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An Interdisciplinary Focus

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Population Issues

An Interdisciplinary Focus

Edited by

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PREFACE

This volume marks the end of an eight-year program of research on population issues, launched in 1990 by the Netherlands Organization for Scientific Research: The NWO Priority Program on Population Issues. Initiatives for this program of research were taken over ten years ago by Hans Van Ginkel — who became the first program chair — and Dirk Van De Kaa. The Dutch community of population scientists is deeply indebted to them for their early efforts. At the time, the program carried the name "Between Individual Development and Social Solidarity: Population and Society in a Period of Transition."

The goals of the Priority Program were threefold: To reduce the fragmentation of research on population issues; to increase collaboration among population researchers with different disciplinary backgrounds; and to strengthen the position of population studies in Dutch academe and in international forums. Looking back over eight years of programed research, we can safely say that the Priority Program has given an enormous impetus to population research in the Netherlands — as this volume attests.

This program of research could not have been carried out successfully without the valuable contributions and constructive input of a large group of scientists. The scope and the focus of the Priority Program were defined by a preparatory committee chaired by Gerard Frinking. Other members of the committee were Frans Dieleman, Jenny Gierveld, Johan Mackenbach, Bernard van Praag, and Ad van der Woude — all of whom continued to invest time and energy in the program of research once it had been effectuated — while Cock Hazeu of NWO served as the executive secretary of the preparatory committee. Others who served the Priority Program in advisory and directing capacities were Salomon Cohen, Hendrik van Dalen, Henk de Feijter, Tineke Fokkema, Kène Henkens, Pieter Hooimeijer, Evert van Imhoff, Bert van der Knaap, Anton Kuijsten, Aart Liefbroer, Clara Mulder, Nico van Nimwegen, Harrie Verbon, Ad Vossen, and Frans Willekens. We would like to acknowledge their efforts in helping to make the program a success. Of course, heartfelt recognition should be given to the over thirty

researchers — PhD candidates, postdocs, and senior researchers — who actually made the program work; they collected data, performed the analyses, and wrote the reports. In short, they were our "ambassadors" in the field. Last, but not least, we — as executive secretaries of the Priority Program — would like to express our sincere appreciation for our trustworthy personal liaisons at NWO: Paul Berendsen, and his successor Harm Prins.

Writing the chapters for this volume was part of the planned research activities of the Priority Program. The aim was to view and evaluate the results from an international perspective by comparing and contrasting Dutch trends with population changes observed elsewhere, and by assessing the Priority Program's accomplishments in terms of its contributions to the scientific literature. As a consequence, the chapters do not offer simple summaries of research conducted in the context of the Priority Program. Rather, they provide thoughtful reflections on empirical and conceptual developments in population studies both in the Netherlands and elsewhere.

To foster consistency and conceptual agreement and integration across chapters, two one-day workshops were held with all the contributors to the volume. Outlines were discussed and revised at the first workshop, which was held in the spring 1998, while draft papers were commented upon at the second, in the fall 1998. These meetings proved to be crucial to reaching coherence in the conceptual framework used throughout the chapters — the life course perspective. They also enabled us to avoid overlap and achieve correspondence between chapters.

In completing the manuscript for publication, we received help from many sources. We consider ourselves extremely fortunate to have been able to call upon Willemien Kneppelhout and her colleagues Ginger van Hasselt and Anne Mark for English-language editing. They rendered their services at short notice, often outside regular office hours, and with the greatest care and precision. We deeply respect and admire their creative reconstructions of grammatically correct but not overly elegant sentences. A final word of thanks goes to the secretarial staff at the Netherlands Interdisciplinary Demographic Institute — in particular to Tonny Nieuwstraten, Elly Huzen, and Jacqueline van der Helm — for their assistance in converting the manuscript into a form suitable for submission to the publisher.

Editing this book has been a truly collaborative enterprise. We should point out that the order of our names does not reflect a division of labor or of responsibilities. In fact, we decided to use the reverse alphabetical order. More important, however, is that our editorial work

has been an interdisciplinary exercise in its own right. With Van Wissen's devotion to formal demography, and Dykstra's immersion in sociology, there have been many intensive, instructive, and enjoyable discussions about what each of us saw — coming from our respective disciplines — as the merits, insights, and weaknesses of each of the chapters.

CONTENTS

1. INTRODUCTION: THE LIFE COURSE APPROACH AS AN INTERDISCIPLINARY FRAMEWORK FOR POPULATION STUDIES

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1.1. DEMOGRAPHY AS AN "OBJECT" SCIENCE

Textbooks tell us that demographers study population change, and that such change is brought about by developments in the three basic components of fertility, mortality and migration. Thus, by tradition, demographers examine the dynamic processes related to childbearing, death and moving, and their consequences for the size and structure of populations. Essentially, demography is what might be called an "object" science, a science primarily defined by its subject matter. Demography focuses on specific kinds of behavioral domains (fertility, mortality, and migration) and their manifestations at the macro level of populations. This sets demography apart from so-called "core" social sciences, which are more readily defined by the approach they take to understanding human behavior rather than by a focus on specific behavioral domains. Sociologists, for example, study social determinants, focusing on the way in which people's behavior is shaped by the relations they have with others or by the groups to which they belong. Psychologists generally try to understand human behavior in terms of processes in people's minds, whereas anthropologists tend to look at human behavior within the context of a specific culture. Given its origins, namely as a discipline primarily defined by its object of inquiry, it is not surprising that demography has always excelled in measurement and description. What makes demography distinct from other social

sciences is its quantitative approach, and its focus on large numbers of people, vital events, and processes that are measurable at the macro level. "Demographers, more than most social scientists, are interested in having their basic data as close to accuracy as possible" (Caldwell, 1996, p. 311). Demographic research is characterized by careful and accurate description, and its array of measurement and projective techniques for monitoring and forecasting population processes (Newell, 1988).

The emphasis on statistics and macro-level description has distinct merits but also a number of limitations. On the positive side, the sound empirical basis of demography is used by other disciplines as the starting point for subsequent research. For example, the study of mortality patterns is taken up by health scientists aiming to find behavioral and medical determinants of longevity; observed changes in age structures form the starting point for economic analyses of labor market relations, while observed changes in migration patterns form an impetus for sociological studies on cohesion in society. Moreover, planners and policy makers rely heavily on demographic accounts of population processes at the macro level. For this reason some researchers regard demography as a basic social science (Hauser & Duncan, 1959) and fundamental to understanding society (Davis, 1948, cited in Caldwell, 1996). On the negative side, the efforts devoted to measurement and description seem to have been made at the expense of explanation, and as a result demographic theorizing has remained relatively underdeveloped. According to McNicoll (1992), a limited interest in the mechanisms underlying observed behavioral patterns, together with the macro-level emphasis, have hindered the formulation of explanatory theories of population processes. Demographers seem to have applied their ingenuity for the benefit of measurement and statistical analysis rather than to probe more deeply into the processes governing behavior.

Description and measurement are intrinsic to demography as an "object" discipline. Explanation and theorizing are not. Demography does not profess to have any distinctive or fundamental views of its own regarding the basic mechanisms guiding human behavior. In other words, to move from description to explanation, demographers *need* to turn to other disciplines: "[Demographic] methods do not take the researcher very far along the road to understanding why fertility rates fall, why mortality rises with age, or why blacks and whites are residentially segregated" (Preston, 1993, p. 594). Drawing upon McNicoll's (1992) work, Preston continues to say: "In theory, the other behavioral and social sciences hold the keys to the relations between demographic events and the behavior of individuals and social systems" (p. 594). Some would therefore agree that demography is by its very nature

interdisciplinary. Stycos (1987) went so far as to call demography an *interdiscipline*. Demography is an interdiscipline in the sense that it is a field of study that draws upon and integrates theoretical perspectives from "core" social scientific disciplines.

Thus, demography may be said to have many close neighbors, where it frequently drops in to borrow explanatory frameworks. Frequently visited neighboring disciplines are sociology, economics, anthropology, social psychology, epidemiology and human geography. In the field of fertility, sociology, social psychology and economics have contributed significantly to demographic thinking. The value of children is a concept that originated in economics and has become a central notion in demographic theorizing about why people may or may not start having families of their own or expand the families they have. Epidemiology with its knowledge of causes of death has contributed much to mortality analyses, whereas many advances in the study of migration originate in human geography with its emphasis on the interplay between household decision making and the wider context of housing and labor markets.

In our view, this looking over or climbing over disciplinary fences that is practiced by demographers, is what makes demography an interdiscipline, and an exciting one at that. Keyfitz (1984, cited by McNicoll, 1992, p. 414) has a more harsh point of view, arguing that demography lacks disciplinary assertiveness: "Far from being imperialistic, [demography] has withdrawn from its borders and left a no man's land which other disciplines have infiltrated". In a similar vein, Siegers (1991) accuses economists of being imperialistic whenever they apply economic theory to other fields of research, without taking into account the accomplishments of the relevant disciplines. He describes this form of research as "multidisciplinary" rather than interdisciplinary. In multidisciplinary research, members of different disciplines approach a problem in isolation and reach conclusions without taking into account the results of other disciplines. Interdisciplinary research is more ambitious in that these endeavors combine the most fruitful and promising theories and use the methods that are best-suited to an analysis of the problem at hand. For instance, in studying duration of unemployment, economists are likely to use the ratio between wage and unemployment benefits in their explanatory models. Sociologists might consider the size and quality of the information networks of the unemployed. Both factors are most probably correlated, and if they are not considered jointly, the results are likely to be biased. An interdisciplinary approach would devise a framework which takes both sets of determinants into account to unravel their unique and shared contributions.

Interdisciplinary research has immediate appeal: It arouses sympathetic responses. There are, however, no simple, straightforward recipes for conducting research of this kind. One prerequisite for interdisciplinary studies is a common framework of understanding. Piaget (1970) distinguishes two types of interdisciplinary research, one starting from a common conceptual or theoretical framework ("structural equivalence"), and the other departing from common methods ("methodological equivalence"). The New Home Economics is an example of a theoretical framework that can be applied to many fields of study (Berk & Berk, 1983). From this perspective, fertility behavior, for example, is "structurally equivalent" to consumer behavior. Both types of behavior can be couched in rational choice terms involving preferences as well as monetary and other constraints. An example of interdisciplinary research based on methodological equivalences is the study of economic demography, where the basic accounting framework developed by demographers is used to study the population of firms (Stinchcombe, 1965). Another example may be found in Chapter 7 of this volume on medical demography. Kunst *et al.* use multi-state life table analysis, one of demography's strongest tools, in analyses of morbidity and mortality by cause of death.

Few will dispute the merits of interdisciplinary research: The cross-fertilization of ideas and expertise, the potential for finding new answers to old questions, and the broadening of perspectives. Despite its merits, interdisciplinary research has problems of its own. Some are evident when working with scientists with a different disciplinary background. Communication across disciplinary borders is not always easy, and it requires efforts to find a common working language. The other's terminology is not always familiar. However, communication should be the least of our worries. More serious problems lie in the quality of interdisciplinary research. As Caldwell (1996) argues, interdisciplinary research is at risk of being non-scientific. Theories imported from other disciplines are often accepted at face value. Due to a lack of knowledge or because researchers have not done their homework properly, dubious untested foreign theories may survive longer than their quality merits.

"Population studies" is the term often used to refer to interdisciplinary demographic research. Its aim is not only to describe the antecedents and consequences of population change, but also to come to an understanding of the mechanisms governing these changes. According to McNicoll (1992) the pursuit of a theory of demographic change is well worth the effort. This should be performed with a clear eye on the accomplishments in other social sciences. Nevertheless, demography itself has much to offer given its unique vantage point and

its extensive empirical knowledge of population change. As an interdisciplinary enterprise, population studies requires a conceptual framework that links and integrates insights from a variety of social scientific disciplines. Moreover, the conceptual framework should consider both the micro level of behavior, and the macro level of institutional and cultural influences on behavior. Such a framework has been developed in recent years: The *life course* approach. This approach offers a multifaceted framework for interdisciplinary research on population studies. The life course approach is also the organizing framework of the chapters in this volume. In what follows we provide a general explication of the life course approach, which serves as a backdrop for subsequent chapters.

1.2. THE LIFE COURSE APPROACH

At various moments in life, people experience events that involve important changes in the structure of their lives. These events are either the result of intentional individual choices, or are caused by other events taking place in the context in which they live. For instance, a person may choose to leave the parental home, and to start a family. He or she may also decide to buy a house, to take on a new job, or to move to another city. In these types of decisions, the individual is the agent performing a willful action that changes the course of his or her life. Other events are not deliberate decisions by the individual, but induced by the context in which a person lives. Here, context is a very general concept, ranging from other individuals within the personal network of the person, to institutions and social norms and values. In other words, it includes both micro- and macro-level influences on individual behavior. For instance, at the micro level, choices taken by one household member may have significant effects on others within the household. A person left by a person becomes single, whether he or she likes it or not. At the macro level, various social institutions shape individuals' lives. In the early stages in life, enrollment in education is compulsory, as is leaving the labor market at retirement age. Norms and values may have a similar effect on the life paths of individuals. According to the life course approach, these events, or *transitions* in life, do not occur at random or in isolation, but have a certain structure. The fundamental concept underlying this structure is *time*. In fact, the life course approach distinguishes at least three time dimensions. The first dimension is *biographical time*, which represents the chronological order in a person's life, and acknowledges that experiences earlier in life have an

impact on choices made later in life. Moreover, a person's biography is not one-dimensional, but made up of various life domains, e.g. family, work and housing. Events in one life domain may have an impact on events occurring in other life domains. The second time dimension is *historical time*, which captures the effects of historical changes on individuals' lives. The third dimension is *social time*. This dimension reflects the effects of the social age calendar, such as institutions, and social norms and values. In addition to these three time dimensions, the notion of interaction between individuals is fundamental to the life course approach. The concept of *linked lives* denotes the effects of other individuals on events in a person's life.

In short, the essence of the life course approach lies in the interaction between biographical time, historical time and social time (Hareven, 1977; Neugarten & Datan, 1973). A matter of central interest is how individuals move through socially created roles, fulfilling them sequentially or simultaneously, in relation to external historical and social conditions (Elder, 1978). As Heinz (1991) notes, the life course is typically viewed as a sequence of status passages, which mark turning points in people's lives, and which in succession make up life pathways. The life course has a structure (Mayer & Müller, 1986) meaning that life is not an uninterrupted flow of undifferentiated time and experience, but consists of a succession of socially constructed phases which are distinguishable from one another by members of a society. The phases are marked by socially significant occurrences or normatively defined transitions. Furthermore, there is a socially defined order in the succession of phases, and there are links connecting the different phases.

Two central concepts in life course analysis are "transition" and "trajectory" (Elder, 1985). The transitions are the status passages that mark socially significant points of change in people's lives. The concept of the trajectory denotes that phases in life follow socially defined sequences and that there are linkages between them. Trajectories are constituted by transitions, while transitions are embedded in trajectories. Different life course theorists use different terminology. Birg (1987), for example, talks about "phases" in life ordered according to their time of occurrence, and delineated by "events" that occur at given points in time. There are phases in family life, such as that of a child, teenager, spouse, parent and grandparent. There are also phases in economic standing, such as education, gainful employment and retirement. These phases are differentiated by events such as the successful completion of schooling (or leaving school without a qualification) and changes in occupation. The sequence of phases delineated by events make up a person's "biography".

Both transitions and trajectories may be explored either at a micro-individual level or at a macro-aggregate level (Hagestad, 1991). The challenge of micro-level explorations is to find orderly patterns in the diversity of people's accounts of their life histories. Hagestad (1991, p. 31) cites Back's (1980) work: "The study of the life course is a search for systematic regularities in events of unique meaning". Aggregate approaches usually involve comparisons across birth cohorts of the timing and sequencing of major life transitions. One of the drawbacks of this approach is that there is little knowledge of individuals' own experiences. Whether the researcher's constructions are consistent with the subjective interpretations of the individuals involved, remains uncertain. Ideally, actor-oriented and macro-social analyses should be combined to obtain a grasp of the dynamic interplay between how individuals live their lives and the way in which society constructs life trajectories (Buchmann, 1989).

1.2.1. Inherent Interdisciplinary

The life course approach is interdisciplinary by its very nature (Hareven, 1982). It brings together demographic, psychological, sociological, anthropological and historical traditions. Without aiming to provide a comprehensive overview, a number of the intellectual roots of the life course approach are described in what follows.

To begin with, the life course approach draws on the concept of the cohort, as developed by *demographers*. A cohort is generally defined as an aggregate of individuals born in the same time interval and aging together (Ryder, 1965). Birth is a prominent cohort-defining event, but cohorts may also be defined by marriage, school exit or first entry into the labor force. Members of a birth cohort have a shared past that reflects the historical circumstances at the time of birth, while growing up and maturing, and in the process of growing old. Social change may be studied by way of a sequential comparison of the characteristics of birth cohorts (e.g. fertility levels, age of entry into employment.) A focus on cohorts underscores the "dual significance" (Ryder, 1965, p. 846) of age. On the one hand, age denotes a position in the life cycle: People of a particular age tend to perform certain roles. On the other hand, age indicates that lives are located and embedded in specific historical circumstances.

The emphasis on biography and life span development is adopted from *psychology*. The essential idea is that people go through predetermined stages of development, each posing specific problems ("crises") or developmental tasks. This line of thinking is exemplified by

Erikson (1963), who has defined stages of psychosocial development that comprise the entire life span, extending beyond infancy to include adolescence, middle adulthood and old age. For example, in the first stage of life (the "oral sensory" stage of the first year) the crisis involves "trust versus mistrust". If the crisis is successfully resolved, the child forms a basic sense of trust that expectations will be met and that hopes will be confirmed. In the last stage of life (old age), the crisis involves "integrity versus despair and disgust", a retrospective accounting of the life one has led: Well lived as opposed to regretting missed opportunities. Linked to the ideas about stages of development are notions about the continuing influence of early experiences on later life. People's biographical pasts affect their present circumstances, and present circumstances shape future life directions.

The idea of expected and socially shared transitions and trajectories is derived from the *sociology* of age differentiation (Riley, 1985; Riley *et al.*, 1972). Presumably, members of a particular society have internalized standards about the appropriate ages for key transitions such as leaving the parental home or becoming a parent, and the sequence in which such transitions should be made. Such standards provide order and predictability in life. They form a benchmark against which individual progress can be measured. Ideas about events being "on-time" or "off-time" (Neugarten *et al.*, 1965) are part of these social scripts. The shape of life trajectories reflects social institutions and may be altered through policy changes. Age systems have a "dual nature" (Hagestad & Neugarten, p. 36): The social-structural dimension reflects the institutionalized mechanisms that impose order in life, whereas the social-psychological dimension refers to people's cognitive representations of the pathways through time and society (cf. Buchmann, 1989).

The notion that status transitions entail a complex set of changes in people's social identities is borrowed from the *anthropological* work on age grading. Age grading refers to the social segmentation of life into a set of stages, each with its own distinctive and socially recognized characteristics (Fry, 1992). Each new stage of life carries specific privileges, rights and obligations. Transitions are differentially structured by gender (Hagestad & Neugarten, 1985). Social constructions of gender serve as an example. For men, adulthood is primarily measured against being a breadwinner, whereas for women it derives more strongly from parenthood.

The focus on the diachronic changes that have an impact on the timing and patterning of life transitions is typical of a *historical* perspective. As Hareven (1982) points out, nonhistorians tend to view historical change in terms of "grand external events" (p. 8) such as the

Great Depression or the Second World War. Without wishing to deny the importance of major events, she argues that the unique contribution of historical research lies in the description of the demographic, cultural, socio-economic and institutional changes that affect life transitions. Examples are changes in marriage, childbearing, home leaving and mortality patterns that affect the time spent in a family unit, economic changes in the opportunity structure that affect the entry into and exit from gainful employment, and legislative changes such as compulsory schooling, mandatory retirement and child labor laws. It is important to note that current life experiences are not only shaped by contemporary social conditions, but may also be subject to the continuing influence of past experiences as they were shaped by historical conditions earlier in time.

1.2.2. The Life Course as a Promising Approach for Population Studies

The life course approach offers a promising and useful framework for population studies. In a substantive sense, this approach is a natural partner for population scientists. The foci of the life course approach are what populations studies are all about. Population scientists have always looked at events in people's lives from birth to death, addressing questions such as: When do they occur, and why? In what ways do social categories differ in the timing of events? What are the variations in prevalence — across time, across social categories, and across countries?

All the substantive foci revolve around timing (Hareven, 1996). The first is the timing of individual transitions, which involves the balancing of entry into and exit from different family, work and community roles (education, employment, marriage, childbearing, housing, leisure, voluntary associations) over the course of a life time. Demographers are inclined to speak about the "interdependence of parallel careers" (Willekens, Chapter 2 of this volume), looking at the ways in which status changes in one life domain preclude, delay, enable or accelerate status changes in other life domains. Research on the motherhood and employment nexus is a well-known example (Siegers *et al.*, 1991): In what ways is childbearing influenced by participation in the labor market, and conversely, in what ways is participation in the labor market influenced by childbearing? Liefbroer, in Chapter 3 of this volume, describes a number of studies that expand on this theme. One notable finding emerging from a cross-national analysis is that the delaying effects of educational attainment and labor force participation are less pronounced if a country has favorable policies for working parents. The

interdependence of life trajectories is a central theme in Chapter 6 of this volume, written by Mulder and Hooimeijer. These authors propose a theoretical model of residential relocation. In a nutshell, the model suggests that events in one life domain can "trigger" a move (e.g. accepting a job in a locality that is beyond manageable commuting distance), while other life circumstances "condition" the actual relocation by generating resources (e.g. income and savings) or imposing restrictions (such as a partner who is not prepared to move).

Whereas the first aspect of timing concerns the synchronization of transitions and roles over an individual's life history, the second involves the synchronization of "seemingly individual" (Hareven, 1982, p. 6) transitions and the collective conditions of the household and family to which the individual belongs. Hagestad (1981, 1991) uses the term "interwoven lives" to describe the social embeddedness of transitions and life paths. Often, the opportunities and constraints faced by individuals are shaped by the needs and dictates of household or family members whose lives are linked to theirs. Family historians have provided rich accounts of such interwoven lives. Hareven and Adams (1996) describe nineteenth century families where it was customary for an adult child to remain at home to care for aging parents. This child, usually a daughter, was discouraged from leaving the parental home and marrying to guarantee support in old age. Hagestad (1981) also draws attention to what Riley and Waring (1976) have called counterpoint transitions in families: A decision taken voluntarily by one family member may have unwanted or unintended consequences for other family members. An only daughter's decision not to have children means that her parents will not become grandparents. Divorce not only affects the bond between the divorcing parents and their children, but also that between the divorcees and their respective parents, and that between grandparents and grandchildren (Dykstra, 1998; Johnson, 1988). In Chapter 6 of this book, Mulder and Hooimeijer provide other examples of the ways in which individual life goals may be at odds with those of household and family members. Decisions to move are not taken easily because the relocation may have very different implications for those involved. The situation of dual-career families with children living at home serves as an illustration. A move might bring better job prospects for one member of the couple, but a loss of occupational status for the other. For the children, a move generally means a disruption of their daily routines because they have to attend a new school, find new playmates and so forth.

The third aspect of timing involves the cumulative impact of earlier experiences on later ones. The "early" or "delayed" timing of certain

transitions, whether such timing is induced by individual or collective decisions, may influence the occurrence or pace of later ones. A finding from the marriage and divorce literature serves as an example: Those who leave home at an early age and marry young are more likely to go through a divorce than are those who marry "on schedule" (Booth & Edwards, 1985; Manting, 1994). Events experienced earlier in life may continue to influence an individual's life chances. Elder (1974) has demonstrated persistent effects in their later lives for those who were in their teens during the Great Depression. Men with delayed timing in education or early entry into the workforce were more likely to have subsequent delays or disruptions in their careers than those who did not suffer deprivation. Women who experienced economic hardship showed the strongest orientation toward family life, childrearing and homemaking later in life, presumably in reaction to the disruptions in the work and family roles in the households in which they grew up. The notion that earlier life transitions may have a cumulative effect on later life sheds light on people's present situation: We gain a better understanding if both current circumstances and past experiences are considered. "Past" experiences can be either biographical events (i.e. occurrences in someone's individual past) or historical conditions shaping the life chances of entire cohorts. These insights have gained ground even in the health sciences. As described by Kunst *et al.* (see Chapter 7) they are gradually becoming part and parcel of the conceptual tools of epidemiologists and medical demographers, who are increasingly addressing the long-term effects of early life circumstances such as exposure to noxious substances, childhood poverty and deprivation (Second World War experiences). Demographic research, with its emphasis on descriptive inter-cohort analyses, has made substantial progress in outlining changes and continuities in life pathways, but relatively little attention has been paid to the interlinkages with the social and historical context (Hooimeijer, 1995). In other words, while demographers tend to be well versed in the empirical description of life patterns, they have considerably less expertise in explaining them. The life course approach has much to offer in this respect. It offers a framework for moving beyond description (that is, charting life patterns) to understanding the ways in which the shape of life trajectories reflects social institutions and historical circumstances.

Typical of the life course approach is that the pacing and sequencing of individual transitions are examined in relation to the social and historical context in which they occur. In a special issue of *Human Development* devoted to life course analysis, Kohli and Meyer (1986) note that in dealing with questions of the life course, the social and

historical context should not simply be seen as a set of opportunities and constraints, but rather as the mechanism shaping status passages in the life course and the linkages between them. They propose the view that context or social structure *organize* the life course, meaning that it should be "conceptualized as a patterned set of rules and mechanisms which regulate a key dimension of life, namely its temporal extension" (p. 146). Viewed from this perspective, historical and social circumstances define and construct the steps to be taken in the life course and the way in which people pass through them. Kohli and Meyer argue furthermore that the rules linking the stages of life may be social and legal as much as psychological in character. Birg's (1987) distinction between "virtual" and "factual" biographies is relevant here. The virtual biography is the *perceived* set of life options open to an individual, or as Birg says, the "biographic degrees of freedom". Life options are shaped by historical and cultural forces (e.g. the expansion of occupational and family roles brought about by industrialization and urbanization), by policy measures (e.g. financial benefits provided by the State) and by earlier life experiences (people might have entered into commitments — become a parent, bought a house — that knowingly or unknowingly serve to restrict the range of their future activities). People's perceptions of their life options (their virtual biographies) are not stable. They change over time through experience, gains in knowledge and understanding, and through external influences. The factual biography is the sequence of activities and commitments that have actually transpired in a person's life. Birg emphasizes that, whereas people's life options are socially defined, organized and constructed, individuals themselves must and can establish order in, and give meaning to their lives.

The idea that the social and historical context organizes the life course draws attention to societal mechanisms that are not easily captured under the heading of "opportunity structure", but nevertheless regulate and define the steps of life pathways. In the same special issue of *Human Development* cited previously, Mayer (1986) describes four such societal mechanisms. His argument is that even in modern society with its emphasis on personhood and its multitude of options for exercising choice, there are still strong structural constraints on the life course. Institutional careers constitute a first mechanism that imposes order and constraints on people's lives. Institutional careers are "specific sequences of roles with an autonomous time scheduling according to an institutionalized logic" (p. 166). Examples are the educational system with its sequence of one-year courses, careerlike sequences in the occupational domain, and the family cycle (and as Mayer notes, although the latter lacks the character of a sequence of formal positions, it does have

a distinctive pattern of tasks and obligations which change as time in the family career progresses). A second way in which life courses are socially organized is through state intervention and regulation. The "state legalizes, defines and standardizes most parts of entry and exit: Into and out of employment, into and out of marital status, into and out of sickness and disability, into and out of formal education" (p. 167). Cumulative contingencies are a third manner in which structural forces shape life courses. Here Mayer refers to what was described previously, namely the impact of the timing of early life events on later life. The timing can be induced by collective or individual decisions. Early events pave the way for some roles and preclude others, altering life chances and prospects. To illustrate this point, Mayer describes the structurally induced, delaying effects on marriage and childbearing of prolonged education for recent cohorts of women. Young women today leave school at later ages than earlier cohorts did. The extension of the period of education affects later life decisions. Women are marrying later and they are investing more heavily in professional careers. As a result, they are having their first children at older ages or not at all because time has "run out". The fourth way in which structural conditions pattern individual life courses lies in the collective and widely varying life chances of birth cohorts. One measure of collective life chances is the absolute size and the relative size of birth cohorts in relation to earlier and later ones, which impose fundamental material constraints on material resources (cf. Easterlin, 1980). Historically, specific conditions such as the Great Depression and the Second World War also constitute the collective fate of cohorts.

The life course approach, with its emphasis on the interlinkages with the social structure, not only brings a promising explanatory framework to population studies, but it also offers a fruitful tool for improving one of demography's methodological strengths, namely forecasting models (Hooimeijer, 1995). For example, knowledge about the institutional expansion of education together with the finding that young adults postpone union formation and childbearing until after they have obtained their degree (see Liefbroer in Chapter 3) is not only useful for household projections but also for projections of housing demand and labor market supply. In examining the interlinkages with the social and historical context, the life course approach also provides a framework for identifying conditions under which life trajectories are susceptible to policy changes (Hagestad, 1991). An example that immediately comes to mind is the effect of economic circumstances on young adults' decisions to leave the parental home (Mulder & Hooimeijer, 1998). High rates of youth unemployment tend to go hand in hand with a relatively

older age at leaving the parental home. Similarly, cutbacks in governmental support for students and unemployed youth tend to discourage young adults from leaving the parental home to live on their own.

In a methodological sense, the life course approach fits the demographic research tradition like a glove. Demographers, in particular, have developed considerable expertise in the research methodologies and techniques applied in life course analysis. On a macro level they involve inter-cohort comparisons, using large (nationally representative) data sets, and methods such as multi-state life tables and the Lexis diagram. Historical changes are inferred by comparing aggregate transition patterns across birth cohorts. A drawback is that repeated cross-sectional cohort studies with their aggregate measures provide only an approximation of what happens to people over the course of time (Mayer & Huinink, 1990). Their lives are not actually analyzed. Moreover, the aggregate level of the data does not provide insight into the variability within cohorts. On a micro level, the techniques involve event history analyses, using data sets with continuous information on individuals, their positions and status changes over a particular length of time. The data are either from panel studies or from surveys with longitudinal information collected through retrospective accounts of life histories.

Ironically, the life course approach was not developed by demographers, though they should have, given their expertise! At this point, we would like to note that there is another reason for using the life course approach, apart from substantive and methodological considerations. We call this a "domestic" reason, "domestic" in the sense that it is internal to demography. The life course approach — as this volume attests — offers a framework for the analysis of *all* phenomena that are of interest to demography. In other words, processes related to fertility, as well as those related to migration and mortality can all be studied from the same perspective. In this way, the adoption of the life course framework can foster communication among scholars and serve to integrate the work of researchers occupied in different areas *within* demography: fertility scholars, migration specialists and students of mortality.

1.3. OVERVIEW OF CHAPTERS

The contributors to this volume are selected participants in an eight-year program of research on population issues, funded by the Netherlands Organization for Scientific Research: The NWO Priority Program on Population Issues — hereafter referred to as the Priority

Program — that began in the fall of 1990 and ended in 1998. The interplay between individuals and the social and historical context formed the program's leitmotiv, as described by Frinking and Hazeu (1990) in the volume that marked the advent of the Priority Program. The micro-macro leitmotiv generated three leading research questions, or general research themes. Starting from the vantage point of the individual, the first research theme addressed decision processes. More particularly, the focus was on both the ways in which people's life options are organized by society, and the ways in which people select behavioral alternatives from the socially created and socially determined options. The second research theme was more strongly characterized by a macro orientation: the development and application of forecasting models. Forecasting models make predictions about macro-level developments, for example about changes over time in the size and composition of populations. However, their input is based on micro-level data such as behavioral decision rules, and information about the interdependencies of people's lives and the interdependencies among different domains of life. The micro-macro duality of population change was the third research theme. Examples of issues addressed here were the implications of changes in population composition (aging, increasing levels of educational attainment, increases in women's employment outside the home, integration of ethnic minorities) for public health, labor market relations and social security. A meaningful treatment of these issues requires knowledge at the micro level about the productivity of older workers, the health of immigrants, the employment histories of men and women, and so forth.

Research on each of the three general themes is presented in this book. The chapters provide comprehensive overviews of results of the Priority Program, integrating results from a wide variety of projects funded by the program. This book is not only of interest to a domestic audience, however. The results are tied in with developments taking place elsewhere. This is done in two ways. On the one hand, Dutch population trends are compared and contrasted with those in neighboring countries, or more generally, with those observed in Western industrialized societies. On the other hand, the substantive findings are linked to and placed in the perspective of the conceptual and methodological questions that are being considered in the international research literature.

As discussed, the life course approach forms the central framework for the chapters in this volume — just as it was central to the Priority Program. Chapters 3 through 7, which have a substantive rather than a methodological focus, roughly follow consecutive stages in the life course.

In Chapter 3, Aart Liefbroer looks at experiences occurring relatively early in life, namely those which are evident in the transition from youth to adulthood. He focuses on status changes in the family domain, such as leaving the parental home, unmarried cohabitation and marriage, and parenthood. The descriptive data in the chapter show that there has been a postponement over the past decades of "high commitment" status changes such as marriage and parenthood, and an increasing popularity of status changes such as living alone and unmarried cohabitation, which have fewer far-reaching and irreversible consequences. Liefbroer goes on to discuss the progress that has been made in explaining these empirical trends from a life course perspective. First, he considers studies that link macro-level changes, such as changes in economic and social structures, cultural changes and technological innovations to changes in young adults' values and the opportunity structures within which they operate, or both. Next, he deals with studies that focus on the dynamics in the individual lives of young adults, such as the interdependency between the life domains of education, employment, union formation and parenthood, and the effects of past historical and biographical experiences on what happens later in young adults' lives. Finally, he looks at studies that specifically try to uncover the motivations (intentions, life strategies) governing young adults' family formation decisions. Readers of Liefbroer's chapter will not only find a wide range of applications of the life course perspective, but also a thoughtful evaluation of the advances that have been made in our thinking about the transition from youth to adulthood.

Anton Kuijsten's chapter shares a focus on family-related life events with the chapter that precedes it. Both draw attention to the delayed timing of marriage and childbearing, but this is where the parallel stops. Kuijsten not only considers the early stages of the life course, but also looks at late life circumstances. His chapter takes what one might call a more traditional demographic approach, examining the collective biographies of cohorts across time. His tables show aggregate-level data for a wide range of European countries: Trends over the past decades in average household size, the proportion of one-person households, and the distribution of household types (including the emergence of "new" living arrangements). Kuijsten focuses on the aggregate-level manifestations of the increasing pluriformity in people's life courses. Interestingly, this focus is not restricted to the demographic mainstay of households and living arrangements, but is extended to include developments in the size and composition of kin networks. The descriptions of changes in kin networks apply to the Netherlands only, given a lack of cross-nationally comparative data. Kuijsten raises a provocative ques-

tion in his overview: Are we witnessing a movement from growing age standardization of the life course (first half of this century), via increasing de-standardization (the following three or four decades), to a new re-standardization (emerging in the nineties)?

Chapter 5, by Hendrik Van Dalen and Harrie Verbon devotes attention to the financial-economic sphere of life. More specifically, they focus on the role of work and savings over the course of people's lives. Their overview is guided by two general considerations. The first is that people's financial resources impinge on the likelihood of status changes in other life domains (e.g. marriage, residential relocation) and on employment status changes later in life (e.g. retirement). The second consideration is that work and savings decisions are structured by economic and social circumstances. For that reason, Van Dalen and Verbon pay specific attention to the influences of labor market conditions, birth cohort size, and the rise of the welfare state. In the first part of the chapter, the authors address the question of how well successive cohorts have fared in the labor market in terms of length of employment, job prestige and earnings. They also look at trends in savings and benefit-tax ratios — the aim of the latter is to assess the effectiveness over time of the redistributive function of social security. The notion that people base work and savings decisions on their expectations of the future is echoed throughout the chapter, which brings the authors to the question: How tenable are future social security and pension arrangements? This question is addressed in reference to the results of a set of ingenious laboratory experiments. In Van Dalen and Verbon's chapter we clearly see the added value of interdisciplinary research efforts. Given their economic background, the authors look at issues that are not readily addressed in the work of life course analysts, namely taxes, benefits and savings. Furthermore, Van Dalen and Verbon illustrate that the experimental research design is well-suited to addressing questions that are of fundamental interest to demographers, economists and psychologists.

Residential relocations are the topic of Chapter 6, written by Clara Mulder and Pieter Hooimeijer. Though decisions to move to a new home, to buy a new house, or to form a household of one's own have been well-researched, the field of study is fragmented and very diverse. There clearly is a need for an inclusive and integrative framework, and this is why Mulder and Hooimeijer's chapter is such an important contribution. The authors develop a theory of residential relocation in which the various strands of research fall into place. The life course approach is their source of inspiration. Following the central tenets of this approach — cumulative contingencies in the life course, the

interdependencies among life domains, and the micro-macro interplay — Mulder and Hooimeijer introduce the concepts of the "triggering" and the "conditioning" roles of careers. A status change in one life domain (e.g. the arrival of a child) can trigger a change in another domain (e.g. the decision to look for a new home). Whether people actually move is conditioned by the circumstances in the various domains of a person's life (e.g. partner status, employment) and by housing and labor market circumstances. Hooimeijer's chapter not only provides a comprehensive overview of recent research on residential relocation, but also nicely shows how the various studies fit together and complement one another.

In Chapter 7, written by Anton Kunst, Judith Wolleswinkel-Van Den Bosch and Johan Mackenbach, we move to the limits of life. This chapter considers the advances that have been made in medical demography, with its focus on determinants of longevity, survival and mortality. Knowledge about trends in (healthy) life expectancy is essential to health care planning and policies. Accurate and reliable description of mortality patterns is a first and important step, and the authors provide an extensive and well-organized overview of past, current and expected trends. Many of the studies surveyed in this chapter go beyond description to arrive at explanations of observed trends. What are the underlying mechanisms (selection or causation)? Which causal chains are involved (determinants of exposure to risk factors, levels of exposure, disease process)? What is the role of the social and historical contexts? Kunst and his colleagues skillfully outline and evaluate the progress that has been made in explanatory medical demographic research and point to the questions that have yet to be answered. In the authors' view, future research will benefit from the insight that people's health is influenced by what happened earlier in their lives.

The substantive chapters are "framed" by two chapters with a more methodological focus: one at the beginning of the book, and one toward the end. Chapter 2 written by Frans Willekens considers the methodological pitfalls of analyzing life histories. Willekens' starting point is that it is helpful to view the life course in terms of the patterned timing and sequencing of life events. He then goes on to argue that problems arise in many life history analyses because the components of the life course are not clearly defined, and as a result poorly or inadequately measured. His clear exposé focuses on four key elements: (a) Life events are the basic units of the life course; (b) Events take place at a particular "time"; (c) Timing is determined by the "risk" of experiencing the event; and (d) The occurrence of the event "depends" on earlier and concomitant experiences. He describes the different ways of looking at

these key elements, and the implications that a particular conceptualization might have for one's research design and methods of analysis. For example, as regards "time", Willekens distinguishes between chronological time (clock time) and developmental time (stage in a developmental process), and argues that in life history analyses, the latter might tell us more about where a person is in life than, for instance, his or her age *per se* — the variable that is usually considered. He also reflects on the problems associated with the measurement of time. Which point in time does one decide to measure, i.e. the time of occurrence of an event or the time of the onset of the process leading to an event? How seriously will respondents' misreporting of the timing of events bias the results? In the last part of the chapter, Willekens discusses what kinds of life history models are required for what kinds of research questions. The essential distinction is between problems focusing on state occupancies — requiring logit models — and those focusing on state transitions — requiring log-rate models. Where relevant, Willekens illustrates his arguments with pertinent research from the Priority Program.

Microsimulation modeling is often criticized for being data-driven rather than theory-driven, and it tends to be associated with practical application rather than with scientific achievement. Recent developments in microsimulation modeling as described in Chapter 8 by Pieter Hooimeijer and Anton Oskamp suggest otherwise, however. Microsimulation is ideally suited for modeling the interplay between individuals and the context in which they live. It does so by defining decision rules about people's behavior. One of the strengths of this chapter is that the authors apply the life course perspective to outline eight criteria for the functional design of microsimulation models. Examples are that the model should be dynamic, and that it should allow "variable richness", meaning that events and circumstances in several life domains should be considered. They state, moreover, that behavioral patterns should be modeled as contingent upon past experiences and upon what happens to other people. The forms of "contingency" should be specified in explicit decision rules. Another example is that choice sets, which incorporate structurally determined opportunities and constraints, should be defined. The eight criteria (of which only a subset are described here) form the "baseline" for evaluating three microsimulation models developed in the Priority Program: KINSIM which simulates developments in the size and composition of kinship networks, NEDYMAS, which simulates the redistributive impact of social security arrangements on income distributions, and LOCSIM, which simulates reciprocal interaction between housing market dynamics and demographic developments. Hooimeijer

and Oskamp's chapter is a state-of-the-art overview of the methodological and conceptual underpinnings of microsimulation. It is not only a valuable resource chapter, but also offers challenging perspectives for the future of microsimulation.

In summary, the chapters in this volume are manifestations of what McNicholl (1992, p. 414) refers to as "deliberate eclecticism". Drawing upon insights from economics, sociology, psychology, medicine, *and* demography, and incorporating them within the life course framework, the respective authors show that demography is not a science taken up solely with technical and measurement issues as so many have suggested, but rather an exemplar of a multi-faceted study of population change.

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2. THE LIFE COURSE: MODELS AND ANALYSIS

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Abstract. The life course perspective has proven to be extremely useful in studies of social and demographic change. In this perspective, life is viewed as an evolving process and demographic events are milestones or critical transitions. Major research questions include (a) how people organize their lives around these life events, and (b) what that means at the population level. The paper aims at contributing to an integration of life course theorizing and methods of analysis. The approach is to reduce life course theories and methods to a few basic and universal elements and to investigate the use of these elements in studies of life histories. Basic elements are life event, time, risk and uncertainty, exposure, and interaction. A better understanding of the conceptual and analytical significance of these concepts will guide theory development, data collection, and modeling.

2.1. INTRODUCTION

Demographic events are milestones in people's lives. In fact, most events that occur between birth and death and that have a notable impact upon a person's life are demographic. Leaving the parental home, marriage, marriage dissolution by divorce or widowhood, migration, labor force entry and exit are among the most important life events. These events change a person's situation and may require substantial lifestyle adjustments. They mark transitions[1] between stages or episodes of life and are the basic components of a "life structure", i.e. a pattern

[1] In this chapter, events and transitions are used interchangeably. Sometimes (e.g. in multistate demography) transitions refer to changes over a discrete time interval.

underlying an individual's life at a given time (Levinson, 1978). Life events and episodes of life are *universal*; they are everywhere, throughout history and in all societies. In view of their universal character, life events, which shape the pathways of life, and which both enable and constrain future behavior, serve as the basic elements in theoretical, analytical and empirical studies of behavior in different but interconnected domains of life and in different social and historical contexts. Irrespective of time and place, life events, their timing and their sequence constitute the skeleton of human life.

The life course provides the dominant theoretical and analytical framework in the NWO Priority Program for Population Issues (see Chapter 1 of this volume by Dykstra and Van Wissen). The emergence of the life course approach forms part of important paradigm shifts in the social sciences, including demography. The shift came about from a convergence of several major theoretical and empirical streams of research into human behavior which linked individual action with social change and social structure (Elder, 1995; Giele & Elder, 1998). The paradigm shift is fundamental and aimed at enhancing our understanding of the causal mechanisms governing demographic behavior and population change. The life course perspective provides an opportunity to link demographic events to other aspects of life that are important to people and that affect their demographic behavior. It is important to move beyond listing factors significantly and that affect behavior and to examine *how* they affect demographic behavior, i.e. to uncover the causal mechanism. Many concepts and measurement tools fall short in identifying causal mechanisms in people's lives. For instance, the concept of time and the way it is usually measured are not enough to unravel developmental processes. The concept of risk used in most demographic studies is limited to "being exposed" or "not being exposed" to an event. The degree of exposure and the factors affecting it and hence the risk level are rarely examined, except in subfields such as family planning and morbidity analysis. The life course perspective invites the researcher to move beyond traditional modes of explaining demographic change and to attempt to uncover causal processes.

The aim of this chapter is to discuss some key issues in the adoption of the life course perspective in population studies. The first issue is: What do we gain by viewing demographic change from a life course perspective? I intend to show that the life course perspective helps us to understand human behavior for the simple reason that it focuses on how individuals themselves perceive their lives and not on how researchers view reality. Individuals experience events and organize their lives around these events. Most people spend a considerable part

of their life either preparing for or coping with major transitions. Some occur by choice, whilst others occur by chance. Although some events may be prevented from occurring whilst other events are allowed to happen, people have considerably less control over *when* events occur. That observation has important implications, not only for individuals but also for society, i.e. at the population level. The life course offers a framework with which to address this issue and to link changes at the macro level to events at the micro level. The second issue relates to basic concepts often used in life history models, but which are frequently only loosely defined: time and risk/exposure. For instance, there are several notions of time, chronological time being only one. Exposure is a fuzzy concept which needs to be defined more carefully than in most of the demographic and social science literature. Many of the cases included in the "population at risk" are not at risk or are at reduced risk. Exposure analysis is one of the challenges in life course research. This chapter intends to contribute to the discussion. The third issue addressed here concerns the relationship between avenues of research, data, and methods of analysis. A frequent problem in life course research is that the available data are inadequate: The most interesting questions cannot be answered. Usually, models are used that take inadequacies of the data set into account. To circumvent the data problems, the distinction is then made between (a) the (latent) underlying process or mechanism of interest, and (b) observations as manifestations of the underlying process. Thus, one moves beyond the modeling of observations towards the modeling of the underlying process. Ideally, the models distinguish between chance and choice, as in real life.

The most basic element of the life course is the life event. Although life events and the stages or episodes of life marked by them are universal, individuals experience the events and go through the stages in infinitely varied ways, which depend on factors internal to the individual, on social factors and on situational factors. The structuration of life, i.e. the emergence of a life structure, is different in different contexts. Notwithstanding the universal presence of a life structure, the particular structure that emerges is time-bound and space-bound. The ultimate aim of research is (a) to detect universal properties of events and stages in life, i.e. properties that hold across time and space (in different historical contexts and in different cultures and socio-economic systems), and (b) to determine how factors that are location- and period-specific affect people's lives, i.e. how threads and the historical landscape (social, economic, cultural, political and technological) are connected. The properties of interest in demography are (a) the (non-) occurrence of an event during an interval and, if there are multiple events, the number

of occurrences, (b) the timing of the events, and (c) their sequence. A major interest lies in the detection of universal "life structures" (patterns) and life strategies (behavioral intentions), and the factors or contingencies (personal and situational) which shape the life course. The interest in life strategies stems from the awareness that critical decisions in life, i.e. decisions related to life events, are not taken in isolation but are part of general conceptions about future developments in different life domains. For a discussion, see Liefbroer (Chapter 3).

That interest is exemplified in the Priority Program. Events studied include transitions to adulthood — leaving the parental home, union formation, family formation — (Liefbroer, Chapter 3; Kuijsten, Chapter 4), labor market transitions (Van Dalen & Verbon, Chapter 5), residential relocation and migration (Mulder & Hooimeijer, Chapter 6) and death (Kunst *et al.*, Chapter 7). Timing of the event(s) and changes in timing are important issues in all the studies. A general observation is the postponement or delay of demographic events, be it nest leaving, union formation, childbirth, or death. Some transitions, such as retirement from work, occur earlier in life. Van Dalen and Verbon observe that, as life expectancy increases, retirement age should show an upward movement and not a downward trend. The downward trend may be explained in part by very strong social norms and even regulations restricting the choice of retirement age.

2.2. THE LIFE COURSE: A PARADIGM SHIFT

The emergence of the life course paradigm, which occupies a central position in Dutch demographic research, is part of a broad change in social sciences along four avenues: (a) from structure to process, (b) from macro to micro, (c) from analysis to synthesis, and (d) from certainty to uncertainty.

2.2.1. From Structure to Process

Much of life course analysis concerns the identification and characterization of stages of life, i.e. the detection and documentation of a *structure* in the pathways of life. A focus on the structure of a system implies that taxonomy or typology and classification are dominant issues, i.e. phenomena or items are ordered within the structure. With increasing awareness of a creation *process* behind every entity and structure, focus shifts from structure to process: origin, progression, interaction with other operating processes and the emergence of struc-

ture (e.g. life structure) as an outcome of interacting processes. Nearly every social and natural science has made the transition from entity-oriented perception of reality to process-oriented perception (for details, see Kegan, 1982). The same applies to life course studies. Life events are outcomes of processes. The causal mechanism underlying an event or causing an event to occur is referred to as an event process. One problem is that events and structures can be observed quite easily, but the "underlying" processes that generate the events and structures are often difficult to detect. To interpret or explain events, the underlying, causal processes must be identified (uncovered), and understood. The interest in the causal mechanisms linking events and the underlying processes can be seen in the studies of parallel careers (intra-individual interdependencies) and "linked lives" (inter-individual interdependencies, e.g. partners and family members). The complexity of causal mechanisms derives from three important features of developmental processes, the first being the ontogenetic nature of processes. Each process has several components: an origin (onset), a change in a particular direction over time, and an end (termination). Ontogeny is the study of the origin, development and direction of a process (see e.g. Baltes, 1997). In biology, ontogeny is the name for all the developmental events between the fertilization of the egg to the death of the organism. The second feature is the epigenetic nature of processes. In an evolving organism, any process is controlled by the activity of at least one other process and the degree of control depends on the developmental stage of the controlling part, based on a more or less stable blueprint (*Bauplan*). Each stage of development creates the basis (developmental readiness) for transition to a new stage in which other parts of the organism (or domains of life) develop (see e.g. Sugarman, 1986). As a result, development is not gradual: Stages of rapid development (transition stages) are followed by relatively stable stages. The third feature is the teleological nature of processes. The processes underlying life events are not entirely beyond the control of the individual. For instance, the birth of a child is an outcome of a choice process as well as a biological process. The control serves a purpose or goal. The degree of control exerted over an event process depends on the event's anticipated effects. The ability of humans to anticipate introduces a major complexity in event processes.

2.2.2. From Macro to Micro

Coleman (1990) distinguishes between two modes of explanation for the behavior of social systems (e.g. populations). The first mode

studies behavior at the *system level* by identifying system variables that co-vary. The second entails the examination of *processes internal to the system*, involving its component parts, or units at a level within the system. Multi-state demography is a typical example, in which a population is viewed as being composed of subpopulations. Each subpopulation has its own dynamics and interacts with other subpopulations at the same time. These interactions are manifest in transactions or exchanges, e.g. migration. Behavior at population level is viewed as the outcome of the behavior of the different subpopulations and the exchanges among them. A second example is where a population is stratified by cohorts and the population dynamics are studied in terms of the dynamics of cohorts and inter-cohort differences. Subpopulations and cohorts are assumed to be homogeneous, which they are not. A third illustration is where a population is viewed as being composed of agents or actors (individuals, groups, institutions) and population changes are interpreted as the outcomes of agents' actions and interactions. Phenomena at the system level emerge from agent interactions. This mode of explanation is known as *methodological individualism*. The focus on individual agents is for methodological reasons, not because of a primary interest in individual agents as such. Individual-level actions are studied because of their effect on system-level behavior. In methodological individualism, population dynamics are viewed as the composite effect of individual life courses.

The trend from macro to micro is a general one in science and represents the search for elementary building blocks of complex organisms and organizations. In his book *Hidden Order*, Holland (1995) describes the fundamental trend as follows: "If model making, broadly interpreted, encompasses most of scientific activity, then the search for building blocks becomes *the* technique for advancing the activity. [. . .] We gain a significant advantage when we can reduce the building blocks at one level to interactions and combinations of building blocks at a lower level: the laws at the higher level derive from the laws of the lower-level building blocks" (Holland, 1995, p. 36). That perspective is consistent with methodological individualism.

A major concern in the shift from macro to micro is the micro-macro link. A feature of any behavior or process at the micro level is that it occurs in a particular context. The feature is referred to as *embeddedness*. The context provides opportunities but imposes restrictions; it enables and restricts individual actions and it is multi-level and dynamic. It may be viewed as being composed of a large number of processes operating at different levels (layers) of aggregation (e.g. the individual, the family, local neighborhood, class, ethnic group, state, birth

cohort). The processes interact with one another and it is the *interaction* that shapes development. Although for the purposes of analysis it is often desirable to isolate a process and study its properties in the absence of other processes (in a "pure state"; *in vitro*), isolation is never feasible in the real world. Instead of trying to isolate particular events and event processes for study, the focus of attention should be the characterization of context in terms of multiple processes operating at different levels of aggregation (see e.g. Courgeau & Lelièvre, 1992; Lillard & Panis, 1998). The study of parallel processes is part of an endeavor to picture demographic behavior and behavioral patterns during the life course as outcomes of interactions between multiple processes (see e.g. Blossfeld *et al.*, 1996; Willekens, 1989).

2.2.3. From Analysis to Synthesis

Traditionally, demography and other sciences focus on decomposition and *analysis*. Once the basic entities (components, building blocks) have been identified and their position clarified, they may be rearranged to produce different higher-level population structures. In this way, the observations of populations as we know them may be situated within a larger context, i.e. the context of what might be possible. Birg *et al.* (1991), for example, refer to "virtual" biographies to denote biographies that are possible given the building blocks. *Synthesis* is the complement of analysis. The synthetic approach constructs aggregates from simple components selected from a finite repertoire and these are then combined according to a *system of rules*. Rules are abstract, formal specifications. They address the logic of demographic processes and population change and not the population itself. For instance, when simple objects or processes are combined according to particular rules, the result may be a complex organism or a composite process. The life course, which is a complex and composite process, may be viewed as an outcome of a combination of a large number of elementary processes. The challenge is to detect the elementary processes and the rules linking them. Microsimulation is the major tool linking multiple elementary processes to generate complex dynamics and to quantify the contribution of a given process to the complex pattern of change (see Hooimeijer and Oskamp, Chapter 8).

2.2.4. From Certainty to Uncertainty

The occurrences and timing of life events, i.e. the outcomes of event processes, cannot be predicted with certainty. Consequently, events are

probabilistic and event processes are random processes affected by chance. Probability theory offers a scientific basis for the evaluation of the effect of chance on the human life course. Although the exact outcome cannot be predicted, the range of possible outcomes is generally known. In addition, the probability of each of the possible outcomes may be known, i.e. the probability distribution of the outcomes is known. For instance, events occurring at a constant rate are more likely to occur sooner than later. The time of occurrence follows a negative exponential distribution and the probability that the event occurs within z units of time, with z equal to 1/rate, is 63 per cent. In the Cox regression model or the proportional hazard model which is often used in demographic research, the effect of the covariates is *either* to postpone the occurrence of the event (covariates reduce the baseline rate of occurrence) or to speed it up (covariates increase the rate of occurrence). Although the exact time of an event cannot be predicted for a given individual, it is possible to ascertain the mean time and the time pattern for a group of people with a considerable degree of accuracy.

Uncertainty is an attribute of an event. An interesting distinction is frequently made between uncertainty, risk, and surprise, e.g. decision making under risk, versus decision making under uncertainty. A recent study by Schneider *et al.* (1998) gives a good overview of the conceptual issues. Risk refers to a condition in which both the event and the probability that it will occur are known. Uncertainty refers to a condition in which the event is known but the probability of its occurrence is not known. Surprise refers to the condition that both the event and the probability of its occurrence are not known. Surprise exists when events cannot be anticipated due to ignorance or denial (unwillingness to recognize that some outcomes are not known).[2]

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[2] For instance, the discovery of a hole in the ozone layer over the South Pole in 1985 came as a surprise because the computer programs written to diagnose the satellite data were specifically instructed to reject measurements that diverged sharply from expected normal conditions. When scientists plotted their own ground-based records by hand, the "outliers" were not omitted and the increase in ozone was detected (Schneider *et al.*, 1998). The example shows that the "knowable remains undetected because of the assumptions or views that frame the question or methods of analysis" (Schneider *et al.*, 1998, p. 166). In population studies it is not uncommon to reject findings that are not anticipated for various reasons, e.g. they are not consistent with established theories, are not captured by established statistical data collection procedures, or are not socially approved ("deviant" demographic behavior).

2.3. ANATOMY OF THE LIFE COURSE

The paradigm shift calls for a particular view of the life course: the life course as an evolving process from infancy to childhood to adolescence to adulthood to mature age. The objective of life history analysis is threefold: (a) to *detect a pattern* in the timing and sequence of life events, i.e. to identify and describe the "life structure", (b) to determine whether and how different life events are related, i.e. to *explain* the "life structure" by identifying underlying elementary event processes and describing how structure emerges from interactions among the processes, and (c) to *predict* or reconstruct life histories from partial observations, i.e. to predict an entire life history given the data. In short, life history analysis describes, explains and predicts people's lives, with a view to explaining and forecasting population change.

The life history may be described in terms of life events or in terms of the states (stages) between events. The former, which is the event history perspective, emphasizes process and the latter emphasizes structure. People are said to have different life histories when differences exist in: (a) the types of events that occur, i.e. the changes in attributes involved by events; (b) the number of events; (c) the timing of events; and (d) the sequence of events. Many factors explain differences in life histories: Some may be biological, others behavioral. Some may be associated with individual values and aspirations, others may be related to social norms, cultural beliefs, legal restrictions and access to economic or other resources (for a discussion, see e.g. Buchmann, 1989). Some may be concurrent, other may be distal. For instance, the effect of a causal factor may be apparent only after some time. An infection may manifest itself many years after invasion by a pathogen when symptoms indicate the presence of an infectious disease. Hence, when an effect is observed, the causal factor or causal event may be situated in the past. Similarly, intentions underlying behavior and actual behavior involve a delay (Liefbroer, Chapter 3 of this volume). Lagged or historical causation is an important aspect of life history analysis (for a discussion, see e.g. Baltes & Nesselroade, 1979). A major challenge in life history analysis is to infer the events and processes that shape the life course from observations that are generally incomplete.

The life course is characterized as an evolving process of structuration (in terms of the timing and sequencing of events, and in terms of interactions between event processes). A necessary condition for studying structuration or the emergence of a life structure is that its components are defined. Life events constitute the basic units of the life

course. Each life event has four aspects: type of event, time of occurrence, the likelihood of occurrence (risk of experiencing the event) and the reason for occurrence (effects of other events and processes). These aspects are frequent sources of problems of definition and measurement, and are discussed in what follows. More specifically, the discussion focuses on the concepts of time, risk and interdependency.

2.3.1. Attributes and Event Types

At a given age, an individual has a multitude of attributes (personal characteristics, traits): gender, marital status, parental status (presence/absence of children or number of children), migration status (has (never) migrated), place of residence, living arrangement, health status, employment status, educational attainment, source of income, *et cetera*. These attributes relate to life domains such as marriage, parenthood and employment. In general, the attributes are objective and measurable. They may also be subjective and refer to values, attitudes, opinions, perceptions, or evaluations (Scott & Alwin, 1998). An individual may be viewed as a "carrier" of attributes. Most attributes considered in demographic studies have a finite number of categories; thus the variables denoting the attributes are discrete (and have a limited number of categories/values). In modeling, a category of an attribute or a combination of categories of a set of attributes is referred to as a "state". A state is a single or a composite category characterizing the individual at a given age. The attribute variable is the state variable. The state occupied refers to the attribute or a combination of attributes.

Attributes vary with age. Each attribute may be associated with a *career*. A career refers to the consecutive changes in an attribute as life evolves and as times passes (events). Examples of careers include marital, fertility, employment, migration, housing and health careers. The life history of an individual is fully described if at each age, one knows the attributes of the individual or state occupied. An alternative but equivalent approach in the description of the life course is to record the initial attribute, the time when an attribute changes (i.e. time of event) and the new attribute after the change (direction of change). The first is the status-based approach, the second the event-based approach to life history recording.

2.3.2. Time and Risk

In life history analysis, time and risk are key concepts. The timing of events in the developmental process is at the heart of life history

analysis. Time raises several substantive and measurement issues, some of which are discussed in this section. Most life history analyses are not overly concerned with types and levels of risk. The greatest effort goes into the measurement of the duration at which a person is at risk of experiencing an event. Analyses could benefit from more systematic risk assessment.

Time. It is useful to distinguish between chronological time and developmental time. *Chronological time* is a marker; it locates events on a time scale. Multiple time scales may be used (e.g. calendar time, age, duration of marriage, time since last childbirth). A common distinction is between age (individual time), duration of process (process time) and historical time (calendar time). Time scales may be viewed as clocks that start measuring time at different origins. Different measurement scales may be used to express time. If a continuous measurement scale is used, time is a continuous variable and associated life history models are known as continuous-time models. If time is measured along a discrete scale (interval or ordinal), it is a discrete variable and associated life history models are known as discrete-time models (e.g. discrete-time survival analysis).

Chronological time, i.e. age, is not a cause of change or an explanation of biological and psychological maturation. It is a marker of stages in the life course (see e.g. Baltes & Nesselroade, 1979; Sugerman, 1986). *Developmental time* situates events in developmental processes. Referring to child development, Sinclair (1985) states that a child's chronological age is a most unreliable guide to assess whether it lags behind in height and weight, since children mature at very different rates. Other age measurements, such as bone age or radiological age (bone growth measured by X ray) are more reliable. For instance, the age at which menarche occurs is more closely related to radiological age than to chronological age. Sometimes weight is a more important determinant of the onset of a biological developmental process than chronological age. Sinclair discusses several indices of maturity: bone age (radiological age), dental age, sexual age, neural age, mental age and physiological age. His discussion shows that chronological age, as generally used in life history studies, may need to be reconsidered in favor of developmental time. Developmental time is related more to the rate of change at a given stage in life (event rate in given stage) or to the number of life events already experienced than to the clock time.

To complicate matters, there is no single developmental process. Every part of an organism or domain of life has a separate rate of

development. Differential growth and development is a main property of human development. Change (growth) in one part may be controlled by activity in another, and the degree of control may depend on the stage of development reached by the controlling part. For a given process, the rate of progression does not have to be constant; indeed in most cases it is not. The rate is high in so-called transition periods and low in stable periods when few events occur. An example is maturation (biological, psychosocial) and personal growth; these processes may start at different ages, progress at different rates (speed), and may take a lifetime to complete or may terminate at a relatively early age. If related developmental processes do not start at the same time or progress at a different speed, friction may arise resulting in problems of *synchronization* (which may be viewed as a problem of matching in time) and *compatibility*. At the individual level, friction is associated with the inability to combine different activities or role expectations. For instance, the combination of work (professional career) and family (parenting career) may involve many problems of timing (synchronization) and compatibility. These problems occur frequently in studies of simultaneous or parallel careers. Friction may be eliminated by rescheduling activities or events (e.g. postponement of motherhood) or by introducing facilities designed to remove incompatibilities (e.g. childcare). If an individual maintains different careers simultaneously, one career is dominant at a given moment and the others are subordinate. The dominant career receives most resources, energy and time.

At the social level, many restrictions are imposed on the scheduling of life events to foster the smooth and effective functioning of society. Many social norms and legal restrictions affect the timing and sequencing of life events. Age norms, i.e. social expectations about proper timing of life events, are amongst the most important. They are in fact indicators of developmental time ("social clock"). A "social clock" indicates whether we are "early", "late" or "on time" for a significant life event. To be "off time" frequently attracts criticism and social sanction. In some societies, people may feel they are a failure if they have not found a job by the age of 25 and do not have at least one child five years after marriage. An age-grade system constitutes a prescriptive timetable for the ordering of life events. Aspects of the age-grade system may be institutionalized, if upper or lower age limits are set for events or activities such as legal marriage, school attendance, eligibility to vote and retirement (see e.g. Buchmann, 1989). Most age limits are not rigid or strictly enforced.

The measurement of time, even chronological time, may cause several problems, two of which are discussed here. Firstly, the time at

which an *event* occurs is generally different from the time at which the occurrence is initiated, i.e. the *onset of the process* causing the event. Ideally the time to be considered is the time at the onset of the process, although in general it cannot be observed. For instance, fertility studies consider the impact of causal factors on the timing (age) of birth although it would be better to consider the impact on the timing of conception (onset of pregnancy). In behavioral studies, measurements of the time at behavior may lead to erroneous conclusions, since the time elapsed between a decision and actual behavior may differ for different people (Blossfeld *et al.* 1996; Kalwij, 1999; Liefbroer, Chapter 3 of this volume).

Secondly, a particularly difficult problem arises when the measurement scale used by the observer (researcher) differs from the scale used by the person who is reporting time (respondent). The distinction relates to the relationship between objective measurability and subjective perception of time and the tension between "external", i.e. given time and "internal", i.e. experienced time (see Nowotny, 1994). When people are asked about the time or age at which they experienced an important event (e.g. migration, first job, arrival of first child), they may misreport the time or age. Similarly, when asked about the length of an episode (e.g. duration of unemployment, duration of marriage at birth of first child, duration of breastfeeding, duration of current residence) misreporting may be common, in particular in some societies. Several sources of inaccurate reporting exist, telescoping and heaping being the best known (see e.g. Dex, 1995; Scott & Alwin, 1998). Heaping refers to the abnormal concentration of responses at certain dates, ages or durations. Loosely speaking, it may be interpreted as rounding-off by the respondent at a scale unit coarser than the one formally adopted in the survey, due to "fuzzy" recall. This problem shares important features with *time-aggregation bias*, which results when the time scale of the (underlying) process being studied does not correspond to the measurement interval (Cunningham & Vilasuso, 1995; Petersen, 1993; Ter Hofstede & Wedel, 1998). Rounding-off is related to the perception of time which can vary greatly according to the society being studied, and thus the measurement problem has a significant cognitive-anthropological dimension. Heaping is a significant problem in life history analysis with few solutions offered in the literature. For instance, in most surveys the micro data collected are not adjusted to remove the effects of heaping. Heaping and misreporting of time (age) due to ignorance or recall bias may seriously complicate the analysis and interpretation of life history data. Misreporting of time may in part be a consequence of the respondent viewing life events not in chronological time but in relation to one

another, i.e. in developmental time. The misreporting of age or the time at events, is barely considered in most life history studies.

Risk and exposure. *Risk* and *exposure* are further key variables in life history analysis. An individual is exposed to or at risk of an event, if he/she can experience the event. For instance, only married persons are at risk of divorce; only fecund women are at risk of conception. The concept of risk is perceived in a variety of ways. Being at risk of an event means that there is a chance that the event will occur, i.e. the probability is not zero. If the probability of occurrence is zero, the individual is not at risk. In everyday language, risk refers to the possibility of some damage or failure. In general, risk refers to a positive probability of an event. A person is at risk of an event when the probability of the event is positive. Risk is related to uncertainty. In some fields, e.g. decision theory, a distinction is made between risk and *uncertainty*. Decisions made under risk pertain to decisions which yield various outcomes with known probabilities. Decisions made under uncertainty refer to a more general case in which the probability of outcomes is not known (see Fishburn, 1988).

People generally differ in *risk level* and *duration at risk*. Indicators of risk level include probability, rate, odds and relative risk. Risk indicators are important because of their direct link with life history models: They are the dependent variables of life history models. The specification of a model implies a choice of risk indicator. The probability measures the likelihood of an event in a given period. The length of the period affects the probability. The rate relates the likelihood to the duration at risk; it is less affected by the length of the period. However, if there is selection, the longer the interval the lower the risk. Ratios of probabilities or rates are used to compare risk in different populations (e.g. relative risk, odds). Since different people have different risk levels, individuals may be assigned to different risk categories. Risk assessment involves the collection of information on individuals and situations to determine risk levels (Williams *et al.*, 1995). The result may be a set of ordered risk categories, e.g. "low risk", "intermediate risk", "high risk", or it may be a regression model relating the risk level (probability or rate) to characteristics of individuals and situations. There are several types of characteristics. For instance, a distinction may be made between risk indicators (e.g. mortality differs according to marital status), risk factors (e.g. smoking affects risk of lung cancer) and interventions (e.g. treatment of chronic disease affects the risk of death; contraceptive use affects the risk of conception). The distinction between a risk indicator and a risk factor is analytically useful (Hoffman *et al.*, 1996). Risk factors

are risk indicators with a known causal mechanism. Relative risk, which is a ratio of probabilities, is used often in epidemiology to compare risk levels of two populations which differ in one attribute or in a set of attributes.

The measurement of duration of exposure is considered in detail in the analysis of life history data, mostly as applied to censoring (see e.g. Yamaguchi, 1991). It is useful (a) to view exposure as a stage or episode in the life course being initiated by the occurrence of an event and terminated by the occurrence of another event, and (b) to distinguish between the duration of exposure and the duration of observation of persons exposed. In general, it is not feasible to observe people during the entire period of exposure to the risk of an event under study; often, the observation covers only part (segment) of the period. The observation is said to be *censored.*

2.3.3. Interdependencies in the Life Course

Life consists of several domains, such as education, employment, marriage, parenting and co-residence (or sharing), known as role domains. The degree of involvement in a domain may be measured by attainment variables such as years of schooling, occupational status and number of children. Activities pertaining to the various domains overlap as they are associated with multiple roles. Domains are linked dynamically and that dynamic linkage is best captured by the notion of career. Each domain of life is associated with a career; they interact with one another and with their common environment. The nature and the extent of the interaction are very difficult to assess in the real world. Career processes may depend on each other directly or indirectly through a third process. In addition, the interaction may involve shifts in timing (e.g. postponement) in order to solve incompatibility problems. In fact, the synchronization of careers or the coordination of careers and associated activities (temporal strategies) are manifestations of dependencies. Finally, the impact of one process on another may become manifest only after a considerable period of time. Ideally, the study of the dependence structure involves first the isolation of each process from the influences of concurrent processes, as is done in a laboratory context, and subsequently the study of the dynamics of the process "in a pure state", i.e. undisturbed by the presence of other processes. Once the intrinsic properties of each process have been revealed, any set of processes may be combined to find out how they interact. These experiments are not yet feasible, so we are left with studying interacting processes *in situ* and cannot do much more than hypothesize about the

mechanisms by which career processes interact. We assume that the careers pertain to the same person.

Two types of dependencies may be distinguished in the life course: status dependence and event dependence. With reference to a single career, status dependence means that the risk of an event (probability or rate) depends on the state occupied. For instance, the probability of migration depends on the region of residence. Event dependence means that the risk of an event depends on the number of times an event has already occurred. For instance, the rate of childbearing is dependent on the number of children already born (parity-specific fertility rates).

Let us consider two careers. Career A is *status-dependent* on career B if the occurrence of an event in career A depends on the position (stage) occupied in career B. For instance, the probability of having a child in a given year depends on marital and employment statuses. Since these statuses also vary over time, they are referred to as time-dependent covariates (see e.g. Blossfeld & Rohwer, 1995; Courgeau & Lelièvre, 1992). Time-dependent covariates may be viewed as parallel careers or as explanatory variables which change over time. Career A is said to be *event-dependent* on career B if the occurrence of an event implying an advancement or progression in career A is influenced by the occurrence of an event in career B. The event in B may enhance or inhibit the occurrence of an event in A. It may also make the occurrence of an event possible. For instance, most professions require a degree. The onset of a professional career is therefore contingent upon the completion of a formal education. An event in one career may trigger an event in another career such that the events appear to occur simultaneously (see also Mulder & Hooimeijer, Chapter 6 of this volume). Examples are marriage and migration, retirement and migration and relocation due to a major change in health status.

Most studies focus on status dependence. Three types of time-dependent covariates are distinguished (Kalbleisch & Prentice, 1980, cited by Petersen, 1995). The first type consists of deterministic time-dependent covariates: any function of time that is pre-specified. The covariates are also known as defined time-dependent covariates (Blossfeld & Rohwer, 1995). Stochastic covariates generated by a stochastic mechanism external to the process being studied (dependent career) are the second type. Examples are job, wage and housing offers and housing prices. This dependence is also known as unilateral dependence or local dependence (Courgeau & Lelièvre, 1992) and the covariates as ancillary time-dependent covariates (Blossfeld & Rohwer, 1995). The values of the covariates are not affected by the dependent career (career being studied). Most are variables reflecting changes at the

macro level. The third type consists of stochastic covariates generated by a stochastic mechanism internal to the process being studied ('internal time-dependent covariates'). An example would be a situation in which the number of children a couple has, depends on whether or not they remain married. The probability of having another child depends on marital status and the probability of remaining married depends on the presence of children or the intention to have children. Another example is the interaction between living arrangements and health status. For the elderly, there is an effect of health status on living arrangements and a reciprocal effect or feedback of living arrangements on health status. The two phenomena are said to be in reciprocal dependence (Courgeau & Lelièvre, 1992). This type of dependence is typical at the individual level for careers in different domains of life and at the level of a limited number of individuals interacting with each other (e.g. linked lives, or household members). Reciprocal dependence frequently involves selection. Elderly people with different living arrangements differ in health because of selection, and not necessarily because of the effect of living arrangements on health. The selection is in turn causally connected to the ability to anticipate. Reciprocal dependence raises the issue of reverse causation, i.e. the (direct or indirect) effect of the dependent career on the independent career. Reverse causation is seen as a problem because the effect of a time-dependent covariate on the transition rate is confounded with a feedback effect of the dependent career on the values of the time-dependent covariate.

Blossfeld and Rohwer (1995) differentiate between two approaches to the investigation of interdependent careers or time-varying covariates. The first, which they call the *systems approach*, is simply to increase the state space to include all possible values of all time-varying covariates. The drawbacks of this approach are well-known in multistate demography. It is feasible only if the number of parallel careers is limited and if for each career, the number of possible states is limited. Blossfeld and Rohwer refer to the second approach as the *causal approach*. Here it is assumed that the current rate of change in the dependent career depends on the history of the other careers but is independent of their current state. In other words, when rate of change is measured for an interval, then the history of the other careers is taken into account up to the current interval. What happens to the other careers during the current interval is not considered. Blossfeld and Rohwer refer to this assumption as the principle of *conditional independence for parallel processes*. This approach has an important implication for the modeling of event histories. From a technical point of view, there is no need to distinguish between defined, ancillary and

internal covariates because these covariate types are treated equally in the estimation procedure. If internal covariates exist, this approach implies that covariates change their values only at discrete points in time. This approach may be implemented by setting relatively small intervals. The transition rate in the dependent career is then affected by the history of the other careers up to the beginning of the current interval. Another way of using this approach is to split the original interval (episode) into subintervals (subepisodes) (and to create a new record of data) each time (at least) one of the covariates changes its value. This approach assures that there is no interval (episode) including more than one transition. The approach is called episode-splitting and is discussed by Blossfeld and Rohwer (1995) and Petersen (1995).

2.4. LIFE HISTORY ANALYSIS: VARIABLES, DATA AND MODELS

Underlying life history models is the idea that the life course (life structure) evolves around a series of life events. Each event is the outcome of a process, the *event process*. Life consists of a great variety of event processes which interact in a variety of ways and cause the life course to evolve and a life structure to emerge. In the Priority Program, most studies of life histories focus on one event only, e.g. leaving the parental home, divorce, migration, incidence of a disease and labor force exit. Few studies address sequences of life events and the *careers* they produce. A number of studies deal with interdependency in event processes, such as processes related to fertility and employment (e.g. Kalwij, 1999), household formation and migration (Mulder, 1993; Mulder & Hooimeijer, Chapter 6 of this volume), living arrangements and health (e.g. Joung, 1996) and employment status and union formation (Liefbroer & Feij, 1998; Manting, 1994). Important issues in the analysis of life history data are (a) the identification of the relevant events and event processes, and (b) the selection of the model which best describes the event process being studied. The choice of model is determined mainly by two factors: the question research and the type of data available. The review of life history models centers around the question of model selection. A distinction is made between two categories of models: *probability models* that *describe* event processes and capture the effect of chance and *regression models* that capture the influence of *explanatory* variables on the process being studied.

An individual's life history is described fully if the attributes of the individual at each age are known. Most attributes considered in demo-

graphic studies have a finite number of categories. Hence the possible outcomes can be represented by a *discrete* or *categorical variable*. Frequently, the number of categories is limited to two (e.g. presence/absence of attribute or occurrence/non-occurrence of event). In modeling, a category is often called a state, the value of an attribute is the state occupied and the variable denoting the state occupied is the state variable. In Section 2.3, two approaches to recording the life history were distinguished: the status-based approach and the event-based approach. The distinction is important since it affects the choice of life history model. In general, the status-based approach leads to logit models, whereas the event-based approach leads to log-rate models.

2.4.1. Focus: States Occupied

One type of life history model is designed to predict *state occupancies*. For a given age or different ages, they describe the number of subjects or respondents in each category. To estimate the parameters of the model, data on state occupancies must be available. Such data are sometimes referred to as status data. They are collected as part of a cross-sectional survey or census, a series of cross-sectional surveys, a prospective longitudinal survey (e.g. panel) or a retrospective life history survey. Common examples of status data are: (a) current status — status at one point in time; (b) status at two points in time — current status and status at previous point in time, e.g. five years ago, at birth, at age 15; and (c) status at several points in time — e.g. current status, status 5 years ago, and status at birth.

The state occupied at a given age may be viewed as an outcome of underlying substantive and random processes. For instance, being married at a given age depends on such factors as level of education, economic resources, social norms, *et cetera*. It is also affected by chance. The chance mechanism is described by a probability model. The binomial and multinomial distributions are probability models which distribute a given number of respondents among a finite number of states or categories. If the number of possible states is limited to two, the state variable is a binary variable and the probability model is the binomial distribution. The distribution has one parameter, which is the proportion of respondents in one of the two states (the first, say). The parameter is denoted by p. The binomial distribution is:

$$Pr\{N_m = k\} = \frac{m!}{k!\ (m-k)!}\ p^k\ (1-p)^{m-k} \qquad (2.1)$$

where m is the total number of respondents, k the number of respondents with a given attribute (or in a given state), and p the parameter.

If the proportion in the first state is known, the proportion in the second state is also known, since the proportions must add up to one. If the number of possible states exceeds two, the state variable is a polytomous variable and the probability distribution is the multinomial distribution with parameters p_i, where i denotes one of the possible states ($\Sigma p_i = 1$). The total number of respondents is given but the distribution among the states or categories is not known and must be predicted by the model. Note that the binomial distribution may be viewed as a multinomial distribution with two states, with $p_1 + p_2 = 1$.

The bi- and multinomial distributions predict state occupancies at a given age. Several factors may influence the state occupied. To account for the factors, a model is specified which relates the parameters of the bi- and multinomial distributions (i.e. the proportions in a given state) to the explanatory variables. A regression model is used. The dependent variable is a proportion and the independent variables are the factors affecting state occupancy at a given age. A simple linear relation between the proportion and the factors may be adequate. To ensure that the proportion predicted by the model remains within the acceptable range from 0 to 1, while the factors may range from $-\infty$ to $+\infty$, a transformation must be used. In demography, the most common transformation is the logit transformation: The logit of p is a linear function of the explanatory variables. It may be written as:

$$\eta_i = \textit{logit}\ p_i = \ln\frac{p_i}{1-p_i} = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots \qquad (2.2)$$

where i denotes category i, η_i is the logit predicted by the model, x_{ki} is the value of the k-th explanatory variable for individuals in category i, and β_k a regression coefficient. The logit transformation implies that, as η_i changes from $-\infty$ to $+\infty$, p_i varies according to a (cumulative) logistic distribution. The regression model is known as the *logit model* and the *logistic regression* model. Although both models are identical from a technical point of view, sometimes a distinction is made between the logit model and a logistic regression on the basis of the independent variables. The logit model has categorical variables only, whereas the logistic regression model may include continuous variables. Note that the logit transformation implies the following relation between p_i and η_i:

$$p_i = \frac{1}{1 + \exp(-\eta_i)} \tag{2.3}$$

which is a logistic function. An alternative transformation is the probit transformation which implies that as η_i changes from $-\infty$ to $+\infty$, p_i varies according to a cumulative standard normal distribution. The logit model or logistic regression is used to predict state occupancies. The dependent variable is a proportion or a probability. A particularly interesting application of the logit model is to predict the choices people make when confronted with a finite number of alternatives. Within the Priority Program, Kalwij (1999) applied discrete choice models to explain the fertility and labor force participation choices women make during the course of their lives.

The state occupied at a given age depends on more than just the factors at that age; it depends also on the past, e.g. on the state occupied at a given previous age. For instance, it is likely that we will observe an individual in the married state, if we know that the individual married a year ago. The current state occupancy is affected by previous state occupancies. When the status is known at two points in time, the state occupancy at the first point in time should be considered when predicting the current state occupancy. The *Markov model* is the probability model which predicts the state occupied at a given age from the state occupied at a previous age. The parameter is the transition probability p_{ij}, with i the state of origin (state at previous age) and j the state of destination (state at current age) and

$$\sum_j p_{ij} = 1 \tag{2.4}$$

The Markov model is related to the multinomial model, or the binomial model if there are two states. Markov models may be generalized to multistate models by relating the transition probabilities to factors affecting the transition probability from state i to state j. Both Markov and multi-state models are applied to predict changes in state occupancies, i.e. transitions from one state to another. Within the Priority Program, Kalwij (1999) developed a multi-state model to study the relationship between the timing of first birth and labor market transitions. The timing of birth affects employment decisions and employment decisions affect the timing of births. Two careers are differentiated: the maternity career and the employment career. Maternity is measured by a binary variable: no pregnancy and no children in the household (N) and pregnancy and/or children in the household (C). The labor market

state is also measured by a binary variable: employed (E) and not employed (U). The assumption underlying the model is that the transition probabilities depend on the state currently occupied, the duration in the current state and observed and unobserved covariates.

2.4.2. Focus: Events

One description of the life course focuses on the states occupied at various ages. An alternative but equivalent description focuses on life events, i.e. the events that cause a change from one stage (state) of life to another. The (exact) timing of the event and the direction of change are of interest (i.e. the personal attribute or the state occupied after the event). Data on events may have different forms, e.g. (a) occurrence/non-occurrence of event in the observation period or observation window; (b) time at event as measured in different time scales, e.g. historical time, individual time (age), exposure time (duration at risk); and (c) number of events during observation period.

The occurrence/non-occurrence of an event, the timing of the event and the number of events are viewed as outcomes of underlying substantive and random processes. The occurrences, i.e. the number of people in a sample who experience at least one event during a period, may be described by a binomial distribution, since the total number of people is fixed (see above). The number of times people experience an event during the interval is not necessarily less than or equal to the total population (sample) number. Some people may experience an event several times (e.g. migration). For that reason, the Bernoulli model is no longer applicable. Consider an interval of unit length (one year or one month, say) and consider a stratified sample of people. Let n_i denote the observed number of events experienced during a unit interval by individuals in category i. The probability of observing a given number of events during an interval follows a Poisson distribution:

$$Pr\{N_i = n_i\} = \frac{\lambda_i^{n_i}}{n_i!} \exp[-\lambda_i] \tag{2.5}$$

where i denotes category i, N_i a random variable representing the number of events experienced by all individuals in category i, n_i a given number of events (a realization of N_i), and λ_i the parameter of the Poisson distribution. The parameter is the expected number of events experienced by individuals in category i during the unit interval.

Several factors may influence the number of events. To account for these factors, a model is specified which relates the parameter of the Poisson model, i.e. the expected number of events, to explanatory variables. The model is known as the *Poisson regression* model. The dependent variable is the expected number of events and the independent variables are the factors affecting the occurrence of events. In general, one can assume there is a simple linear relation between the expected number of events and the factors. The number predicted by such a model may be negative, which is not acceptable. To ensure that the number of events predicted by the model is not a negative number, a logarithmic transformation is used. The transformation ensures that the number of events remains non-negative when the factors affecting the number range from $-\infty$ to $+\infty$. The model may be written as follows:

$$\ln \lambda_i = \ln E[N_i] = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots \qquad (2.6)$$

where i denotes category i, x_{ki} is the value of the k-th explanatory variable for individuals in category i, and β_k a regression coefficient. The model is known as the *log-linear model*. The log-linear model predicts the parameter of a Poisson distribution that describes the distribution of events occurring during a unit interval. Hence, when research calls for predicting the number of events during an interval, the log-linear model or Poisson regression model should be used.

If the interval is not of unit length, the expected number of events depends on (a) the length of the interval, and (b) the size of the population (sample). More specifically, it depends on the total duration of exposure to the risk of experiencing the event, i.e. the person-years or person-months spent by the population during the interval. Let P_i denote the time spent in the interval by individuals in category i. The ratio of the number of events N_i and P_i is the *occurrence-exposure rate*, i.e. the number of events per year or month of exposure. The rate is denoted by μ_i. In most applications, the total exposure P_i is assumed to be independent of the number of events. It is treated as a fixed number. In that case, the expected rate may be written as:

$$\ln \mu_i = \ln E\left[\frac{N_i}{P_i}\right] = \ln E[N_i] - \ln P_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots \qquad (2.7)$$

The model is known as the *hazard model* or *log-rate model*. It was developed independently by Laird and Olivier (1981) and Holford (1980) to analyze mortality rates in the context of survival analysis. The

log-rate model is a Poisson regression for rate data. For an introduction, see Yamaguchi (1991) and Vermunt (1997). The fixed term P_i is sometimes referred to as a weight. The log-rate model and the more general weighted log-linear models imply that the count or frequency N_i is Poisson distributed with mean λ_i, conditional on P_i. In other words, the Poisson model applies to the ratio (rate) N_i/P_i.

The expected number of events is:

$$\ln E[N_i] = z_i + \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots \qquad (2.8)$$

where $z_i = \ln P_i$ is fixed and often denoted as *offset*.

The log-rate model was applied extensively in the Priority Program. Manting (1994), for example, applied it to determine the factors affecting union formation and dissolution, using data from the Netherlands Fertility and Family Survey 1988. Dependent variables were monthly rates of moving into first union (cohabitation or marriage), into marriage after cohabitation and the rate of union dissolution. Independent variables included cohort, religion, education level and pregnancy status at time of union formation. The log-rate model was used by defining two tables: a table showing the number of events that occur during a given interval and another showing the duration of exposure. In the Fertility and Family Survey, most events were recorded by month and year of occurrence. For some events, such as leaving the parental home, the month was not recorded, in which case Manting assumed that the event occurred in the middle of the year. Nusselder (1998) applied the log-rate model to a multistate analysis of changes in health expectancy. Two health states were considered: "non-disabled" and "disabled". In addition, the state of "death" was distinguished. The rates of transition between health states (by age) were estimated from survey data and related to background factors using the log-rate model. Data from two different panel surveys were pooled: the Health and Living Conditions Survey among the population of the city of Eindhoven (GLOBE), and the United States Longitudinal Study of Aging (LSOA). The two studies have much in common, but the Eindhoven study covered the population up to and including age 74. Information on morbidity and mortality of the 75+ population was taken from the LSOA. Since panel surveys do not provide information on changes in states during periods between two consecutive waves, Nusselder assumed that at most one transition occurred during an interval and that it occurred in the middle of the interval. Since Nusselder required smooth age profiles of transition rates, both the Gompertz model and a logistic model were used to represent the age profile of transition rates.

2.5. CONCLUSION

Life is an evolving process consisting of various stages separated by life events. The understanding of the human life course in all its aspects and in its implications for society is also an evolving process. The emergence of the life course paradigm in many if not most of the behavioral and social sciences has been a milestone in our research endeavors. The adoption of a life course perspective offers solutions to a number of critical problems in the study of population change, e.g. how to link changes at the population level to experiences at the micro level, how to shift from a comparative static analysis of change to a truly dynamic analysis, and how to capture the effects of chance (uncertainty) on change. The significance of the emergence of the life course perspective is considered as important as the introduction of the cohort perspective in the study of social change. In fact, the life course perspective and the cohort approach are complementary, a view advocated by Ryder as early as 1965. Ryder observes that "The cohort approach to social analysis derives strong support from the continuity of individual life" (Ryder, 1965, p. 31). This continuity is an outcome of early socialization (early crystallization of the life course). In recent years, continuity has been replaced by flexibility and individual pathways of life, resulting in greater intra-cohort variation. The cohort remains an important concept in the study of demographic change but, as suggested by Ryder, the increased significance of the life course concept is due to the tremendous increase in the pluriformity of people's lives.

The life course paradigm raises new challenges. Some of the often used concepts require thorough examination and in this chapter two were singled out: time and exposure. Although chronological time is generally used, developmental time may be preferred although at the moment its measurement remains close to impossible. However, to understand human behavior throughout the life course, we should understand how individuals perceive and experience life. That includes the perception and experience of time in general, and age and duration in particular. The lack of understanding of the subjective experience of time has consequences beyond the study of time. Part of the inability to unravel the interdependencies among parallel careers in the life course is because people experience time differently and because the duration between a decision and its implementation is not the same for everyone (for a discussion, see Courgeau & Lelièvre, 1992). Exposure too merits close scrutiny. The level of exposure or risk level should be elucidated as well as the duration of exposure. Demography could benefit

from disciplines such as occupational epidemiology, in which exposure analysis and risk assessment are more developed (see also Kunst *et al.* in Chapter 7 of this volume).

Life as an evolving process represents interesting perspectives, with excellent prospects for theorizing, but the translation into empirical research and statistical analysis represents a major hurdle. Steps in the latter direction were taken in the present chapter by modeling the life course as a multistate process. The attributes of an individual at a given age represent a state, and the probability that a given attribute is present is the state probability. The life history of an individual is fully described if one knows the state occupied at each age. With this information, the duration in each state and the timing of transitions from one state to another are known precisely. If information is incomplete, which is always the case, models to replace observations can be introduced. Such models can also be introduced to quantify how given factors affect state occupancies, the timing of events and the entire life course. Different types of models were reviewed in this chapter. The choice of model depends on the question of interest. A study of state occupancies of people at a given age calls for logit models and logistic regression. An interest in state transitions calls for a Markov model or a multi-state model. If the research is concerned with the exact timing of life events, the log-rate model should be selected as it is the only model which accounts for duration of exposure by the individuals at risk of experiencing the event. The models reviewed here are the ones commonly used in demographic analysis. They also have a clear link with demographic methods such as life tables. A number of extensions have been developed to better grasp the complexity of a real life course. One extension differentiates between factors associated with individuals and factors associated with groups of individuals (households, communities, states, cohorts). The life course of an individual is shaped by both types of factors, and multi-level models are the ones that differentiate between them. Another extension focuses on multiple careers and linked lives, their interaction, their competition for limited resources and the effect on the scheduling of life events. Research in these areas is not yet very advanced. A promising avenue of research is the identification of rules of interaction and the specification of (nonlinear) models encompassing them.

The cohort and the life course are important concepts in the study of demographic and social change. They relate to two different levels of analysis. The study of demographic change may benefit from further integration of individual characteristics and cohort characteristics in a multi-level perspective and a multi-level model.

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3. FROM YOUTH TO ADULTHOOD: UNDERSTANDING CHANGING PATTERNS OF FAMILY FORMATION FROM A LIFE COURSE PERSPECTIVE

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Abstract. Past decades have witnessed the postponement of important family-life events like marriage and parenthood and the rise in popularity of unmarried cohabitation and living alone. The transition from youth to adulthood has become much less predictable as a result of these changes. This chapter suggests that these developments are driven by changes in young adults' preferences about family formation and in their constraints and opportunities. The occurrence and timing of family-life events can be conceptualized as the outcome of choice processes in which young adults strategically try to balance the attainment of their family-life goals with their goals and opportunities in other life domains. The life course approach offers a promising framework for studying the impact of individual time, social time, historical time and linked lives on the family-life decisions made by young adults.

3.1. INTRODUCTION

The past few decades have witnessed major changes in the occurrence and timing of family-life transitions in the lives of young adults. Some of these transitions, such as marriage and childbearing, are postponed or even foregone altogether. Other transitions, such as the transition to unmarried cohabitation and to living alone, have become more prevalent. Partly as a result of these changes, patterns of family-life transitions from youth to adulthood have become much less predictable and much more varied than in the past.

Changes during young adulthood have not been confined to the family domain which is the key focus of most demographers, but have also occurred in the "public" domains of education and work as well as in the psychological domain. In all these domains, the past few decades have seen profound changes in the timing of and the ways in which young adults achieve independence from their parents and other caregivers. In this chapter, the focus will be on understanding the changes occurring in the family lives of young adults. However, attention will also be paid to changes in educational and work careers of young adults, given that developments in both domains are strongly interrelated.

This chapter will not provide a comprehensive summary of the changes in family life which have occurred since the 1960's. I will confine myself to a brief description of these changes, taking the Dutch "case" as an example of the trends which have occurred in many other Western societies as well, but which began at different points in time and are developing at varying rates. One of the key challenges facing demographers is to understand temporal, cross-national and intra-country variations in the ways in which young adults achieve independence. Much headway has been made in this area over the past decade. The aim of this chapter is to discuss these advances and to outline some promising issues for further research. Special attention will be given to studies conducted as part of, or related to, the NWO Priority Program on Population Issues.

3.2. CHANGES IN FAMILY-LIFE TRANSITIONS: THE DUTCH CASE

The timing and sequencing of family-life events in the transition from youth to adulthood have changed fairly dramatically since the early 1970's. This will be illustrated below in the Dutch case, mainly drawing on data from the Family and Fertility Survey held in 1993 (Latten & De Graaf, 1997). I will then briefly discuss the extent to which developments in other industrialized countries have differed from those in the Netherlands.

3.2.1. Leaving the Parental Home

In the Netherlands, the timing of leaving home has not changed substantially for cohorts born since the 1950's. This is illustrated in Figure 3.1 which shows the cumulative percentage of women who had left the parental home by a certain age. As shown, half of them had

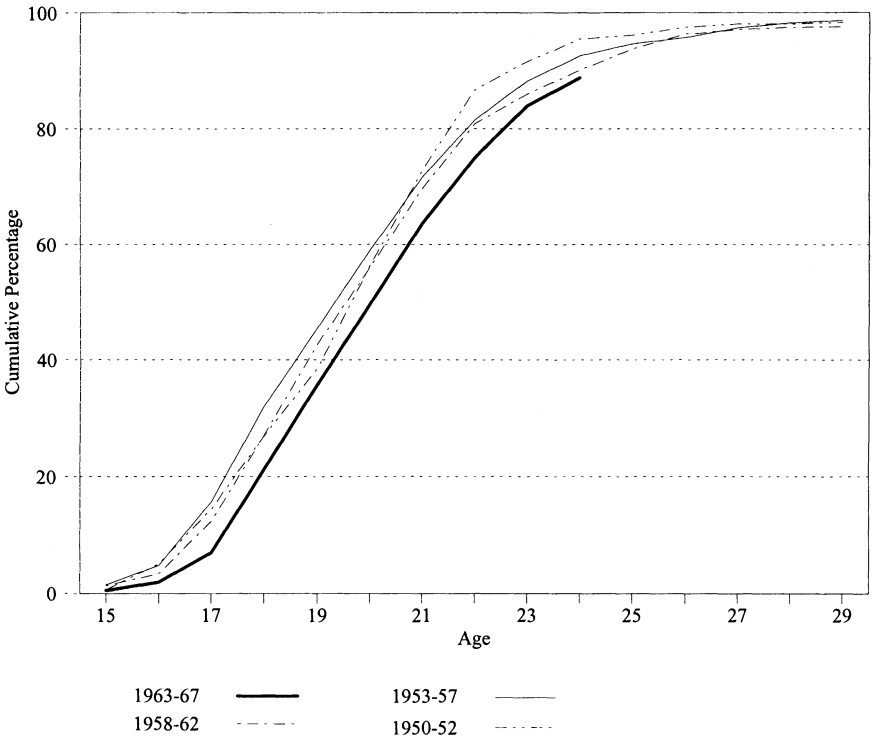

Figure 3.1. Cumulative percentage of women who ever left home, by birth cohort (Latten & De Graaf, 1997).

already left the home by the age of 20. A slight increase in age at leaving home is apparent among the youngest birth cohorts. Men, on average, left the parental home roughly two years later than women and here there is also evidence of a slight delay in leaving home. Much more profound changes have occurred in the reasons for and the destination after leaving home. Leaving home to start living with a partner has become less likely, whereas leaving home to complete one's studies or to gain freedom and independence has become more likely. Iedema and Sanders (1996) estimated that more than 60 per cent of young adults born between 1950 and 1954 had left home either to marry or to cohabit outside of marriage, but that for cohorts born ten years later this figure had dropped to only 40 per cent. Leaving home for educational reasons or to gain autonomy had clearly increased among the latter cohorts. Leaving home in order to continue or complete education increased from 12 to 20, and leaving home to gain independence increased from 19 to 28 per cent. This shift also implies that more young adults now live

alone after leaving home, rather than live with a partner (Mulder & Hooimeijer, 1998).

3.2.2. Union Formation

Figure 3.2 shows that younger birth cohorts also delayed union formation. Seventy per cent of women born in the early 1950's were already living with a partner — either inside or outside of marriage — by the age of 22. This percentage dropped to just over 50 for women born in the late 1960's. However, as in the case of leaving home, there was a much more profound change in the type of union entered into than in its timing. Marriage without prior unmarried cohabitation has largely been superseded by unmarried cohabitation followed by marriage within a couple of years. Three-quarters of the women born in the early

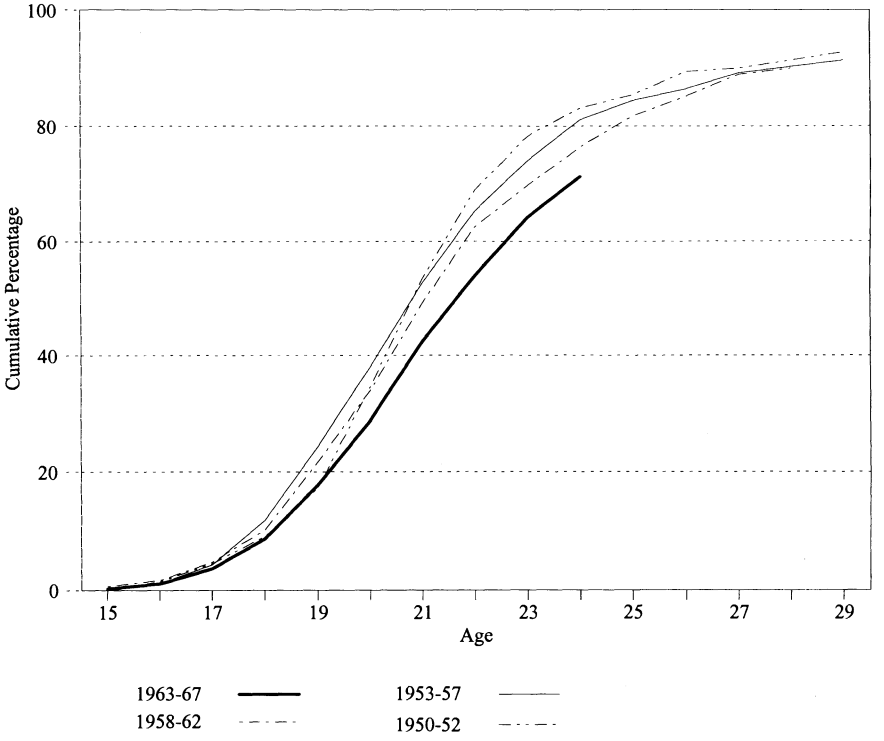

Figure 3.2. Cumulative percentage of women who ever cohabited, by birth cohort (Latten & De Graaf, 1997).

1950's married without having previously cohabited with their partner compared to only a quarter of the women born in the late 1960's (Latten & De Graaf, 1997). The duration of unmarried cohabitation also became more extended and a larger proportion of young adults abstained from marriage altogether. 48 per cent of the women born between 1950 and 1952 had married within three years of the start of their consensual union, but this figure dropped to 31 per cent among women born between 1963 and 1967. Figure 3.3 shows the implications of these trends for the timing of first marriage. First marriage has been postponed by a number of years and will probably be foregone altogether by a growing minority of men and women. In summary, marriage without premarital cohabitation is becoming increasingly rare, whereas cohabitation without subsequent marriage is becoming increasingly common.

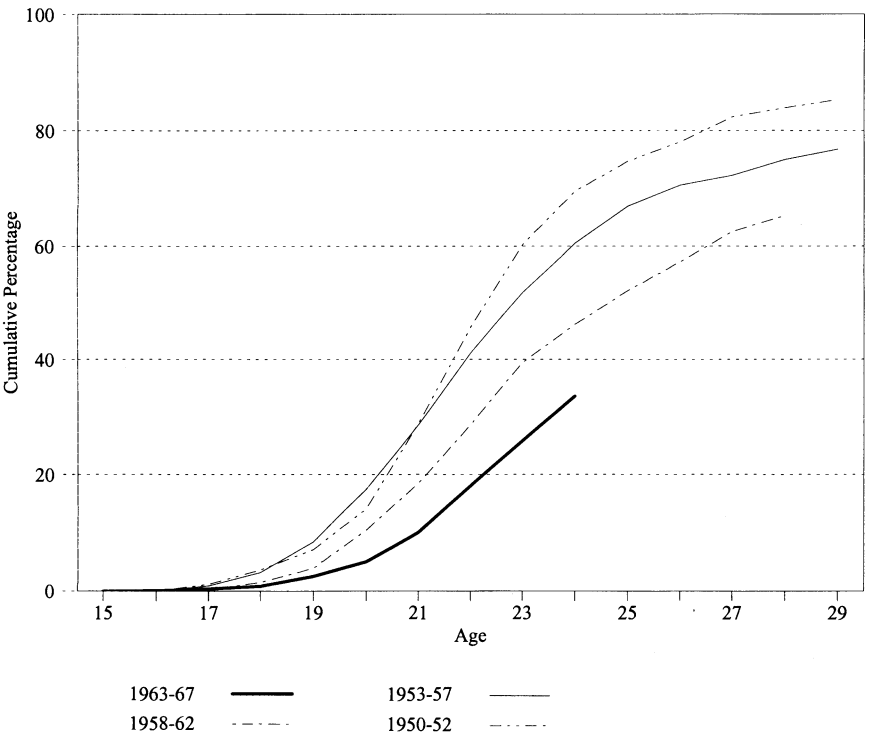

Figure 3.3. Cumulative percentage women who ever married, by birth cohort (FFS_9^3-data, own calculations).

3.2.3. Parenthood

Parenthood has been delayed among recent Dutch cohorts, as have leaving home and entry into unions. However, the postponement of entry into parenthood has been much more marked than the delay in the other transitions. Figure 3.4 shows that 42 per cent of the women born between 1950 and 1952 had had a child by age 24 compared to only 20 per cent of the women born between 1963 and 1967. Having a second child was also postponed. The percentage of women who gave birth to a second child within five years of their first decreased from 78 to 67 from birth cohort 1950–52 to birth cohort 1963–67 (Latten & De Graaf, 1997). Whether or not the postponement of childbearing will result in an increase in the proportion of women and men who remain childless is difficult to predict because women born since the late fifties are still in their reproductive period. However, if one combines information from the Family and Fertility Survey on actual family size and

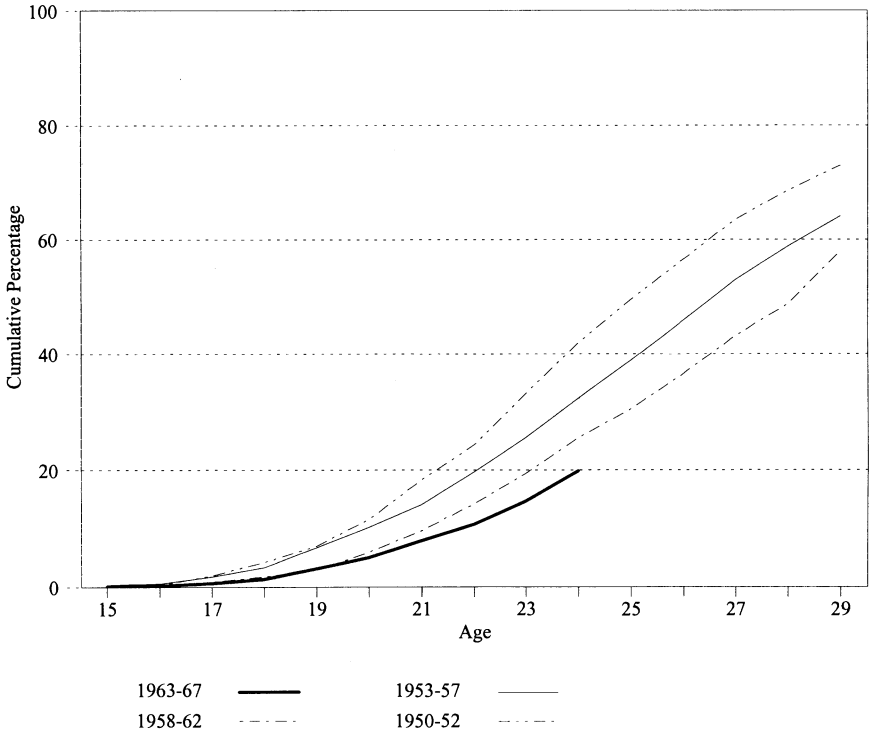

Figure 3.4. Cumulative percentage of women who ever had a child, by birth cohort (Latten & De Graaf, 1997).

expected family size, no increase in childlessness is evident as yet (Latten & De Graaf, 1997). If anything, the survey indicated the reverse. Whereas only seven per cent of the women born between 1963 and 1967 expected to remain childless, the figure for women born between 1950 and 1952 was 13 per cent. Although the final percentage of women born between 1963 and 1967 who ultimately remain childless will undoubtedly be higher than seven per cent as a result of (yet unknown) infecundity, these figures do not suggest a sharp increase in voluntary childlessness among recent cohorts of women.

3.2.4. Patterns and Sequences in Young Adulthood

Many family-related transitions have been postponed, but variation in the timing and sequencing of these events has also increased. This is evident in many respects. For most events, the inter-quartile range — the time that has passed between the age at which one quarter and three quarters of a cohort have experienced an event — was smallest among cohorts born between 1933 and 1942 (Liefbroer & De Jong Gierveld, 1995). Among cohorts born between 1961 and 1965 the interquartile ranges increased again for age at marriage (from 3.7 years for women born between 1933 and 1942 to 7.8 for women born between 1961 and 1965), age at first union (from 3.7 to 4.4 years), and age at first childbirth (from 4.9 to more than 6 years).

Another indicator of the growing diversity in family-life trajectories is the increasing incidence of union dissolution. Nine per cent of all cohabiting women born between 1950 and 1952 — both married and unmarried — experienced a dissolution within five years of the start of their union; for women born between 1963 and 1967 this percentage had increased to 15. This increase was mainly due to the increase in unmarried cohabitation. Consensual unions are much more prone to dissolution than marriages (Manting, 1994; Teachman *et al.*, 1991). However, a slight decrease in the likelihood of consensual unions ending in dissolution was also apparent. 33 per cent of the women born between 1950 and 1952 who were cohabiting outside of marriage experienced a dissolution within five years of the start of their union, compared with only 16 per cent of their counterparts who were born between 1963 and 1967. But despite this decrease, this figure is still much higher than the comparable figure for married women — "only" six per cent of whom experienced a separation or divorce within five years (Latten & De Graaf, 1997).

The growing prevalence of living alone, unmarried cohabitation and divorce, and the postponement of marriage and parenthood have

changed the sequencing of family-life events during young adulthood. For women born in the 1930's just two patterns accounted for more than three-quarters of all family-life sequences before age 30. 56 per cent of women born between 1933 and 1942 left home to marry a partner and went on to have their first child before the age of 30. A further 21 per cent left home to live alone and subsequently married and had their first child. The picture that emerged for women born in 1961 was much more fragmented. Only 23 per cent had left home at marriage and subsequently had a child, and only eight per cent had lived alone, then gone on to marry and have a child before the age of 30. A number of other sequences had become fashionable among the 1961 birth cohort. 12 per cent left home to live in a consensual union followed by marriage and childbirth; a further 12 per cent first lived alone before progressing to unmarried cohabitation, marriage and childbirth. 11 per cent were living in a consensual union by the age of 30 after having lived alone for some time, and seven per cent were living on their own without having lived with a partner at all (Liefbroer & De Jong Gierveld, 1995). Compared to older cohorts of women, there is not only a strong increase in unmarried cohabitation but also a much wider diversity in patterns of family formation in general. No single sequence can be said to be dominant.

3.2.5. Family Formation Trends in a European Perspective

This brief overview of family-life developments in the Netherlands will have made it abundantly clear that young adults are postponing family formation — and particularly those aspects of family formation which have far-reaching and irreversible consequences. At the same time, the diversity in patterns of family formation is increasing. To what extent do these developments parallel those in other Western countries?

Comparative research — based on both micro- and macro-level data — suggests that the postponement of leaving home, marriage and parenthood is virtually "universal" in Western, industrialized societies. The same is true for the growing popularity of unmarried cohabitation and the increase in union dissolution and extramarital births (Bosveld, 1996; Coleman, 1997; Corijn & Klijzing, forthcoming). But the countries differ in a number of important respects. For one thing, developments began much earlier in some countries than they did in others. For example, the birth rate started to decline much earlier in Western European countries than in Southern Europe. For another, the rate at which changes have occurred has varied widely. Consensual unions became popular much earlier in Northern, predominantly Protestant,

European countries than they did in Catholic countries. Finally, the prevalence of certain events throughout the Western world varies enormously. For instance, in most countries the likelihood of an extramarital birth is on the increase, but the levels vary strongly. In Italy, the percentage of births which occur outside wedlock is still less than ten, compared to almost 40 per cent in France and almost 50 per cent in Norway (Eurostat, 1997).

These cross-national differences in the family formation process need to be explained, as do trends and intra-country variations in family formation processes. Most theoretical and empirical attempts to account for these differences emphasize the multidimensional nature of the explanation. Monocausal explanations are too simple. Before summarizing the most important determinants, I will first outline the main developments which have taken place over the past decade in the field of explanatory research into the transition between youth and adulthood.

3.3. MAJOR RECENT DEVELOPMENTS IN STUDIES ON THE TRANSITION FROM YOUTH TO ADULTHOOD

The transition to adulthood has become an important research area over the past two decades and a number of overviews of research and theory have been published (Buchmann, 1989; Corijn & Klijzing, forthcoming; George, 1993; Hogan & Astone, 1986). Although the research carried out in this field has been very diverse, a few key characteristics common to most studies can be discerned.

First, the vast majority of studies use some sort of "choice" framework to explain developments and variations in the transition to adulthood. Within this framework young adults are viewed as rational, purposive actors trying to achieve their goals, but constrained by a diverse set of circumstances. This basic framework is used throughout the social sciences although the terminology might differ. Sociologists speak of "values" or "goals", psychologists refer to "attitudes" or "utilities", economists talk of "preferences", but all of them essentially designate the same thing — people strive to achieve certain goals, the realization of which will depend on their resources and on the constraints they have to contend with. Most studies focus on how constraints affect the behavior of young adults. This is particularly true of economists, who often take preferences as given and invariant in time and space (Berk & Berk, 1993). However, the past decade has witnessed a clear increase in interest in the role played by values and preferences,

stimulated by the contention of sociologists that there is an increase in the latitude for choice in our society (Beck & Beck-Gernsheim, 1995; Buchmann, 1989; Giddens, 1991; Lesthaeghe & Surkyn, 1988).

A second important feature of research on the transition from youth to adulthood is the increasing popularity of the life course perspective. Within this perspective, choice processes are viewed as occurring within a dynamic, interdependent context. Elder (1994) suggests that there are four aspects which distinguish the life course perspective from other theoretical paradigms. It stresses the impact of three different contexts or time perspectives on people's lives. These contexts are *historical time* — the impact of historical changes on people's lives —, *social time* — the impact of age-graded institutional arrangements, age-related norms and parallel careers —, and *linked lives* — the impact of opinions, behavior and careers of significant others. In addition, the life course perspective supports the "rational choice" thrust of research on young adulthood by stressing the importance of *human agency*. People are goal-oriented within the constraints of historical and social time and of their links with significant others.

A third important feature of research on young adulthood has been the development and application of sophisticated analysis techniques to study life histories (Blossfeld *et al.*, 1986; Courgeau & Lelièvre, 1989; Yamaguchi, 1991). These techniques have enabled researchers to take the imperatives of the life course paradigm seriously and to study the choices made by young adults dynamically.

Although most studies on the transition from youth to adulthood have one or more of the above features in common, they can be distinguished by their differences in focus. A broad distinction can be made between three types of studies. Firstly, there are studies — both empirical and theoretical in nature — which focus on the macro-level determinants of the changing behavioral patterns of young adults (e.g. Lesthaeghe & Surkyn, 1988; Oppenheimer, 1994). Although these studies focus on societal changes, they clearly display the general features of studies on the transition to adulthood outlined above: The importance of a macro-level factor is demonstrated by linking it to changes in individual-level preferences, constraints or both.

The second type concerns empirical individual-level studies which focus on the intricacies of individual lives by showing how values and constraints influence the life course, how macro trends affect the lives of individuals and how constraints and preferences themselves can vary between individuals, between cohorts and over the life course (e.g. Axinn & Thornton, 1993; Blossfeld & Huinink, 1991; Goldscheider & Waite, 1991).

The third type are theoretical and empirical studies which focus on the choice processes occurring during young adulthood. These studies attempt to open the "black box" of how decision processes occur by examining the considerations which are relevant in decision-making and by uncovering to what extent the decision-making process is "rational" (Miller & Pasta, 1995; Thomson, 1997).

In the remainder of this chapter, I will discuss each of these three types of studies in turn and will pay particular attention to contributions from the Priority Program when discussing the second and third types of studies.

3.4. SOCIETAL CHANGES INFLUENCING THE TRANSITION FROM YOUTH TO ADULTHOOD

Changes in the transition from youth to adulthood are brought about by a complex set of factors. The most important of these factors will be briefly discussed in this section. I will structure the discussion by making two kinds of distinctions. Firstly, Van De Kaa (1994), in his overview of the factors which gave rise to the Second Demographic Transition, distinguished between three broad types of factors, namely: changes in the social structure of a society, cultural changes and technological innovations. These three types of factors have an impact on all aspects of the transition from youth to adulthood. Secondly, the distinction between values and structural constraints made earlier can prove useful. Each important societal-level factor can have an impact on the values of young adults, the opportunity structure within which they operate, or both.

3.4.1. Changes in the Economic and Social Structure

The economy and social structure of Western societies have undergone various changes since the 1950's and 60's, and these have had an impact on the lives of young adults. A first major change has been the *expansion of the educational system.* Although this process started more than a century ago (Meyer *et al.*, 1992), an impressive acceleration occurred during the 1950's in most Western countries which dramatically increased the participation in the educational system of young adults in their late teens and early twenties. For instance, in 1961 in the Netherlands only 12 per cent of all 20-year-old, and four per cent of all 25-year-old men were enrolled in full-time education. By 1991, these figures had increased to 43 per cent and ten per cent, respectively.

Increases in the educational enrollment of women were even more impressive — from five per cent of all 20-year-olds in 1961 to 36 per cent in 1991, and from one per cent of all 25-year-olds to six per cent (CBS, 1994). Nowadays, women are almost as likely to go to university as men are (CBS, 1998). This prolonged participation in the educational system has had various consequences for the process of family formation. The proportion of young adults leaving the parental home in order to complete their education has increased, particularly among students attending institutes of higher education, many of whom either move into student accomodation or become boarders. The process of educational expansion has contributed to the postponement of union formation and childbearing (Blossfeld, 1995; Blossfeld & Huinink, 1991; Thornton *et al.*, 1995). Marriage and children can be an impediment to one's studies, particularly for women. In addition, students usually have very limited finances and are financially dependent on their parents. This, coupled with the norm that one should not start a family of one's own until one has achieved economic independence, is likely to result in young adults postponing union formation and childbearing until after they have completed their education. Students are less likely to cohabit unmarried and to marry than age peers who have completed their studies. However, the postponement in union formation is more apparent for marriage than for unmarried cohabitation. Oppenheimer (1988) suggests that this has to do with the lower level of commitment a consensual union entails. According to her "theory of marriage timing", cohabitation enables young adults to avoid high-cost search activities for a suitable partner during a period in which it is still difficult to assess the economic prospects of potential spouses.

A second factor of eminent importance is the *increase in the labor force participation of women*, a development which is, once again, evident in all Western countries (Bernhardt, 1993). The Netherlands was one of the last countries in which this increase occurred, and continues to lag behind other countries in terms of women's full-time employment. Having said that, the increase in the number of women active in the labor market in either a full-time or part-time job has been fairly impressive. In 1975 only 31 per cent of Dutch women aged 25 to 34 were in the labor force, but by 1994 this had increased to 72 per cent (OECD, 1995). Female labor force participation is generally assumed to influence both union formation and childbearing, although its effect on childbearing is stronger (Becker, 1981; Blossfeld, 1995). Labor force participation enhances women's economic independence and reduces their interest in traditional marriage where the assumption is that they will take prime responsibility for children. Highly educated women in par-

ticular risk losing a great deal of potential income if they enter into a relationship characterized by a traditional sexual division of labor or if they have children. Although most men and women in Western societies prefer a less sex-specific division of labor (Hakim, 1996), women still assume the lion's share of responsibility for childrearing and childcare (Maassen Van Den Brink & Groot, 1997). Combining motherhood with a career therefore remains a complex juggling-act for women. To avoid this dilemma, many working women — particularly those who are highly educated — postpone marriage and motherhood. Some also prefer unmarried cohabitation to marriage because cohabitants tend to have less clear expectations about the sex-specific division of labor and because women have more "power" to command a more equal division of labor if they have committed themselves less strongly to a partner.

The transition from youth to adulthood is also influenced by *economic developments* in Western societies. In the 1960's and early 1970's, in particular, Western economies experienced a boom which resulted in a sharp rise in income. In the Netherlands, for example, average income increased from 23,000 Dutch guilders in 1963 to 37,000 Dutch guilders in 1979, an increase which benefited young adults as much as other age groups and which in turn dramatically increased their ability to live their lives as they pleased (Inglehart, 1997). However, in contrast to the developments discussed above, the impact of this factor is not clear-cut. The improvement in the financial situation of young adults helped accelerate the process of family formation during the 1960's, but during the 1970's this link was severed. Despite ever-growing financial opportunities available to them, young adults began postponing family events which entailed strong commitments, such as marriage and parenthood. The economic climate deteriorated during the 1980's and this may have contributed to the process of postponement. One well-known theory in this respect is Easterlin's socialization hypothesis which suggests that young adults who are confronted with a deteriorating economic climate will not give up the consumption aspirations acquired during their youth. In order to be able to live up to these aspirations, they will instead postpone activities which could hamper their realization, such as family formation (Easterlin, 1980; Pampel & Peters, 1995).

A fourth structural development which influences the process of family formation is the *creation and subsequent revision of the welfare state*. Since the 1950's, many Western countries have created an extensive safety net of welfare payments which has weakened the link between socio-economic circumstances and decisions about family formation. Relatively advantageous levels of welfare benefits probably made it easier for young adults with poor labor force prospects to start

a family. Welfare benefits also provided a buffer against the negative economic consequences of union dissolution, thereby lowering the barriers against such decisions (Lichter *et al.*, 1997; Wouters, 1990). The lowering of benefits levels and the reduction of welfare rights since the 1970's have hit young adults particularly hard and may have contributed to the postponement of family formation.

Governments influence the family formation process not only through their general policies on income and welfare, but also through policies targeted at specific segments of the population, such as family policies and policies to promote women's labor force participation (Gauthier, 1996; Kaufmann *et al.*, 1997). Some fairly large differences between Western nations are apparent in this respect. Gauthier (1996), for instance, distinguishes between four main family-policy models, namely: a pro-family/pro-natalist model (France), a pro-traditional model (Germany), a pro-egalitarian model (Sweden, Denmark), and a pro-family but non-interventionist model (USA, UK). In the Netherlands, policies to promote women's labor force participation are of a fairly recent nature and arrangements aimed at facilitating the combination of labor force participation and child rearing have long lagged behind most of Europe (Kuijsten & Schulze, 1997). In this respect, policy-making in the Netherlands has long resembled the pro-traditional model outlined by Gauthier. Dutch women have for many years chosen to leave the labor force for varying lengths of time after the birth of their first child. Because of the difficulty of combining motherhood with employment in the Netherlands, women who wanted to prolong their stay in the labor market responded by postponing motherhood. It is only during the last decade that policies have been developed to improve the compatibility of labor force participation and childrearing. As a result, the proportion of women who remain in the labor market after they have become mothers has increased (Camstra, 1993).

Most Western countries promulgate explicit family policies, but despite much debate, relatively little empirical work is being done to establish whether differences in policies have any effect on family-related behavior. One particular area of debate is the question of whether family benefits have an impact on the timing and number of children. Gauthier and Hatzius (1997) suggest that this *is* the case, but that the effect is fairly weak.

A final structural influence on changes in family formation are *changes in the economic structure* (Buchmann, 1989; Hakim, 1998). During the last decade economic restructuring has led to the workforce becoming more "flexible" which has resulted — among other things — in more part-time jobs and more short-term contracts offering minimal

job security. These trends can affect the transition from youth to adulthood in several ways. One could argue that young adults will be more reluctant to commit themselves to family-life at an early age, given that their future prospects on the labor market will remain uncertain for a much longer period of time than in the past. Demands imposed by the need to be flexible make it more difficult to combine a career and a family (Mulder & Manting, 1994). On the other hand, one could argue that economic restructuring has favored the labor market position of women wanting to combine motherhood and paid work because they are able to provide the flexibility required by many employers (Hakim, 1996, 1998). This could lead to more women opting for a family model in which they combine motherhood with (part-time) occupational activity.

3.4.2. Cultural Changes

The abovementioned social-structural developments have coincided with important cultural changes which have primarily — though not exclusively — influenced the values of young adults concerning family formation (Lesthaeghe & Surkyn, 1988). To begin with, the past few decades have witnessed a *decrease in normative controls* on the behavior of young adults which has enabled them to fulfill their own wishes and preferences to a much greater extent than in the past (Buchmann, 1989). The authority of existing normative institutions has eroded substantially. The authority of parents has diminished, because young adults have acquired financial independence earlier and because they leave home at an earlier age than in the past. The same is true for the Church. The Church has always been fervently in favor of traditional family values. As a result of secularization (Dobbelaere, 1981) many people — and young adults in particular — have left the Church. In addition, the Church has lost its grip on the behavior of many of its adherents. Community control has decreased as well, in particular as a result of increasing spatial mobility and increased opportunities for protecting one's privacy.

Not only has the authority to exert normative control declined during the past few decades, the wish to exert such control has diminished as well. This second cultural factor, which is usually designated by the term *individualization*, has been a major influence on the changing behavior of young adults. Individualization primarily implies the increased freedom of individuals to decide for themselves — without the intervention of others — how to organize their own life. This increased autonomy can express itself in a number of ways. On the one

hand, it can lead to hedonism. People might start indulging in a lifestyle characterized by a strong orientation towards the "here and now". On the other hand, individualization might translate into a highly rational view on life in which people rationally evaluate the options available to them and choose whichever option will contribute most to their individual happiness. This combination of individualization and rationalization is better suited to the way many different sectors of contemporary society are organized (Buchmann, 1989). Within the economy in particular, a growing appeal is made on the abilities of individuals to rationally weigh the advantages and disadvantages of available options.

The consequences of the individualization process for the ways in which young adults structure their intimate relationships are complex. One might expect young adults to postpone decisions which are far-reaching and difficult to reverse, such as marriage and parenthood, until after they are able to make a rational decision about the consequences of these steps. This attitude of finding out "who one is dealing with" appears to be an important motivation behind the growing prevalence of unmarried cohabitation. A rational orientation towards parenthood is likely to result in a growing desire to closely monitor the pros and cons of parenthood before deciding to have children. The process of individualization has also led to growing concerns about the quality of intimate relationships (Giddens, 1992; Jamieson, 1998). Because entering into an intimate relationship has become a strictly individual decision based on its — potential — quality, there is a need to constantly monitor whether the quality of the relationship is still satisfactory. If not, one either tries to restore its earlier quality or terminates the relationship. This attitude is particularly true of partner relationships and can result in an improvement in the quality of existing unions, but can also lead to an increase in the dissolution of unsatisfactory partner relationships.

A third cultural factor which has had a considerable impact on the transition from youth to adulthood was the re-emergence of *feminism* during the 1960's (Presser, 1997) which resulted in a reorientation of life priorities, particularly amongst higher educated women. Criticism of traditional gender roles diminished the acceptance of a traditional division of labor and led women to give more priority to their own careers. However, feminism has not only had an impact on preferences. It has also influenced the opportunity structures within which young women operate. Although there were several reasons for governments to implement policy measures aimed at improving the compatibility of work and motherhood, the feminist criticisms were certainly among the more prominent.

3.4.3. Technological Innovations

Technological innovations have been important catalysts for the changes in family formation which have occurred in Western societies over the past decennia. The most noticeable innovation was the *introduction and widespread distribution of reliable contraceptives* such as the Pill, IUD and condoms (Van De Kaa, 1994) which have increased opportunities for family planning and enabled people to postpone having children. But the general availability of contraceptives has also changed the values of young adults about family formation. It brought about the separation between sex and reproduction. As a result, the meaning of marriage, which had formerly offered the only legitimate framework for reproduction, was undermined. It no longer made sense to wait until one was married before having sexual relationships — or to marry because of the unplanned consequences of such relationships. Unmarried cohabitation offered an alternative means of enjoying some of the benefits which were formerly the reserve of married couples, without having to deal with some of the real or alleged disadvantages of marriage.

A second technological innovation which has influenced the lives of young adults has been the introduction and widespread *dissemination of the mass media*, and television in particular. The mass media undermine the self-evident nature of one's life-world. At the same time, the media assist in creating "new" self-evident ideas and behavioral patterns. This has had a major impact on the private lives of individuals. The most well-documented example of this is the effect television has had on family planning (e.g. Olaleye & Bankole, 1994). But television has influenced more than just contraceptive behavior. For instance, people's familiarity with, and acceptance of what used to be called "alternative lifestyles" has increased partly as a result of the media attention given to these lifestyles in both informative and entertainment programs.

This — admittedly general and incomplete — discussion of prime factors which have influenced the family formation process reveals the complexity and multicausality of its nature. Table 3.1 summarizes the main types of effects generated by the various factors discussed above. Some of the factors, and in particular the social-structural ones, had a major impact on the opportunity structures within which young adults operate. Cultural factors mainly caused a shift in value patterns. Technological innovations have influenced both the values of young adults and the opportunities available to them.

Most of the research focusing on trends in family formation is either theoretical or rather descriptive in nature, and links macro trends

Table 3.1. Main type of effect of selected social factors which influence the transition to adulthood

	Major Impact on	
Type of Societal Change	Value Patterns	Opportunity Structures
Social-Structural Changes		
Educational Expansion		X
Increased Labor Force Participation of Women	X	
Fluctuations in Economic Prosperity	X	X
Growth and Revision of the Welfare State		X
Economic Restructuring		X
Cultural Changes		
Reduced Normative Control		X
Individualization	X	
Feminism	X	X
Technological Innovations		
Increased Availability of Contraceptives	X	X
Growing Media Penetration	X	

in determinants with macro trends in family formation indicators. A second type of empirical research tries to link determinants and behavior at the individual level. Much headway has been made in this type of research. Dutch contributions to this research have been characterized by an emphasis on the contingent nature of effects on family formation. The next section will discuss these sorts of studies.

3.5. DYNAMIC STUDIES OF THE INDIVIDUAL-LEVEL DETERMINANTS OF FAMILY-LIFE DECISIONS

Individual-level studies of the determinants of the timing of family-related events such as leaving home, union formation and childbearing have benefited from the development of sophisticated techniques of event history analysis during the 1980's. These techniques have enabled researchers to focus specifically on the dynamic aspects of decisions about family formation. The interplay between careers in different life

domains and the contingent nature of life-course effects represent promising lines of research. I will discuss both these lines of research in turn.

3.5.1. The Interplay between Parallel Careers

The occurrence and timing of family-related events during the transition from youth to adulthood depend partly on the progress young adults make in other life domains (Marini, 1985; Thornton *et al.*, 1995). Events and positions in these "parallel careers" (Willekens, Chapter 2 of this volume), in particular in the educational and occupational career, can influence family formation. An interesting aspect of modeling such effects is that one has to solve the problem of how to take account of changes in the positions in parallel careers. Hazard analysis offers a solution to this problem by allowing the use of time-varying covariates (Blossfeld *et al.*, 1986; Lillard & Waite, 1993). This technique has been used most extensively to study the impact of educational enrollment, unemployment and female labor force participation on union formation and parenthood. A pioneering study on this topic was made by Blossfeld and Huinink (1991) who showed that the postponement of marriage by higher educated women in Germany was the result of their prolonged enrollment in the educational system rather than the higher level of education attained by them. The delaying effect of educational enrollment has been found in a number of Dutch studies as well. Manting (1994), for example, made an extensive study of the impact of current circumstances on the union formation patterns of young women in the Netherlands. She had expected that enrollment in education and employment would lower the rate at which young women entered a union. Although students did indeed postpone union formation, employed women were just as likely to enter into a union as women who were not employed. Students were also more likely to cohabit unmarried rather than to marry straightaway, compared to both employed and not employed women. Cohabiting female students were also more likely to postpone marriage than cohabiting employed and not-employed women. These results were largely confirmed in a study by Iedema *et al.* (1997). Liefbroer and Corijn (forthcoming) replicated the finding that not-employed women have the same rate of entry into a union as employed women. They also found that unemployment did not lead to a delay in union formation among Dutch men. A possible explanation for this could be that welfare benefits in the Netherlands make family formation a viable option even for people whose economic prospects are bleak. If this is the case, then the impact of unemployment

on union formation should be stronger in countries where benefits levels are lower.

3.5.2. Contingency in the Life Course

As stated earlier, the life course paradigm suggests that the behavior of young adults depends on different dimensions of "time", such as historical time, social time and family time. One of the attractive features of event history techniques is their ability to take such considerations of contingency into account.

Manting (1994) hypothesized that the effects of past and current life course experiences on the entry into a union are contingent on the historical situation and on the passage of individual time. Her *historical change hypothesis* suggests that when a pattern of behavior still is relatively uncommon, it is more clearly identified among specific categories in the population than when it has become more common. Manting (1994), for example, expected educational level to have a stronger impact on the entry into unmarried cohabitation of older cohorts — for whom cohabitation was still a deviant phenomenon — than of younger cohorts — for whom unmarried cohabitation is an accepted part of the life course. She also suggested that the impact of past life course experiences diminishes with age. The rationale behind this *life course change hypothesis* is that, as they grow older, young adults become increasingly independent of their parents and current life experiences become more important than those of the past. She also formulated another type of age-dependent effect for "current" life course experiences, the so-called *catching up hypothesis*. Factors that initially delay an event may later cause an acceleration as early "postponers" start "catching up". This can be illustrated with regard to educational level. At an early age a high level of education might cause women to postpone having children, but as they grow older and time begins to run out, highly educated women may show a higher rate of childbearing. Manting (1994) found strong support for her general hypotheses although her specific findings were not always exactly in line with expectations.

Liefbroer and Corijn (forthcoming) recently elaborated on the concept of contingent life course effects in a study on the impact of educational attainment and labor force participation on union formation and childbearing amongst Dutch and Flemish men and women. They argued that the delaying effect of educational attainment and labor force participation depends on the incompatibility of combining family formation and an occupational career. The lower the barriers to combine these two careers, the less the impact will be. This led them to

hypothesize that the effects of labor force participation and educational attainment would be *sex-specific* — more keenly felt by women than men —, *event-specific* — most impact on childbearing, least impact on unmarried cohabitation —, *age-specific* — least impact at higher ages — and *country-specific* — least impact in countries with adequate policies for combining parenthood and a career. Finally, they specified a *cohort-specific hypothesis* which suggests that the effect would be stronger for cohorts dominated by traditional family values. As in Manting's study (1994), the theoretical reasoning was largely supported by the results of the empirical analysis.

Most studies on the determinants of family formation focus on more or less objective determinants because this type of information can be relatively reliably obtained using retrospective survey designs. Very few studies examine the impact of values on family formation. Beets *et al.* (forthcoming) studied the interplay between parenthood values and fertility behavior. Using data from a panel study of young adults, they found that parenthood attitudes had a clearly discernible effect on the timing of the birth of the first child. They also found that attitudes about parenthood tended to become more positive with age and that they varied according to the living arrangement choices made by young adults. They formulated two hypotheses. The *role hiatus hypothesis* suggests that young adults who experience events which constitute a break with traditional life course patterns develop less traditional family-life attitudes as a result of being exposed to the advantages of living in a situation which involves few commitments. The *role expectations hypothesis* suggests that as people grow older and experience one or more traditional family-life events, they gradually come to adopt "traditional" ideas about family life. As a result, their attitudes towards these issues become more positive. The results of their study supported both these hypotheses. The association between attitudes and behavior would therefore seem to be reciprocal. Attitudes influence the occurrence and timing of family-related events, but the occurrence — or non-occurrence — of family-life events also influences attitudes concerning family issues.

3.6. OPENING THE "BLACK BOX": STUDIES ON INDIVIDUAL DECISION-MAKING PROCESS

An important characteristic of virtually all studies on the transition from youth to adulthood is that the choices made by young adults are regarded as "rational". What rationality actually implies, however, can

differ quite strongly (De Bruijn, 1999). Studies examining the issue of how decision-making occurs are still relatively few and far between. In this section, I will discuss three key issues which relate to the "rationality" of individual decision making about family-life events and will illustrate them using data from recent Dutch studies.

3.6.1. Fit between Intentions and Behavior

Social-psychological theories of decision-making — such as Fishbein and Ajzen's (1975) theory of reasoned action — postulate that people's evaluations of the pros and cons of alternative lines of action determine their intentions, and that people then try to realize these intentions. In demography, this intentions-behavior nexus has primarily been examined with regard to the timing of childbearing (Bracher & Santow, 1991; Miller & Pasta, 1995; Thomson, 1997; Thomson *et al.*, 1990). Liefbroer (1998) studied the extent to which timing intentions coincide with actual behavior for several different family-life events during young adulthood. As discussed earlier, in Section 3.2, the most common sequence of events is leaving home, followed by unmarried cohabitation, marriage and childbearing. This sequence was reflected in the intentions of young adults. Young adults expected to leave home first and then to cohabit unmarried. Their intentions with regard to marriage and parenthood were much less clear-cut and less short-term. Not surprisingly, a comparison of intentions and subsequent behavior for all these family-life events revealed a very strong link between the two in the expected direction: The sooner a young adult intended to experience a specific family-life event, the sooner it actually occurred. More interesting is the finding that young adults systematically overestimated their chances of experiencing these events in the short term. In general, it took more time to experience an event than expected. For instance, only 50 per cent of young adults who intended to leave home in about a year actually did so. The percentages were as low, or even lower, for the other events — 40 per cent in the case of unmarried cohabitation, 30 per cent in the case of marriage and 50 per cent in the case of having a first child. Liefbroer *et al.* (1994) suggested that Weinstein's (1980) concept of "unrealistic optimism" could explain this phenomenon. Weinstein argued that young adults overestimate their chances of experiencing positive life-events and underestimate their chances of experiencing negative ones primarily because they have an exaggerated sense of their own ability to control events and because they want to protect their self-image. However, the extent to which non-psychological factors, such as changes in the educational and occupational careers of

young adults, can explain discrepancies between intentions and behavior is as yet unclear.

3.6.2. "Good Reasons" for Family-Life Decisions

A general assumption when studying individual behavior is that people have "good reasons" for their behavior (Boudon, 1987; Giddens, 1979). One of the objectives of research into the transition to adulthood is to reveal the "good reasons" why young adults behave the way they do. Research into family formation has tended to focus on the decision to have children (Miller, 1994; Seccombe, 1991). Dutch research is interesting for several reasons: (a) because it devotes attention to the reasons behind young adults' behavior in terms of other family-life events in young adulthood, such as the timing of leaving home (Baanders, 1998) and the choice between unmarried cohabitation and marriage (Liefbroer & De Jong Gierveld, 1993), (b) because Dutch research into fertility decisions concentrates on categories which have been relatively neglected in earlier research, and (c) because this research does not confine itself to simply describing the reasons behind the behavior of young adults, but also tries to test the impact of these reasons by applying Fishbein and Ajzen's (1975; Ajzen, 1985) theory of "reasoned behavior".

Baanders (1998) studied the decision to leave the parental home. She conceptualized the transition out of the parental home as a two-stage process. In the first stage, the intention to leave home is formed. In the second stage, intentions are translated into actual behavior. In order to establish the impact of perceived consequences and normative pressures on both stages of the decision-making process, she compared the evaluations of young adults who had no intention of leaving the parental home, young adults who planned to leave home in the near future and young adults who had left home the previous year. Normative pressures from parents and friends were found to be particularly important during the intention-formation stage. These were also important in the second stage, but expectations about the consequences that leaving home might have for their financial position seemed to be particularly crucial to young adults' decisions about whether or not to leave. The more satisfied young adults were with their financial position, the more likely they were to realize their intentions to leave the parental home.

Liefbroer and De Jong Gierveld (1993) studied the impact of rational considerations and perceived normative pressures on the intention to cohabit unmarried or to marry straightaway. As in Baanders' (1998)

study on leaving home, the opinions of parents and friends seemed to be crucial in the decision-making process. Moreover, young adults who were opposed to marriage had lower ratings of the benefits of marriage as compared to those of unmarried cohabitation, than young adults who planned to marry straightaway. The latter were much more convinced that marriage was a better environment than unmarried cohabitation in which to raise children, and that it would enhance their feelings of security.

Wijsen (1994a) focused on the decisions about motherhood of "older" women — those aged 30 and above. She distinguished between three major types of considerations which featured in the decision-making process. First, considerations of self-fulfilment, such as the feeling to achieve something important, personal development and so on. Secondly, "older" women take account of the potentially adverse consequences of parenthood, such as unfulfilled expectations, a reduction in the time available to do other things in life and that children entail uncertainties and worries. A third type of consideration centers on the benefits of the future mother-child relationship, such as feeling another person's dependence and a sense of closeness. "Older" women who postponed childbearing envisaged more negative consequences of motherhood, but — at the same time — recognized the potentially positive consequences for their self-fulfilment. Women who already had a child were more doubtful about how another child might contribute to their self-realization. This could be due to already being familiar with how it felt to become a mother, and that having another child would not give them as much emotional gratification as they had felt when their first child was born (Bulatao, 1981). Wijsen (1994b) also asked women who had given birth after the age of 30 which factors had delayed or accelerated the birth of their first child. The prime factors that were identified as delaying childbearing were the difficulty of combining motherhood and paid employment, the lack of sufficient financial means and the lack of suitable housing. Difficulties in coming to an agreement with their partner was an additional reason for delay for women who had postponed having children until the age of 35 or later. The age of the mother was the driving force that ultimately accelerated childbearing. The recognition that they would soon be too old to have children seemed to make them take care that childbearing was not postponed until it was too late.

Most research into the motivations behind parenthood concentrates on surveying women. A study carried out by Jacobs (1998) is interesting because of its focus on the desire of would-be fathers to have children. An important finding was that, generally speaking, the costs

and benefits of having a child identified by men were not very different from those identified by women. Jacobs found that affective and emotional aspects were deemed more important than practical considerations. In particular, being able to offer love and tenderness to a child and being able to watch one's "own" child grow up were singled out as important benefits of fatherhood. The loss of personal autonomy was viewed as the main disadvantage. Relatively few men — roughly 30 per cent — regarded the incompatibility of work and fatherhood as a major problem. This was more often cited as being likely to present problems for their wives. Jacobs (1998) did not examine which specific motivations influenced men's fertility intentions. Instead, he examined the extent to which the perceived overall costs and rewards of having children influenced timing intentions. In line with expectations, the more costs and the fewer rewards young men perceived, the later they planned to become fathers.

These studies revealed that both men and "older" women want to have children despite being aware of the clear, objective disadvantages associated with parenthood. Ultimately, the affective, emotional and subjective advantages — however vague — seemed to be more important.

3.6.3. Strategic Behavior of Young Adults

Research into decision-making processes in young adulthood has also been influenced by the life course perspective. This has led to a growing awareness that family-life decisions are not taken one at a time, but are part of young adults' general conceptions about future developments in different life domains. This reasoning is implied by such terms as "strategic life-planning" (Giddens, 1991), "biographical strategies" (Buchmann, 1989) and "life strategies" (Ní Bhrolcháin, 1993). To date, however, very few attempts have been made to examine life strategies empirically. A number of Dutch studies which have done so suggest that the concept may be viable.

The leitmotiv of a study by Turkenburg (1995) was that women's choices about motherhood can only be understood by taking account of their more general ideas about women's roles and expectations about employment and parenthood. What makes her research particularly interesting is that she focused on women with a low level of education and showed that these women used several different strategies. Women either used *family-oriented strategies*, in which they gave priority to the wishes and needs of their families, *partner-oriented strategies*, in which the wishes and needs of the partner were given priority, or *individual-*

oriented strategies, in which women gave priority to their own wishes. Family-oriented women viewed the sex-specific division of labor as a "normal" part of life, whereas individual-oriented women felt that their job was just as important as their responsibility to their children. Although her findings were interesting, a limitation of Turkenburg's study was that the use of strategies was reconstructed by the researcher based on subjective accounts of one's *past* life by the respondents themselves.

Mulder and Manting (1994) and Liefbroer (1998) tried to develop and test the idea that strategies guide the course of young adults' lives without relying on post-hoc interpretations by young adults themselves. Mulder and Manting (1994) assumed that there are two possible ways in which young adults can react to the increasing freedom of choice, and to the uncertainties that accompany it. On the one hand, they can opt for security (cf. Friedman *et al.*, 1994). These young adults will try to "settle down" by establishing their own household — including a partner, children and their own house — as soon as possible. Although this strategy does not put an end to all worries, it provides a sense of certainty and future direction — one has assumed responsibilities and can concentrate on living up to those responsibilities. On the other hand, some young adults react to the growing uncertainties of living in our "risk society" (Beck & Beck-Gernsheim, 1995) by opting for a strategy of "flexibility". They put off assuming responsibilities until they are more certain about their occupational future. Mulder and Manting (1994) found a strong association between the timing of becoming a home-owner, marriage and childbearing, which suggests that these three aspects could indeed be part of a "settling down" strategy. However, they also found an increase in the proportion of Dutch young adults who postponed each of these major life-transitions, which suggests that an increasing number of young adults opted for the "flexibility" strategy during the 1980's. Liefbroer (1998) viewed these two strategies of "settling down" versus "flexibility" as the poles of a continuum and tried to classify young adults along this continuum based on their intentions with regard to the timing of unmarried cohabitation, marriage and parenthood. Next, he examined whether young adults who favored a strategy of "keeping their options open" experienced different family-life events later than young adults who favored a strategy of "settling down", which indeed turned out to be the case.

A weakness of all of the studies discussed here is their reliance on either indirect or *post hoc* information on the strategies used by young adults. As a result, it remains to be seen to what extent young adults actually use strategies, or whether the concept is something which exists

mainly in the minds of the researchers or has been constructed in retrospect by young adults themselves.

3.7. FEATURES OF THE FUTURE: HOW WILL STUDIES ON THE TRANSITION FROM YOUTH TO ADULTHOOD EVOLVE?

As this overview will have made clear, research into the transition from youth to adulthood is burgeoning. This is primarily due to the combination of a fruitful theoretical paradigm — the life course perspective — and a methodological innovation — event history analysis. Although this combination undoubtedly has more to offer in terms of future research, I also expect to see a shift in emphasis and the development of new lines of research. For one thing, new data sources, such as panel data or data emerging from international comparative research, will provide more opportunities for testing existing hypotheses and ideas. For another, a fuller appreciation of the richness of the life course perspective will stimulate the emergence of new research themes.

By now, the catalogue of societal-level influences on family formation seems more or less complete. Although theoretical attempts to integrate these diverse determinants into a coherent and simple framework remain welcome, research interest is likely to move towards testing existing ideas rather than developing radically different ones. Cross-national comparisons of family formation processes are one of the most promising lines of research. These sorts of comparisons provide scope for studying the effects of societal-level factors which do not vary, or vary only slightly, within a country, such as government policies and the economic characteristics of countries and for examining the extent to which these macro factors moderate the effects of individual-level variables such as educational attainment and unemployment. Conducting cross-national studies within Europe will be particularly interesting for at least two reasons. Firstly, the process of economic and political integration within the European Union provides a "natural laboratory" for examining the extent to which shifts in cross-national economic and cultural differences affect family formation. Secondly, a comparison of Eastern and Western European countries provides an opportunity to study whether the former Communist countries will go down the route of the "Second Demographic Transition" in the same way that Western countries did some decades ago. Cross-national comparisons within Europe will be able to benefit from the round of Fertility and Family

Surveys conducted in the 1990's by the Population Activities Unit of the United Nations' Economic Commission for Europe.

Research into the relative importance of opportunity structures and value patterns will also become increasingly important in the next decade. This line of research will benefit from the wider availability of panel surveys in many countries. Whereas past research — and theory — has often focused on establishing which types of factors are dominant, my expectation is that future research will focus on the interactions between economic and cultural factors and on the conditions influencing their relative impact.

Although recent research has benefited to a considerable extent from the application of life course concepts, much can still be gained by making fuller use of the concepts incorporated in this perspective. For instance, research in the 1980's and 1990's concentrated on family-life events which are part of the "normal" life course, such as leaving home, marriage and first parenthood. Research into events which constitute a break with the traditional life course, such as lone parenthood, divorce and returning home, has been much less common, at least within Europe. However, since "reversals" of this kind are becoming part and parcel of the life course of young adults, more research attention needs to be given to these issues.

Although the term "life course" suggests a focus on trajectories, most research to date has actually focused on single events. Trajectories are, however, more than simply the sum of single events. A key problem of studying the transition from youth to adulthood as a trajectory rather than as a series of separate events is that the methodology available for studying trajectories is still relatively crude. However, new methodologies such as "optimal matching" (Abbott, 1995) offer promising lines of research for the analysis of life course trajectories. Optimal matching is a method to evaluate the extent to which sequences of data differ. The number of changes needed to turn one sequence into another is used as an indicator for the resemblance between sequences. The resulting proximity information can be used to create clusters of sequences that are more or less alike. This type of research will improve our descriptions of the transition from youth to adulthood, but will also enable a better understanding of the extent to which young adults behave strategically in their family formation decisions, because strategic behavior presupposes consistency in behavior across life events and life domains. Research on trajectories will reveal the extent to which such consistency actually is visible in young adults' behavioral patterns.

Finally, relatively little attention has been paid to one of the four "postulates" of life course research, i.e. its emphasis on "linked lives."

All family-life decisions involve more than one individual (Burch & Matthews, 1987). Leaving home involves parents and children, whereas union formation and childbearing usually depends on two actors rather than one. Again, some studies — particularly those focusing on childbearing — have taken this "multiple-actor" character of most decisions seriously, but issues of family formation have tended to be treated as individual decisions. Focusing on partners and others involved in household decisions would not only be a much more realistic approach, but it would also enable us to focus on issues which have been relatively neglected in research into the transition to adulthood, such as issues relating to the balance of power between partners. Adopting this sort of perspective requires collecting data from several different actors within personal networks.

To summarize: Our understanding of the transition from youth to adulthood has grown by leaps and bounds over the past few decades but many interesting questions still remain. Future research will probably be less wide-ranging and more in-depth than studies carried out during the 1980's and 1990's. Although detailed studies of this kind may not capture the imagination as much as older studies did, progress can only be made by going down this route. In fact, this transition from wide-ranging to in-depth studies could well signal that this field of research itself has finally made the transition from youth to adulthood.

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4. HOUSEHOLDS, FAMILIES AND KIN NETWORKS

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Abstract. Trends over time in household and family structure reflect changes in the timing and occurrence of major life transitions such as marriage and parenthood. The focus in this chapter is on trends in the Netherlands, but data from other European countries are presented for comparative purposes. The key question is how socio-demographic developments shape household and family composition (who lives with whom) and kin networks (how many and what kinds of kin ties do people have). The socio-demographic trends pertain to individuals, partnerships, and offspring. The chapter describes the ways in which the combined outcomes of these trends show up in patterns of household composition (e.g. increasing numbers of people living on their own) and family structure (e.g. decreasing proportions of families with dependent children, living arrangements of the elderly). The chapter addresses not only past and ongoing trends, but also possible developments in the future, using the results of microsimulations of kin networks. National census and register data are supplemented, where necessary and feasible, with representative survey data.

4.1. INTRODUCTION

The past five decades have seen profound changes in people's life courses, not least from a demographic point of view. These changes may be summarized as a mix of increased certainties *and* uncertainties. Today, people are more certain about the later stages of their lives. There has been an overall increase in longevity, and, as stated by Kohli and Meyer (1986, p. 146), "The significant change in this respect is not primarily the rise of the mean [age] but the drop in variation." This is an example of the *growing institutionalization* of the life course, of age

becoming an ever more important dimension of social organization. But not only has the "third age" as such become more institutionalized, it has also become a stage in the life course in which people may expect more than ever before to see all their children and grandchildren grow up. By the same token, the younger generations may expect their grandparents, parents and siblings to stay alive for longer periods than in the past.

At the other end of the life course, however, it looks as if the *un*certainties have increased. People have more options than ever before to arrange their private lives as they wish, no longer restricted by the norms and values of the old days when parents, social network members and institutions such as the church prescribed how they had to behave. The notion that people construct their own biographies is an essential feature of *individualization*, and not — as is often implied — the individualization-is-selfishness doctrine. The increased range of life options structurally offered by society has the largest effect at young ages when most biographic decisions still have to be made. *Pluralization* can be viewed as the "natural ally" at the structural level of society of the cultural process of individualization at the individual level (Van den Akker *et al.*, 1992). As regards the timing of the transitions into formal partnership and parenthood, one can safely say that the process of *age standardization* that reached a peak in the 1950's has eroded into a process of de-institutionalization or *de-standardization* (Held, 1986) and as a result the mean age at these transitions has increased. It is still too early to determine whether a *re-standardization* around a significantly older age has actually taken place.[1] It has become less clear when people are "on time" or "off time" in these respects, as well as what the "proper" sequence of these, and other, transitions is. Moreover, since individuals' life trajectories may be strongly "intertwined", in particular their household and family careers, these growing uncertainties in the lives of young

[1] A splendid example of what we mean was published recently by Ravanera *et al.* (1998), who compare life transitions of successive cohorts of Canadian women. For cohorts 1916–20 to 1971–75 they give values of the means, the quartiles and the interquartile ranges for the transitions of school completion, start of regular work, leaving the parental home, start of first union, start of first marriage, and birth of first child. Their figures for the transitions of first union, first marriage and birth of first child confirm our feeling that it is still too early for such a re-standardization to manifest itself. But their figures for the transition of school completion are a perfect example of what might also happen with these "demographic" transitions: While the mean is gradually rising, the interquartile range first widens from cohort 1916–20 to cohorts born in and around the Second World War, and then narrows again.

adults have repercussions for the next generation: The increased incidence of cohabitation, union dissolution and unmarried parenthood has made children's lives less certain with respect to the household type in which they will grow up until they themselves reach adulthood. So, the predictability of people's demographic trajectories from birth to death has been affected by both greater certainties and greater uncertainties, leading to increased pluriformity in individual trajectories and in pathways in collective biographies of successive cohorts (Hagestad, 1991).

4.2. CHANGING HOUSEHOLD AND FAMILY STRUCTURES IN PRESENT-DAY EUROPE

Household and family structures in Europe have changed considerably in the last three or four decades. These changes may be summarized as a growing pluralization, as evident in the distributions of households and families by size and type. In general, changes at the level of individual or collective biographies are underestimated for the simple reason that cross-sectionally measured prevalence usually yields lower figures than life-time incidence measures.[2] Basically, similar trends have been observed in the different regions and countries of Europe, but changes have not been equally profound across the continent, and the situation in the early 1960's, at the onset of the changes, was far from uniform. Most recent overviews of European household trends (Council of Europe, 1990; Hall, 1986; Hoffmann-Nowotny, 1987; Höpflinger, 1991; Keilman, 1987; Kuijsten, 1995; Kuijsten & Oskamp, 1991; Schwarz, 1988) tend to emphasize uniformity in trends rather than the between-nation and between-region variety in household structures that still exists despite the uniformity in trends; others, however, place more emphasis on the persistence of national and regional differences (Kuijsten, 1996; Reher, 1998).

Both views are supported by data, depending on whether one looks for uniformity in trends or for diversity in cross-sectional structures. At the same time, neither view can be proven conclusively. One of the reasons is that the usual statistical sources for such series of cross-sectional overviews are censuses or large-scale surveys, statistics which

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[2] The word "household" refers to a configuration of one or more persons, irrespective of blood relationship, who live together in the same dwelling. The word "family" refers to a network of people related by blood. The word "living arrangement" is often used in a sense that makes it interchangeable with the concept of household. In section 4.2.5., however, it also embraces an economic criterion.

are not made for the purpose of documenting development of, or change in household structures (Bertram, 1991). These sources as such do not provide insight into sequences of living arrangements over the life course: They are just snapshots. Another reason, which is particularly disadvantageous in international comparative research, is that national statistical offices use different types of cameras to make these snapshots: International harmonization of concepts, definitions and classifications in the realm of household statistics has progressed much less than the harmonization of most other demographic statistics (Casimiro & Calado Lopes, 1994; Duchêne, 1990, 1995; Keilman, 1995a, 1995b; see Van Solinge & Wood, 1997, for similar problems encountered when using sample surveys as a data source for studying so-called "new living arrangements"). First, there is a basic distinction between a "housekeeping unit" and a "dwelling unit" in the definitions of a household (UN, 1989).[3] Another question is whether people who cohabit outside of marriage are regarded as a couple by statistical offices and census-takers. Then, there is the question of who is regarded as a "child" in a couple household, and, if there is an age delimitation for children, what is seen as the upper age limit. In the case of lone-parent families, for instance, all these three aspects may play a role when considering whether or not a particular configuration is regarded as a lone-parent family, or as a household containing a lone-parent family nucleus. Fortunately, however, although relative levels of certain household types may depend on matters of definition, trends are less sensitive to such matters (Keilman, 1995a, 1996). Keilman concludes that between-country comparison of trends in family and household size and structure (see below) is not severely hampered by differences in concepts and definitions as long as differences in proportions are not interpreted too precisely.

I will highlight some fundamental changes in household and family structure in the Netherlands over the past four decades and put these changes in a broader European perspective to determine the Netherlands' place in Europe in this respect. This comparative international research was funded by the NWO Priority Program on Population

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[3] In the housekeeping definition, the determining criterion is the sharing of resources to provide the household members with food and other essentials for living. In the dwelling unit or housing unit definition, the determining criterion is a residential one: occupation of all or part of a dwelling unit. Most countries in Europe use a household definition that incorporates both the housekeeping and the dwelling unit criteria. Having said that, some countries use the dwelling unit concept and some use the co-residing family as the unit of census enumeration rather than the household.

Issues (introduced in Chapter 1 of this volume by Dykstra and Van Wissen). In doing so, the grouping of countries used is largely arbitrary. Household and family structures may be characterized with the aid of several criteria. If one opts for one particular criterion to classify countries there will always be anomalies when using classifications based on other criteria. I will therefore use a simple geographical classification into North, West, South and East-Central Europe, a classification that is certainly not meaningless. I will then try to connect some of these indicators to current demographic developments, their causes and their consequences.

4.2.1. Average Household Size

As shown in Table 4.1, there has been a continuous decrease in average household size by between 0.5 and 1 person across Europe over the past decades. At the same time, we see a continuation of between-region differences that existed as early as around 1950: The Nordic countries tend to have the smallest average size of private households, and the Southern European countries the highest. Western Europe occupies an intermediate position and the countries of East-Central Europe show the greatest within-group variation. Within Western Europe, the Netherlands has experienced a relatively sharp decline in average household size. This is probably the result of the atypically high average household size in the immediate post-war years which, by European standards, were characterized by relatively high proportions of family households with relatively large numbers of co-resident children.

According to Keilman (1996), two demographic causes of this continuous fall in average household size stand out: (a) numbers and proportions of persons living alone have greatly increased, and (b) family households have decreased in size, due to the fall in fertility rates, especially those of higher birth orders, in addition to increased levels of voluntary childlessness in some countries. Changes in the age structures of these countries have also contributed to this trend: An aging population means a growing proportion of one- and two-person households.

4.2.2. One-Person Households

One of the causes of the declining average household size is the ongoing increase in both absolute numbers and proportions of one-person households, that is to say, of persons living alone. In fact, there is a very strong negative correlation between average household size

Table 4.1. Average size of private households, selected European countries, 1950–1990

	Around 1950	Around 1960	Around 1970	Around 1980	Around 1990
Northern Europe					
Denmark	3.20	2.90	2.70	2.40	2.27
Norway	3.30	3.28	2.97	2.68	2.40
Sweden	2.90	2.84	2.59	2.32	2.10
Western Europe					
Austria	3.11	3.02	2.90	2.70	2.54
Belgium	2.97	3.00	2.95	2.70	2.49
Germany	2.99	2.88	2.74	2.43	2.25
Netherlands	3.50	3.56	3.25	2.81	2.43
Southern Europe					
Greece	4.11	3.78	3.39	3.12	2.98
Italy	3.97	3.63	3.35	3.01	2.83
Spain	3.75	3.95	3.81	3.53	3.26
East-Central Europe					
Croatia	3.94	3.56	3.43	3.23	3.10
Czech Republic[a]		2.95	2.78	2.64	2.53
Slovenia	3.80	3.47	3.35	3.18	3.07

[a] Current territory.
Sources: Council of Europe 1990; Kuijsten, & Oskamp, 1991; Kuijsten, 1996; Own calculations based on census tabulations.

and proportion of one-person households, over time in time-series analyses as well as over space when comparing countries or regions within countries. This correlation comes to the fore when comparing Table 4.2, which presents proportions of one-person households for selected European countries, and Table 4.1. Again, proportions are highest in the Nordic countries, lowest in Southern European countries, while the Western and East-Central European countries occupy an intermediate position. Here too we see that, within the group of Western European countries, the Netherlands has strongly reduced the backlog it had around 1960.

The growing proportions of one-person households is usually interpreted as clear evidence of increased *individualization* (Van den Akker *et al.*, 1992), which to some extent it is. However, one should also take

Table 4.2. Proportion of one-person households in all private households, selected European countries, 1950–1990

	Around 1950	Around 1960	Around 1970	Around 1980	Around 1990
Northern Europe					
Denmark	14.0	19.8	20.8	29.0	34.0
Norway	15.0	14.2	21.1	27.9	
Sweden	20.7	20.1	25.3	32.8	39.6
Western Europe					
Austria	17.5	19.7	24.6	28.3	29.7
Belgium	15.8	16.8	18.8	23.2	28.4
Germany	19.4	20.6	25.1	31.3	35.0
Netherlands	9.0	11.9	17.1	22.1	29.4
Southern Europe					
Greece	8.7	10.1	11.3	14.6	16.2
Italy	9.5	10.7	12.9	17.8	20.6
Spain			7.5	10.3	13.3
East-Central Europe					
Croatia	13.8	16.0	15.5	16.0	17.8
Czech Republic[a]				24.2	26.9
Slovenia		17.8	17.4	17.1	18.0

[a] Current territory.
Sources: Council of Europe 1990; Kuijsten 1996; own calculations based on census tabulations.

into account scarcity on the housing market, which still plays a crucial role in countries such as Spain (see e.g. Miret-Gamundi, 1997 for a discussion of the effects on nuptiality of the tight housing market in Spain, and similar effects on people who would prefer to live alone). Moreover, one should not overestimate the importance of individualization, in the sense that a proportion of one-person households *in all private households* of almost 30 per cent, as is the case in Austria, Belgium and the Netherlands, for example, means that only about 11 to 12 per cent *of all persons* live alone. Furthermore, living alone among young people might be considered a manifestation of individualization, but widowed elderly people have no choice in this respect, and a part of the absolute growth in the numbers of one-person households has been caused by population aging. In the Netherlands, for instance, the number of

females in one-person households aged 65 and over increased by 41 per cent, from 367,000 to 519,000 between 1981 and 1993, whereas the total number of one-person households grew by 76 per cent, and the total number of households by no more than 25 per cent (CBS, 1996). Females aged 65 and over constituted 32.5 per cent of all people living alone in 1981, against 26.1 per cent in 1993. But in Spain, where the possibilities for young people of living alone are limited, women aged 65 and over form 44 per cent of all people living alone, and as much as 66 per cent of all women living alone.

4.2.3. Household Size Distribution

In view of the decreasing average household size, an increasing proportion of one-person households means, of course, that the growing importance of one-person households and of small-sized households in general has occurred at the expense of larger households. For the Netherlands, this is clearly shown in Figure 4.1. The figure compares the 1960's, 1970's and 1980's in terms of the average annual changes in the numbers of households in the size categories 1 to 7+. Although there are some "irregularities" in the percentage changes for size categories 4 and 5, which occupy a sort of hinge position, the picture is clearly one of a strong inverse relationship between household size and rate of

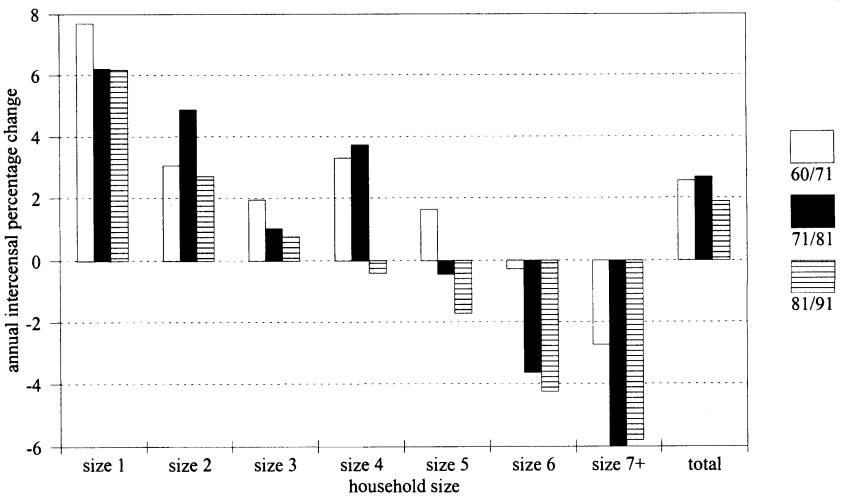

Figure 4.1. Average annual intercensal percentage change in number of households by household size, the Netherlands, 1960–1989

change. This inverse relationship tends to become somewhat stronger over time, despite a decline in the rate of increase in the total number of households since the 1980's. Over the entire period, the numbers of households in size categories 1, 2, and 4 strongly increased, one-person households increasing most (by 6 to 8 per cent per year). Conversely, almost equally sharp relative declines may be observed for households with 6 or more persons, namely three-generation households and couple households with above-average numbers of children.

Developments in the numbers of households by size are part and parcel of the changes that have collectively been called the Second Demographic Transition. "A shift from uniform to pluralistic families and households" was one of the central elements of this transition (Van De Kaa, 1987, p. 11). The decline in institutional controls over individual people's biographic preferences and choices, denoted by the key word individualization, has led to a process of ongoing pluralization of living arrangements and forms of family life at the aggregate level. This has resulted in both changing cross-sectional distributions over time and changing within-cohort distributions, indicating a decline in the institutionalization of the life course. European patterns of household and living arrangements have thus "converged to diversity" (Boh, 1989).

The increase in the proportions of one-person households is just one aspect of this growing pluralization of living arrangements. In the Netherlands, the proportion of non-family households — households without a family nucleus, i.e., not including a married couple with or without children or a single parent with children — to which one-person households belong, increased from 15 to 39 per cent between 1960 and 1993 (Table 4.3). Besides one-person households, another important subcategory of non-family households is that of multi-person households — households with more than one person and not containing a family nucleus; examples are siblings or friends living together — which increased from 3.1 to 8.1 per cent of all households in the same period. In contrast, the proportion of family households, in particular the stereotypical "traditional" family — two parents and one or more unmarried children living at home, where as a rule the husband is the breadwinner and the wife cares for the children at home — though still constituting a majority of all households, is no longer as predominant as it was, and declined from 85 per cent in 1960 to 61 per cent in 1993. Family households comprising a couple have remained the by far largest subcategory, although it too declined, from 77 to 54 per cent. This decline was caused entirely by a drop in the proportions of couple households with unmarried children, from 55 to 32 per cent, whereas couple households without unmarried children have retained their share of 22 to 23 per cent over

Table 4.3. Private households by type, the Netherlands, 1960–1993 (percentage distributions)

	1960	1971	1981	1989	1993
Non-family households	*15.0*	*19.6*	*27.7*	*35.9*	*39.1*
One-person	12.0	17.1	22.1	29.2	31.0
male	3.7	6.4	7.8	12.0	13.2
under 35	1.2	3.0	3.4	5.6	5.9
35-64	1.2	2.0	2.5	4.6	5.2
65 and over	1.3	1.5	1.9	1.8	2.1
female	8.2	10.6	14.3	17.2	17.8
under 35	1.1	1.9	3.3	4.8	4.9
35-64	3.3	3.5	3.8	4.5	4.7
65 and over	3.9	5.3	7.2	7.9	8.1
Multi-person	3.1	2.5	5.6	6.8	8.1
Family households	*85.0*	*80.4*	*72.3*	*64.1*	*60.9*
Married couple	77.1	73.6	66.0	57.2	54.4
without unmarried children	22.0	22.2	22.7	22.2	22.9
with unmarried children	55.1	51.4	43.3	35.0	31.5
Lone parents	5.5	4.8	6.0	6.6	6.3
mother with unmarried children	3.7	3.5	4.8	4.8	4.2
father with unmarried children	0.9	0.7	0.8	0.9	0.8
parent with unmarried children and other person(s)	0.9	0.6	0.5	1.0	1.3
Multi-family	1.7	1.2	0.3	0.2	0.2

Note: For definitions of the most important household types, see the text. With respect to the multi-family household, it should be emphasized that in this type two or more 'family nuclei' live together in one household, which does not automatically imply a co-residing three-generation family.
Source: Kuijsten *et al.* (forthcoming).

the same period. This means that in the subcategory of couple households, the proportion of households with unmarried children has dropped from 71 (55/77) to 58 (32/54) per cent. This development, however, does not mean that the Dutch are less oriented toward family life than they were in the past. They still value family life and child-rearing highly (Van den Akker & Halman, 1994), but they tend to postpone having children for a number of years, first enjoying life as "free" adults and earning money. No wonder then that, again in cross-sectional perspective, the declining share of family households among all private households is almost completely explained by the shrinking number of

couples with children. Whereas they still constituted more than half of all households in 1960, their share was less than one-third in 1993, equal to that of one-person households.

Surprisingly, the share of lone-parent households is still relatively small and has even declined since the mid-1980's, following a modest increase in the 1970's. Lone-parenthood is above all the result of divorce or separation, rather than widowhood, as was the case in the past; this fact has affected the social acceptance of lone-parenthood and is largely responsible for the ambivalent public attitudes towards it (Niphuis-Nell, 1995; Van Der Staay, 1995). Only the small category "lone mothers or fathers with children and other persons" has increased. Many of these "other persons" are probably cohabiting partners, as may also be the case in many multi-person non-family households. Extended, multi-family households, in 1960 still almost two per cent of all households, have dwindled to insignificance.

So, between 1960 and 1993 major changes took place in the relative importance of specific household types. Couple households with unmarried children — despite their declining importance — still form the largest category, followed by one-person households. The latter category has become more important than that of couples living alone. A similar change has occurred in the United Kingdom where, between 1971 and 1991, and for the first time on record, one-person households (which had increased from 17 to 26 per cent) were more numerous than married couples with dependent children (24 per cent) (Ringen, 1997). Admittedly, the unusually high share of lone-parent families in the United Kingdom (18 per cent) among all families with dependent children might easily overestimate the importance of this change compared with other countries. Provisional results for other countries participating in the ongoing international comparative research program "Family Change and Family Policies in the West"[4] show that the trends observed in the Netherlands fit into a clear Western and Northern European pattern. Non-family households as a proportion of all households increased from 24 per cent in 1950 to 34 per cent in 1990 in Finland, from 21 per cent in 1960 to 36 per cent in 1990 in Switzerland, and from 20 per cent in 1961 to 32 per cent in 1991 in Belgium. Families without

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[4] This international comparative research program is coordinated by Peter Flora of the Mannheim Centre for European Social Research (MZES), Mannheim, Germany. The country reports containing the figures mentioned here will all be published in the years to come in the *Family Change and Family Policies in the West* series (Series editors: P. Flora, S.B. Kamerman & A.J. Kahn). See Kuijsten, Schulze and Cuyvers (forthcoming) and Ringen, (1997).

dependent children as a proportion of all families showed an upward trend as well: From 31 per cent in 1960 to 42 per cent in 1990 in Switzerland, and from 28 per cent in 1960 to 38 per cent in 1995 in Norway. In Belgium, the proportion remained remarkably the same: 35 per cent in 1961 against 34 per cent in 1991. The situation is quite different in Southern and Eastern-Central Europe, and resembles the situation in countries in Western and Northern Europe in the 1960's, if not earlier. Non-family households constituted 21 per cent of all households in Greece in 1991 and in Poland in 1995, and increased from 11 per cent in 1970 to 16 per cent in 1991 in Spain. In Poland, couples without dependent children as a proportion of all family households increased from 19 per cent in 1970 to 22 per cent in 1995; in Spain they comprised 23 per cent in 1991 and in Greece 30 per cent in 1991.

4.2.4. Regional Variation

Above, household and family structures were described and compared at the aggregate national level. But structures may also vary at the regional level. In a research project included in the Priority Program, Crommentuijn (1997) shows, basing himself on a variety of large-scale sample surveys, that the study of the evolution of regional household structures from a life course perspective offers a wide range of possibilities. He is thus able to show that regions that function as an "escalator region" (in the Netherlands first and foremost the Randstad area, in particular the Northern wing) for social mobility through, among other things, highly selective in- and out-migration processes, have household and family structures that typically match such a regional function: Higher-than-average proportions of young people in small and "new" household forms, with an above-average educational level, and lower-than-average proportions of people co-residing with dependent children and of children living in the parental home. But Crommentuijn had to combine big "functional" areas to demonstrate these differences. Unfortunately, the data infrastructure in the Netherlands does not enable us to describe and analyze regional household structures on lower geographical scales and with the same degree of precision as, for instance, in Belgium (Deboosere *et al.*, 1997), Germany (Bertram *et al.*, 1993), or Spain (Solsona & Treviño, 1990). On the other hand, and thanks to the efforts of human geographers in particular (e.g., Vijgen & Van Engelsdorp Gastelaars, 1986, 1992), we are quite well informed about the diversity in household and family structures among neighborhoods in the bigger cities.

4.2.5. Living Arrangements of Young Women

So far, we have presented changes in household and family structures in terms of changes in proportions of the entire population or the total number of households. Changes of this kind are clearest among young adults. On the one hand, their "biographical age" is sufficiently young for them to choose the new options that have emerged and that were first experimented with by a small group of forerunners who set an example and paved the way for later cohorts (Van De Kaa, 1997). On the other hand, they have had the opportunity of following one of the "old" scripts, but perhaps with deliberate postponement. Age-specific variation in household type is therefore greatest among young adults.

This idea was one of the presuppositions of an international comparative research project entitled "Family Life Forms and Everyday Family Life in European Comparison", carried out in the early 1990's and coordinated by the University of Bielefeld (Kaufmann *et al.*, 1997; Kuijsten, 1996). The research team compared ten countries, among them the Netherlands, on the basis of a uniform model layout, focusing on developments in the 1980's and on women aged 25–29 (women in their "early parental phase") as one of the age groups for comparison. The results show a large degree of between-country variation in composition by living arrangement. The research team defined living arrangement or "family life form" in such a way that it includes not only the categories usually included in household type classifications, but also — as a second dimension — the division of roles between spouses in terms of the number of incomes the couple has at its disposal.

At one end of the scale are the Mediterranean countries and Ireland, characterized by the persistence of a traditional pattern, in the sense that there is an almost complete lack of family life forms between the parental "family of origin" and the wife's own "family of destination", i.e., a lack of so-called "new household forms" to which we have grown accustomed in Western and Northern Europe. In Italy, for instance, 36 per cent of women in this age category were (still or again) living with their parents at the end of the 1980's. There was even a surprising eight per cent rise in the proportion living with parents between 1983 and 1988. In the Italian top-six list of family life forms drawn up by the researchers, numbers two to six were traditional family patterns, namely not gainfully employed housewives with one child (15 per cent, second place) or two or more children (13 per cent, third place), and in fourth and sixth place a pattern where the mother combined childcare

with gainful employment. Married employed women without children were in fifth place. Interestingly, none of the so-called "new household forms" (living alone, unmarried cohabitation, lone motherhood) had high enough proportions to figure in the Italian top-six list of living arrangements among young adult women.

At the other end of the scale are the Scandinavian countries, where Sweden is perhaps the best example. Compared with a mere five per cent in Italy for all "new household forms" taken together, young adult women living in these "new household forms" in Sweden constituted a slight majority (51.5 per cent) around 1990. Here, this category could be broken down into 13 per cent singles living alone or in a multi-person non-family household, 19.6 per cent cohabiting without having children, ten per cent cohabiting and with co-residing children, and 3.5 per cent lone mothers. In contrast, the share of young women living in a family household had dropped significantly to about 30 per cent around 1990. And, irrespective of their living arrangement in demographic terms, a large majority of Scandinavian women had a paid job. Among Norwegian women aged 25–29, those in all "new household forms" taken together also constituted a majority in the early 1990's (Gulbrandsen, 1997).

With respect to basic differences within Europe in family formation and reproductive patterns, Hobcraft and Kiernan (1995, p. 58) have drawn the conclusion that "The Southeastern countries are still more traditional in that childbearing and child rearing are more likely to take place within formal marriage and with both parents present; concomitantly levels of lone parenthood are much higher in Northwestern Europe. It is probably not at all surprising that breakdown of traditional norms regarding partnership stability and childbearing within marriage have changed least in predominantly Catholic Southern European countries and most in the social democratic Scandinavian countries." A similar conclusion is justified with respect to the repercussions this has had on equally basic differences in household and family structures.

The Netherlands is one of the countries that occupies an intermediate position as regards the popularity of "new" living arrangements, albeit with a tendency to move towards the Nordic pattern. The top-six lists for the Netherlands for the early and late 1980's are given in Table 4.4. As shown in the table, within no more than a decade, the top position in the list has shifted from "married housewife with two or more children" (the traditional living arrangement, where all possible demographic *Festlegungen*, or commitments, have been made before age 30) to "married childless employed wife". The share of "married housewives

Table 4.4. Top-six Living arrangement ranking, women aged 25–29, the Netherlands, 1981/82 and 1989/90

1981/82			1989/90		Difference in
Rank	%	Living arrangement	%	Rank	percentages
1	23.5	Married, 2+ children, one income	13.1	4	–10.4
2	19.3	Married, no children, two incomes	18.5	1	–0.8
3	16.6	Married, 1 child, one income	9.2	5	–7.4
4	10.0	Single	16.4	2	6.4
5	5.5	Cohabiting, no children, two incomes	14.6	3	9.1
6	4.9	Married, 2+ children, two incomes	4.0	-	–0.9
-	4.8	Living with parents	7.3	6	2.5
	15.4	Other	16.9		

Source: Kuijsten & Schulze 1997: 283.

with children" almost halved between 1981/82 and 1989/90. This, together with the rise in both the proportions and the rankings of the categories "living alone" and "cohabiting, no children, both employed", is a clear indication of a breakthrough of a modern dual-career family pattern among young Dutch women.

The latter category in particular is on the rise. In the Netherlands, proportions of cohabiting persons in the younger age groups are much higher than in Flanders, for instance, but not as high as in Scandinavia or in the UK: 27 per cent of 25 to 29-year-old Dutch men and 26 per cent of 20 to 24-year-old Dutch women in 1993 (CBS, 1994). And we should call to mind that such cross-sectional incidence figures tend to underestimate lifetime prevalence: At age 27, the proportion of women who had ever lived in a consensual union increased from 23 to 55 per cent between cohorts 1950–4 and 1961–5 (Liefbroer *et al.*, 1996). From a life course perspective, an interesting contrast with Flanders is not so much a difference in mean age at entering a first union, but rather in type of first union entered. Some 60 per cent of home leavers in Flanders do so to enter marriage (Corijn & Deven, 1991; Elchardus & Heyvaert, 1991). So, this is still the most common transition. Unmarried cohabitation, or living alone, are options chosen less frequently, living alone to a greater extent by young men than by young women. Moreover, Corijn and Deven found an increasing "de-chronologization" of all living arrangement transitions among young adults. In Flanders, postponement of marriage is leading to a prolongation of the period of living in the parental home, rather than an increase in unmarried cohabitation as it has done in the Netherlands.

4.2.6. Living Arrangements of the Elderly

Variation in living arrangements occurs at all ages, and the elderly are no exception. Van Solinge (1994) is among those who have carried out research into this variation, based on the 1989/90 Housing Demand Survey (WBO), a large-scale sample survey of approximately 50,000 Dutch households. Compared with 1960, she observed a sharp rise in the proportion of unmarried elderly (65 and over) who live alone (from 35 to 66 per cent), and a noticeable decline in the proportion of elderly who live with others, either as a head of household or as a household member (from 51 to 17 per cent). The proportions for the Netherlands in 1989/90 are not directly comparable with the 1994 EU averages given by Van Solinge *et al.* (1998), which refer to the population aged 60 and over, where the percentage of unmarried elderly living alone is 69 for males and 71 per cent for females. Co-residence of elderly people with their children, still quite high in countries like Ireland, Italy and Portugal (43, 35 and 35 per cent, respectively), is rather uncommon in the Northwestern part of Europe. Interestingly, Van Solinge *et al.* (1998) report that in most European countries co-residence of this sort is the preferred living arrangement when parents are no longer able to live independently, but the Netherlands shows one of the lowest proportions in this respect. Having said that, and irrespective of state of health, in Denmark, Sweden, and the Benelux countries, preferences for institutionalization are quite strong, even among the elderly themselves.

To explain these trends, Van Solinge (1994) assumes that the choices made by the elderly to live alone, to remain living alone, or to opt for other living arrangements is determined by the objectives of the elderly themselves on the one hand and by the opportunities and constraints with which they are confronted on the other hand. Living arrangements in later life are strongly affected by (demographic) events that have taken place earlier in the life course, marriage being a key factor in this respect. Another demographic constraint that shapes choices regarding living arrangements is "kin availability". If no children or few relatives are available, the choice is likely to be limited. But even where children are available, opinion surveys indicate that the elderly in the Netherlands value their privacy highly, and that the idea of moving in with their children is very unpopular (Van Den Brekel & Moors, 1992). The availability of sufficient financial resources is a prerequisite for a single person to run his or her own household. The Netherlands distinguishes itself to some extent by the generosity of its pension system. Van Solinge therefore assumed that the influence of income on living alone was slight. Due to the influence of traditional

role patterns during socialization and within marriage, men were assumed to have more problems coping with household tasks than women. An inability to perform household tasks could also arise from limitations in physical activity or from more general health problems.

Both in Van Solinge's and in other research (Dykstra & De Jong Gierveld, 1997; Knipscheer *et al.*, 1998; Liefbroer & De Jong Gierveld, 1995), being or having been married turned out to be a key life course factor determining present living arrangements, and thus indirectly affecting informal and formal exchanges of support, as is the case with having children. Apparently, marital and parental careers in earlier stages of the life course "pay off" in later life. In 1990, 43 per cent of the elderly (65 years and older) had either never been married or — the vast majority — were no longer married. Living alone was the predominant living arrangement among the non-married elderly. However, this living arrangement was not equally represented in all groups. Males, never-married elderly, and the youngest old lived alone relatively less often.

Those who lived with others, lived either with a partner or with relatives (usually with children), and only a small minority lived with non-kin. Living with a partner without being married was most common among the younger elderly, but both the very old and those in their late sixties were more inclined to live with children than were other elderly persons.

Ever-married elderly were more likely to live alone than never-married elderly. When they lived with others, the living arrangements varied. Ever-married elderly usually lived with children, while never-married persons tended to live with other relatives. When examining males and females separately, it appears that widowed and divorced males lived alone less often than did widowed and divorced females. The same applies to never-married persons. Multivariate analysis confirms the general pattern that women were more likely to live alone than were males, and never-married persons were less likely to live alone than were ever-married persons.

Apart from sex differences, there are important cohort differences. Younger cohorts have experienced increasing divorce rates, decreasing fertility, and an increasing life expectancy. Liefbroer and De Jong Gierveld (1995) have summarized the effects of these important changes as follows. Firstly, the decrease in the number of children and the decrease in the age at which children leave the parental home, have led to a drop in the age at which the "empty nest" phase starts and have extended its length. Secondly, the increase in divorce and separation has led to a rise in the number of people living in one-person and in

one-parent households. Thirdly, the increase in life expectancy has extended the time elderly spend in both one-person households and with a partner.

Living arrangements are dynamic phenomena which, for the elderly as for anyone else, change as people age. Liefbroer and De Jong Gierveld (1995) demonstrated that living with children becomes much less common with increasing age, as does living with a partner, albeit at later ages, and that this phenomenon is much more pronounced among women than among men. So, the patterns for men and women diverge after age 60, because of (a) the large surplus mortality among men, and (b) the higher age of men at marriage. From a longitudinal perspective, the most noticeable cohort changes at the age of 60 are: (a) a decline in households with both a partner and children (b) a rise in the proportion of households with both partners only and (c) an early drop and later rise in the proportion of men and women living on their own. In sum, an earlier start of the empty nest phase and a greater incidence of one-person households. At age 75, the most pronounced between-cohort changes from a longitudinal perspective have been those of a continuing upward trend to live alone among elderly women, and a downward trend among elderly people to live in institutions. This is also due to policy changes (Knipscheer *et al.*, 1998).

Being in a specific living arrangement is related to mental and physical well-being. This is partly the result of selection processes, as health and functional capacities decline with advancing age. The way people are embedded in (family) networks that may provide support also plays an important role. Older adults who live alone require more support from others and have to invest more in relationships of this kind than elderly who have a partner. Widowers and older never-married women stand out positively in this respect, whereas older never-married men tend to stand out negatively as do older divorced men (Liefbroer & De Jong Gierveld, 1995).

It remains to be seen what these findings may imply for the future, in particular whether the number of elderly who live alone will increase or decrease. According to Van Solinge (1994), in cases where in the past a lack of household skills restricted the possibility of running an independent household, the next generation of elderly males will be somewhat better placed to do so. This may result in a rise in the number of men living alone, but perhaps not in a rise in the need for care. Moreover, both Van Solinge (1994) and Liefbroer and De Jong Gierveld (1995) emphasize that younger cohorts have spent more years in education, will enjoy higher incomes and higher rates of home ownership, and will therefore have better socio-economic resources. In the next

elderly generations more persons will have the opportunity of living alone, and for longer periods. Within such an improved aggregate situation, however, the divorced elderly and never-married men may remain particularly disadvantaged, whereas never-married women are expected to fare quite well.

4.3. YOUNG FAMILIES AND THE AGING OF FERTILITY

We have shown above that there is a large variation in living arrangements among young adults. This diversity results from the fact that living arrangements are "simply" the outcome of the demographic processes of union formation, childbearing, divorce, migration and death (Liefbroer & De Jong Gierveld, 1995). Formal marriage and childbirth have been postponed in recent decades, and the number of children per couple has decreased. Union dissolution for other reasons than death of a spouse has increased strongly in middle adulthood in contrast to union dissolution resulting from the death of a spouse at older ages, which has been "postponed" due to increasing longevity. Finally, the age at which children leave the parental home is generally lower than it used to be, despite fluctuations since the mid-1980's. All these factors have contributed to the trend that couples (married or unmarried) today may expect to spend fewer years with dependent children and more years without them. From a cross-sectional point of view, decreasing proportions of family households with children, as shown above, is the logical result.

In the Netherlands, a driving force behind this trend has been the postponement of first birth. In fact, on a global scale the Netherlands ranks first in late fertility, taking a vanguard position in a trend that is manifesting itself in most European and other modern industrialized countries and that is part and parcel of the Second Demographic Transition (Beets, 1996). The contribution of age-specific fertility rates for ages 30 and higher to the period total fertility rate increased from 31 to 44 per cent between 1967 and 1990. In Europe it was surpassed — in 1990 — only by Ireland, where traditional age patterns of fertility with comparatively high age-specific fertility for older women were just beginning to become eroded (Bosveld *et al.*, 1991). Mean age at first childbirth increased from around 25 in the early 1970's to close to 29 today, the highest level in Europe, just above that of Switzerland (Council of Europe, 1997).

Bosveld (1996) has developed a schematic overview of the trajectory and phasing of fertility patterns by age and birth order that is

typical of the era of the Second Demographic Transition. Patterns have been remarkably similar all over Western and Northern Europe, where these delay processes started. In countries in Southern and Eastern-Central Europe, the direction of the fertility changes are basically the same, but they started later.

The end of the baby boom was marked by a fertility decline that set in in all countries of Western and Northern Europe in the early 1960's, largely as a result of declining births of orders three and higher. This led to some convergence between countries in their levels of third- and higher-order birth rates, and in their TFR levels. During the next phase, newly arrived cohorts of women started to postpone their first and second births. This led to a major downturn in period TFR's. Among the countries compared by Bosveld, this second phase started earliest in Sweden, namely in 1965. West Germany followed in 1967, the Netherlands in 1969, and Belgium, France and Norway around 1971. In Southern and Eastern-Central Europe, first- and second-order birth rates declined too when couples began to postpone births there, albeit much later. In Portugal, Italy and Hungary, for instance, the decline set in around 1975. Czechoslovakia followed suit in 1979. In Eastern-Central Europe, age-specific fertility rates for all birth orders showed similar fluctuations over time, much more so than in Northern and Western Europe. Period effects appear to have had a much larger impact on TFR's in Eastern-Central Europe, probably because of the family policies implemented during the communist era.

A third phase set in when the women who had started postponing first and second births began catching up delayed births later in their lives. As a result, the decline in higher-order birth rates which started during the first phase began to stagnate. In most countries, this compensation for delayed births took place when the cohorts were in their late twenties, but in some countries substantial numbers of women had their first child when they were in their early thirties. The Netherlands has a special, rather extreme position in this respect. For instance, cumulative first-order birth rates at age 26 for cohort 1965 were about 38 percentage points lower than those for cohort 1944 (Bosveld, 1996). In Western and Northern Europe, this catch-up phase started in the second half of the 1970's, and in Southern and Eastern-Central Europe, which is still going through this phase, it did not start until the mid-1980's. This may be one of the reasons why the decline in period TFR in these regions has been so sharp. So far only the countries of Western and Northern Europe have experienced a next, the fourth phase, characterized by a continuing compensation for delayed first and second births at older ages, together with the first signs of rising birth rates for higher

birth orders. In most countries, first- and second-order birth rates among young women are still decreasing, except in Sweden and Norway where delays of first and second births seem to have come to a halt.

Bosveld's scheme has general applicability, but one should bear in mind that the timing and pace of this phasing process varies from country to country. In some countries, such as the Netherlands and Germany, the proportions of women who delay births has increased substantially, in others such as Czechoslovakia and Hungary there has hardly been any increase at all. In some countries, the ages from which women are catching up on delayed births is concentrated mainly after age 30 (in particular in the Netherlands), while in most other countries the catch-up of delayed births is concentrated between ages 25 and 29. Moreover, in countries where postponement of childbearing has so far been moderate (such as the Eastern-Central European countries before the 1990's) this trend is not associated with a decrease in family size, whereas in other countries, in particular in Western and Southern Europe, the much greater decrease in fertility at young ages is expected to result in a rise in ultimate childlessness.

However substantial these between-country differences may be, the shift in age at first birth has resulted in increasing proportions of "late" mothers, that is, women *without* young children at younger ages, but increasingly *with* young children at older ages. In 1980, the proportion of women aged 30–34 with children aged five or younger was 20 per cent or lower in all countries studied. Between 1980 and 1990 this proportion increased in most countries, except in Portugal and the Eastern-Central European countries. The highest proportions — around 30 per cent — were found in the Netherlands, Sweden and Italy. In the 35–39 age group the proportions also increased in the countries of Western and Northern Europe and in Italy, but were much lower than those in the 30–34 age group: between six and ten per cent.

Postponement of first birth is strongly related to postponement of formal marriage, the mean age at first marriage having shifted from 22.7 in 1970 to 27.6 in 1996 (Council of Europe, 1997). Firstly, both may be seen as expressions of a general tendency to postpone commitment and "settling down", to remain "flexible" for longer periods of time (Manting *et al.*, 1993; Mulder & Manting, 1994). Second, men and women in consensual unions show much lower fertility than married people of the same age. Third, most cohabiting people wait until they are married before they decide to have children, or they enter formal marriage when pregnant. As phrased by Hobcraft and Kiernan (1995, p. 46): "There are contexts within which people are more or less likely to decide whether to have children or not, perhaps embedded in the

notion of the 'appropriate time' to become a parent rather than the 'proper time' to marry as in times past."

Manting (1994) has shown that early life circumstances (living at home, parental divorce, religious upbringing, family size, age of the mother, and home town) are of primary importance to transitions in young adulthood, but much less so in the later life course. Current life experiences, on the other hand, are important in explaining union formation at all ages and in explaining the transition from cohabitation to marriage, the most important factor in this respect being fertility. When considering union dissolution, the type of union, the timing of the first union, and the timing of the children are the most important demographic variables. Cohabiting couples, for instance, have a much higher risk of disruption than married couples, and cohabitation prior to marriage is no insurance against later union disruption.

In the foregoing, first-birth postponement was described in terms of averages for the entire female population. There is, however, systematic variation within the population, for instance with respect to level of education. Today, Dutch women with low levels of education have their first child around the age of 27, whereas the average age at which the most highly educated women have their first child is 34 (Moors *et al.*, 1999). On the basis of the results of a secondary analysis of data provided by the 1988 Fertility Survey, Turkenburg (1995), in a Priority Program research project, reached the conclusion that this difference may be strongly related to job aspirations and/or aspirations concerning the combination of a job and a family. Women with a high level of education have strong "job aspirations", which is in line with an individual-oriented or a partner-oriented strategy, whereas less-educated women tend to pursue family-oriented strategies and therefore have much stronger "child aspirations" and are more motherhood-oriented.

So it looks as if education, and of course employment after finishing education, are very important motives for postponing family formation, and might thus be among the most important driving forces, if not *the* most important driving force behind the high age at fertility in the Netherlands, where female labor force participation has risen strongly in recent years. Having said that, results reported by Wijsen (1994, forthcoming), who in a project funded by the Priority Program conducted interviews with some 350 women who had just had a child at age 30 or higher, suggest that caution should be observed when making such a statement. First, many "older" women do not feel they have postponed childbirth: Only slightly less than half the respondents (47 per cent) reported having deliberately delayed pregnancy (Wijsen, 1994). When

the proportions are broken down by age, we see that the older age categories (above 35 years of age at childbirth) report even less deliberate delay than the younger age groups (between 30 and 35 at childbirth). So, when we are dealing with postponement of childbirth at the macro level, as a statistical fact, we should bear in mind that at the individual level deliberate postponement is only taking place in a minority of cases. Second, when looking at the overall influence of employment on the timing of children among older mothers, we see that it has been important for some, but certainly not for all. Besides employment, Wijsen found two other important categories of reasons for "later" childbirth: material circumstances (such as a dwelling that is not yet in order or too small) and agreement between partners. Of course, since a child can be "planned", couples have to reach agreement about the timing. If there is no agreement, it is not uncommon for childbirth to be delayed.

4.4. CHANGING KIN NETWORKS

Every family, whatever its type, almost every individual, and the vast majority of households are embedded in a larger kin network. Smaller families will in the long run result in smaller and less complex kin networks (of course this observation is only valid if one disregards divorce and remarriage). The most extreme example of this trend is demonstrated by what could be the ultimate consequence for the kin network of a prolonged and even stricter one-child policy than that implemented in China in the recent past: Kin networks become more uniform and much smaller, overwhelmingly "verticalized" and basically "top heavy", and devoid of categories such as brother/sister, uncle/aunt, nephew/niece, cousin, and any other more distant relatives.

Such extreme changes have not occurred in the Netherlands, and will most probably never take place. But there have been profound changes in the size and structure of kin networks in the past, and equally profound changes are expected in the near future. Priority Program research into past and future changes in the size and composition of people's kin networks (Post *et al.*, 1997a, 1997b; Van Imhoff & Post, 1998) was based on the supposition that the significant demographic changes that have taken place over the past century have had a major impact on the size and structure of kin networks. Networks have basically become more "verticalized" — until the late 1960's predominantly as a result of the mortality decline during the first demographic transition, after that time also as a result of declining fertility, changes in nuptiality and trends in divorce, all of which are characteristic of the Second

Demographic Transition. In general, there is a very loose relationship between average household/family size and average kin network size. Nevertheless, to the extent that average household/family size is decreasing because couples are having fewer children than before, decreasing household/family size is coincident with a decrease in the size of kin networks.

Post *et al.* have applied ingenious methods of analysis and estimation to a large set of descendant genealogies which they had collected to explore trends in size and structure of extended kin networks in the period 1830–1990. They also constructed the microsimulation model KINSIM which can be considered a pure-state household demographic model for the modeling of kinship relations. Kin networks are solely affected by birth, death, union formation and union dissolution. By generating these elementary demographic events, KINSIM reproduces complete kinship networks. Starting in 1947, it first generates a picture of developments in the recent past and then generates future genealogies in order to project kin networks for the period 1990–2050. For a more detailed description, see Chapter 8 by Hooimeijer and Oskamp in this volume.

Two restrictions of the modeling procedure have to be taken into account when interpreting their main results since these restrictions affect the historical reconstruction for the period 1830–1990 in particular. Due to the limited data available consanguineous kin only were considered, ignoring kin relations that run via the spouse. Moreover, information on remarriage was of a dubious nature, so that the allocation of children to marriages out of which they were born was unreliable (Post *et al.*, 1997b).

4.4.1. Historical Reconstructions of Kin Networks, 1830–1990

The effects of the increased predictability of, and "certainties" in people's lives due to extended longevity (people may expect more than ever before to see all their children and grandchildren grow up, and by the same token, younger generations may expect their grandparents, parents and siblings to stay alive for longer periods than in the past) are reflected in the changes over time in kin network size and composition that come to the fore in genealogical reconstruction. However, the degree to which they are reflected depends strongly on type of kin, historical time, and on the age and cohort of the individuals involved.

The average number of surviving descending kin (children, grandchildren, nephews and nieces) did not undergo fundamental changes in the period studied, except for the number of nephews and nieces which,

for the population as a whole, increased from 5.0 in the 19th century to 7.8 in the 1950's. Despite recent changes in fertility, the average numbers of children, grandchildren, and nephews and nieces among all age groups in 1990 were still as high as, or even higher than in the early nineteenth century, mainly as a result of the sharp decline in child mortality.

The average numbers of surviving ascending kin (parents, grandparents, uncles and aunts) for the population as a whole have changed only slightly in absolute terms; only the number of uncles and aunts has increased considerably. However, fundamental changes have taken place by age group, with particularly sharp increases for the younger age groups, resulting from the combination of the continuously rising life expectancy and initially increasing and later decreasing fertility in preceding generations. The average number of lateral kin (siblings and cousins) has shown the largest changes in absolute numbers. Again, developments over time differ between age groups: The younger the age group, the earlier the maximum size of this type of kin network was reached and the earlier it began to decrease again owing to the fertility decline.

Since the trends differed by type of kin, it is practically impossible to estimate the total size of the kinship network for the period 1830–1990 by combining all types of relatives discussed in the foregoing, not least because data restrictions for each type of kin differed too. Nonetheless, the total average number of relatives has risen notably since 1830, reaching its highest values between 1930 and 1960. In this period the family network size of the elderly almost doubled. Today, their networks of grandchildren, nephews and nieces, and cousins are relatively large, compared with those of other age groups and other periods. In short, demographic changes in Dutch society over the past 160 years have significantly affected the kinship configuration.

4.4.2. Projections of Kin Networks, 1990–2050

Will the trends observed in the Netherlands in the latter part of the historical reconstruction period continue in the first half of the twenty-first century? All age groups will no doubt witness strong decreases in their average numbers of kin during the period 1990–2050. Differences between age groups may be attributed for a part to the recent fertility drop, for another part to differences inherent to the stage in the life course. Different age groups have different types of kin relationships. People below age 20, for instance, generally do not have children, and most elderly people do not have surviving uncles and aunts. A

remarkable finding in this respect are the small differences between the projected average numbers for the age groups 60–80 and 80+. On the one hand, the latter have fewer surviving brothers and sisters, aunts and uncles and cousins, but on the other they have more (grand)children, nephews and nieces who are still alive. At the end of the projection period the differences between age groups as regards average kin network size have decreased. Whereas in 1990 the difference between age groups 40–60 and 0–20 was 20 kin members, in 2050 this will be no more than seven. And whereas in 2010 the difference between the young elderly (60–80) and the youngest age groups (0–20) will be almost 30 kin members, in 2050 this is expected to be no more than ten.

These developments may have repercussions for the elderly, especially for the possibility of receiving informal care. Needless to say, informal care is not dependent on the size of the kin network alone. Still, Post *et al.* have paid special attention to expected developments in the kin networks of those aged 75 and over. The results of their simulations clearly show that the average numbers of kin of almost all specific types will decrease by about 50 per cent until 2050. Persons aged 75 and over in 1990 had three children on average, those in 2050 will have 1.7; in 2050 they will have no more than three grandchildren, against about six grandchildren in 1990. Whereas in 1990, persons aged 75 and over had about two surviving siblings, in 2050 this number will have dwindled to 0.7 on average, and the proportion with no siblings alive will have increased from 20 to 50. The proportion of those aged 75 and over without a partner will remain remarkably stable over the period (just under 70 per cent). But the composition of those without a partner by partner history will change profoundly: Fewer will be left alone because of widowhood, and more because of divorce or separation. The average numbers of children still alive will decrease, partially because of an increase (after an initial decrease) in the proportions of childless couples, but more strongly because of an increasing dominance of the two-child model, at the expense of the proportions of couples with four or more children still alive. Moreover, there will be a decrease in the proportion of those aged 75 and over with sons as well as daughters. This outcome is attributable to the drop in fertility. If family sizes decline, the likelihood of having children of both sexes declines as well.

4.4.3. The "Sandwich Generation"

The simulations mentioned above indicate that women aged between 40 and 65 will, in the first half of the 21st century, increasingly run the "risk" of having to combine caring for one or more dependent

children under the age of 20 with caring for frail older adults aged 75 and over. The simulations predict that the proportion of women aged 40–65 who belong to the so-called "sandwich generation" may increase from less than 20 per cent in 1990 to about 33 per cent in 2040, after which the percentage will decrease slightly. This category of "women in the middle" involved in two forms of caring — caring for dependent children and caring for frail older adults — already exists today. Dykstra (1997) has carried out a study into the position of the Netherlands within the EU in this respect. Her study is based on data from the first wave in 1994 of the European Community Household Panel (ECHP) which yielded interesting between-country differences. With respect to childcare, her data demonstrate the existence of strong national differences: high rates of involvement in childcare for both men and women in the Netherlands and Italy, and low rates for both men and women in France and Portugal. On the whole, male-female patterns of involvement in childcare appeared to be parallel rather than compensatory. With respect to eldercare, her study shows moderate between-country differences in terms of rates of eldercare, against much stronger between-country differences in the time involved in eldercare. The time investments of Irish, Portuguese and Spanish caregivers, for example, were considerably higher than those of their Danish and Dutch counterparts.

The important question, of course, is to what extent these categories overlap. How many are "sandwiched" between caring for dependent children and caring for a frail older adult? Between-country comparisons show that the proportions with overlapping care responsibilities were relatively high among both men and women in Ireland, and among women in Greece and Spain. They were relatively low among both men and women in Denmark and France. The answer to the question regarding the size of the "sandwich generation" is that it comprises five per cent of the EU population aged 35–64 (three per cent among men, eight per cent among women), and as Dykstra (1997) points out, the proportion is much smaller than commonly thought. Figures for the Netherlands are slightly below these averages: two per cent for men, and six per cent for women. When interpreting such cross-sectional figures, one should always recall that, from a lifetime perspective, involvement in these double burdens may be much higher.

Caregiving, be it for children or for adult parents, is often at the expense of the labor careers of women. After inclusion of employment status, the above-mentioned proportions are smaller. In answer to the question how many European women are "women in the middle", subjected to the competing demands of dependent children, elderly parents

and employment outside the home, Dykstra's findings indicate that in the EU as a whole six per cent of women aged 35–64, with jobs of 15 hours or more per week, reported that juggling the responsibilities of work, childcare and eldercare was part of their everyday lives. The proportions are relatively high in Greece (13 per cent) and Italy (11 per cent) and relatively low in Denmark and France (three per cent) and in Portugal and the Netherlands (four per cent). It is a misrepresentation of reality, however, to see caring as women's work only. Though the involvement of men in caregiving activities tends to be lower than that of women, their contributions should not be overlooked. As Dykstra emphasizes, we should continue to search for ways in which *both* women and men can satisfactorily assume and carry out caregiving tasks together with jobs outside the home.

4.5. SOCIAL NETWORKS OF THE ELDERLY

As mentioned above, present-day Dutch society is characterized by a growing complexity of living arrangements, and the elderly do not form an exception to this rule. This is reflected in some results of the NESTOR-program.[5] Some elderly live in so-called "new household forms", albeit not to the same extent as young adults. Very few, less than 0.5 per cent, live in private co-housing arrangements (where amenities, meals are shared). Slightly more live in consensual unions, some two per cent according to Knipscheer *et al.* (1998) and De Jong Gierveld (1995). However, if we look at the unmarried elderly only, this proportion increases substantially, especially among the younger elderly: ten per cent of the unmarried in the 55–64 age group, five per cent in the 65–74 age group, and three per cent in the 75–84 age group. When so-called Living-Apart-Together (LAT) relationships, where partners do not actually cohabit, are also taken into account, these proportions more or less double. Apart from age specificity, there is a strong regional varia-

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[5] NESTOR (Netherlands Programme for Research on Ageing) was funded by the Ministry of Health, Welfare and Sports and the Ministry of Education, Culture and Sciences. Research reported on here was carried out within the framework of the sub-programme on "Living Arrangements and Social Networks of Older Adults" by researchers of the Department of Sociology, Social Gerontology and Social Research Methodology of the Free University in Amsterdam, and the Netherlands Interdisciplinary Demographic Institute (NIDI) in The Hague.

tion and variation according to religious affiliation. Using two contrast groups, De Jong Gierveld (1995) shows that unmarried cohabitation and LAT relationships taken together comprise 26 per cent of all non-religious unmarried elderly aged 55–64 living in Amsterdam and surroundings — the "innovators" among the elderly — against no more than five per cent among elderly church members aged 65 and over living in the Eastern-Central and Southern regions of the Netherlands.

As Knipscheer *et al.* (1998) point out, both the social sciences and the popular media may have created a caricature of family relationships, suggesting that they have been weakened due to growing individualization, materialism and egocentrism. It is a myth that the elderly are isolated from their children and siblings. On average, over 90 per cent of elderly parents have weekly contact with one of their children, and more than 50 per cent have three or more children with whom they have contact at least once a month.

When these average figures are qualified, however, structural and life course determinants come to the fore. First, people who have children do not always mention all of them when specifying their support networks since they are not in touch with them or do not receive support from them: About one in four children are not mentioned; for siblings, this proportion is 60 per cent. The average size of the support networks of childless elderly people is smaller than that of the networks of older adults with children. In general, childless elderly have bigger shares of non-related persons in their networks than elderly people with children.

In several respects, never-married women fare better than other women, whereas never-married men fare worse than other men. Never-married men have the smallest network sizes (average size 7.8) compared with men in other marital states, whereas the networks of never-married women are substantially bigger, bigger even than those of divorced women (average sizes 12.1 and 10.6, respectively). Social participation of never-married men is quite low compared with that of married men, but social participation of never-married women (and that of widows) is significantly higher than that of married and divorced women. Earlier life course experiences influence the size and composition of individuals' social (support) networks in old age. Dykstra and Liefbroer (1998) show that having children when young "pays off" in later life in terms of enjoying frequent contacts and intensive support. But family networks may be disrupted due to divorce. Dykstra (1998) demonstrates that divorced parents mention fewer children when

specifying network members than the never-divorced, taking into account differences in family size.

4.6. CONCLUSION

In the introductory section of this chapter, we referred to recent changes in people's life courses related to marriage and childbearing. These changes are most visible when studying collective biographies of cohorts, but they are also reflected in trends over time in household and family structures and in the size and composition of kin networks. The result of these changes, which may be summarized as increased pluriformity of household and family structures, is clearly reflected by the data we have presented for the Netherlands. There has been a decline in the relative importance of household and family types that used to form part of the "standard" life course (leaving the parental home at the moment of marriage, having one or more children, remaining married until the death of one of the partners dissolves the union; Van Leeuwen, 1990). At the same time, there has been an increase in formerly "non-standard" household and family types such as living alone, households of cohabiting couples, married-couple households without dependent children, lone-parent households, and non-traditional living arrangements among the elderly. Changes in the size and composition of kin networks have been significantly affected by past demographic changes in Dutch society. These changes have not, however, affected all age groups and cohorts to the same extent. They are particularly marked among members of today's young generations, and since the changes are strongly related to age and cohort they will, in the future, lead to a further decrease in the size of kin networks and to continued differences across age groups in average kin network size. It is not easy to determine where the Netherlands stands in present-day Europe. Although the indicators do not all point in the same direction, the findings seem to indicate that the Netherlands occupies a middle position. The Dutch may be regarded as the forerunners in Europe when it comes to choosing how they would like to arrange their private lives. As for the actual choices people make, however, as reflected in observed household and family structures, the Dutch do not make use of the options available to them as much as the "anything goes" image they have abroad would suggest. Presupposing an evolutionary perspective, the Netherlands lags behind the Scandinavian countries, it belongs to the mainstream in Western Europe and it is clearly ahead of the countries in Southern and

Eastern-Central Europe. Again, this does not apply equally to all indicators.

There is ample opportunity for future cross-nationally comparative research, as exemplified by an ongoing study by Bosveld (1998), in which she tries to explain between-country variation in fertility. In her theoretical approach, she assumes that life strategies refer to the tactics people use to balance their needs and wants within both the macro-level opportunity structures and individual life stages and to reach the best possible level of satisfaction during the life course. The latter comprises three life domains: the family, the economic domain and the residential life domain. Each life domain has its own specific strategies and opportunity structures. These interacting domains are partly complementary and partly in conflict with each other. Harmonizing these life domains is done by way of so-called optimization strategies, in particular when people need to combine conflicting events and life stages, such as the problem of combining a family and a job (Bosveld, 1998). At a more general level, we need to address the question about the existence of strategies as such. Do demographers, like many other social scientists, rightfully assume that the people whose life course events they measure and analyze actually pursue a strategy, or is such a strategy nothing more than a mental concept in the minds of researchers, however helpful in ordering his or her data?

This leads us to another field of fruitful new research, namely the realm of consequences of life course decisions for household and family structures consisting of more than one person in view of the fact that the life trajectories of people are intertwined, for instance in their roles as partners, parents and children. How do choices made by the members of one generation affect the lives of members of another generation, and to what extent do these choices have life-long repercussions for the people concerned?

Finally there is the field of within-country regional variation in household and family structures. The discussion above was conducted almost exclusively at the national level, comparable with Roussel's (1992) typology with geographical labels, Chesnais' (1996) distinction between "nations of families" and "nations of individuals", or Jensen's (1998) differentiation between countries with partnership-dominated family structures and countries with family structures dominated by "children families". But national-level research may be too crude, especially in a continent that is said to be moving in the direction of a "Europe of regions". To what extent do people's life course decisions with respect to household and family arrangements coincide with their decisions regarding residence? Are we seeing regions within countries

emerging with specific household and family structures and "matching" differences in marriage and childbearing patterns?

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5. WORK, SAVINGS AND SOCIAL SECURITY IN A LIFE COURSE PERSPECTIVE

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Abstract. This chapter describes how work, savings and social security shape the course of people's lives and at the same time how structural factors (e.g. birth cohort conditions, the legal system and the rise of the welfare state) influence work and savings decisions. The general picture emerging from cohort histories is that the labor force participation of men has decreased, whilst the participation of women has increased. Each successive cohort seems to be better off in terms of net lifetime income, but the current social security system is increasingly becoming a burden for current and future cohorts as population aging will lead to fewer workers who have to pay for an increasing number of social security beneficiaries. However, empirical evidence shows that people have an innate willingness to support transfers between and within generations, especially when social cohesion among players is strong.

5.1. INTRODUCTION

Each individual starts his or her adult life with great expectations. Possibilities are felt to be almost unlimited and people are considered to be free to choose their level of education, their career paths and the date of retirement. This is, at least, the ideal picture of the life course. But things turn out to be rather different in the real world. The most important choices in life are irreversible. Leaving home, choosing an education or a career path, retirement, having a child, all these events are brought about by choices, both rational and irrational, and most of us cannot get our money back once a choice has been made. Irreversibility is thus one aspect of the real world. Another aspect is that initial conditions at the time of birth or during one's formative years in life make a difference. Experience shows that the endowments and initial socio-economic circumstances with which people start their lives are important determinants of the course their lives will take. One should, however, make a distinction between individual and aggregate (or collective) initial conditions. The *individual* initial conditions include factors such as the place or country of birth, social and family background, life expectancy at birth, *et cetera*. Closely connected, but distinctly different, are the *aggregate* initial conditions. In other words, it matters in which year or era a person is born. The primary reason for making this distinction in examining the life course is that changes in quantities will affect markets, such as the labor market and the capital market. Demographic changes are a case in point. The size of different birth cohorts differs as population growth is generally of a non-stationary nature and this can lead to labor market pressures that are not the result of economic choice. For instance, the size of the baby-boom generation is bound to affect the labor market and indeed signs that the baby boom is affecting current labor market conditions are already visible. These effects are what Easterlin (1980) calls the fortunes of birth. An additional reason why cohorts differ is that people of the same cohort are "educated" in certain norms and values and that these norms and values color the course their lives take. The birth cohort then becomes a so-called generation, a group of people sharing a history and a culture.

In this chapter we will focus on the two most important variables which shape the economic side of the life course: work and savings. Work and savings provide the means to finance choices with respect to family formation, housing, and life styles. In other words, they play a central role in structuring the course of people's lives. Understanding how work and savings evolve over the life course, and to what extent

they are influenced by economic and social circumstances, is therefore of primary importance. In general, savings are accumulated during an individual's working years and provide the means to finance the retirement period. However, most individuals largely rely on social security when it comes to financing the retirement period and hence "savings" should be interpreted in a broad sense. The difference between regular savings and social security is simple: instead of relying on investment in physical capital and the returns that capital assets yield, people rely on human solidarity and kindness when they need financial support. In some ways the financing of social security looks much like a chain-letter scheme in which people contribute money at one point in time and hope that future contributors to the scheme will not break the chain. However, contrary to chain-letter schemes, social security is not based on individual, self-serving motives but primarily on feelings of reciprocity and altruism toward those who are less fortunate or who deserve care and leisure. Of course, the willingness to pay for others has its limits and measuring these limits has been the focus of attention in recent empirical work on social cohesion in gift experiments. However, social security plays a double role in life. Besides protecting individual households from income uncertainty it has also shaped the life course by standardizing, legalizing and defining states of unemployment, disability and old age (Mayer, 1986).

In this chapter we will review how work and savings are affected by elements which shape the course of people's lives and, conversely, how work and savings have shaped the life course. The first part of this chapter (Sections 5.2 to 5.4) presents a *historical* perspective as we look back on how the life course has been shaped and changed over time. We will review how cohorts have fared in the labor market and we look at certain transitions, such as the transition from school to work and from work to retirement. As savings and social security provide the means to make the transition from work to retirement, we will also take a look at what has driven changes in savings and social security.

The last part of this chapter (Section 5.5) will focus on the *future* of savings and social security, as changing demographic circumstances will have far-reaching financial repercussions if nothing changes in present government policies or in individual behavior. Central in this part of our chapter is the question whether collective arrangements such as social security and occupational pension schemes — arrangements which are based on solidarity between generations — are sustainable when the circumstances of a society change radically. The reason why we focus on this issue is that the way in which social security structures the course of people's lives is closely connected to the trust current

generations have in future generations. To be more precise, the expectations of workers today about their future retirement income are based on predictions about how much future workers are willing to contribute in light of the fact that social security benefits for the old are generally financed by taxes paid by the working population. The social security system generates no savings on which people can fall back. The last part of the life course therefore depends on the much cited but uncertain factor of solidarity between generations. The central question in this part of the chapter will be: is social security a sustainable institution?

5.2. TRANSITIONS IN THE LABOR MARKET

Today's labor market is characterized by the fact that people are living longer, entering the labor force later, working fewer hours, and retiring from the labor force earlier than ever before (Maddison, 1995; Wise, 1997). These developments have changed the course of individuals' lives quite considerably. Naturally, these trends cannot go on indefinitely — people will always need to earn a living and life expectancy is not likely to run into Methuselahian figures in the near future. The central question is whether these developments are of a transitory nature affecting only a limited number of cohorts or whether current practices are permanent features of the labor market. In order to answer this question, we need to discover what has triggered the transitions in the labor market. These influences may be split up into circumstances tied to (a) economic developments; (b) institutional developments as reflected in the introduction and extension of social security programs and labor legislation; and (c) cohort-specific developments. Below we will review three specific transitions in the labor market that have shown marked changes over time.

5.2.1. The Transition from Education to Work

A number of steps mark the stages which people pass through in the labor market. Some of these steps are based on discrete choices, others are a matter of being in the right place at the right time (Van Dalen, 1999; cf. Stephan & Levin, 1992) and still others are the result of institutional design. The choices concerning people's basic level of education are generally not a matter of individual choice as school attendance is mandatory up to the age of 16 in most countries. Table 5.1 shows the long-term trend in investment in formal education across cohorts. After this threshold age, formal education can take a number of routes,

Table 5.1. Number of years of formal education by cohort and by sex in the Netherlands, 1995

Birth year	Total	Men	Women
< 1920	8.1	8.5	7.9
1920-1929	8.5	8.8	8.3
1930-1939	9.3	9.5	9.0
1940-1949	10.3	10.7	9.9
1950-1959	11.4	11.7	11.0
1960-1969	12.7	12.8	12.7

Note: Formal education is the average number of years of formal full-time education from age six onwards.
Source: CBS, 1997.

which affect not only human capital accumulation but also household formation since prolonged education may, for example, delay the timing of childbirth. The motivation for investing in education is partly inspired by the explicit and implicit returns that a higher education yields. The timing of this transition, however, is affected by the demographic and economic circumstances under which different cohorts start their adult years.

Sanders and Becker (1994) have shown, with the aid of aggregate OECD data, how the transition from education to work and social independence (operationalized as "the birth of the first child") has shifted across birth cohorts born between 1945 and 1965 in four countries with markedly different demographic histories (the US, the UK, the Netherlands and Germany). Compared with the generation born between 1945 and the mid-1950's (which they call the "Protest Generation") the transition from education to work by the generation born between the mid-1950's and 1965 (the "Lost Generation") has shifted considerably to a later stage in life. The United States, where the transition from education to work among men and women is taking place slightly earlier in life, is the only exception to this rule. With respect to the birth of the first child, it was clear that the trend toward later social independence was apparent in all four countries: in the Protest Generation far more women gave birth to their first child between the age of 15 and 24 than in the Lost Generation.

The transition to social independence was examined in more detail for the Netherlands by Iedema *et al.* (1997). Social independence was measured by variables such as the age at which the first job is taken on,

the age at which people leave the parental home, marry or become parents. The authors showed that as the level of education rises, children leave their parents' home at an earlier age. However, the trend toward increasing social independence at younger ages does not appear to be of a permanent nature: Generations born between 1930 and 1954 became independent at increasingly young ages, whereas the generations born after 1955 reached independence at more advanced ages. Part of this delayed transition may be ascribed to the unfavorable circumstances under which the youth of the Lost Generation had to compete for jobs. Having said that, the increased enrollment in education appears to be a manifestation of the long-term trend in human capital accumulation rather than a precautionary measure taken to mitigate the adverse consequences of labor market fluctuations. Educational investments are therefore best explained by the needs of society for more highly educated people, as reflected by the high return on investment in education.[1]

Not only has the expansion of the educational sector made individual human capital accumulation possible for the population at large, it has also formalized part of the life course. For instance, in order to qualify for a university education, candidates need a high school certificate. In most European countries, the average age at which young people enter university is 18 and the average duration of a university education is 4 to 5 years. For those who want to earn a doctorate most European countries now offer a Ph.D. program along the lines of the American educational system, which adds another 4 to 6 years to their period of education.

The character of education has, however, gradually changed in recent decades. In the past, people only needed to invest in education at the beginning of their lives. Today, as technical progress creates new knowledge whilst at the same time destroying existing knowledge, it has become more important for people to continue investing in knowledge during the course of their lives, either through formal education or by learning-by-doing on the job. For instance, Caballero and Jaffe (1993) show that the rate of knowledge obsolescence rose from 2 to 3 per cent at the beginning of this century to between 10 and 12 per cent per year

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[1] In recent years, the return on investment in higher education has dwindled and a considerable number of people tend to be "overeducated". According to Groot (1993), 68 per cent of a cross-section of a cohort of Dutch 43-year-olds have a level of education that is in line with their job, 16 per cent have too many years of education (i.e. they are overeducated), and 16 per cent are undereducated. In the recent past, most people were undereducated and only a small percentage was overeducated.

at the end of the 1980's. Since knowledge travels faster than it used to, the destruction of existing knowledge will also be affected. The speed of knowledge dissemination is quite rapid. Mansfield (1985), for instance, found that seventy per cent of product innovations were known and understood by rivals within 12 months. A competitive edge in knowledge within firms therefore disappears within a year if employees do not continue to invest in fundamental knowledge. The same degree of competition did not exist before the Second World War, giving workers no incentive to continue investing in education during the course of their lives. The fast depreciation of knowledge will make ongoing (formal) learning and on-the-job training during the life course a necessary part of a professional career.

5.2.2. Transitions in the Professional Career

From the moment most people enter the labor market, their aim is to pursue a career and to climb the job ladder. Besides spells of unemployment, the average worker used to stay in the same job from the time he left school or university to the time he could afford to retire from the labor force. This characterization of working life has long applied exclusively to men. In most European countries, men are estimated to work an average of between 40 and 43 years (Gonnot, 1995), whereas the number of years women are active in the labor market is considerably smaller and varies more strongly across Europe: 13 full-time years (the Netherlands) to 29 full-time years (Finland). Male and female labor force participation profiles are converging, however, the labor force participation of women rapidly increasing and that of men slowly decreasing (Eurostat, 1996). The length of a career with a fixed retirement age of 65 also differs by educational level as more highly educated workers tend to enter the work force later than low-skilled workers. As shown in Table 5.2, the median length of careers across cohorts has shortened by between three (better educated) and seven (less educated) years.

For women, labor force participation is an entirely different story. Institutional barriers and social pressures have been important in explaining their labor market behavior. Van Solinge and Fokkema (1998) show how Dutch laws have been a major impediment to women wishing to participate in the labor market. In the past, women were forced to resign when they married or were expecting their first child. For women in the civil service, the obligation to resign was laid down in a law that was in force until 1957. In this light it is not surprising that the majority of the women belonging to cohorts born in the period 1903–1932 stopped working permanently once they married or had their

Table 5.2. Median career length for Dutch men, by birth cohort

	Cohort born in the years:	
Level of Education	1903-1907	1933-1937
Primary education	50.5	43.7
Lower general/vocational education [a]	50.3	44.6
Intermediate general/ vocational education [b]	48.9	44.0
University education	43.6	40.6

[a] 3 years in addition to primary education
[b] 6 years in addition to primary education

Source: Liefbroer and Henkens (1997, p. 102).

first child. Only unmarried women managed to make a career for themselves comparable to that of men. The careers of never-married women born in the years 1903–1937 spanned an average of 39 years, whereas married or ever-married women worked an average of 17 years.

With respect to social pressures or norms concerning the *division of work* and housework between men and women, the consequences are equally far-reaching. For instance, 13 per cent of Dutch women born in the years 1930–1939 have never worked during their lives, whereas none of the Dutch men of the same cohort in the sample experienced a period of joblessness during their working lives. However, this is not a uniquely Dutch phenomenon. Wunderink and Niehoff (1997) show that in four distinctly different countries (Russia, the Netherlands, the US and Japan) women tend to do the housework, although the degree to which work is divided among the sexes differs considerably. In Japan, approximately 80 per cent of the women say that they always do the housework, while in Russia the division of work is more equal and less than 10 per cent of the women say they do all the work in the home. It is difficult to evaluate whether this division of work is "good" or "bad" since the majority of men and women indicated that the division of work is more or less fair. Still, today the social pressures for women to stay at home are far less strong than they used to be. For older cohorts of women the pressures of these social norms were stronger than for younger cohorts, as reflected in their different labor market histories.

Cohort effects also seem to play a role in the *functional level* people attain during the course of their lives. Dykstra and Liefbroer (1995)

have shed some light on the question whether the functional level attained within an organization, measured by the degree of job prestige, is attributable to the initial state of the labor market or to the endowment of talent and individual effort. They studied the labor market efforts of four birth cohorts — people starting to work during the roaring twenties 1923–1929, the crisis years 1930–1939, the war years 1940–1945 and the reconstruction years 1946–1950 — and found no differences between birth cohorts with respect to the prestige of the first job of both men and women. Cohort differences were, however, clearly visible among *men* when taking into consideration their level of education at the beginning of their careers. Younger cohorts were better able to exploit their educational investments than cohorts born in times of economic recession. With respect to the final job in the life course, differences were also quite marked: the younger the cohort, the better educated they were, but when the initial level of education and the job prestige of individuals are taken into account, cohort differences disappear. In other words, although the cohorts born in "bad times" did not start at a position that would be in line with their level of education, they caught up with succeeding generations since they were better able to exploit their human capital.

The same does not seem to apply to the labor market status of *women*. Despite the increased educational attainment of younger cohorts, women did not benefit commensurately in terms of job prestige in the labor market. This is related in part to state regulation of the labor market and to social pressures on women. We mentioned earlier how legal constraints constituted an impediment to women willing to work, but there were numerous implicit restraints in society. For instance, the social pressure to refrain from working while raising children was enormous. Public opinion polls illustrate this point quite clearly: in 1965 a large majority of Dutch men and women (84 per cent) disapproved of married women working while they had children of school-going age. Five years later, there was no longer a majority, but 44 per cent of the people still disapproved. By 1997 this percentage had dropped to 18 per cent (SCP, 1998).

Differences in female labor supply during the life course and over time may be explained partly in terms of the demands which motherhood impose on women. Kalwij (1999) investigated the interrelatedness of the timing of births and female labor force participation and his main finding is that the probability of transition into maternity is higher for women who do not participate in the labor market or who are unemployed than for women with jobs. In short, increased female employment occurs at the "expense" of a lower fertility rate. Differences in

female labor supply across cohorts may not be ascribed to differences in the timing of births by women.

Besides differences in job prestige and labor force participation across cohorts, it is of some importance to know whether the relative size of different cohorts has affected the *earnings* across the life course. Most economic analyses tacitly assume that the age profiles of productivity and wages do not change as a result of changes in the age distribution. This is, however, a far cry from reality in which the size and distribution of the work force do seem to affect relative prices such as wages and interest rates. For instance, a number of authors (Berger, 1985; Ermisch, 1988; Wright, 1991) have shown for the UK and the US that when a relatively large cohort of young men enter the labor force, their hourly or weekly earnings relative to older men are depressed. However, for other European countries such as Sweden (Klevmarken, 1993) and the Netherlands (Hartog *et al.*, 1993) the cohort size was not found to have an impact on the age-earnings profile. A plausible explanation might be that the Netherlands and Sweden have wage-setting structures which differ quite markedly from those of the US and the UK. More rigid wage structures forced upon employers by unions or government will give rise to the prediction that cohort size mainly affects the relative unemployment of different age groups, since the price of labor is assumed to be fixed. For instance, workers born in large cohorts would be expected to experience higher unemployment rates when they are young because their relative earnings are not adjusted to their relative numbers. Schmidt (1993) and Ermisch (1988) find evidence for this cohort pattern of unemployment. These findings suggest that small generations entering the work force in the years to come are likely to receive higher wages and experience fewer unemployment spells at the start of their careers in contrast to the preceding baby-boom cohorts. These cohort effects are quite important since the level of an individual's initial wage affects wage levels throughout a person"s career if the steepness of the profile remains unchanged. Cohorts born in the trough of the European baby bust (the late 1970's) are most probably the ones enjoying good lifetime earnings prospects, because — as theory (Smith, 1981) predicts — slightly larger cohorts precede and follow them.

5.2.3. The Transition from Work to Retirement

The transition which has received most attention in the academic and popular press is the switch from work to retirement. The "culprit" in the stories told about the early retirement of workers from the labor

force is usually the welfare state with its many exit routes, extensive benefit outlays and the high tax rates that discourage labor participation. The evidence about these effects of the social security system is clear and unambiguous (Gruber & Wise, 1998; Kapteyn & De Vos, 1998; Rust & Phelan, 1993): social security and early retirement programs have been pivotal in bringing about early retirement around certain ages. The high replacement rate in combination with a high marginal tax rate on labor earnings, provide a powerful incentive to retire as soon as the worker is eligible for early retirement. In the Netherlands, the early retirement age is around 60 years. At that point in the life course the implicit marginal tax rate on net earnings would be more than 100 per cent, that is, working an extra year would imply that one loses more than one gains from welfare entitlements.[2] Needless to say, many people in the Netherlands have made use of the option to retire early.

The mystery of the transition from work to retirement is that with an increase in life expectancy the date of retirement should in theory show an upward movement and not a downward trend. Of course, the mystery is partially solved when one takes into account the high implicit marginal tax rates on work shortly before the early retirement date as set by governments, and the fact that the retirement decision may not be prompted by the circumstances and preferences of the worker alone. Theeuwes and Lindeboom (1995a) have shown for the Netherlands that approximately 25 per cent of the workers who retired early were more or less forced to do so by their employers. Early retirement may therefore not be seen as the sole problem of the employee. Theeuwes and Lindeboom (1995b) show furthermore that the circumstances at a particular time dominate the cohort effects (or in demographic terms: the period effects dominate the cohort effects). This means that the initial conditions at the time of birth are not central to predicting the transition from work to retirement. The state of the economy at the time that early retirement decisions are made seems to dominate over cohort-related factors. With hindsight, this observation is not strange as the ulterior motive to use early retirement programs in the seventies and eighties was a feeling of solidarity among the older workers with the — mostly young — unemployed. By retiring, older workers could offer young workers the chance of obtaining a regular job. Like most initia-

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[2] To be more precise, Kapteyn and De Vos (1998) define the implicit tax rate as the change in social security wealth relative to what an individual would earn over an extra year's work, where social security wealth is the actuarially discounted sum of future benefits of all social security programs combined, minus the actuarially discounted sum of future contributions to these programs.

tives which seem sympathetic at first sight, the initial purpose of early retirement schemes was soon forgotten and organizations started using these programs to "buy out" older workers.

One might obtain the impression that taxes and pension schemes are the dominant factors underlying the long-run decline in labor force participation. Recent evidence from a life course perspective, however, sheds new light on this popular explanation. Costa (1996) finds strong evidence that the tendency toward retirement and earlier ages of retirement in the US began well before public-policy legislation of the New Deal. Between 1880 and 1930 labor force participation by men aged 65 years and older dropped from 78 per cent to 58 per cent. By comparing retirement rates found in the records of the first major pension program in the US — a pension program for Union Army veterans of the Civil War — with current rates, Costa found that 70 per cent of the decline in the labor force participation rate as experienced among white males aged 65 and older between 1880 and 1990 occurred *before* 1960, and much of this decline occurred before the passage of the Social Security Act. Over time, there has been a clear trend in a number of factors determining the transition from work to retirement. At first there was a strong relationship between income and retirement. Estimates of elasticities with respect to pension income suggest that the Union Army veterans were very responsive to retirement income. In 1900 the elasticity was 0.73 and in 1910 it was 0.46. Recent elasticities are much smaller and are, in fact, almost zero (Costa, 1998). This decreasing responsiveness is due in part to the fact that the income position of many workers is no longer close to subsistence levels. Furthermore, the influence of leisure goods on retirement decisions appears to be increasing. In that respect, the finding by Henkens and Tazelaar (1994) and Henkens (1998) that early retirement is not much affected by financial incentives, is in line with Costa's results. The role of income in determining the transition from work to retirement is limited, and according to Henkens (1998) the say of the partner in determining retirement is significant. The quality of leisure time in the retirement period seems to play a decisive role in making this transition. Workers retire early in the belief that such a step is an investment in their health status, thereby enabling the worker and his or her partner to enjoy the retirement period. Kerkhofs and Lindeboom (1997) show that working until the official retirement age of 65 speeds up the process of health deterioration. Retiring early at age 55 initially does not improve the health status of a person compared with that of a person who continues working. Only after six years does one see that the health status of early retirees is better than that of workers of a similar age and job status.

5.3. SAVINGS OVER THE COURSE OF A LIFE TIME

The transition from work to retirement is often financed by savings generated during the working period. In making this transition, labor income is replaced by income derived from capital. Theories of saving are, however, difficult to test as the most crucial aspects of saving are hard to measure. The life-cycle theory of saving, for example, states that people accumulate savings during their active working careers and decumulate their savings during retirement. This theory of savings is not easily confirmed because people receive and make transfers; this makes it difficult to distinguish which part of a person's income is actually saved for their own retirement, which part is saved for the benefit of their children and which part is received from parents or other relatives. An anomalous finding in the literature on savings is that the old and retired keep on saving and that the very old even increase their savings (see Börsch-Supan & Stahl, 1991). The main reason why people increase their savings at very old ages is that their consumption patterns are shaped by steadily decreasing needs while pension income remains more or less constant. Although this explanation seems plausible, this finding may well be a statistical artefact. The source of this anomalous finding may lie in the consumption and income data as registered by the statistical offices. Savings in studies of this sort are defined as the difference between income and consumption. When one of the two variables is not measured correctly, these so-called anomalous findings may arise. With the aid of three different types of panel data[3] Alessie *et al.* (1997a) show that there must be a data problem since the surveys which record increases in wealth and self-reported savings do not confirm this finding. The authors have also gathered information which gives some clues as to the direction of intergenerational transfers and savings motives (see Alessie *et al.*, 1995). Panel data show how unevenly wealth is distributed among the elderly and that decumulation of the stock of savings does not take place until a very advanced age. Consumption in old age is financed primarily by social security benefits and (contractual) pension savings. Privately owned savings tend to be very small and seem to function as a buffer for lean times. The absence of decumula-

[3] To with: the Socio-Economic Panel (SEP) of Statistics Netherlands with data on a wide range of financial assets and liabilities, the Consumer Expenditure Survey (CES) with data on household income and consumer expenditures; and the VSB Panel, a panel supported by the foundation of the Verenigde Spaarbanken (VSB, United Savings Banks) which reports the results of a survey on self-reported savings and savings motives.

tion of wealth in old age seems to suggest that bequest reasons are a strong motive for saving. A questionnaire corroborates this feeling by looking at people's savings motives in a more direct manner. Among rich households in particular, people give bequest motives as a reason for saving money (see Alessie *et al.*, 1997b).

Just as transitions in the labor market are affected by the time of birth, so are savings affected by the initial macroeconomic and demographic circumstances under which people start a career. The most straightforward reason why this is so is that the level of savings depends directly on the wage rate and as each new generation starts with a higher initial wage rate (Easterlin *et al.*, 1993), savings will also start at a different level. There are, of course, other reasons why cohort differences may exist in savings behavior: the real interest rate, the emergence of capital markets, the inflation rate, imbalances on the housing market, all these factors can make a considerable difference to the absolute *level* of savings and the savings *rate* (see Hurd, 1990). Besides these economic factors, demographic events may also lead to cohort differences in savings behavior. The delay in the age at first childbirth and the decrease in the number of children are among the most prominent changes which have had an impact on lifetime income and consumption (see Attanasio, 1998; Attanasio *et al.*, 1995; Nelissen, 1994). Attanasio and Banks (1998) have recently shown, with the aid of counterfactuals for the US and the UK, how cohort-specific differences in the timing of children, the availability of female labor in the household and the number of children present can affect the level of savings. By imposing present-day family patterns (of the cohort born during the years 1955–1959) on the family circumstances of older cohorts the authors track how demographic structure matters in savings behavior. If the older cohorts had had the same high level of female labor supply as the young cohort born in the late fifties, their saving rates would have dropped considerably. Delaying childbearing by two years without changing the total number of children will flatten the saving profile over the life course, with greater savings than in the past at the beginning of the life course (as the older cohorts will have fewer children in this thought experiment) and less in late middle age (when they have more children). The biggest change, however, occurs when the total number of children changes. If the older cohorts had had the same number of children as the younger cohorts they would also have saved considerably more.

An aspect which Attanasio and Banks (1998) have unfortunately not considered was the effect of life expectancy on savings. What distinguishes the older cohorts from the younger (and probably future) birth cohorts is that life expectancy has increased considerably, making

the accumulation of savings necessary. For a stylized model of life course savings[4] Van Dalen (1992) has shown in which direction the long-term savings rate varies when life expectancy increases or when people retire at increasingly early ages. Table 5.3 presents the steady-state savings figures which are aggregate figures comprising the savings of the working population and the dissavings of the retired. Naturally, the savings rate for each individual will vary over the life course as income and consumption levels differ and grow at different speeds. An important parameter in this model is the preference (σ) for a smooth or steep

Table 5.3. Aggregate savings rates (as percentage of national income)

	Preference (σ) for smooth consumption path over the life course[a]				
Life expectancy[b]	$\sigma = 1/3$	$\sigma = 0.5$	$\sigma = 2/3$	$\sigma = 1$	$\sigma = 1.5$
75	15.4	10.0	7.1	4.0	1.9
80	19.7	14.0	10.9	7.6	5.4
85	23.4	17.5	14.2	10.7	8.3
90	26.7	20.5	17.1	13.4	10.9
95	29.7	23.2	19.6	15.8	13.1
Retirement age[c]					
65	15.4	10.0	7.1	4.0	1.9
63	16.9	11.8	9.0	6.1	4.1
60	19.2	14.4	11.8	9.1	7.2
57	21.3	16.8	14.4	11.9	10.2
55	22.6	18.4	16.1	13.7	12.0

[a] The preference parameters σ indicate the smoothness of the consumption level over the life course, ranging from the parameter value 1/3 which indicates a relatively steep and rising consumption profile over the life course, to 1.5 which represents a relatively flat consumption path. The shaded rows represent the benchmark case.
[b] The calculations are based on entry onto the labor market at age 20 and retirement at age 65 with the real interest rate at 4 per cent, time preference at 3 per cent, population growth at 1 per cent per year and wage growth at 3 per cent per year over the life course.
[c] As (a) but now the retirement date is varied and life expectancy is fixed at age 75.
Source: Van Dalen (1992).

[4] Based on the consumption model of Summers (1981).

consumption path over the life course. If people prefer a smooth consumption path (e.g. $\sigma = 1.5$) they will start their lives with a consumption level that is close to their wage income level, hence they need not save considerable amounts of money. However, if people want a steep and rising consumption path over their lifetime (e.g. $\sigma = 1/3$) they will start with a lower initial consumption level and save far more than consumers with a preference for smoothness in order to finance their lifestyles of ever rising consumption levels.

As shown in Table 5.3, both trends toward longer life and earlier retirement imply considerable changes in savings rates. An increase in life expectancy by ten years implies a tremendous increase in the savings rate as a longer period of inactivity has to be financed by a relatively shorter period of activity. The consequences of early retirement are perhaps even stronger as the decision to retire early is a decision that simultaneously *decreases* the period of activity and *increases* the period of inactivity. The simple warning that "there is no such thing as a free lunch", aired repeatedly by Milton Friedman, seems to be more than relevant in the case of early retirement from the labor force. Someone has to pay for a prolonged period of inactivity and the question right now is whether the collective or the individual has to pay for this decision.

The above calculations were made with the tacit assumption that individuals or pension funds save to provide for income during retirement. However, it would be a mistake to think that retirees largely depend on privately accumulated savings. At present, public pensions make up most of the income in the retirement period of the life course, especially for lower income groups (see Börsch-Supan, 1998). In some countries, such as the Netherlands and the UK, the role of occupational pension programs should, however, not be neglected as they provide a large share of retirees' income (see column "other transfers"). These facts are clearly illustrated in Table 5.4.

Contrary to private savings, public pension systems do not involve the reservation of income as these pensions are generally financed on what is known as a "pay-as-you-go" (PAYG) basis: a finance system whereby the work force pays for the social security benefits of the old and retired. In other words, no savings are generated and the social security budget is, by definition, balanced each and every period. Given the dominant position of social security in western societies and the fact that social security differs in more than one way from private savings, the next few sections will focus on the role of social security in the life course and the forces which shape it.

Table 5.4. Composition of retirement income

		Transfers			Self-provided income			
		Public	Other	All	Earnings	Assets	All	Total
France[a]	Singles	67.8	..	67.8	7.2	25.0	32.2	100
	Couples	66.9	..	66.9	9.3	23.8	33.1	100
Germany	Singles	78.3	5.9	84.3	6.9	8.9	15.7	100
	Couples	68.5	5.3	73.7	17.3	8.9	26.3	100
Italy	Singles	60.5	..	60.5	6.0	33.5	39.5	100
	Couples	34.7	..	34.7	21.8	43.4	65.3	100
Netherlands	Singles	65.7	30.8	96.4	0.1	3.4	3.6	100
	Couples	55.6	36.9	92.5	3.0	4.2	7.5	100
UK	Singles	61.5	18.8	80.3	4.7	15.0	19.7	100
	Couples	45.0	24.0	69.0	16.9	14.1	31.0	100
USA	Singles	45.8	25.5	71.4	8.3	20.4	28.6	100
	Couples	39.7	25.0	64.8	14.2	21.1	35.2	100

Note: the income sources are depicted as a percentage of the gross income of families with a head of family of around 67 years of age.
[a] Mandatory occupational pensions form part of public transfers in France; earnings may come from younger spouses and/or coresident children.
Source: Börsch-Supan (1998).

5.4. SOCIAL SECURITY OVER THE COURSE OF A LIFE TIME

Social security is usually associated with the introduction of the welfare state, a state that promises to provide care from the cradle to the grave, as described in William Beveridge's blueprint (1942). Before that time, income support was, of course, not absent from most twentieth-century societies, but the extent of support was limited and not universal. The aging of the adult population can be seen as a leading force in the process of establishing and extending the welfare state (Lindert, 1994). After the Second World War most countries started to introduce full-fledged income support systems. The number of countries with an old-age/disability/survivors' program increased from 33 in 1940 to 155 in 1993 (Kinsella & Gist, 1995). The reasons for introducing social security are both opportunistic and of a more noble nature. Governments have intervened in this area of the life course for reasons ranging from myopia, i.e. the possibility that people may lack the farsightedness to save for their own retirement, and the fact that some people do not earn enough during their working lives to save for retirement, to inad-

equate savings instruments and insurance market failures. The argument of inadequate savings instruments refers to the possibility that capital markets are underdeveloped and macroeconomic circumstances may be too volatile for savings to be of any use. The risks of expropriation or double digit inflation figures are, for instance, important factors discouraging savings. Insurance market failure does not only occur in underdeveloped countries; it is more widely spread as it refers to the phenomenon that private insurance companies may select their participants on the basis of profit maximization (better known as "adverse selection") which will leave less fortunate people outside the insurance contract. Certain risks, e.g. risks of longevity and disability, are therefore not adequately covered by private insurance.

Social security solves some of these problems, but at the same time it gives rise to new problems which were not foreseen at the time of introduction. The fact that social security was widely introduced shortly after the war and financed on a PAYG basis gave rise to a host of income distributional consequences. The introduction of public pension schemes led to windfall gains for cohorts already in the labor market or retired at the time of introduction. These lucky generations therefore received benefits or were to receive benefits for which they had never paid contributions on an actuarially fair basis. As most of the industrialized countries today have to deal with a mature public pension system, the gains of social security do not seem as large as they were during the initial stages. The high premium and tax rates needed to sustain the programs and the prospective aging of the population have made social security a bad financial deal for young generations and future generations. To see how aging affects social security tax rates, we shall examine the case of public pensions. As mentioned, these pensions are based on the PAYG principle:

$$\tau \times W \times N_W = B \times N_R \tag{5.1}$$

The left side of the equation represents the income side of the social security system. The tax rate τ times the wages W of the working population N_w is divided among the retired N_R who each receive a benefit B. Usually, the benefit is stated in terms of a replacement rate θ of the average wage rate W (i.e. $B = \theta W$). Governments try to guarantee this replacement rate either by automatic indexation or on an *ad hoc* basis where indexation is contingent on economic growth and the balance between the working population and the retired population. With the help of this simple accounting equation we can solve for the equilibrium tax rate to see how demography affects this rate:

$$\tau = \theta \, N_R/N_W \tag{5.2}$$

The ratio of the inactive and retired population to the active population is the main driving force behind the development and level of the tax rate. For instance, an increase in life expectancy will raise the number of inactive people and with a fixed retirement date it will therefore also raise the tax rate (see Van Dalen, 1996). The retirement date is the most important economic parameter as it is the dividing line between the working and non-working population. When this dividing line is lowered, the number of pensioners increases whilst the number of workers decreases.

As history has shown, developments with respect to demography and economics are not in the least constant and cohorts experience different tax rates and benefits, depending on which items of the budget governments choose to vary, see equation (5.1). If governments decide to sustain current benefit replacement rates, tax rates will have to rise in order to cover social security expenditures, thereby shifting most of the burden of public pensions to the future work force: children who have not yet entered the work force and unborn generations. The degree to which they will have to increase is, however, not fixed as knowledge about the future course of mortality trends is highly uncertain. Lee and Tuljapurkar (1997) show that each additional year of life expectancy requires a 3.6 per cent increase in payroll tax in relation to the initial levels. If, say, the life expectancy for the sexes combined increases to 87 years in 2070, the payroll tax rate would have to increase from 12 per cent to 24 per cent. But if life expectancy increases to 100 years, the payroll tax rate would have to rise to no less than 32 per cent.

With respect to the past, it is clear that when social security systems were introduced, the aged experienced a windfall gain, as they received benefits for which they had never paid any taxes. As can be deduced from Table 5.5, the redistributive role of public pensions (in this case the Dutch public pension scheme, founded in 1957) has become less effective over time and part of the explanation lies in the maturation of the public pension system. The benefit-tax ratios denote the average public pension benefits and contributions over the course of a lifetime, adjusted for household composition and inflation, and a two-per cent discount rate is used to translate past and future payments into current values (for an extensive analysis see Nelissen, 1995, 1997). An actuarially fair pension fund would offer a benefit-tax ratio of 1.0. As shown in Table 5.5, this has not been the case.

Income has been redistributed from the young to the old and from the rich to the poor. The mechanisms behind these transfers are the

Table 5.5. Benefit-tax ratios for the Dutch public pension scheme, by income decile (ranked on the basis of equivalent before-tax income) and by birth cohorts

	Cohorts born in the years:			
Income decile	1930-1935	1936-1945	1946-1955	1956-1965
1	4.12	3.01	2.15	1.68
2	3.35	2.39	1.81	1.41
3	2.81	2.19	1.62	1.29
4	2.49	2.04	1.49	1.18
5	2.24	1.82	1.35	1.11
6	2.11	1.71	1.29	1.04
7	1.96	1.60	1.19	0.94
8	1.85	1.48	1.14	0.93
9	1.67	1.38	1.05	0.85
10	1.53	1.19	0.96	0.78
All	2.19	1.75	1.31	1.06

Source: Nelissen (1995, p. 445).

following. First of all, the cohorts who were working when social security schemes were introduced as well as those who were retired at the time enjoyed a windfall gain: they received more benefits than they had paid in taxes. As the system matures, more and more generations will experience that benefits and taxes are more or less balanced. High-income groups may even find that they pay more than they will ever receive in benefits. If the benefit-tax ratio is structurally below 1.0 for all income groups, the public pension scheme does not function like an actuarially fair insurance scheme. As shown in the last column of Table 5.5, this is already the case for the higher income groups of the youngest cohort: they will pay more in taxes than they will receive in benefits. Of course, actuarial fairness or efficiency is not the primary goal of public pension systems and should therefore be evaluated not only on the basis of efficiency considerations, but also in terms of the way in which income is redistributed. Table 5.5 shows that social security seems to have lost its effectiveness in redistributing income. The decreasing effectiveness of social security in redistributing income is primarily tied to the PAYG principle. The aging of the population exacerbates existing financial problems since the number of beneficiaries increases whilst the number of tax payers declines. Generational accounting of taxes and benefits on the basis of population forecasts almost invariably points to implicit *public pension deficits* in the near future: the discounted value of public

pension benefits exceeds by far the discounted value of public pension contributions (CBO, 1995; Kotlikoff, 1992). In other words, young and future generations will have to pay for these pension problems if nothing changes. Insofar these increases in social security costs are brought about by aging populations, it would seem fair to tax generations differently. By minimizing, or perhaps even neutralizing these cost increases, the benefits and costs of aging would be shared among different generations. A government that smooths the social security costs of aging offers, in a manner of speaking, an intergenerational "insurance" scheme which can improve welfare to a considerable degree (Brandts & De Bartolome, 1992). The tax increases implied by population aging can be viewed as a demographic "accident" against which generations should be insured as this type of risk cannot be diversified on the private capital market. Of course, social security is a collective arrangement in which there does not seem to be room for individual choice in buying such an "insurance policy". However, social security is governed by elected politicians whose existence depends on the support of voters (Van Dalen & Swank, 1996). What individuals value is therefore of some importance in matters of collective choice.

The key question with respect to social security is whether future generations will be willing to share the burden of public pensions and other social security programs. For their retirement income, today's workers are dependent on contributions by future workers. If these future workers declare the social security system null and void, today's workers will fall into a state of poverty since they cannot make up for this income loss once they are retired. Today's workers will therefore have to trust future generations. Past history of social security is not of much help in predicting the behavior of future generations. The current circumstances of the aging population are unprecedented. To find out how willing people are to pay and share, we can draw on the insights provided by experimental studies and surveys on the willingness to pay for public pensions and the motives for doing so. We shall discuss this issue at some length in the next section.

5.5. SUSTAINABILITY OF SOCIAL SECURITY

Individual income is made up of several components, and these change during the course of people's lives. In childhood, individuals are dependent on their parents for survival. In many countries the government takes care of the development (education) of children. As a result, consumption by children comprises voluntary transfers by parents and

compulsory transfers by the government. In adulthood, the average individual provides for him- or herself by earning an income of his or her own. Part of that income, however, is typically saved, and these savings and their accumulated interest payments are consumed during old age. How much individuals need to save in adulthood depends on the public transfers that people expect to receive when they are old. Obviously, if these transfers are large, there is less need to save. So, in one way or another individuals need to assess whether future generations will remain willing to sustain intergenerational transfers and/or whether they would prefer to be able to fall back on individual savings. In the latter case, current generations would act wisely to rely more strongly on savings.

This section sheds some light on the willingness of people to contribute to intergenerational transfer schemes. It does so on the basis of empirical research extracted from a survey and experiments conducted as part of the NWO Priority Program on Population Issues in the Netherlands (see Chapter 1 of this volume by Dykstra and Van Wissen). Laboratory research in the social sciences combines economics, psychology and demography. While economics is experiencing an upsurge in this interdisciplinary approach, McNicoll (1992, p. 405) points out that demography "has let itself become increasingly distant from the frontiers of psychology and the cognitive sciences in general".[5] Since this type of interdisciplinary research offers new insights, or at least reminds us that economics is a social science, we will discuss these methods at some length.

5.5.1. Willingness to Pay: Insights from a Recent Survey

If the well-being of individuals improves (or: if they attain a higher utility in the economists' jargon) as soon as members of other generations are better off, in particular if they have to give up income themselves to have this realized, then they may be called *altruists*. If, moreover, they believe that other generations have a right to earn a decent or fair return (not necessarily related to the market rate of return) on their contributions to the public pension system, they are motivated by considerations of *fairness* rather than by individual cost-benefit calculations, as generally assumed by economists. By means of questionnaires completed by individual respondents, Van der Heijden

[5] McNicoll's assertion is confirmed by an extensive science study by Van Dalen and Henkens (1999).

et al. (1997a) investigated whether individuals care about the income which members of other generations have at their disposal (altruism) and whether, in evaluating public pension schemes, the ratio of pension benefits received to contributions paid played a part (fairness) in their well-being. In a way, the question of fairness depends on how the benefit-tax ratios of Table 5.5 are interpreted. This large-scale survey was carried out among a representative sample of the Dutch population in January 1994. Individuals were asked to evaluate several hypothetical changes in the public pension system that would affect their own income position and the income position of others. Furthermore, the changes in the public pension system would also imply changes in the ratio of pension benefits to contributions.[6] Respondents were thus not asked to evaluate fairness or altruism directly, but to evaluate the outcomes of the pension system under various scenarios. The alternative scenarios had varying income effects for different generations. The possible impact of feelings of altruism and fairness could then be inferred from the answers given by estimating a statistical model. Altruism was measured by the effect of another generation's income on one's own welfare, and fairness was measured by the individuals' evaluation of the ratio of pension benefits to contributions which they and other generations had received and paid, respectively.

The results showed that both altruism and fairness play a significant role in the evaluation of public pension schemes. By way of illustration, we present in Table 5.6 some of the results regarding the existence of altruism. The table reproduces coefficients of a regression analysis. The numbers indicate whether a respondent's own income and the income of representative individuals of other generations determine the respondent's well-being. For instance, the well-being of the young increases by 15.3 per cent if their own income rises by 10 per cent. If individuals are driven by selfish motives only, other generations' incomes should have a zero coefficient in the table. The table shows that the coefficients are (statistically) not equal to zero among the working population only (i.e. young and middle-aged generations), indicating the presence of altruism. The elderly appear to be somewhat less altruistic as their well-being is hardly affected by changes in the income of younger generations.

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[6] The basic question asked was: "How would you evaluate a situation with lower (higher) contribution rates and lower (higher) pension benefits?" Respondents were provided with information on the consequences of a hypothetical change for their own households as well as for other households. They had to grade different scenarios and these grades were used as a representation of the well-being of the individuals concerned.

Table 5.6. The importance of income in the well-being of respondents

	Generation		
	Young	Middle-Aged	Old
Respondent's own income	1.53	1.00	0.58
Other generations' income	0.24	0.28	0.08[a]

[a] This coefficient is not statistically different from zero.

Table 5.7. Actual and estimated 'fair' rate of return on public pension contributons

For generation:	Actual rate of return[a]	Preferred by generation:		
		Young	Middle-Aged	Old
Young	1.2	1.49	0.97	0.93
Middle-Aged	2.4	2.57	2.67	2.44
Old	3.5	4.72	5.24	3.41[b]

[a] The actual rates of return are calculated from Nelissen (1994), assuming a real discount rate of 2 per cent and a real economic growth rate of 2 per cent per year.
[b] This value of the coefficient indicates a minimal required value instead of an optimal value.

From a statistical point of view, this low level of altruism among the elderly was not significant.

The effect of fairness on the well-being of individuals was rather small but all generations seemed to have a clear idea about the fairness of tax-benefit ratios. Table 5.7 presents a typical result. The table reproduces the actual rate of return on public pension contributions for particular generations together with the rate of return that members of other and the same generations would like them to obtain. Interestingly, the two older groups of respondents considered a below-market rate of return for the young to be fair. The middle-aged group, for instance, felt that the young should make a loss (0.97) on their contributions to the public pension system. An actuarial fair rate of return would have been 1.0. In other words, in the eyes of the older generations the young should pay more taxes during the course of their lives than they would receive in public benefits. On the other hand, the working-age population (i.e. the young and middle-aged) considered a relatively high rate of return

for the old generation to be fair. The young preferred a rate of return of 4.72 for the old, where a return of 3.50 would have been in accordance with the real world; the middle-aged even considered a rate of return of 5.24 to be fair.

In fact, the results of this project show that the young would be willing to support an increase in public pension benefits for reasons of fairness, but not out of altruism. Thus, speculation by the elderly about altruism by the young (as in Veall, 1986) is risky. However, if the elderly claim that a continuation of the PAYG system is "fair" (as is sometimes done in public discussions), the future elderly may stand a better chance of finding support for the public pension system. Here "fair" should be understood to imply that young and old share the view that it is not undesirable per se for older individuals to have a higher rate of return than younger individuals. At any rate, the predominantly one-way public transfers from the young to the old in western welfare states could be a result of the specific forms of intergenerational altruism and notions of fairness found in the study under consideration, namely that younger generations care more about older generations than vice versa and that the unbalanced gain from the system between generations is not considered to be unfair.

Finally, we add that the sustainability of the public pension system appears to be at risk. Although altruism and feelings of fairness appear to exist at present, these expressions of non-selfishness may be insufficient grounds for the continued support of the system given the expected aging of the population. Aging basically means that the price tag that is attached to altruism will show a higher price, making it more expensive for individuals to be altruistic. Increasing the price of altruism will imply that people will shy away from generous behavior, as they shy away from buying more bread as soon as the price of bread rises.

5.5.2. Willingness to Pay: Insights from Laboratory Experiments

One relatively new method to test economic theories is the use of laboratory experiments.[7] Over the past twenty-five years, the use of data gathered in economic laboratories has become well-established as an alternative to the use of natural data. Methodologists have often found

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[7] The first experiments in economics were conducted by Chamberlin as early as 1948 (Chamberlin, 1948). He presented subjects with a market environment. By allowing trade between subjects, namely graduate students, who were given a value (of an artificial good) or a cost, respectively, he tried to test whether competitive price and quantity predictions came true.

social sciences, notably economics and sociology, to be problematic because of the lack of experimentation in scientific inquiry. The controlled, repeatable laboratory experiments were thought to be impossible to execute. However, a flourishing industry of experimentation in economics has yielded new insights into individual responses to auctions, lotteries, and two-person bargaining situations (see Hoffman *et al.*, 1998). A recent addition to this field of study is presented below and concerns a series of studies of decision-making with regard to public pensions and private savings. The reason for undertaking a more detailed inspection of this type of decision-making in a controlled experimental environment is the intellectual stalemate that has arisen in conventional economic studies of pensions. At the end of the day, the direction in which taxes and transfers will move depends on individual preferences and decision-making in unprecedented circumstances. Experiments can shed light on the willingness of individuals to contribute to public transfers, be they intergenerational or intragenerational. So, this type of research is complementary to the survey research discussed in the previous subsection.

5.5.3. Reciprocity between Generations

The actual willingness of individuals to contribute to a transfer system in a laboratory setting was investigated by Van der Heijden *et al.* (1997b, 1998a, 1998b). The basic design of their experiments was simple. Putting an arbitrary number of people in a laboratory, arranging them in a sequential order, and letting them decide on transfers to other people, provides information which sheds some light on individual decision-making. Each of the participants is, however, linked to another person. For instance, in an overlapping-generations (OLG) experiment there are always two persons (generations) present who live in two periods. The transfer game is that at a certain point in time person 2 has to make a decision on a transfer to person 1, in the next period person 3 in turn has to make a decision on a transfer to person 2, and so on. The person who makes the decision is rich (young) when he makes the transfer decision and poor (old) when he receives the transfer. In a way, this setting mimics some of the essentials of the income position of people during the course of their lives.

In the second setting the transfers no longer occur *between* generations but *within* generations: player 1 decides about a transfer to player 2, after which the latter decides about a transfer to the former. Again, the player who decides is "rich" in the sense that he or she has a large endowment, while the receiving player is poor in the sense that he or

she has a small endowment. For each participant it is of prime importance that their income is spread over the two states (young versus old, and rich versus poor). In order to make the participants take these experiments seriously they actually receive their experimental income in cash. In both settings it would be collectively efficient or wise for all individuals to engage in voluntary transfers. Through transfers, consumption is spread over time (being young and being old) or across states of nature (being rich and being poor). On the other hand, transfers are individually irrational because the direct private benefits of giving a transfer are negative. The money people give to others is simply lost and one can only hope that the gesture will be reciprocated.

In the OLG-treatment the experimental set-up described can be used to derive and explain the evolution of transfer systems such as public pension systems. It might be of some interest to examine whether the presence of a voluntary "social contract" between successive generations can explain the evolution of transfer systems. Even if generations are not entirely altruistic towards other generations, (implicit) social contracts with positive intergenerational transfers may result.[8] Ingredients of contracts of this kind include, first, the obligation to provide the elderly with a transfer equal to a prescribed level if they have observed the contract themselves, and, second, a sanction if the elderly break the social contract.

A less sophisticated but related explanation is that successive generations "build confidence" during the course of their lives in the transfer system by looking at the system's past performance. Public transfers may reach socially optimal levels, if confidence in the system grows as a result of the fact that successive generations continue to apply the scheme.[9]

The relation between past and present decisions plays a decisive role in both the social contract approach and the confidence-building approach. By monitoring the behavior of past decision-makers, current decision-makers decide whether they wish to support a transfer system. So, if positive transfers have emerged in the past, current decision-makers may be inclined to support positive transfers. To test such a hypothesis in a controlled experiment, the opportunity for the present generation to monitor and react to the transfers of previous generation(s) could be used as a control parameter in a laboratory experiment.

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[8] See Sjoblom (1985); and Kotlikoff *et al.* (1988) for a related model. See Veall (1986), for a model that demonstrates that altruism in itself does not engender intergenerational transfers.

[9] See Verbon (1987) and Van Dalen and Van Praag (1993) for this approach.

By comparing the results of experiments where monitoring is allowed to experiments where such monitoring is not allowed we can test whether the *monitoring opportunity* supports the development and stability of a voluntary system of intergenerational transfers. So, two information treatments were used in the experiments. In one treatment, player generations are supplied with information about the transfer levels of previous generations. In the second (control) treatment they are not supplied with this information. So, if monitoring and the possibility of using incentives and sanctions across generations add to the development and stability of a voluntary transfer system, this should show up as a difference between the two treatments.[10]

Contrary to what was expected, the main result appears to be that the level and stability of the intergenerational transfer system is not furthered by the opportunity of monitoring transfers of past generations. The transfers in both scenarios were almost the same. However, subjects never made the theoretically optimal number of transfers. Participants seemed to weigh the collective interest of a transfer scheme against the individual temptation of discarding these schemes. The average transfer was half the value of the (theoretically) optimal transfer. This result corresponds well with the "average" willingness of subjects to contribute taxes in a public-goods experiment (see Ledyard, 1995, for a survey of the literature). This would suggest that in the OLG experiment the public-goods factor creates a form of social cohesion that is independent of the opportunity of monitoring. The average individual appears to have a generic, albeit moderate willingness to support transfer programs, almost irrespective of the past behavior of the recipient. It is worth noting that in the above experiments interpersonal transfers are the only vehicles for spreading consumption over the life course. However, if savings were included in these experiments, the size of transfers would shrink substantially. Having said that, solidarity between generations would not be wiped out completely (See Van der Heijden *et al.*, 1997b for details).

5.5.4. Reciprocity within Generations

The above results, based on a survey and experiments, indicate that in an intergenerational framework subjects are willing to support

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[10] For exact information on the number of sessions, the period of experimentation, the recruitment of subjects, and so on, we refer the reader to the original publications. Note that in all experiments every subject participated in more than one round of the game he or she was in.

anonymous "older" generations. The main driving force appears to be a generic willingness to maintain intergenerational solidarity rather than reciprocity. It is of interest to investigate how these results carry over to the *intra*generational case. Many experiments have considered the role of altruism and reciprocity in the bargaining process between two persons. In gift exchange experiments, for example, the responder's return gift is often bigger than the proposer's gift (Berg *et al.*, 1995; Fehr *et al.*, 1993, 1998). So, reciprocity may be found in bilateral relationships if both sides have some bargaining power in the sense that they can sanction the behavior of other players. Experimental evidence suggests, furthermore, that the latter condition is not only sufficient but also necessary for gift exchange to occur.

Van der Heijden *et al.* (1998a, 1998b) have compared the results of experiments where subjects engage in bilateral gift-giving with those of experiments where transfers are made to "previous" young players. The question of cooperation in an overlapping generations setting is, of course, closely related to the question of cooperation in bilateral exchanges. While overlapping-generation games may be said to describe the links between generations, bilateral games may be assumed to provide insight into the popular support for unemployment or disability schemes. The potential for cooperation and reciprocity may be expected to be greater in bilateral games since one player may reward or sanction another player in response to the way in which the former *him- or herself* was treated by the latter. In the OLG game, however, rewards or sanctions are given to the "older" player in response to how *someone else* was treated by that player. In bilateral games, opportunistic players may be inclined to make no return gifts. If subjects who participate in a bilateral game are in frequent contact with the same opponent, however, gift exchange is likely to occur. An additional variable was therefore introduced in bilateral gift experiments, namely the way in which individuals were matched in every round. In the so-called *strangers treatment*, individuals were rematched with a new opponent in each new round, while in the *partners treatment*, no rematching occurred. So, in the latter treatment, subjects play an iterated game with the same opponent, whereas in the former treatment each new round consists of a one-shot game, leading one to expect participants to behave opportunistically. Contrary to strangers, partners share both a past and a future. This makes it easier to build up reciprocity. Partners are able to react almost directly to each other's actions. With different opponents (strangers) in each new round, it is more tempting to ride freely on the gifts of the others, and individual defection and non-cooperation are more likely to go unpunished.

The average number of transfers was very large in the case of bilateral partners (close to the optimal value of transfers), whereas in the case of bilateral strangers the transfers dropped considerably to a quarter of the optimal number of transfers. So, the partner treatment leads to higher transfers than the stranger treatment, while the OLG treatment takes an intermediate position. As noted above, in the OLG experiments a chain of players are tied together, whereas in the bilateral strangers experiments the players act in continuously changing pairs. This may well explain why the subjects in the OLG-game experiments consider themselves to be part of a group, more or less sharing a common fate. As social identity theory suggests (Tajfel & Turner, 1986), when subjects consider themselves to be members of a group they are more inclined to take account of the group interest than when they see themselves as separate individuals. Hence, the OLG experiments elicit a more group-oriented attitude than the bilateral strangers experiments. In the bilateral partners experiments, on the other hand, subjects continuously interact with the same persons and they all have some influence on the opponents with whom they exchange transfers. As a result, in a bilateral partners setting, individuals are able to build confidence in each other's cooperative attitudes.

Obviously, one should beware of generalizing the above results to the real world. Since experiments use subjects who perform artificially constructed tasks they are essentially simulations. The task of the experimenter is, of course, to yield reliable data by focusing on the essential elements of the decisions in question in the real world. In our opinion, the results show that the creation of social cohesion is of paramount importance in generating support for transfer systems. If individuals consider themselves to be anonymous members of society, free-riding on collective transfer systems is likely to occur. Interestingly, collective intergenerational transfer systems appear to create social cohesion and therefore tend to be more strongly supported than intragenerational transfer systems. The latter may lead to substantial welfare gains, however, if they are embedded in a structure in which individuals see themselves as members of a non-anonymous group.

5.6. CONCLUSIONS

During the course of their lives people go through a number of status changes. The occurrence and timing of these status changes are not natural constants; they differ as the demographic, economic and political circumstances change. In the previous overview we have pre-

sented some evidence of the changing character of the life course with respect to work, savings and social security. Social security programs have formalized part of the life course by defining certain states. Benefits and taxes have also — indirectly — influenced choices with respect to work and private savings. The most notable effect with respect to changes in work is the delayed entry onto the labor market as a result of increases in educational attainment, early retirement from the labor force, and the effect of economic circumstances on career choices made during the life course. The biggest change experienced by generations living in the post-World War II era, is the introduction and extension of social security systems and collectively financed early retirement schemes. This has led to low participation rates by older workers, although recent long-run evidence suggests that a large part of the decrease in labor force participation is caused by steadily rising incomes rather than social security transfers. Nevertheless, the income of retirees in most countries is primarily financed by public transfers (see Börsch-Supan, 1998), thereby making the issue of sustainability of social security an important topic in the public domain.

The idea that social security is an unsustainable collective arrangement is not vindicated by the findings of laboratory experiments and surveys in which respondents were asked about their preferences and willingness to make transfers to other generations. However, the survey showed that one should not push the willingness of the working generations to pay for the old too far. If the price of social security becomes too high — and with population aging this is likely to occur if no policy measures are taken — then individuals will want to opt out of the public transfer system. Of course, decisions on public transfers are made by governments rather than by individuals, but governments in most countries are elected and therefore not entirely immune from what the electorate wants. The desires of voters are indeed real and not some figment of imagination as brought to light in time series evidence (Van Dalen & Swank, 1996) or experiments and surveys as reviewed in this chapter.

As for the future, it is more than likely that the structure of the life course, especially the retirement period, will increasingly become the responsibility of individuals since there are limits to what collective systems such as social security schemes are able to provide. Having said that, it will never be the sole responsibility of individuals since social security systems are able to solve problems that decentralized market systems would never be able to solve. The biggest challenge for society will therefore be to find a balance between the pros and cons of social security and private initiative in markets and families. Perhaps then, will we succeed in achieving the best of both worlds.

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6. RESIDENTIAL RELOCATIONS IN THE LIFE COURSE

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Abstract. The life course perspective has proved to be a powerful instrument in developing a general theoretical framework to interpret a variety of phenomena pertaining to residential relocation. The first phenomenon is that relocations are instrumental to goals arising from a specific life course trajectory or "career". It is important to distinguish between moves triggered by the educational career, the labor career, the family career and the housing career. The second phenomenon is that even those careers that are not the actual trigger for the move, are still pertinent to the relocation decision. These other careers condition the decision by providing the resources for the move and by imposing restrictions on geographical mobility. The third phenomenon is that residential relocation, which has a positive effect on the triggering career, can have a detrimental effect on other careers or on the careers of other household members. The attractiveness of the life course perspective is that it allows for feedback effects between these phenomena, thereby improving the understanding of relocation behavior.

6.1. INTRODUCTION

In addition to fertility and mortality, residential relocations are the third component determining the size and structure of a population. Thus residential relocations are an important topic of research for population scientists who have tended to limit the study of residential relocations to just those relocations which cross administrative boundaries, denoting these as migration. The practice of limiting the study of relocations to cross-boundary migration stems from the tradition of demographic forecasting. However, this definition of migration is just a specific measurement of spatial mobility processes that are continuous in time and space (De Gans, 1994; Willekens, 1987).

As population scientists become ever more interested in explaining demographic phenomena rather than just describing and forecasting them, the option to restrict residential relocations research to just those moves that cross arbitrary administrative boundaries becomes less viable. Population scientists now tend to show an interest in all residential relocations, albeit often with a specialization in either short-distance moves (residential mobility) or long-distance moves (migration). If both types of moves are studied simultaneously, a distinction between short-distance and long-distance moves is usually thought appropriate (e.g. Courgeau, 1985; Mulder, 1993; Wagner, 1989a). In the distinction between short-distance and long-distance moves the crossing of administrative boundaries is sometimes used as a criterion, but only to serve as a proxy for distance. International migration has remained a separate research topic.

The study of residential relocations is relevant to governments and policy makers because relocations are important for three social domains: the processes of household formation and dissolution; the demand for amenities such as housing, education, shopping and recreation; and the supply of labor. Housing is obviously a crucial aspect in the study of residential relocations. Access to housing opportunities is a necessary condition for household formation. At regional levels, housing is demography-driven in the sense that suppliers of housing react to the development of the number of households in the region. This number is determined by the rate of household formation and dissolution and by the regional migration balance which originates from the availability of labor and educational opportunities. At the local level, housing "drives" demography as the local supply of housing opportunities has an impact on both the residential relocations within the area and on the local household formation rates (Hooimeijer & Heida, 1995).

Long-distance migration is generally appreciated and facilitated by employers and governments as it helps to bring about equilibrium in regional labor markets and reduces long-distance commuting. It is seldom acknowledged that the two aims of stimulating home ownership and facilitating long-distance moves might be in conflict with one another. Home ownership forms a serious barrier to relocation (Courgeau, 1985; Mulder, 1993; Wagner, 1989a).

In the NWO Priority Program on Population Issues, residential relocations were the focus of several projects. The projects have two features in common. First, the use of a life course perspective, if not always life course data and second, the combination of micro and macro approaches in the explanation of relocation behavior. During the course

of the Priority Program, several building blocks of a theoretical framework were developed: These have guided most of the program's research into residential relocation. In Section 6.2 an attempt is made to integrate these building blocks into one theory of residential relocations.

Empirical research into residential relocations is very diverse. The empirical questions answered within the Priority Program can be split into six types. The first seeks to unravel the way in which people reach decisions to relocate. One could denote this research as process-orientated: It focuses on the decision process preceding the relocation, thereby aiming to open up the "black box" between explanatory factors and relocation behavior. The second seeks to explain residential relocations as such: Who moves, and under which circumstances? The third seeks to explain specifically those residential relocations which have the intention of forming new households: leaving the parental home. The fourth seeks to explain residential relocations towards certain destinations: Who moves to the city, who moves to the suburbs? The fifth seeks to explain the type of dwelling people choose after moving, and more specifically its tenure: Who moves to owner-occupied dwellings, who moves to the rental sector? The sixth is oriented to the consequences of residential relocations, rather than their causes.

The most frequently used data set for residential relocations research within the Priority Program is taken from the Housing Demand Surveys, conducted every four years by Statistics Netherlands. These are not longitudinal life history surveys, but cross-sectional surveys containing short-term retrospective information on household and housing situations. They also contain information about education levels and current income. It is therefore possible, using the Housing Demand Surveys, to assess the impact of situations and events in the life course trajectories of household and housing, but the coverage of the educational and occupational trajectories is much less detailed. In 1993, two retrospective life history surveys became available for the Netherlands: the ESR or Telepanel data (ESR/STP, 1992) and the Netherlands Family Survey (Ultee & Ganzeboom, 1993). The ESR data were first used for an analysis of residential relocations by Camstra (1996). The ESR and NFS samples were pooled for Mulder and Wagner's (1998) analysis of transitions into home ownership. Transitions to home ownership were also studied by Everaers *et al.* (1993) using data derived from a panel sample of Dutch taxpayers, containing official tax data (the IPO data set). Naturally, these data contain detailed income measures, but information about education and occupation is scarce.

The order of the six types of research questions above is followed in the discussion of empirical results below. Results from the Priority Program projects are set out side-by-side with results from other (mainly European) research.

6.2. A LIFE COURSE THEORY OF RESIDENTIAL RELOCATIONS

Residential locations have two aspects: site and situation (Broek, 1966). *Site* refers to the characteristics of a place itself: its physical layout, its social composition, its climate, and so forth. Site characteristics also include the characteristics of the dwelling: for example, its size, quality and tenure. *Situation* refers to the position of a place in relation to other places. It is therefore also denoted as relative location. The relation to other places is expressed in distance: distance measured in kilometers, or in time units. The "other places" important for residential location are for instance the workplace, schools, shops, cultural amenities and sports facilities. It is important that the places where people perform their usual activities are within reasonable traveling time: These places must be inside people's *daily activity spaces* (Hägerstrand, 1970).

Spatial mobility in its widest sense, including both travel and relocations of residence, workplace or places of consumption, is a means of combining activities in space and time. Travel and relocations are complementary. Any relocation will result in a change in the distance or route of travel from the place of residence to other places of activity and *vice versa*. This issue of complementarity can be used to distinguish between *residential mobility* and *migration*. Residential mobility can be defined as a residential relocation triggering complementary action with respect to travel only and not to other forms of daily activities (such as the workplace). Migration is then defined as a multiple relocation decision with respect to more than just the place of residence (Hooimeijer & Van der Knaap, 1994; Roseman, 1971). It is therefore more disruptive to the activities and social networks of the persons involved. Whether or not a residential relocation is a migration may differ within households depending on the means of transportation of its members. To school-going children a move to the suburbs will mean a change of schools, while their parents may be able to continue their daily activities in the same places. Residential relocations therefore incur important non-monetary costs in the form of the disruption of local ties to activities and people. Thus people will not relocate unless there is some trigger (or even an absolute necessity) causing the benefits of moving to outweigh its costs. Moreover, if people move, they will only migrate

over a longer distance if the relative advantage of the new location exceeds the costs of leaving the previous daily activity space (Sjaastad, 1962).

The existence of a trigger or motive for moving is a necessary but not sufficient condition for a move to take place. Actual behavior will also depend on the situation that conditions the action of the person involved. One should distinguish between the personal or micro context, which is open to change by the individual, and the social or macro context, which cannot be changed by individual action (Willekens, 1991). These contexts can enable or limit individual action (Desbarats, 1983; Gordon & Vickerman, 1982). We propose to refer to the enabling aspect of the micro context as resources and to that of the macro context as opportunities. As for the limiting aspect, the term restrictions is used for the micro context and the term constraints for the macro context (Mulder, 1996).

Housing and job opportunities arise within the macro context of the regional housing and labor market. As both dwellings and jobs are heterogeneous goods, not all opportunities will be relevant to the person involved. Access to these opportunities is constrained by qualifications required (for jobs), by eligibility criteria (for social housing) or by price (private market housing), further limiting the choice set. Actual behavior therefore arises from the interaction between the individual motives, resources and restrictions on the one hand and the specific choice set on the other hand (Hooimeijer & Oskamp, 1996). The life course perspective is crucial within the theoretical framework, because it demonstrates the interdependency between the various life course trajectories or careers (De Bruijn, 1999; Willekens, 1991) that run parallel to each other. Parallel life course trajectories or careers influence the trajectory of relocations in two distinct ways. The progression in one parallel life course trajectory will trigger the move (that is, provide the motive for moving), while parallel careers will also condition the actual relocation through their effect on the choice set people have. The conditioning careers either generate resources for or impose restrictions on the move (see below). By using a life course perspective, the theoretical framework developed here builds on earlier work by others including Sandefur and Scott (1981), Courgeau (1985), Willekens (1987) and Wagner (1989a). The framework is summarized in Figure 6.1.

6.2.1. Triggers for Moving: Residential Preferences

A motive for moving, or *trigger*, arises from one of the various life domains that develop in parallel to the domain of relocations — parallel life course trajectories, or careers (Mulder, 1993, 1996;

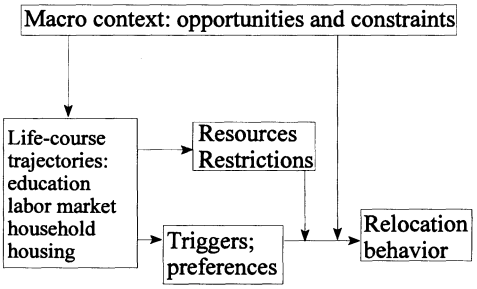

Figure 6.1. Diagram of theoretical framework.

Willekens, 1991). The parallel life course trajectory leads to a mismatch between an actual and a preferred residential location or housing situation. The trigger is associated with a *preference* for a certain new location or type of residence. Such a preference might be anything from very precise (to live in a specific neighborhood, in a specific type of dwelling) or rather vague (to live within commuting distance from a certain place of work). De Jong and Fawcett (1981) addressed the issue of which triggers (or goals, in their terms) might underlie a decision to move. They identified a list of potential goals possibly related to moving, based on a review of the empirical and theoretical literature. Their list contains the following seven categories: wealth (for instance, having a high or stable income); status (for instance, having a prestigious job; having power and influence); comfort (for instance, living in a pleasant community; having comfortable housing); stimulation (for instance, having fun and excitement; being able to meet a variety of people); autonomy (for instance, being free to say and do what you want; having privacy); affiliation (for instance, living near family, friends; being with spouse or prospective spouse); morality (for instance, exposing children to good influences; living in a community with a favorable moral climate). The evolution of life course trajectories is accompanied by changes in the need for housing and the importance attached to specific site or situational characteristics of the residential environment. These changes may either be sudden, such as events, or gradual, such as stress which builds up to attain a certain threshold (cf. Brown & Moore, 1970; Wolpert, 1966).

Household and housing life course trajectories are linked to the need for space and other amenities within the dwelling, or in the immediate environment — site characteristics of the residential location. In most cases, changes in household and housing trajectories do not lead to changes in daily activity patterns. Thus, needs arising from household

and housing trajectories lead to short distance moves, mainly within the daily activity space. But household formation may also lead to long-distance moves: Mulder and Wagner (1993) showed, for example, that among the moves in West Germany coinciding with marriage, a substantial number exceeds 50 kilometers, especially for women. Within existing couples, too, the wish to remain living with the present partner may lead to a long-distance move. This might happen, for instance, when one of the partners accepts a job elsewhere and the whole household moves (Smits, 1998).

Triggers arising from the household and housing trajectory also lead to moves in specific directions and with specific destinations, such as moves from city to suburb, or from rented to owner-occupied dwellings (Mulder, 1993). As argued by Bootsma (1998), household evolution and anticipated future household events are important factors determining residential preferences. During the first few years after leaving the parental home, residential location relative to school, jobs, cultural amenities and friends probably matters more than the layout of the dwelling or the quality of the residential environment. Certain site characteristics of the dwelling and residential environment, e.g. the presence of a garden, playgrounds and schools, safety and green spaces are particularly important in the stage of child-rearing. One could say that young singles, and young couples not (yet) anticipating parenthood, tend to optimize the relative location of their residence, thereby compromising on site characteristics if necessary. Conversely, families with children tend to optimize site, thereby accepting a less than optimal relative location. In Green's (1997) words, they compromise for the sake of the children.

Changes in the life course trajectories of education and work usually only lead to a move when they require change in the daily activity space. In many cases, people have the choice between migration and commuting. This is why there may be a considerable time lag between a change in workplace and a migration. After a trial period of commuting that might last for years, people may decide after all to move nearer to the new workplace. Since those with higher incomes and higher education tend to be more attached to their labor market careers than others, one can assume that they are more willing to move for their jobs. They also have reasons to move more frequently, as highly paid specialized jobs are geographically more dispersed than lower status jobs.

We argued above that young people, particularly those who do not yet have family obligations, attach great importance to the relative location of their place of residence. For the young highly educated, a central

location, with access to universities and specialist jobs, is particularly advantageous. For Britain and France, Fielding (1992) and Lelièvre and Bonvalet (1994) respectively showed that living in Greater London or Paris at the beginning of a labor market career exerts a positive influence on the further course of that career: These regions act as "escalator regions". As Crommentuijn (1997, p.105) remarks, "the escalator region is the spatial expression of the interaction of spatial and social mobility in the life course".

The majority of moves are related to the life course trajectories of housing, household, education and work. But one should acknowledge that other life domains may also provide triggers for moving. Upon reaching old age, to mention just one example, (anticipated) health problems or the loss of one's partner are major reasons for moving, particularly to nursing homes or serviced apartments (Harrop & Grundy, 1991).

6.2.2. The Micro Context: Resources and Restrictions

The resources needed to put into effect the desire to move and the restrictions hampering moves are also linked to the various life course trajectories in the same way as triggers and residential preferences — again, mainly those concerning housing, household, education and work. Financial resources are needed to move; not only to cover the cost of the move itself, but also to pay the new rent or mortgage. The main source of financial resources is income, earned within the working careers of the adult household members. The income needs not only to be sufficient, but also sufficiently stable, particularly if the new dwelling is owner-occupied and bought using a mortgage. Furthermore, savings count as well as income. A high education matters, not only for the income at a given moment, but also for career prospects.

In the housing trajectory, home ownership forms a restriction to moving. Home ownership is accompanied by a long-term investment, which is not easily undone. It is highly undesirable to sell a home very soon after purchase because of high transaction costs, to mention but one reason. Since people are well aware of this transaction cost, the desire to buy a home is likely to arise only among people who do not foresee moving again soon (Mulder & Wagner, 1998). In Britain, the public housing sector also seems to form a barrier, but only in the case of long-distance moves (Boyle, 1995).

The household trajectory is another important source of restrictions, particularly as a barrier to moving greater distances. In households consisting of more than one person, the choice to relocate is consider-

ably less easy than in one-person households. Several persons' daily activity spaces have to be taken into account. In dual income households, two persons' distance to work is important. School-age children's daily activity space is small and plays an important role in relocation decisions: Parents are reluctant to make their children change school (Mulder, 1993).

6.2.3. The Macro Context: Opportunities and Constraints

A move can take place only if a place to live is available: a vacant dwelling, a plot of land to build on, or a part of a dwelling. These *housing opportunities* become available mainly through new construction and through the departure or death of the previous inhabitants. Opportunities are created externally to the individual or household.

The set of housing opportunities available to a given household wanting to move is only a small fraction of the total number of vacant dwellings in a country. The limitation of the choice set is due to several factors. First, the location of the new dwelling has to be within the household members' daily activity spaces — either the existing daily activity space, or the new one if there has been a change in activities. Second, within that space, certain requirements regarding site characteristics of the new dwelling and its environment have to be met. Naturally, this is particularly important when the prospective move is triggered by housing needs. Third, there are limits to the accessibility of vacancies offered, in terms of price or tenure. The owner-occupier sector is only accessible to, and attractive to, households with higher and stable incomes. In other words, the availability of resources (Section 6.2.2) determines which opportunities are within reach. The availability and price of mortgage loans are also important, as are tax advantages. The social housing sector is only accessible to the lower and middle income groups, due to eligibility criteria. The availability of housing opportunities and their distribution over space, price segments, and tenure sectors is strongly influenced by government policy — particularly in the Netherlands as well as in some other Western European countries.

If the wish to move stems from a desire to find better housing, the household can opt to postpone the move for lack of suitable housing opportunities. The greater the urgency of the move, the greater the propensity of households will be to accept lower quality housing or a higher price (Oskamp, 1997). Since the urgency of long-distance moves is generally greater than short-distance moves, one could suggest that the availability of housing opportunities is less important for long-

distance moves. For long-distance moves, job opportunities or educational opportunities may be more important than housing opportunities.

Constraints are any pressures or obstacles producing "attitude-discrepant" (or counter-attitudinal) actions (Desbarats, 1983). These constraints may be a lack or shortage of opportunities. There may also be rules preventing certain opportunities from becoming available to certain population categories, e.g. allocation rules. These constraints also include any contextual circumstances that make people reluctant to move, e.g. unfavorable economic prospects. Just like opportunities, constraints are created externally to the individual.

6.2.4. Conclusion: From Theoretical Framework to Empirical Research

In the theoretical framework above, triggers from various life course trajectories form the necessary conditions for a move. The trigger also determines whether the move exceeds the boundaries of the daily activity space, and where it is directed. Besides, there are two types of enabling and limiting factors. Resources and restrictions arise from the life course trajectories; opportunities and constraints arise from the social context. Elements of this framework were present in nearly all projects on residential relocations that were carried out within the Priority Program. This is true despite the fact that the research questions in the projects have been quite diverse, as will become clear in the next sections, within which the various projects are examined under the headings of the six types of research questions referred to in the introduction.

6.3. PROCESSES UNDERLYING THE DECISION TO MOVE

In empirical research on residential relocations, the decision-making process underlying potential moves is often treated as a "black box". This is also true for the majority of the research within the Priority Program. However, some research is aimed explicitly at opening that black box. It seeks to clarify the decision process preceding and underlying the actual relocation. It is denoted here as "process-oriented" research. Within the Priority Program, two studies can be placed under the heading of process-oriented research. The first is the study by Voets (1994), aimed at reviewing the literature on choice processes with regard to relocation. The second is the work by Hooimeijer and Oskamp

(1996) on housing search models in which the staging of the search process is modeled.

There are two major strands of "process-oriented" literature. The first strand considers the way in which the components of choice (alternatives, behavioral options, values, preferences) are combined and weighed. De Jong and Fawcett (1981) proposed the Value-Expectancy model, postulating that the strength of migration intentions follows from the value attached to the outcome of the relocation decision multiplied by the expectancy (or subjective probability) that relocation will lead to the desired outcome. Among the values attached to relocation is the decrease in residential stress (see the previous section) or, to put it the other way round, the increase in residential satisfaction. In recent literature on residential relocations, residential satisfaction and mobility intentions are often seen as intervening variables which mediate the effects of "structural" factors on relocation behavior (Lu, 1998). Lu proposes and estimates a model in which measures of residential satisfaction and mobility intentions are included as predictors of actual moving behavior, besides such "structural" factors as tenure, income, duration of residence, age, race, household type and gender. He concludes that the attitudinal variables are important predictors of migration decisions, but that the structural variables appear to have significant direct effects on migration over and above the indirect effects channeled through the attitudinal variables.

In terms of the theoretical framework above, one could say that this first strand of literature concentrates on triggers or motives for relocation. People's preferences are taken into account, combined with their advance evaluation of the extent to which the actual consequences of the relocation will comply with those preferences.

The second strand of "process-oriented" literature considers the unraveling of the decision process into distinct stages. In the two-stage approach, it is assumed that the individual or household first decides to move and then decides where to move to (Brown & Moore, 1970; Rossi, 1955; Speare *et al.*, 1975). In the three-stage approach, the decision to move is conceptualized as a process consisting of the decision to consider moving, the search for a place to move to, and the final choice whether or not to move to that particular place (Gordon & Vickerman, 1982; Hooimeijer & Oskamp, 1996; McCarthy, 1982). So, the choice is between accepting and not accepting a particular opportunity to move, rather than between several housing opportunities as in the two-stage approach. The assumption is that opportunities present themselves one by one.

In both the two-stage and the three-stage approach, the relocation trigger arises in the first stage. But in the two-stage approach the roles of resources, restrictions, opportunities and constraints are not specified. Further specification takes place in the three-stage approach. The advent of opportunities is modeled explicitly; the probability of accepting a particular opportunity is determined by resources and restrictions (Hooimeijer & Heida, 1995; Hooimeijer & Oskamp, Chapter 8; Oskamp, 1997). As far as we know, it is no coincidence that the three-stage model has never been fully estimated in analytical models. Integrating all the elements of the three-stage model into one analytical model is too ambitious a task (Mulder, 1996; Pickles, 1980). One of the difficulties is that the supply of opportunities is partly created internally within the process one is studying: through household moves. Simulation models offer a viable alternative. Both multi-state models (Hooimeijer & Heida, 1995) and micro-simulation models (Hooimeijer & Oskamp, Chapter 8; Oskamp, 1997) have been developed which fully implement the three-stage model.

6.4. WHO MOVES UNDER WHICH CIRCUMSTANCES

There is a long tradition of empirical research attempting to explain residential mobility and migration behavior, whilst treating the decision process (largely) as a black box. The questions answered in this research tradition are variations on the general question: Which factors influence relocation behavior?, or: Who moves under which circumstances? One of the aims of Mulder's (1993) Priority Program research was to answer these questions for the Netherlands in the 1980's. She used data from the Housing Demand Surveys conducted in 1981, 1985 and 1989. The majority of her analyses were done using logistic regression models. An analysis of relocations was also part of Camstra's (1996) project, using the ESR life course data (see Section 6.1 for a brief description of the data sets). The aim of his analysis was to test a hypothesis on gender differences in the influence of commuting distance on the probability of moving.

In Mulder's (1993) research, a central question was how the likelihood of moving was influenced by events and states in various life course trajectories: household, housing, education and work. Both triggers for moving and resources and restrictions from these trajectories were considered. Support was found for the hypothesis that the household trajectory triggers mainly short-distance moves, but that the restric-

tions from the household trajectory are more important in migration than in residential mobility. Long-distance moves are typically undertaken by singles and less frequently by couples, especially when there are children in the household. A similar effect on short distance moves disappeared after controlling for "progression" in the housing trajectory (with the following typical stages of housing tenure: dormitories, rented rooms *etcetera*; rent; owner-occupation). The presence of a second earner in couples and families resulted in a strong negative influence on long-distance moves. So, support was found for the idea that restrictions on migration arise from having to take into account more than one daily activity space.

The housing trajectory was shown to be of greater importance in short-distance moves than in long-distance ones. Lack of dwelling space was found to trigger short-distance moves — but not migration. Home owners are reluctant to move, whereas people living in "other" accommodation (dormitories, rented rooms) move very frequently and renters are somewhere in between. This influence of housing tenure on migration was considerable, but it was even greater on short-distance moves. For migration, housing tenure is supposedly a chief restriction, but tenure is also associated with triggers for residential mobility: In the early stages of the housing trajectory, people are more likely to move for housing reasons.

The effect of higher levels of education (obtained in the educational trajectory) was positive and considerable on long-distance moves. As expected, education levels had no significant influence on short distance moves. In Mulder's (1993) study, occupational career influence could only be operationalized in terms of income. She suggested that the income effect had two components: a resource component and a component denoting type of occupation and geographical density of the job market. The resource effect showed up positively for short-distance moves, at any rate after controlling for housing quality. The effect on long-distance moves was greater and much less dependent on tenure. Camstra (1996) showed that the likelihood of moving was positively related to commuting distance. He found this effect to be stronger for women than for men, interpreting this as a sign that women are more sensitive to commuting distances than men.

A strong age effect is typically found in studies of residential relocation. Courgeau (1985) and Mulder (1993) found a strong decrease in age differences after reducing events and states in the various life course trajectories. Remaining age differences were attributed to the age structuring of migration-triggering events in parallel life course trajectories that were not measured in the data (for instance job changes) and

the uncertainty and demands for flexibility associated with young adulthood.

6.5. HOUSEHOLD FORMATION: LEAVING THE PARENTAL HOME

When young adults leave the parental home, they do not just relocate; leaving the parental home forms an important step in the transition to adulthood. A great deal of international literature has covered leaving the parental home, and particularly its timing in the life course: See for example, Wagner and Huinink (1991) for Germany; Rossi (1997) for Italy; Cordón (1997) for Spain; Goldscheider *et al.* (1993) and Goldscheider (1997) for the United States. In the Priority Program, leaving the parental home was studied by Crommentuijn (1997), Mulder (1993), and Mulder and Manting (1994). Other studies for the Netherlands include Baanders (1996, 1998), De Jong Gierveld *et al.* (1991); Hooimeijer and Mulder (1998), Iedema *et al.* (1997), Liefbroer and De Jong Gierveld (1993), and Van Hekken *et al.* (1997).

As argued by Hooimeijer and Mulder (1998), it is useful to distinguish between leaving the parental home to live alone, and leaving the parental home to live with a partner. Like any desire to relocate, the desire to leave the parental home derives from a trigger in some other life course trajectory: mainly the trajectories of education, work, household or housing. The wish to live with a partner obviously derives from a different life course trajectory than the wish to leave home to live alone. The role of opportunities and resources is arguably also different for living with a partner and living alone. Those aiming to live with a partner will prefer independent housing, whilst those settling as singles might find shared housing with less space, less privacy and the communal use of facilities a viable alternative.

Females leave the parental home a few years earlier than males. This has been found repeatedly, not only for those leaving the nest to live with a partner, but also for those leaving to live alone. Enrolment in higher education is an important reason for leaving the parental home. It is therefore not surprising that highly educated people are more likely to leave the nest as singles than the less well educated. However, higher education has a negative impact on the probability of leaving the parental home to live with a partner. As Blossfeld and Huinink (1991) have shown convincingly, educational enrolment and marriage are virtually incompatible in western European countries. In her theory of marriage timing, Oppenheimer (1988) stresses the impor-

tance of work and income stability, particularly for males. It is therefore not surprising that having paid work and a higher income have a positive effect on leaving the nest to live with a partner, particularly for males.

The availability of housing and job opportunities is crucial for the timing of leaving the parental home. Hooimeijer and Mulder (1998) show that, in regions with tight housing markets, young people are significantly less successful in putting into practice their wishes to start living with a partner, but also their wishes to start living alone.

A recurrent finding in the international literature is the postponement of nest-leaving by the younger birth cohorts, after decades of increasingly early nest-leaving. This postponement is much less dramatic in the Netherlands, Germany and the United Kingdom than in Southern European countries such as Spain, Greece and Italy (Cordón, 1997). Our understanding of this difference between Northwestern and Southern European countries is enhanced by distinguishing between two processes of nest-leaving. In the Netherlands as in Southern Europe, living with a partner is being postponed. However, postponing leaving the nest to live alone has not occurred much and only very recently: Up to the late 1980's young people who left the home to live alone did so at an increasingly early age. The slight postponement of nest-leaving in the Netherlands has resulted from the different evolutions of the two processes. In the Netherlands, about half of the young people who leave the parental home do so to live alone. In southern European countries such as Italy (Rossi, 1997) and Spain (Cordón, 1997), leaving the parental home to live alone is barely an option for young people. In these countries, the evolution of nest-leaving is comparable to the evolution of the timing of first marriage.

6.6. RESIDENTIAL ENVIRONMENTS

As argued in Section 6.2, (relative) location is assumed to be an important characteristic in decisions concerning changing residence (Speare *et al.*, 1975). People who look for a new place to live do so within a limited area, and this is supported by empirical research findings. However, as shown by Floor and Van Kempen (1997), the area within which people are prepared to accept a new dwelling is often not so small that it just comprises one neighborhood or even city: People with an initial preference for living in a certain city are often prepared to move to a suburb if this helps to find a dwelling of the preferred quality, size or tenure, or a residential environment of the preferred type

(Michelson, 1977). The role of cities versus suburbs or other less urbanized areas in residential relocations was addressed in several projects in the Prioity Program; for example Bootsma (1998), Camstra (1994), Crommentuijn (1997), and Mulder (1993).

Locational needs and preferences vary systematically throughout the life course. During some of its stages, people are primarily interested in living near school or work; in others, they place a higher value on the quality of the dwelling and its environment. Students tend to place a high priority on living near school, friends and cultural amenities, probably because of their common lack of access to private transport — at least in many European countries — and the necessity of leading their social lives primarily outside their home. Young people who have just begun working are busy shaping their labor market careers, particularly if they are highly educated. They have a high propensity to change jobs, and living near job opportunities is of great help to their careers (Blau & Duncan, 1967). In Section 6.2 we argued that certain urban areas act as "escalator regions" (Fielding, 1992). Empirical evidence seems to suggest that for the Netherlands, the Randstad region is such a region (Crommentuijn, 1997). However, decisive evidence can only be obtained from longitudinal data. Since migrants are attracted to cities mainly because of their opportunities for education and work, moves to the city are primarily made by young, highly educated and single people (Mulder, 1993).

Site characteristics of the dwelling and its environment are more important to families with children and couples anticipating having children than to singles and childless couples (Bootsma, 1998). This argument is supported by empirical findings: The choice of moving out of the city is made primarily by families with children, existing couples (more than newly formed couples), and those aged over 30 (Bootsma, 1998; Kruythoff, 1993; Mulder, 1993). Furthermore, higher income is found to be an important resource. One might argue that in finding a compromise between site and situation (see Section 6.2), families tend to grant high values to site characteristics, which might mean that parents accept longer home-to-work journeys. They can afford to do so, if they have made enough progress in their labor market career and have the necessary income resources.

The finding by Camstra (1994) that dual earner households are more likely to live in large cities than single earner households might also be viewed as support for the above argument. Dual earners are often childless couples. Thus the over-representation of dual earner households in the cities might comprise precisely those dual earners without children. All other things being equal, another interpretation

for this over-representation could be that dual income households attach greater value to the city's situational advantages than single earner households. This argument is not corroborated by Bootsma's (1998) finding that, after controlling for education, income and the presence of children, the propensity to leave the city is higher among dual earner households than single earner households.

6.7. RENTING AND OWNING

Another characteristic of the destination of residential relocations is the type of dwelling the move is aiming at. In particular, the tenure of the dwelling moved into — rented versus owner-occupied — has justifiably received ample attention in the international literature, including Priority Program publications. This is because the choice between renting and owning a dwelling has an important and long-lasting impact on people's financial and housing situations and on further residential relocations.

There are two main ways of analyzing moves into owner-occupation. The first is by analyzing the likelihood of becoming a home-owner versus a renter for those who move: "tenure choice" (see, for example, Dieleman & Everaers, 1994; Deurloo *et al.*, 1987; Kendig, 1984; Mulder & Hooimeijer, 1995). The analysis of tenure choice is compatible with the theory that first people decide to move, and then whether to rent or buy. It is only the second decision which is studied: The first is treated as given. The second way of analyzing moves into owner-occupation is to analyze the transition to first time home ownership (Clark *et al.*, 1994, 1997; Courgeau & Lelièvre, 1992; Henretta, 1987; Mulder & Wagner, 1998; Withers, 1998). This analysis is compatible with the view that the first move into owner-occupation is an important life course transition, comparable to transitions such as those into partnership or parenthood.

The wish to move into home ownership is often triggered by housing reasons. More specifically, home ownership is particularly attractive to families with children and those couples anticipating parenthood. Compared with rented dwellings, owner-occupied homes are more often of the single-family type; they are on average larger, and better equipped with such amenities as gardens and garages and they are more often found in suburban and rural areas. Home-owners have a larger degree of control over their own housing situation. Lastly, financial arguments are also important in the decision to own a home rather than rent it. To own a home is to invest in housing rather than just to consume it (Ioannides & Rosenthal, 1994).

Compared to renting, there are certain risks attached to owning a home. First, there is a risk of value decline. Second, there is a risk of income loss and inability to pay for the mortgage. And third, there is a risk of having or wanting to move again soon; this is highly unprofitable because of the high transaction costs associated with buying and selling a home. Given these risks, those with unstable incomes or those who are uncertain about where and with whom they want to live, are unlikely to buy a home. This is true, for example, for young singles or those just starting their labor market careers. At the other end of the scale, those with sufficient and stable incomes and those with stable household types, are particularly inclined to become home-owners. The stable household types are mainly couples with children and couples anticipating parenthood. There is ample evidence for a strong association of home ownership with these household types (Clark *et al.*, 1994; Everaers *et al.*, 1993; Mulder & Hooimeijer, 1995; Mulder & Wagner, 1998; Withers, 1998). These same studies also provide evidence for a strong positive influence of income resources on home ownership. Unemployment reduces the likelihood of becoming a home-owner (Clark *et al.*, 1994; Mulder & Wagner, 1998), whereas self-employment enhances it (Mulder & Wagner, 1998). Home ownership by the parents increases the likelihood of home ownership by their children, either through financial help or socialization (Henretta, 1987; Mulder & Wagner, 1998). For the United States, being non-white was found to be a barrier to home ownership (Clark *et al.*, 1994; Withers, 1998).

Moves into home ownership form a very clear example of the importance of opportunities and constraints for relocations. It was convincingly argued that local housing market contexts, government policy, tax systems and economic shifts were all decisive factors in people's propensity to become home-owners (Börsch-Supan, 1993; Clark *et al.*, 1994; Deurloo *et al.*, 1994; Mulder & Wagner, 1998).

6.8. THE CONSEQUENCES OF MIGRATION FOR LABOR MARKET CAREERS

Another aim of empirical research is to study the consequences of residential relocations. They are undertaken with a certain goal in mind; to what extent is that goal attained? And furthermore, if people move for the benefit of someone else in the household, how are they affected by the move? In Lam's (Lam *et al.*, 1996) and Smits' (1998) Priority Program research, the influence of migration on the incomes of the male and female partners in two-sex couples was assessed. The Housing

Demand Surveys were used in both studies. Camstra (1996) studied the consequences of residential relocations for continuing versus quitting work, and for commuting distance, using the ESR data.

Since migration is only undertaken if benefits outweigh costs, there is a common hypothesis that migration of working people is followed by an increase in household income. But a move need not be accompanied by increased income for all the individual household members: One member might profit from the move, whereas another might accept it for the sake of the benefit experienced by the household as a whole. Those who move for the sake of their partners' careers are called "tied movers" (Mincer, 1978). Likewise, there are also "tied stayers": Those who are kept from moving by a partner who is not prepared to move. Due to the traditional division of labor between men and women that still exists in many households, tied movers are mostly women (Bonney & Love, 1991). One might therefore expect a positive effect of migration on income for men, but a negative effect or at least no positive effect for women. Indeed both Lam *et al.* (1996) and Smits (1998) found a significantly positive effect of migration on income for men, but no significant effect for women.

However, both authors correctly point out that interpreting these results is not without its problems. Lam *et al.*'s argument concentrates on the direction of causality. It is true that migration might lead to higher income, but it is also true that certain occupations — mostly precisely those with higher incomes — lead to a higher necessity to migrate. This causality problem can only be solved using longitudinal data. Smits points to the fact that migrants are a self-selected category, consisting of people who may differ from the non-migrants in characteristics pertaining to their income. It is therefore conceivable that those people who migrate would have experienced favorable career developments even without moving. This self-selection might lead to biased estimates of the effect of migration. Following Cooke and Bailey's (1996) example, Smits constructed a factor to correct for the self-selection of migrants; it was derived from the respondents' estimated probability of moving. After including this factor, the effect of migration on income became negative, not only for females but also for males. After applying this technical solution to self-selection bias, a new problem arises of interpretation of this counter-intuitive result. One could speculate that, all else being equal, those who actually have to move in order to further their career progression are somewhat worse off, or have a weaker bargaining position, than those who manage to do so while staying put. It would only be possible to assess the influence of migration on the income *changes* of individuals with the proper longitudinal data. An

analysis of the influence of migration on lateral, upward and downward job mobility (in the sense of occupational status) was undertaken by Wagner (1989b) for West Germany. He found that migration had a positive effect on upward mobility, but only for males; a positive effect on downward mobility, but only for females; and a positive effect on lateral mobility, which was stronger for females than for males. It should be noted, however, that he used a rough operationalization of migration: living in a different region from that at age 15 or not. Another relevant finding was that home ownership had a negative effect on all kinds of job mobility.

For women, it is far more common to quit working around a relocation than for men. Camstra (1996) found that around one third of the women who moved quit work in the two-year interval around the move, whereas it was only about 15 per cent of the men. Surprisingly, among women, there was only a small and non-significant difference between short-distance and long-distance movers in this respect. A significant difference was found, however, between women who worked close to home before the move and those who worked further from home. Apparently, the labor market participation of those women who work close to home is particularly sensitive to relocations. In his analysis of the impact of migration on commuting distance, Camstra (1996) found that women who move over a long distance experienced an increase in commuting distance more often than men did (around 45 per cent, versus around one third), regardless of whether they remained in the same job or changed jobs. Furthermore, among those who remained in the same job after a long-distance move, about half of the men experienced a decrease in commuting distance as against only about 40 per cent of the women.

6.9. CONCLUSION

When the Priority Program was set up, the life course was chosen as the general framework for research (Dykstra & Van Wissen, Chapter 1 of this book). During the course of the program, the life course perspective proved to be a powerful instrument in developing a general theoretical framework encompassing a variety of issues linked to the event of residential relocation. The fact that various life domains influence the likelihood of a residential move has long been acknowledged. It is the varying role of the life course trajectories that is crucial in the life course perspective employed in the program: in the decision process that leads to relocation, in the enabling and limiting role in the

occurrence of the actual move, in the destination in terms of geographical and housing space and in the implications of the move for both housing and labor careers. A number of insights gleaned from the Priority Program illustrate the conceptual power of distinguishing between the conditioning role and the triggering role of other life course trajectories.

One example is the way in which we view the difference between residential mobility and migration. This difference is usually defined in terms of distance or administrative boundary crossing. Insights gained in the Priority Program have shown that this difference can also be defined in terms of multiple relocations. Residential mobility is a relocation only of the place of residence. Migration is a relocation not only of the place of residence, but also of activities in other life course trajectories such as in the labor market. This definition of migration implies restrictions not only for the person involved, but also for other household members. The damage done to other careers, such as the loss of social contacts, loss of spouse employment, a change in the children's school *etcetera*, was identified in research on the implications of migration. This potential damage was also included in the analysis of the relocation process. Thus it is clear why dual earner households relocate less often and accept larger commuting times.

Another interesting example is the conditioning role of the housing career on the occurrence of household events. In the dominant conceptualization, residential mobility is the process by which changes in household composition and size trigger the housing adjustment process. The program shows that a lack of suitable housing opportunities leads to a postponement of union formation and prolongs the stay in the parental home. Thus one can avoid the implicit assumption of consumer sovereignty in the process of residential mobility. Unlike in a consumer sovereignty situation, households are not completely free to decide whether to move or not.

An intriguing idea is that residential relocation towards the "escalator region" of a country in the early stage of adult life will have a long term positive effect on labor career progression later in life. Thus the spatial course of the residential career enables social mobility. The ability and willingness to migrate can therefore be a resource in professional achievement. Research aiming to test the escalator region hypothesis for the Netherlands has yet to be done. But in the Priority Program, some research was done into the effects of migration on labor market careers. It was shown that migration has positive effects for some, particularly for men, but negative effects for others, in particular women.

In general, the flexibility of the life course perspective in specifying the effect of the role of life course trajectories on other trajectories has created conceptual clarity in the analysis within one overall framework of interpretation. It has also led to an increasing awareness of the context's role in shaping individuals' behavior and lives — both at the micro-level of household and at the macro level of structures of provision. Of equal importance is the adoption of the life course perspective which has triggered new forms of data collection in the form of retrospective surveys with considerable detail on individuals' full life history. These data sets have great potential and will stimulate new research questions which previously could not be addressed empirically. For one thing, the availability of life course data facilitates research into the longer-term causes and consequences of residential mobility and migration. Research into the importance of the spatial aspects of relocation trajectories — for example, the role of escalator regions — has also become possible.

A major part of research following the life course approach concentrates on the instantaneous probability of the occurrence of a relocation event. Within this type of research, event history techniques are part and parcel of mainstream analytical tools. Important advances have been made with regard to including time-varying besides time-invariant independent variables (or covariates). The use of the logistic regression of person-time units applied as discrete-time event history models (Yamaguchi, 1991) has proved to be fruitful in this respect. A major drawback of event history models is that they do not allow a distinction between the micro and macro context effects on overt behavior. Within the class of analytical models, multi-level modeling (DiPrete & Forristal, 1994) seems a promising avenue in which to include the arrival of opportunities on the regional and local housing market in an event history framework. However, this will not solve the issue of dependence of the arrival of opportunities on individual households' successful housing market search. During the course of the program, housing market simulation models were developed as an alternative to incorporating opportunity generation, and to simulate the role of access-criteria that constrain preferred behavior. The statistical identification of the models, however, is to some extent problematic (see Hooimeijer and Oskamp, Chapter 8 of this book). We expect that both approaches will gain momentum in the future not just because of their scientific value in linking the macro context to individual behavior and *vice versa*, but also because of the strategic interest to governments and other parties in disentangling this interaction.

Only a small part of the research was devoted to the implications of relocation decisions. The longer-term consequences of these decisions for the further development of life course trajectories are a major future research priority. One such topic is the longer-term influence of migration on the labor market trajectories of males and females. So far it has not been clear to what extent and for whom in the household, migration really works out better in the longer term than staying put. Another important topic is the consideration of the longer-term consequences of early family formation or early home ownership on further housing and labor market careers. One might expect "settling down" early in the life course to have negative effects on the further course of careers, but whether this expectation is correct remains as yet unanswered. Finally, the consequences of residential relocations for social change remain an important research topic. Residential segregation stems from a long series of residential relocation decisions by individual households. In the end, all these decisions may lead to a situation where people find it difficult to "escape" from a certain neighborhood and hence may be vulnerable to social exclusion. Other examples are the consequences of migration for labor supply in a particular area, or the consequences of the lack of migration for daily mobility.

In the Netherlands, the share of dual income couples is increasing rapidly, and so is the share of home-owners. Both phenomena could lead to a further decrease in residential relocations. Given the role of relocations in individuals' job mobility and in the match between labor and housing markets at the macro level, a problem of immobility may arise. A decrease in residential relocations might not only lead to immobility on the labor market, but also to an increase in long-distance commuting and its concomitant pressure on the infrastructure and environment. Long-distance commuting may also take the form of weekly commuting, which seems to be on the rise in Britain (Green, 1997). Weekly commuting has negative side effects: It leads to pressure on the housing market (one family needs two homes) and on family life and the division of household tasks (one household member is absent during weekdays).

Research on residential relocation from a life course perspective has made enormous progress since Courgeau's and his colleagues' publications (e.g. Courgeau, 1985), to mention just one important research group. The life course perspective has led to new angles in approaching old problems and to new topics. New technical instruments for event history analysis have been developed very rapidly which allow researchers to put new hypotheses to empirical tests. Old instruments

like microsimulation models have found new applications and specifications. Gradually, the data needed to test life course hypotheses in their proper longitudinal, long-term specification have become available. The challenge for future research is to use these favorable conditions to make further progress.

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7. MEDICAL DEMOGRAPHY IN THE NETHERLANDS: RECENT ADVANCES, FUTURE CHALLENGES

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Abstract. This chapter provides an overview of medical demographic research conducted in the Netherlands during the 1990's. The methods and principal findings are discussed of studies on: (a) past trends in mortality, (b) current mortality differentials, (c) future trends in mortality, (d) future trends in morbidity, and (e) the consequences of these trends for health care demand, costs and financing. Compared with the late 1980's, significant advances have been made in all these fields of research. Studies that combined advanced data acquisition with multivariate statistical techniques have succeeded to move from description to explanation of mortality trends or differentials. Studies that applied sophisticated population-based models have greatly improved the projection of future trends in mortality and morbidity. Many of these studies have important implications for health policies, including preventive policies and the administration of health care services. There are several ways in which future medical demographic research can continue to enhance our understanding of mortality and morbidity, and thus contribute to health policies.

7.1. INTRODUCTION

The 20th century has witnessed an impressive increase in life expectancy in industrialized countries. This increase has been brought about by a reduction in mortality from many causes of death, including various infectious diseases and maternal mortality. More recent increases in life expectancy reflect considerable progress in the fight against a number of causes of death typical of modern society. For

example, mortality from traffic accidents and heart disease in the Netherlands has declined sharply since the 1970's (Wolleswinkel-Van den Bosch, 1998). The latter decline was brought about by a decreasing incidence of heart disease (number of new cases per year per 1000 population) and the prolonged survival of heart disease patients. Advances in medicine have contributed to these favorable developments. It has been estimated that, between about 1952 and 1982, improvements in the detection and treatment of several diseases added 3 and 4 years to the life expectancy at birth of Dutch males and females, respectively (Mackenbach, 1988).

While the increase in life expectancy is one of the main triumphs of the 20th century, it will pose formidable challenges to health policies and health care services in the 21st century. Many members of generations born in the 20th century will survive until old age into the next century, and will be increasingly likely to suffer from chronic disabling diseases, especially diseases of old age such as dementia and chronic heart failure. Present generations may now expect to live longer than past generations, but will the greater part of these additional years be spent coping with disease and disability? An increased burden of disease and disability may be faced not only by individuals over their lifetimes, but also by society at large. There is widespread concern that the aging of populations will in the future strongly increase the burden of disease, the demand for health care services and the future costs of health care (RIVM, 1997).

The increase in life expectancy of modern populations is therefore of great relevance to health policies and health care services, but its role is complex and even ambivalent. On the one hand, longevity is a fundamental value, particularly if the extra years of life are lived in good health. On the other hand, increases in life expectancy contribute to population aging, in particular to the rising number of oldest old, thus increasing the burden of disease and demand for health care. A better understanding of trends, patterns and consequences of changes in life expectancy would be of great benefit to health policies. It would, for example, help policy makers to make decisions on the relative importance of policies directed at fatal disease versus non-fatal disabling disease (for instance, cancer versus musculo-skeletal diseases) and predict the consequences of interventions aimed at improving the survival of population groups (such as screening for a fatal disease).

Recent research in the Netherlands has greatly improved our understanding of trends in mortality and morbidity and their implications for health care and health policies. The purpose of this chapter is to give an overview of recent Dutch research in this field, and the con-

tribution it has made to the international literature. Due to the limited space available, we have had to make a selection from a wide range of studies conducted over the past years, and from the many results generated by individual studies. Emphasis will be placed on studies that have provided new insights through innovative research. Special attention will be given to studies carried out within the framework of the NWO Priority Program on Population Issues. This chapter will only address research that deals with the Netherlands and international comparative research covering the Netherlands.

Note that only some of the studies discussed in this chapter have been carried out by demographers. Many have been conducted by epidemiologists, public health researchers, economists or others. Studies from other disciplines will be discussed insofar as they address the same questions as those which are central to medical demography. By including studies from other disciplines we recognize the fact that certain studies may be relevant to different scientific disciplines, rather than suggesting that they can be annexed by medical demography.

7.2. CHALLENGES FOR MEDICAL DEMOGRAPHY

7.2.1. About Medical Demography

Research in medical demography, as in any other field of demography, usually starts with a description ('graphy') of the occurrence or prevalence among populations ('demos') of person-based phenomena. The medical event that is most commonly described in medical demographic studies is mortality. Unlike epidemiologists, who tend to study (cause-specific) mortality as one of the possible end points of a disease process, demographers usually describe (all-cause) mortality from the point of view of survival and length of life. This perspective is expressed by demographers' frequent use of life tables and measures such as life expectancies and the proportion of people that survive until a specific age.

A focus on mortality, survival and length of life is important for two reasons. First, it is essential for people not to avoid death (as this is impossible) but to be able to live long lives. One of the main goals of public health is therefore to secure a long and healthy life for as many people as possible (VWS, 1995). Measures of length of life are a direct indicator of the progress that has been made towards achieving this goal. Second, measures of survival and length of life express directly the way in which mortality affects the size and structure of populations. In

a closed population, the number of people at a specific age is simply a function of the number of people born to that population and the proportion surviving to that age. In real populations of industrialized countries, the future rate of "double aging" will largely depend on the proportion of currently living generations that will survive until the ages of 80 years or over (Vaupel & Gowan, 1986).

A core activity in medical demography is therefore to describe levels, patterns and trends in mortality and survival of individual populations. However, it is generally recognized that medical demographic research should not be confined to mere descriptions (Lopez *et al.*, 1995). A parallel may be drawn with clinical medicine. Physicians who treat patients with potentially fatal diseases need to start by making a diagnosis of individual patients. Next, they should aim to (a) determine the factors that influence the chances of survival of these individual patients, and (b) predict their survival, especially in relation to alternative interventions in the disease these patients suffer from. Medical-demographic research faces similar tasks, but then at the population level. Together with other researchers in the field of public health, demographers should aim to (a) determine the factors that influence the mortality trends and patterns that are observed for specific populations, and (b) predict future trends in mortality in these populations, in particular in relation to diseases and factors that may be modified by public health policies. Both challenges will be discussed below.

7.2.2. From Description to Explanation

Descriptive studies on trends and variations in mortality often do little more than reveal well-known and even predictable patterns. However, we often still barely understand the mechanisms that are behind observed mortality trends and variations. Knowledge of these mechanisms is essential, however, for the prediction of future mortality trends and the evaluation of the potential effect of interventions on their determinants (Willekens, 1990). A reliable and valid description is an essential prelude to explanation. However, explanatory research needs to go further and to study empirically the different mechanisms that might explain the observed trends and patterns of mortality. This explanatory research faces two challenges.

The first challenge is to distinguish between causation and selection effects. This applies in particular to mortality variations by status variables, such as marital status, socio-economic status and immigrant status. These variations may reflect a causal effect of the status variable on mortality (the causation hypothesis), but may also be due to an effect

of ill health or other health-related variables on the socio-demographic status (the selection hypothesis). This distinction is crucial to projection and prevention: Changes in the status variables may only be expected to have an effect on mortality if the observed associations reflect causal effects.

The second challenge emerges when the observed associations appear to be due to causation. The challenge is then to identify the precise causal mechanisms involved. Mortality risks at a specific age are determined by causal chains that consist of a series of factors operating successively over time. These factors include: the disease process immediately preceding mortality (for instance lung cancer), exposure to behavioral and biological risk factors for that specific disease (such as smoking), and the factors that determine exposure to these risk factors (such as chronic stress). Each causal chain may contain several factors, and there may be several causal chains for one mortality outcome. A major challenge to explanatory research is to identify the factors and chains that are responsible for observed trends or differences in mortality.

In addition, explanatory research should give attention to the social context within which these causal chains develop at the individual level. Contextual determinants may be specific to some diseases or factors (e.g. tobacco advertisement campaigns) or of a more general nature. In recent social epidemiology, much attention has been given to income inequalities and social cohesion as a contextual determinant of national and regional variation in life expectancies (Wilkinson, 1996).

In recent years, it has been increasingly recognized, especially in research on socio-economic inequalities in health, that explanatory research may benefit substantially from a life course perspective (Vågerö & Illsley, 1995; Van De Mheen, 1998). The logic behind this recognition simple. Mortality levels at a specific age are determined by exposure to determinants during the earlier life course. These determinants may be biographic, that is specific to individuals, or historical, that is shared by the cohort to which the individuals belong. Influences that occur at some period in time usually take some time before they lead to death. Especially if exposures take many years before they result in death, as in the case of smoking and lung cancer, the associations between mortality rates and their determinants should be studied for different age groups and for different periods of exposure. In addition, it should be kept in mind that a factor seldom operates alone, but interacts with other factors to determine chances of survival. For example, the effect of dietary intake on heart disease mortality has been suggested to be dependent on the experience of poverty in early life

(Barker, 1992). In these cases, the combined effect of different factors can only be studied within a life course framework with emphasis on age, earlier life, and the economic, social and cultural forces shaping people's lives.

Given the complexity of the subject, it is no easy task to move from description to explanation in medical demography and in related sciences. Progress in this field is inevitably slow, but certainly not absent. Later in this chapter we examine the contributions that were recently made by innovative explanatory research on past mortality trends and current mortality differentials in the Netherlands.

7.2.3. From Explanation to Projection

Knowledge on past trends and current levels of mortality are indispensable for projections of future trends in mortality and the effects of these trends on future population structures, disease prevalence, and the demand for medical care. Projections are made not only to predict the most likely future trends, but also to construct "what if" scenarios on the consequences of hypothetical future changes in mortality or its determinants. Setting up projections and scenarios is an art in itself. Whereas studies on past trends and present differentials are based on statistical analyses of empirical data, explorations of future trends lack these data and need other tools.

A long-established and invaluable instrument in the demographer's tool kit are models of population dynamics. In medical demography, these models are used, for example, to estimate the effect of mortality change on population structure. When mortality rates decrease, for instance due to new medical interventions, some people will be saved from dying and remain part of the living population. The result is an increase in the size of the population and changes in its composition in terms of age and perhaps other characteristics as well. For example, if new medical techniques are developed to increase the chances of survival of heart disease patients, the population effect is to increase the number of people with heart disease and related diseases (Barendregt & Bonneux, 1998). The net effect may be quite unexpected, and may even be an increase in heart disease mortality rates at older ages.

A major task for demographers is to model these population dynamics in order to make visible how mortality change at a particular age and period may influence mortality, morbidity and the demand for medical care at older ages and in later periods. This task comprises two specific challenges.

The first challenge is to include information on determinants of mortality. In most European countries, predictions of future mortality trends have been made without a formal model that describes future mortality trends as a function of its major determinants. Having said that, these models may be indispensable for more objective and more reliable predictions of future mortality trends. Determinant-based models are also needed to construct "what if" scenarios on the consequences of, for example, the elimination of smoking. Even though the need for determinant-based models has long been recognized (Willekens, 1990), attempts to construct such models were sadly lacking until recently.

The second challenge to demographic modeling is to include information on morbidity and demand for health care. Morbidity may be included in mortality models in different ways. A well-known example is the so-called "Sullivan" method for calculating disability-free life expectancies (Barendregt *et al.*, 1997a; Bone *et al.*, 1995; Robine *et al.*, 1993). The analytical value of this method is limited, however, as it does not explicitly model the processes that simultaneously determine both mortality and the prevalence of disease or disability. In recent years, models have been developed that estimate mortality and disease prevalence as outcomes of the same underlying disease processes. Ideally, these models use estimates of the incidence, recovery and case fatality of a specific disease, and estimate how changes in one of these transition rates lead to changes in both the prevalence and mortality of the disease. Dutch projects that have used models to make projections of future trends in mortality and morbidity, and the implications of these trends for health care demand and costs are discussed later in this chapter.

7.3. STUDIES ON PAST TRENDS IN MORTALITY

The impressive increase in life expectancy during the 20th century has aroused the interest of epidemiologists and demographers in the Netherlands as well as in other countries. In several studies, secular trends have been described in detail and attempts have been made to explain the trends that were observed. Attempts to move from description to explanation are motivated not only by an intrinsic interest in the causes of the secular increase in life expectancies, but also by the fact that a better understanding of these causes may help us predict how life expectancies will develop during the course of the 21st century.

7.3.1. Descriptive Studies

One way to describe mortality trends is to compare the life expectancies that are observed for successive birth cohorts. Comparisons of several birth cohorts are made in a few countries only, as they require the creation of a mortality database for all deaths over more than a century classified both by year of death and by year of birth. For the Netherlands, a detailed mortality database was created by Van Poppel *et al.* (1996). These data were analyzed by means of cohort life tables and age-period-cohort analyses. Comparison of older generations with younger generations showed that, as expected, life expectancy at birth had increased substantially. The life expectancy of men increased from 40 years for those born in 1850 to 52 years for men born in 1900. A stronger increase was observed for women: From 42 to 57 years. For both sexes, life expectancies increased gradually with increasing year of birth.

An alternative and more common way of studying secular trends in mortality is to classify deaths by year of death and to compare calendar years by means of period life tables or age-standardized mortality rates. In most industrialized countries, these data show a fairly gradual mortality decline during the course of the 20th century, except for mortality peaks due to wars and the 1917 Spanish influenza epidemic. For the Netherlands, Wolleswinkel-Van den Bosch (1998) looked at the pace of mortality decline in the period 1850 to 1992 in more detail. A "turning point analysis" on age-standardized mortality rates was used to determine whether the pace of mortality decline was even over the entire period. Mortality rates in the Netherlands started to decline around 1880. The decline was particularly rapid between 1917 and 1955, whereas almost no decline occurred between 1955 and 1970. Mortality started to decline again after 1970. Thus, on closer inspection, secular mortality trends in the Netherlands have gone through phases of acceleration and deceleration.

Mortality declines of similar magnitude have been observed in many Western countries. This common experience has led to the formulation of demographic and epidemiological transition theories. The most well-known theory, presented by Omran (Olshansky & Ault, 1986; Omran, 1971), emphasizes changes in the cause-of-death pattern of mortality: A decline in infectious disease is expected to be accompanied by a rise of "degenerative and man-made diseases". Many authors have argued that this theory needs revision. Wolleswinkel-Van den Bosch (1998) has provided important new empirical material for such a revision. Studies on secular mortality trends tend to be restricted to broad

groups of causes of death, or to give particular attention to infectious diseases. In her study, however, trends in mortality since 1870 were examined for a wide range of specific causes of death. All deaths in the Netherlands since 1870 were reclassified by means of detailed "concordance tables" that make cause-of-death codes comparable across all different cause-of-death classifications used since 1870. Analysis of these data brings to light highly varied patterns of cause-specific trends. For example, while mortality from waterborne infectious diseases such as diarrhoea started to decline rapidly in the late 19th century, airborne infectious diseases, such as tuberculosis, showed a less precipitous decline. Mortality from some chronic diseases appeared to have declined during the greater part of the 20th century. These results challenged the conventional interpretation of the epidemiological transition, which assumes a uniform decline of infectious diseases and a uniform increase in non-infectious diseases. A more detailed account of trends in specific causes of death provides a better starting point for explanatory studies.

7.3.2. Explanatory Studies

Central to the debate on the causes of the secular decline in mortality in industrialized countries has been the work by McKeown (1976), who argued that the contribution of medical care to the mortality decline prior to 1970 was modest. In his view, the most important cause was the general improvement in living standards and, more specifically, the nutritional status of modern populations. McKeown's thesis triggered a prolonged debate among historical demographers and others (Szreter, 1988). An important contribution to this debate was made by a series of studies from the Netherlands conducted by Mackenbach (1988, 1996). A central aim of these studies was to reassess the extent to which the 20th century mortality decline could be attributed to advances in medicine. To that end, trends in cause-specific mortality were studied for periods during which new medical techniques or public health interventions were introduced. For the period 1875 to 1970, Mackenbach (1996) estimated that medical care (such as vaccinations) contributed between 15 and 20 per cent to the decline in total mortality. A similar contribution was made by public health measures such as the introduction of safe water supplies and sewage systems.

Other explanatory studies that have been carried out in the Netherlands did not focus specifically either on medical care or on another specific determinant, but attempted to quantify the contribution made by several determinants to mortality trends in a specific period.

Wolleswinkel-Van den Bosch (1998) focused on the period during which the secular decline in mortality in the Netherlands started, namely the decades after 1870. The specific method applied in her analyses was that of geographical disaggregation: Mortality trends by province and major city were correlated with trends in a number of determinants. In the late 19th century, mortality decline was predominantly associated with cultural factors (steepest declines in secularized areas), whereas in the early 20th century, mortality decline was associated more strongly with economic factors (steepest declines in wealthy areas). Thus, both cultural and economic factors appeared to play an important role in bringing about the mortality decline in the Netherlands, albeit in different periods. Additional analyses of intermediary factors suggested that the main cultural factors were the acceptance of new ideas on health and hygiene and, to a lesser extent, the fertility decline.

The trends during the later phases of the epidemiological transition were just as remarkable as the trends in this initial phase. In the Netherlands, as in most other industrialized countries, mortality from several causes of death started to decline rapidly around 1970 (Wolleswinkel-Van den Bosch, 1998). The effect of these declines was so large as to positively influence trends in survival and life expectancy, in particular the survival of men between 50 and 80 years. Striking examples of declining mortality from particular causes of death are ischaemic heart disease (IHD, including heart attack) and traffic accidents. A number of studies have attempted to identify the causes of these declines.

In international research, most attention has been given to the causes of the decline in mortality from IHD. Several factors are assumed to have contributed to this decline, including favorable changes in lifestyle (such as less smoking, healthier diets, more physical exercise) and the introduction of effective medical care for patients with myocardial infarction. The relative contribution of these two factors has often been the subject of debate (Hunink *et al.*, 1997). For the Netherlands, the contribution of these factors has been recently determined in two studies. Oei and Erkelens (1995) measured the effect of changes in a number of risk factors (smoking, hypertension and serum cholesterol) by combining data on trends in the prevalence of these factors in the Dutch population with estimates of the increase in the risk of dying from IHD among persons who are exposed to these factors. They estimated that these three factors were responsible for 70 per cent of the decline in IHD mortality between 1974 and 1992 and argued that the contribution of medical care was relatively small. Bots and Grobbee (1996), however, who estimated directly the contribution of medical care (such as by-pass operations), concluded that about 45 per cent of the decline

in IHD mortality may be attributed to the improved treatment of myocardial infarction.

Another strategy was applied in an explanatory study on trends in accident mortality. Since 1970, accident mortality has declined rapidly in most industrialized countries, including the Netherlands. Van Beeck (1998) presented a framework to explain trends in accident mortality as the net result of changes in the incidence of injuries (the number of injured persons per 1000 inhabitants per year) and changes in their case fatality (the number of deaths per 1000 injured persons). Analysis of mortality trends along with trends in incidence and case fatality rates showed that different determinants operated in different periods. Between 1950 and 1970, accident mortality rose due to an increasing incidence of accidents. This was followed by a sharp mortality decline due to a decreasing incidence combined with a rapidly falling case fatality rate. After 1985, the mortality decline continued, but at a much slower rate than before because there was an upturn in the incidence of several types of injuries. Thus, trends in accident mortality rates were the net result of diverging trends in incidence rates and case fatality rates. Each of these components had their specific determinants. The case fatality of accidents was favorably influenced by both preventive measures (for instance, seat belt use) and improvements in trauma care. The incidence of accidents, on the other hand, was positively related to economic fluctuations. These results issue a warning that, despite progress in trauma care, accident mortality might increase in the years to come due to growing or new exposures.

While most explanatory studies focus on specific causes of death, some focus on specific age groups. In recent years, demographic studies have paid increasing attention to trends in mortality at ages 70 years and over (Kannisto *et al.*, 1994). Trends in mortality among the elderly population are highly relevant to the future aging of the population, and the future demand for health care by the elderly (Manton *et al.*, 1991). In the Netherlands, life expectancy at very old ages (85 years) has declined since the 1980's, for both men and women. These unfavorable trends stand in stark contrast to those in most other industrialized countries where the life expectancy of the elderly has increased consistently for several decades (Kannisto *et al.*, 1994). Empirical evidence on the causes of these trends was provided by Nusselder (1998), who calculated the contribution of specific causes of death to the decline in life expectancy at 85 years in the Netherlands in the 1980's. This decline was mainly due to unfavorable trends in bronchitis and related diseases, lung cancer, mental disorders and diabetes mellitus. On the basis of these results, Nusselder suggested that the decline in life expectancy may be

due, among other factors, to differences in smoking histories. Smoking prevalence rose quickly in the Netherlands in the early 20th century. The effect may be an increase in the mortality of elderly men in the Netherlands in the late 20th century, and probably even into the first decade of the 21st century.

7.4. STUDIES ON MORTALITY DIFFERENTIALS BETWEEN POPULATION GROUPS

Fundamental to studies on survival and length of life is the differentiation of mortality rates by age group, as in life tables. However, current patterns in mortality need to be described in more detail. Mortality differences between subgroups of the population are particularly important. The most basic distinction is by gender. The higher mortality of men as compared to women has consequences for the population structure: In the Netherlands, as elsewhere, the population aged 80 and older consists mainly of women. For the same reason, it may be important to examine mortality variations between subpopulations defined along other criteria, such as region of residence.

This section discusses recent Dutch research on mortality differentials between subgroups of the population. It focuses on three socio-demographic variables: marital status, socio-economic status and place of residence. We will not discuss the few, mainly descriptive, Dutch studies on mortality differences by gender (Van Poppel *et al.*, 1996) or by ethnicity (e.g. Schulpen, 1996). Nor will we deal with Dutch studies on small population groups such as monks (e.g. Gouw *et al.*, 1995) and babies born during the "Hunger Winter" in 1944 (Lumey & Van Poppel, 1994). These studies are interesting in that they can provide information on the aetiology of diseases, but they are of little relevance to the health of populations at large.

7.4.1. Marital Status

Differences in mortality according to marital status have been observed for over a century (e.g. Reesema, 1882; Van Poppel, 1976). Studies consistently observe relatively low mortality rates for married men and women, and high rates for unmarried men and women, especially divorced men. Several explanations have been put forward for these differences, but empirical tests on alternative explanations are relatively rare (e.g. Ben-Shlomo *et al.*, 1993).

A project by Joung (1996) made an important step from description towards an explanation of mortality differences by marital status. In her study she began by describing mortality differences by marital status in the Netherlands in recent years. Substantial differences were observed, the age-adjusted mortality rates of divorced men and women being about 50 per cent higher than those of married men and women. Substantial differences were not only observed for mortality, but also for self-reported indicators of morbidity, including health complaints and the prevalence of diseases.

A first step towards an explanation of mortality differences according to marital status was made by distinguishing various causes of death (Joung, 1996). In the late 1980's, accidents and violence, especially suicide, contributed substantially to the excess mortality of unmarried groups in the Netherlands. These causes of death suggested a strong effect of poor social integration and risk-seeking behavior. The contribution of cancers and diseases of the circulatory system to the excess mortality of the unmarried population was smaller. This seemed to be due in part to less favorable smoking histories among unmarried men and women.

An old and still unresolved issue is whether the association between marital status and mortality is due to causation (marital status has a causal effect on survival) or rather to health selection (ill health and related behavior has an effect on marital status). These two mechanisms can be disentangled most effectively in a longitudinal study in which marital status at the start of follow-up is related to survival during the follow-up period. International studies of this sort are rare. Joung (1996) used data from a large prospective cohort study, the GLOBE-study (Stronks, 1997). This study consists of a baseline measurement of both marital status and health status followed by an observation period of four years. Mortality differences by marital status were observed for men, but were not found for women. Control for health status at the start of the study hardly reduced the mortality differentials observed for men. This suggested that health selection effects contributed little to mortality differences by marital status. Causation seemed to be more important.

This finding raised the next question: Which factors may have mediated the causal effect of marital status on mortality? Joung (1996) measured the contribution of two sets of intermediate factors: health behavior (smoking, alcohol consumption, physical activity, and body mass index) and material circumstances (financial difficulties, level of household income, housing problems, crowding). Both series of factors

were measured in the baseline measurement of the GLOBE study. Their role was measured empirically in a multivariate analysis of the association between mortality and marital status, while controlling for the selected intermediate factors. These factors appeared to be able to explain about one half of the excess mortality of divorced men, but only a small proportion of the excess mortality of widowed men. Health behavior appeared to be more important than material living conditions.

In addition to explanations in terms of intermediate factors, one might ask to what extent mortality differences by marital status are influenced by the wider social context. This question has been addressed internationally by only a few studies such as comparisons over time or across countries (e.g. Hu & Goldman, 1990; Mergenhagen *et al.*, 1985). Joung (1996) has contributed to this literature by studying trends in mortality differences by marital status in the Netherlands between 1950 and 1990. After 1965, important changes took place in the Netherlands, such as changes in divorce legislation and improvements in the material living conditions of unmarried persons following the introduction of the General Welfare Act. If marital status is causally related to mortality, such changes may influence mortality differences by marital status. Joung found that mortality differences between married and divorced persons did indeed decrease after 1970, but that the differences between married and never-married people increased. Cause-specific analysis has shown that excess mortality from accidents and violence decreased for all unmarried groups. This decline may be a direct reflection of the effect of social changes, which may impinge on intermediate factors such as perceived stress and social support.

7.4.2. Socio-Economic Status

In recent years, a large number of Dutch studies have been conducted on mortality differences according to socio-economic factors such as education, occupational class and income level (Mackenbach, 1994; Stronks *et al.*, 1997). Since these differences were felt to be unnecessary, unfair and avoidable, they have been of prime concern to health policy makers. In the Netherlands, research on socio-economic inequalities in health was strongly stimulated in the 1990's by two successive five-year research programs sponsored by the Ministry of Health (Mackenbach, 1994) and by a surge in interest in socio-economic inequalities in health among epidemiologists and public health researchers from various other countries, in particular the United Kingdom (Blane *et al.*, 1996).

Even though there was little doubt that socio-economic inequalities in mortality existed in the Netherlands as well as in other European countries, by the late 1980's there was very little evidence to substantiate this expectation. Therefore, several descriptive studies were carried out around 1990 with the aim of demonstrating the existence of socio-economic inequalities in mortality in the Netherlands, and providing estimates of their magnitude, trends and patterns. The first pieces of evidence came from comparisons of rich and poor urban areas (e.g. Reijneveld, 1995a), and from reanalyses of data from epidemiological follow-up studies (e.g. Doornbos & Kromhout, 1990). Nation-wide evidence came from a study by Statistics Netherlands that related mortality registers at the individual level to tax registers (Kardaun & Glerum, 1995). In general terms, these studies revealed patterns of mortality that were known from British and Scandinavian studies. Some evidence indicated an increase in mortality differentials between 1950 and 1980 (Kunst *et al.*, 1990), but not in later years (Otten & Bosma, 1999). Several studies demonstrated that lower socio-economic groups not only had higher chances of premature death, but were also more likely to suffer from disease and disability (e.g. Cavelaars, 1998).

Some indications of the causes of socio-economic inequalities in mortality were obtained by distinguishing causes of death. A number of Dutch studies showed that, similar to what has been observed elsewhere, lower socio-economic groups have higher rates of mortality from a wide range of causes of death (e.g. Kardaun & Glerum, 1995; Reijneveld, 1995a). This suggests that a wide range of factors contribute to inequalities in mortality. Alternatively, these results were interpreted as evidence for a "general susceptibility" factor, such as increased psychosocial stress, which affects several diseases at the same time (Evans *et al.*, 1994).

An interesting observation from a life course perspective was that the effect of socio-economic factors on mortality is highly dependent on age. For example, mortality differences according to educational level are largest among people aged 30 to 45, and smallest among people aged 60 years and older (Kunst, 1997). There may be several explanations for this age pattern, such as shifts in the relative importance of different causes of death. The possibility that the effect of education on mortality itself might vary during the course of a person's life is an important finding. Education seems to be especially important to health and survival at the ages that men and women enter the labor market and pursue their careers.

The main task of international health inequalities research over the past years has been to move from description to explanation. Several

studies, especially in the United Kingdom and Scandinavia, have attempted to find empirical support for alternative explanatory mechanisms (Blane *et al.*, 1996; Davey Smith *et al.*, 1994). Much attention has been given to the health selection explanation, which states that health and socio-economic status are related in that the former affects the latter. A number of foreign studies concluded that this mechanism is of minor importance during adult life (Blane *et al.*, 1993). The extent to which health selection operates in early childhood or during the transition into adulthood remains uncertain, however. Dutch contributions to clarifying this issue have been made by Van Der Lucht (1992) and Van De Mheen (1998). The latter observed a clear association between childhood health and both adult health and adult socio-economic status. However, these associations can only partially explain the fact that lower socio-economic groups reported greater health problems during adulthood. No results were presented for mortality.

If selection explanations do not suffice, causation explanations offer an alternative: Socio-economic status is related to premature mortality in that the former has a causal effect on the latter. The principal question is which intermediate factors are involved. Many studies from Scandinavian and Anglo-Saxon countries have analyzed the contribution of well-known risk factors for heart disease, including smoking, cholesterol, hypertension and overweight. A common finding of most of these studies is that these factors contributed for no more than about one third to socio-economic differences in all-cause mortality or mortality from heart disease (e.g. Pekkanen *et al.*, 1995). Dutch studies obtained similar results (e.g. Doornbos & Kromhout, 1990). The general conclusion drawn from these studies is that several other factors must be involved, including perhaps diet, psycho-social stress and living conditions in early childhood (Davey Smith *et al.*, 1994; Vågerö & Illsley, 1995)

Explanatory studies that have determined empirically the contribution of these factors are more rare. A number of Dutch projects have yielded important results. For example, Stronks (1997), included behavioral factors as well as material factors and psychological factors, and considered several of the complex ways in which these factors together mediate the effect of education on self-reported morbidity. In the field of mortality, the most comprehensive study is an analysis by Schrijvers *et al.* (1999) based on the GLOBE study. Their analysis was based on a five-year mortality follow-up to the baseline survey. This survey included questions on both socio-economic indicators and on factors that may mediate the effect of socio-economic factors on mortality. The intermediate factors considered in this study include both material living conditions and behavioral factors. The higher mortality among

less educated groups could be largely explained by the intermediate factors included in the study. Material living conditions appeared to be more important than behavioral factors.

Other mortality studies focused on specific diseases of specific intermediate factors. For example, Van Loon (1997) attempted to explain socio-economic inequalities in mortality from lung cancer. Even though it would be highly plausible to find that these inequalities could be explained by differences in tobacco exposure, Van Loon observed that control for smoking could explain only a minor part of the observed mortality differences. Her findings, together with those from a few studies conducted in other countries, suggest that even in the case of lung cancer explaining mortality differences is complex and should include other factors such as diet and exposure to carcinogenic (cancer inducing) substances in the workplace.

In recent years, Dutch studies have also contributed to our understanding of the ways in which the wider social context determines the associations between socio-economic status and premature death. New insights have been obtained by comparative studies, including studies on time trends in mortality differentials (Kunst *et al.*, 1990; Otten & Bosma, 1999; Van De Mheen, 1998), and international comparisons (Cavelaars, 1998; Kunst, 1997). Most comparative results underline the persistent nature of socio-economic inequalities in mortality. In the Netherlands and comparable welfare states like Sweden, these inequalities have not diminished over time, nor are they smaller than in countries with less egalitarian socio-economic and health care policies. However, a large variability was observed for, among others, inequalities in mortality from ischemic heart disease (IHD) (Kunst, 1997). These inequalities varied considerably over time (in most countries, IHD changed from being a managers' disease in the 1950's to a low-class disease in the 1970's and later) and between countries (in the 1980's IHD was still a managers' disease in France and southern Europe). Parallel variations were observed in the social gradients in both smoking and dietary habits. This suggests that the social gradients in both smoking and dietary habits can have a strong effect on inequalities in IHD mortality. This variability also shows that the cultural and social context may have a considerable influence on the magnitude of socio-economic inequalities in mortality.

7.4.3. Place of Residence

Place of residence is the third socio-demographic variable studied by several Dutch researchers in relation to mortality (Van Oers *et al.*, 1997). Variations between urban districts were analyzed for several

Dutch cities, mainly with the aim of obtaining information about the effect of socio-economic deprivation on premature mortality (for instance Reijneveld, 1995a). Here, we will discuss another line of research, which relates to mortality variations between regions.

Descriptions of regional mortality differences have a long tradition in the Netherlands, as in many other European countries. Recent descriptive studies have introduced new elements. For example, Bloemberg *et al.* (1992) have provided a detailed description of mortality by cause of death in areas serviced by district health services. Regional mortality differences in the Netherlands have been put in an international perspective by Van Der Veen (1994) and by Spijker *et al.* (1998), while Dutch institutes have collaborated with UN organizations to create an impressive European atlas on regional differences in mortality by cause of death (WHO European Centre for Environment and Health, 1997). In all these studies, regional mortality variations in the Netherlands appear to be fairly small compared with those in other countries.

Explanatory studies with respect to all-cause mortality have focused on possible associations with the socio-demographic composition of regional populations. In the Netherlands, the religious background of regional populations is an important factor. The decline in mortality in the 19th century started relatively late in Roman Catholic areas (Wolleswinkel-Van Den Bosch, 1998), resulting in excess mortality in these areas in the early 20th century. This excess mortality persisted until the second half of this century, but its magnitude has declined gradually since the 1950's (Mackenbach *et al.*, 1991). Since the 1980's, regional life expectancies have been more strongly related to socio-economic level than to religious composition. Mackenbach and Looman (1994) showed that this new pattern, with higher mortality rates in socio-economically deprived regions, is found in all large and medium-sized countries of Western Europe.

Although regional variations in the Netherlands are fairly small for total mortality, large and marked variations have been observed for some causes of death (Bloemberg *et al.*, 1992; Mackenbach *et al.*, 1991), suggesting large differences between regions in the presence of disease-specific factors. A few studies have analyzed regional variations in cause-specific mortality in order to identify these determinants.

One approach is exemplified in a study on lung cancer mortality. An obvious explanation for regional variations in lung cancer rates is that they are due to regional differences in exposure to smoking. This hypothesis can be tested by means of correlations between smoking prevalence rates and rates of lung cancer mortality or incidence. Sur-

prisingly, Dutch studies found no strong correlations (e.g. Kunst & Mackenbach, 1993). This puzzling finding was explored further by looking at regional differences in mortality among the cohort of men born between about 1900 and 1910 and by relating these differences to smoking at various phases in the cohort life course (Kunst & Mackenbach, 1993). A strong positive correlation was observed between mortality in the 1980's and a proximate measure for smoking in the 1930's. This finding stressed the potential importance of a life course perspective, as it shows that explanations for mortality patterns may need to go back 50 years or more in people's lives.

A study on regional differences in traffic accident mortality applied a different approach (Van Beeck, 1998). Regional traffic accident mortality rates were broken down into two components: the incidence rate (number of traffic accidents per 1000 inhabitants per year) and case-fatality rates (number of deaths per 1000 traffic accidents). Both components were broken down further. For example, the traffic accident incidence was decomposed into exposure rates (e.g. number of kilometers traveled by car per 1000 inhabitants per year) and injury risk (e.g. number of injuries per 1000 kilometers traveled). Different components showed entirely different regional patterns. For example, the socio-economic level of a region was positively related to exposure rates but inversely related to injury risk. This de-composition provided a means to determine more accurately the possible effect of different determinants. It was observed, for instance, that case-fatality rates were relatively low in regions with sophisticated trauma care, providing evidence for a beneficial effect of this type of care on the survival of injured persons. This effect would have gone unnoticed in analyses that do not decompose traffic accident rates into case-fatality rates and other components.

An approach that is becoming increasingly popular in Anglo-Saxon countries is multi-level analysis, in which attempts are made to disentangle individual-level effects from aggregate-level effects (Anderson *et al.*, 1997; Waitzman & Smith, 1998). Multi-level techniques are now beginning to be applied to the analysis of geographical mortality differences in the Netherlands (Bosma *et al.*, 1998). Experience has already been gained with the analysis of differences in morbidity indicators. An example is a study of the relatively high prevalence of self-reported morbidity in poor urban districts in Rotterdam (Van Oers *et al.*, 1999). Multi-level techniques were used to determine whether this aggregate-level association could be attributed to the well-known association at the individual level between poor health and low socio-economic status. The analysis showed that even after correction for this individual-level

association, the aggregate-level association persisted. This result suggests an independent effect on health of the socio-economic environment in which people live.

7.5. STUDIES ON FUTURE TRENDS IN MORTALITY

Predicting future trends in mortality is traditionally one of the key activities of medical demographic research. Projections of future trends in mortality are an integral part of population forecasts. In addition, a large body of research has developed, especially in the Netherlands, that evaluates the future course of mortality under alternative economic, socio-demographic or epidemiological trends by means of "what if" scenarios (Brouwer & Schreuder, 1986). Special attention has been given to the potential effects of specific interventions by the health sector, such as the introduction of new medical treatments or the prevention of risk factors like smoking.

A reference point for all studies in this area are the mortality projections that are made as part of the annual national population forecasts of Statistics Netherlands. These projections are based on a fairly simple methodology (Van Hoorn & De Beer, 1997). Qualitative considerations of possible future trends in the main determinants of mortality are used to predict future trends in male and female life expectancies. Three scenarios have been constructed, differing with respect to the pace of increase in life expectancy. The scenarios have been derived from assumptions on the maximum attainable life expectancies in the decades to come, and on likely future trends in male-female differences in life expectancy.

Projections of future mortality should take into account estimates of the maximum life span (i.e. the maximum age that any human being may expect to live), and the extent to which current life expectancies are approaching this maximum. The maximum life span of the human race is the subject of a debate in which views differ widely (Tabeau, 1997). These views are based on alternative theories of aging, and on alternative interpretations of current patterns of, and trends in mortality. A few Dutch studies have contributed to this debate by means of analyses of old-age mortality in the Netherlands. Aarsen and De Haan (1995) have estimated the maximum life span on the basis of data for the cohort born in 1871–1881. The maximum life span was estimated to be between 113 and 124 years (estimates with 95 per cent confidence). Nusselder (1998) has examined to what extent recent mortality trends agree with Fries' (1980) famous hypothesis that survival curves will

become increasingly rectangular. Rectangularization occurs if deaths are increasingly "compressed" into a limited age range. For deaths that occur after the age of 60, rectangularization of survival was found to occur in the Netherlands in the 1980's, but an opposite trend was observed for the 1960's and 1970's. This evidence did not consistently support Fries' prediction that mortality will be increasingly more compressed around the age of about 85 years.

Nusselder's study (1998) is an example of research that looks at past developments to aid projections of future trends. This principle is used more systematically by studies that predict future mortality trends by describing and extrapolating past trends in mortality by age, sex and cause of death (Keyfitz, 1982). It is essential that these studies describe past mortality trends by means of a number of parameters that can be extrapolated into the future with a reasonable degree of certainty. A Dutch contribution to these developments was made by a series of studies conducted by Tabeau. In one study, the Heligman-Pollard model was used to describe past trends in total mortality (Tabeau & Tabeau, 1998). The estimated parameters were extrapolated in order to make projections up to the year 2020. In a subsequent study, Tabeau and Huisman (1997) applied a similar methodology to describe and project trends in mortality from specific causes of death. Projected cause-specific mortality rates were combined to obtain estimates of future trends in all-cause mortality and life expectancy. Interestingly, the life expectancies that were projected in this way were fairly close to those assumed in the national population forecasts.

A further step towards projecting future trends in mortality can be obtained by explicitly taking into account trends in the principal determinants of mortality. Determinant-based models of mortality enable researchers to explore how mortality trends may develop in the near future in relation to possible trends in one or a few determinants (Willekens, 1990). At the international level, determinant-based models of mortality have so far scarcely been used. An important contribution has been made by Van Genugten *et al.* (1997). Their study aimed to determine the impact on future mortality of possible trends in a number of risk factors: smoking, hypertension, high serum cholesterol and physical inactivity. Alternative scenarios were constructed on the future development of these risk factors, such as the complete elimination of smoking. The effects on mortality were modeled by means of multi-state life tables with one disease-free state and five states corresponding to five fatal diseases. Rates of entry into these disease states (incidence rates) were modeled as a function of exposure to risk factors. Scenarios that assumed moderate future reductions in risk factor exposures

yielded interesting results. One of the conclusions was that lung cancer mortality was likely to decrease more rapidly than had been predicted by studies based on an extrapolation of past trends in lung cancer mortality (Tabeau & Huisman, 1997). This discrepancy may be attributed to the fact that the determinant-based model was the only one that could take into account recent declines in the prevalence of smoking in the Netherlands.

Dutch epidemiologists and related scientists have gained special experience in the modeling of trends in mortality (and other outcomes) from specific diseases. Several models have been developed in a series of scenario studies on, among other diseases, cancer, diabetes mellitus and heart disease (Brouwer & Schreuder, 1986). An exemplary scenario study was a study on accidents. Future trends in accident mortality were modeled by breaking down accident mortality into the same components as those distinguished to describe trends over the past (see Section 7.3) and differences by region of residence (see Section 7.4.3). Scenarios of future trends in accident mortality were developed by making separate projections of different components. These projections were based on analyses of past trends and the advice of experts obtained by means of the Delphi method (Lapré& Mackenbach, 1989). Ten years later, this approach was found to have yielded fairly accurate projections of trends in accident mortality in the 1990's (Van Beeck 1998).

A type of study with a long tradition in demography and one that resembles scenario studies is research based on cause-elimination life tables (Chiang, 1991). Although these tables are generally used to quantify the relative importance of different diseases, they also serve to provide an estimate of gains in life expectancy that may be obtained by eliminating (partially or completely) individual diseases. The methodology of cause-elimination life tables has hardly developed further since the 1970's (Chiang, 1991). In a recent Dutch study, however, efforts were made to refine the traditional methodology (Kunst *et al.*, 1999; Mackenbach *et al.*, 1998). Cause-elimination life tables normally assume independence among causes of death: Those who were expected to die from a specific cause do not have an increased risk of dying from other causes. It would be more realistic, however, to take into account associations between causes of death. Information on these associations was obtained from an analysis of multiple cause-of-death statistics, and consequently used in a multi-state version of the cause-elimination life table. The revisions made in this way had important effects on the results. Whereas traditional calculations found that the largest gains in life expectancy would be obtained by the elimination of cardiovascular diseases, the revised calculations suggest that eliminating cancer mor-

tality would be more or less equally important. The reason for this finding is that patients with cardiovascular diseases were more often found to suffer from diseases that could turn into a new cause of death if cardiovascular disease were to be eliminated.

7.6. STUDIES ON FUTURE TRENDS IN MORBIDITY

Increasingly, studies on future trends in mortality also attempt to estimate the concomitant changes in morbidity. In these studies, the burden of morbidity in the future population is measured by the prevalence of specific diseases or by some generic (i.e. non disease-specific) measure such as the prevalence of disability. The main reason for combining mortality and morbidity is that health policies aim to do much more than merely extend survival. Often, health policy documents recognize that in addition to "adding years to life" they should be targeted at "adding life to years" (WHO, 1993). The public health impact of future trends in mortality can therefore be evaluated more appropriately if concomitant changes in morbidity are also taken into account.

The scientific debate on the effects of mortality decline on the burden of morbidity has long been dominated by two opposing theses (Manton *et al.*, 1991). The *compression thesis* states that disease and disability are increasingly limited or "compressed" to the last years of life (Fries, 1980). The *expansion thesis*, on the other hand, predicts an increase in the burden of morbidity because the extra years of life gained due to the mortality decline are expected to be mainly years of life spent in ill health (Barendregt & Bonneux, 1998; Nusselder 1998).

The simplest way to project future trends in the burden of morbidity is to make independent estimates of the future prevalence of morbidity, and to combine these estimates with projections of future population numbers. This method has been used to estimate the effect of aging on the future burden of disease in the Dutch population (Van den Berg Jeths *et al.*, 1997). By combining age-sex-specific rates on the prevalence or incidence of diseases with age-sex-specific population numbers, projections were made of the future incidence and prevalence of a large number of diseases for the period 1994–2015. As expected, the aging of the Dutch population will result in a substantial increase in the incidence and prevalence of most diseases, especially chronic diseases typical of old age.

A demographic refinement of this method takes into account not only the future composition of the population by age and sex, but also

changes in the population by other socio-demographic characteristics. Even though this is an obvious approach to use from a demographic perspective, it is hardly applied internationally. Experience with this approach was obtained by Joung (1997) and Joung *et al.* (1997) who made predictions of the future prevalence of disability and other generic health indicators. A multi-dimensional cohort projection model was constructed that took into account not only future changes in the population structure by age and sex, but also changes by education, marital status and living arrangement. Estimates of current prevalence rates by these socio-demographic variables were combined with available forecasts of the future population composition by the same variables. The effect of aging would be to increase substantially the future prevalence of ill health. This effect was found to be reinforced slightly when taking into account the expected increase in the proportion of the population that will be living alone. An opposite effect was observed, however, when taking into account the fact that the educational level of the elderly will increase dramatically over the next 20 years. For some health indicators, notably perceived ill health, the effect of aging is almost completed compensated for by the higher educational levels of the future elderly population.

A disadvantage of the projection methods discussed above is that trends in mortality and in measures of morbidity are projected in isolation. Ideally, mortality and morbidity are modeled as outcomes of the same diseases processes (Barendregt *et al.*, 1997a; Bone *et al.*, 1995; Robine *et al.*, 1993). One approach is to include morbidity measures within a multi-state life table that redistributes the life table population into a healthy state and one or more unhealthy states (e.g. being disabled or having a specific disease), and that allows for transitions between these states. This model yields simultaneous estimates of the level of mortality and of the percentage of the living population in an unhealthy state.

A study by Nusselder (1998) was one of the first in which these models were used to project mortality in relation to the prevalence of disability. The principal aim of this study was to identify conditions under which "compression of morbidity" would occur. More specifically, it evaluated how an increase in life expectancy could be achieved without resulting in an increased prevalence of disability. Multi-state life tables were used to evaluate two types of hypothetical changes: elimination of specific diseases and elimination of smoking. The results for smoking showed that a reduction in smoking would not only substantially increase the life expectancy of the Dutch population, but would also increase the proportion of years spent without disability. Thus, the

extra years of life gained by elimination of smoking would mainly be years spent in good health.

Until now, Nusselder (1998) has been one of the few researchers who used multi-state life tables to model mortality in relation to a generic measure like disability. Most other researchers applied this technique to model the incidence, prevalence and mortality from specific diseases (Bone *et al.*, 1995; Robine *et al.*, 1993). The advantage of disease-specific models is that they enable the researcher to evaluate the effect on mortality and morbidity of interventions in specific diseases, such as prevention of risk factors for these diseases, and medical treatment of patients with these diseases. Barendregt and Bonneux (1998) made important contributions to the development of life table models for specific diseases. The type of results obtained can be illustrated for cardiovascular diseases. The most likely future changes in cardiovascular disease epidemiology are a lower incidence (fewer new cases per 1000 persons per year) and increased survival (postponement of death) for both heart disease and stroke. Scenarios based on multistate models showed that these favorable trends would result in a substantial increase in the life expectancy of the general population and in a decrease in the prevalence of cardiovascular diseases at young ages. Unexpectedly however, the prevalence of these diseases at older ages would increase. The net effect of these opposing trends is that there would be almost no change in the burden of cardiovascular disease in the general population.

Models that include several diseases simultaneously, complemented with a rest group of all other diseases, are most interesting for demographic purposes (Barendregt & Bonneux, 1998). With these multi-disease models, cause-specific mortality rates can be combined to estimates of all-cause mortality and survival. A more problematic issue is how to obtain an aggregate measure of the total burden of morbidity. It makes no sense to simply add up prevalence rates for different diseases. The total burden of morbidity from different diseases can only be calculated after having translated disease-specific prevalence rates into a generic measure like disability. The best known approach to this problem was presented in influential reports by Murray and Lopez (1996, 1997), who introduced the DALY (disability-adjusted life year) concept. Several Dutch research groups have introduced this concept to the Netherlands, and improved the methodology used for its calculation (Van der Maas & Kramers, 1997). The DALY approach is an example of a bottom-up approach: Disease-specific prevalence rates are first calculated and then combined by means of a generic measure such as disability. Some Dutch studies applied the reverse top-down approach.

These studies start with a measure of the total burden of disability, and then redistribute this burden to individual diseases. The top-down approach relies on an analysis of empirical data, for instance from health interview surveys, regarding associations between disability and specific diseases. Significant advances in this top-down approach were made by both Nusselder (1998) and Boshuizen *et al.* (1997).

7.7. STUDIES ON CONSEQUENCES FOR HEALTH CARE DEMAND, COSTS AND FINANCING

Although differences and changes in mortality and morbidity are likely to have important consequences for health care, the precise nature of these consequences can not be determined in a straightforward way. Increased levels of morbidity may be expected to give rise to increased demand for health care, but the extent to which this is likely to occur is uncertain. Similarly, there is no doubt that increased morbidity and demand for health care will raise the costs of health care, but the degree to which costs will rise and the implications for the financing of the health care system remains uncertain. Studies are needed that explicitly investigate the demand for health care and costs of health care in relation to demographic and epidemiological developments.

Special interest exists in the effect of demographic trends on the future costs of health care. In the Netherlands, measurement of these effects is greatly facilitated by unique data which specify to what extent the total cost of health care in the Netherlands is attributable to patients with specific diseases or patients in specific age-sex groups (Polder *et al.*, 1997). By applying the age-sex specific health care costs to projections of the future population by age and sex, Polder *et al.* (1997) estimated the extent to which the aging of the Dutch population was expected to contribute to an increase in health care costs. These extrapolations could be made for the total costs as well as for the costs attributable to specific diseases. Substantial effects were observed and, not unexpectedly, the increase in costs was largest for diseases that are strongly related to age, such as dementia and other psycho-geriatric diseases. The authors conclude, however, that future trends in health care costs will depend more on future developments in other factors, including rising price and wage levels and the application of new expensive medical techniques, than on demographic changes.

A logical extension to studies on the effect of aging is to take into account changes in other socio-demographic characteristics. A Dutch contribution to this line of research was made by Joung (1997) and

Joung *et al.* (1997), who estimated the potential effects of future changes in the composition of the Dutch population according to age, sex, education and marital status. Changes in health care demand were expressed by the number of contacts with general practitioners and specialists, and by the number of hospital admissions. As with morbidity (see Section 7.6), they found that the aging of the population may be expected to result in an increase in the demand for health care. Unlike morbidity, however, there was no substantial effect of the future increase in the educational levels of the elderly. Currently, the use of medical care hardly varies according to educational level, and if this pattern persists in the future, an increase in the educational level of the elderly would not greatly influence the future demand for health care. Similarly, it was found that changes in the composition of the Dutch population by marital status would have only a modest effect on the future demand for medical care.

Whereas the previous studies looked at changes in the socio-demographic composition of the Dutch population, a few other studies looked at changes in more specific determinants (Brouwer & Schreuder, 1986; RIVM, 1997). An interesting example is a scenario study by Barendregt *et al.* (1997b) on the effect of the elimination of smoking on the future costs of health care. These effects were estimated by means of a multi-state life table that modeled the incidence, prevalence and mortality of several diseases as a function of smoking. The disease-specific output of this model was translated into cost estimates by means of the costs-of-disease data mentioned above (Polder *et al.*, 1997). Application of this model showed that elimination of smoking would first reduce costs of health care (due to a decrease in the incidence and prevalence of smoking-related diseases) but that in the longer term costs would increase (due to the survival until old age of those saved from dying from smoking). It was observed that the financial balance of the initial savings and the extra costs at a later stage cannot be measured unequivocally, because this balance strongly depends on the time horizon of the study, and the discounting rate applied to future costs (Barendregt & Bonneux, 1998).

So far, there have been few international studies of the implications for health care of future trends in the socio-demographic characteristics or other relevant factors. Having said that, several countries have extensive experience in estimating the health care implications of geographical variations in these factors. In the United Kingdom, in particular, "resources allocation formulae" have been developed to estimate differences between administrative areas in the need for health care on the basis of epidemiological and demographic information (Mays, 1995).

Only a few Dutch studies fit into this tradition (e.g. Reijneveld, 1995b). Examples are studies on the spatial distribution of health care services for the elderly such as nursing homes (Fokkema & Van Der Knaap, 1996; Fokkema & Van Solinge, 1998). In the Netherlands, the number of beds per capita is high in urban areas, and low in suburban areas. This unequal distribution may be explained by the fact that the elderly are overrepresented in urban areas. In the near future, however, suburban areas will face a rapid increase in the proportion of elderly, while "disaging" may occur in urban areas. These emerging trends raise the question whether some health care services should be moved from urban to suburban areas (Fokkema & Van Solinge, 1998). In a study on Amsterdam and surrounding areas, Fokkema and Van Der Knaap (1996) compared districts in terms of their future age composition, as well as other socio-demographic characteristics and a few morbidity indicators. When only future age compositions were taken into account, some areas appeared to receive a disproportionate share of the health care for the elderly. However, consideration of all relevant socio-demographic and epidemiological information showed that the current distribution of services seems to match patterns of need fairly well.

Socio-demographic patterns have implications not only for the demand for, and costs of health care, but also for the way in which health care costs are financed. A number of influential Dutch studies have examined the distributive effects of health care financing systems (e.g. Van Doorslaer *et al.*, 1992). A life course perspective was applied in the studies by Nelissen (1997, 1998). The financing systems of most European countries appear to be progressive: Measures of income inequality are found to be smaller after transfers related to health care use and financing have been taken into account. One should not forget, however, that people with high incomes generally live longer than people with low incomes. As a result, higher income groups may receive the benefits of health care that, at least under the Dutch system, flow from younger generations to older generations. Thus, differential mortality may make the Dutch health care system less progressive than it would appear to be at first sight. The magnitude of this effect is not known, however, and needs to be estimated by modeling the population dynamics that result from differential mortality. To this end, Nelissen (1997) applied the NEDYMAS micro-simulation model (see Chapter 8 of this volume by Hooimeijer and Oskamp for details on this microsimulation model). The expected effect was observed, but it was found to be of minor importance. Thus, the results did not support the assumption that differential mortality would turn the progressive Dutch health care financing system into a regressive one.

7.8. POLICY RELEVANCE

Many of the studies discussed in this chapter have important implications for health policies, including preventive policies and the planning and administration of health care services.[1] It is not possible here to discuss in detail the implications for health policies of all studies mentioned in this chapter. Instead, we shall discuss in general terms the different types of implications that studies in the field of medical demography appear to have had in recent years. At the same time, we shall provide an overview of fields where future demographic research may be directly relevant to health policies.

7.8.1. Monitoring Population Health and Disease Surveillance

A basic responsibility of health authorities is to monitor the state of public health and to identify emerging hazards such as new epidemics of infectious disease (RIVM, 1997). An essential source of information are mortality statistics. Unlike most other health statistics, mortality statistics have the advantage that they cover long periods of time and that they allow for detailed disaggregations by age, sex and other sociodemographic characteristics. Cause-of-death statistics remain a key source of information for monitoring trends in specific injuries and fatal diseases (RIVM, 1997). The use of mortality statistics may be improved with the aid of several types of studies, including studies that measure the quality of cause-of-death registration (Ruwaard & Kramers, 1994) and studies that link mortality records to other sources of information, such as income, neighborhood of residence and ethnicity (see, for instance, Kardaun & Glerum, 1995). Equally important for public health monitoring is the development of models that provide a basis for defining "expected" trends which may later be compared with observed trends (e.g. Van Beeck, 1998). Several of the models that were developed over the past years will be used to monitor future trends in mortality and morbidity, and to evaluate specific interventions. Finally, the use of mortality statistics may be improved further by the development of measures like disability-adjusted life expectancy (DALE) that

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[1] For example, estimates of the consequences of demographic and other developments for the future costs of health care have provided important data, instigating the Dutch Minister of Public Health to call for a substantial annual increase in the health care budget. This increase was agreed during negotiations between the political parties that formed a new coalition government in the summer of 1998.

combine mortality and morbidity data, yielding comprehensive measures of population health (Barendregt *et al.*, 1997a).

7.8.2. Prevention of Premature Death and Disease

A fundamental value shared by all societies is to live a long and healthy life. Regrettably, even today, at the end of the 20th century, about 1 in 10 new-born babies in Europe will not reach the age of 65 (WHO, 1996). Prevention of premature death and increasing length of life therefore remain important goals for health policies (VWS, 1995; WHO, 1993). One of the policies that contribute to achieving these goals is the prevention of specific risk factors for fatal diseases, such as smoking and alcohol abuse (Murray & Lopez, 1996; RIVM, 1997). Evidence of the effects of specific risk factors is provided by studies on trends and differentials in mortality. For example, studies on geographical differences in mortality have led to the influential hypothesis that poor living conditions in childhood have a detrimental effect on survival in adulthood (Barker, 1992). More importantly, studies on trends and differences in mortality have increased the awareness that health is not only determined by exposure to specific risk factors, but that it is also influenced by the broader social, economic and cultural forces that shape people's lives and influence their exposure to these risk factors. It has repeatedly been shown, for example, that people in poor socio-economic circumstances experience greater difficulty in quitting with smoking (Graham, 1995). A corollary of this observation is that the health of populations is sensitive to general socio-economic and cultural trends, and that where necessary and feasible, policy makers should attempt to influence these trends by means of intersectoral policies (Blane *et al.*, 1996; Evans *et al.*, 1994; Wilkinson, 1996).

7.8.3. Evaluation of the Impact of Health Care Interventions in Population Health

Given the increasing costs of health care, the costs and effects of new interventions should be carefully weighed, and the cost-benefit balance should be compared with that of other interventions (Schouten & Van Der Meer, 1997). Accurate measurement of the effects of interventions on the burden of mortality and morbidity in the total population is essential. Demographic techniques in particular are needed to measure the effect on population health of interventions that increase the average length of life of the target population, such as preventive screening for cancer or improvements in the treatment of myocardial

infarctions. In these cases it is important that we estimate how a mortality reduction at a specific age and period will affect mortality and morbidity at older ages and in later periods. In recent years experience has shown that these effects can best be estimated by applying population-based mortality models (Barendregt & Bonneux, 1998; Nusselder 1998; Robine *et al.*, 1993). Particularly valuable are models that are able to simulate developments in the intervention population during the remaining life course and that provide information about the length and quality of life (e.g. disability-adjusted life expectancy). In some instances, these models may generate results that are unexpected or even felt to be counter-intuitive. For example, in Section 7.6 we discussed that a common expectation (reducing smoking saves health care costs) may be called into question when examined in greater detail by means of advanced population-based models (Barendregt *et al.*, 1997b).

7.8.4. Administration and Planning of Health Care Services

Health care services should be receptive to the specific needs in their service areas. Changes in needs should be anticipated to give those concerned sufficient opportunity to allocate resources, to create new infrastructures, and to train the necessary personnel. Similarly, variations in needs between areas (e.g. municipalities) and population groups (e.g. migrant groups) should be quantified so that discrepancies between service provision and demand for services may be identified. A study of spatial differences in the demand for health care by the elderly has shown that first impressions of these differences may change substantially on the basis of a thorough description of demographic and epidemiological differences between areas (Fokkema & Van Der Knaap, 1996). More detailed and more reliable estimates of health care demand and related budgets may, in the future, be provided by research that integrates the results of empirical analyses in a population-based model of mortality and morbidity.

7.9. CHALLENGES TO FUTURE RESEARCH

Medical demography is advancing rapidly. Compared with the situation in the late 1980's (Van Poppel, 1990), marked improvements have been made both in the acquisition of data and in the analysis of these data by means of models and statistical techniques. Substantial contributions have been made by the various projects that formed part of the NWO Priority Program on Population Issues. Continued progress may

be envisaged in the years to come. Advances may be expected in both descriptive research, explanatory research, and projections based on models.

7.9.1. Description

Research on trends and differentials in mortality has so far been mainly descriptive. The repetitive nature of this research has led to a situation in which most descriptive analyses do little more than reveal familiar and predictable patterns. This does not imply, however, that there is no need for further advances in descriptive research. A common experience of those who work with population-based mortality models is that, despite a seeming abundance of mortality data, enormous gaps in the available knowledge exist (Barendregt & Bonneux, 1998; RIVM, 1997) In the Dutch situation, for example, data on socio-economic differences in mortality are still sadly lacking. Despite several studies in this field, there is still a great deal of uncertainty about trends in socio-economic differences in mortality, and about the magnitude of these differences among children, women and the elderly (Stronks *et al.*, 1997). Even fewer data are available on mortality differentials based on a number of other status variables. The absence of data on levels and patterns of mortality among some immigrant groups in the Netherlands, such as people born in Surinam and the Netherlands Antilles, is particularly acute.

The creation of new databases could make a major contribution to future descriptive research. The Netherlands trails far behind the Nordic countries, where statistical linkage on the basis of personal identification numbers creates extensive opportunities for descriptive mortality analyses. Future research should seize any new opportunities offered by information systems. The introduction of the automated national municipal population administration (GBA) in 1995 is a case in point.

7.9.2. Explanation

In recent decades, experience has shown that it takes much time and effort to move from description to explanation. The extent to which certain mortality variations (such as higher mortality among female homemakers, the unemployed, and unmarried people) reflect the effect of ill health on socio-demographic status (health selection) rather than true causal effects, remains unclear (Mackenbach & Verkleij, 1997). In addition, where causal effects are known to be most important, for instance in the association between mortality and education, there is still

considerable uncertainty about the relative importance of alternative causal mechanisms (Stronks *et al.*, 1997). Over the past years, there have been substantial advances in explaining mortality differences by socio-economic factors, but much less progress has been made in explaining mortality differences by other factors, such as place of residence. Future advances in explanatory research may be achieved with the aid of a number of complementary approaches.

A first approach builds directly on descriptive studies. Future descriptive research should acknowledge the fact that descriptions are not only valuable in their own right, but may also provide important building blocks for explanatory research. It may be particularly informative to analyze simultaneously several socio-demographic variables that have so far been analyzed in isolation. The life course perspective underlines that mortality differences need to be studied in relation to socio-demographic variables that relate to different phases in the life course, for example, to the level of education completed in early adulthood, to the occupational position achieved in late adulthood, and to the wealth that has been accumulated at retirement age. These analyses pinpoint which specific phases in life — and the specific economic, social and cultural forces shaping these phases — appear to have the largest effect on survival in later life.

Multivariate analyses of this kind are comparable to multi-level analyses. Important information about the causes of geographic differences in mortality may be obtained by using techniques of multi-level analysis to relate the mortality of individuals both to their place of residence and to individual-level data on marital status, ethnicity and other socio-demographic variables. Multi-level analyses are particularly valuable in that they may provide information about possible contextual determinants of mortality such as socio-economic policies and social cohesion (Anderson *et al.*, 1997; Waitzman & Smith, 1998).

Another challenge to explanatory research is to identify at the individual level the specific risk factors (e.g. smoking, diet, stress) that may mediate the association between socio-demographic factors and survival. Similarly, there is a pressing need to determine the contribution of different risk factors to trends in mortality over time. Research on the contribution of risk factors can make substantial advances only by using data from longitudinal studies in which (trends or differences in) survival at specific ages is related to (trends or differences in) the exposure to risk factors at younger ages. Several epidemiological follow-up studies that were embarked on in the Netherlands in the 1990's are set to generate important information (RIVM, 1997). Additional possibilities for analyses are offered by retrospective follow-up studies of

historical cohorts, such as the Historical Sample of the Netherlands (HSN) conducted by the International Institute of Social History in Amsterdam. Unfortunately, longitudinal studies are scarce, and often small and restricted to specific populations. Initiatives should be taken to facilitate the creation of national representative longitudinal data, such as panel studies or a mortality follow-up to large-scale national surveys. Note, however, that longitudinal data are not a panacea, since there are problems inherent in explanatory research which the available longitudinal data may not be able to resolve (Stronks, 1997). Other types of data should therefore not be overlooked. Data that can be fruitfully analyzed from a life course perspective are, for example, cross-sectional health surveys with an extensive battery of retrospective questions on socio-economic, residential and other careers (Van De Mheen, 1998).

7.9.3. Projection

Health policy makers and researchers will continue to be interested in predictions or "what if" scenarios of future trends in mortality, disease prevalence, and demand for medical care. Studies on future trends in mortality and morbidity will therefore have to apply and further develop the specific tools needed for projection. Most important among these tools are population-based models of mortality and morbidity (Bone *et al.*, 1995; Murray & Lopez, 1996; Robine *et al.*, 1993). In recent years, a wide range of such models have been developed and applied in medical demography and public health research. Most models embodied a life course perspective by using a version of the life table. The standard life table has been extended in different ways, depending on the specific purpose of the model. Examples are dynamic models (that include calendar time), exposure-prevalence-based models (that stratify the population according to a status variable such as smoking status), and incidence-prevalence mortality models (that add disease states between the health state and the "dead" state). In one study, the model that was applied was evaluated afterwards for its ability to predict mortality trends in the near future (Van Beeck, 1998).

Future progress in the application of life table-based models depends in part on the development of modeling techniques. Innovative work is needed in both the bottom-up and top-down approaches that link disease-specific prevalence rates to generic measures such as disability (Nusselder, 1998). In addition, new approaches may need to be developed to take into account associations between diseases, even though experience in recent years has shown that results of models are often fairly insensitive to whether or not disease dependency has been

taken into account (Barendregt & Bonneux, 1998). Finally, techniques may be devised that estimate mortality and morbidity rates not only in relation to people's present status, but also in relation to their preceding life trajectories. Microsimulation may be the most appropriate method. This technique has so far been applied mainly to the study of infectious disease dynamics (e.g. Kretzschmar & Van Duynhoven, 1997) but in the near future it will also be applied to the modeling of chronic diseases.

Interesting new techniques should not, however, obscure the fact that the quality of a model largely depends on the quality of its empirical input. Detailed and accurate descriptive data are often lacking in medical demography, while estimates of the size of causal effects are absent or imprecise. This even applies to the well-known and indisputable association between smoking and lung cancer: The extent to which smoking cigarettes increases the risk of dying from lung cancer among men is estimated to be less than threefold in some studies, but more than tenfold in others (Van De Mheen, 1996). Descriptive and explanatory research in demography can make a major contribution to the provision of more accurate empirical input for population-based mortality models.

7.9.4. Conclusion

Future research in the field of medical demography will most likely be as diverse as research in this field has been over the past years. Researchers will continue to be intrigued by phenomena ranging from the onset of the decline in infant mortality at the start of the 20th century to the fact we are now closer to the limits of human life than ever before in the history of mankind. Even though these two topics may seem to be a world apart, they are not: They refer to the beginning and the end of the lives of those belonging to the same birth cohort. Further integration of medical demography may take place once we realize that the health and survival of specific generations may be understood by what happened during their earlier life course, and that this understanding is essential to predicting the survival, health and demand for care of these generations when they grow older.

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8. ADVANCES IN THE MICROSIMULATION OF DEMOGRAPHIC BEHAVIOR

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Abstract. Modeling the interactions between individuals and their context requires a specific methodology. Two types of interactions are central to the NWO Priority Program on Population Issues. First, the interaction between careers of various individuals within one household, the micro context. Second, the interaction between individuals and society at large, the macro context. Starting from a life course perspective in which these interactions are conceptualized, microsimulation is the appropriate methodology for empirical expression. In this chapter we shall discuss advances in the microsimulation of demographic behavior in the context of the social security system and the structures of housing provision. Our starting point is the elaboration of the life course perspective in order to develop a number of criteria for the functional design of models dealing with issues like: stochastic properties; dynamic cross-sectional modeling; variables richness; the consistency and sequencing of linked events; the transformation of behavioral intentions into observable behavior; and the incorporation of decision rules. The methodological pitfalls inherent to these issues are discussed. Next, three microsimulation models (KINSIM, LOCSIM and NEDYMAS) that were developed in the Priority Program will be evaluated in terms of the technical solutions needed to meet the criteria and to solve the methodological issues. Neither of these models uses the full potential of microsimulation to model life courses. Some promising avenues for future research, both substantive and technical, are identified.

8.1. INTRODUCTION

Population forecasts form the root of demography as a discipline. Contemporary demography still reflects this origin by its clear diachronic tradition, looking at the evolution of demographic change

over time. Since the publication of Ryder's (1965) seminal article *The cohort as a concept of social change*, this diachronic view has taken root in the wider social sciences as well. Even though many amendments have been made to his original view, in particular with respect to intra-cohort homogeneity and to the fixating nature of the formative years, the cohort is still a powerful concept. Very few will deny that the future course of society at large is influenced by the macro biography of the cohort. For instance, studies of the implications of population aging invariably stress that cohort history is both a product and a cause of social change (Riley, 1987). The work of Coleman (1990) in particular has shifted attention towards the individual level, acknowledging the theoretical primacy of the individual in transforming and reproducing social structure through behavioral responses to changes in the macro context. This interaction between the individual and the context lies at the heart of the NWO Priority Program on Population Issues (see Chapter 1 of this volume by Dykstra and Van Wissen). The general goal of the microsimulations that have been developed in the Priority Program is to model the interaction between micro and macro at the intersection of calendar or historical time and age or lifetime. The models simulate events in the micro biography of individuals and households, producing output at the cohort level, generating shifts in the macro context that affect the micro biographies.

In this contribution we will report the progress that has been made in the microsimulations carried out in the context of the Priority Program. First, the shared conceptual framework in the Priority Program, namely the life course approach, will be elaborated in order to develop a number of criteria for the functional design of simulation models of demographic behavior. Next, some general methodological issues that have been resolved in the Priority Program will be discussed. Third, the substantive properties of three microsimulation models will be described in more detail. The first is the NEDYMAS-model, which simulates the redistributive impact of social security schemes on the income of successive birth cohorts. The second model is KINSIM, a pure-state household demographic model that models kinship relations. The third is LOCSIM, which was designed to model the feedback effects between demographic change and the housing market and is being extended to include the labor market. Together these three models do not only represent the state of the art in demographic microsimulation in the Netherlands but also illustrate the strengths and weaknesses of various approaches in the field of microsimulation. In the conclusion we will identify promising avenues for future research.

8.2. THEORY: MICRO BIOGRAPHIES AND MACRO STRUCTURES

At the level of the individual, the life course has been adopted as the unifying concept in the Priority Program, as described in Chapter 1 of this volume. Starting from a life course perspective implies a shift in the choice of both analytical models and simulation models. In this section we will show the power of the concept in specifying microsimulation models. The central theoretical reasoning is the contextual nature of human behavior, both in the micro context of the household and in the macro context of structures of the provision of labor, housing and social security. Microsimulation assumes a different nature once these contextual aspects have been chosen as the central focus of research and it has added value over analytical models in handling this context consistently. The argument is that microsimulation models should be theory-driven rather than data-driven and should be used to model human behavior as being contingent on a multi-level context.

8.2.1. The Life Course as a Unifying Concept

The life course develops in the form of a number of parallel and interacting careers. The central notion is the interdependence of these careers. It is acknowledged, for instance, that demographic behavior is influenced by people's educational careers and that their labor and housing careers are influenced by household and fertility careers. The traditional demographic system of fertility, mortality, migration, household formation and household dissolution is expanded by the life course perspective to include issues like labor and housing, and wealth and health. In expanding the demographic system, the number of variables in the analysis increases rapidly. Conceptual reasoning and analytical models are used to limit the number of variables in modeling specific processes. However, the number of variables is larger than in traditional demographic modeling and one of the attractive features of the life course approach is that it enables researchers to analyze various processes in a single model. This requires a model that is very flexible in its specification so as to avoid premature system closure, and that is capable of handling a large number of variables.

With respect to the interaction of careers, the explicit distinction between triggering and conditioning careers (Mulder, 1993) has proved very useful. Triggering careers specify that behavior arises from the wish to progress in a particular career. Conditioning careers provide the

resources (for instance income) to make progress, or impose restrictions that hamper or even exclude such progress. The distinction is crucial in understanding behavior. An example may clarify this point. Residential moves are often conceptualized as behavior aimed at improving the housing situation, conditioned by the labor career to provide the monetary resources to do so. In this case the housing career provides the trigger. However, some of the residential moves are triggered by other careers, for instance household careers in the case of union formation or dissolution, or labor careers in the case of job changes over longer distances. In this case the housing career conditions demographic or labor market behavior. The inability to find a suitable housing vacancy may lead to a postponement of the decision to start cohabiting. This issue of intentionality of human behavior is crucial to the causal ordering of life events. Theory-driven models of human behavior should take the decision rules of individuals as a starting point.

The issue of intentionality is directly related to interactions within households. The decision to leave the parental home is intentional behavior aimed at participating in higher education or at forming an independent household. The unintentional outcome of this decision, however, is a change in the parental household. Transitions to the empty-nest phase in family careers should therefore be modeled using the decision rules of the children, not those of the parents. Widening the argument, life course theory with its emphasis on the interdependency of the lives of people who co-reside or who are members of the same family, informs us that life events experienced by the individual may be conditioned or even triggered by the careers of others, such as household members. The idea of conceptualizing the other household members as additional careers to those of individuals (Hooimeijer, 1996), allowing interaction among individuals and joint decision-making, is therefore a useful modeling strategy. This requires a model in which the careers of various members of a household can be linked consistently.

So far, application of the life course perspective in microsimulation has shown that the interdependency of life careers should be modeled. This pertains both to the interdependency of an individual's various careers in different domains ("within" the individual) and to the interdependency between the careers of those whose lives are closely linked to each other ("between" individuals). However, the life course approach tells us more. The concept of a life course trajectory, the notion of the life course as a succession of passages and the linkages between them, shows that the consideration of longitudinal development and change is pertinent to any modeling attempt. Here the distinction

between the virtual and the factual biography made by Birg (1987) is extremely helpful. At the onset of adult life, the number of options open to individuals is very large. Numerous life paths are possible and together they span the virtual biography. Any career move made by individuals will include a choice between different paths and will restrict or enable future choices.

The first crucial concept is therefore the path dependency of the choice sets that are open to individuals during the course of their lives. Wealth in old age as a simple example will depend on the accumulation of monetary assets over the life course in the form of housing assets, individual savings and/or pension entitlements. The relation with the conditioning careers is direct. Resources accumulate and depreciate over the life course and constraints will grow as a result of commitments to choices made earlier in life. The relation with the triggering careers is even more fascinating. By specifying that behavior should be understood from the long-term goals that people strive for in life, a conceptual distinction is made between long-term, strategic behavior and short-term, tactical behavior. The labor force participation of young females may serve as an example. This behavior may be strategic, aimed at reaching a permanently high position in the woman's professional career, or tactical in providing enough resources to buy a proper house to raise and care for children. Life style as a container concept of what people deem important in life, can now be made more specific in the concept of career orientation (Willekens, 1991). Career orientation is defined as the relative value people attach to various careers. Attitudinal variables that measure the orientation on family versus profession have proven to have considerable explanatory power in the analysis of residential choice of otherwise comparable young couples (Bootsma, 1998). In terms of modeling (the timing of) life events, the concept of career orientation can be very helpful in specifying hypotheses on their causal ordering. The decision to rent or buy a single family dwelling is contingent on the long-term plan to have children, but might be used in the model as a predictor of future fertility. More in general, the inclusion of relevant aspects of individual life histories will greatly enhance the explanatory and predictive power of simulation models.

The second crucial concept is that the choice sets do not only depend on the actions and decisions made by individuals in an earlier stage, but they also depend on the macro context. The opportunities with respect to housing, labor, but also fiscal arrangements and social security benefits are more than just the backcloth of human behavior. In the short run the availability of these opportunities might actually deter-

mine whether or not an event will occur. The creation of these opportunities and the constraints imposed on access to these opportunities is often decided by public choice (legislation, policy measures, and so forth). Government interference in market processes often entails detailed eligibility criteria for access to housing and to tax and social security programs in particular. The basic distinction between resources and restrictions that arise from conditioning careers in the micro context and the opportunities and constraints that arise in the macro context is that the latter cannot be influenced by individual, but only by collective action. The interaction between the individual and the context has been expressed by Runyan (1984) in a powerful metaphor of the river. Though the "preference" of the water can be easily understood from the law of gravity and does not change over time and though the landscape will only change very gradually, the actual "behavior" of the river can only be understood from the interaction between the water and the landscape. This interaction generates lakes and cataracts, and transforms the landscape in the long run as a result of the collective impact of waters on the banks.

Microsimulation is a powerful methodology to incorporate aspects of the context that are exogenous to individuals and households, by "separating" opportunities from individuals and by incorporating decision rules that determine the match between individual preferences and the macro context. Two sorts of decision rules may be incorporated. First, there are the rules determined by public choice that define the choice sets that are open to various individuals. Second, there are the individual decision rules that describe behavior as contingent on both individual preferences and opportunities. The concept of contingency of human behavior on the context has led to two strands of microsimulation. In the first strand behavior is modeled directly by striving for statistical identification of parameters that describe the behavior. In the second strand the starting point is formed by *a priori* or hypothetical decision rules of individuals, given aspects of the context. By systematical variation of the context (over time or across space), the behavioral outcomes can be validated. The first type of modeling has dominated the social sciences and demography in particular, although with notable exceptions (Franson & Mäkilä, 1994; Holm & Oberg, 1985). It is the second type of simulation modeling that may provide considerable added value over analytical models as they explicitly model behavior as the outcome of behavioral intentions that are transformed into actual behavior on the basis of the choice sets open to individuals at that specific time and place.

8.2.2. The Cohort and Structures of Provision

Choice sets provide a macro-micro link, in the sense that they detail the outcomes of public policy measures or market selection at the level of the individual. Eligibility criteria for social security benefits in the Netherlands, for instance, involve a detailed account of the composition and income sources of the households involved. The same holds for tax exemptions and rent rebates. The Dutch government even sets detailed criteria for the access to affordable housing. Presumably, relatively straightforward accounting models that apply these criteria to a given population or a projected population could be used. However, such models neglect the behavioral responses to these criteria. In aggregation, these responses provide the micro-macro link. Developments and changes in public expenditures serve as illustrations. Tax reform is a continuous activity aimed at blocking legal tax evasion schemes once they have become popular among a substantial proportion of taxpayers. In fixed budget programs, if the number of users of a specific program exceeds the budget, rationing by shifting eligibility criteria is likely to take place. Behavioral responses by individuals might shift the burden to other programs, triggering a new round of adjustment. Limiting access to programs of early retirement is likely to increase the number of applications for disability or unemployment schemes. These behavioral responses can be modeled starting from a simple decision rule that people, in the face of losing employment, will opt for the scheme that provides the highest income, choosing the next best if the best opportunity is blocked.

As many welfare programs are either explicitly or implicitly age-related, the cohort is an important medium in the specification of these feedbacks. Major government responses occur to shifts in cohort size, aging being an obvious example. Shifts in the provision of health care and old age pensions are now undertaken in anticipation of future aging, extending the time frame from immediate feedbacks within one period of government to long-term adjustment of structures of provision. Microsimulation provides a way to perform *ex ante* evaluations of various scenarios with respect to future forms of provision, aggregating individual responses to overall shifts in behavior of cohorts in the future.

Widening the discussion from pure public intervention to include market provision the argument remains the same, housing being a good example. At the regional and national levels, the supply of housing is largely demography-driven. Private developers of housing are

likely to try to keep pace with the development of the number of households to avoid overproduction and make the most of the market. At the local level, however, the supply of housing drives demography through the process of residential mobility (Hooimeijer & Heida, 1995). The reason for this phenomenon is the extremely durable nature of housing as a consumer good. In the Netherlands 80 per cent of the supply on the housing market arises through vacancies in the existing stock. Most of these vacancies are created as the unintended outcome of individual behavior. Household events such as the death of a single person, the move into an institutional household, or the cohabitation of two single persons, create vacancies on the market. Also, households that change from one dwelling to another unintentionally create vacancies for others. The feedback between households is therefore direct and disequilibria are bound to arise continuously as a result of shifts in aggregate patterns of demand and its resulting supply. Whether or not vacancies are absorbed by the market depends on the behavioral responses at both the demand and the supply side of the market. If (new) households stick to their original housing preferences, they will decide to wait for a suitable or affordable vacancy to be offered in the market. If they are willing to adjust their preferences (for the time being) they will accept what is available rather than what is desirable. One of the Priority Program's projects has shown that the form of behavioral response is determined by the trigger for moving house. Each different trigger is associated with a greater or smaller urgency (Goetgeluk *et al.*, 1995). Urgent moves occur mainly at those ages when households are formed and careers are made. With the aging of the population, urgent housing adjustments will be less numerous causing longer-term disequilibria in the market.

Microsimulations that are specified as market models have the obvious advantage of allowing cross-sectional aggregation of both demand and supply arising from housing changes. Market processes can therefore be modeled as dependent on the rate of demand for specific dwellings, the arrival rate of vacancies and the behavioral responses of individual households to the offers they receive (Pickles & Davies, 1991). This three-stage model of housing adjustment is not restricted to housing market behavior but can also be applied to the labor market and, as we will show below, to the formation of consensual unions by modeling this as a partner market process. Shifts in cohort size generate the well-known marriage squeeze. Microsimulation is a way of tracing the behavioral response to a lack of partners of an "appropriate" age.

8.2.3. Criteria for the Functional Design

To link individual demographic and related behavior to the social consequences of demographic and related change, one needs a flexible methodology that models the interaction between the individual and the context. Microsimulation has the potential to provide such a methodology. As a general proposition, models should be theory-driven and not data-driven. Statistical models like event history analysis have a high potential for identifying structure in given data sets. The added value of microsimulation is the opportunity to include and test (explicit) decision rules about the behavior of individuals. Rather than directly reproducing the outcomes themselves, these rules describe the process within the confines of choice sets that lead to behavioral outcomes. Starting from the general proposition that models should be theory-driven rather than data-driven, a number of more detailed methodological criteria for microsimulation models can be listed:

- From a theoretical and statistical point of view, the incorporation of a random component is a necessity in modeling individual behavior. Individual lives are not only the result of choice but also of chance. Simulation models lack a clear statistical error term. Monte Carlo sampling and its associated variation provide an alternative procedure to validate the model.
- As the aim is to model processes of interaction, the model should be dynamic. This does not necessarily mean that the model should be designed or used to produce forecasts. Impact or sensitivity analysis can be more enlightening to the scientific and practical user of the model than uncertain forecasts.
- Life course simulation implies richness in variables. Pure state demographic models can be helpful in analyzing specific demographic problems, but fail to incorporate important determinants of demographic behavior. Conceptual reasoning and analytical modeling are the tools that can be used to make the proper selection of variables. Premature system closure should be avoided.
- As the aim is to simulate (part of) the life course, the model should be able to handle interactions between several careers of one individual and interactions between careers of individuals within households. Consistency in the linking of events within households and in dealing with household formation and dissolution are a requisite.

- Distinguishing between triggering and condition careers will help to define the causal ordering of events. The dominance of one career over another should guide the handling of simultaneous events.
- The model should preferably distinguish between behavioral intentions and choice sets as inputs for the model, and produce actual behavior as output. This requires algorithms that portray the decision rules of individual behavior contingent on the choice sets. Any model that incorporates restrictions on human behavior uses implicit decision rules about contingency (for instance utility maximizing). It is conceptually rewarding to make these rules explicit.
- As the behavior of individuals is enabled and constrained by the actions of other individuals, the modeling should cross-sectionally update the context for successive time periods.
- The macro context is defined as opportunities for behavior that are constrained by decisions made by others than the individual. The model should therefore entail a module for the generation of opportunities and the specification of (explicit) decision rules by those that control the opportunities.

The criteria listed above are instrumental in identifying methodological issues that arise when an attempt is made to model behavior from a life course perspective. They will be used as such in the next section.

8.3. MICROSIMULATION METHODOLOGY

8.3.1. The Essence of Microsimulation

The history of microsimulation reflects a number of the issues raised above. Microsimulation modeling has become increasingly popular since Orcutt (1957) first suggested the use of such a model. His starting point is a more general plea for microeconomics. In his view the understanding of the functioning of a real economy is impossible without testable hypotheses about the behavior of micro units. Policies, however, require output on collectives and not on individuals. Micro-analytic simulation models as he calls them, were originally devised to facilitate the effective use of the output of micro-analytic research due to their ability to aggregate values of variables. The first application of these models made by Orcutt (1960) was for tax-policy evaluation in the

US (see Merz, 1991, and Sutherland, 1995, for overviews). Other advantages of the method were found in the way "tax and transfer laws and regulations relating to micro units can be given a literal representation", but also because "available understanding about the behavior of entities met in everyday experience can be used" (Orcutt, 1986, p. 14). The three arguments: ease of aggregation, the literal representation of laws and regulations and the use of available knowledge about behavior, have direct parallels with the discussion above. In the more general terminology used above these arguments are represented by the aggregation of micro biographies of individuals to the macro biography of cohorts, by the incorporation of choice sets that are decided on by public choice and by the plea for theory-driven models that use explicit decision rules on behavior of individuals. Even though the criteria stated in the previous section are certainly more ambitious, some of them have at least partially been met in the earliest attempt at microsimulation modeling.

Yet microsimulation has remained associated with practical application rather than with scientific achievement. Applications generally aim at the *ex ante* evaluation of the effects of government policy in varying domains, such as travel and transport, recreation, housing, residential mobility and social policy (Goulias & Kitamura, 1992; SCP, 1985; Timmermans & Van Der Heijden, 1987). Very little attention has been paid to the potential of microsimulation modeling to represent conceptual models.

In demography, there was a shift, in the first half of the century, from geometrical equations describing populations as one homogeneous entity, to cohort-survival analyses based on events experienced by micro units (De Gans, 1997). This trend developed into multi-state, dynamic simulation models that described and projected past and future courses of the size and composition of the population. Orcutt (1986) describes these models as belonging to the class of micro-analytic models. In demography they are generally referred to as macrosimulations. Models that operate at the level of individual micro units (households, individuals) are referred to as microsimulation models.

In microsimulation models the occurrence of events is modeled at the level of individuals and households. Starting point of a microsimulation is a database of micro units, each unit representing one individual. Each individual is sequentially exposed to the risk of experiencing an event. Whether or not an event occurs is determined by *a priori* decision rules, or by applying Monte Carlo simulation to calibrated probability density functions. A random number is drawn from a uniform distribution in the interval [0,1] and compared to the probability that a

particular event occurs. If the random number is lower than the corresponding probability, the event occurs.

Contrary to macrosimulation models, the population in microsimulation models is stored as a database (or list) rather than in a matrix. There are several advantages to list-wise storage. First, in list-wise storage there is no limit to the amount of characteristics (variables) to be included. Where a matrix expands multiplicatively, and soon becomes uncomfortably large, a list-wise representation grows additively only. When there are many variables to consider, a list-wise representation (database) is more efficient than a matrix. Second, in a list-wise representation of a population, variables or dimensions need not be discrete; continuous variables can just as easily be stored. In a matrix, continuous variables such as rent or income must always be aggregated into categories, leading to loss of information. Third, list-wise representation of the population does not call for *a priori* classification schemes. Characteristics can be stored as they are, requiring no classification, and characteristics generated during the simulation (such as year of last marriage) can be added to the records without any problem. This feature allows researchers to aggregate the simulation results at will, to construct any feasible cross-tabulation and to calculate and use durations.

In modern microsimulation two modeling traditions merge: on the one hand, the essentially economic tradition of static methods and models, but with a great richness in variables, and on the other a demographic tradition of dynamic modeling with a smaller number of variables. In the merging of these traditions, two of the criteria listed above (dynamic models and variable-richness) are met. As we will show below, this merging has its methodological problems. Modern microsimulation research more explicitly voices the ambition to focus on individual decision-making and to model the interaction between the individual and the context. Bonsall (1979, p. 82) defines microsimulation as a "technique of computerized modeling within which the decision-making process is replicated for individual decision-makers within the system". Nelissen (1993, p. 33) states that "Microsimulation analyses the behavior of a system using characteristics of the micro units distinguished in the system, whereby with the aid of a model that reproduces the functioning of the system under study, the individuals' characteristics are adjusted".

8.3.2. Some Methodological Issues

A more complete overview of the methodological problems associated with microsimulation may be found in Oskamp (1997) and Van

Imhoff and Post (1998). Here, the focus is on those elements of microsimulation methodology that relate to the criteria, as sketched in section 8.2.

Random fluctuations. Apart from sample variation, which is common in most forms of empirical research, probabilistic microsimulation has an extra source of random fluctuation due to the so-called Monte Carlo variation. The individuals who experience events in a microsimulation are selected randomly. The sequence of random numbers determines which individuals experience which events. If a different seed for the random generator is used, another series of random numbers and therefore a different set of individuals experiencing the events will be produced. Each "run" of the microsimulation model is therefore different, even if all probability distributions are kept constant. The mean and standard deviation of a large number of runs — that is, a large number of samples from the future population — are often used as a measure to quantify Monte Carlo variation. Random fluctuations of the model associated with Monte Carlo variation can be reduced by first determining how many events should take place — that is, calculate the expected value of the number of events — and then assigning this exact number to randomly chosen individuals (cf. Van Imhoff & Post, 1998). Conceptually this is hardly a solution if the model aims to simulate the number of events in a situation where the expected value of the number of events is unknown. This is the case when the number of simulated events not only depends on a single probability density function and Monte Carlo process but also on the interaction with other events, other individuals or with the context. However, if the number of events is constrained by the context, for instance in the event that a limited set of opportunities is to be distributed over a population, this constraint reduces Monte Carlo variation. This strategy is often feasible in modeling life course progression. For example, the number of housing or job vacancies in a limited period of say two months can be calculated beforehand due to the time lag between the creation of a vacancy and the filling of the vacancy. Vacancies created in the previous time period of the model can be distributed in the next time period. An overview of variance reduction methods is given by Bekkering (1995).

Propagation of errors in dynamic models. Van Imhoff and Post (1998) quite rightly point to another source of random fluctuations, which they claim is often underestimated by microsimulation modelers: Specification fluctuation. Each process that is modeled is made dependent on a number of characteristics of the individuals liable to experi-

ence the event. In a microsimulation model, the characteristics of the individuals, which act as the independent variables in the model of each process, are generated by the microsimulation model itself. Therefore, two sources of variation associated with specification variation may be identified. First, the estimation of each separate model governing the occurrence of an event is subject to random error (as measured by the standard errors), and second, the estimation of the independent variables of the individual undergoing the process is subject to Monte Carlo variation. This second source is termed cumulative Monte Carlo variation. The use of a more elaborate model to describe a process may lead, on the one hand, to a reduction in standard errors, but on the other to an increase in the specification variation due to an accumulation of the Monte Carlo variation. Van Imhoff and Post (1998) therefore conclude that the specification of a microsimulation model should be kept simple: The occurrence of events should be made dependent on a limited number of variables, and the modeler should not be tempted to specify elaborate models, especially in forecasting applications.

This conclusion is too general as it overlooks one of the primary reasons for choosing a microsimulation rather than a macrosimulation model, namely to simulate behavioral processes which are in fact interactions between individual preferences and contextual constraints. Preferences tend to be stable and relatively simple, as is the case for the context. The interaction, however, is complex and depends on many characteristics of both the individual and the context. Propagation of errors is a serious problem if the output of the model is used in its complexity for the next round of simulation. In Post *et al.*'s (1997) example (the KINSIM microsimulation model of kinship networks), the outcomes are complex because of the multitude of different kinship networks distinguished. Propagation of errors is less of a problem if the context is part of the overall accounting framework. For instance, in modeling the feedback between household formation and housing market behavior, the simple accounting rule that the number of new households (requiring a residence and ending a vacancy chain) can never exceed the number of vacancy chains that have been started in the market, controls the process. Vacancy chain creation itself is the result of relatively stable events like the mortality of single persons, moves to institutional households and levels of new construction. A promising procedure to reduce cumulative Monte Carlo variation is to use the context as model-constraints on behavior.

Variable-richness: A debated issue. The general statement that models should be kept simple is correct, but does not necessarily imply

variable-poorness or *a priori* system closure. Conceptual instead of technical reasoning should be used to make the right abstractions. For instance, modeling fertility behavior based on age and parity without including the number of years spent in education will generate results with lower Monte Carlo fluctuations. Nevertheless, simulated fertility will certainly be incorrect, because the model is conceptually inadequate as is shown, for instance, by Manting (1994). One of the appealing features of microsimulation is that the results of this type of analytical research can be used directly to broaden the conceptual framework of the microsimulation model and to respecify it accordingly. Conventional statistics like partial correlations and level of explained variance can be used to select the determinants. Due to its flexibility in handling data given the list-wise representation, new determinants can be added, developing more detail in the model.

Variable-richness may also be required for policy evaluation. Generating household models for the evaluation of social security benefit programs requires detailed output on household composition and will be conceptually more interesting if feedback effects of income transfers on household formation are part of the model. This might make the model less reliable as a forecasting tool, but will increase the value of the model as a basis for sensitivity analyses.

Consistency of linked events. One of the striking differences between macrosimulation and microsimulation is that in the microsimulation approach the link between events can be modeled directly, while macro models depend on consistency algorithms to force the results of different processes or different groups (Van Imhoff, 1992). If properly specified, for instance by using pointer variables that link individuals in one household, microsimulation can model the links between separate events. As one individual experiences an event, the consequences for other individuals are immediately noted and carried through. This not only guarantees consistency in individual events, but also in household events. For example, union dissolution can be modeled consistently for both partners as a result of either the decision by the person or by his or her partner to break up the union. Life courses of several individuals (in one household or in more households) are consistently linked, making it possible for modelers to simulate life course evolution dependent on other individuals' life courses.

Dominance and consistency. Conceptual reasoning about the dominance of various careers is helpful in determining the nature of dependency among linked events. Some household events are the unin-

tended outcome of intentional behavior. The transition to the "empty nest" is the unintended outcome of the decision by the last child to leave the parental home. *A priori* dominance should therefore be given to the nest-leaving process in the modeling. The well-known two-sex problem in macrosimulation is solved by either forcing consistency afterwards (Van Imhoff, 1992), or by assuming female or male dominance in the process of union formation (Hooimeijer & Heida, 1995). Both approaches are conceptually wrong. Klevmarken (1991) shows that men and women use different criteria in defining a good match. In a microsimulation approach, union formation can be explicitly modeled in a matching module (Galler, 1988). Such a module can optimize the conceptualization of the matching process, including, for instance, differences in choice structures between men and women and incorporating as many dimensions of the choice process as deemed necessary.

Competing and multiple events. Two methodological issues are related to the sequencing of events (Oskamp, 1997). The first is the dependency issue. The occurrence of one event may change the probability that another event will occur. Therefore, in event-driven simulation models explicit thought must be given to the sequence in which the various events are simulated. For instance, it is well known that fertility varies by marital status. So, if marital status changes (a marriage or divorce occurs), then the likelihood of having a child may increase or decrease. Conversely, if childbirth occurs, the likelihood of marriage will increase. One should keep in mind, however, that many of these sequential influences have only a weak conceptual basis: The causality of, for instance, marriage and then childbirth is a good example since many marriages are triggered by pregnancies. Again, conceptual arguments should guide decisions on the causal ordering of events and the solution to the dependency issue. Here, the distinction between triggering and conditioning careers may be helpful (see Section 8.2.1). It has become conceptually plausible to see fertility as goal-oriented behavior and to regard marriage as instrumental to this goal. The household transition creates better conditions for fertility transitions. The order in which events happen does not necessarily reflect the causal ordering. Marriage is dependent on childbirth, regardless of chronological order.

The second methodological issue concerns exclusion. The sequence of simulation of events may bias the number of events that occur. For instance, death leads to the removal of the individual record from the database. Therefore, if death is simulated before fertility, the number of births is underestimated because women who have died are no longer exposed to the risk of childbearing. If fertility is simulated before death,

the number of births will be overestimated, since births are included for women who died before giving birth. If events are competing, meaning that they are not causally related, the problem is purely technical, and can be solved by simply removing the person from the population at risk for the other event. If events are interdependent, conceptual arguments should solve the sequencing. Several strategies have been employed in microsimulation models to deal with sequencing (cf. Galler, 1995; Hellwig, 1988; Oskamp, 1997). Basically, a model can use a fixed order or a random order of events. In either case, the probability that a next event occurs is made dependent on the events that have previously occurred. If a random order is used, biases are evenly distributed over the processes and individuals.

Conceptually, another method is preferred as it is consistent with the life course approach. In this two-step method, the order of events is random. For each event, the first step simulates only whether it occurs. This is determined in a fixed order, so that known dependencies are taken into account. The probability that an event occurs is assumed to correlate with the probability that another event occurs, and it is assumed that the chronological order does not imply a causal order (for instance: Marriage and childbirth are correlated, but whether couples get married as a reaction to or in anticipation of a birth is trivial). The probability of the next event occurring is adjusted for the correlation with other events already simulated, regardless of their timing: earlier or later. The second step then executes the events in a random order. The conceptual implication is that events (e.g. marriage and fertility) are treated as synchronized events, which are causally linked, but whose chronological order is irrelevant (Willekens, 1990, 1991). There is a clear link to the work by Mulder and Wagner (1995) who distinguish three states in the study of synchronization of marriage and mobility: unmarried, marrying and married. The dependence issue is solved without having to concede to the exclusion issue: Exclusions remain random and are therefore unbiased.

Intentions and choice sets. The decision to model behavior as a result of interaction between individual preferences and macro opportunities and constraints, has important repercussions for the structure and parameters of the behavioral models. Two issues are briefly discussed: first, stated versus revealed preferences, and second, decision rules.

Ordinarily, parameters for behavioral models, such as marriage probabilities, are based on observed numbers of marriages, related to a population at risk. Probabilities calculated in this manner are referred to as revealed preferences. Stated preferences relate to parameters mea-

sured on the basis of intended behavior. The terms stated and revealed preference stem from housing-choice literature (e.g. Goetgeluk *et al.*, 1994). In housing choice, there are typically large differences between what housing searchers want (their stated housing preferences) and what they are able to obtain (revealed housing preferences) given their financial situation, the availability of housing opportunities and the allocation rules administered by governing bodies. Only when stated preference probabilities are implemented, can choice or behavior be simulated contingent on and in interaction with the context.

The estimation of stated preference parameters calls for different data sources. For housing choice and mobility, these sources are available in most countries, namely housing demand surveys; for fertility, many countries conduct surveys measuring attitudes towards fertility decisions; for union formation, stated preference behavioral parameters are not or barely available.

A second issue pertaining to intentions and choice sets is how the choice is made: What do individuals do when the dwelling/job/partner of their preference is not available? Two approaches may be applied: an algorithmic and an empirical approach (Goetgeluk *et al.*, 1995). In the algorithmic approach, *a priori* decision rules or heuristics are formulated. For example, households will not accept dwellings in which they have fewer rooms per person than in their current home. The second approach is based on empirical decision rules, for instance the decision plan net method, in which the choice structure of individuals is disentangled (Whan Park *et al.*, 1981). General decision rules may be derived from these empirical decision trees. When these rules are subsequently applied with the aid of Monte Carlo simulation to capture heterogeneity, a hybrid method emerges (Oskamp, 1997). This approach will be elaborated on in Section 8.4.

Cross-sectional versus longitudinal modeling. In microsimulation modeling longitudinal and cross-sectional approaches exist. Cross-sectional microsimulation models allow micro units to interact with each other. The interaction may be direct or indirect. An example of direct interaction is the death of a spouse. The death of one spouse by definition leads to a state change for the surviving partner. Indirect interaction takes place, for instance, in the partner market: Since the number of marriage candidates is limited, the marriage of two individuals means a more limited "supply" for other individuals searching for a partner. In longitudinal microsimulation such interactions are not possible: The life course of each micro unit is simulated without taking into account any interaction with the life course of others. State changes

obviously involving other micro units (such as marriage) are not translated to other micro units: Complete independence is assumed.

Cross-sectional microsimulation enables interaction between an individual's various careers and between different individuals in the population, but it also allows for interactions between the individual and the context. At any moment, for instance, the number of potential partners in the partner market is known. Union formation may be modeled as a process that not only depends on the characteristics of the respective spouses, but also on search and choice strategies in a competitive partner market. The same holds for the housing market and the job market, if these are included in the microsimulation model.

The choice for a cross-sectional instead of a longitudinal approach hardly involves methodological problems, and the conceptual gains are large. The major technical drawback of cross-sectional modeling is that a more complex computer code is needed.

Defining the macro context. In a microsimulation model, the macro context cannot, by definition, be endogenous to the model, because it is not a characteristic of the individual. This observation is not restricted to microsimulation models; it holds equally for analytical models specified at the level of individuals (e.g. models for life course analysis, cf. Chapter 2 of this volume by Willekens). In these models, researchers often incorporate context by adding contextual variables to the individual in the sample. Lately, multi-level modeling has become more popular in addressing the statistical problems associated with this practice. Multi-level models can deal with macro or context variables in an otherwise individual model (Courgeau, 1996; Jones, 1997). However, they fail to deal with the dependency on the behavior of other individuals in the system (Pickles, 1980) through the indirect interaction described above.

In microsimulation models, the context remains exogenous to the model. The optimal solution is to define the macro context in such a way that it can be directly related to individual behavior, for example, by giving a literal representation of rules and regulations that relate to individuals. This means that the context, which is often represented in formalized criteria that determine the choice set of individuals, is incorporated in the form of opportunities and constraints.

The extent to which the context influences individual behavior cannot be estimated directly in terms of statistical identification. Also, a reliable forecast of future developments in public choice and sociocultural trends is a contradiction in terms. Possible causes of sociocultural trends and of future public choices may be reflected in scenar-

ios relative to a base-line simulation, in which current opportunities and constraints are retained. The effects of, for instance, a change in rules regarding social security, eligibility to a dwelling, or the tax deduction of commuting costs, alter the choice sets for individuals, inducing different choices and behavior, and therefore producing a different simulation result. The outcomes of microsimulations that evaluate the effects of policy should always be presented adjacent to a base-line simulation (Pudney & Sutherland, 1994), and the analysis of the differences should not focus on details, but on the direction and magnitude of the differences. Presentation of simulation results should be accompanied by confidence intervals, which are calculated from the distribution of results from a number of simulations with different random number sequences. Relating the confidence interval of the policy simulation to that of the base-line simulation, yields a strong indication of the significance of the simulated policy effect.

A requisite for this approach is, of course, that the behavioral models can cope with changes in opportunities and constraints that are based on stated and not revealed preference and that the models allow choices to be made contingent on the macro context.

8.4. STATE OF THE ART: MICROSIMULATION MODELS IN THE PRIORITY PROGRAM

In the Priority Program three microsimulation models have been developed. All three are dynamic, cross-sectional microsimulation models that have been formulated from a life course perspective. Below, we shall first give a concise description of the aim and scope of these models. Then, using the criteria listed in Section 8.2.3 above, we shall investigate whether these models make full use of the possibilities offered by microsimulation methodology, and we shall identify the weak and strong points of these models.

8.4.1. Three Microsimulation Models

The three microsimulation models are KINSIM (*kin*ship *sim*ulation), NEDYMAS (*Ne*therlands *dy*namic *m*icro *a*nalytical *s*imulation model) and LOCSIM (*loc*al *sim*ulation model). In all three models, the main processes of demographic development are simulated in the same straightforward way. Only salient differences in modeling approaches will be discussed here. For more elaborate descriptions of the models, we refer the reader to Post *et al.* (1997) and Van Imhoff and Post (1998) for KINSIM,

Nelissen (1993) for NEDYMAS and Oskamp (1997) for LocSim. The crucial difference between KINSIM and NEDYMAS on the one hand and LocSim on the other, is that the latter model includes not only interactions between individuals, but also interactions with another system: The housing market. In KINSIM and NEDYMAS, demographic development is autonomous; in LocSim, part of the simulated demographic behavior is conditional on the availability of housing.

Aim and scope. The aim of NEDYMAS is to simulate "the redistributive impact of social security schemes on income distributions for different birth generations in the Netherlands" (Nelissen, 1993, p. 1). The simulations cover the birth cohorts 1930–1960. NEDYMAS has a straightforward simple demographic model, which is combined with very complex social security legislation. The interactions in NEDYMAS are direct: Individual demographic developments have implications for social security, and social security has an effect on individual and household income and purchasing power. However, the model lacks reciprocal interaction in the form of behavioral responses to shifts in the choice set. For instance, a change in eligibility criteria for certain social security benefits may change household income, but this cannot lead to shifts in household formation.

The KINSIM-model aims to reconstruct kinship networks in the Dutch population from 1947 and to simulate future developments until 2050. The starting point, namely 1947, has been chosen to simulate, on the basis of known demographic probabilities, the structure of family networks in 1993. From there, a projection to 2050 is made. KINSIM is a purely demographic model, as kinship networks are solely affected by birth, death, union formation and union dissolution (including marriage and divorce). KINSIM is a relatively straightforward model. It contains only demographic modules, and internal interactions are limited to the partner market. The output of KINSIM, however, is very complex. A virtually infinite number of types of kinship networks is generated. This would have been impossible in a macrosimulation model.

The LocSim-model's aim is "to simulate demographic development in interaction with housing market dynamics and to simulate the impact of policies in the reign of the housing market" (Oskamp, 1997, p. 15). LocSim therefore contains reciprocal interaction: Housing market behavior depends on demographic developments, and demographic choices are influenced by housing market conditions. The choice to include feedback effects has important implications for the modeling strategy. Probability distributions cannot be estimated on the basis of observed behavior from the past, but need to be based on the stated

preferences of individuals. Actual behavior is the output of the model; it is generated through the confrontation of preferences with the opportunities at hand.

NEDYMAS uses the 1947 Dutch census to create the starting population. The reason for starting this far back is that complete life courses are needed to calculate lifetime accumulated social security claims. NEDYMAS creates families and households based on a number of known cross-tabulations from the 1947 Dutch census. The KINSIM-model uses the same population created by Nelissen (1993) for NEDYMAS. The reconstructed database contains very little information on kinship. Only unmarried children under 26 are linked to their parents (only the mother in the case of widows and divorcees). Kinship networks for the 1993 population are constructed by simulating the development of the population from 1947 to 1993. LOCSIM uses two main databases: a population and a dwelling database. The population is ordered into households, and uniquely linked to a dwelling in the dwelling database. The databases are derived from the municipal population and dwelling registration. NEDYMAS and KINSIM both reconstruct their population database from cross-tabulated census data. LOCSIM employs a sample from an actual empirical database.

8.4.2. Functional Design and Technical Solutions

Theory-driven. By definition, simulation models cannot be entirely data-driven. Simulation models aim to generate data by replicating the actions of their micro units. But, the fact that they are not data-driven does not necessarily imply that all microsimulation models are theory-driven. Given their specific modeling goals, the three models might be positioned as technique-driven (KINSIM), policy-driven (NEDYMAS) and theory-driven (LOCSIM).

KINSIM is essentially a demographic model. It is based on theories and concepts from demography: fertility, mortality, union formation and union dissolution. The model is not designed to simulate changes in fertility and marital behavior, but to trace the effects of these changes on the development of kinship networks. The projections may be regarded as analyses of the sensitivity of the size and composition of these networks to demographic change. The reason for choosing microsimulation rather than macrosimulation is to keep track of what happened to whom and who is related to whom, rather than simulating the demographic events themselves. In this respect, KINSIM is data-driven.

NEDYMAS is policy-driven. Its aim is to evaluate effects of social security policies on household and individual income, and to measure

the budgetary effects of demographic changes on the social security system. Individual-level data are needed to simulate lifetime social security claims. This suggests that NEDYMAS employs microsimulation mainly for its data-recording features rather than for its conceptual features.

LOCSIM is theory-driven in the sense that it aims to simulate conceptual models of housing market behavior. The interactions between the demographic system and the housing market system have been disentangled extensively and minutely; conceptualization was then the starting point for the functional design of the model.

Random fluctuations. All three models are largely based on Monte Carlo simulation, thereby incorporating randomness into the simulations. Where simulation results are presented, the modelers provide indications of the Monte Carlo variation. The extent to which standard deviations and confidence intervals are presented in publications differs. For KINSIM, the results are accompanied by variation coefficients (standard deviation divided by the mean of 100 simulations). Both LOCSIM and NEDYMAS provide standard deviations of 10 runs.

In LOCSIM, further tabs are kept on Monte Carlo variation because of the constraining function of the housing market. The next subsection elaborates on this point.

Propagation of errors in dynamic models. All three models are dynamic in the sense that the behavioral parameters in the model may change over time, and that individuals' characteristics may change. The number of behavioral models governing the simulated processes and their elaborateness lie at the heart of the problem of propagation of errors, which all three models face. As NEDYMAS reconstructs a historic population, the propagation of errors in the reconstruction period cannot get out of hand. In KINSIM, the approach chosen to limit propagation of errors is to keep the model as simple as possible. LOCSIM does not take special precautions against propagation of errors, nor does NEDYMAS where it simulates into the future.

As stated above, LOCSIM contains a natural limit to propagation of errors since it deals with the housing market. The numbers of new households, residential moves and in-migrations cannot exceed the number of dwelling opportunities. NEDYMAS and KINSIM do not contain comparable natural constraints. A possible way for NEDYMAS to guard against run-away results is to constrain or limit the total social security budget.

Variable richness. As mentioned above, the KINSIM-model addresses the problem of random variation and error propagation by

limiting the model's scope and number of variables. The result is a microsimulation model in which only one domain — the demographic — is simulated. The reason why the KINSIM-developers opted for a microsimulation model does not seem to be conceptual, but rather of a more technical nature: How to keep track of the multitude of different types and structures of kinship networks. This may not be the most common reason for opting for microsimulation, but it is perfectly legitimate. LOCSIM and NEDYMAS employ a much larger number of variables in their specifications. The goals of these two models are not restricted to demographic outcomes only. NEDYMAS studies the impact of social security on income. Therefore, a great many individual-level variables pertaining to demography and incomes need to be incorporated in a life course perspective. LOCSIM simulates housing market behavior, and therefore needs information on characteristics of households that influence the housing demand. To simulate the choices made, the model needs information on each separate dwelling. In both NEDYMAS and LOCSIM, the variable richness is the direct result of the conceptualizations of the interactions between the two systems under study: between demography on the one hand and social security and the housing market, respectively, on the other. In general, the three models show that the greater the number of domains of the life course that are being modeled, the greater the variable richness of the model.

Consistency of linked events. All three models contain the standard demographic careers of fertility and marriage. NEDYMAS and LOCSIM also add the household career. NEDYMAS includes social security careers while LOCSIM considers housing careers. Whatever the domains, they are all modeled from a life course perspective. The modeling of the partner market — present in all three models — serves as an example of the way in which each of the models achieves consistency.

KINSIM opts for a non-sex-biased individual approach. For union formation, this means that everyone may either initiate the search for a partner him/herself, or he/she may be found in someone else's search for a partner. KINSIM creates a file with individuals searching for a marriage partner and a separate one for individuals searching for a cohabitation partner. Individuals from these search files are then matched to non-searching individuals. Matching takes place by first determining, through Monte Carlo simulation, the characteristics of the prospective partner. The age of both partners is the only characteristic involved in matching. Cohabitation and marriage both use the same age-relation matrix. An eligible individual with these characteristics is then searched for. In the case of marriage, both partners are marked as married; in the

case of cohabitation they are marked as unmarried/cohabiting. When no partner with the right characteristics can be found — this happens very infrequently — the searcher does not start a union.

In NEDYMAS any unmarried person aged 15–84 can marry. If the Monte Carlo process leads to the decision to marry, the individual is moved to a file of marriage candidates. This approach does not automatically lead to equal numbers of marrying males and females. In the case of a shortage, men are added to the file of candidates. Candidates are matched by selecting 10 men for each marrying woman based on an age-relation matrix, containing the probability that a woman with age x will accept a partner with age y. From these 10 men, one is selected based on both partners' levels of education. Cohabitation is treated analogously.

In LOCSIM's population database, all individuals not living with a partner are copied to a partner market file. In the partner market each individual is subjected to a search probability that he or she will actively search for a partner. If search commences, it is decided whether the union will be "internal" or "external". "Internal" indicates that the searching individual searches a partner who is currently living in the same municipality (in other words, the candidate file is searched). "External" search indicates that the searching individual searches for a partner from outside the municipality. In this case a partner is "imported" and the candidate file is not examined.

If the individual searches internally, he/she sequentially searches through the file until a partner is found that fits the search criteria. The match is made on the basis of an age-relation matrix. The search method rules out any sex bias, as any individual can be designated as a searcher. Theoretically, a shortage of marriage candidates may exist. In practice, this does not occur because the number of searchers is limited by the appropriate probability of being in search, while the number of potential partners for the searcher is only limited by the entry-into-partner-market criteria (18 years or over and not in a union). Finally, for each union formed, LOCSIM decides whether the union will be marital or extramarital. Depending on the origin of the partners, union formation may be conditional on the availability of a dwelling. If no dwelling is found, the marriage or consensual union is called off.

None of the modeling approaches sketched above optimizes the possibilities offered in a microsimulation model. The partner market could be modeled much more explicitly, for instance by using more characteristics of spouses or employing search and contingency strategies. This inherently leads to more variables in the model, which — given the aim of the models — is not always desirable.

Dominance and consistency. The three models all distinguish parallel careers which influence each other in some way or another. In KINSIM this is limited to a small number of demographic careers. The occurrence of an event has no influence on the probability of other events occurring. In this sense KINSIM does not distinguish triggering and conditioning careers, nor does it explicitly define one career as being dominant over another. There is an indirect linkage, however, as fertility is dependent on marital status. In other words, marriage in this year will increase fertility in the following year, which implicitly means that the marital career is dominant over the fertility career. Where the demographic careers are concerned, both other models function in the same manner. In NEDYMAS, however, any demographic change pertaining to individuals or their households may trigger a change in their social security position. In LOCSIM, a direct link exists between the occurrence of demographic events and the triggering of a wish to make a residential move. In both cases the demographic careers are dominant over social security position and residential relocation. In LOCSIM the actual event of a residential relocation is conditioned by the availability of suitable housing.

Competing and multiple events. NEDYMAS uses a fixed order in which events are simulated. A number of improbable multiple events are excluded (marriage, cohabitation, dehabitation and divorce). Outmigration and death do not rule out the occurrence of other events, but the probabilities of these occurring are halved. In this way, the model largely deals with competing risks. In KINSIM, a fixed order is used too, thereby excluding multiple events, with the exception of fertility and marital status changes. The LOCSIM-model uses a random order of events for each individual, following the two-step method described in Section 8.3.2. In LOCSIM, therefore, biases due to a fixed order are circumvented. The two-step model has the additional advantage that it can fully incorporate a conceptual model of interdependent demographic events.

Intentions and choice sets. In microsimulation models where the aim is to model life course development, behavior needs to be modeled contingent on the context. In KINSIM the interaction between the individual and the context goes no further than the partner market: The choice for a partner is contingent on the available partners. The interaction between the individual and the context in NEDYMAS can potentially stretch much further. However, individuals in NEDYMAS do not base their demographic choices on the consequences of these choices for

their social security positions. The opposite is true: The macro context is shaped by the social security effects of individual demographic behavior.

The LocSim-model contains reciprocal interaction: Housing market behavior depends on demographic development, and demographic choices are influenced by housing market conditions. In order to model this interaction, the following approach is applied. First, demographic choices that are contingent on the availability of housing opportunities are made "virtual". A search intensity is derived from the intended demographic behavior. Housing searchers and housing opportunities are matched using search intensity and a probabilistic heuristic search model. The intended demographic behavior is effectuated only when a match is made. If no dwelling can be found, the intended demographic behavior is canceled. In the probabilistic heuristic search model, housing searchers are offered only a limited number of vacancies. This limitation forms the choice set. It is restricted on the one hand by the search intensity and the housing preferences of the housing searcher, and on the other by the rules and regulations of the housing market, such as eligibility criteria.

Cross-sectional versus longitudinal modeling. The LocSim modeling approach sketched above is in fact a three-stage search model in which the decision to search, the search itself and the decision to actually move are distinguished. The three-stage search model is driven by three central entities: the search intensity, the arrival rate of opportunities and the acceptance rate, respectively. The determination of the arrival rate of opportunities links the individual housing searcher to the macro level. The macro ratios of demand and supply on the housing market are the result not only of exogenously induced construction programs, but also of households vacating and occupying dwellings in the stock. In a cross-sectional microsimulation, the total number of housing opportunities is known at every instance. As soon as one dwelling is vacated, it becomes available to other searchers. It is this capacity that makes microsimulation so well adapted to model markets, where the actions of one individual have repercussions for the opportunities of other individuals. The three-stage search model cannot be specified or solved in an analytical model (Chapter 6 of this volume by Mulder and Hooimeijer). Given that partner selection is modeled as a "marriage market" where the number of partners (opportunities) is limited, it is logical that all three models are cross-sectional microsimulation models. In longitudinal microsimulation "markets" cannot be modeled.

Defining the macro context. In microsimulation, the macro context should be a literal representation of rules and regulations that shape the choice set of individuals. Both LocSim and NEDYMAS incorporate such a choice set. In view of KINSIM's aim, there is no macro context to consider.

NEDYMAS considers all rules, regulations and laws in the domain of social security and medical insurance. Together these form the choice sets for individuals. NEDYMAS, however, does not contain the possibility of simulating demographic choices contingent on these choice sets.

In LocSim the macro context is formed by housing construction, and regulations on the housing market, such as eligibility and allocation rules. Extensions to housing allowance legislation and tax exemptions are possible. These rules shape individuals' choice sets. In LocSim housing searchers weigh their housing preferences and their resources against the available and accessible opportunities. Their housing choice is contingent on the choice set.

In both NEDYMAS and LocSim, scenarios entailing minor or drastic changes in the macro context can be defined, and their effects simulated. In LocSim, this may then lead to a shift in behavioral responses. For instance, if housing allowances were to be abolished, one might see, among other things, a prolonged stay in the parental home by young adults. In NEDYMAS, these behavioral responses cannot be traced, as demographic choices are not made contingent on the macro context. The structure and content of the model, however, do not prohibit it. If NEDYMAS were to allow such interaction, choice processes (e.g. weighing living together against the loss of a social benefit) could be simulated. Changes in rules pertaining to these benefits might then trigger behavioral responses: higher or lower rates of living together.

8.5. CONCLUSION

None of the three models discussed use the full potential of microsimulation to model life courses. The KINSIM model is a very restricted model. It simulates life courses but does not allow much interaction. In the case of KINSIM, it is safe to say that a microsimulation approach was chosen on the basis of complexity considerations rather than conceptual considerations. NEDYMAS and LocSim are life course microsimulation models with a much broader scope. Both connect two distinct life course domains. NEDYMAS connects demographic developments with the social security system, whereas LocSim connects the housing system to demographic developments. Conceptually speaking,

the biggest difference between them is that NEDYMAS is a unidirectional model, while in LOCSIM, the two modeled systems interact reciprocally. NEDYMAS studies the effect of demographic developments on the social security system, but does not allow demographic decisions to be influenced by considerations arising from that domain. In LOCSIM demographic decisions are based on housing-market considerations and *vice versa*. Even though the three models are all based on a life course perspective, and all three are microsimulation models, they are virtually incomparable.

8.5.1. Substantive Considerations

The structure of microsimulation models enables modelers to integrate theories pertaining to different life domains. The NEDYMAS model provides a very elaborate and detailed account of the relation between household change, labor market behavior and income dynamics. Its present orientation is towards the socio-economic consequences of demographic change within and between cohorts. Feedback effects can be entered into the model exogenously by including various scenarios with respect to social security programs and the development of demand on the labor market. A relevant extension of the model would be to include the direct effects of changes in income situation on the demographic behavior of individuals. In the LOCSIM model, theories on household development and housing market behavior are implemented, as are theories on the interaction between careers. The geographical scope of the model, aimed at local or regional populations and housing markets, provides the rationale for the elaboration of this link. The appealing feature of this model is that demographic behavior is modeled as being contingent on the structure of the housing market, while at the same time changes in the structure of demand and supply in this market are modeled as the outcome of the aggregated behavior of individual households.

The Priority Program's research has yielded an abundance of insights into three fields of research that are of importance to the further development and future extension of microsimulation models in general, and LOCSIM, KINSIM and NEDYMAS in particular. These three fields pertain to the functioning of markets (e.g. Clark & Dieleman, 1996; Hooimeijer & Heida, 1995), the process and content of choice (e.g. Beets *et al.*, 1997; Bootsma, 1998; Camstra, 1996; Henkens, 1998; Manting, 1994; Mulder, 1993; Voets, 1994; Wijsen, 1994) and the occurrence of simultaneous and interacting events (Kalwij, 1999; Mulder, 1993; Smits, 1997).

The methodological knowledge and expertise gained from the development of NEDYMAS, KINSIM and LOCSIM, together with the substantive knowledge from a multitude of other projects, now enable modelers to design a behavioral microsimulation model which simultaneously simulates the three-tier system of household development, housing market and labor market dynamics, integrating many of these insights.

An ideal model combining many of the results presented would consist of three interrelated market models: the partner market (combined with other demographic processes), the housing market and the labor market. Such a model would simultaneously simulate three careers of individuals and households. Events happening or not-happening in one career would trigger intentions of behavior in other careers. These triggers would be hierarchical in nature: Some triggers would be more important than others. In other words, in some cases the household career would be dominant, whereas the labor career would be dominant in others.

Modeling the labor career in a household context — that is, simultaneously and in reciprocal interaction — is very complex (Van Ham, 1998). First, employment-related decisions do not only have consequences for the individuals concerned, but also for their partners, and — in the case of employment-related migration — for entire households. Not only should a model of labor market behavior take characteristics of the household and its members into account, it should also account for second-order effects. An example of a second-order effect is the case where a secondary-income earner has to give up his/her job and search for a new one because the primary-income earner has accepted a job requiring residential relocation. Second, for some individuals employment-related decisions are based on the place of residence, whereas for others housing market behavior is based on work career motivations. It is not unreasonable to suggest that the dominance of one or the other is neither constant within households, nor over time. These problems are met by microsimulation models, which offer a direct and consistent link of individuals to other household members, their jobs and the dwelling occupied by the household. Employment-related decisions can then be conceptualized and modeled using these linkages.

8.5.2. Technical Considerations

A major concern of microsimulation modelers has always been the initial population. The basic question is where to find a database at the appropriate micro level, containing the units needed with the charac-

teristics needed. The ideal database does not exist, and estimation procedures are called for. In recent years, progress has been made in the synthetic linkage of different survey databases. One method is to carefully select a number of variables and to draw a sample for different surveys in such a way that the variables are representative. These surveys can then be synthetically linked through that set of variables. The resulting database will contain much information from several surveys, without loss of representativeness (Paass, 1986). A second method is to take cases from a survey as a starting database and to add missing information by employing the iterative proportional fitting procedure. This procedure estimates the missing data, while maintaining information on known marginals (Oskamp, 1998). A hybrid approach, containing elements from the previous two, is also feasible (Oskamp, 1998; Williamson *et al.*, 1998).

In microsimulation models it is relatively simple to implement more and new theories on human behavior. The model is specified at the level of the acting units: the individual, the household, the employer. Translation of theories of micro behavior to higher levels of aggregation is therefore not necessary. Whether a theory is operationalized as a series of "if-then" statements or as an elaborate statistical model makes no difference. Both types can be implemented, giving considerable freedom to the modeler. In the models of the Priority Program different formulations have been used: behavior driven by purely stochastic Monte Carlo experiments, decisions driven by purely rule-based statements, and combined stochastic/heuristic-driven behavior. In the future, complex decision structures involving not only deterministic if-then rules, but also stochastic elements, learning loops and decision strategies may be designed and implemented using knowledge from the field of Artificial Intelligence, such as neural networks, genetic algorithms and cellular automata (see e.g. Batty *et al.*, 1997). Williamson *et al.* (1998) have implemented a genetic algorithm in a procedure to estimate local-level disaggregate databases, which can be used as microsimulation input. Cellular automata in particular have much in common with microsimulation as described above. First, the rules or driving forces are extremely simple, but the outcomes are very complex. Second, micro behavior is driven by macro circumstances. In the fields of geographical information systems (GIS) and urban simulation applications, these approaches have received much attention. In microsimulation the focus has predominantly been on Monte Carlo processes. The use of elements from the field of Artificial Intelligence in demographic microsimulation could open all sorts of new paths to the successful conceptualization and application of behavioral microsimulation models.

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9. EPILOGUE: NEW DIRECTIONS IN POPULATION STUDIES

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9.1. INTRODUCTION

Most Western countries today face similar population issues. Sustained low fertility, evolving household structures, aging, care, health, social security, and labor force participation are among the most important topics addressed by both population scientists and policy makers in these countries. The chapters in this book show that this characterization also applies to research conducted by Dutch population scientists over the last decade. The distinguishing quality of the contributions in this book is that they approach these population issues from an interdisciplinary life course perspective. This perspective has proven to be extremely useful. This chapter highlights and evaluates some of the most salient findings, and at the same time elaborates on some of the deficiencies in our current knowledge.

To a certain extent this book, written on the occasion of the completion of the NWO Priority Program on Population Issues, reflects the special emphasis of Dutch population studies. For instance, in the Netherlands, more than in any other developed country, population issues have always been closely tied to the housing market, whereas fertility issues have drawn relatively less interest from the field (Coleman, 1998). The reason for this special emphasis on households and housing is that demography has historically been closely connected to spatial planning. The contributions in this book reflect this typical Dutch atti-

tude, to the extent that two of the chapters (the contributions by Mulder and Hooimeijer, Chapter 6, and Hooimeijer and Oskamp, Chapter 8) deal with the housing market and residential mobility. Taken as a whole, however, the book covers the broad issues in population studies, which are relevant to most Western countries.

The new emphasis in the study of population issues may be characterized by four developments. First, in population science attention is increasingly moving from description to *explanation*, and from explanation to *synthesization*. The emphasis on explanation is motivated by the need to understand the antecedents and the consequences of changes in population observed at the macro level. The social, economic and cultural structure of society has become much more complex in recent decades, and simple *ad hoc* explanations of observed macro trends in demographic behavior often turn out to be inadequate. The move to synthesization is motivated by the need to link different partial theories into a more comprehensive framework of understanding.

The second development is the shift from macro-level studies to the micro level. This development is very closely linked to the emphasis on explanation. The mechanisms of behavior can only be explained at the micro level. Explanation implies the specification of the underlying *process* at the level of the individual, as well as the restrictions on behavior implied by the social context. The *process-context* approach in demographic research has gained momentum in recent years (De Bruijn, 1999). This development is reflected not only in theoretical developments but also in a shift in the methodological focus of the field. New micro-level analyzing techniques have been introduced. Micro-level studies, such as survey research, are now familiar activities in the field of population science. Other types of micro-level methodologies may follow the same path. For example, the laboratory experiments reported in the contribution by Van Dalen and Verbon (see Chapter 5), an approach that originated in psychology and found its way into economic research, may prove to be valuable in population studies as well.

The third development is the move from *uni-* to *multi-disciplinary*, and from *multi-* to *interdisciplinary* research. This move should also be seen in conjunction with the other two developments. As stated in the introduction, whenever demographers look for explanations, they turn to neighboring disciplines. Increasingly, in the Netherlands, disciplinary boundaries between demography, sociology, economics, epidemiology, anthropology and other fields are being removed. Interdisciplinary research has resulted in stimulating new ideas for both demographers and other population scientists. The chapters in this book contain results

of interdisciplinary work in geography and demography (Mulder & Hooimeijer in Chapter 6; Hooimeijer & Oskamp in Chapter 8), economics, demography and psychology (Van Dalen & Verbon in Chapter 5), sociology and demography (Liefbroer, Chapter 3), and epidemiology and demography (Kunst *et al.*, Chapter 7).

Lastly, and again only to be understood in close connection with the other three developments, or perhaps as a panacea for the demands made on population science as a result of the previous three developments, the *life course* has been adopted as the theoretical framework for interdisciplinary research of population issues. The life course offers the theoretical tools needed for communication between demographers and other disciplines, as illustrated in the contributions in this book. These contributions also show that the life course offers an adequate framework for explanatory research, theories and even projections. Liefbroer, in Chapter 3, shows the merits of the life course framework in describing and explaining decisions during young adulthood. Mulder and Hooimeijer, in Chapter 6, develop a new theory of residential location, thereby using the potential of the rich framework of the life course to combine various seemingly unconnected elements of conceptual work on residential relocation and migration into a more elaborate theory. Hooimeijer and Oskamp, in Chapter 8, organize their microsimulation projection model around the structuring and synthesizing concept of the life course. In all these applications, the life course is the organizing concept for the linkages between the micro and the macro level, as well as for the linkages between the various life domains of an individual, and the interrelations between individuals within a household.

We feel that most demographers welcome this development towards more micro-oriented explanatory research in population studies. Another issue is whether this development is, or should be the mainstream focus in population studies. Elder (1994) claims that the life course is the new paradigm in social science. Willekens, in Chapter 2, explicitly applies this claim to population science as well, but we do not know whether most demographers would agree with this statement. Demography has its roots in the study of population trends at the macro level. The inspiration for life course research should start here. Understanding decision mechanisms in the life course is not the ultimate goal in demography, but a necessary intermediary step towards understanding and projecting population trends at the macro level. Understanding micro-level mechanisms within a life course perspective is a necessary but not a sufficient condition for understanding macro-level trends and mechanisms. For instance, in order to understand housing market or labor market developments, we need a macro-level description of the

market mechanism as well. This requires additional macro-level theories and methodologies, such as general systems theory, or (dis-)equilibrium theory.

The basic questions for demographers lie at the macro level of society at large. Demographers will therefore concentrate more than other life course researchers on issues such as aggregation and synthesis. Demographers have traditionally been specialists in aggregation and translation of micro- to macro-level consequences. The demographic practice of decomposing time into age, period and cohort is largely the aggregate equivalent of the biographic and historical time dimensions in the life course approach. The construction of synthetic cohorts based on micro-level life course data provides insight into the social consequences of individual life paths, as shown, for instance, by Liefbroer in Chapter 3, Kuijsten in Chapter 4, and Van Dalen and Verbon in Chapter 5. But the complexities of multiple interdependent careers, and those of "linked lives", as well as the reciprocal relationships between the micro level and the macro level — all of which are implied by the life course perspective — make life a little more difficult for demographers who want to translate results from the micro level to the macro level. In general, greater understanding of behavioral mechanisms involving multiple and interacting careers that operate within an environment of opportunities and restrictions does not result in easy answers and interpretations at the macro level. The multidimensional model, which is the bread and butter of formal demography, has little to offer in these instances. The interactions are too complex to fit in the Markov model framework, which underlies the multidimensional demographic model. Hooimeijer and Oskamp, in Chapter 8, show that microsimulation may offer a solution in these cases. Fortunately, the life course is well suited as a framework for microsimulation modeling of multiple interacting careers, involving both micro-level processes and macro-level opportunities and constraints.

9.2. ACCOMPLISHMENTS AND CHALLENGES

According to Mulder and Hooimeijer (Chapter 6) the life course approach offers new perspectives for the study of old problems whilst at the same time adding new topics to the research agenda. The authors in this book have presented various new approaches to old population issues. We will highlight a number of salient theoretical and methodological innovations generated by research covered in this book.

9.2.1. Theoretical

From a theoretical point of view, the new theory of residential relocation developed by Mulder and Hooimeijer in Chapter 6, is an important contribution to the field. Their theory is a clear example of theoretical synthesis of various partial theories which in the past were only loosely connected. The distinction between triggering and conditioning careers is central to our understanding of relocation behavior, namely a process driven by status changes in other domains of life. Their theory shows that residential mobility and migration should be defined along one continuum, with differences in the triggers that cause them and the impact they have on other life careers. In the past, theories on residential mobility, with their foci on household dynamics and the housing market, developed more or less independently of migration theory, which has a much stronger focus on the labor market, networks and institutions. The life course theory of residential relocations puts both partial theories into a broader framework. This framework will undoubtedly feature prominently in the research agendas for some years to come.

Another example of theoretical innovation is Kunst *et al.*'s usage, in Chapter 8, of elements of the life course in medical demography. In this field of research, as in other fields of population studies, description is being replaced by explanation and projection. The main contribution of the life course approach in the analysis of mortality and morbidity has so far been the recognition that events in early life have profound effects on health and mortality later in life. In other words, the life trajectory is essential to explaining health and mortality. In all these cases, the life course offers a framework for new insights into old problems.

At the same time, it is probably fair to say that the life course point of view also highlights the main gaps in our theoretical knowledge. Various authors have contributed to this list of "things to do in population studies" in the coming years. A number of the research issues to be addressed in the future may be noted here. The first issue is "normal" versus "non-normal" transitions and trajectories. Liefbroer (in Chapter 3) points out that most research conducted in the 1980's and 1990's has focused on events that are part of the "normal" or "traditional" life course, that is, part of the socially expected and statistically dominant life pathways, such as leaving home, marriage and first parenthood. At the same time "non-normal" transitions are becoming more and more prevalent (see also Hagestad, 1991). Future research should pay greater attention to lives that do not fit into "standard" patterns as well as to

so-called "disrupted" lives (Becker, 1997), meaning that attention should be given to the questions of divorce, childlessness, remarriage, step-parenting, stay-at-home fathers, and fathers who work part-time.

Second, present life course analysis focuses on transitions rather than on trajectories (Willekens, Chapter 2; Liefbroer, Chapter 3; Mulder & Hooimeijer, Chapter 6). This is caused in part by the fact that event history models use transitions as dependent variables, and that most empirical data do not allow the testing of these longitudinal chains of events. But even when these drawbacks are taken into account, our theoretical understanding of the effect of personal history on behavior is incomplete. Mulder and Hooimeijer, in Chapter 6, mention a number of hypotheses of history dependence in relocation behavior, such as the effect of early home ownership on job mobility.

This is a typical example not only of studying trajectories, but also of studying interactions between careers, an issue implied by Mulder and Hooimeijer's theory of residential relocation, and a third item on the list of "things to do". Here, the payoff of interdisciplinary research is probably highest of all. In any case, improved knowledge, both theoretical and empirical, of the interactions between careers is essential to understanding life course processes. An important theoretical contribution to an understanding of parallel interacting careers is the notion of career orientation: the relative value people attach to various careers (Willekens, 1991; see also Section 8.2.1.). For instance, some people's primary motivation in life could be their work, whereas for others it could be the family. These different orientations are likely to have an impact on their life paths.

A fourth issue, brought up by Liefbroer and others, is that of "linked" or "interwoven" lives (Hagestad, 1991), referring to the interdependence of the occurrences in people's lives with the lives of people who are close to, or linked to the individuals in question. Life course negotiations within the household (Roth, 1983) denote the way in which people living under the same roof negotiate the alignment of their parallel careers. The notion of linked lives is particularly important when studying the housing decisions of dual earners, and not surprisingly, it is an integral part of Mulder and Hooimeijer's theory of residential relocation. Though considerable headway has been made over the past two decades in analyses of the interdependence of household members, and couples in particular, little attention has been paid to the role of people outside the household. This topic will require greater consideration in future studies. Examples of questions to be addressed are: To what extent are decisions to leave or to remain in the labor force motivated by family concerns (the need to personally care for, or to provide for

aging parents, grandchildren, and so forth)? To what extent are decisions to move house motivated by broader family considerations (the desire to see one's grandchildren more often, the perceived obligation to serve as a back-up resource for frail parents)?

A fifth issue, but certainly not the least important, is the problem of aggregating the effects of micro mechanisms to the macro level, especially if there are reciprocal effects from macro to micro and *vice versa*. This issue is particularly pertinent to demography in view of its emphasis on social trends. If we have an appropriate micro theory of behavior as well as an appropriate macro theory of institutions and markets, as given in the microsimulation context presented by Hooimeijer and Oskamp, we are able to solve this problem. But this is a conditional statement with two conditions. To meet the first condition, the life course approach is an extremely useful way of finding an appropriate theory of micro behavior, including the influence of the macro context on behavior. The second condition, an appropriate macro-level theory, brings us outside the realm of life course analysis. Here, we need another framework — at the macro level — to construct a theory of the housing market, the job market, the marriage market, or any other market where aggregate demand and supply interact. We need theories of such a macro-level mechanism to answer questions about the social consequences of, for instance, trends in residential relocation behavior or household transitions for unemployment, social change, daily mobility, *etcetera*. This focus on aggregate processes and the mechanisms operating at that level is a major challenge for future research. As stated before, these macro-level studies are complementary to the life course approach.

9.2.2. Methodological

Many authors point to the methodological advances that have accompanied the life course approach. By far the most important analytical innovation has been event history analysis, and most authors have benefited, either directly or indirectly, from this instrument in their contributions to this book. Willekens, in Chapter 2, provides an overview of these types of models in relation to underlying theoretical methodological and empirical issues. Many of the results reported in the contributions by Liefbroer (Chapter 3), Mulder and Hooimeijer (Chapter 6) and Hooimeijer and Oskamp (Chapter 8) were obtained using event history techniques. A second methodological development in social science is multi-level modeling. This technique also has great potential in life course analysis, in particular in the identification and estimation

of macro- versus micro-context influences on transitions. Third, and particularly prominent as a key issue within the Priority Progam, is the development of life course microsimulation models. The LocSim model presented and evaluated by Hooimeijer and Oskamp in Chapter 8, is life course theory framed in computer code, and as such offers a full view of the potential of the life course concept in population studies. Present-day computers and software enable researchers to model the complexities of the life course approach in a relatively simple manner.

Despite these methodological advances, various authors in this book point to deficiencies in our knowledge in this field. First, various authors note that event history analysis, despite its great value as a tool for studying transitions, cannot be used for the study of life trajectories. What is needed is a methodology for the study of sequences of spells and transitions. Although developments in this direction are still in their infancy, we shall address some of these developments in the following. Second, event history models need to distinguish between the micro and the macro context as explanatory variables (covariates). In fact, a multilevel event history model is needed. From a technical point of view, this is not an insurmountable problem (see for instance Sastry, 1996, 1997 for recent examples). It will take some time, however, for these approaches to be developed and implemented in the computer software used by population scientists. Third, a similar remark may be made about multivariate event history models. These models exist (Courgeau & Lelièvre, 1992; Kalwij, 1999; Yamaguchi, 1990), but implementation is still limited. Models of this sort are needed for the joint statistical estimation of multiple transitions. When used for sequences of transitions within one career, these models are useful to analyze longer periods within the life history. When applied to multiple careers, the interactions between these processes may be estimated. However, the data requirements for these types of analysis are considerable. Fourth, as noted by Liefbroer in Chapter 3, more international comparative research as well as intertemporal research is badly needed. Only by systematically comparing different macro contexts, both in space and in time, are we able to measure the effects of the macro context on individual behavior. The contribution by Kuijsten in Chapter 4 is exemplary of this type of work, but it is clear that much more research is needed. Data requirements are not the least of our problems in this respect. Finally, with respect to microsimulation models, some problems remain despite the advances that are being made. The theoretical, methodological and empirical requirements for theory-driven microsimulation models are substantial. The real problems lie not so much in the implementation of the simulation model itself, but rather in the theoretical underpinning and analy-

sis of the underlying processes, both at the micro level of the decision maker, and at the macro level of the market. This brings us back to the lacunae of our theories discussed above, as well as to the methodological problems of statistical estimation of behavioral parameters. If a proper theory is lacking, we face the problem of misspecification, and the results of simulation will be incorrect. Moreover, if we have a theory but are unable to accurately estimate the parameters of the corresponding model, implementation of these estimates in a microsimulation model will result in a propagation of errors in the model. Microsimulation approaches are therefore best suited to those areas of life course research that have reached a certain level of maturity, both at the theoretical and at the empirical level. The challenges in life course microsimulation are therefore twofold. First, and in line with the conclusion reached by Hooimeijer and Oskamp in Chapter 8, the field should take advantage of the rapid developments in computer science and simulations, such as cellular automata, Artificial Intelligence, and so on. Second, reinforcing the theoretical and other methodological conclusions stated above, microsimulation should make use of state-of-the-art conceptual knowledge about the mechanisms underlying individual decisions-making and about the linkages between individual behavior and the contexts in which individuals operate.

9.3. THE LIFE COURSE: A USEFUL INTERDISCIPLINARY FRAMEWORK?

The chapters in this book are based, either implicitly or explicitly, on the concept of the life course. It has proven to be a suitable framework for analysis of population issues. The meaning of the word framework should not be misunderstood in this respect. The life course has proven to be an *organizing*, or even a *synthesizing concept*, but this is something else than being a theory in itself. By using the life course, we distinguish between historical time, biographical time and social time. We structure events and transitions into different life domains, and within each life domain into ordered trajectories over time in the life histories of individuals. This ordering principle is not only a fruitful tool for a systematic description of life histories, but also for the purpose of explanation. Events and trajectories in the life course are explained with reference to both historical and biographical time. Moreover, it explicitly takes into account interdependencies among the various life domains of individuals as well as those among individuals with interlocking lives. Furthermore, the life course can only be understood by

making a distinction between the micro context, in which individuals make choices, and the macro context, which defines the setting within which individuals act. This organizing concept acts as a bridge between different social disciplines. Each discipline has a natural entry into the framework of the life course. For demographers, the dimension of time as the ordering principle of events is the doorway through which they enter the life course concept. Social scientists from other disciplines have an equally natural, but different entry into this framework. Once inside, demographers, sociologists, geographers, and others are able to collaborate without denying their own theoretical and methodological background. The various chapters in this book show that this type of interdisciplinarity works.

The life course redefines old problems within population studies, and opens up new avenues for solutions that are not constrained by traditional disciplinary boundaries. But the area covered by the life course approach is immense, and there is a risk that researchers will acquire holistic aspirations. A social theory of life is certainly too ambitious, even for interdisciplinary research. The reason for conducting interdisciplinary research is not so much to enlarge our field of interest, but rather to gain a deeper understanding of relevant population processes.

In our view, this book shows that interdisciplinary research may deepen our understanding of population issues, and that it offers an inspiring conceptual framework for both demographers and other population scientists. Research in the Netherlands in the nineties has shown that the life course approach is a valuable tool in interdisciplinary research. It is clear that the potential gains offered by this approach have so far barely been exploited, and we hope that this book will serve as an invitation to continue along this road.

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