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TITLE: Providing space for time. The impact of temporality on demographic research*

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Providing Space for Time.
The impact of temporality on life course research

Melinda Mills

ABSTRACT. The article alerts those in the field of quantitative life course research to the ontological impact of different forms of temporality. The first section reviews the influence of natural and cosmic, human development, historical, cultural, social and institutional forms of temporality on behaviour. Two central themes arise. Institutional calendars shape our everyday lives, and seemingly innocent calendars may influence behaviour. Furthermore, behavioural affects from environmental and biological time are increasingly colonized by social constructions temporality. The second section outlines how ontological perceptions of time shape our epistemological approach. The discussion separates temporal effects from what is an artefact of data, methods and methodology. Timing and method of data collection, memory, and self-registration influence results. The author suggests reflexivity, new interpretations of memory, and blending of methods and sources to improve research.

Introduction

The objective of this paper is to make those using quantitative means of processing life history data alert to the ontological affects of different forms of temporality.[i] Ontology is the philosophical position that underpins our theoretical assumptions and ideas about existence. Ontological assumptions frame not only our understanding of reality, but direct our epistemological approach. An epistemological standpoint is how we come to gain knowledge from the external world. Ryder (1965), for instance, advanced the temporal-based argument that each birth cohort develops a certain 'mentality' due to his or her immersion in a unique historical context. Armed with this ontological assumption, he then proposed the epistemological approach of cohort analysis. A quantitative approach to life course research demands the use of temporal-based census, vital statistics or survey data coupled with statistical methodology to reconstruct and interpret life histories. By placing ontological effects of temporality at the core, three central aspects require disentangling. These are: what is naturally or biologically determined, what reflects the ontological reality of historical, social and cultural context of the researcher and respondent and what is related to data error and the epistemological approach.

The discussion is divided into two sections. The influence of multiple dimensions of temporality such as, natural and cosmic, human development, historical, cultural, social and institutional forms, on life course behaviour are explored first. Within this review, two central themes arise. First, that seemingly innocent temporal categories such as an institutionally contrived calendar may affect demographic behaviour. The second related area explores if the type of temporality that influences everyday life and thus life course construction has shifted. It is argued that natural and biological forms of temporality are increasingly colonized by cultural, social and institutional constructions. The second section draws attention to the interplay between temporality and the epistemological approach. The ontological construction and experience of temporality by both the respondent and researcher in addition to selectivity, memory, and methods of data gathering influence results. We must furthermore separate what is a temporal affect or an artefact of the data, methods and methodology.

This exploration of temporality draws from life course research within the disciplines of sociology and demography. Life course research focuses on how social processes such as the family, education, employment, health, and migration domains are structured over the individual life span (Elder, 1974; Hogan, 1981; Mayer and Tuma, 1990). The empirical focus is on the occurrence, timing in life-stage or age, sequencing, duration, or interaction among life events and domains. Life events are, for instance, marrying, having a child, and entering, or exiting the labour force. Together, events make up life course domains or careers such as partnership (formerly marital), fertility or labour force. Using data comprised of the occurrence and timing of life events, researchers then reconstruct a discernible life path, often referred to as the life course. Life course research does not only focus on the timing or occurrence of events. There is also an attempt to understand the way in which individuals shape their life course, based on a unique and meaningful sequence of events and decisions. The life course is thus distinguished from the life cycle, which is a predictable circuit of life stages (Elchardus, 1984). The current life course state or stage of the individual is a reflection of cumulative past events and an anticipation of their future life trajectory (Giddens, 1991; Hareven, 1994). Furthermore, when an individual engages in decision-making or life planning, she or he often seek to 'colonize the future' (Giddens, 1991; Nowotny, 1994). However, the individual does not make decisions within a vacuum. The construction of the life course is embedded within historical, cultural, social and institutional (e.g., familial, religious) contexts. To guide the reader through this discussion, examples are used from the research area of family formation, which consists of partnership and fertility behaviour. The study of partnerships includes legal marriages and consensual unions. Marriages are defined by the reported or registered event of a wedding. Consensual unions are unmarried, intimate sexual partners sharing the same household (i.e., distinct from merely co-residence). Aspects of

fertility relate to reported or registered births and social, cultural and biological matters associated with sexuality and conception.

What does it mean to take a temporal standpoint to analyse partnership and fertility behaviour in the life course? The answer is that the focus shifts from static spatial or group-based comparisons of the life course (e.g., current socio-economic status, residence, education) to more dynamic analysis of the evolving, natural, constructed and data-related aspects of time. We are then driven to ask different types of questions. Why are there twice as many births occurring in December as compared to July in Bangladesh? Why did yearly Chinese fertility drop so sharply in 1966 and then rise in 1987? Why do births peak in the spring months and September in Canada? Why were so many women trying to conceive a child on April 9, 1999? Why do births climax in January and fall suddenly in December in the former USSR? Why do one-third of all first marriages in China occur in December and January? Are seasonal fluctuations in birth and marriage data related only to the natural rhythms of the cosmos? Why are most life history surveys collected from persons between the ages of 15 to 49 years of age? Why do women in India report their age at first marriage with digits that end with a zero or five or at the exact age of 18 years? Why is there more missing data for the date of cohabitation as opposed to the date of marriage in some surveys? Do women remember family events differently from men? How do we methodologically reckon with the assumption that the present contains pages of the past and expectations of the future? The answers to these questions are explored through the course of this study.

Previous life course studies

The recognition of temporality in life course research is not new. Pioneering researcher Elder argues that "any serious study of lives must consider time, process and context" (1991: 58). Mayer and Tuma concur that "research on the life course needs to use both a multilevel and multitime framework" (1990: 7). This move to rid life course research of static or 'time-less' theoretical and methodological thinking (Blossfeld, 1996: 183) has been embraced by many in the field (Courgeau and LeliΠvre, 1992; De Bruijn, 1999; Elder, 1994; Giele and Elder, 1998; Hareven, 1994; Ryder, 1992; Willekens, 1990, 1997).

The inclusive reaction to time has most likely occurred for three central reasons. The *first* is the realization that the classic multiple levels of the 'micro-meso-macro' often only reflected spatial or abstract (non-temporal) symbolic systems. The life course was situated in a context ranging from micro-level agency (psychological phenomena, action, choice), meso-level interaction (decision-making in partner or family unit) and macro-level structure (institutions, social structures to world systems). Although embracing multiple levels, research was unable to embody the more evolving, dynamic and process-based parallel aspects of time (Willekens, 1990).

This relates to the *second* catalyst, which is the general shift from static to dynamic approaches in the social sciences. The classic measurement of time in quantitative research was discrete. The symbol '*t*' was often used to represent the occurrence of an event or date of observation. Change was then registered by another discrete state, denoted by time '$t - 1$' (Ryder, 1965). As outlined in the final section of this paper, time is now often viewed as dynamic and process-based. Life events are understood as the outcome of processes, often with a focus on the duration within a life state (e.g., marriage to first child, conception to birth). Life course progression, thus, is in a perpetual process of 'becoming' (Prigogine, 1980; Young, 1988).

The *third* impetus is largely a reaction to temporality as narrowly defined only at one level. In many cases, time is used as a synonym for one aspect of temporarily such as age, cohort, or point-in-time events (e.g., change in abortion law) (Mayer and Tuma, 1990). Although these aspects are vital to uncover the force of temporality, they cannot be synonymous to time or seen as the only temporal effects. The recognition that time consists of multiple clocks still largely

appears to be in the work of an innovative handful. In some cases, the ontological affects are realized, but the epistemological approach is insufficient to encompass all aspects. Conversely, the epistemological approach may lead the study, automatically excluding additional ontological affects of temporality.

Thus, the rationale of raising awareness of the ontological affects of temporality in this field is twofold. The first impetus is to promote further research of the ontological affects of temporality at *multiple levels*. This requires going beyond the often epistemologically driven analyses that equate temporality with only one or a few of the clocks of the individual, family, historical, cohort, seasonal cycles, duration in a process, or point in time events. The non-quantifiable aspects of temporality related to collective social, cultural and institutional experience and memory remains largely underestimated. Furthermore, the force of institutional calendars that differentially schedule everyday life experience for disparate groups such as men and women, workers and non-workers are rarely explicitly addressed. Secondly, issues of temporality should be introduced at *all phases of the research process.* A well-developed theoretical approach is less often coupled with problems related to the temporal interchange with the collection, processing, analysing and interpretation of life history data by researchers in this field. This leaves the connection between ontological temporal assumptions and the epistemological approach relatively unchecked. Since the use of data organised by clock and calendar conceptions of time is often central to quantitative life course analysis, the ontological affects of temporality on the epistemological methods and methodology is a vital consideration. The ontological influence of temporality at multiple levels is now discussed in detail.

Different forms of temporality

The presence of multiple temporal clocks, or as Nowotny (1992: 424) coined 'pluritemporalism', has also not escaped the notice of social theorists. As with life course research, the approach to time within social theory has been shaped by varying ontological and epistemological approaches. Durkheim focused on the social synchronising and integrative function of time. Marx examined the commodification, economic dimension and role of the state in time. Weber looked at the rationalisation of time (in Adam, 1990). Mead (1932/1980) argued that the past is continuously re-created and reformulated as the present unfolds (see De Gans, 1994). Adam contends that "there is no single time, only a multitude of times which interpenetrate and permeate our daily lives" (1995: 12). Schutz and Luckmann (1973) advanced the idea of persistently interacting multiple lifeworlds, where the past and future simultaneously permeate the present rhythms of the human body, planets, seasons and routines centered upon clocks and calendars. Luhmann (1977/1982), argued that synchronic (interdependent) and diachronic (dynamic) systems differentiate themselves from the environment, also adding that the past and future are mere horizons of the simultaneously occurring present. This relates to Nowotny's (1994) conclusion that the future is merely the 'extended present'. Likewise, Giddens (1991) posits that by planning our life course we seek to 'colonize the future'. We will return to this discussion of the interplay of the past, present and future at the end of this paper. H≅gerstrand (1975) offered the concept of lifelines and recurrent time-space paths that give rise to world lines. Giddens (1981, 1984), building on H≅gerstrand and others, speaks of three temporal levels of how everyday life experience make up the life course and social institutions themselves. He divided time into experience in daily life, followed by the temporality of the life cycle and the duration of social institutions produced or reproduced through regularised practices.

From this brief review, it is clear that choices are required in order to conceptualise and operationalise the ontological influences of temporality on human behaviour within the life course. On a basic level, we must distinguish what is a temporal effect or what is attributed to the epistemological approach. This is addressed within the second section of this paper. Within temporality itself, however, it is useful to clearly separate the natural from what is symbolically

constructed within cultural and social systems. H≅gerstrand's (1988) conception of time is a useful starting point to understand this division. Time, he argues, consists of 'embedded time', which is tangible and real and 'symbolic time', which is an abstract entity to summarise experiences and observations. Similarly, Domingues (1995) divides social time into 'identitaire' and 'imaginary' time. Identitaire time is based on the calendar and is repetitive or cyclical due to its tie with cosmic time. Imaginary time is a free creation of society, whereby individuals assign symbolic meaning to temporal dimensions within their lives.

The division between the natural, cosmic or biological and the symbolic, imagined or socially or culturally manufactured are essential divisions in this paper. As the next section describes, natural or cosmic time (i.e., embedded, identitaire time) remains relatively fixed across time and space. Temporal constructs, such as historical, social, cultural and institutional calendars are perpetually in a state of becoming. They are assigned different meaning and re-invented dependent on the context. Throughout this paper, the interconnection between different ontological aspects of time is also forged. For instance, the natural seasonal cycles are often mirrored in other calendars of agricultural production, religious, educational and sports calendars (e.g., ice hockey season during the winter months). These divisions and interrelations of temporality are now discussed in detail in relation to family formation in the life course.

Natural and cosmic time

Natural and cosmic time is based on the relatively fixed, repetitive or cyclical rhythm of the natural environment, such as the lunar and seasonal cycles. The ontological affects of natural and cosmic temporality are often understood through the epistemological approach of studies of seasonality. These studies examine the influence of temperature, latitude, the photoperiod and precipitation, often through statistical (regression) analysis, with demographic behaviour being the dependent variable or the outcome influenced by these factors.

Several studies have examined how the *temperature*, which is regulated by the natural cycle of the seasons, influences fertility. Canada, a country that experiences the extremes of heat during the summer and cold during the winter is an interesting case. Werschler and Halli (1992) found a statistically significant association between conceptions and the temperature between 1920-54. Conceptions were higher, for instance, in years where the temperature in February was above normal. They also found evidence that intense summer heat in July reduced coital frequency. Trovato and Odynak (1993) also showed that especially in 1881, Canadian couples timed births to occur in the spring and summer to avoid extreme winter cold. In addition, they noted a peak in births in September, a finding that will is addressed shortly in relation to institutional calendars.

Due to the *latitude*, individuals may also experience different levels of *luminosity* during the course of the year. James (1990) linked seasonality of births to increased sexual activity occurring at different latitudes due to variations in the photoperiod. Russell, Douglas and Allan (1993) associated seasonal variation in births in Scotland during 1938 to 1987 to natural factors such as temperature, latitude, photoperiod and environmental pollution, which they argued, influenced sexual activity.

Finally, fertility has been linked to *precipitation* or the monsoon cycles, which are often tied to agricultural production cycles. Bantje (1988) found that the number of births in Tanzania increased during the dry season of June to October and declined during the rainy season. This drop in the conception rate during the hot and wet agricultural season was attributed to physical factors of exhaustion and stress on female workers. Panter-Brick (1996) also detected that women's bimodal birth patterns in Nepal followed a seasonal pattern mirroring the monsoon. The first conception trough occurred as a result of male out-migration in the middle of the monsoon period. The second drop was a result of ovarian suppression and low progesterone levels due to female weight loss during the arduous agricultural monsoon work period.

Natural temporality may also influence partnerships. Using a sample of an early English colony in Australia, Gunn (1990) tested whether the inversion of seasons experienced by moving from England's Northern to Australia's Southern Hemisphere affected marriage patterns. Gunn established, however, that marriages were regulated not only by the natural environment of seasons, but also tied to the cycles of production. The agricultural or labour period is a more prosperous one when individuals have increased material resources. Marriage behaviour therefore interacts with and is dependent upon favourable production cycles, which are often contingent on weather conditions and longer photoperiods.

Although the lunar and seasonal cycles remain fixed over time, some studies also report that the natural influences begin to subside (Russell, Douglas and Allan, 1991; Werschler and Halli, 1992). This is largely attributed to the increased colonization of natural cycles via the introduction of air conditioning, central heating and irrigation. In other words, it is no longer hazardous to have a child in the cold of winter or unpleasant to conceive a child on a hot July day. Within these first examples, it is clear that natural time is not the only behavioural influence. Some studies have also attributed their findings to the 'festival effect', which is discussed later in relation to institutional calendars (James, 1990; Trovato and Odynak, 1993). Furthermore, the force of the seasonal cycles works through the medium of the individual's own biological system. Changes in the temperature, photoperiod and rainfall influence biological aspects of hormonal production but also activity levels and psychological perception of the world. The lack of sexual activity during extreme periods of heat for instance, is a blend biological lethargy and personal choice or will. Thus, the discussion now turns to the temporal aspects of human development.

Biological and psychological human development

The next universal aspect of temporality is the internal clock of the individual, which is divided into biological and psychological development. The ontological affects of human development are often seen via the epistemological approach of comparative, descriptive or statistical modeling of life events, using age (often mean or median age) or life stage as a yardstick of progression (Neugarten, 1979).

Biological development relates to physiological growth and maturation through life stages. The biological chronometer is tied to the predictable circuit of the human body as it moves through its own physical timetable. The clock begins at birth to maturation, onset of menopause or sterility, followed by progressive cell degeneration resulting in aging, and the decline of health and eventual death. It is also important to explicitly note the differences in biological development of men's and women's bodies. The reproductive clock of women is often the focus on many life history studies of fertility. Factors such as the onset or end of menstruation, lactation, post-partum ammenorhea, nutrition or health affect a woman's risk of conceiving a child or being considered a suitable mate (Bongaarts and Potter, 1983). The 'biological clock' is increasingly referred to in relation to fertility, or the awareness in the age of partnership and parenthood postponement, that there is a definitive reproductive period.

In addition to interrelation with natural cycles, biological time is also increasingly colonized by socially constructed and technologically based perceptions of time. This relates to Young's (1988) study of 'chronobiology', which connects biological and humanly constructed timetables, discussed shortly in relation to institutional calendars. For example, before the introduction of the contraceptive pill in the 1960s, the menstrual cycle was often thought of as a regular and cyclical occurrence tied to natural rhythms. The standardisation of menstrual time via the pill and other contraceptives represents an interaction with socially constructed visions of what a regular biological cycle ought to be. This was one of the first global moves of colonization of the human body by science and has affected the natural temporal cycles of women around the world. Building on the work of Zerubavel (1981), Foster (1996) took a sociocognitive as opposed to biological approach to study the menstrual cycle. Previously, menstrual time was viewed as

'sacred' and often equated with physical separation, evil and uncleanliness, factors that had serious implications for women's everyday lives. This shift to control biological temporal influences (also, fertility, mortality) disrupts the natural cycle to the extent that it is now almost entirely socially constructed. Foster concludes in relation to the menstrual cycle, that the "mental mapping out of what constitutes the elements to this rhythm, so often taken for granted as a purely natural pattern of time, is a highly social act" (1996: 544). Biological development, therefore, can also no longer be understood as solely fixed or natural. Our ability to time and control conception with new reproductive technologies is touched upon again in relation to the effects of institutional calendars. Due the introduction of new technologies, fertility is no longer based on chance, but often the result of conscious decision-making process of the individual, partnership-unit and family. The increased social construction of biological time is an important finding that will become increasingly relevant as the force of technology enters more and more into all realms of everyday life, and thus the construction of the life course.

The individual clock does not only progress biologically. There is psychological and personality growth related to the life course, a topic that originally stems from Erikson's (1950/1963) theory of developmental readiness. According to Erikson, biological, psychological and social factors determine the stages of development and sequences that individuals pass through as they chronologically age. Although persons may be of identical age or the same point in duration since the last demographic event, they may be at significantly different levels of biological and psychological development (Willekens, 1997).

Furthermore, there is interplay between historical-cultural-social contexts and the perception of psychological development. This is illustrated within Giddens'(1991) discussion of self-identity formation in the age of modernity. The construction of one's ontological outlook in pre-modern and agrarian contexts was shaped by kinship relations, the local community, religious cosmologies and tradition. Whereas, in the age of modernity, individuals develop their identities in relation to personal relationships and abstract systems, with a more future-oriented perception connecting the past and present. Abstract systems consist of symbolic tokens and expert systems, which span over time and space (Giddens, 1991). Symbolic tokens are mediums of exchange, which have a standard value, such as money. In relation to the life course, symbolic tokens could be a wedding ring, co-residence or wearing of black by a widow. Expert systems are what individuals base their knowledge, trust and security of their existence on, or their 'ontological security'. Individuals rely on advice from midwives, elders and doctors in relation to fertility. Others may decide to marry instead of cohabiting based on the force of guardian of a religious figure, for instance, viewed as an expert. Psychological human development and decision-making in the age of modernity, therefore becomes increasingly reflexive and individualistic. An example will solidify this point.

Let us compare basic elements of family formation of women in the largely agrarian area of the northern Indian State of Uttar Pradesh and the modern Western-European nation of the Netherlands. In a 1992-93 survey taken in Uttar Pradesh, 63.9 percent of women between the ages of 20 to 24 were married by the age of 18 (IIPS, 1996).[ii] A similar 1993 survey in the Netherlands found that for women of the same age, 16.9 percent had entered some kind of consensual or marital partnership. However, only 1.2 percent had entered into legal marriages not preceded by cohabitation (Latten and De Graaf, 1997: 60). In the first instance, there is a clear disparity in the timing of first partnership transitions in these two groups of women. As described shortly, differences such as these are often related in the literature to the more obvious disparate social, cultural and historical contexts. However, this finding can also be connected to the less-often-noted ontological affect of the perception of women's biological and psychological clocks.

The same survey in Uttar Pradesh shows that over half of girls marry at an early age, but remain in their parental household after marriage. It is not until after the 'gauna' ceremony, which signifies the onset of menstruation and entrance into womanhood that a woman co-resides with her husband (Mukherjee, Bhattacharya and Singh, 1996). In this way, her authentic entrance into

a marital partnership is signaled by her biological readiness to experience the life transition. Although this begins to change among groups of women (higher education, urban), a girl's entrance into marriage is still largely regulated by her biological readiness, ascribed by the family, community, traditional and religious beliefs. Conversely, in the Netherlands, there is more emphasis placed on individual choice, romantic love and preference based on a woman's own reflexive conception of her psychological readiness. This comparison relates to not only an individual's psychological development and socio-cultural context, but also to the luxury of developing one's self-identity. Russell, Douglas and Allan (1993), for instance, found that births within wealthier social classes in Scotland occurred largely during the summer, suggesting that the wealthier had the resources to better plan childbirth.

Although natural and human development clocks are important in governing the life course, it is still too simplistic to see them as the regulating factors. As suggested in the previous example, the way that individual development is interpreted varies by social, cultural and historical contexts. Furthermore, individuals were compelled to time their births during particular seasons due not only to their geographic, but also historical location (i.e., no central heating, air conditioners). This relates to the next area of discussion, which is the historical context.

Historical time

Life course researchers (Elder, 1974; Hogan, 1981; Hareven, 1994) have extensively refined the concept of historical time, which is defined by the particular socio-cultural, economic, physical, political and economic configuration of an individual's context (De Bruijn, 1999). This type of time, along with individual and family or household-based time clocks, is one of the most studied influences of temporality in life course studies. Historical events are seen to shape a cohort, period or generation. These include war, invasion or sanctions, famine or surplus, environmental or ecological catastrophes, plague or advanced health, shifts in ideology such as fundamentalism, capitalism or communism, and economic depression or boom. The ontological affect of historical period on the individual or family unit are often traced through the epistemological approach of age, cohort, generation and period analysis, discussed in the second section of this paper.

Mayer and Tuma (1990) maintain that a core assumption of life course research is that "life courses emerge in particular historical settings" (1990: 6). Elder (1974), demonstrated this temporal affect in his book, *Children of the Depression*. In this book, he explores not only the effects of economic change on individuals, but also the connections between such change to the adult careers of men and women born during the depression. Focusing on adaptations made by the family, Elder noted differences in the timing and sequencing of events in childhood and later adulthood. Cohorts that had to forgo higher education, lack of employment or had menial jobs during the Great Depression had less favourable life chances. Due to these conditions, the cohort often delayed marriage and family formation. Conversely, a cohort was born during World War II had greater opportunities in an atmosphere of economic prosperity, possibility of military service and later entered employment, marriage and family formation with greater ease than their predecessors.

The importance of cohort or period is a central factor in life course opportunities such as marriage, employment or the ability to begin a family. However, the temporal category of birth cohort, which is often only arbitrarily constructed as an epistemological tool by the researcher, may also be a factor related to value shifts. Foot and Stoffman (1996) studied the baby boom generation that occurred in Canada between the years of 1946 to 1966. In 1996, this generation comprised of approximately 33 percent of the population and therefore often set the political, social and cultural agenda of the country. They argued that the current phenomena of 'return to family values' could not be attributed to a value shift, but rather, a cohort effect. This is due to the fact that this large cohort, now between the ages of 30 and 40 years, are in the 'family' life stage of mortgages and children. Foot and Stoffman (1996: 189) predict that at the turn of the

millennium, when the large 'baby-boom echo' cohort born from 1980 to 1995 begin to leave the parental home that values will shift to sex, drugs and new music. "Social observers will herald the arrival of yet another value shift," they argue, "but the real reason will be the demographic shift" (1996: 189). This finding supports Ryder's (1965: 13) original theory of the importance of cohort size, as "likely to leave an imprint on the cohort as well as on society." Although one's spatial or physical location, for instance, may change as a consequence of migration, persons are born into not only a particular historical, but also a unique cultural and social context.

Cultural and social time

The cultural and social construction of reality shapes the institutional calendars that regulate everyday life. Behaviour in everyday life in turn makes up the social practices that construct the life course and social-cultural structure itself (Giddens, 1981, 1984). How different cultural and social groups experience time is discussed in detail in the final section of this paper, which deals with the epistemological approach in research. These tools are often based on an ethnographic approach or involve the use of a life history calendar or mnemonic devices to remember life events (Freedman et al., 1988; Hertrich, 1993).

Cultural time is the subjective conception, use and meaning ascribed to temporality manufactured within different cultures (H≅gerstrand, 1988; Adam, 1995). This discussion, often based in anthropology and geography, via cultural schema's and meaning systems argues that there are culturally specific interpretations of time (D'Andrade, 1995). Just as DNA shapes our biological systems, human culture invents ontology about the nature of the world and prescribes how individuals should behave in it. Bronowski (1974) originally suggested that the landscape is human made and shaped by our own symbolic construction. H≅gerstrand (1988: 33) likewise considers time as a 'wholly cultural phenomena'. As touched upon previously, the geographic space of countries or regions, biological life cycle and the natural cycle of days or seasons is generally constant. Differentiation stems from how different cultures transform this social space and time to reflect unique ontological conceptions. By taking this reflexive position, we attempt to understand different ways of experiencing time. This places the Western researcher beyond the 'our' and 'their' time distinction so prevalent in earlier anthropological works (Adam, 1995).

Cultural conceptions of time may also impact life course events. Salvat et al. (1997), for instance, analysed marriage records from Parish data in the Cerdanya valley of the eastern Pyrenees. Their goal was to find if there was greater social and cultural cohesion among the French and Spanish communities in the early 1900s. By comparing the seasonality of marriages, they found that the choice of the month of marriage was largely culturally determined between the two groups. The reason for these differences is often based on religious calendars, discussed shortly. In the last section of this paper, one's cultural conception of time is related to problems of data recall and collection.

Social time include norms, values, rules and responsibilities about the expected time that a life event ought to occur (Adam, 1995; Zerubavel, 1981;). Elder (1994: 6) defines it as "the incidence, duration, and sequence of roles, and relevant expectations and beliefs based on age", which regulate the life course. Social time has been extensively discussed by Mead (1932/1980), Luhmann (1977/1982), Elder (1994), Hareven, (1994), Nowotny (1994) and Adam (1995). Elias (1987/1992) suggested that social time, defined as that which extends former dimensions of space and time to embrace consciousness and experience, is the result of a cumulative civilization process. As discussed at the outset of this section, Domingues (1995) further divided Elias' conception of social time to include 'identitaire' and 'imaginary' time, or the natural and symbolically constructed.

Social time is manifested in the area of partnership and fertility behaviour through calendars that prescribe the ideal age at marriage, having a first child and ending one's fertility career. Age is often applied as a standard to judge the 'proper' timing of life events, or

'timeliness' of life transitions. The individual is then placed in some sort of logical social temporal order of being 'on' or 'off' time in their development (Neugarten and Hagestadt, 1976). Hareven (1994), for instance, discusses the differences between the importance of the 'timeliness' of life transitions in the United States and Japan. In Japanese there is a specific word, "tekirei" which "designates set norms of timing, meaning the age most 'fit' for accomplishing various life transitions" (1994: 205). It also refers to the orderly sequencing of life course transitions. Dissimilar to many contemporary Western societies, in Japan, the order and sequence of life transitions from leaving the parental home, school completion, starting a first job, and marriage accounts for over 90 percent of each cohort (Hareven, 1994: 206). Hareven adds that only after World War II did persons in the United States began to adhere to more strict social rules regarding age norms rather than postponing life transitions due to familial needs. As societies shift from agrarian and pre-modern forms to modernity, Young (1988) has argued that the strength of the natural solar, lunar and seasonal rhythms are being replaced by the symbolic systems and timetables created by recent human culture. This separation of the natural (identitaire, embedded) forms of the celestial realm and attention to symbolic (imaginary) systems and timetables results in the 'metronomic society' (Young, 1988). The way in which cultural and social systems transform temporality is often realized through institutional calendars.

Institutional calendars

Institutional time, viewed through institutional calendars, is defined as the timetables produced via the adaptation and life span of institutions. Institutions are located within and produced by historical, social and cultural contexts. Institutions include the family, religious, education, work/production, political and government and gender divisions. These institutions are often accompanied by seemingly innocent calendars that in fact often regulate everyday life and thus most behaviour in the life course. Furthermore, due to an individual's position in these institutions, such as being male or female and worker or non-worker, she or he experiences time in a different way. These multiples calendars are often neglected, underestimated or viewed only in relation to the family or production systems. The ontological affect of institutional temporality is furthermore, generally realized through the epistemological approach of examining the influence of point-in-time events such as a change in a divorce, abortion or parental leave legislation. For this reason, institutional calendars are described in greater detail in this paper.

Calendars that are created and located within a specific historical-social-cultural context dictate the majority of individual action and group interaction in everyday life (Fraser, 1987). Adam (1995) argues that this form of temporality mediates most of our social interaction. The calendar, therefore, may also serve as a solidifying basis of group solidarity and identity, or as vital in the 'mechanical solidarity' of a society (Zerubavel, 1982). Calendars range from the agrarian, Julian, Mayan, Chinese lunar zodiac, Hindu Mahabharata, Catholic liturgical, Arabic lunar, Coptic, family, education, work, political or sports. The origin of the calendar is often an interweaving of natural, cosmic and agricultural cycles with socially constructed aspects of religious cosmologies.

Religious institutions were highly connected to the creation of calendars that influence everyday life. These calendars shape the timing and enforce the observance of sacred times such as Ramaydan or the Sabbath and rituals that mark passing phases in the life course (e.g., baptism, bar mitzvah, wedding, funeral) (Zerubavel, 1981). They also often serve to determine auspicious and inauspicious times or years for the optimum occurrence of life events, such as marriage or childbirth. Two studies, for instance, have shown the historical ecclesiastical restriction of marriage by the Catholic Church, during Lent and Advent (March and December) in the Netherlands and Belgium during the 17th to 18th century (Van Poppel, 1995; Lesthaeghe, 1989). Similarily, Trovato and Odynak (1993) attributed the peak of September births in Canada not

only to climate or natural causes, but also to the festival effect of Christmas and overall individual preference.

The *Chinese lunar calendar* is an interesting example of how this blend of the natural lunar, cultural and religious cosmology influences partnership and fertility behaviour. The calendar has 12 moons, each lasting 29 to 30 days and one new moon (embolism) that is added every two to three years to match the Western calendar (Abeysinghe, 1991).[iii] The timing of demographic events has been linked to the Chinese New Year and auspicious and inauspicious years within the 12-year lunar cycle. Using vital registration data, Goodkind (1996) connected the timing of births among Chinese in Singapore between 1970-90 to this calendar. He discovered a baby boom in the auspicious year of the Dragon and bust in the inauspicious year of the Tiger. Using the 1988 *Demographic and Health Survey* from Vietnam, Thang and Swenson (1996) also found a correlation between births and marriages considered auspicious years in the Chinese and Vietnamese astrological calendars. They concluded that individuals purposely planned marriage and childbirth to coincide with optimal calendar timing. Abeysinghe (1991) also found that marriages peaked during the Chinese New Year in Malaysia, Singapore, Hong Kong and Taiwan. An additional factor relates to not only the actual timing of marriage or birth, but also the artificial construction of peaks and drops due to when events were officially registered. We will return to this essential factor in the final section of this paper.

The influence of the Western or Gregorian calendar, which marks the turn of the *Millenium*, is another excellent example of how something as arbitrary as the date on a calendar can influence life course behaviour. The transition to the new millennium is viewed as a large event in many cultures. It has also created anxiety due to the risk of technical chaos in the form of the 'millennium bug'. However, it also serves as an impetus for retrospection about time itself, the nature of society and, as any individual who has ever made a 'New Year's Resolution' knows, reflexive thinking about our own lifestyle and life course. As Giddens (1994: 56) summates:

> We live, as everyone knows, at a time of endings. There is, first of all, the end not just of a century but of a millennium: something which has no content, and which is wholly arbitrary – a date on a calendar – has such a power of reification that it holds us in thrall. *Fin de siIIcle* has become widely identified with feelings of disorientation and malaise, to such a degree that one might wonder whether all the talk of endings, such as the end of modernity, or the end of history, simply reflects them (original italics).

The turn of the century, indexed by a calendar, presents not only anxiety as we realize that we rely upon all-pervasive technology, but forces us to reevaluate our entire ontological construction of the world. The rise in books about calendars, time, and construction of monuments such as the 'Millennium Dome' adds to a feeling that a calendar event is indeed momentous.

This calendar-derived event may also influence fertility and partnerships behaviour in the form of a mini-baby boom or rise in marriages. Although it is too soon for researchers to examine, the printed and electronic media are full of examples, including a 'Millennium Mom' Web Page on the Internet. Potential parents received instructions about how to specifically time a pregnancy, which translates to approximately April 9, 1999 as the optimum date for conceiving the first baby to enter the new millennium. One potential Millenium-Mom planned the event to the hour using a pregnancy planning kit with ovulation predictors. As she explains in her own temporally-laden words:

> Most women ovulate between 24-36 hours after the LH [luteinizing hormone that triggers ovulation] surge is detected. I used a stick this morning (2:00 a.m.) and the test was positive! Calculate this for yourself and we are dead on for 4/9! [iv]

This echoes the previous discussion regarding the colonization of our natural biological cycles by new technologies. In response to fertility planning, and added festivities, some hospitals and

midwives have also been warned of a holiday ban at the turn of millennium in countries such as Britain (see source above).

The Millennium date may also result in a rise in marriages. Reuters news service (5/05/99) reported that the New Zealand parliament has relaxed a rule banning weddings between 10 p.m. to 6 a.m. in order that marriages may occur in the first time zone that enters the new century. The government-backed 'First to the Future' campaign will most likely capitalise on the influence of this calendar date. The important point is that a date or a year in a calendar that may appear to be insignificant at face value may have direct consequences on life event planning. More importantly, the way that individual's interpret or experience this calendar pervades their everyday life activities. Just as religion has determined many calendars, another institution central in the construction of events in the life course has remained and evolved through time. This is the institution of the family.

Family time is another familiar topic in life course research (Hareven, 1994; Ryder, 1992). It is the recognition that the individual lives and makes decisions in the context of first the parental, and then the spousal and in-law and their own paternal family. Family time includes aspects of the life cycle of family and households, spousal time (e.g., dual-earner couples) and parent-child times (e.g., increasing participation of fathers). Ryder maintains that "the family is above all the institution to which is assigned the responsibility for attempting to solve problems of the passage of time both for the individual and for the population" (1992: 161). In an applied study, Young (1992) focused on the interdependent lives of partners and family members by considering the layers of individual, family and historical time in Malaysia. For instance, the migration or death of the head of the household results in a drastic change for the interdependent family members. Hareven (1994) also clearly connects the levels of the individual, family and historical time. Since the examples used throughout this paper relate to the family, it is clear that the individual and the family cannot be separated in this respect. Life history data can generally be shifted to examine the individual, family or household. However, as the force of more traditional institutions such as the family and religion wanes in many Western societies, timetables are being increasingly shaped by other forms of temporality beyond the sacred or traditional (Lesthaeghe, 1989). This 'civilization' of time means that daily life becomes centered around more industrialised cycles of education, work, political, economic, sports or other secular timetables (Ikuko, 1997).

Educational calendars shape children's identities, arguably training them for entry into the next social institution of the labour force (Adam, 1995). It is the first space that individuals become aware of bureaucratic or commodified time. This includes the importance of punctuality and being 'on time' in grade progression, which will again occur in relation to partnerships and fertility. This is also the first experience of distinct mono-temporal divisions of time to allot for each specified subject. When these children, especially women, enter adulthood, they will find that this mono-temporal division of time cannot accommodate the interdependent life domains of partnership, fertility, education and work. In addition, the proper timing of the transition from the education to work calendar has a pervasive influence in shaping further life course transitions such as marriage or migration.

The *work or production calendar* regulates many everyday activities and forces us to focus on time-management and setting deadlines. Individuals must also timetable their leisure or private family time around their public employment time. The importance of agricultural and production cycles in relation to the timing of marriages was discussed previously (Gunn, 1990). There has been a general shift to production time is what Van der Poel (1997) terms the 'modularization' of time, or time as a commodity, which is abstract and exchangeable. Via the rise of temporal reflexivity (time-tabling, planning) and construction of one's own life trajectory in Western societies, there is a surplus of a new type of time - *leisure time* (Van der Poel, 1997). When individuals make life course decisions, they do so in relation to these new forms of time. There is a division not only between private and public time, but also between leisure or disposal

time. As Giddens (1991: 77) states, "self-actualisation implies the control of time – essentially, the establishing of zones of personal time which have only remote connections with external temporal orders". An individual's ability to focus on the development of self-actualization, however, stems from her or his historical and geographic location, family membership, sex and worker status. The amount of integration into the production calendar has been largely gender-based. For this reason, the construction of production, reproduction and gendered time is now discussed in relation to one another in terms of social accessibility.

Female and male calendars, or *(wo)men's temporal experience*, has been surprisingly absent in many demographic and life course studies. (Wo)men's time refers to the disparate temporal experience and use of time by women and men. There is a history of reproduction and production divisions between the sexes. The most obvious difference in time use by men and women is reproductive or 'procreation' time (Tobler, 1996). However, differences also include division of labour such as part-time female work or allotted 'spaces' where women can act (Friberg, 1993). These disparate temporal calendars are less often integrated or seen as defining factors or remain largely as a study in itself in the form of women's time (Kristeva, 1981; Davies, 1989; Forman, 1989; Friberg, 1993; Leccardi, 1996). When fertility is discussed, women are often the subjects, yet the unique female experience of space and time is ironically forgotten, or at worst, women's productive ability is linked solely to reproduction (Tobler, 1996). Women and men's perception and use of time often vary substantially from one another ranging from basic biological differences to distinct patterns of managing public and private time and space. These calendars are therefore now discussed in relation to work or production time due to interrelations with the use of public and private time by the sexes and workers and non-workers.

An individual's social accessibility and perception of reality is centered on the division of private and public time. Private time is "deliberately designed to prevent, or at least discourage, the formation of human contact and to separate people from one another" (Zerubavel, 1981; 143). Public time "is deliberately meant to promote the establishment of human contact and draw people together" (Zerubavel, 1981: 143; Leccardi, 1996). In a study of women's everyday lives, Friberg (1993) observed that many of the structures and amenities that exist in public space are male dominated, leaving private household space to women. Figure 1 provides an illustration of the temporal division by sex, showing the number of paid (public) and unpaid (private) hours currently worked by women and men in different regions of the world. To varying degrees of difference, when public and private work is accounted for, women engage in more 'productive' hours per week than their male counterparts. The largest differences are apparent in the division of unpaid private labour time. In comparison with their male counterparts, women consistently work double private time in Canada, the Netherlands and the Former USSR, triple time in Israel and almost 10 times more in Japan (United Nations, 1996: 132). This is largely attributed to the private-public gender space divisions, which translate to more private time for women spent in household chores, preparing meals, childcare and shopping. These long-term processes of gender division and segregation of public and private time in turn serve to gather political value and reinforce themselves (Leccardi, 1996: 175). This time conflict is increasingly addressed in studies of women's parallel life course, such as the combination of motherhood and employment.

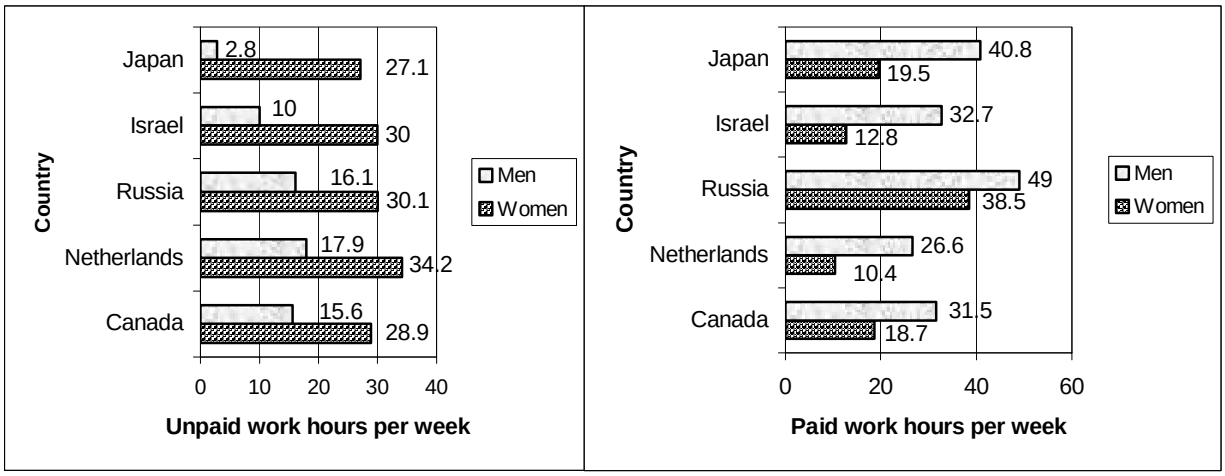
The position taken by researchers is situated among a collection of ontological assumptions of temporality. The researcher may assume that natural or cosmic cycles, biological or psychological development, historical period or institutional calendars created by cultural and social time are central to the analysis. However, temporality may not be the sole influence on the supposed 'temporal affects' that we observe in life histories. To this point, the discussion has intentionally excluded any detailed mention of the data, methods and methodology used to study the life course. In the previous section, it was argued that temporality in relation to the natural or biological determined context should be separated from what is symbolically, socially and culturally constructed. The next section now builds on this division by addressing the interplay

and necessary separation from what is a temporal affect and what is related to errors, anomalies and approaches related to data, methods and methodology.

Temporal aspects of data, methods and methodology

Data, methods and methodology are the epistemological instruments linking empirical evidence to the social processes that make up the life course. This final section argues that as researchers, we should clearly isolate what is an affect of temporality or what is an artefact of the epistemological approach of data, methods and/or methodology. Life history *data* are generally taken from surveys or vital statistics, parish or medical records. Surveys may be prospective (panel) or retrospective (cross-sectional). Prospective or panel data are collected at discrete points in time, often following the same group of individuals. Retrospective cross-sectional surveys contain information on the timing of recorded past life histories of individuals. Although the survey is taken at one point in time, the life history of an individual is reconstructed by distinguishing the time and sequence of life events. A *method* is the technique used to gather evidence and acquire knowledge, such as qualitative methods of interviewing or observation, or quantitative approaches of the data mentioned above.

FIGURE 1
Unpaid and paid work hours of women and men in selected countries



Source: United Nations. *The World's Women 1995. Trends and Statistics*. Social Statistics Indicators. Series K., No. 12. New York, NY: UN, 132. Japan (1991), Israel (1991-92), Former USSR (1986), Netherlands (1988), Canada (1992)

Four distinctions between the data and method and temporality are discussed first. These are *timing of data collection*, *memory or recall problems*, *method of data gathering* and *self-registration*. The first three aspects are related to survey data, which is most often used in event history analyses of the life course. The last is related to vital statistics or other largely respondent-regulated records of life events. The discussion then turns to innovations in methodology that have been developed to deal with temporal problems. *Methodology* is the way that the ontological or theoretical structure finds its application in life course research. A common approach to study the life course, for instance, is via the use of age, cohort and period analysis and other statistical techniques and models. It is concluded that although some temporal problems are already realized, several aspects are still lacking. These are reflexivity at all points in research, new ways

of understanding the memory of life events, blending of qualitative and external data sources, and the use of methodology that expressly deals with temporal assumptions.

Timing of data collection: Selectivity and age truncation

The timing of data collection is important to determine if the survey sample is selective, or, representative of the actual population. The first basic pitfall is that a survey collects data only from *survivors and non-migrants*. Thus, in areas with, for instance, many deaths due to war or economic or political migration, the researcher must realize who is *not* in the sample due to the influence of historical time. Secondly, life history data is often only collected in the *labour productive* (18 to 65) or *fertility reproductive* (15 to 49) age periods of individual's lives. The institutionally defined ontological assumptions that place the (re)productive periods as the most important times in the life course dictates these ages for data collection. Arguably, many major life transitions related to education, partnership, fertility and work take place within these age intervals. However, attention to cumulative lifetime experience, such as childhood experiences (e.g., divorce, unemployment, migration of parents) could also be determinants of decisions in the adult life course. When postponement of life events and the advance of reproductive and life-saving technologies are taken into account, classic age intervals (e.g., 15 to 49) of life events and data collection will be increasingly eroded. Furthermore, as the baby-boom cohort in many Western regions begins to age, this cohort effect will produce a new interest in later life course events such as grandparenthood, health and active life expectancy. Finally, the assumption that women are central to reproduction results in the epistemological manifestation of fertility data gathered only from women, thus omitting the unique fertility histories of men.

A third aspect related to the timing of data collection is *age truncation*, which addresses the problem of when the data is collected in the progression of the respondent's life course. This is a common problem when examining life histories of younger individuals. Since the survey is taken at a particular time in their life course, younger persons have not had enough time to accumulate higher order life transitions by the date of the survey (e.g., second child, widowhood). In this case, the age of the individual at the date of the survey is a distinct methodological factor in defining the partnership or fertility process. A Lexis diagram is useful to understand the differential amount of time lived or observed by different cohort or age groups.[v]

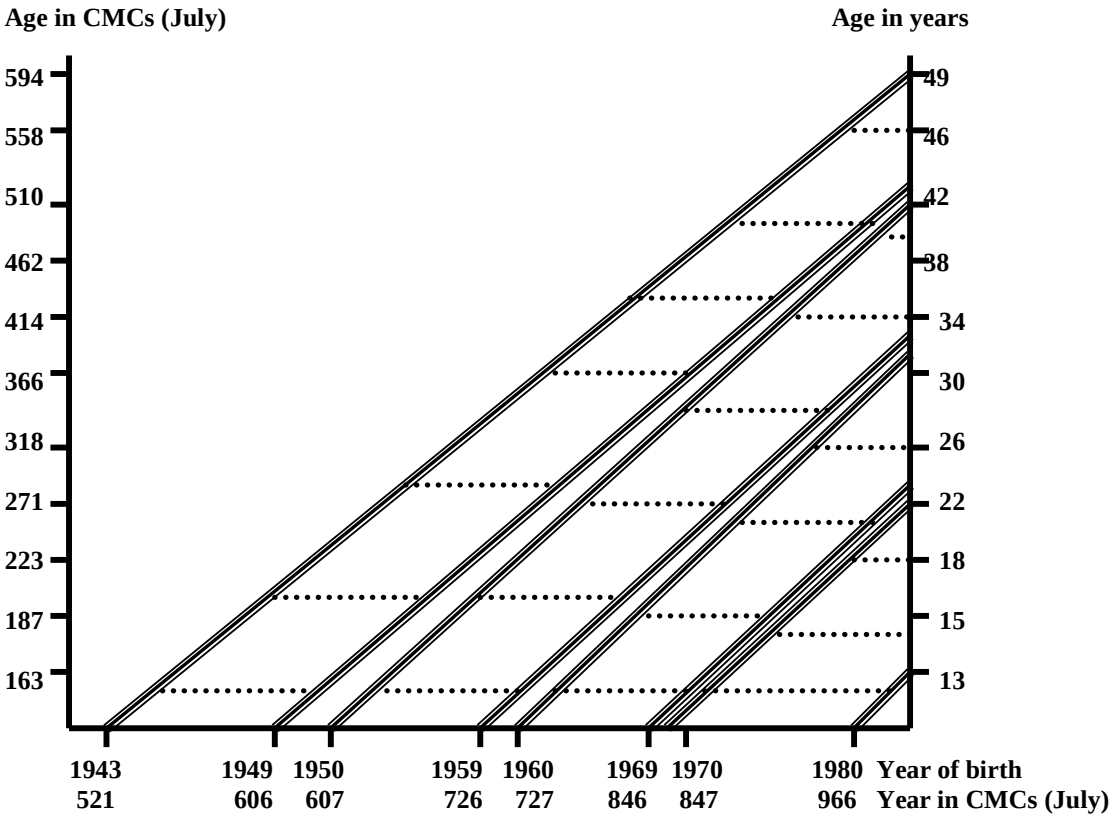
Figure 2 illustrates that cross-sectional retrospective survey data provides a partial information set of life history data. The diagram shows a sample of individuals born from 1943 to 1980, aged 13 to 49 at the date of survey and divided into four cohort groups. It is easy to see from this figure that we have life history information on a disparate number of years for each cohort of women. For the oldest cohort, born from 1943 to 1949, we have life history information up to age 42 to 49. However for the youngest cohort, born from 1970 to 1980, we have life history information until approximately age 13 to 22. We do not obtain a detailed life history of the younger respondents, as many of their life events will be censored (not occurred) by the date of the survey. For middle cohorts, we may also not have detailed information. For instance, many younger women in Western European countries are postponing life events such as entry into a partnership or motherhood in comparison to older cohorts or generations. In addition, since the survey is only collected up to age 49, we are unlikely to obtain information about higher order union experiences, such as partnership dissolution due to death of the partner. Another temporally related aspect immediately apparent in Figure 2, are the multiple clocks that are used to study the individual's life course. These are discussed in detail in the methodological section shortly.

In addition to the importance of the timing of data collection in the individual's personal clock, the timing in the day, month or year that data is gathered may have implications on results. The number or monthly variation in specified days, such as variations by dates of religious festivals or national holidays can influence the data. 'Seasonally adjusted rates' are often used, for instance, to reflect seasonal employment opportunities and activity levels.

Memory problems

Another common problem in retrospective data collection is memory or recall problems of past life events, which results in misreporting. Memory problems are often connected with age, sex and social and cultural conceptions of time. When gathering life history data, researchers must be aware of the respondent's not only experience of time, but also reflexively examine their own temporal construction. Data problems such as age heaping or digit preference related to cultural mismatches of respondent-researcher visions of time is discussed first. However, missing or misreported temporal data is less often compared by the *type* of life event. The second point thus argues that the meaning or importance that one attaches to family or life course events plays an additional role in remembering the date of the event. Furthermore, it is not only the individual's conception, but also the ritualization of the event in the current historical-cultural-social context that affects memory.

FIGURE 2
Lexis diagram of exposure time by birth cohort, year of birth and age at the time of survey in years and Century Month Code units, Survey date 1993



A common problem associated with recall and misdating often manifests itself in the form of *age heaping* or *digit preference*. The result is anomalies such as an over-representation of dates or ages ending in zero or five. This is attributed to the fact that in many contexts, age or the date of an event by month or year is not an intuitive indicator of time. Figure 3 (appended) is vivid example of age heaping and the need to be weary of ontological perceptions of temporality.

This figure shows the reported age at first marriage for women in the Indian State of Uttar Pradesh using the 1992-93 *National Family and Health Survey*. Digit preference has clearly occurred at age 5, 10, 15 and 20 years. However, socially (or perhaps legally) elevated heaping also occurs at age 18, which is the legal age of marriage for girls in India. The data may reflect either more marriages at age 18, or the socially constructed data artefact of 'reported' marriages at this age. Numerous applications are based solely on the adjusting, imputing, indexing and standardising of age and various mathematical indices have been developed to 'smooth' or account for the extent of misrepresentations such as these.[vi] A more ideal solution, however, would be to start at the root of the problem, which is in the first phase of research questions, questionnaire construction and data gathering. This is discussed in the next section. In addition to age heaping, certain types of temporal data may also be missing. We now turn to whether missing or misreported data varies by the type of respondent and life event.

When examining the extent of misreported or missing data, older respondents typically provide less accurate responses. However, aspects beyond the age of the respondent also affect memory. For instance, do women remember family events better than men? Are there certain life events that have more missing temporal data than others? In life history analysis, the month and year of a life event are often the central indicators that specify the beginning and end of life stage, timing of transitions and mean age at occurrence of events. However, it is common that for some types of life events, more respondents report the year, but not the month of the event. Poulain, Riandey and Firdion (1991) compared the accuracy of temporal reporting of life events by couples. They confirmed differences in reporting by sex and type of event. A sample of 445 couples was first interviewed in separate rooms about family-related life history events. They were then allowed to adjust for any uncertain dates via the use of family records, rent receipts, etc. The researchers then consulted vital statistics registers to check the accuracy of temporal reporting. They found that dates were satisfactorily reported for marriage and birth or death of a child, dates also traceable by registration records. Marriage and birth of children were reported within a month in 90 percent of the cases. However, migration of the household or date of children leaving the parental home was only exact to within a month for 39 to 67 percent of the cases. Finally, the information provided by women was better than by men, with the two combined spousal answers being more accurate.

In the study of partnership formation, there is often more missing data regarding the month of cohabiting unions as opposed to legal marriages. Using data from the Netherlands' 1993 *Fertility and Family Survey*, for instance, there is a clear difference in missing data for the month of event by type of union and sex. Table 1 shows the missing month dates for unions by frequency and percentage for women and men.

TABLE 1
Frequency and percentage of reported and missing cases in the monthly timing of union events, 1993 Netherlands *Fertility and Family Survey* by sex and type of union*

TYPE OF UNION EVENT	WOMEN (n=4,516) Month of event			MEN (n=3,705) Month of event		
	Reported	Missing	Percent missing	Reported	Missing	Percent missing
MARITAL UNIONS						
First marriage	2632	7	0.3	1745	7	0.4
First dissolution	314	25	8.0	177	15	8.5
Second marriage	114	2	1.8	68	2	2.9
Second dissolution	13	1	7.7	8	4	50.0
COHABITING UNIONS						
First union	961	75	7.8	741	58	7.8
First dissolution	441	48	10.9	352	34	9.7
Second union	149	5	3.4	144	11	7.6
Second dissolution	153	3	1.9	57	10	17.5
Third union	16	-	-	26	-	-
Third dissolution	7	-	-	8	1	12.5

Source: 1993 *Netherlands Fertility and Family Survey* [Onderzoek Gezinsvorming]. *Totals may differ slightly due to weighting. Percentages are calculated from the valid number of year of reported events.

Percentages with a small number of cases should be regarded with caution due to small numbers. Despite this, it is still possible to see a general difference between the higher percentage of persons who cannot recall the beginning month of their cohabiting or consensual partnerships, particularly for males. When comparing first union formation, around 0.3 to 0.4 percent of women and men do not recall the month of their first marriage, compared to 7.8 percent who do not recall the month of their first co-residence. The amount of missing data is elevated in higher order unions. This could be attributed to the fact that less ritual or meaning is placed on these repeated unions. Finally, by comparing the percentages of women and men who cannot recall the month of the partnership event, men generally have more problems remembering the month, particularly union dissolution. This basic comparison finds support for Poulain et al.'s (1991) findings. Beyond identifying the problem of memory in data gathering, researchers have attempted to find mnemonic devices and collection strategies to improve the quality of life history data.

Data gathering: understanding the ontological experience of temporality

In recent years, solutions have targeted the root of memory problem, rather than focussing on post-facto adjustment of the data. In 1988, Freedman et al. developed a life history calendar that is now widely used by researchers in the field. They argued that the use of this calendar improves the quality of retrospective data collection via the facilitation of visual and mnemonic timing of various life events. In the first step of constructing this life history, a calendar-based framework is utilised to provide a basic reference point for events. The more significant, and thus, easily remembered events such as marriages, births and deaths, are asked initially to serve as temporal or mnemonic markers for other questions. After this skeleton of life course events is established, more detailed occurrence, timing and sequencing of events are more readily and efficiently recalled. Hertrich (1993) also provides an explicit discussion and solution to age estimation problems in her discussion of data collection in a rural African community in Mali. Beyond chronological classification of events and more technical estimation methods, she argued that

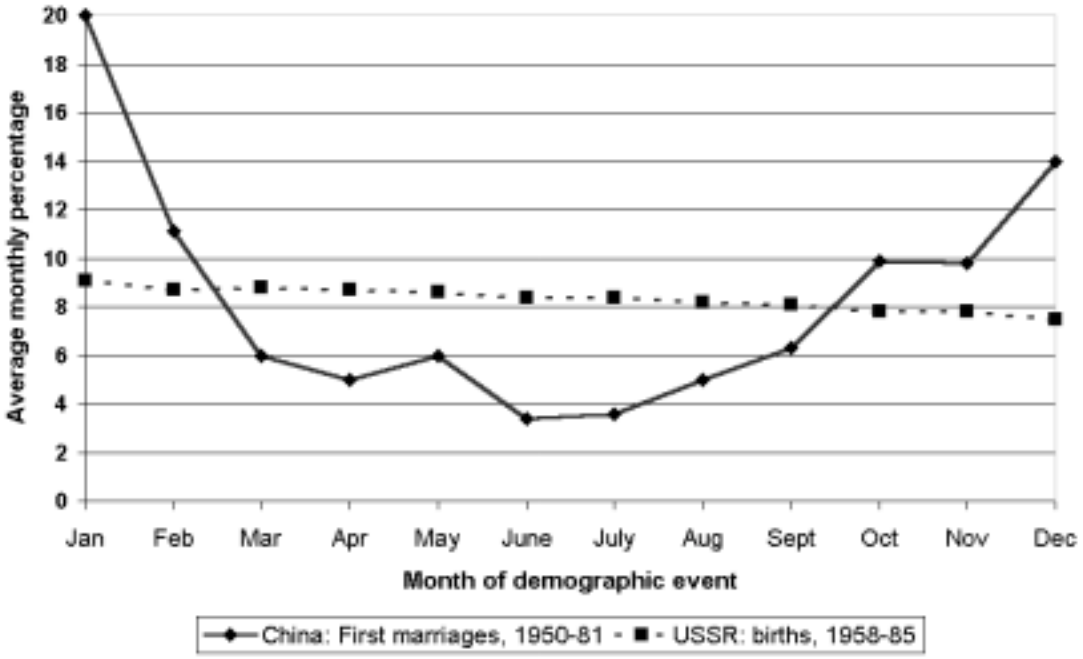
existing sources such as vital registration, Christian missions and maternity records could be used to facilitate dating problems that survey information could not provide. These events can then be used as 'milestones' or 'dating references' for dating events within individual or family history construction.

The discussion to this point has been based on problems related mostly to survey data where the researcher has a large influence on the data gathering process. The degree to which the researcher realizes his or her own conception of time in addition to that of the respondent is essential in separating what is truly temporally and what is related to data error. However, life histories can also be constructed from historical, parish, medical or vital statistics records where events are self-registered or controlled by the registration agency. This leads us to the final problem, which is the influence of data registration on temporal data.

Self-registration: The influence of data collection on temporality

The argument can been seen not only from the point of view of the perception of time, but also the context of registration of events. In some cases, phenomena that have been associated with temporal affects such as seasonality or the influence of institutional calendars may in fact be attributed to the data itself. Two examples of the monthly variation of timing of events are shown in Figure 4. The two lines represent the average monthly percentage distribution of first marriages in China from 1950-1981 and births in the former USSR from 1958-85. A striking difference is that 20 percent of first marriages in China occur in January and 14 percent in December. This supports the previous discussion that marriages peak during the Chinese New Year in January and February. This 'festival effect' however, should not result in a higher number of marriages in October (9.9 percent), November (9.8 percent) and December (14.0 percent) as the figure shows. We can conclude from this, similar to Abeysinghe (1991) that the jump in marriages in the latter part of the year can be attributed to early registration of marriages spurred on by the festival effect. If first marriages were explained without acknowledging the force of both registration and institutional calendars, results would be highly misleading.

FIGURE 4
Average monthly percentage of distribution of events:
First marriages in China, 1950-81 and Births in USSR, 1958-85



Source: Xuan (1983: 107) in Yi (1985: 33), 'Average monthly percentage of distribution of first marriage in China, 1950-81', and calculated from Anderson and Silver (1988: 307) 'Mean daily number of births reported by calendar month, for USSR, 1958-85'

Figure 4 also shows monthly distribution of the mean daily number of births reported by calendar month in former USSR. Anderson and Silver (1988: 306) found that there was a substantial drop in births in December (12 percent) and an excess of births in January (9 percent) that could not be attributed to any institutional, natural or biological calendar. After a detailed investigation and analysis of the data, they attributed these seasonal fluctuations largely to changes in the country's registration system more than any true seasonal effects. They found evidence that many births that actually occurred in December were officially reported as occurring in January of the next year. This is attributed to the fact that Soviet law permits a 30-day delay between the occurrence of a birth and its registration. People tended to delay the registration of vital events during the December holiday period. Finally, they found that vital registration offices conducted their yearly audit to uncover missing data and unreported births in January of each year. These missing births were then added to the January records. These findings show that the institutional calendar via the festival effect, for instance, may not only affect the occurrence, but the actual registration of demographic events. The methods of data collection and understanding the way that respondents and researchers perceive time increasingly shapes quantitative life course research. However, data gathering is only the first step in this epistemological approach. The second portion is the methodological portion of data analysis.

Methodology: the force of ontology on the epistemological approach

The methodological approach in this field is often based on the ontological assumptions outlined in the previous sections of natural, human development, historical, and social time. The approach is therefore centered on the clocks of age, period, cohort, duration, or episode (parity, partnership, job). When natural or cosmic temporality is considered as the underlying factor governing the occurrence of events, the epistemological approach often centers on seasonality studies. If biological or human development is seen as a primary factor shaping the life course, the social gauge of age progression is often used to judge if someone is 'on' or 'off' time. The ontological effects developing a certain temporal mentality by virtue of living within a particular historical period is often studied by implementing cohort, generation or period analysis. Measures of social change are frequently determined by comparing birth cohorts, a method which ties macro-level events (e.g., economic depression, post-war) to micro-level individual and meso-level family adaptations and outcomes (Ryder, 1965; Elder, 1974, 1991, 1994; Hogan, 1981). Conceptually and methodologically, it is a challenge to disentagle the effects of age, cohort and period. Age effects are related to growing older, such as the accruement of higher education or income with time. Cohort effects are common to persons born at the same time, such as common historical events, opportunities, constraints, competition and size. Period effects are the result of this shared experience of historical events, or historical time. The choice of time axis rests firmly on the researcher's shoulders and stems from theoretical and statistical needs (Blossfeld and Rohwer, 1995).

A variety of clocks is often used to reconstruct the life course after the timing of life events has been gathered or registered. Recall that Figure 2 shows a blend of five different methodological clocks. The left and bottom axes shows a time unit commonly used in analysis, called Century Month Codes (CMC's). CMC's are the number of months since the beginning of the twentieth century. For instance, the date of January 1900 has a CMC value of one, since it is one month since the beginning of the century. A CMC of 555 is March 1946, and so on. These units are often used in event history analysis of the life course, which is a broad term for longitudinal statistical techniques. This approach investigates transitions, timing, duration, and sequencing of events in the life course (Tuma and Hannon, 1984; Mayer and Tuma, 1990; Courgeau and LeliΠvre, 1992; Blossfeld and Rohwer, 1995). Via the use of CMC's, chronological time can be standardised on an identical clock for each respondent, regardless of age, life stage, and historical period or cohort membership. CMCs can be easily calculated from the month and year of the event.[vii] The first CMC clock represents the age of the respondent since the turn of the century. This corresponds to the second clock, which is their biological or individual age in years on the right axis of the diagram. The third clock, represented by the diagonal lines, shows the four cohort divisions that can be used to compare social change or differences in life course behaviour over historical time. This relates to the fourth and fifth clocks, shown at the bottom of the diagram, which are historical times in years and CMC units since the turn of the century.

Another common way to organise life history data is by episodes (e.g., first, second, third birth episode) within each life career. This relates to a vision of temporality unique to this field, often referred to as *process* time (Blossfeld, 1996; Courgeau and LeliΠvre, 1992; De Bruijn, 1999; Willekens, 1997). Process time is the duration since the last demographic event of interest (e.g., first birth) and the onset of the process when the individual becomes 'at risk' of experiencing another event (e.g., second birth). This type of time is frequently related to survival, duration and Semi-Markov modeling and analysis. Adam (1995: 21) supports this interplay between clock and calendar time and the timing of events and social processes.

> …the existence of clock and calendar time does not prevent us from locating the past, present and future with reference to events, processes and social relations.

Based on what is seen as theoretically or substantively important in the analysis, different or combined clocks such as age (in years or CMCs), cohort, historical period, generation, or process time are used. However, we often have information of life events reported in the present, as the individual recalls the past and imagines the future. As discussed in the opening section of this paper, the lifeworld of the present is often interpenetrated by these other temporal realms.

The past, present and the future

The notion that the present contains remnants of the past and pages of the future is increasingly noted by researchers in this field (De Gans, 1994). Life course outcomes are seen as embedded in a process that follows a unique narrative path (Willekens, 1990). Proponents of event history analysis, such as Courgeau and LeliΠvre (1992: 61) maintain that "the hypothesis which consists in ignoring the influence of the past on the future development of a process leads to errors of appreciation or interpretation of the phenomena observed." De Gans (1994: 339) argues that after an event occurs there are 'adjustment responses' which "effect the understanding and the image of the past and have a modifying effect on goals and plans for the future." Mayer and Tuma (1990: 7) likewise argue that "life events and phases must be studied as part of a life trajectory in which later outcomes are partly consequences of earlier conditions, events, and experiences." If this is indeed the case, how do we reckon with these ontological assumptions in quantitative research?

One epistemological approach is based in stochastic-based research. In stochastic analysis, time is represented by the distribution 'T', which is a positive random variable to account for chance in the life course (Courgeau and LeliΠvre, 1992: 30). Previous models, such as those governed by the Markov assumption assumed that the occurrence of a life event depended directly on the origin state (e.g., divorced state). In this way, the model overlooked the *way* or the process in which the origin state was reached. The probability of a transition, for instance between states *i* to *j*, is not only dependent on the origin state *i*, but also on the age of the individual, often denoted by *x* (Namboodiri, 1991: 136). This type of model is therefore often referred to as a time-inhomogeneous, finite-space, continuous time Markov process model. Obviously, all social processes do not obey the Markovian assumption.

How an individual reached the divorced state, for instance, is often contingent on the sequencing, type and duration of previous life events (e.g., first cohabited, duration of marriage) and interaction with other life course careers (e.g., presence of children, gainful employment). If duration is considered important, the model is extended to a *Semi-Markov* model. This reflects not only the occurrence of the life transition, but also the importance of duration, seniority or experience in a state, often referred to as duration-dependence (Namboodiri, 1991; Willekens, 1997). This duration between two states defines a stage in an underlying developmental process or the 'staging process' (Chiang, 1984: 246 in Willekens, 1997). A further extension of these models is to consider the entire life history or sequencing of life events of the individual by shedding all Markovian assumptions in a *non-Markov* model (Rajulton, 1992). This type of model would be the epistemological equivalent to the ontological assumptions of the importance of the past life path (path-dependence) on the present and future life course of the individual. It can include information on the timing, but more importantly, the sequencing and number of events. In this way, primary sequential patterns of life course paths are determined.

A dynamic aspect of time can also be introduced into the regression model itself (for a detailed discussion, see Blossfeld, 1996: 193-6). Within the model, explanatory factors or covariates are often used to describe the impact of certain characteristics (education, residence) on the life event outcome. Covariates may be fixed, or remain the same over the entire life span (sex, place of birth). Covariates may also be dynamic or *time-varying*, which accrue or change values over time (education level, socio-economic status). To examine the first birth experiences

of women born in 1946, for instance, the covariate influence does not lie in her current education, residence or socio-economic status at the time of the survey. Rather, it depends on the values of these variables at the time when she was 'at risk' of experiencing the demographic event.

Finally, in order to understand how individuals plan their future life course in light of the present and probabilistic future reality relates to the field of *projections* and *micro-simulation.* In this type of analysis, life history transition probabilities from the present are used to simulate or project future partnership, fertility, and workforce or migration scenarios of the future. Based on alternative scenarios and based on current developments in rates of the social processes under study (e.g., marriage, divorce, fertility rates), a model is projected. This model is then used to reflect the future life courses of individuals, households or population groups (Willekens, 1990).

Although there have been innovations to incorporate temporality in life course research, this discussion reveals that several areas are still wanting. The first is the lack of reflexivity in research at all points of the analysis. The experience of time by both the researcher and the respondent should be central when collecting temporal data. Second, memory problems should not only be examined in relation to the timing of events, but to the extent of missing temporal data for types of events and specific respondents. Thirdly, quantitative life course research should not only be 'quantitative'. To fully realize ways that time is perceived and reported, prior qualitative or ethnographic research may be necessary. This means focussing on respondent's and researchers everyday perceptions and assumptions regarding time and the life course. From this ontological understanding, a more efficient and reliable epistemological tool, such as an ethnographic approach or life history calendar can be perfected for each context. In addition to qualitative research, external sources of data, such as family or vital registration records could be relied upon to determine or trigger the respondent's memory of the true timing of events. Finally, although innovative methods of data collection and analysis have been introduced, researchers too often rely on classic measurement of age, cohort, period or clock and calendar time. The approach should therefore move beyond 'fixing' or arbitrarily dividing the data into convenient categories, to trying to understanding the underlying interplay between temporality, our epistemological approach and the life course.

Conclusion

The main intent of this paper was to heighten awareness of the ontological effects of temporality for life course researchers. This review also identified the strengths and gaps, which translates awareness into new research possibilities. Temporality can be introduced at multiple levels from the cosmic to individual's conscious cognition. The force of temporality is also present at all points in research, from the reflexive perception of time in different contexts to research hypothesis, data gathering and development of a statistical model. In addition to presenting traditional temporal influences such as natural, biological and psychological, historical and social time, less often addressed aspects in this discipline were presented. This included the importance of cultural conceptions of time and distinct temporal experience by groups of individuals such as women and men or workers and non-workers. Furthermore, it is essential to explicitly recognise that institutional calendars shape many of our everyday activities, which in turn make up the life course. Through a more detailed exploration of these timetables, it became clear that seemingly arbitrary dates, such as the year of the Tiger or the coming of the Millennium, might have a tangible influence on life course construction. The religious, family, educational, production and gendered experience of institutional time can likewise influence one's social accessibility, which is centered on the daily divisions of public and private time.

There is also less often a link made between theoretical notions of time and the epistemological approach of the data and methodology. The timing of data collection and ontological reality of the respondent and researcher require unique data collection methods, such as the ethnographic interviews, a life history calendar and use of external records to verify or

serve as mnemonic devices. In addition, not only the sex or age of the respondent, but also the type of or ritualization of a demographic event may influence memory and subsequent reporting. There is little research in how we remember different types of life events in this field at this time. Finally, institutional calendars may also influence the registration of life events, such as the pre-registration of marriages or postponement of registration of births over the holiday season. Research can integrate the collection of data using various sources and methods in addition to utilising the full breath of the statistical techniques offered through recent applications in event history and stochastic analysis.

Beyond a review of multiple temporal affects, several general trends relevant to life course research were noted. First, previously natural, biological and religious calendars that regulated everyday life are increasingly colonized by social constructions of time. This colonization or civilization of temporality starts at the most fixed element of natural cosmic cycles through the introduction of technological advances such as air conditioners or heating. Technology also allows the social construction of biological menstrual cycles, for example, through contraceptives in addition to the ability to control or time fertility. New types of time, such as leisure time, may also influence lifestyles and thus life-planning. Secondly, the type of institutional calendar that shapes our everyday life has also shifted from religious, family or agricultural calendars to more modernized aspects of educational and industrialised production timetables. This shift in temporal experience results in more individualistic thinking about the timing of life events. Individuals make decisions based on the preference of when to have a child, rather than being constrained by the natural cycles of climate or biological, or traditional religious cosmologies, gendered and family time. A final point is that although this paper focussed only on the temporal, many of the aspects discussed, such as cultural and social perceptions of time are developed within and have distinct or multilevel spatial locations. The hope is that temporal awareness will shift to increased multi-temporal applications where time in the life course can be seen as more than a synonym to age, cohort, period, or as something to be smoothed, adjusted or taken-for-granted. Our assumptions about the effects of time will then shape a distinct new research approach.

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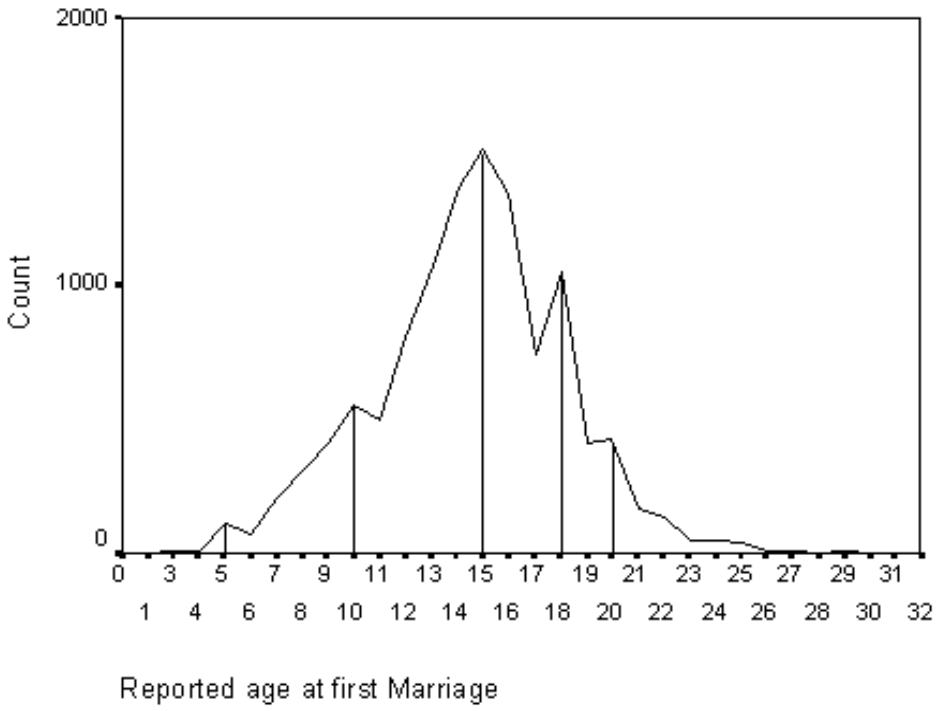
FIGURE 3
Age heaping in reported age at first marriage, Women, Uttar Pradesh, India, *NFHS* 1992-93



Notes

[i] This discussion is likewise pertinent and is no way intended to negate the significance of qualitative biographical or narrative life history studies.
[ii] National Family Health Survey, 1992-93 initiated by the Ministry of Health and Family Welfare in India and co-ordinated by the International Institute for Population Sciences in Mumbai, India.
[iii] Ikuko (1997) described how in 1873, the Japanese adopted, as opposed to accommodating, Western time measurement by assuming the 24-hour day and Gregorian calendar.
[iv] Taken from the Everything 2000 Millennium Mom website, http://www.everything2000.com/life/millenniummoms.
[v] For a more detailed description of the Lexis diagram in relation to marital unions, refer to Willekens (1987).
[vi] These include rectangularity, linearity, Whipple's, Myers' Blended (1940), Bachi (1951), Carrier (1959), Ramachandran (1965), and the United Nations (1967) age-accuracy Indices (in Shyrock and Seigal, 1976: 116-8).
[vii] See Blossfeld and Rohwer (1995: 39) for calculation details. For researchers with survey dates occurring after the turn of the twenty-first century, the Millennium-friendly equation for CMCs is: CMC = (YEAR – 1900) * 12 + MONTH] for dates ∃2000.

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