially, income-based divergence is mainly explained by this cumulative advantage mechanism. In the case of the resource substitution mechanism, occupational prestige has the age interaction due to stronger effects of work quality in disadvantaged employment status more prevalent in older ages. The prestige of last occupation plays an important role for

Table 4.9. Depression (Square-Rooted) Regressed on Interactive Work and Age, Their Interaction, Potential Mediators, and Potential Mediating Interactions: U.S., ASOC 1995.

Model	1	2	3	4	5	6	7	8
Interactive Work	-.181*** (.020)	-.125*** (.019)	-.155*** (.021)	-.107*** (.028)	-.086** (.028)	-.096*** (.028)	-.069* (.029)	-.084** (.029)
Age	-.062*** (.009)	-.112*** (.009)	-.059*** (.010)	-.060*** (.010)	-.068*** (.010)	-.072*** (.010)	-.073*** (.010)	-.073*** (.011)
Age ²	1.502*** (.428)	.800* (.394)	1.523** (.452)	1.571*** (.452)	1.237** (.448)	1.214** (.447)	1.608*** (.448)	1.535*** (.451)
Interactive Work × Age	-.020† (.011)	-.006 (.010)	-.022* (.011)	-.007 (.014)	-.009 (.014)	-.010 (.014)	-.011 (.014)	-.012 (.014)
Physical Impairment		.838*** (.040)						
Retired ^a			.004 (.044)	.009 (.044)	.008 (.043)	.029 (.043)	.024 (.043)	.024 (.043)
Non-employed ^a			.216*** (.037)	.204*** (.038)	.193*** (.037)	.191*** (.037)	.214*** (.037)	.224*** (.038)
Interactive Work × Retired ^a				-.112† (.066)	-.111† (.065)	-.100 (.065)	-.118† (.065)	-.091 (.066)
Interactive Work × Non-employed ^a				-.119* (.050)	-.116* (.049)	-.081 (.049)	-.117* (.049)	-.073 (.052)
Sense of Control					-.215*** (.026)	-.134*** (.034)		
Sense of Control × Retired ^a						-.085 (.061)		
Sense of Control × Non-employed ^a						-.305*** (.065)		

Social Support							-.173***	-.116***
							(.027)	(.034)
Social Support × Retired ^a								-.113†
								(.067)
Social Support × Non-employed ^a								-.183**
								(.067)
Female	.156***	.110***	.120***	.120***	.106***	.111***	.134***	.134***
	(.026)	(.024)	(.026)	(.026)	(.026)	(.026)	(.026)	(.026)
White	-.063†	-.034	-.074*	-.082*	-.053	-.052	-.071†	-.067†
	(.038)	(.035)	(.038)	(.038)	(.037)	(.037)	(.037)	(.037)
College	-.144***	-.091**	-.130***	-.132***	-.094**	-.094**	-.114***	-.113***
	(.031)	(.029)	(.031)	(.031)	(.031)	(.031)	(.031)	(.031)
High Occupation	-.080**	-.021	-.071**	-.072**	-.052†	-.050†	-.066*	-.067*
	(.028)	(.025)	(.027)	(.027)	(.027)	(.027)	(.027)	(.027)
Constant	.718***	.524***	.696***	.696***	.683***	.670***	.673***	.670***
	(.042)	(.039)	(.042)	(.042)	(.041)	(.041)	(.042)	(.042)
R ²	.094	.237	.112	.114	.139	.147	.130	.133

Note : N = 2,319. Metric coefficients with standard error in parentheses are shown. Age is modeled as $(\text{Age}-45) \times 10^{-1}$, Age² is modeled as $(\text{Age}-45)^2 \times 10^{-4}$.

^a Compared to respondents who are currently employed.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

Table 4.10. Anxiety (Square-Rooted) Regressed on Interactive Work and Age, Their Interaction, Potential Mediators, and Potential Mediating Interactions: U.S., ASOC 1995.

Model	1	2	3	4	5	6	7	8
Interactive Work	-.119*** (.025)	-.080** (.025)	-.088*** (.026)	-.095*** (.026)	-.107*** (.026)	-.052 (.035)	-.018 (.036)	-.032 (.036)
Age	-.134*** (.009)	-.177*** (.009)	-.143*** (.009)	-.144*** (.009)	-.120*** (.012)	-.121*** (.012)	-.132*** (.012)	-.132*** (.012)
Interactive Work × Age	-.031* (.013)	-.021 (.013)	-.035** (.013)	.026† (.014)	-.033* (.013)	-.011 (.018)	-.014 (.018)	-.016 (.018)
Physical Impairment		.604*** (.053)						
Social Support			-.151*** (.033)	-.132*** (.034)			-.152*** (.033)	-.097* (.042)
Social Support × Age				-.049** (.019)				
Retired ^a					-.074 (.051)	-.067 (.051)	-.052 (.051)	-.054 (.052)
Non-employed ^a					.117* (.046)	.111* (.047)	.120** (.047)	.129** (.047)
Interactive Work × Retired ^a						-.160† (.082)	-.166* (.082)	-.140† (.083)
Interactive Work × Non-employed ^a						-.114† (.062)	-.113† (.062)	-.069 (.065)
Social Support × Retired ^a								-.102 (.084)
Social Support × Non-employed ^a								-.184* (.084)

Female	.190*** (.032)	.157*** (.031)	.203*** (.032)	.202*** (.032)	.167*** (.033)	.168*** (.033)	.180*** (.033)	.180*** (.033)
White	.126** (.047)	.148** (.046)	.136** (.047)	.139** (.047)	.119* (.047)	.110* (.047)	.120* (.047)	.124** (.047)
College	-.092* (.039)	-.052 (.038)	-.078* (.039)	-.081* (.039)	-.087* (.039)	-.089* (.039)	-.074† (.039)	-.072† (.039)
High Occupation	-.016 (.034)	-.027 (.033)	-.010 (.034)	-.009 (.034)	-.008 (.034)	-.009 (.034)	-.004 (.034)	-.005 (.034)
Constant	1.006*** (.049)	.852*** (.049)	.991*** (.049)	.980*** (.049)	1.009*** (.050)	1.009*** (.050)	.990*** (.050)	.985*** (.050)
R ²	.109	.156	.119	.112	.116	.118	.126	.128

Note : N = 2,310. Metric coefficients with standard error in parentheses are shown. Age is modeled as $(\text{Age}-45) \times 10^{-1}$, Age² is modeled as $(\text{Age}-45)^2 \times 10^{-4}$.

^a Compared to respondents who are currently employed.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

psychological well-being after retirement because it positively affects the current work quality, and the daily work quality has a stronger effect in later life. Work factors have the age interactions of divergence due to stronger effects of work quality, personal control, and social support in disadvantaged employment status more prevalent in older ages. All the results for both depression and anxiety have similar patterns, increasing the reliability of results and conclusions in this study.

CHAPTER 5: SOCIOECONOMIC STATUS AND AGE TRAJECTORES OF HEALTH.

1. HYPOTHESES

Using ACL panel data (1986, 1989, and 1994 survey) and latent growth-curve modeling, this chapter examines the effects of education and family income on trajectories of depression and physical impairment across the adult life course. Although this study's main interest is in mental health, the patterns of physical impairment are also examined in this chapter because physical impairment is the most important mediating factor in the process of SES-based cumulative advantages in mental health according to the results in chapter 4. Additionally, the inter-cohort trends in the relationship between education and health are examined. Five hypotheses are tested.

Hypothesis 1: physical impairment diverges over the follow-up period across levels of education for all adult age groups.

Hypothesis 2: physical impairment diverges over the follow-up period across levels of family income for all adult age groups.

Hypothesis 3: depression diverges over the follow-up period across levels of education for all adult age groups.

Hypothesis 4: depression diverges over the follow-up period across levels of family income for all adult age groups.

Hypothesis 5: there are inter-cohort trends relatively favoring the higher-educated in terms of health.

2. PHYSICAL IMPAIRMENT

Table 5.1 presents the results from two latent growth models predicting physical impairment. The first LGM examines the effect of education and the second LGM estimates the effect of family income. In the education model, college graduates report better health at baseline (constant) and a smaller slope (change rate), compared to the group with less than a high school degree. Because the interaction between age and college degree on the slope for health is negligible (-.001 in Column 2 of Table 5.1), this suggests that college degree has a cumulative advantage in health regardless of age, resulting in consistent diverging gaps over the 8-year aging process in all adult life stages. The mid-education group demonstrates the same patterns as college graduates but with a smaller effect size.

The pattern of results from the income model is basically consistent with that of the education model, but the slope difference (i.e., $-.004-.001(\text{Age}-45)/10$) between the high-income group and the low-income group in most ages is not significant as presented in Column 4 of Table 5.1. The middle-income group also shows the same pattern as the high-income group. In both models, the effect of age on health change (within-person slope) is positive and significant (.006 in both Column 2 and 4) regardless of SES groups – implied by the negligible interactions of age and SES. It indicates that the predicted changes get more positive as age at baseline increases. In other words, physical impairment decreases less and/or increases more as age increases. As confirmed in Figure 5.1, the slopes of physical impairment get steeper in older ages or older birth cohorts.

The aging-vector graphs shown in Figure 5.1 provide summaries of the LGM results presented in Table 5.1. Each arrow represents the predicted origin and change in physical impairment for a 1-year birth cohort. The horizontal axis indicates the cohort's age at the beginning and end of the survey period. The vertical axis indicates the cohort's

Table 5.1. Physical Impairment Constant and Change Regressed on Socioeconomic Status Factors and Their Interactions with Age: Multi-Indicator Latent Growth Models with Missing Data Imputed by Expectation Maximization (Metric Coefficients with Robust Standard Errors for Non-Normal Data in Parentheses.)

Variables	Education Model ^a		Income Model ^b	
	Constant	Change	Constant	Change
Female	.054* (.024)	-.001 (.003)	.026 (.023)	-.001 (.003)
White	.003 (.023)	-.019*** (.004)	.037 (.023)	-.018*** (.004)
Age	.129*** (.014)	.006*** (.002)	.128*** (.014)	.006*** (.002)
Age ²	.249*** (.045)		.147** (.047)	
College Degree ^c	-.235*** (.033)	-.022*** (.005)	-.143*** (.034)	-.020*** (.005)
Mid-Education ^c	-.152*** (.032)	-.014** (.004)	-.087** (.033)	-.012** (.004)
High Income ^d			-.256*** (.037)	-.004 (.005)
Middle Income ^d			-.158*** (.036)	-.006 (.005)
Age × College ^c	-.042 [†] (.022)	-.001 (.003)		
Age × Mid-education ^c	-.030 [†] (.016)	.000 (.002)		
Age × High Income ^d			-.050** (.018)	-.001 (.002)
Age × Middle Income ^d			-.005 (.017)	-.001 (.002)
Intercept	1.250*** (.032)	.050*** (.005)	1.391*** (.041)	.053*** (.005)
Residual Variance	.217*** (.010)	.002*** (.000)	.205*** (.015)	.001*** (.000)
Residual Correlation R ²	-.339*** .278		-.342*** .304	

Note: Age is modeled as $(Age-45)10^{-1}$, and Age² is modeled as $(Age-45)^210^{-3}$, N= 3,617

^a Fit indexes: $\chi^2=185.1$, df=40, p < .001; SRMR=.011, RMSEA=.024; Yuan-Bentler scaled $\chi^2=207.9$, df=40, p < .001. ^b Fit indexes: $\chi^2=233.9$, df=48, p < .001; SRMR=.011, RMSEA=.025; Yuan-Bentler scaled $\chi^2=248.2$, df=40, p < .001.

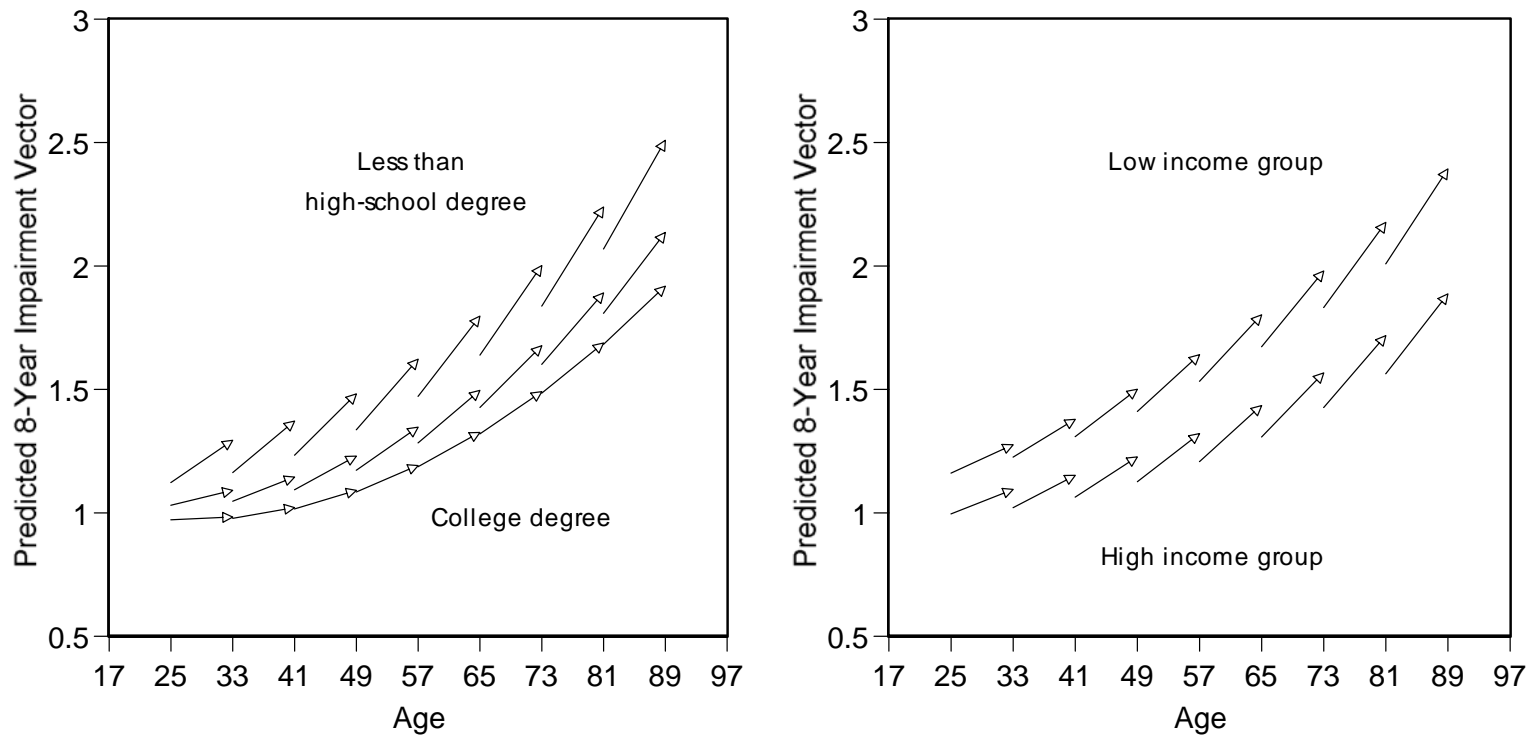
^c Compared to less than high school degree. ^d Compared to low income.
[†] $P < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$ (2-tailed tests)

predicted health at the beginning and end of the survey period. Mean values of each of the control variables are used to generate predictions of the vectors. To simplify the figure, vectors are shown for every eighth age group (Mirowsky and Kim forthcoming).

A series of vectors in the lower portion of Figure 5.1 illustrate the health trajectories of the higher-SES group, and the vectors in the upper portion illustrate those of the lower-SES group. Across all age groups or life stages, I can confirm diverging health gaps by education and income over the 8-year aging period. Inter-cohort trends appear to exist. The left graph of Figure 5.1 illustrates unfavorable trends for those with less than a high school degree across all age groups – the 8-year newer cohort has higher or worse age-specific levels of health at all age groups. As a similar pattern, slightly unfavorable trends exist for high school graduates. In the case of college graduates, there is no inter-cohort trend – the example of perfect conformity or Bell’s convergence. Therefore, the connected aging-vectors for the college graduates provide the image of trajectory in physical impairment over the entire adulthood attributed to pure aging process. Occasionally, this kind of relatively pure aging pattern for current population can be found on certain topics.

The hypothesis that the effect of education is stronger in more recent cohorts is supported by the difference of inter-cohort trends across level of education; the less-educated have modestly greater unfavorable trends. If this contemporary trend is sustained and the illustrated diverging education-gaps over 8 years in each life stage accumulate over the life course, the health disparity will increase more and more in the future aging population.

Figure 5.1. Predicted 8-Year Aging Vectors of Physical Impairment by Educational Attainment and Family Income.



Note: N=3,617; College degree group (n=500), High-school degree to less than college degree (n=1,768), Less than high-school degree group (n=1349), High income group (the highest one third; n=1254), Low income group (the lowest one third; n=1,176).

In the income model, the high-income group does not show a significantly lower slope for physical impairment than the low-income group in most ages, as noted earlier. According to studies focusing on the dynamic nature of people's experiences with income and poverty, long-term income is more consequential to health than current income, and persistent poverty is more harmful to health than are occasional spells of poverty (Benzeval and Judge 2001; Duncan 1996; McDonough and Berglund 2003). Because income has a time-variant characteristic, I examine another LGM taking into account income change and persistence. For this model, 3,081 cases that provided any follow-up information are used, and I generate three dummy variables indicating groups of (1) persistently higher income (individuals with incomes consistently above the median over time), (2) rising income (individuals who moved from incomes below the median at baseline to incomes above the median in the last valid wave), and (3) falling income (individuals who moved from above the median at baseline to below the median in the last valid wave), with the persistently lower income group (individuals with incomes consistently below the median over time) serving as the reference category. The model is not weighted because the ACL data does not include an appropriate weight variable for the 3,081 cases.

The results in Table 5.2 indicate that the persistently higher income group has lower increases in physical impairment across all observed ages than the persistently lower income group. In Column 3, the slope difference between the two groups is $-.014 + .002 \times (\text{Age} - 45) / 10$. The positive age interaction is not significant, and the critical age in which the slope difference (or divergence) is disappeared is 115 (the age = $45 + 10 \times (.014 / .002) = 115$). Therefore, the hypothesis of divergence or cumulative advantage is basically supported across all observed ages, but the diverging gap or

Table 5.2. Physical Impairment Constant and Change Regressed on Temporal Patterns of Family Income and Their Interactions with Age: Multi-Indicator Latent Growth Models with Missing Data Imputed by Expectation Maximization (Metric Coefficients with Robust Standard Errors for Non-Normal Data in Parentheses.)

Variables	Constant		Change	
Female	.076***	(.019)	-.004	(.003)
White	.013	(.022)	-.013***	(.004)
Age	.072***	(.009)	.008***	(.001)
Age ²	.184***	(.040)		
College Degree	-.148***	(.032)	-.018**	(.005)
Mid-Education	-.161***	(.026)	-.007	(.004)
High Occupation ^a	-.013	(.027)	.001	(.004)
Middle Occupation ^a	.009	(.027)	-.001	(.004)
Stable High Income ^b	-.134***	(.023)	-.014***	(.004)
Falling Income ^b	-.118***	(.029)	-.008	(.006)
Rising Income ^b	-.052	(.039)	-.019**	(.006)
Stable High Income ^b × Age	-.018	(.013)	.002	(.002)
Falling Income ^b × Age	-.052**	(.013)	.003	(.003)
Rising Income ^b × Age	.034	(.015)	-.007†	(.004)
Intercept	1.259***	(.019)	.055***	(.005)
Residual Variance	.172***	(.013)	.003***	(.000)
Residual Correlation	-.258***			
R ²	.269		.121	

Note : N = 2,946 (excluded 135 cases of most severe physical impairment out of 3081; 4 points).

Fit indexes: $\chi^2=245.8$, $df=64$, $p < .001$; SRMR=.014, RMSEA=.027.

Age is modeled as $(Age-45) \times 10^{-1}$, Age² is modeled as $(Age-45)^2 \times 10^{-3}$

^a Compared to the lowest one third in occupational SEI score.

^b Compared to respondents of stable low income.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

slope difference diminishes in older ages. As supplemental interpretations of the effects of income dynamics on health, the falling income group has no significant slope difference in physical impairment from the stable low income group although their initial income status was good. In Column 3 of Table 5.2, the rising income group has significantly better change in functional health than the stable low income group across all adult ages although their initial income status was bad.

3. DEPRESSION

Table 5.3 presents the results from the two latent growth models predicting depression. In the education model, college graduates show lower initial depression levels and lower depression slope, compared to the group with less than a high school diploma. The interaction between age and college degree on the slope for depression is not significant (.002 in Column 2 of Table 5.3), implying diverging gaps over 8 years of aging in all adult ages or life stages, although the divergence diminishes in older ages. The graph on the left portion of Figure 5.2 summarizes the patterns.

The diverging aging-vectors between college graduates and persons with less than a high school diploma support the hypothesis of cumulative advantage although the amount of advantage diminishes in older ages. However, the diverging gaps between high-school graduates and persons with less than a high school diploma change into converging gaps in the old age cohorts (the critical age is about 63 at 1986, so the cohort was born in 1923), as illustrated in the left graph of Figure 5.2. In addition, this graph indicates weak cohort trends among persons who did not complete high school and strong evidence of inter-cohort trends favoring high school graduates especially among younger

Table 5.3. Depression Constant and Change Regressed on Socioeconomic Status Factors and Their Interactions with Age: Multi-Indicator Latent Growth Models with Missing Data Imputed by Expectation Maximization (Metric Coefficients with Standard Errors in Parentheses.)

Variables	Education Model ^a		Income Model ^b	
	Constant	Change	Constant	Change
Female	.080*** (.011)	-.006*** (.002)	.079*** (.011)	-.007*** (.002)
White	-.088*** (.015)	-.003 (.002)	-.080*** (.015)	-.003 (.002)
Age	-.024*** (.007)	.000 (.001)	-.035*** (.008)	.001 (.001)
Age ²	.105*** (.018)		.080*** (.019)	
College Degree ^c	-.169*** (.018)	-.012*** (.003)	-.136*** (.019)	-.008** (.003)
Mid-Education ^c	-.094*** (.015)	-.010*** (.002)	-.071*** (.015)	-.007** (.002)
High Income ^d			-.140*** (.020)	-.004 (.003)
Middle Income ^d			-.104*** (.017)	-.001 (.003)
Age × College ^c	-.001 (.011)	.002 (.002)		
Age × Mid-education ^c	-.011 (.008)	.005*** (.001)		
Age × High Income ^d			.010 (.012)	.002 (.002)
Age × Middle Income ^d			.004 (.008)	.003** (.001)
Intercept	1.502*** (.018)	.005* (.003)	1.579*** (.021)	.004 (.003)
Residual Variance	.050*** (.004)	.000 (.000)	.051*** (.004)	.000 (.000)
Residual Correlation	-.068		-.041	
R ²	.134	.632	.167	.471

Note: Age is modeled as $(Age-45)10^{-1}$, and Age² is modeled as $(Age-45)^2 10^{-3}$; N= 3,617

^a Fit indexes: $\chi^2=165.1$, df=38, p < .001; SRMR=.014, RMSEA=.021.

^b Fit indexes: $\chi^2=233.9$, df=46, p < .001; SRMR=.016, RMSEA=.024.

^c Compared to less than high school degree. ^d Compared to low income.

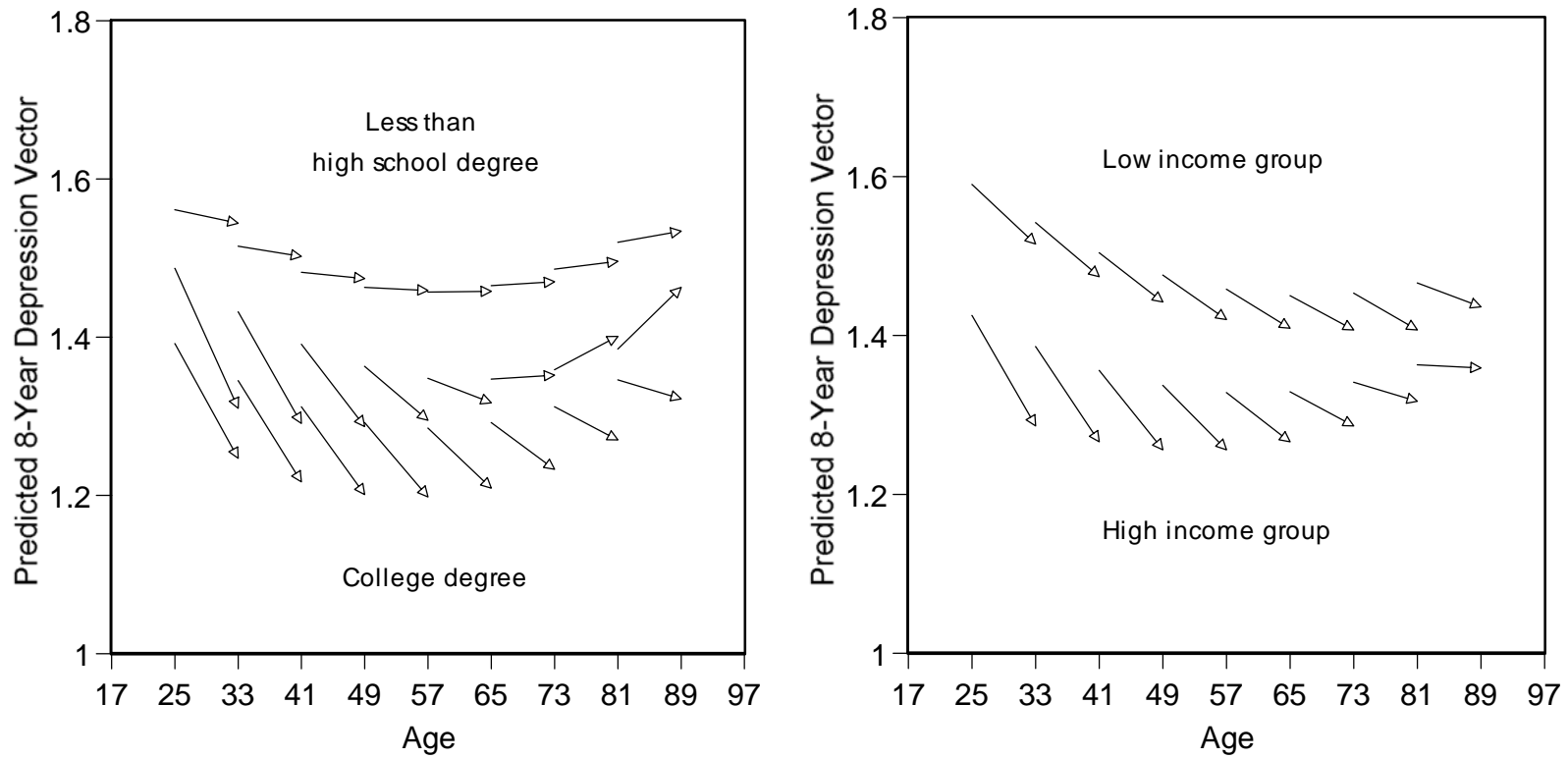
* $p < .05$; ** $p < .01$; *** $p < .001$ (2-tailed tests)

adult groups. College graduates enjoyed favorable inter-cohort trends in all age groups as illustrated in the graph, corroborating previous findings that indicate a stronger effect of education on health in more recent cohort.

For the income model, the difference in depression change between the high-income group and the low-income group is not significant in most ages according to Column 4 of Table 5.3. The cumulative advantages of income on reducing depression might not be as strong as the advantages accumulated as a result of education. Moreover, as illustrated in the right graph of Figure 5.2, the weak diverging gaps change to convergence after age 65 (calculated from $-.004 + .002 \times (\text{Age}-45)/10 = 0$). Because income may be time-variant, I examine another LGM with the same procedure as the modeling in physical impairment. The results in Table 5.4 indicate that the persistently higher income group has lower slopes than the persistently lower income group until age 70 (calculated from $-.005 + .002(\text{Age}-45)/10 = 0$); after that, the diverging gaps change into convergence, basically, resembling the pattern shown in Figure 5.2. As supplemental interpretations of Table 5.4, falling income group has no significant difference in depression change from stable low income group. Rising income group has significantly better depression changes than stable low income group in young adults and middle age groups, but the mental health divergence shifts into convergence after age 59 – calculated from $-.007 + .005(\text{Age}-45)/10 = 0$. Rising income's mental health advantage diminishes and disappears in older ages.

As illustrated in the right graph of Figure 5.2, the convergence appears to occur because depression of the low-income group does not increase by much in old ages, but the mortality selection bias is not likely to be a major explanation of the converging

Figure 5.2. Predicted 8-Year Aging Vectors of Depression by Educational Attainment and Family Income.



Note: N=3,617; College degree group (n=500), High-school degree to less than college degree (n=1,768), Less than high-school degree group (n=1349), High income group (the highest one third; n=1254), Low income group (the lowest one third; n=1,176).

Table 5.4. Depression Constant and Change Regressed on Temporal Patterns of Family Income and Their Interactions with Age: Multi-Indicator Latent Growth Models with Missing Data Imputed by Expectation Maximization (Metric Coefficients with Standard Errors in Parentheses.)

Variables	Constant		Change	
Female	.083***	(.013)	-.005**	(.002)
White	-.055***	(.014)	-.003	(.002)
Age	-.054***	(.007)	.002**	(.001)
Age ²	.110***	(.022)		
College Degree	-.104***	(.023)	-.003	(.004)
Mid-Education	-.080***	(.016)	-.001	(.002)
High Occupation ^a	-.041*	(.018)	-.006†	(.003)
Middle Occupation ^a	-.013	(.016)	-.006*	(.003)
Stable High Income ^b	-.120***	(.018)	-.005†	(.003)
Falling Income ^b	-.074**	(.023)	.000	(.004)
Rising Income ^b	-.043†	(.025)	-.007†	(.004)
Stable High Income ^b × Age	.026**	(.009)	.002	(.001)
Falling Income ^b × Age	-.004	(.012)	-.000	(.002)
Rising Income ^b × Age	.017	(.014)	.005*	(.002)
Intercept	1.527***	(.018)	.007*	(.003)
Residual Variance	.049***	(.004)	.000**	(.000)
Residual Correlation	-.113			
R ²	.208		.151	

Note : N = 2,987 (excluded 94 cases of severe depression out of 3081; over 2.5).

Fit indexes: $\chi^2=192.1$, $df=62$, $p < .001$; SRMR=.016, RMSEA=.020.

Age is modeled as $(Age-45) \times 10^{-1}$, Age² is modeled as $(Age-45)^2 \times 10^{-3}$

^a Compared to the lowest one third in occupational SEI score.

^b Compared to respondents of stable low income.

† $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$ (2-tailed tests)

pattern in old age cohorts, as examined in next parts. Although the possibility of cohort variation (i.e., a weak effect of income on depression in old-age cohorts) can not be completely excluded, an age-based explanation is more plausible, based on previous theories. Maturity, coping abilities, and managing skills of finance that accrue with age as a result of life experience might operate as a leveler that reduces the income-based gap in depression among the elderly.

4. THE POSSIBILITY OF MORTALITY SELECTION BIAS

Follow-up surveys inevitably lose cases for a variety of reasons, potentially reducing the representativeness of the sample. However, my interest is in whether mortality selection substantially influences my research results regarding age variation in SES-gap in health. In the main results, the SES-gap in functional health has a consistent diverging pattern across all adult ages. Possible mortality selection would just result in the underestimation of the diverging SES-gaps in the functional health trajectories (Lynch 2003). Therefore, even if mortality selection bias has a substantial influence in the result, the hypothesis of cumulative advantage would still be supported for physical impairment.

In this section, I focus on the possibility of mortality selection bias in the SES patterns found in the depression trajectories – e.g., later-life convergence. Table 5.5 presents results of two latent growth models for depression. For these models, two variables, a dummy variable indicating dropout due to death and its age interaction term, are simply added to the previous latent growth models presented in Table 5.3. In the results, the dropouts due to death have higher slopes in depression, compared to the others in the sample, according to this estimation from observed data and imputation.

This result suggests the possibility of attrition bias due to self-selection – i.e., underestimation of depression slopes in my results. However, there is a significant negative age interaction (-.007 in both Column 2 and 4 of Table 5.5), and it implies that the slope difference between dropouts due to death and the others diminishes in older ages; thus, the possibility of attrition bias is relatively small in older ages.

Although this attrition bias (underestimation of depression slopes) exists, the primary concern in this study is the possible influence of the mortality selection bias in the slope difference by SES, especially in the old ages. Although there is underestimation of the depression slope in absolute terms, it would be not a significant threat to our results if the potential bias does not affect relative SES-gaps in depression across all ages. As demonstrated in the comparison between the slope coefficients of Table 5.3 and Table 5.5, to control for attrition due to death does not influence the effects of SES on depression slopes substantially. Regardless of follow-up status, the SES patterns in the depression trajectories across age groups are almost same. When I assume the unobserved pattern of the dropouts due to death is likely to follow the pattern predicted from the observed data and the imputation, mortality selection bias is unlikely to distort the main findings and interpretations of this study.

Table 5.5. Depression Constant and Change Regressed on SES, Attrition due to Death and Their Interactions with Age: Multi-Indicator Latent Growth Models with Missing Data Imputed by Expectation Maximization (Metric Coefficients with Standard Errors in Parentheses.)

Variables	Education Model ^a		Income Model ^b	
	Constant	Change	Constant	Change
Female	.088*** (.011)	-.006*** (.002)	.088*** (.012)	-.007*** (.002)
White	-.086*** (.015)	-.003 (.002)	-.076*** (.016)	-.003 (.002)
Age	-.029*** (.007)	.000 (.001)	-.040*** (.008)	.002 (.001)
Age ²	.088*** (.020)		.051* (.022)	
College Degree ^c	-.168*** (.018)	-.012*** (.003)	-.124*** (.019)	-.009** (.003)
Mid-Education ^c	-.094*** (.015)	-.010*** (.002)	-.063*** (.015)	-.008*** (.002)
High Income ^d			-.144*** (.019)	-.002 (.003)
Middle Income ^d			-.073*** (.018)	-.002 (.003)
Age × College ^c	.002 (.011)	.002 (.002)		
Age × Mid-education ^c	-.010 (.008)	.006*** (.001)		
Age × High Income ^d			.014 (.010)	.001 (.001)
Age × Middle Income ^d			-.007 (.009)	.005*** (.001)
Death ^e	.105** (.032)	.030*** (.005)	.076* (.034)	.033*** (.005)
Age × Death ^e	-.008 (.013)	-.007*** (.002)	.007 (.014)	-.007*** (.002)
Intercept	1.492*** (.019)	.006*** (.003)	1.568*** (.022)	.004 (.003)
Residual Variance	.050*** (.004)	.000 (.000)	.051*** (.004)	.000 (.000)
Residual Correlation R ²	-.066 .145		.039 .191	

Note: Age is modeled as $(\text{Age}-45)10^{-1}$, and Age² is modeled as $(\text{Age}-45)^210^{-3}$; N= 3,617

^a Fit indexes: $\chi^2=174.0$, $df=46$, $p < .001$; SRMR=.012, RMSEA=.018.

^b Fit indexes: $\chi^2=241.3$, $df=54$, $p < .001$; SRMR=.014, RMSEA=.022.

^c Compared to less than high school degree. ^d Compared to low income. ^e Compared to respondents (3075 cases) who are not dropouts due to death.

* $p < .05$; ** $p < .01$; *** $p < .001$ (2-tailed tests)

5. SUMMARY

I find that education- and income-based gaps in physical impairment diverge throughout the adult life course, supporting the hypothesis of cumulative advantage. The education-based gap in depression also shows divergence across the life course, but the income-based gap in this aspect of mental health shows convergence in old age, supporting the age-as-leveler hypothesis. This distinct finding suggests the possibility of different life-course patterns between different SES factors and different health outcomes. Nevertheless, overall results confirm the persistent and cumulative health inequality by SES over the life course. In the case of income's effect on health in aging, significant cumulative advantages are found only when persistence or duration of income status is taken into account; that is, the health trajectories of the persistently higher income group have significantly better change (i.e., lower slope), compared to those of the persistently lower income group. These results suggest the necessity to take into account temporality at examining the effects of time-variant SES factors on health. Finally, there are inter-cohort trends relatively favoring higher education groups, consistent with previous findings suggesting that the effect of education on health is stronger in more recent birth cohorts.

CHAPTER 6: TEMPORAL PATTERNS OF WORK QUALITY AND DIVERGENCE IN PSYCHOLOGICAL WELL-BEING.

1. HYPOTHESES

Utilizing the ASOC national telephone probability sample collected in 1995, 1998, and 2001, this study examines the effect of persistent or changing work quality on individual's mental health trajectory over time. Fulfilling or nonroutine work quality as a structural condition is hypothesized to have mental health advantages, generating divergence in depression or anxiety across adult life stages. Four main hypotheses are tested.

Hypothesis 1: SES factors such as education, occupational prestige, and income have positive effects on daily work quality.

Hypothesis 2: stable good work quality over time results in cumulative advantages (divergence) in psychological well-being regardless of age or life-stage, compared to the stable bad work quality group.

Hypothesis 3: the gap in psychological well-being between the stable good work group and the falling work quality group diverges over time for all adult age groups.

Hypothesis 4: the gap in psychological well-being between the stable bad work group and the rising work quality group diverges over time for all adult age groups.

2. BASIC STATISTICS AND THE INFLUENCES OF SES ON WORK QUALITY

The variables of work quality are measured in terms of fulfillment and complexity of respondent's primary daily task. The primary daily task includes both paid work and unpaid activity, and Table 6.1 presents the subcategories of unpaid activity. All the values

in Table 6.1 are adjusted for the oversampling of the elderly. 58.5 percent of U.S. adults reported only paid work as their primary daily task, and 41.5 percent of them reported a unpaid activity as their primary task. In overall comparison of the mean values in Table 6.1, paid work is more fulfilling and more complex than unpaid activity. In terms of psychological well-being, the individuals who reported a paid work as their primary task have lower depression but similar level of anxiety, compared to the others. Unpaid activities are classified with six categories. Among the six, the most fulfilling activity is ‘care for child or elderly’, and the most nonroutine activity is ‘volunteer/church work’. In terms of psychological well-being, the individuals who reported ‘school work’ as their primary task show the lowest depression, and the group of outdoor recreation shows the lowest anxiety.

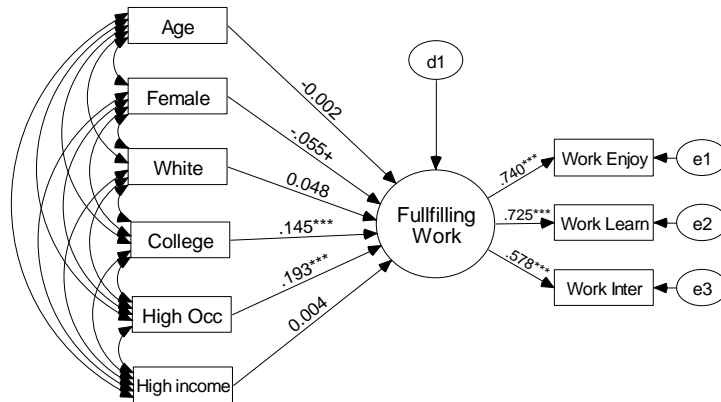
Figure 6.1 illustrates a two-group structural equation model (SEM) to examine the effects of three SES variables on the fulfilling work quality. Fulfilling work is a subjective measure because the respondents themselves evaluate their work’s fulfilling level regardless of what their primary daily task is. The latent factor structure of SEM has the advantage of adjusting for measurement errors, which might be problematic in subjective measures – three observed indicators for work fulfillment are utilized in this model. This model distinguishes the elderly group (1,098 cases) from the non-elderly group (1,494 cases) because daily activities of the elderly after retirement might be less influenced by their SES such as their last occupational status. However, when I test the equality of the path coefficients from SES to work quality between the two age groups, the effect sizes are not significantly different. It implies that SES plays important roles in both the quality of paid work in the younger and that of unpaid activity in the elderly. When I also test the equality of the work factor loadings to the observed indicators between the two age groups, the loadings are not significantly different, and it implies

that the measures of work fulfillment are equally valid for both age groups, even though many of the elderly answered about unpaid activities rather than paid works.

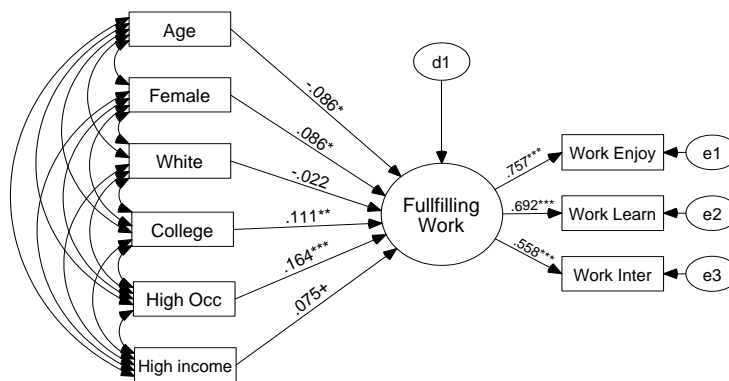
Table 6.1. Subcategories of Primary Daily Task, Means with Standard Deviations in Parentheses (Weighted N = 2,104).

Primary Daily Task	Percentage	Fulfilling Work Quality	Nonroutine Work Quality	Depression	Anxiety
Paid Work	58.5	3.272 (.528)	.306 (1.565)	.767 (1.101)	1.970 (1.890)
Unpaid Activity	41.5	3.069 (.545)	-.445 (1.494)	1.157 (1.528)	1.964 (2.147)
Housework	18.6	3.066 (.573)	-.452 (1.499)	1.205 (1.582)	2.060 (2.197)
Care for Child, Ill, or Elderly	2.4	3.221 (.535)	-.469 (1.560)	1.091 (1.221)	2.003 (2.151)
Garden/Home Maintenance	4.6	2.985 (.523)	-.672 (1.552)	1.248 (1.556)	1.972 (2.123)
Volunteer/ Church Work	1.9	3.054 (.556)	-.154 (1.458)	1.328 (1.550)	2.241 (2.035)
Recreation in the Home	6.3	3.051 (.507)	-.487 (1.426)	1.117 (1.584)	1.877 (2.176)
Recreation Outside	3.0	3.086 (.591)	-.258 (1.685)	1.146 (1.642)	1.694 (2.110)
Schoolwork etc.	4.7	3.102 (.464)	-.353 (1.363)	.911 (1.262)	1.742 (2.019)

Figure 6.1. SES and Fulfilling Work Quality: Two-Group Structural Model with Standardized Coefficients.



< The Non-Elderly Group >



< The Elderly Group >

Note: + p<.10, * p<.05, ** p<.01, *** p<.001 (two-tailed tests).

Fit Indexes: Chi-square=61.66, df=24, p<.001, NFI=.976, CFI=.985, RMSEA=.025.

As illustrated in Figure 6.1, in the non-elderly group (18 to 59 years old), education (*college degree*) and occupational prestige (*high occupation* is a dummy variable representing the respondents above the mean prestige score) have highly significant positive effects on the fulfilling work quality, but income (*high income* is a dummy variable representing the respondents above the mean income) does not have a significant effect net of other variables. The causality from income to work quality is skeptical among the non-elderly. I include income in the model simply to examine the comparability between the two age groups. As expected, occupational status has the biggest effect on the fulfilling work quality, and education contributes to having a desirable work quality even after controlling for occupational status. In the case of the elderly group (age 60 and more), the effects of education and occupational prestige are slightly reduced but still significant. Even though their occupational prestige represents mainly that of their last full-time occupation, the last job's prestige has an effect on the quality of their current daily activity. One interesting finding is that, in the elderly group, income has certain (marginally significant) effect on the desirability of their daily activities. Income in older ages might play a substantial role in enjoying desirable activities after retirement.

Other interesting findings regarding demographic variables are that age has a negative effect on work quality for the elderly, implying that their work quality gets worse with age, but not a significant effect for the younger, and female has worse work qualities than male in their working years but better work qualities in their retirement years. In equality test, the age coefficients between the two age groups are significantly different, and the female coefficients also differ significantly. In sum, the characteristics of primary daily tasks (even unpaid activities) are not independent from structural restrictions by socio-economic status. In terms of its effect on psychological well-being, a

work quality such as fulfillment can be considered a distal or a fundamental cause of health because it is a structural condition proximal to SES and affects psychosocial mediators to mental health such as sense of control and social support (Ross and Willigen 1997).

3. STABLE GOOD WORK QUALITY VERSUS STABLE BAD WORK QUALITY

Table 6.2 presents the results from two latent growth models about depression. The first LGM examines the effects of temporal patterns of fulfilling work, and the second LGM estimates the effects of temporal patterns of nonroutine work. In the fulfilling work model, with adjustment for sex, minority status, education, and occupational prestige, the adjusted slope difference between the stable fulfilling work group and the stable unfulfilling work group is $-.054-.000 \times (\text{Age}-45)/10$ in Column 2 of Table 6.2 (refer to equation (9) and (14) in METHODS section). In these results, b_{11} has a significant negative value (-.054) and b_{14} is not significant (-.000), so it implies that the depression gap between the two groups diverges over survey period in all ages (or regardless of age). This result supports the cumulative advantage hypothesis.

The left graph of Figure 6.2 summarizes the results of the fulfilling work model in Table 6.2. This graph contrasts the stable fulfilling work group with the stable unfulfilling work group with omitting the other two groups (the rising and the falling work groups). A series of arrows or vectors in upper side illustrate the depression trajectories of the stable unfulfilling work group, and the vectors in lower side illustrate those of the stable fulfilling work group. Mean values of each of the control variables are used to generate predictions of the vectors. In all the age groups or birth cohorts, we can confirm diverging depression gaps over the six years of aging process.

Table 6.2. Depression Constant and Change Regressed on Temporal Patterns of Work Quality and Their Interactions with Age: Multi-Indicator Latent Growth Models with Missing Data Imputed by Expectation Maximization (Metric Coefficients with Standard Errors in Parentheses.)

Variables	Fulfilling Work Model ^a		Nonroutine Work Model ^b	
	Constant	Change	Constant	Change
Female	.144*** (.037)	.006 (.008)	.139*** (.039)	.002 (.009)
White	-.093 (.059)	-.040** (.013)	-.097 (.061)	-.056*** (.014)
Age	-.002 (.016)	.010** (.003)	-.009 (.016)	.004 (.004)
Age ²	.519 (.546)		.669 (.573)	
College Degree	-.093* (.044)	.005 (.010)	-.110* (.046)	-.001 (.010)
Higher Occupation	-.090* (.041)	-.010 (.009)	-.107* (.042)	-.015 (.009)
Higher Work Quality	-.174*** (.041)	-.054*** (.011)	-.054 (.043)	-.047*** (.012)
Falling Work Quality		.059*** (.012)		.040*** (.012)
Rising Work Quality		-.058*** (.012)		-.046*** (.013)
Age × Higher Work	-.052** (.020)	-.000 (.005)	-.036† (.020)	.009† (.005)
Age × Falling Work		-.002 (.006)		-.006 (.006)
Age × Rising Work		-.008 (.006)		.007 (.006)
Intercept	.621*** (.067)	.095*** (.015)	.579*** (.071)	.120*** (.017)
Residual Variance	.203*** (.035)	.007*** (.002)	.234*** (.038)	.008*** (.002)
Residual Correlation	-.302†		-.301†	
R ²	.128	.165	.078	.119

†P < .10, * p < .05, ** p < .01, *** p < .001 (2-tailed tests)

Note: Age is modeled as (Age-45)10⁻¹, and Age² is modeled as (Age-45)²10⁻⁴; N= 1,559.

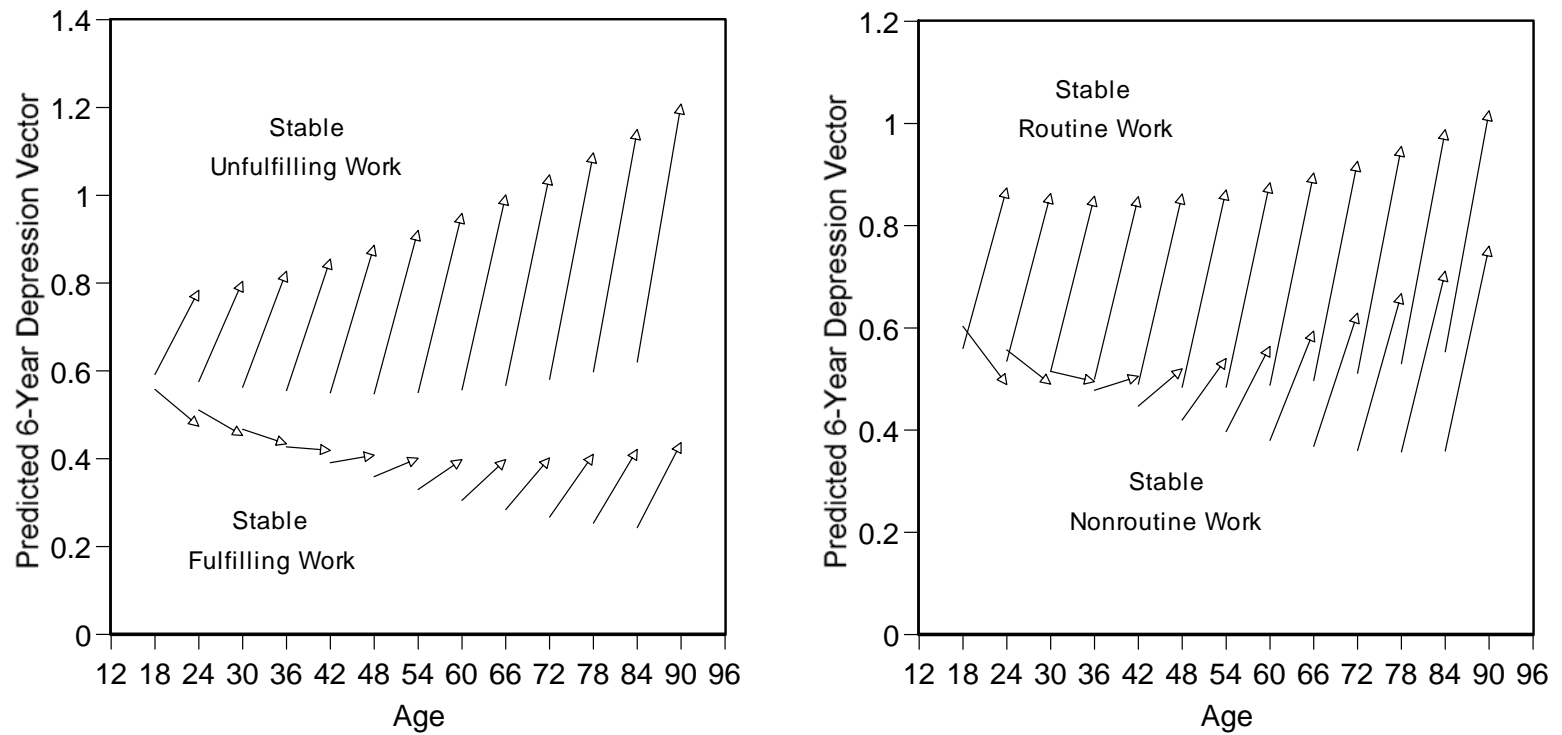
^a Fit indexes: $\chi^2=102.580$, $df=60$, $p < .001$; BBN=.989, NNFI=.993, SRMR=.014, RMSEA=.021.

^b Fit indexes: $\chi^2=111.997$, $df=60$, $p < .001$; BBN=.989, NNFI=.993, SRMR=.014, RMSEA=.024.

In the interpretation of the graph, the extent of divergence (or cumulative advantage) should be evaluated by the length difference in depression change between the two work groups not by the angle between the two vectors of the two work groups. For example, the age interaction in Column 2 of Table 6.2 is negligible (-.000), and it implies that the degree of divergence is same across all ages. In the left graph of Figure 6.2, the angle between the two vectors looks different across age groups – it appears to decrease with age. However, the length difference in depression change between the two work groups looks similar across ages as we can apparently expect from the result (the negligible age interaction effect) in Table 6.2. The slope difference refers to the length difference rather than the angle difference. Although the length differences (or slope differences) are same, the angles could be different, depending on the lengths of vectors – i.e., if the vector is longer, the angle gets smaller as shown in the later-life pattern of the graph. This is a point to be careful in the interpretation of the vector graphs.

In the nonroutine work model of Table 6.2, the adjusted slope difference between the stable nonroutine work group and the stable routine work group is $-.047 + .009 \times (\text{Age} - 45)/10$ in Column 4 of Table 6.2. In these results, b_{11} has a significant negative value (-.047) and b_{14} has a marginally significant positive value (.009), so the diverging pattern might change into convergence after certain age. When the critical age is calculated (the age = $45 + 10 \times (.047 / .009) = 97$), it is older than the oldest person (95) observed in this study. Therefore, the hypothesis of divergence or cumulative advantage is basically supported across all observed ages, but the diverging gap or slope difference diminishes in older ages. As illustrated in the graph of right side in Figure 6.2, the divergence in depression between the two groups apparently diminishes in later life, but the patterns

Figure 6.2. Predicted 6-Year Aging Vectors of Depression by Stable Good Work and Stable Bad Work.



Note: See Table 6.4 for the number of cases in the combinations between age groups and work groups.

still show divergence not convergence in the old-old ages, supporting the cumulative advantage hypothesis. For the diminishing divergence, the declining tendency in cognitive flexibility in older age might explain this diminishing benefit of the nonroutine work quality.

Table 6.3 presents the results from two latent growth models about anxiety. In the fulfilling work model, the adjusted slope difference between the stable fulfilling work group and the stable unfulfilling work group is $-.079-.009 \times (\text{Age}-45)/10$ in Column 2 of Table 6.3. In this results, b_{11} has a significant negative value (-.079), and b_{14} is also a negative value (-.009) although it is not significant. The negative age interaction implies that the diverging gaps become greater with advancing age. The graph on the left of Figure 6.3 summarizes the results. The graph illustrates diverging anxiety gaps in all age groups, implying apparent cumulative advantages of the stable fulfilling work.

Finally, in the nonroutine work model of Table 6.3, the adjusted slope difference between the stable nonroutine work group and the stable routine work group is $-.034-.000 \times (\text{Age}-45)/10$ in Column 4 of Table 6.3. In these results, both b_{11} and b_{14} have negative values, so they basically support the cumulative advantage hypothesis in all age groups. However, the anxiety slop difference is not statistically significant (t-value = -1.64) at all ages because the age interaction is just negligible (b_{11} , -.034, implies the slope difference in persons aged 45 at baseline). The graph on the right side of Figure 6.3 illustrates the results.

In sum, the stable fulfilling work quality is an important structural condition to generate cumulative advantages in mental health across all adult life stages. The stable nonroutine work quality also generates cumulative advantages in most adult life stages, but the benefits on mental health are relatively weak and diminish in older ages.

Table 6.3. Anxiety Constant and Change Regressed on Temporal Patterns of Work Quality and Their Interactions with Age: Multi-Indicator Latent Growth Models with Missing Data Imputed by Expectation Maximization (Metric Coefficients with Standard Errors in Parentheses.)

Variables	Fulfilling Work Model ^a		Nonroutine Work Model ^b	
	Constant	Change	Constant	Change
Female	.274*** (.079)	.018 (.015)	.257*** (.078)	.012 (.015)
White	.251* (.125)	-.051* (.024)	.246* (.123)	-.061* (.024)
Age	-.208*** (.029)	.004 (.006)	-.233*** (.028)	-.003 (.006)
College Degree	-.072 (.092)	-.010 (.018)	-.091 (.092)	-.019 (.018)
Higher Occupation	.004 (.086)	-.003 (.017)	-.007 (.085)	-.014 (.017)
Higher Work Quality	-.250** (.087)	-.079*** (.020)	-.084 (.087)	-.034 (.021)
Falling Work Quality		.093*** (.022)		.037 † (.021)
Rising Work Quality		-.054** (.021)		-.031 (.022)
Age × Higher Work	-.022 (.043)	-.009 (.010)	.036 (.041)	-.000 (.009)
Age × Falling Work		-.007 (.011)		-.002 (.012)
Age × Rising Work		.010 (.011)		.027** (.010)
Intercept	1.508*** (.138)	.083** (.028)	1.461*** (.139)	.090** (.029)
Residual Variance	1.131*** (.130)	.021** (.007)	1.124*** (.128)	.022** (.007)
Residual Correlation	-.149		-.138	
R ²	.132	.090	.119	.052

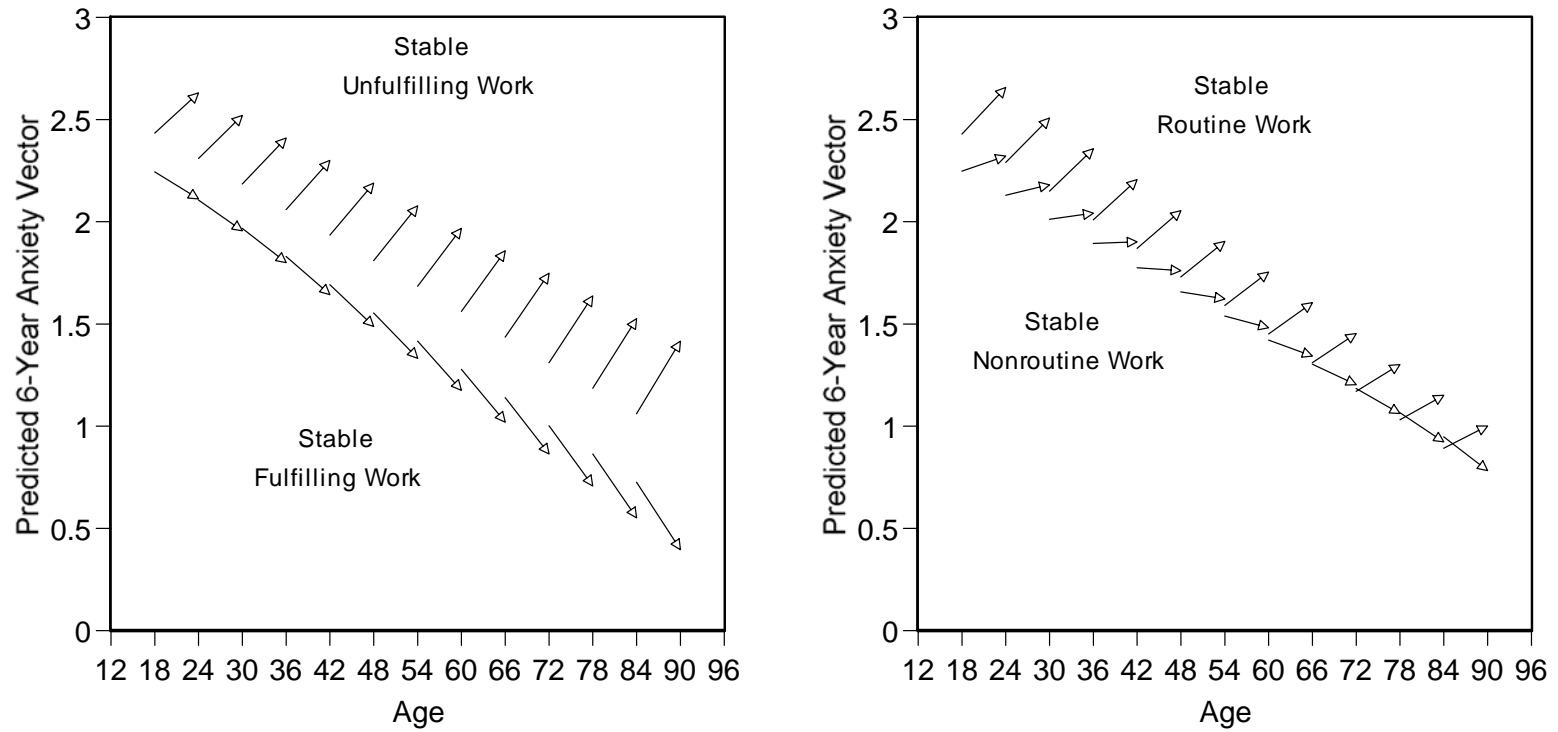
†P < .10, * p < .05, ** p < .01, *** p < .001 (2-tailed tests)

Note: Age is modeled as (Age-45)10⁻¹; N= 1,524.

^a Fit indexes: $\chi^2=292.220$, df=108, p < .001; BBN=.968, NNFI=.963, RMR=.026, RMSEA=.033.

^b Fit indexes: $\chi^2=278.409$, df=108, p < .001; BBN=.971, NNFI=.968, SRMR=.026, RMSEA=.032.

Figure 6.3. Predicted 6-Year Aging Vectors of Anxiety by Stable Good Work and Stable Bad Work.



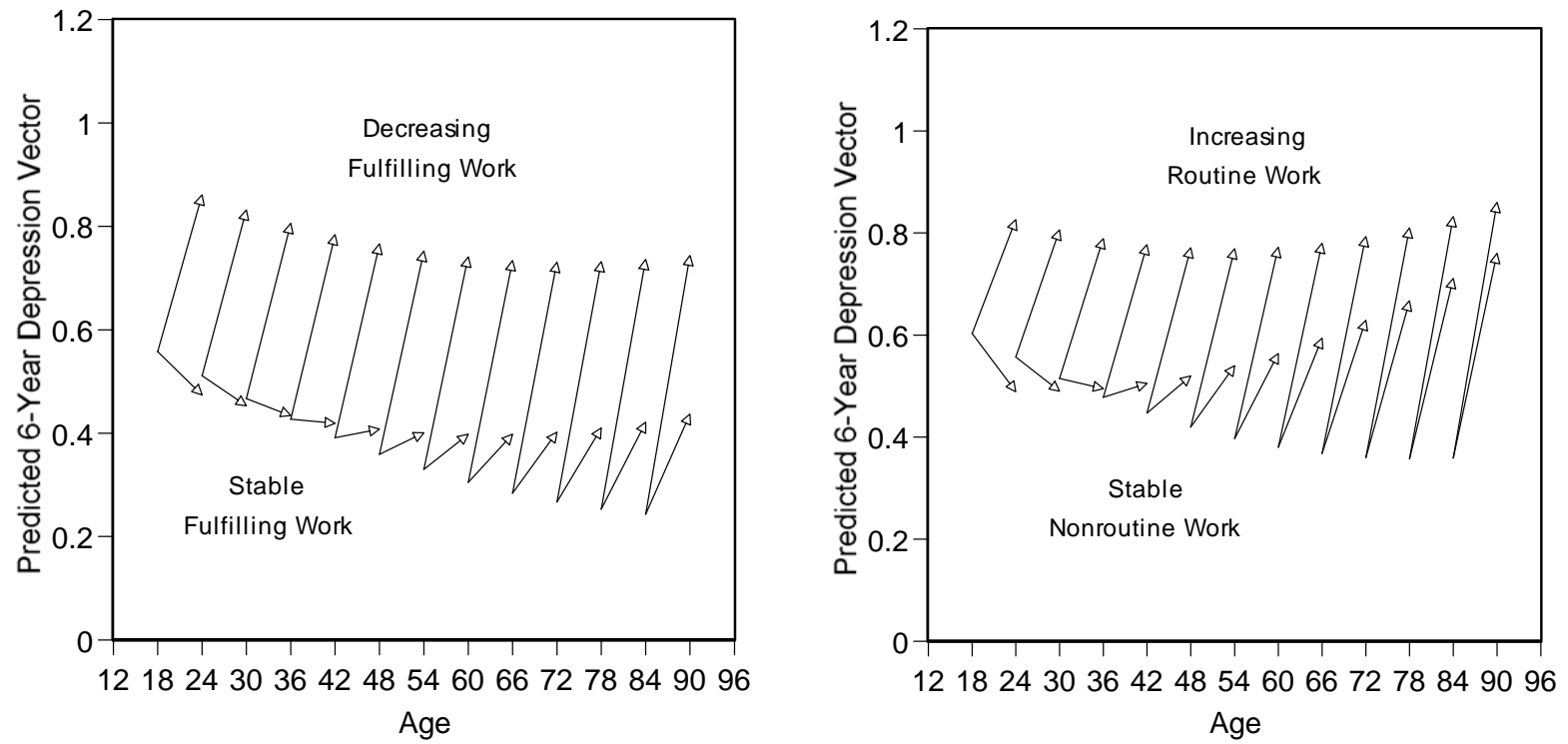
Note: See Table 6.4 for the number of cases in the combinations between age groups and work groups.

4. STABLE GOOD WORK QUALITY VERSUS FALLING WORK QUALITY

Declines in work qualities might degrade mental health, resulting in divergence from the stable good work group. In other words, the falling work quality group might experience increasing disadvantages in mental health although their initial work quality was good. As presented in Table 6.2, the adjusted slope difference between the stable fulfilling work group and the falling work fulfillment group is $-1 \times [.059 - .002 \times (\text{Age} - 45) / 10]$ in Column 2 of Table 6.2 (refer to equation (9) and (18) in METHODS section). In the slope difference, $-.059 + .002 \times (\text{Age} - 45) / 10$, the significant negative value ($-.059$) and the negligible age interaction ($.002$) implies that the depression gaps between the two groups diverge over time in all life stages. The graph on the left of Figure 6.4 illustrates the results. As mentioned earlier, the extent of divergence should be evaluated by the length difference in depression change rather than the angle between the two vectors in each age group. Although the angle between the two vectors in older ages gets smaller, the length difference in depression change is similar across all age groups.

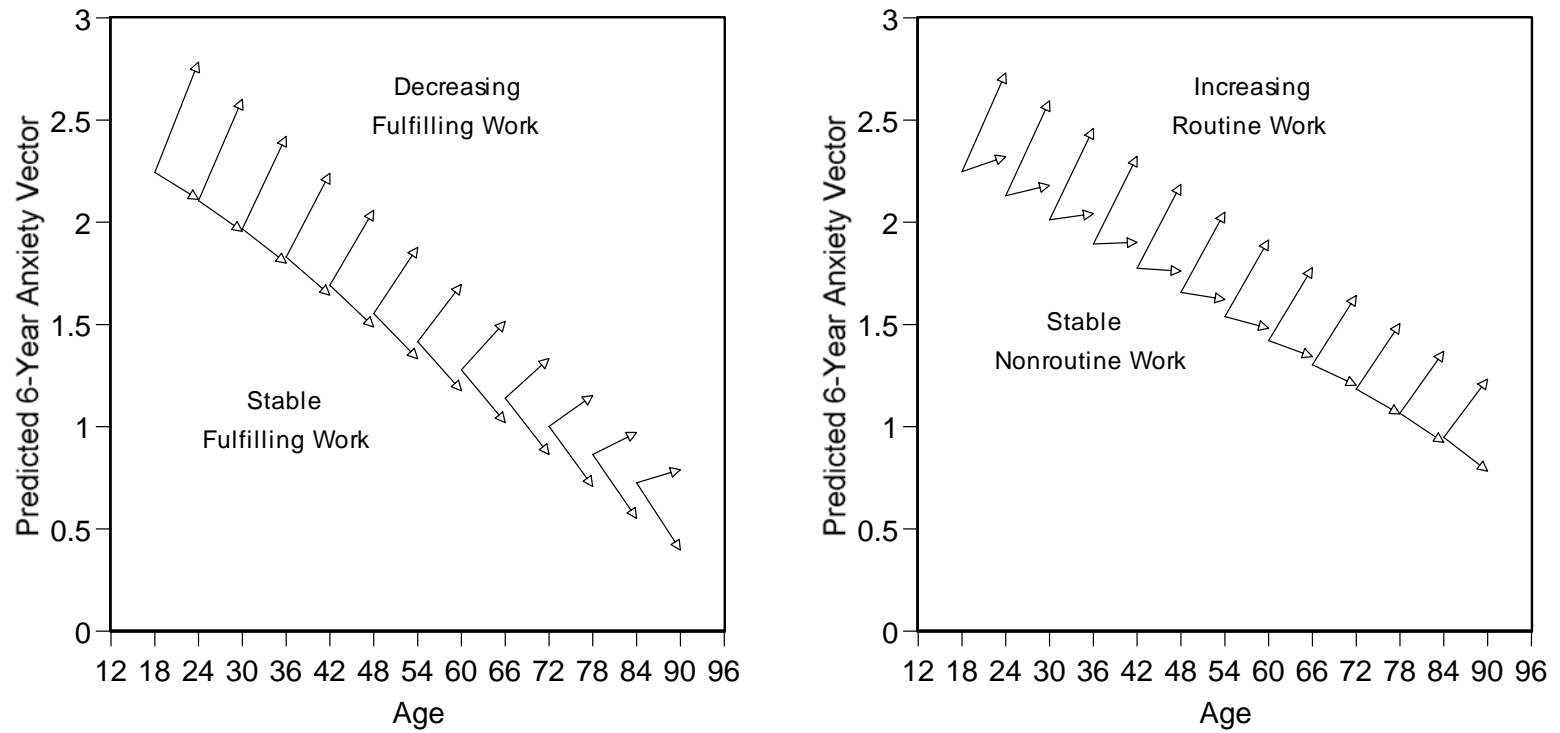
Next, the adjusted slope difference between the stable nonroutine work group and the falling work complexity group is $-1 \times [.040 - .006 \times (\text{Age} - 45) / 10]$ in Column 4 of Table 6.2. In the slope difference, $-.040 + .006 \times (\text{Age} - 45) / 10$, although it is not significant, the certain amount of age interaction ($.006$) implies that the diverging depression gaps between the two groups diminish with advancing age. The right side graph of Figure 6.4 illustrates the pattern. In the results for anxiety presented in Table 6.3, the slope difference between the stable fulfilling work group and the falling work fulfillment group shows the same patterns as the results for depression. The results in Column 2 imply that the anxiety gaps between the two groups diverge in all adult ages. The graph on the left of Figure 6.5 summarizes the results. In the case of nonroutine work, as presented in

Figure 6.4. Predicted 6-Year Aging Vectors of Depression by Falling Work Quality and Stable Good Work.



Note: See Table 6.4 for the number of cases in the combinations between age groups and work groups.

Figure 6.5. Predicted 6-Year Aging Vectors of Anxiety by Falling Work Quality and Stable Good Work.



Note: See Table 6.4 for the number of cases in the combinations between age groups and work groups.

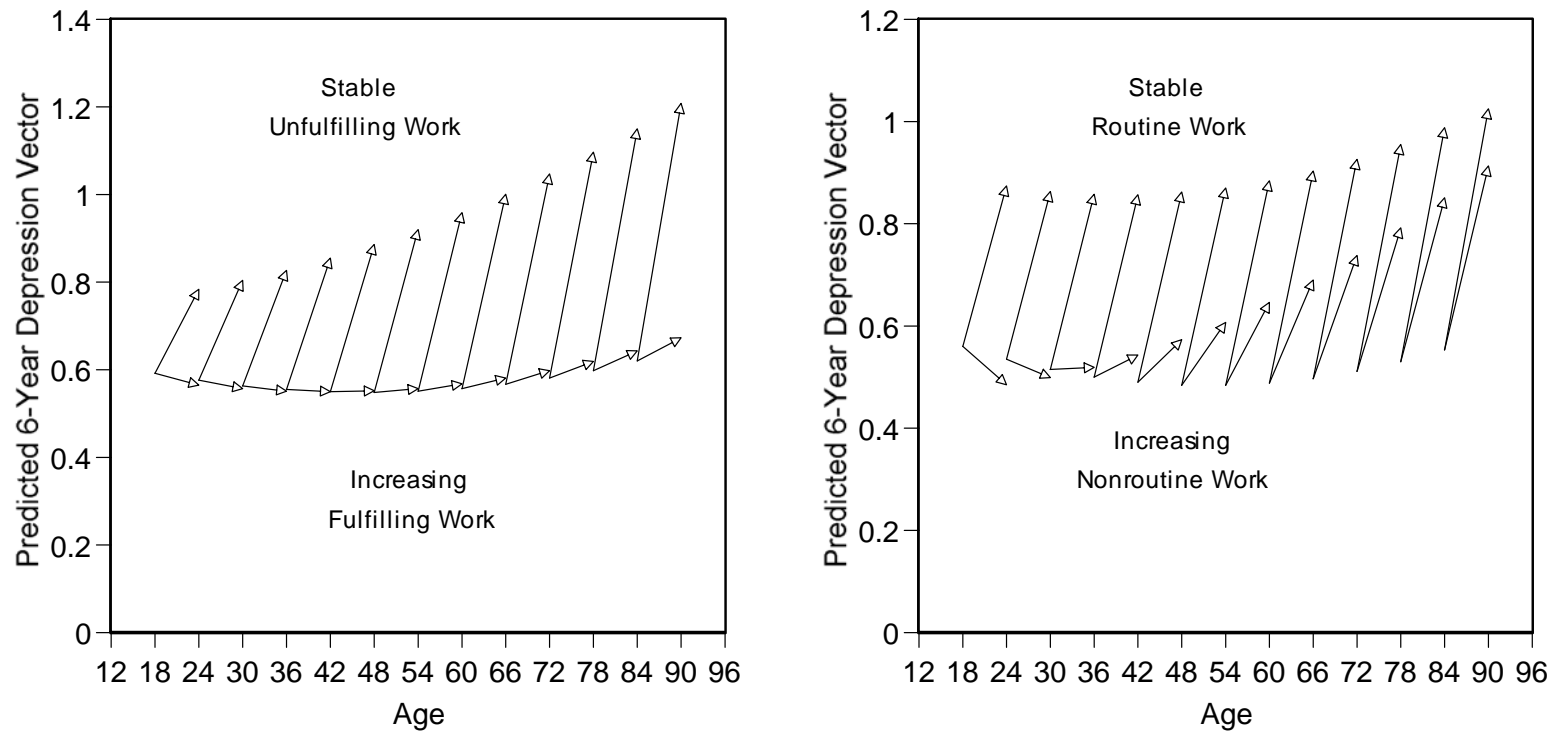
Column 4 of Table 6.3, the falling work complexity also results in a worse change in anxiety than the stable nonroutine work in all adult ages although the slope difference is not so big (the slope coefficient, .037 is marginally significant). The graph on the right of Figure 6.5 illustrates the results.

In sum, the declines in either the fulfilling work quality or the nonroutine work quality make their anxiety become worse in all ages, compared to the stable good work groups. In the declines of work qualities, depression also gets worse in all adult ages, but the disadvantages are greater in young or middle adult ages. This implies that the job degradation or unemployment in younger adulthood could increase depression sharply although it also has a negative effect on older adult's mental health.

5. STABLE BAD WORK QUALITY VERSUS RISING WORK QUALITY

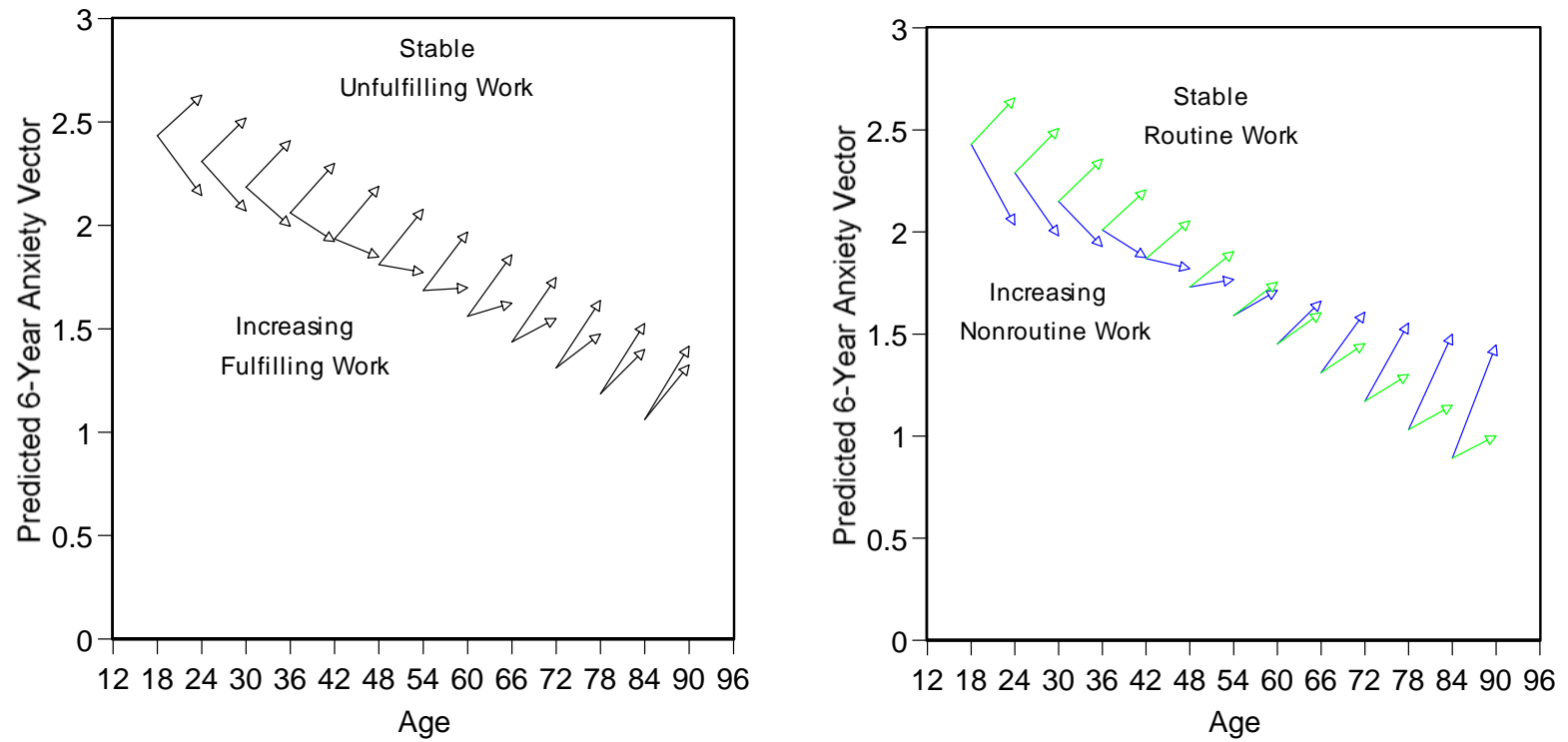
As presented so far, work quality plays a role as an important social condition to affect mental health in all adult life stages. The persons in stable bad work conditions have cumulative disadvantages in mental health over the life course. Is it possible, then, to overcome the disadvantages if they experience the improvement in work qualities? The results in Column 2 of Table 6.2 demonstrates that the rising work fulfillment group experiences significantly better changes in depression than the stable unfulfilling work group in all the ages (the slope difference = $-.058 - .008 \times (\text{Age} - 45) / 10$; refer to equation (9) and (15) in METHODS section). Especially, an improvement in the fulfilling work quality gives greater benefits for depression of older adults (the negative age interaction of $-.008$), as shown in the left graph of Figure 6.6. An improvement in the nonroutine work quality, as presented in Column 4 of Table 6.2, benefits depression in all ages, but the benefit diminishes with increasing age (the positive age interaction of $.007$) although

Figure 6.6. Predicted 6-Year Aging Vectors of Depression by Rising Work Quality and Stable Bad Work.



Note: See Table 6.4 for the number of cases in the combinations between age groups and work groups.

Figure 6.7. Predicted 6-Year Aging Vectors of Anxiety by Rising Work Quality and Stable Bad Work.



Note: See Table 6.4 for the number of cases in the combinations between age groups and work groups.

the age interaction is not significant. The graph on the right of Figure 6.6 summarizes the results.

In the case of anxiety, as presented in Column 2 of Table 6.3, an improvement in the fulfilling work quality gives greater benefits to younger adults (the positive age interaction of .010) although the divergence still occurs in older ages. The graph on the left of Figure 6.7 summarizes the results. In brief, the improvement in the fulfilling work quality can effectively decrease depression in older adults and can effectively decrease anxiety in younger adults. This provides an implication for social interventions because anxiety tends to be higher in younger adults and depression is a serious problem in mental health of the elderly (Mirowsky and Ross 1992; Turner and Lloyd 1999). The improvement in the fulfilling work quality can effectively ameliorate respective major mental health problems corresponding to age groups.

The most unexpected result in this study is that the rise in the nonroutine work quality aggravates anxiety in older age groups. There is a significant age interaction (.027 in Column 4 of Table 6.3), so the slope difference between the rising nonroutine work group and the stable routine work group strongly depends on age. The critical transition age in which reverse divergence occurs is 56 – from the equation of $-.031 + .027(\text{age} - 45)/10 = 0$ (refer to equation (16) and (17) in METHODS section). It implies that the rising work complexity is even detrimental in older ages, in terms of anxiety. The graph on the right of Figure 6.7 shows the cross-over pattern. The rising work complexity increases anxiety sharply among the elderly. This case in which the elderly from the routine work strata (below the median work quality at baseline) experience the rise to the nonroutine work strata might occur rarely. Table 6.4 presents the proportions of respondents according to the combinations of age groups and temporal patterns of work quality, and about 12 to 16 percent of the elderly reported the rising work complexity

over the survey period. Therefore, this is not a rare case. In addition to declining cognitive flexibility in older ages, the sharp increase in work complexity among the elderly who have managed relatively routine works might become an emotional or a cognitive overload to them.

Table 6.4. Cross Tabulation Between Age Groups (at Baseline) and Temporal Patterns of Work Quality

	Under 30		30-39		40-59		60-69		70 and older		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Fulfilling Work												
Stable Good	52	31.1	94	37.0	153	35.0	110	30.3	69	20.7	478	30.8
Falling Quality	32	19.2	32	12.6	68	15.6	62	17.1	62	18.6	256	16.5
Rising Quality	37	22.2	48	18.9	81	18.5	50	13.8	48	14.4	264	17.0
Stable Bad	46	27.5	80	31.5	135	30.9	141	38.8	154	46.2	556	35.8
(Total)	167	100	254	100	437	100	363	100	333	100	1554	100
Nonroutine Work												
Stable Good	61	36.5	115	45.3	205	46.9	133	36.6	72	21.6	586	37.7
Falling Quality	24	14.4	35	13.8	81	18.5	54	14.9	64	19.2	258	16.6
Rising Quality	44	26.3	54	21.3	56	12.8	58	16.0	39	11.7	251	16.2
Stable Bad	38	22.8	50	19.7	95	21.7	118	32.5	158	47.4	459	29.5
(Total)	167	100	254	100	437	100	363	100	333	100	1554	100

In short, improvement in fulfilling work quality benefits mental health in all ages, and it gives more benefits to the younger adults in anxiety and more benefits to the older adults in depression. Rising work complexity benefits depression, especially in younger adults. However, it gives relatively weak benefits to younger adults in anxiety and aggravates anxiety in older adults after age 56.

6. POSSIBLE SAMPLE ATTRITION BIAS

A final issue that needs to be mentioned about the results is the possibility of selection bias because I excluded the cases that did not provide any follow-up information in my modeling. Non-random component of sample attrition can bias regression estimates. Table 6.5 presents descriptive statistics of variables which are considered in this study. A total of 2,592 respondents can be classified into four groups by follow-up status. When the mean values in each variable are compared across the four groups in Table 6.4, it provides a foundation of the assessment for the possible attrition bias.

All latent growth models in this chapter excluded group four, who participated in only wave one. If group four respondents did not randomly drop out, the possibility of bias in my results exists. As shown in Table 6.5, group four has lower work qualities and higher depression and anxiety than all other three groups. Therefore, group four might experience worse changes in mental health than other three groups. Group four might tend to be included in the stable bad work or the falling work quality groups if their temporal patterns were observed. However, although this possibility of attrition bias exists, the potential bias would result in the *underestimation* of mental health gap by work qualities, implying conservative estimations about the life-course divergence in mental health. Despite of this potential underestimation forces, this study's findings support diverging patterns in mental health across all age groups in most results. In the case of the exceptional result showing a cross-over in later life and the diminishing diverging patterns with age in several models, I can not completely exclude the possibility of mortality selection bias as an artifact to affect the results. However, mortality selection bias seems to be not a major part of explanation for the patterns found in this study because the later-life convergences are found inconsistently across models.

Table 6.5. 1995 Means with Standard Deviations in Parentheses (Weighted N = 2,104)

	Total Sample	Follow-up Sample			
	1995	Group 1 Waves 1, 2 and 3	Group 2 Waves 1 and 2	Group 3 Waves 1 and 3	Group 4 Wave 1 Only
White	.846 (.361)	.905 (.292)	.859 (.348)	.850 (.358)	.786 (.410)
Female	.574 (.494)	.581 (.493)	.554 (.497)	.553 (.498)	.584 (.493)
Age	47.609 (17.749)	50.238 (16.016)	46.501 (18.317)	47.636 (17.685)	45.797 (18.680)
Education (Schooling)	13.40 (2.648)	13.67 (2.641)	13.43 (2.576)	13.41 (2.665)	13.14 (2.663)
Occupational Prestige	44.593 (13.295)	45.740 (13.503)	44.117 (13.506)	45.007 (13.366)	43.685 (12.926)
Fulfilling Work Status	3.189 (.543)	3.225 (.534)	3.162 (.573)	3.256 (.514)	3.153 (.541)
Non-routine Work Status	-.001 (1.579)	.124 (1.489)	.029 (1.658)	.138 (1.469)	-.160 (1.632)
Depression	.928 (1.309)	.745 (1.141)	.958 (1.383)	.684 (1.009)	1.135 (1.437)
Anxiety	1.967 (1.999)	1.761 (1.882)	2.011 (1.976)	1.777 (1.904)	2.174 (2.112)
Percentage	100	34.1	18.5	9.0	38.4

7. SUMMARY

SES factors have positive effects on the fulfilling work quality in both the non-elderly and the elderly, confirming the work quality as a structural condition restricted by SES. In the results from the latent growth models which are specifically designed to examine dynamic patterns, stable good work qualities produce divergence in both depression and anxiety in all adult age groups, compared to the stable bad work group. Persons who experience decline in work qualities have increasing disadvantages in psychological well-being, and persons who experience improvement in work qualities have increasing advantages. The fulfilling work quality is important for psychological well-being of older adults, and the nonroutine work quality is important for psychological well-being of younger adults.

CHAPTER 7: DISCUSSION AND CONCLUSION

The cross-sectional analyses about the age interactions of SES or work factors support the hypothesis of mental health divergence over the adult life course. The divergence is explained by the cumulative advantage in physical impairment and the resource substitution in disadvantaged employment status more prevalent in older ages. A cross-sectional analysis has the potential problem of cohort effect confounding. My longitudinal analyses with latent growth models reveal that education- and income-based gaps in physical impairment show divergence in the 8-year aging process of each life stage. The education-gap in depression also shows divergence, supporting the cumulative advantage hypothesis, but the income-gap in depression shows convergence in old ages, supporting the age-as-leveler hypothesis. Work qualities such as fulfillment or complexity are time-variant, so dynamic patterns need to be examined in longitudinal analyses. Stable good work qualities generate divergence in depression and anxiety in all adult life stages, compared to the stable bad work quality group. Rising or falling work qualities can change the disparity. The rising work quality group gains advantages in psychological well-being, and the falling work quality group loses advantages. Discussions for the results of three sub-topics are examined below.

The Mechanisms of Mental Health Divergence

The cross-sectional analyses in chapter four support the hypothesis that the life-course patterns of psychological well-being by SES and work factors show consistent divergence. Even after retirement, the health inequality by social conditions persistently increases. Next, the diverging gaps over the life course are explained by the two mechanisms of cumulative advantage and resource substitution. Cumulative advantages

in mental health operate through physical impairment for all the SES and work factors. Especially, the income-based divergence is mainly explained by the cumulative advantage mechanism. The resource substitution mechanism operates through stronger effects of resources such as daily work quality, personal control, and social support in disadvantaged employment status more prevalent in older ages. In retired or other non-employed status, the resources have stronger effects on mental health. The prestige of last occupation plays an important role for mental health after retirement because it positively affects daily work quality, which has a stronger effect in later life.

There are two limitations which are related to data availability for other possible mediators to explain the divergence. First, other potential mediators of the cumulative disadvantage might exist. For example, a variety of stressors might explain the mental health divergence by social conditions. My supplemental analysis examined economic hardship as a possible stressor and found little substantial importance of the mediating factor. However, other stress relevant accumulations might explain the diverging SES-gap in psychological well-being. Second, the work-based divergence might be explained by the resource substitution through psychological resources such as self-esteem and life satisfaction. According to previous studies (Cutler Riddick and Daniel 1984; Reitzes et al 1995), they are important mediators from work qualities to mental health. They might have stronger effects on mental health in disadvantaged employment or marital status more prevalent in older ages. As a future research direction, because several resources appear to have greater impacts on the mental or physical health of homemakers, retirees, or the non-married, it would be an appropriate topic with policy implications to identify the most effective resources for the non-employed or the non-married and to examine why this resource substitution for health occurs.

The confirmation of the cumulative advantage mechanism in explaining the divergence suggests the importance of social interventions from early life-stages to reduce the gaps in fundamental social conditions or in their mediating resources to mental health. One important finding in this study is to reveal another mechanism of age-related divergence in psychological well-being. The resource substitution mechanism explains the greater effect of occupational prestige on psychological well-being in later life. In non-employed status more prevalent in older ages, daily work quality becomes a more effective resource for mental health. It provides a specific policy implication about improving fragile older population's psychological well-being with supporting them, especially low SES elders, to have more desirable daily activities.

SES and Age Trajectories of Health over the Adulthood

The results of latent growth models in chapter five support the hypothesis of cumulative advantage for the life-course relationship between physical impairment and SES. In cross-sectional analyses in chapter four, the cumulative advantage (divergence) in physical impairment mainly explains the divergence in mental health by SES. And, the results are consistent with the longitudinal results in chapter five, in which both education and income generate diverging-gaps in physical impairment across all adult life stages. In the case of depression, the results are mixed and partially inconsistent with the cross-sectional pattern of ASOC data. In the longitudinal patterns of ACL data, education leads to cumulative advantages for depression, but the effect of income is relatively weak and appears to diminish in later life. These distinct findings suggest the possibility of different life-course effects of different SES factors on different health outcomes. Nevertheless, overall results demonstrate persistent and cumulative health inequality by SES in aging. Moreover, there is an inter-cohort trend relatively favoring higher-SES individuals,

especially in terms of mental health, and it suggests that the impact of education on health is stronger in more recent birth cohorts; there are cohort trends disfavoring less-educated persons in functional health and favoring better-educated persons in mental health. This study's results extend the findings of previous research that suggest that the effect of education on self-rated health or mortality has grown in more recent cohorts.

In the case of income's effect on health in aging, the hypothesis of divergence is strongly supported when persistence or duration of income status is taken into account; that is, the health trajectories of the persistently higher income group show better changes than those of the persistently lower income group. These results suggest the necessity to take into account temporality to examine the effects of time-variant SES factors on health.

Furthermore, this study finds that the divergence in depression by income observed throughout early and middle adulthood changes to convergence in later life, supporting the age-as-leveler hypothesis. Maturity as a leveling mechanism in the aging process may operate to prevent worsening depression in lower-income elders. According to Gove and colleagues (1989), age indicates increasing maturity and as individuals age, self-concepts include more positive features. According to their study, older adults had more positive self-evaluations, including higher life satisfaction and higher self-esteem. Mirowsky and Ross (2001) found that the effect of economic hardship on depression diminishes in later life and explained the moderating effect of age with the increasing maturity and coping abilities associated with older age. Convergence in maturity and coping abilities might generate the convergence in depression by income among older adults observed in this study. Moreover, economic hardship itself decreases with age even though income decreases with age (Mirowsky and Ross 1999). In other words, older Americans are better at managing their household economics and avoiding economic

hardship in the condition of low income. Decreasing economic hardship in old ages among the low income group might also explain the later-life convergence in depression between the income groups.

For the convergence in depression between high-school graduates and the low-educated found in old age cohorts, three explanations are possible; 1) mortality selection bias, 2) the age-as-leveler hypothesis, 3) cohort variations in aging. The possibility of mortality selection bias was not strong, especially, in old age cohorts. As previously noted, age at baseline inherently represents both age effect and cohort effect, and no strict statistical solution exists to disentangle these effects. Instead, I must rely on previous theory and empirical research to infer which effect is largely responsible for the observed convergence. Previous research and the cohort trend analyses in this study suggest that a cohort-based explanation is more plausible in this case.

Consistent with works that indicated that the beneficial effect of education on survival has increased in more recent cohorts (Feldman et al. 1989; Lauderdale 2001), my study finds the same cohort trends in depression as well as physical impairment. Consistent with Lynch's study (2003) of physical health trajectories, the late-life convergence in mental health observed between high-school graduates and those who did not graduate from high school may be due to a weaker effect of education on the health of old-age cohorts as compared to young- and middle-age cohorts. Moreover, there are the inter-cohort trends favoring high school graduates only in young- and middle-age cohorts not in old-age cohorts, as illustrated in the left graph of Figure 5.2. This trend pattern is unique for high school graduates. This unique trend pattern in depression might be explained by recent improvements in the quality of high school education. The quality of high school education to foster psychosocial resources that enhance mental health may have significantly improved in recent decades over the education that the old-age cohorts

in our study experienced more than a half century ago – therefore, the trends favoring high school graduates exist only in young- and middle-age cohorts, and the beneficial effect of high school education on mental health is weak in old-age cohorts.

Finally, this study confirms SES-based cumulative advantage in physical impairment across all adult life stages and in mental health across most life stages. An additional process that may operate over the life course, acting to amplify cumulative advantage or disadvantage in aging is “feedback amplification,” or the mutually reinforcing effects of physical and mental health (Mirowsky and Ross 2003). For example, a decline in physical health tends to increase depression, and depression tends to negatively affect physical health (Aneshensel et al 1984; Farmer and Ferraro 1997). If this vicious cycle operates over the life course and especially in later life, cumulative advantage and disadvantage in aging would result in increasingly divergent gaps in both physical and mental health by SES.

Aging-Vector Graph and Period Effect

This study’s LGM and aging-vector graph can express 9 potential patterns of health inequality over the life course, distinguishable by statistical significance – (1) consistently diverging gaps (or vectors), (2) diverging to constant gaps, (3) diverging to converging gaps, (4) constant to diverging gaps, (5) consistently constant gaps, (6) constant to converging gaps, (7) converging to diverging gaps, (8) converging to constant gaps, and (9) consistently converging gaps. More complex patterns can be expressed with the inclusion of higher-powered baseline age terms and related age interaction terms, although the model presented in this study is likely to be appropriate for many related topics. This approach can be applied to many research topics of stratification over the life course, including age trajectories of various health outcomes, well-being indices,

psychosocial resources, or economic status predicted by education, occupation, gender, race, ethnicity and so on. As another advantage, this approach provides a graphical way to evaluate inter-cohort trends that favor or disfavor certain subgroups.

Two potential limitations related to period effects warrant further consideration. As an inherent limitation in every panel study, there is a possibility of the confounding problem between the effects of age and period. Therefore, I can not exclude the possibility that period effects contribute to the diverging aging-vectors found in this study. If the SES-based inequality increased between 1986 and 1994, period effects as well as aging effects might contribute to the observed health divergence over time (Lauderdale 2001; Manton, Stallard, and Corder 1997).

The second issue is the potential sensitivity to the survey period, due to the utilization of relatively short-term panel data. If a relatively short survey period does not adequately represent recent aging patterns or contemporary cohort trends, generalization of the findings to predict future life-course health trajectories should be limited. However, this synthetic cohort design to make long-term predictions based on relatively short-term panel data, which are more widely available, is one of this approach's advantages. If additional studies using data of different periods are conducted and yield similar patterns of results, this potential period sensitivity can be eliminated as a significant limitation.

Dynamics of Work Quality and Psychological Well-Being Across the Adult Life Course

In chapter six, I intend to reveal the importance of daily work qualities in psychological well-being across all adult life stages including later life. First, work quality might be considered another fundamental cause of health closely related to SES. In the results, education and occupation have positive effects on the fulfilling work

quality in both the non-elderly and the elderly groups, confirming the work quality as a structural condition restricted by SES. Second, persistence in work quality is important to understand cumulative advantages in psychological well-being over the life course. Persistently good work quality results in cumulative advantages in psychological well-being across all adult life stages (even after retirement), compared to the persistently bad work quality group. Fulfilling work quality appears to have stronger effects on psychological well-being over the life course than nonroutine work quality. If certain persons experience bad work qualities in most of their lives, the psychological well-being gap from persons with stable good work qualities will diverge more and more to the extent that the diverging gaps in each life stages accumulate over the life course. Third, nevertheless, the cumulative advantage or disadvantage can be altered by dynamic changes in work qualities. Persons who experience falling work quality lose advantages in psychological well-being, and persons who experience rising work quality gain advantages in psychological well-being, especially in depression.

Fourth, the dynamic relationships between work qualities and psychological well-being are moderated by age or life stage. And, the age interaction differs by dimensions of work quality. Fulfilling work quality tends to be important for psychological well-being of the older, and nonroutine work quality tends to be important for psychological well-being of the younger adults. Finally, the life-course relationships can also vary by different health outcomes (depression and anxiety). For example, the results about effects of rising work quality on psychological well-being are mixed. For depression, the rising work qualities in both fulfillment and complexity result in increasing advantages across all adult ages. However, the effect of rising work complexity on anxiety change is not significant, and the weak benefits change into detriment after early old age. As an interpretation for the cross-over after age 57, increasing nonroutine characteristics in

later-life activities may give too much burden for the elderly who tend to experience decline in cognitive flexibility (Schaie 1990). Among the elderly, the rapid increase in complexity in their daily activity is likely to increase their anxiety.

Finally, to the extent which the recent aging pattern is sustained and the divergence in each life stage is accumulated, the future aging population is expected to experience a more salient disparity in psychological well-being by work quality. In the trend of increasing proportion of aging population and retirees, this study's confirmation of the importance of daily work quality in psychological well-being across all life stages provides implications for social interventions to ameliorate mental health disparity. According to the results in this study, the individuals who experience improvement in their daily work quality can gain benefits in psychological well-being although their initial work quality was bad. It suggests the possibility of effective social interventions to improve certain target population's psychological well-being through improving their activity qualities. For example, the qualities of daily activity are important for the psychological well-being of the retirees and homemakers, and they are more likely to have worse depression and worse work qualities (see Table 6.1). Social policy might need to support for the lower SES elders or homemakers to have more desirable daily activities – such as supports for their community or recreational activities.

Conclusion

In conclusion, first, this study confirms increasing mental health inequality over the adult life-course. Various SES and work quality factors generate diverging gaps in psychological well-being across life-stages. The cross-sectional analyses taking into account education, occupational prestige, and income as well as daily work qualities support the hypothesis of consistent divergence in depression or anxiety with age. The

cumulative advantage mechanism explains the mental health divergence through physical impairment and sense of control, and the resource substitution mechanism explains the divergence through stronger effects of work fulfillment, sense of control, and social support in non-employed status more prevalent in older ages. Cumulative advantage is the more dominant mechanism to explain the income-based divergence. Both the mechanisms of cumulative advantage and resource substitution have similar contributions to the occupation-based and the work-based mental health divergence.

Second, in the longitudinal analyses with latent growth models, the consistent divergence in physical impairment by income and education observed in this study lends support to the cumulative advantage hypothesis. The education-based gap in depression trajectories also shows divergence across all adult life stages, but the income-based gap in depression shifts to convergence in old age, supporting the age-as-leveler hypothesis. The examination of different health outcomes by different SES factors reveals that the life-course patterns in health may differ by various dimensions of SES and health, suggesting the necessity of studying the life-course relationship between diverse SES factors and health outcomes. According to the aging-vector graphs in this study, there are trends relatively favoring higher-SES groups (especially, in terms of mental health), supporting the notion that the effect of education on health is stronger in more recent cohorts. The results suggest the possibility of increasing health inequality in the future aging population if this contemporary trend is sustained. SES as a fundamental cause of health plays persistent roles in generating health disparity over the life course.

Finally, the dynamics of work quality have importance in understanding the trajectories of psychological well-being over time. Persistence in work quality plays an important role in increasing psychological well-being disparity over the life course, but rising work quality enables persons with bad initial work quality to overcome their

disadvantages in psychological well-being. Fulfilling work quality is more important for psychological well-being of older adults, and nonroutine work quality is more important for younger adults. This study provides rich understanding about the dynamic relationships between work quality and psychological well-being and highlights the importance of work as a structural social condition in the lifelong health disparity. This study confirms the importance of SES and work as fundamental causes of health and reveals the mechanisms and dynamics of mental health divergence across adult life course.

REFERENCES

- Adler, Nancy E. and Joan M. Ostrove. 1999. "Socioeconomic Status and Health: What We Know and What We Don't." Pp. 3-15 in *Annals of New York Academy of Sciences, Volume 896: Socioeconomic Status and Health in Industrial Nations: Social, Psychological, and Biological Pathways*, eds. Nancy E. Adler, Michael G. Marmot, Bruce S. McEwen, and Judith Stewart. New York: The New York Academy of Sciences.
- Allison, Paul. D. 2001. *Missing Data*. Sage University Paper Series on Quantitative Applications in the Social Sciences 07-36. Thousand Oaks, CA: Sage.
- Aneshensel, Carol S. 1992. "Social Stress: Theory and Research." *Annual Review of Sociology* 18:15-38.
- Aneshensel, Carol S., Ralph R. Frerichs, and George J. Huba. 1984. "Depression and Physical Illness: A Multiwave, Nonrecursive Causal Model." *Journal of Health and Social Behavior* 25:350-71.
- Beckett, Megan. 2000. "Converging Health Inequalities in Later Life -- an Artifact of Mortality Selection?" *Journal of Health and Social Behavior* 41(1):106-19.
- Bell, Richard. 1953. "Convergence: An Accelerated Longitudinal Approach." *Child Development* 24(2):145-52.
- Bentler, Peter M. 2003. *EQS 6 for Windows Program Manual*. Los Angeles, CA: Multivariate Software.
- Benzeval, Michaela and Ken Judge. 2001. "Income and Health: the Time Dimension." *Social Science and Medicine* 52(9):1371-90.
- Bird, Chloe E. and Catherine E. Ross. 1993. "Houseworkers and Paid Workers: Qualities of the Work and Effects on Personal Control." *Journal of Marriage and the Family*. 55: 913-925.
- Clipp, Elizabeth C., Eliza Pavalko, and Glen H. Elder. 1992. "Trajectories of Health: In Concept and Empirical Pattern." *Behavior, Health, and Aging* 2: 159-79.
- Colley, Louise. 1985. "Work Occupation and Leisure Patterns of Self-supporting Women in Pre- and Post-Retirement." *Society and Leisure* 8(2):631-658.
- Collins, Linda M., Joseph L. Schafer and Chi-Ming Kam. 2001. "A Comparison of Inclusive and Restrictive Strategies in Modern Missing Data Procedures." *Psychological Methods* 6(4): 330-51.

- Crosnoe, Robert and Glen H. Elder, Jr. 2002. "Successful Adaptation in the Later Years: A Life Course Approach to Aging." *Social Psychology Quarterly* 65: 309-328.
- Crystal, Stephen., Denis Shea, and Shreeram Krishnaswami. 1992. "Educational Attainment, Occupational History, and Stratification: Determinants of Later-Life Economic Outcomes." *Journal of Gerontology: SS* 47:213-221.
- Curran, Patrick J. 2000. "A Latent Curve Framework for Studying Developmental Trajectories of Adolescent Substance Use". Pp. 1-42 in *Multivariate Applications in Substance Use Research*, edited by J. Rose, Laurie Chassin, Clark Presson, and Steven J. Sherman. Hillsdale, NJ: Erlbaum.
- Cutler Riddick, C. and S.N. Daniel. 1984. "The Relative Contribution of Leisure Activities and Other Factors to the Mental Health of Older Women." *Journal of Leisure Research* 16(2):136-148.
- Dannefer, Dale. 1987. "Aging as Intracohort Differentiation: Accentuation, the Matthew Effect, and the Life Course." *Sociological Forum* 2:211-37.
- Dohrenwend, Bruce P., Itzhak Levav, Patrick ShROUT, Sharon Schwartz, Guedalia Naveh, Bruce Link, Andrew Skodol, and Ann Stueve. 1992. "Socioeconomic Status and Psychiatric Disorders: The Causation-Selection Issue." *Science* 255:946-52.
- Duncan, Terry E., Susan C. Duncan, Lisa A. Stryker, Fuzhong Li, and Anthony Alpert. 1999. *An Introduction to Latent Variable Growth Curve Modeling: Concepts, Issues, and Applications*. Mahwah, New Jersey: Lawrence Erlbaum Associates.
- Duncan, Greg J. 1996. "Income Dynamics and Health." *International Journal of Health Services* 26(3):419-44.
- Elder, Glen H., Jr. and Monica Kirkpatrick Johnson. 2002. "The Life Course and Human Development: Challenges, Lessons, and New Directions." Pp. 49-81 in *Invitation to the Life Course: Toward New Understandings of Later Life*, edited by Richard A. Settersten. Amityville, NY: Baywood.
- Elo, Irma T. and Samuel H. Preston. 1996. "Educational Differentials in Mortality: United States 1970-85." *Social Science and Medicine* 42:47-57.
- Ekerdt, David J. 1987. "Why the Notion Persists that Retirement Harms Health." *Journal of Gerontology* 27:454-457.
- Evans, Robert G. 1994. "Introduction." Pp. 2-36 in *Why are Some People Healthy and Others Not? The Determinants of Health of Populations*, edited by Robert G. Evans, Morris L. Barer, and Theodore R. Marmot. New York: Aldine de Gruyter.

- Farmer, Melissa M. and Kenneth F. Ferraro. 1997. "Distress and Perceived Health: Mechanisms of Health Decline." *Journal of Health and Social Behavior* 39:298-311.
- Feldman, Jacob J., Diane M. Makuc, Joel C. Kleinman, and Joan Cornoni-Huntley. 1989. "National Trends in Educational Differentials in Mortality." *American Journal of Epidemiology* 129: 919-33.
- Ferraro, Kenneth, Melissa M. Farmer, and John A Wybraniec 1997. "Health Trajectories: Long-term Dynamics Among Black and White Adults." *Journal of Health and Social Behavior* 38:38-54.
- Firebaugh, Glenn. 1997. *Analyzing Repeated Surveys*. Thousand Oaks, CA: Sage Publications.
- Fries, James. F. 1980. "Aging, Natural Death, and the Compression of Mortality." *New England Journal of Medicine* 303(3): 130-135.
- George, Linda K. 2003. "What Life-Course Perspectives Offer the Study of Aging and Health." Pp. 161-88 in *Invitation to the Life Course: Toward New Understandings of Later Life*, Ed. Jr. R. A. Settersten. Amityville, NY: Baywood publishing company.
- Glenn, Norval D. 2005. *Cohort Analysis*. 2nd ed. Thousand Oaks, CA: Sage Publications.
- . 1977. *Cohort Analysis*. Beverly Hills, CA: Sage.
- Gove, Walter R., Suzanne T. Ortega, and Carolyn Briggs Style. 1989. "The Maturation and Role Perspectives on Aging and Self through the Adult Years: An Empirical Evaluation." *American Journal of Sociology* 94: 1117-45.
- Haan, Mary N., George A. Kaplan, and S. Leonard Syme. 1989. "Socioeconomic Status and Health: Old Observations and New Thoughts." Pp. 76-135 in *Pathways to Health: The Role of Social Factors*, eds. J. Bunker, J.D. Gomby, and D. Kerher. Menlo Park, CA: Henry H. Kaiser Family Foundation.
- Haan, Mary N., George A. Kaplan, and Terry C. Camacho. 1987. "Poverty and Health. Prospective Evidence from the Alameda County Study." *American Journal of Epidemiology* 125:989-98.
- Halfon, Neal and Miles Hochstein. 2002. "Life Course Health Development: An Integrated Framework for Developing Health, Policy, and Research." *The Milbank Quarterly* 80: 433-479.

- Haug, Marie et al. 1984. "Mental Health and the Elderly: Factors in Stability and Change Over Time." *Journal of Health and Social Behavior* 25: 100-115.
- Herzog, A, Regula and James S. House. 1991. "Productive Activities and Aging Well." *Generations*. 15(1): 49-54.
- Holt R. Robert. 1982. "Occupational Stress." Pp. 419-444 in *Handbook of Stress*, edited by Leo Goldberger and Shlomo Breznitz. New York: Free Press.
- House, James S. Ronald Kessler. Et al. 1990. "Age, Socioeconomic Status and Health." *The Milbank Quarterly*. 68(3): 383-422.
- House, James S., M. Lepkowski, Ann M. Kinney, Richard P. Mero, Ronald C. Kessler, and A. Regula Herzog. 1994 "The Social Stratification of Aging and Health." *Journal of Health and Social Behavior* 35:213-234.
- House, James S., Pauls M. Lantz and Pamela Herd. 2005. "Continuity and Change in the Social Stratification of Aging and Health Over the Life Course: Evidence from a Nationally Representative Longitudinal Study from 1986 to 2002/2002 (American's Changing Lives Study)." *Journals of Gerontology: Series B* 60B (Special Issue II):15-26.
- Hu, Li-tze and Bentler Peter.M. 1999. "Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives." *Structural Equation Modeling: A Multidisciplinary Journal* 6(1):1-55.
- Johnson, Christopher, and Stephen W. Raudenbush. Forthcoming. "A Repeated Measures, Multilevel Rasch Model with Application to Self-Reported Criminal Behavior." In *Quantitative Methodology in Aging Research*, edited by Cindy S. Bergeman and Stephen M. Boker. Mahwah, NJ: Erlbaum Press.
- Kaplan, George. A. 1996. "People and Places: Contrasting Perspectives on the Association between Social Class and Health." *International Journal of Health Services* 26:507-519.
- Kitagawa, Evelyn M. and Philip M. Hauser. 1973. *Differential Mortality In the United States: A Study in Socioeconomic Epidemiology*. Cambridge, MA: Harvard University Press.
- Kessler, Ronald C. and Cleary Paul D. 1980. "Social Class and Psychological Distress." *American Sociological Review* 45(3): 463-478.
- Kessler, Ronald C. 1982. A Disaggregation of the Relationship Between Socioeconomic Status and Psychological Distress. *American Sociological Review* 47:752-64.

- Kobasa, Suzanne E., Salvatore R. Maddi and Sheila Courington. 1981. "Personality and Constitution as Mediators in Stress-illness Relationship." *Journal of Health and Social Behavior* 22: 368-378.
- Kohn, Melvin L., and Carmi Schooler. 1982. "Job Conditions and Personality: A Longitudinal Assessment of Their Reciprocal Effects." *American Journal of Sociology* 87:1257-86. 1982. "Job Conditions and Personality: A Longitudinal Assessment of Their Reciprocal Effects." *American Journal of Sociology* 87:1257-86.
- . 1973. "Occupational Experience and Psychological Functioning: An Assessment of Reciprocal Effects." *American Sociological Review* 38: 97-118.
- Kohn, Melvin L. and Kazimierz M. Slomczynski. 1990. *Social Structure and Self-Direction: A Comparative Analysis of the United States and Poland*. Cambridge: Blackwell.
- Lantz, Paula M., John W. Lynch, James S. House, James M. Lepkowski, Richard P. Mero, Marc A. Musick, and David R. Williams. 2001. "Socioeconomic Disparities in Health Change in a Longitudinal Study of U.S. Adults: The Role of Health-Risk Behaviors." *Social Science and Medicine* 53:29-40.
- Lauderdale, Diane S. 2001. "Education and Survival: Birth Cohort, Period, and Age Effects." *Demography* 38:551-561.
- Lennon, Mary Clare. 1994. "Women, Work, and Well-Being: The Importance of Work Conditions." *Journal of Health and Social Behavior* 35: 235-47.
- Link, Bruce G., Mary Clare Lennon, and Bruce P. Dohrenwend. 1993. "Socioeconomic Status and Depression: The Role of Occupations Involving Direction, Control, and Planning." *American Journal of Sociology* 98(6): 1351-1387.
- Link, Bruce G. and Jo Phelan. 2002. "McKeown and the Idea That Social Conditions Are Fundamental Causes of Disease." *American Journal of Public Health* 92: 730-732.
- . 1996. "Review: Why Are Some People Healthy and Others Not? The Determinants of Health of Populations." *American Journal of Public Health*. 86:598-9.
- . 1995. "Social Conditions as Fundamental Causes of Disease." *Journal of Health and Social Behavior* Extra Issue:80-94.
- Little, Roderick J. A., and Donald B. Rubin. 2002. *Statistical Analysis with Missing Data, Second Edition*. New York: John Wiley and Sons.

- Loscocco, Karyn A. and Glenna Spitze. 1990. "Working Conditions, Social Support, and the Well-being of Female and Male Factory Workers." *Journal of Health and Social Behavior* 31:313-27.
- Lowe, Graham S. and Herbert. C. Northcott. 1988. "The Impact of Working Conditions, Social Roles, and Personal Characteristics on Gender Differences in Distress." *Work and Occupation* 15: 55-77.
- Lynch, Scott M. 2003. "Cohort and Life-Course Patterns in the Relationship between Education and Health: a Hierarchical Approach." *Demography* 40 (2): 309-331.
- Lynch, John W., George A. Kaplan and Sarah J. Shema. 1997. "Cumulative Impact of Sustained Economic Hardship on Physical, Cognitive, Psychological, and Social Functioning." *The New England Journal of Medicine* 337(26):1889-1895.
- Maddox, George L. and Daniel O. Clark. 1992. "Trajectories of Physical impairment in Later Life." *Journal of Health and Social Behavior* 33(2):114-25.
- Manton, Kenneth G., Eric Stallard, and Larry Corder. 1997. "Education-Specific Estimates of Life Expectancy and Age-Specific Disability in the U.S. Elderly Population." *Journal of Aging and Health* 9: 419-450.
- Martikainen, Pekka, Stephen Stansfeld, Harry Hemingway and Michael Marmot. 1999. "Determinants of Socioeconomic Differences in Change in Physical and Mental Functioning." *Social Science and Medicine* 49(4):499-507
- McArdle and Fumiaki Hamagami. 1992. "Modeling Incomplete Longitudinal and Cross-Sectional Data Using Latent Growth Structural Models." *Experimental Aging Research* 18(3):145-166.
- McArdle, John J., Emilio Ferrer-Caja, Fumiaki Hamagami and Robert W. Woodcock. 2002. "Comparative Longitudinal Structural Analysis of Growth and Decline of Multiple Intellectual Abilities Over the Life Span." *Developmental Psychology* 38(1):115-42.
- McDonough, Peggy and Pat Berglund. 2003. "Histories of Poverty and Self-Rated Health Trajectories." *Journal of Health and Social Behavior* 44:198-214.
- McLeod, Jane D. and Michael J. Shanahan. 1996. "Trajectories of Poverty and Children's Mental Health." *Journal of Health and Social Behavior* 37:207-20.
- Merton, Robert K. 1968. "The Matthew Effect in Science." *Science* 159:56-63.
- Miech, Richard Allen and Michael J. Shanahan. 2000. "Socioeconomic Status and Depression over the Life Course." *Journal of Health and Social Behavior* 41:162-76.

- Miech, Richard A., Avshalom Caspi, Terrie E. Moffitt, Bradley R. E. Wright and Phil A. Silva. 1999. "Low Socioeconomic Status and Mental Disorders: A Longitudinal Study of Selection and Causation during Young Adulthood." *American Journal of Sociology* 104(4):1096-1131.
- Mirowsky, John. and Ross, Catherine E. 2003. *Education, Social Status, and Health*. NY: Aldine-de Gruyter.
- , 2001. "Age and the Effect of Economic Hardship on Depression." *Journal of Health and Social Behavior* 42:132-150.
- , 1999. "Well-being Across the Life Course." Pp. 328-47 in *A Handbook for the Study of Mental Health: Social Contexts, Theories, and Systems*, edited by Allan V. Horowitz and Teresa L. Scheid. NY: Cambridge University Press.
- , 1998. "Education, Personal Control, Lifestyle and Health: A Human Capital Hypothesis." *Research on Aging* 20(4): 415-49.
- , 1992. "Age and Depression." *Journal of Health and Social Behavior* 33: 187-205.
- Mirowsky, John and Jinyoung Kim. Forthcoming. "Graphing Age Trajectories: Vector Graphs, Synthetic and Virtual Cohort Projections, and Cross-Sectional Profiles of Depression." *Sociological Method and Research*.
- Mirowsky, John and John R. Reynolds. 2000. "Age, Depression, and Attrition in the National Survey of Families and Households." *Sociological Methods and Research* 28(4): 476-504.
- Miyazaki, Yasuo, and Stephen W. Raudenbush. 2000. "Tests for Linkage of Multiple Cohorts in an Accelerated Longitudinal Design." *Psychological Methods* 5(1): 44-63.
- Moen, Phyllis, Donna Dempster-McClain, and Robin M. Williams, Jr. 1992. "Successful Aging: A Life-Course Perspective on Women's Multiple Roles and Health." *American Journal of Sociology* 97: 1612-38.
- Mulatu, Mesfin. 2002. "Causal Connections between Socio-Economic Status and Health: Reciprocal Effects and Mediating Mechanisms." *Journal of Health and Social Behavior* 43:22-41.
- Musick, Marc A. and John Wilson. 2003. "Volunteering and Depression: the Role of Psychological and Social Resources in Different Age Groups." *Social Science and Medicine* 56: 259-269.

- Musick, Marc A. Regula Herzog and James S. House. 1999. "Volunteering and Mortality Among Older Adults: Findings From a National Sample." *Journal of Gerontology: Social Sciences* 54B:S173-S180.
- Nesselroade, John R., and Paul B. Baltes. 1979. *Longitudinal Research in the Study of Behavior and Development* New York: Academic.
- Newacheck, Paul W., Lewis H. Butler, Aileen K. Harper, Dyan L. Piontkowski, and Patricia E. Franks. 1980. "Income and Illness." *Medical Care* 18:1165-76.
- Newmann, Joy Perkins. 1989. "Aging and Depression." *Psychology and Aging* 4(2):150-65.
- O'Rand, Angela. 1995. "The Cumulative Stratification of the Life Course," Pp. 188-207 in *The Handbook of Aging and the Social Sciences, 4th Edition*, edited by Robert H. Binstock and Linda K. George. San Diego: Academic Press.
- Passuth, P.M. and Vern L Bengtson. 1988. "Sociological Theories of Aging: Current Perspectives and Future Directions." Pp. 333-355 in *Emergent Theories of Aging*, edited by James E. Birren and Vern L. Bengtson. New York: Springer Pub. Co.
- Pearlin, Leonard I. 1989. "The Sociological Study of Stress." *Journal of Health and Social Behavior* 30:241-256.
- Pearlin, Leonard I. and Carmi Schooler. 1978. "The Structure of Coping." *Journal of Health and Social Behavior* 19:2-21.
- Pugliesi, Karen. 1995. "Work and Well-Being: Gender Differences in the Psychological Consequences of Employment." *Journal of Health and Social Behavior* 36: 57-71.
- Radloff, Lenore. 1977. "The CES-D Scale: A Self-Report Depression Scale for Research in the General Population." *Applied Psychological Measurement* 1:385B401.
- Raudenbush, Stephen W. 2001. "A Comparing Personal Trajectories and Drawing Causal Inferences from Longitudinal Data." *Annual Review of Psychology* 52:501-25.
- Raudenbush, Stephen W., and Wing-Shing Chan. 1993. "Application of a Hierarchical Linear Model to the Study of Adolescent Deviance in an Overlapping Cohort Design." *Journal of Consulting and Clinical Psychology* 61(6): 941-51.
- . 1992. "Growth Curve Analysis in Accelerated Longitudinal Design." *Journal of Research in Crime and Delinquency* 29: 387-411.

- Reynolds, John R. and Catherine E. Ross. 1998. "Social Stratification and Health: Education's Benefit Beyond Economic Status and Social Origins." *Social Problems* 45(2) : 221-248.
- Reynolds, John R. 1997. "The Effects of Industrial Employment Conditions on Job-Related Distress." *Journal of Health and Social Behavior* 38:105-116.
- Riley, Matilda White. 1987. "On the Significance of Age in Sociology. American Sociological Association, 1986 Presidential Address" *American Sociological Review* 52 (1):1-14.
- Ritzes, Donald C. et al. 1995. "Activities and Self-Esteem: Continuing the Development of Activity Theory." *Research on Aging* 17(3): 260-277.
- Robert, Stephanie. 1999. "Socioeconomic Position and Health: The Independent Contribution of Community Context." *Annual Review of Sociology* 25:489-516.
- Rodin, Judith. 1986. "Aging and Health: Effects of the Sense of Control" *Science, New Series*. 233 (4770): 1271-1276.
- Ross, Catherine E. 2000. "Occupations, Jobs, and the Sense of Control." *Sociological Focus* 33(4):409-420.
- Ross, Catherine E. and John Mirowsky. 2006. "Sex Differences in the Effect of Education on Depression: Resource Multiplication or Resource Substitution?" *Social Science and Medicine* forthcoming.
- , 1989. "Explaining the Social Patterns of Depression: Control and Problem Solving—or Support and Talking?" *Journal of Health and Social Behavior* 30: 206-219.
- Ross, Catherine E and Chia-Ling Wu. 1996. "Education, Age, and Cumulative Advantage in Health." *Journal of Health and Social Behavior* 37: 104-120.
- , 1995. "The Links between Education and Health" *American Sociological Review* 60 : 719-45.
- Ross, Catherine E. and Marylyn P. Wright. 1998. "Women's Work, Men's Work, and the Sense of Control." *Work and Occupations* 25(3):333-355.
- Ross, Catherine E and Marieke Van Willigen. 1997. "Education and the Subjective Quality of Life." *Journal of Health and Social Behavior* 38: 275-297.
- Ross, Catherine E and Patricia Drentea. 1998. "Consequences of Retirement Activities for Distress and the Sense of Personal Control." *Journal of Health and Social Behavior* 39: 317-334.

- Schaie, K. Warner. 1990. "The Optimization of Cognitive Functioning in Old Age: Predictions Based on Cohort-Sequential and Longitudinal Data." Pp. 94-117 in *Successful Aging: Perspectives from the Behavioral Sciences*. Edited by Paul. B. Baltes and Margret. M. Baltes. Cambridge: Cambridge University Press.
- Schieman, Scott. 2001. "Age, Education, and the Sense of Control: A Test of the Cumulative Advantage Hypothesis." *Research on Aging*. 23(2):153-178.
- Schieman, Scott, Karen Van Gundy and John Taylor. 2001. "Status, Role, and Resource Explanations for Age Patterns in Psychological Distress." *Journal of Health and Social Behavior* 42(1):80-96.
- Seeman, Teresa E., and Eileen. Crimmins. 2001. "Social Environment Effects on Health and Aging: Integrating Epidemiologic and Demographic Approaches and Perspectives." *Annals of the New York Academy of Sciences* 954: 88-117.
- Smith, James P. and Raynard Kington. 1997. "Demographic and Economic Correlates of Health in Old Age." *Demography* 34(1):159-70.
- Thoits, Peggy A. 1995. "Stress, Coping, and Social Support Processes: Where Are We? What Next ?" *Journal of Health and Social Behavior* (Extra Issue):53-79.
- Thoits, Peggy A. and Lyndi N. Hewitt. 2001. "Volunteer Work and Well-Being." *Journal of Health and Social Behavior* 42:115-131.
- Turner, R. Jay, Blair Wheaton, and Donald A. Lloyd. 1995. "The Epidemiology of Social Stress." *American Sociological Review* 60:104-25.
- Turner, R. Jay and Samuel Noh. 1988. "Physical Disability and Depression: A Longitudinal Analysis." *Journal of Health and Social Behavior* 29: 23-37.
- 1983. "Class and Psychological Vulnerability Among Women: The Significance of Social Support and Personal Control." *Journal of Health and Social Behavior* 24:2-15.
- Turner, R. Jay., and Donald A. Lloyd. 1999. "The Stress Process and the Social Distribution of Depression." *Journal of Health and Social Behavior* 40: 374-404.
- U.S. Bureau of Census 1995. *The Statistical Abstract of the United States 1995*. Washington, D.C.:U.S. Government Printing Office.
- Van Willigen, Marieke. 2000. "Differential Benefits of Volunteering Across the Life Course." *Journal of Gerontology: Social Sciences* 55B:S308-S318.

- Waitzman, Norman J. and Ken R. Smith. 1998. "Phantom of the Area: Poverty-Area Residence and Mortality in the United States.[Erratum Appears in Am J Public Health 1998 Jul;88(7):1122]." *American Journal of Public Health* 88:973-6.
- Wheaton, Blair. 1978. "The Sociogenesis of Psychological Disorder: Reexamining the Causal Issues with Longitudinal Data." *American Sociological Review* 43:383-403.
- Wickrama, K.A.S., Frederick O. Lorenz, Rand D. Conger, Lisa Matthews, and Glen H. Elder. 1997. "Linking Occupational Conditions to Physical Health through Marital, Social, and Intrapersonal Processes." *Journal of Health and Social Behavior* 38: 363-75.
- Williams, David R. and Chiquita Collins. 1995. "U.S. Socioeconomic and Racial Differences in Health: Patterns and Explanations." *Annual Review of Sociology* 21:349-86.
- Winship, Christopher, and Larry Radbill. 1994. "Sampling Weights and Regression Analysis." *Sociological Methods and Research* 22(2):230-57.
- Yuan, Ke-Hai. and Bentler, Peter. M. 2000. "Three Likelihood-Based Methods for Mean and Covariance Structure Analysis with Non-Normal Missing Data." *Sociological Methodology* 2000, 165-200.

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