Aging and the Life Course

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Abstract

This essay reviews major elements of aging and life course research, its foundations, frontiers, and research challenges. This research examines how human lives are organized and manifested across the life span in different environments. The first foundation of life course research is the historical observation of the institutionalization of the life course; that is, how it became standardized in industrialized contexts through the operation of work, family and state institutions and how it is increasingly destandardized in the new global economy. The second foundation is the examination of the life course as a process that is manifold and cumulative: manifold because it consists of intertwining roles and events over time and cumulative because it consists of sequentially contingent transitions and path-dependent processes. The third foundation is the recognition of the formative and enduring impact of exposures to severe life conditions or major sustained macro events such as wars or disasters. The stress process is the fourth foundation that addresses how stresses over the life course shape its trajectory. Finally, cognition and emotion over the life span serve as a foundation for the major psychological experience of aging. Three frontiers of life course research are highlighted: the individualization of the life course and the devolution of risk; cumulative advantage and cumulative disadvantage as major processes of life course inequalities; and biological processes and the life course. The essay ends with consideration of life course data and methods and the challenges of interdisciplinary research.

INTRODUCTION

The question of how human lives are organized and manifested over the life span has occupied scholars from many disciplines including gerontology, demography, psychology, sociology, history and other social science specialties, the humanities, and some biological sciences. These disciplines have focused on different aspects of aging or the successive phases of the life course, which constitutes a *manifold* process comprised of interwoven components that are distinct but interdependent in complex ways over time. As such, human biographies are products of the multiplex interactions among biological, psychological, social-structural, and cultural-historical factors as individuals age from birth to death. Biological aging formatively

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proceeds toward the limit of human life spans, but is constrained in the process by psychosocial differences, opportunity structures and life chances, cultural schema, and historical conditions that produce differences in human lives across and within age-groups. These constraints differentiate the life courses of human cohorts in ways that result in cumulative disparities in psychological and physical health and mortality, socioeconomic inequalities spanning childhood and adulthood, and diverse psychosocial cognitions and identities, among other differences.

The life course framework has emerged over the past six decades as a product of the convergence of several traditions in US and European social sciences concerned with common or related problems. The doubling of life expectancy around the world over the past 200 years has established aging as a central existential phenomenon that drives historical and social change and which, in turn, is a result of social forces related to the control of diseases of various kinds in different periods, economic development and global restructuring, and social institutions regulating normative life transitions, life scripts, social inequalities, and life-and-death processes. At the population level, aging is defined by the demographic transition from high mortality and high fertility to steeply declining rates of both in relationship to differential economic development across countries over this long period. The demographic transition has been accompanied in recent decades by an epidemiologic transition in which chronic disease has superseded infectious disease as the dominant cause of poor health or death in the most advanced countries where population aging has reached its highest levels.

At the individual and cohort levels, the aging experience is defined by life course processes that reflect the interactions among biological, institutional, economic, historical, and psychosocial factors. Cohorts consist of individuals who encounter history at the same ages together, but who have differential experiences that result from these encounters.

This essay will emphasize aging at the individual and cohort levels of analysis, although aging at the population level provides a historical context that has independent effects on the individual life course and the aggregate experiences of cohorts, especially on social patterns related to differential employment opportunities across ages and retirement policies for the old. The confluence of foundational research from several traditions has identified five general factors that shape and condition the length of and quality of life for individuals and cohorts: the institutionalization of the life course; the manifold, cumulative life course; fundamental causes and situational imperatives; the stress process; and cognition and emotion over the life span. The identification of these factors has propelled life course research and

generated several current research fronts or cutting-edge research agendas that will be identified later in this essay.

FOUNDATIONAL RESEARCH

Institutionalization of the Life Course

The major foundation of aging and life course research focuses on the institutional and cultural origins, and ongoing construction and reconstruction, of the phases of life defined by age-related roles, institutional policies, and long-lived traditions. The institutional tradition identifies social regularities in the aging process and their bases in social structure and culture. It maps the domains of life, including family, education, work, health, citizenship, and leisure, among others, defined by institutions, and investigates their synchronization or interconnectedness over time. It also examines the processes of inclusion and exclusion that allocate populations across institutional sectors and into status groups by age, gender, race/ethnicity, citizenship, nativity, and other socially meaningful categories with differential social obligations and rights with age.

The tripartite life course has been described by Martin Kohli as the dominant standardized form in industrial (or work) societies with age-related roles organized for the young around education, for adults around work and family, and for the old around retirement. State, market, civic, and other institutions complement each other to construct and reinforce this configuration. Educational systems, age laws protecting youth from social risks (e.g., child labor, alcohol, and driving), and auxiliary civic programs developed to support children's development and socialization, among other institutions, define the first tripartite phase. The adult phase is also constructed by legal and traditional systems regulating marriage, parenthood, the employment sector (employers and workers), social protections of individuals and families, civil activities, and social behaviors. Finally, retirement institutions define the last phase, including its timing, social and economic entitlements, and cultural status.

Much research has focused on major transitions in the tripartite life course, particularly the transition to adulthood and the transition to retirement. The transition to adulthood is observed as a demographically dense sequence of multiple transitions from adolescence to adulthood that signify movement towards social independence from the family of origin. These transitions include finishing or leaving school, leaving home, entering the military, starting work, marriage, and pregnancy and childbirth. The sequencing of these transitions was normatively regulated for several generations, but is

undergoing change across countries. Demographic researchers have characterized this change as "the second demographic transition," which includes remaining in education until later ages, delaying marriage or never marrying, cohabitation, and childbirth outside of marriage and childlessness. Changing gender roles are implicated in this transition as women complete higher education at higher rates and enter and stay in the labor market during longer periods in their lives. One welfare state theorist, Gösta Esping Anderson, refers to this process as *defamilization*.

The transition to retirement includes the exit from income from paid work to income from a pension. Retirement institutions have varied across countries in their regulation of the age(s) of retirement of different subgroups; however, the fiscal pressures of population aging in advanced countries, where the ratios of workers to retirees have declined, have impelled efforts to extend the retirement age to later years. Retirement institutions have also varied in the mix of social, occupational, and private sources of pensions. Social pensions are usually based on rules of entitlement not necessarily connected to employment. Countries with more liberal welfare institutions (e.g., USA, and UK) have historically favored occupational and private sources of pension income, while social democratic (e.g., Norway, and Sweden) and corporatist governments (e.g., Germany, and The Netherlands), respectively, have provided higher ratios of social benefits to retirees. However, population aging and global macroeconomic forces have encouraged the latter to shift in the direction of occupational and private savings regimes similar to liberal states to offset the rising costs of social pension systems that are less sustainable than in the past. Proposals for gender-neutral benefit policies and for later ages of normal retirement are spreading throughout the advanced and developing world.

THE MANIFOLD, CUMULATIVE LIFE COURSE

The second foundation of life course research focuses on the more finely gauged temporal dynamics of aging beyond the simpler phasic approach summarized above. In this line of research the life course is examined as a manifold phenomenon of intertwining cumulative processes. The two major components of this research include the ideas that (i) lives are lived simultaneously across multiple domains (education, work, family, health) where experiences in co-occurring roles or with co-occurring events are mutually influential or interdependent and (ii) lives are path-dependent and comprised of chains of sequentially contingent transitions. The first component emphasizes the manifold structure of lives over time. It addresses the phenomena that individuals have multiple "careers" as they age—educational careers, family careers, work careers, health histories, and so on—that are

mutually influential. Extended educational careers tend to delay work, marriage and childbearing, that early exits from education are associated with earlier childbearing for women and earlier work for men. Loss of a job can precipitate returning to schooling or a decline in mental health. The onset of a physical disability increases the likelihood of loss of employment and/or exposure to poverty. Long-term unemployment increases the onset of cardiovascular diseases, and so on.

This component also includes the idea of "linked lives" based on the work of Glen H. Elder, Jr. and his colleagues over several decades. The manifold life courses of related individuals influence each other. Hence, the loss of a job by a working father can have an impact on the course of his children's lives. Alternatively, the early parenthood of a single mother significantly predicts the repetition of this pattern in the next generation.

The second component emphasizes the cumulative processes that lead to stratification and individualization in aging cohorts. Later statuses and events in the life course are contingent on earlier statuses and events. Sequential contingency reflects aging as a social selection process across individuals, with increasing intra-individual continuities as they age. However, the temporal characteristics of sequential contingency are complex. First, the order and timing of some transitions in the life course are consequential for later life outcomes, especially if order or timing has strong normative underpinnings or institutional requisites. For example, adolescent childbirth outside of marriage is associated with the lower likelihood of high school completion and higher risks for poverty later. Second, the temporal proximity of earlier and later transitions can have quite different effects. The loss of a job that is rapidly replaced by a new one increases the probability of future job and income stability. Alternatively, the duration of unemployment negatively affects reemployment and increases the risk for poverty.

Sequential contingency generates differentiation in aging cohorts as individual lives become increasingly distinct. Glen H. Elder, Jr has identified the "accentuation principle" in life course research that observes that individuals' earlier behaviors and preferences are not only continued but often amplified across succeeding transitions. The famous Bennington Study follow-up by Duane F. Alwin, Ronald L. Cohen, and Theodore M. Newcomb demonstrates this principle in the longitudinal study of women's political attitudes over time and their selections of spouses with similar attitudes.

FUNDAMENTAL CAUSES AND SITUATIONAL IMPERATIVES

In countries and regions with weaker institutional protections against life course risks such as poverty or illness inequality is pervasive in aging

cohorts, beginning with childhood. Research on numerous manifest life course outcomes, including health disparities and economic inequalities, repeatedly demonstrates the enduring impacts of childhood conditions and opportunity structures for young adults on health, mortality and economic well-being in later life. Early exposures to poverty and poor health exert a social gravity on the later life course through observable processes of exclusion from or limited access to resources such as education. Fundamental cause theory argues further that much of the effect of early poverty and poor health is latent and not readily observable until later in life. The long latency of these exposures exists cognitively and physiologically, masking scars or hidden injuries that are nevertheless consequential. As such, this body of work is interested in the question of how adversity "gets under the skin." Further, the theory argues that statistical mediation of the effects on childhood adversity by intervening variables does not diminish the fundamental and pervasive impact of these conditions throughout life.

In a similar vein, Glen H. Elder, Jr argues that negatively disruptive life events such as job loss as well as severe and sustained large-scale events such as economic depressions and wars have enduring manifest and latent impacts on lives. These situational imperatives can redirect lives or amplify earlier behaviors and perceptions that have developed over the life course.

THE STRESS PROCESS

The stress process is a widely used model in medical sociology developed by Leonard I. Pearlin that focuses on individuals' responses to primary life stressors (traumatic life events, hardships, challenges) and secondary stressors (role strain and diminished self-concept) that are conditional on social, economic and personal resources and prior exposures to stressors. The stress process is cumulative and can be initiated by traumatic experiences and cascade into serial episodes and encounters with new stressors over the life course. The chief outcome of interest is mental health and its effects on physical health and the general well-being of aging populations and those who care for them. Successful coping mechanisms and access to social supports are chief mediators in the stress process.

COGNITION AND EMOTION OVER THE LIFE SPAN

Cognitive aging has been observed for decades by researchers and aging individuals alike. What has been established in the research is that cognition is multidimensional; declines in measured cognitive function are significant and manifestations of a more general neurological decline; and they begin early in adulthood. Variability in cognition over the life span is traceable

to childhood conditions and their impact on cognitive and socioemotional development. At the population level, patterns of cognitive decline appear to be constant across succeeding twentieth-century cohorts, a counterintuitive finding largely attributable to "survival effects" or the ability of lower cognitive functioning individuals to survive in more recent cohorts as a result of economic and technological development. The chief conundrum is to separate age effects from the effects of other (sometimes unmeasured) variables, especially in cross-sectional research.

Cognitive functioning and socioemotional development are associated over the life course, with the latter strongly implicated in motivation. Laura Carstensen's socioemotional selectivity theory argues that over the life course time horizons shrink and aging individuals are motivated by different goals than younger individuals. Younger individuals have longer time horizons and are motivated by knowledge-related or rational goals associated with developing skills, career aspirations, and instrumental relationships. Older individuals have shorter time horizons and are motivated more by emotion-related goals associated with the quality of present-centered social relationships and interactions. The latter age group also prefers positive over negative information in their observations and recollections.

CUTTING-EDGE RESEARCH

Individualization of the Life Course and the Devolution of Risk

Globalization processes characterized chiefly by the ascendance of market and financial practices that generate economic uncertainties are eroding the twentieth-century state, employment, and family institutions that constructed the standardized tripartite life course. Employment security has declined across economic sectors (first in manufacturing, then in service and other sectors) as market enterprises engaged in price competition seek to reduce labor costs and increase shareholder returns; advocate deregulation, privatization and liberalization policies; depend on information and communication technologies for management and information diffusion; and are increasingly vulnerable to random shocks with distal origins. Arguably, employment security has been the fulcrum of the tripartite life course by providing predictable and protected economic resources for workers and their families, often through corporatist arrangements among employers, unions, and governments. These resources accompanied by publicly supported educational, health, and retirement policies have anchored the life course.

Research over the past decade reveals the strongest emergence of globalization forces that make employment security highly problematic. These forces also have centrifugal impact on the life course since the erosion of social institutions protecting against life course risks leads to the devolution of risk. The devolution of risk refers to the shift of responsibility for the management of life course risks to individuals and their families and away from collective institutions associated with state policies and earlier employment institutions. Shared resources and shared entitlements are disappearing, albeit more quickly in more liberal regimes than others.

Research reveals that the shift transcends the employment sector to include educational institutions, which are becoming more decentralized and privatized in liberal states, and family institutions, which are vulnerable to the centrifugal effects of economic insecurity and the loss of welfare protections. In the case of the former, education has become less equally accessible across countries. Family income is affecting educational life chances. In the case of the latter, family dynamics related to everything from fertility to divorce and children's educational opportunities are sensitive to macroeconomic changes that are not buffered by social protections.

The convergence of globalization with population aging has had particular impact on the life course, especially in its major transition phases to adulthood and to retirement. Many studies of these transition periods across countries demonstrate growing insecurity for young and older workers alike. The flexCAREER Project funded by the German Research Foundation and led by Hans-Peter Blossfeld has compared the changing features of these transitions across OECD countries. The key concept in this project is the spread of flexible employment (also referred to as *precarious work by Arne Kalleberg*) characterized by short-term, part-time, and contingent work that is more likely to be encountered by new labor market entrants, women and racial/ethnic minorities. This work is characterized by low wages, nonstandard hours, and little to no benefits. The duration of this exposure in employment careers is consequential for later employment security. Random shocks such as recessions affect this labor market sector first. Accordingly, research on the transition to adulthood across countries finds observable delays among the young in entering fulltime stable employment that, in turn, has delayed parental home-leaving, fertility and family formation in this group. What remains unclear is the extent to which these patterns are long- or short-lived for these younger cohorts.

Mid-career and older workers are typically more secure in employment as a result of their cumulative careers. Indeed, many advanced countries implemented early retirement policies in the twentieth century in order relieve national labor markets. In the current context, the challenges are different and contradictory. Early retirement policies present new challenges as life

expectancy increases in the retired population and the ratio of retirees to younger workers increases. Demographic and policy research over the past decade reveals the efforts of different countries to diminish the burden of pension and related costs through legislation for later eligibility for retirement benefits and incentives for the privatization of retirement savings for younger cohorts. Although pension politics vary across countries given their political, economic and cultural histories, the shift is clearly towards occupational pensions and private savings regimes, especially but not exclusively among liberal market states.

Still even mid-career and older workers are being affected by random shocks and contracting employment opportunities across sectors. Normal volatility in stock markets has typically had less effect on older workers' continued employment than extended recessions with sustained high unemployment. The latter increases the rate and duration of unemployment among mature workers, decreases the likelihood of reemployment (especially with increased duration of unemployment), increases the likelihood of flexible employment, and leads to intermittent work careers (careers that mix part-time and full-time employment with unemployment, underemployment, and disability) that can last for many years before retirement eligibility.

Research is demonstrating that this stratification of the labor force increases income inequality in aging cohorts, especially in societies with less regulated economies. The devolution of risk promotes what some researchers refer to as a *free-agent* mentality, or an isolated market participant identity of individualization that challenges earlier notions of class, occupation or union membership as the strong basis of economic identity. The free agent mentality also introduces variability in the choices made by individuals that range from school choices for children, to family migration decisions, to the retirement transitions. As such, diverse temporal pathways across the transition to adulthood and retirement have been observed. The accumulation of highly individualized decisions increases the likelihood of increased inequality, especially in the absence of equalizing institutions.

CUMULATIVE ADVANTAGE/DISADVANTAGE

After controlling for the impact of equalizing institutions, the individual mechanisms whereby economic and health or mortality inequalities in aging cohorts emerge are the foci of considerable research across countries. Overall, research across countries and cohorts demonstrates two general patterns: that inequality pervades the life course, especially in liberal welfare contexts, and that it is generally cumulative, with successive statuses significantly predicted by earlier statuses. These patterns are labeled as cumulative

advantage and cumulative disadvantage. Research is uncovering three principal loci of these inequalities—inter-cohort variations, childhood conditions, and educational attainment—although some disagreements persist in the literature on the relative priority of social selection versus social causation in the distribution of economic and health disparities.

COHORT VARIATIONS

Recent research has made much ground in disentangling the effects of age, period and cohort in longitudinal and pooled cross-sectional data. These innovations have assisted in determining whether social (sex, class, and race) disparities in outcomes such as health and mortality follow similar cumulative patterns across birth cohorts. While cumulative patterns are identified across cohorts, cohort-related changes have also been uncovered: trajectories of different health conditions (e.g., heart attacks) vary across cohorts; social inequalities exist in the levels of some health conditions but not in the growth rates of health conditions; and the widths of social disparities in health vary across cohorts.

Similar cohort variations have been observed in education. Generally, successive cohorts have increased levels of educational attainment in a nonlinear pattern revealing a slowing of growth. A major cohort-related change is the change in educational attainment by gender, with women in the most recent cohorts in advanced countries completing secondary and higher education at higher rates than men. Research suggests that one explanation is that women's market roles require more educational credentialing than men's. The full explanation has not been uncovered.

CHILDHOOD CONDITIONS

The availability of longitudinal datasets with baseline observations in childhood and adolescent samples and reliable retrospective survey items about childhood health and economic adversity have energized scholarship on the impact of childhood on later life well-being. This research is adding greater specificity and complexity to the more general fundamental cause and situational imperative traditions outlined above. Childhood conditions are associated with later life outcomes through processes of accentuation, amplification, and mediation depending on the outcome of interest (e.g., mortality) and on the intervening life conditions studied (e.g., educational attainment, employment stability, and marital history) and the temporal properties (trajectories) of these intervening conditions (e.g., timing, sequence, and duration).

BIOLOGICAL PROCESSES AND THE LIFE COURSE

Once an unorthodox and largely infeasible line of research in the life course, the examination of biological processes involved with the life course has emerged as a frontier. This is driven by some long-standing and some recently emergent research concerns. A long-standing question in the demography of the life course regards the health-survival paradox in gender life expectancy. Researchers have been challenged to explain the female advantage in survival in spite of women's poorer health over the life span. Observable gender-related patterns of health behaviors and social relationships have been implicated in this paradox: men engage in more risky health behaviors and women maintain more salient and supportive social ties. However, underlying biological processes have been suspected to be interdependent with these more readily observable patterns. Similarly, the variable onset and courses of mental and physical diseases and disabilities have been tied to observable behaviors, but the contributions of biological processes to these trajectories have only recently been implicated in these life course processes. The actual mechanisms of interdependence have only begun to be specified.

Some longitudinal studies have thus turned to collecting biomarker data from study participants to study biological markers of physiological and endocrinological responses to environmentally mediated experiences such as stress (cortisol) that bear upon the life course. Neuroscience methods (e.g., fMRA scans) are also increasingly integrated into social psychological processes of aging including cognitive decline, depression and other mental health conditions. Finally, heritability and gene–environment interactions have become the newest candidates for studying the life course from childhood to old age. Twin studies were the initial method for conducting experimental and panel research on heritability and gene–environment interactions in intellectual development and social behaviors. In addition, recently the life course literature has grown substantially with studies of heritability in such behaviors as alcoholism, church attendance, coping styles, educational attainment, impulsivity, self-esteem, among other measureable behaviors with life course implications. Following twin studies, target gene studies [which examine specific genes associated with diseases such as Alzheimer's (APOE) or Parkinson (GBA)] have proliferated to improve prediction of the risks for and onset of diseases associated with aging. Similarly, studies focused on DNA sequence variations between individuals (single-nucleotides polymorphisms—SNPs) use technologies similar to DNA fingerprinting to look for multiple genetic variations correlated with observable behaviors and health conditions over the life course. Questions of feasibility and reliability dominate this research, but this frontier is

perhaps the most interdisciplinary growing tip of life course research in the twenty-first century.

KEY ISSUES FOR FUTURE RESEARCH

Steadfast Maintenance of Comparable Longitudinal Studies

Although an important place remains in life course research for case studies and qualitative examinations, frontier research strongly depends on longitudinal data and analytical methods that capture dynamic processes. The life course consists of events, transitions, and trajectories and sequences that, when monitored as close as possible in "real" time, permit the tracking of lives being lived through history. Longitudinal data also can incorporate causal factors, from retrospective accounts of the earlier biography and also in "real" time as lives proceed across the multiple domains of family, education, work, health, leisure, and so on. Hence, the manifold, cumulative life course becomes observable.

Since the late 1960s, in the United States, Britain, and Europe, longitudinal databases for life course research have proliferated. Today publicly available databases for aging-related secondary analyses in this area are available in multiple countries. The US National Institutes of Health maintains updated listings of and links to many of these data sources (see http://www.nia.nih.gov/research/dbsr/publicly-available-datasets).

Notably, over the past two decades efforts towards the development and maintenance of comparable databases across countries have succeeded. Following the US Health and Retirement Study (HRS) initiated in 1992 and continuing biennially to the present (http://hrsonline.isr.umich.edu), longitudinal databases using identical and comparable survey items have been initiated in several countries:

SHARE in Continental Europe and Israel (http://www.share-project.org)
ELSA in England (http://www.ifs.org.uk/elsa/)
KLoSA in South Korea (excl Jeju) (http://klosa.re.kr/KLOSA/default.asp)
MHAS in Mexico (http://www.mhas.pop.upenn.edu/English/home.htm)

All of these databases follow mature samples over the age of 45 at the first wave. Other national databases developed more recently include: the Japanese Health and Retirement Study (JHRS) with first wave in 2007; The Chinese Health and Retirement Longitudinal Survey (CHARLS) with first wave in 2010; the Longitudinal Aging Study in India (LASI) with first wave in 2010 or 2011; and the WHO Study of Global Ageing and Adult Health (SAGE). Many of these surveys include collection of biomarker data

and linkages to health and earnings records that permit a triangulation of data and the examination of biological and social processes as well as the reconstruction of past work and health histories.

Databases with more age-heterogeneous and younger samples are also useful for longitudinal analysis. The Panel Study of Income Dynamics (PSID) initiated in the United States in 1968 and the German Socio-Economic Panel (GSOEP) with cross-national equivalence files initiated in 1984 are often used in comparative life course research to examine labor market and family dynamics in the life course. Newer longitudinal datasets of younger populations provide the promise of direct examination of conditions during childhood and adolescence that have consequences for later life. The National Longitudinal Study of Adolescent Health (Add Health) initiated in the 1994–1995 school year in a nationally representative sample of seventh to twelfth graders continues to the present (with the sample reaching ages 24–34 in the 2008 wave) and serially triangulates individual survey data with social environmental and biological data to capture manifold processes of aging.

The steadfast maintenance of such datasets is required for life course research to proceed, to provide solidly grounded explanations of the life course process and to inform policies that influence the quality of life. However, the same globalization processes that are implicated in destandardizing life courses and increasing socioeconomic inequalities across countries threaten the continuation of the studies mentioned above and the initiation of new studies in parts of the world where they are needed.

Comparative Studies of the Life Course

Context matters in human development. In addition, theory is advanced only in the context of comparisons. Two major sources for comparisons of the life course are history, primarily through cohort studies, and nation-state or region or meaningful subgroupings within these geographical units such as race/ethnic, class, or gender groupings. The proliferation of comparable longitudinal databases is facilitating both temporal and contextual comparison. However, data must be accompanied by analytical tools that can exploit them and, over time, improve them. Fortuitously, new statistical techniques have coincided with the spread of long-running longitudinal studies.

Life table methods helped to enhance and expand life course research over four decades ago. These dynamic methods have been extended to deal with the diverse properties of samples and variables, including their temporal characteristics, in order to arrive at reliable causal relationships. These methods were developed further to examine survival (or duration) processes and instantaneous transition rates and their causes over time. Their capacity to

track multiple transitions over time (trajectories), including reversible processes (as in the case of leaving school and then returning to school; marrying, divorcing, and remarrying; or becoming ill, recovering, or dying) have pushed life course research to the frontiers discussed earlier.

Other analytic methods have been developed to move beyond examination of average tendencies to capture the underlying diversity of aging populations. Latent class and latent trajectory models (or mixture models) can sort populations into clusters of individuals with similar temporal characteristics of the life course to capture heterogeneity in populations. Multi-level models that nest transition or event trajectories within higher level units (individuals; families; schools; nation-states; etc.) can accommodate for the impact of unmeasured factors associated with contexts. Such methods help to account for unmeasured or latent heterogeneity in populations that would otherwise be unobservable using different methods.

INTERDISCIPLINARY COLLABORATION IN A DATA-RICH ENVIRONMENT

The challenges are for data to fit the requirements of existing analytic methods and for new methods to be developed to handle the idiosyncracies of new and different data. In a data-rich environment, the need for interaction with computational disciplines is more and more pressing. Quantitative social scientists have played important roles over four decades of research on the life course, but the explosion of data and the possibilities for linking diverse databases, including longitudinal surveys with administrative, political, geographic information systems (GIS), DNA databases, census, epidemiologic data, among others, requires a broader base of collaboration. The incentives for such collaboration have traditionally come from governmental agencies or private enterprises who are convinced of the value of such work. However, the life course project will also need the researchers themselves to reach out to other scientists to move its frontiers forward.

SUMMARY AND CONCLUDING COMMENTS

Aging and life course research can be viewed as a progressive research program that has developed steadily since the 1960s with strong foundations that have motivated several frontiers of research. These foundations have generated new questions. Similarly, data on the life course have accumulated over the same period and culminated in comparable long-running longitudinal datasets that make the observation of the life courses of different historical cohorts and different national and cultural populations possible. Life courses have been changing as biographies have encountered history. Globalization forces over recent decades have exerted forces to

de-standardize the life course and to introduce growing inequalities between and within cohorts. Population aging has coincided with globalization to influence the capacities of nation-states to provide life course protections against the hazards of globalization and random shocks. Matching rich longitudinal data with robust analytic techniques and comparing these observations across countries constitutes the current strength of life course research that is advancing theory.

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Angela M. O'Rand is Professor of Sociology and former Dean of Social Sciences at Duke University, Durham NC, USA. She has authored and coauthored books, chapters, and articles on several topics related to the life course, including: the comparison of US baby boomer life trajectories to earlier cohorts; the impact of childhood conditions on later life economic and health statuses; race-ethnic differences in late-life health trajectories; factors influencing reentry into formal education among mid-life adults; factors

influencing diverse retirement patterns among working couples; the spreading privatization of retirement systems in advanced countries; the impact of globalization and changing pension institutions on the retirement trajectory; and the growing impact of financial literacy on retirement security. She was honored in 2008 with the Matilda White Riley Award for her exceptional contributions to research on aging and the life course by the Section on Aging and the Life Course of the American Sociological Association. Her current project focuses on financial literacy as a life course risk.

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