THE IMPACT OF PRECARIOUS EMPLOYMENT IN EARLY ADULTHOOD ON AGE AT FIRST CHILDBIRTH:

Development of theoretical, methodological and analytical frameworks from a life course perspective

Emily J. Steele

BAppSc (Physio), MPH

Discipline of Public Health
School of Population Health and Clinical Practice
Faculty of Health Sciences
The University of Adelaide
Australia

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THESIS SUMMARY

The average age of Australian women at first childbirth in 2006 was 28.2 years, while the proportion of first births among women aged ≥ 35 years increased from 8% in 1997 to 14% in 2006. From a public health perspective, this shift has a raft of health consequences for women and children, including increased risks of miscarriage, gestational diabetes, and birth defects in the child. Furthermore, the use of assisted reproductive technologies associated with older childbearing carries risks in pregnancy, and adverse outcomes in offspring, in addition to very significant financial and emotional costs. Thus, it is imperative to understand barriers to childbearing at 'optimal' ages. Since evidence also suggests women now have fewer children than they would like, it is particularly important to investigate underlying structural determinants of older motherhood and foreshortened reproductive careers. Precarious employment conditions, related to trends in international labour markets, may play an important role in older age of first-time motherhood (as suggested in contemporary fertility theories). However there is a paucity of Australian research about this issue.

A post-positivist approach was used to design a theory incorporating multiple disciplinary perspectives. The theory sought to explain the influence of macro-economic factors on individual lives, and was cognisant of the life course dimension. The ensuing conceptual framework and research questions guided the design of a retrospective cross-sectional study based on a birth cohort (n ~ 1000, born 1973-75) which was established when women were aged ~ 30 years. A detailed event history instrument was developed to obtain data regarding a range of life domains including pregnancy, partnering, education, and employment (sometimes as detailed as monthly intervals). Time-varying and time-constant survival analysis techniques were applied within a life course framework to examine the effects of precarious employment on age at first childbirth (taking into account educational attainment and other influential factors), with a sub-set of the study cohort (n=230).

This project is innovative at a number of levels. For the first time within the public health domain, an argument is presented for the relevance and significance of the contemporary social issue of older age at first childbirth. From an epidemiological perspective, the project offers advances in a number of areas, including theory-building

(particularly in the convergence of life course and hierarchical perspectives) and engagement with a relatively new exposure variable (precarious employment). The project contributes substantially to the sub-discipline of life course epidemiology, in the following ways: (1) collection of fine-grained life course data (event history data as opposed to cross-sectional or successive point-in-time measures); (2) improvement of techniques to collect high quality retrospective data (type of survey instruments and fieldwork procedures); and (3) presentation of a framework for the use of survival analysis techniques to complement life course theories.

This PhD thesis presents and discusses each stage of project development and execution, including theory-building, survey design, fieldwork, and construction of the analysis framework, culminating in a description of preliminary data analyses conducted (n=230) and results obtained. In this thesis the intellectual contributions arise from the combined work on theoretical, methodological and analytical frameworks. They will form the basis of future (postdoctoral) analyses to be conducted with the entire dataset.

Results from this project will contribute to the growing evidence base highlighting detrimental impacts of globalisation and recent changes to labour market institutions on the lives of individuals. Ultimately the study findings may help to shape policy which enables women and their partners to have children (if desired) at a time in the life course which is most conducive to their health and to the health of their children.

DECLARATION

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution to Emily Steele and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Signed: …….

Emily Jane Steele

Date: …….

AWARDS AND MERITS ARISING FROM THIS THESIS

2009	Early Career Award, Australasian Epidemiological Association: $500. (Declined due to personal circumstances preventing travel).
2007	Mutual Community Postgraduate Travel Grant: $2 500.
2007	University of Adelaide Faculty of Health Sciences Research Committee Postgraduate Travelling Fellowship: $1 000.
2007	Invited participant, the European Consortium for Social Research and the European Science Foundation TransEurope Research Network 5-day summer school, Groningen, The Netherlands (August 27-31 2007).
2007	Student bursary from the European Science Foundation TransEurope Research Network to attend summer school (see previous item): $1 400.
2007	Respondent's Prize, State Population Health Conference (award for best presentation as determined by chairs and expert respondents for presentation sessions).
2005-2009	National Health and Medical Research Council Public Health Postgraduate Research Scholarship: $78 927.

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Steele E, Moore V and Davies M. *Does financial uncertainty play a role in delayed childbearing?* (Oral presentation). State Population Health annual conference 'Population Health Impact of Health Services Research.' Adelaide, Australia, October 20, 2007.

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Steele EJ, Moore VM and Davies MJ. *A novel approach to a much-discussed issue: how do economic factors impact on the timing of first childbirth?* (Oral presentation). Australian Population Association 13th Biannial Conference 'Population, Policy & Australia's Destiny'. Adelaide, Australia, December 5-8, 2006.

INVITED SPEAKER ADDRESSES ARISING FROM THIS THESIS

Statistical Society of Australia and Australasian Epidemiological Association, South Australian chapters. 'Epidemiological and statistical approaches to working with life course data'. In conjunction with Dr Lynne Giles. Adelaide, Australia, planned for August, 2010.

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The Working Women's Centre. 'The impact of economic uncertainty on delayed childbearing in Australia: a project report' Adelaide, Australia, June 3, 2008.

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European Society for Social Research and the European Science Foundation TransEurope Research Network Summer School: Globalization, Inequality and the Life Course: Comparative Methodological Approaches. 'The impact of economic uncertainty on delayed childbearing in Australia: a progress report'. Groningen, The Netherlands, August 27-31, 2007.

Healthy Development Adelaide Research Cluster Annual Research Day, The University of Adelaide. 'The role of precarious social circumstances in delayed childbearing.' Adelaide, Australia, May 26, 2006.

Allied Health Department, Women's and Children's Hospital. 'Public health implications of delayed childbearing.' Adelaide, Australia, February 26, 2006.

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ABBREVIATIONS

ABS	Australian Bureau of Statistics
AFBM1	Age at first birth minus one year
ART	Assisted reproductive technologies
C	Casual
CI	Confidence interval
EHC	Event History Calendar
FT	Full-time
FTC	Fixed-term contract
HILDA project	Household, Income and Labour Dynamics of Australia project
IVF	In-vitro fertilisation
LJYWP	Life Journeys of Young Women Project
NILF	Not in the labour force
NLC project	Negotiating the Life Course project
OR	Odds ratio
P	Permanent
PCC	Participant Completed Calendar
PT	Part-time
SE	Self-employed
SEIFA	Socio-Economic Index for Areas
SES	Socio-economic status
UE	Unemployed

CHAPTER 1 Project rationale

1.1 INTRODUCTION

This chapter develops a rationale for an Australian investigation of the influence of non-standard employment arrangements on age at first childbirth, from a life course perspective. First, the demographic trend of increasing maternal age is presented in Section 1.2. Section 1.3 discusses the significance of this trend from a public health perspective. Section 1.4 highlights the predominance of a treatment-oriented response to the trend thus far, and outlines the principles guiding the 'preventative' approach taken in this project. Next, the rise of casual employment arrangements in Australia in the past few decades is presented, along with the notion that such arrangements may be problematic for some individuals (Section 1.5). Empirical evidence from international studies linking these work arrangements to older maternal age at childbirth is summarised and critiqued, and the need for an Australian investigation based on a new dataset is outlined (Section 1.6). The key approaches to, and challenges within, life course epidemiological investigations are introduced in Section 1.7. The research questions and study design pertaining to this project are then presented (Sections 1.8), and finally the thesis objectives and an overview of the thesis are provided (Sections 1.9 and 1.10).

1.2 AUSTRALIAN TRENDS IN AGE AT FIRST CHILDBIRTH

Australian women are having children at older ages. Over the 30 year period to 2006, birth rates under the age of 30 years dropped 50%, while rates for women over 30 years rose by more than half.[1, a] The mean age of all women giving birth steadily increased over much the same period, from 26.7 years in 1974 to 30.0 years in 2004. Mean age at *first* childbirth, which is the focus of this thesis, has similarly increased - from 25.6 years in 1981 to 28.3 years in 2000.

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[a] All calculations presented in Section 1.2 were conducted by Rebecca Kippen, based on published and unpublished data from the Australian Bureau of Statistics and the Perinatal Data Collection, Australian Institute of Health and Welfare. Details of data sources are provided by Kippen (2006).[1]

Trends in fertility according to birth cohort offer insights to fertility behaviour at an individual-level. Ideally I would present trends in age at first childbirth in Australia by cohort, however this is not readily available, and secondary analyses of fertility data were beyond the scope of this PhD. Instead, I present the percentage of Australian women who were childless at their 30th birthday, by birth cohorts born between 1951 and 1971 (Table 1.1).

Table 1.1 Percentage of Australian women childless at 30th birthday, by birth year 1951-1971[1]

Birth year	1951	1956	1961	1966	1971
% childless	21	28	35	41	46

As shown, the proportion of Australian women childless at age 30 has risen from 21% for women born in 1951, to almost half of those born in 1971. In summary, age at first childbirth has increased in Australia over the past thirty years, along with successive birth cohorts starting their families at older ages.

Older maternal age has been of concern to Australian demographers,[2] social and political commentators[3 4] and the Australian government.[5] Often concern has focussed on the link with low national fertility rates,[b] and been underpinned by anticipated future decreases to the working-age population and the potential economic consequences should this occur.[1] However, it was recently acknowledged that 'attempts to foster fertility primarily on demographic and economic grounds are not well-founded.'[7, p. xviii]

[b] Kohler et al. (2002)[6] show that age at first childbirth is negatively associated with completed fertility (that is, older first birth is associated with having fewer children). Kippen (2006)[1] notes that progressively later first childbirth implies a continuing decline of national fertility rates. However, this is counter to recent trends in fertility in Australia, where mean age at first childbirth is increasing, as is the fertility rate, which may be because younger women who had postponed having children are now having babies – the so-called 'recuperation' effect (see Lattimore and Pobke 2008).[7]

The next section provides a rationale for concern about older maternal age from a public health perspective, irrespective of its impact on national fertility rates.

1.3 THE SIGNIFICANCE OF OLDER MATERNAL AGE FROM A PUBLIC HEALTH PERSPECTIVE

Childbearing at older ages has a range of detrimental consequences related to the health and well-being of mothers and their children. The average maternal mortality rate throughout the world amounts to approximately 10-20 per 10^5 live births and increases as a function of maternal age.[8] Historically, pregnancies to women over the age of 35 were considered to be high-risk, with interest specifically focussed on increased risks of chromosomal abnormalities.[9 10] A recent study from the USA involving data from more than 36 000 women was conducted to estimate the effect of maternal age on obstetric outcomes.[11] Table 1.2 shows the results of this study, and highlights the association between increasing maternal age and a number of complications including miscarriage, perinatal loss, chromosomal abnormalities, preterm delivery and low birth weight.

While some studies suggest that women aged over 35 years are at minimal risk for maternal morbidity (once maternal disease conditions are taken into account: a debatable analysis strategy), and that overall neonatal outcomes do not appear to be significantly affected,[12 13] in general the methodological rigour of such studies is questionable since many involve small populations of patients.[14]

Table 1.2 Obstetric complications by maternal age: adjusted models[11, p. 986]

The long-term health consequences for women of having children at older ages have not been widely studied. However, available evidence suggests a tendency towards selective risk enhancement due to older maternal age with regard to cardiovascular disease and its risk factors, including diabetes and hypertension.[15] Many of the adverse outcomes associated with older maternal age are likely to have implications for general well-being in addition to specific health consequences. For example, there are potential consequences of older childbearing related to stress and fatigue post-birth (that is, throughout the early parenting experience), above that experienced by younger mothers. To my knowledge these issues have not been studied empirically.

A related issue is the impact of the trend of older maternal age on the use of assisted reproductive technologies (ART). As more women delay attempting to become pregnant, the issue of age related sub-fertility becomes more pertinent, and many women are turning to ART to help them achieve a viable pregnancy. A range of complications are associated with these technologies. A recent study synthesised systematic reviews that investigated birth outcomes following the use of ART.[16] This showed that in singleton ART infants there are two-fold increases in risk of perinatal mortality, low birth weight and preterm births; about a 50% increase in small for gestational age, and a 30-35% increase in birth defects, compared with singletons conceived spontaneously.[16] There are a number of reasons that women's health may be compromised after ART procedures, including the consequences of the increased incidence of multiple births, operative deliveries, and preterm infants, the possible adverse effects of the drug regimens used for ovarian stimulation (including risk of ovarian hyperstimulation syndrome), and the instrumentation involved in ART procedures.[17] Also, the stress associated with undergoing ART should not be underestimated.[18 19] Much of the stress is associated with fertility treatments not being as effective as women hope. The success rate for in-vitro fertilisation (IVF), for example, varies between 5 - 50% per attempt, depending on the woman's age, the number of eggs retrieved, the number of eggs fertilised (dependent also upon the sperm), the number of embryos transferred and the state of the uterus.[20]

Long-term health sequelae of ART have not been extensively investigated. There has been recent concern regarding increased risks of breast and uterine cancer (that is, cancers which are hormone-related) in women who have undergone IVF treatment. However, whilst one study found an association between exposure to fertility drugs with IVF, and increased cancer incidence within 12 months of treatment (breast and uterine cancer) (1·96 [1·22–3·15] and 4·96 [1·24–19·8]),[21] a more recent study did not support this finding,[22] and recent reviews conclude that there is no clear evidence that ovulation induction or IVF increases the risk of cancers (including ovary, breast, endometrium and thyroid cancer, and melanoma).[23 24] Given the wide-spread use of ART, studies of its impacts on health and well-being of women and children will be an important area of future research.

ART is also expensive. In 2010, a standard IVF treatment cycle costs AUD$6 495, of which patients pay AUD$1 996.[20] This does not include indirect costs such as hospital admission and extra surgical costs (which may only be partially covered by private insurance or government funded Medicare), potentially reduced income associated with time taken to seek treatment, and costs associated with travelling for treatment.

From a resource allocation and health service planning perspective, potential impacts of older maternal age for health sequelae for mother and child are not trivial. Also, as the mean age of childbirth increases, knowledge of the consequences of this trend will need to inform preconceptual and antenatal counselling, and may indicate a need to more closely monitor these women throughout their pregnancies.

In summary, the issue of older maternal ages is significant from a public health perspective based on the health risks to mother and child, implications of increased use of ART, and the potential for an increased burden on health systems and services - throughout life if the child has a disability. The focus on *first* childbirth for this investigation is pertinent since the older a woman is at first childbirth, the older she is at subsequent births (if she has further children).

1.4 A PREVENTATIVE APPROACH TO OLDER FIRST CHILDBIRTH

> We need to understand that nature can be driven by policy in a country [25]
>
> *Dr Luca Gianaroli, chair of the European Society of Human Reproduction and Embryology, 18 November, 2009*

Limited attention from within the public health discipline has been directed towards older maternal age (in general, or with regard to first childbirth). In comparison, reproductive medical specialists, who have a clinical interest in infertility and sub-fertility, have responded by directing significant resources to the development of ART 'treatments'. This has occurred with support from the Australian government in terms of research funding and subsidised treatment.[26] Two recent examples point to an acknowledgement from the medical field of the need for a parallel, non-treatment oriented, approach. The first is from Professor Lone Schmidt, University Hospital of Copenhagen, who presented at a workshop held by the European Society of Human

Reproduction (12th November 2009). She noted the need for 'two simultaneous strategies [in response to the issue of infertility], fertility treatment and prevention'.[25] The second example is from Professor Fiona Stanley, School of Paediatrics and Child Health at the University of Western Australia. In an article published in The Australian newspaper in 2005, she said:

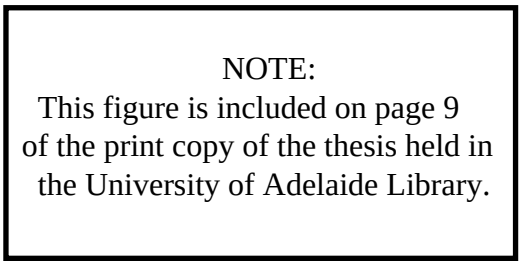
> If we had taken a preventive view…We would study the trends in infertility: are they increasing or decreasing, and are there particular characteristics of couples that enable us to identify the causes, preventive strategies, alternative interventions or treatments that may be cheaper, more effective and have fewer complications than IVF? IVF would in that case have been part of a broader approach to the problem of infertility, with due emphasis on causes and prevention rather than primarily on one form of treatment.[27]

While these examples point to the need for a preventative approach to infertility, I take a broader perspective by focussing on understanding the causes of older age at first childbirth (as the basis for a 'preventative' approach to older childbearing). My perspective resonates with that of Bewley et al., who wrote in the British Medical Journal in 2005:

> The scientific question as to why maternal age is rising remains unasked and unanswered….we have identified a host of theories…They remain entirely speculative but deserving of urgent research. [28]

A large body of theoretical and empirical literature focuses on determinants of low fertility rates in Western countries, much of which can be applied to childbirth timing (for reasons outlined in Footnote b page 3). Van de Kaa[29] and de Bruijn[30] provide overviews of the main theoretical orientations. Figure 1.1 depicts one conceptualisation of determinants of fertility.[7, p. 36] As implied by this diagram, determinants at multiple levels are likely to be important (such as the policy environment, social norms, and individual psychological factors).

Figure 1.1 The determinants of fertility[7. p. 36]

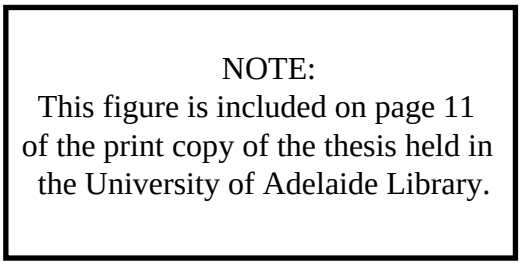


From a public health perspective, determinants amenable to *population-level intervention* are appropriate foci of investigation (whether they be determinants of health/disease, fertility rates, or childbirth timing). The next section discusses contemporary working arrangements in Australia, in order to develop a rationale for investigating the influence of such arrangement on the timing of first childbirth.

Discussions on the causes of older maternal age are often contentious, and it is appropriate to clearly state the position of this project with regard to the most common issues. This project is not underpinned by a view that older mothering is inherently bad, or to be avoided, except from a health perspective, nor does it seek to enter into the debate regarding the 'best' age for childbearing.[31 32] Rather, it seeks to identify and quantify determinants of the trend – with a view to devising interventions that aim to help women and their partners have children if and when they would like to do so. With this in mind, the focus is on the identification of barriers to having children at younger ages.

The media often portray older childbearing in light of 'selfish' women who are too busy with their careers to have children, as seen in Figure 1.2 (from The Advertiser, the leading South Australian newspaper, in 2005).[33, p. 4-5] Contrary to this perspective, in this project I seek to highlight the role of factors that are beyond the control of individuals, but may influence the timing of childbirth. Importantly, this approach does not deny the role of individual agency. Perspectives on the relationship between structure and agency, along with definitions for these terms, are discussed in Chapter 2.

Figure 1.2 Example of older maternal age portrayed by the media in terms of selfish women[33, p. 4-5]



1.5 CASUAL EMPLOYMENT IN AUSTRALIA

In the past few decades there has been an emergence of new forms of work arrangements in Australia. Traditionally, typical Australian workers had full-time, waged jobs in which they worked from 9am to 5pm Monday to Friday, and which they could expect to retain for significant periods of time (if not their entire working lives). This arrangement is referred to as 'standard work' or 'standard employment' in academic literature.[34] However, in the past few decades there has been an emergence of new forms of non-standard arrangements. Non-standard employment comes in a variety of forms, but 'by far the most important [in terms of prevalence]' is casual employment.[34, p. 64] A casual employment contract means that an employee is paid one hour's wage for one hour of work, with no other employment benefits, such as paid sick or holiday leave, or notice of dismissal,[35] although the hourly rate may be elevated in partial reflection of foregone benefits. Between 1985 and 2007, the proportion of the Australian labour force in casual employment increased from 16% to 25%.[34 36]

The rise in casual employment can be directly attributed to clauses in the Australian labour regulation system allowing exemptions to full-time, permanent work. These exemptions enable employers to pursue cost-savings through employment of workers on casual contracts and other non-standard working conditions, and provide employees with alternatives to the standard work schedule. At a more distant level, the role of neoliberal policies, economic deregulation, and globalisation in shaping this situation is widely acknowledged.[34 37] Buchler et al. provide a summary of the history of Australian labour market institutions, and the development of the environment under which casual employment has flourished.[35]

There are important differences in the prevalence of casual employment by sex and age. This project focuses on *women's* employment arrangements during the *reproductive* life period (~ age 15 – 45 years); consequently, I would ideally present the trend in prevalence of casual employment for women by age strata. However, this information is

not routinely published in Australia. Instead, Figure 1.3 shows the percentage of casual employment (according to leave entitlements)[c] in Australia in 1988 and 2001, separately by sex and age strata.[34, p.68]

Figure 1.3 Percentage of casual employment in Australia (leave entitlement basis), in 1988 and 2001, by sex and age[34, p. 68]

According to Figure 1.3, the proportion of casual employment increased for both genders and all age groups between 1988 and 2001. Women were more likely than men to be employed casually at both points in time (1988: ~ 22% of women, 12% of men; 2001: ~32% of women, ~ 28% of men). The youngest group were the most likely to be casually employed at both points in time, and experienced the greatest relative increase (~ 38% in 1988 to 65% in 2001). Other age categories had a prevalence of around 15% in 1988, but by 2001 this had increased to ~ 30% for 20-24 years olds, and ~ 20% for all other categories relevant to the reproductive life course. Clearly a significant proportion

[c] The leave entitlement system, based on access to paid annual and sick leave, is one of two methods used by the Australian Bureau of Statistics to classify contractual arrangements, the other one being self-report.[38 39]

of young people, and women, are employed with casual contracts in the contemporary Australian labour market.

Watson et al. note that:

> It is the ability to discard bits and pieces of the conventional obligations of the employer role that renders…casual employment….attractive to many employers, and problematic for many employees.[34, p. 64]

A critical point of academic and public engagement surrounding new forms of non-standard work is the degree to which they constitute sub-standard arrangements. This critique suggests that, whilst advantageous to employers, for many employees the arrangements result in a lack of 'security',[d] which has potentially detrimental impacts - at the level of the individual, the family, and to society. Of particular relevance to this project, Professors Barbara Pocock and Marian Baird have been instrumental in investigating the impact of the insecurity created through new working arrangements, on women and families in Australia.[40-46] My project is situated within this body of enquiry.

Public health researchers have a long-standing interest in the relationship between unemployment and health,[47] and have recently engaged with new forms of employment, including casual contractual arrangements, as potential determinants of poor health outcomes (although not necessary drawing on the mechanism of insecurity).[48] Benach et al. present a comprehensive rationale for further conceptual and empirical work in the area.[49] Attention is drawn to further development of causal theories and pathways, suggesting that 'future research should be able to capture multiple situations of precariousness associated with flexible employment in different social contexts'.[49, p. 277]

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[d] The terms 'flexible', 'insecure', 'precarious' and 'uncertain' are variously used to describe job parameters (of which contractual arrangements are one), or the impact of such parameters on individuals, within the literature. Chapter 2 provides clear definitions for the job parameters of interest in this study, and the mechanisms through which they are speculated to act.

My project considers one such situation: the influence of casual contractual arrangements on the age of first childbirth.

1.6 EMPIRICAL EVIDENCE OF THE INFLUENCE OF CASUAL CONTRACTUAL ARRANGEMENTS ON THE TIMING OF FIRST CHILDBIRTH

There is considerable international literature that investigates the influence of contractual job arrangements on first childbirth. Rather than summarise all available literature, I focus only on quantitative studies that use individual-level data concerning women. Within these parameters, no Australian study has been conducted to date. Internationally, the main contribution comes from a consortium of European sociologists, demographers and economists, based on the 'GLOBALIFE - Life Courses in the Globalisation Process' project.[50] (I refer to this body of work as the 'Globalife' project throughout the thesis). In this section I summarise the Globalife work, justify the need for an Australian study, and provide a methodological critique of existing studies in order to guide the current project. First, however, it is pertinent to briefly mention the sole epidemiological study that has considered the influence of employment contract on childbearing, which I have summarised and critiqued in some detail in Appendix 1. In short, no association was found between the exposure and outcome in this study. However, the study was based on cross-sectional data (current employment contract and current parental status); thus it was not possible to ascertain the temporal relationship between the variables, nor therefore, to explore causation.[51]

The Globalife project consisted of secondary analyses investigating (in part) the impact of contemporary labour market arrangements on having a first child in a range of European and North American countries. The project was undertaken between 1999 and 2005, and was led by sociologist Professor Dr Hans-Peter Blossfeld, of Otto Friedrich University Bamberg, and funded by the Volkswagen Foundation, one of the major independent research funding bodies in Germany. An overarching theoretical

framework linked globalisation[e] with aspects of national labour markets that increase uncertainty at the individual-level, resulting in a delay in events such as childbirth for some individuals. Datasets were longitudinal in nature and generally based on population-level prospective cohort studies such as the British Household Panel Survey and the German Socio-economic Panel Study. Survival analysis techniques were applied to investigate the impact of employment arrangements, including casual contractual arrangements, as proxies of uncertainty, on the hazard of having a child, over a period of follow-up. Table 1.3 describes key parameters of one such investigation, based on data from the British Household Panel Study.[52] The outcome variable in this study was time of childbirth, with study wave being equivalent to year(s) from study entry due to annual interview schedule, or final study wave, in instances when a child had not been born. In Globalife analyses the exposure variable was usually lagged (for example, by one year) so that the impact of labour market state on the risk (likelihood) of becoming pregnant (and having a child the following year) was the focus.

[e] The concept of globalisation is summarised by the Globalife group according to four interrelated structural shifts that affect life courses in modern societies during the last two decades: (1) the internationalization of markets; (2) the rapid intensification of competition based on deregulation, privatisation, and liberalisation within nation states; (3) the accelerated diffusion of knowledge and the spread of global networks that are connecting all kinds of markets on the globe; and (4) the rising importance of markets and their dependence on random shocks occurring somewhere on the globe (Blossfeld et al. 2005).[50]

Table 1.3 Summary of British investigation of the impact of employment uncertainty on first childbirth

Findings of country-specific investigations were published from the Globalife project in 2005, in a volume entitled 'Globalisation, Uncertainty and Youth in Society'.[50] Results varied: four analyses showed a decreased likelihood of childbearing due to the impact of 'employment uncertainty' (Sweden, Norway, Canada, U.S.A.), six analyses showed an increased likelihood (Germany, the Netherlands, Hungary, Britain, Italy, Spain), and one analysis showed mixed results, depending on the exposure variable used (France).[50, p. 425] (No significant effect was observed in two countries, and one investigation did not investigate effects by gender). Investigators commented that the type of national-level welfare regime influenced results: countries with so-called social-democratic and liberal regimes were more likely to reflect a decreased likelihood of childbearing due to employment uncertainty compared with conservative, post-socialist and family-oriented regimes.

Recent fertility theory points to the need for 'specific knowledge of particular settings' – that is, that explanations of fertility trends are not generalisable.[30, p. 553] This is explained by Australian demographer Professor Peter McDonald:

> The search for a common set of conditions that will prevail in every society as it experiences the onset of fertility decline is necessarily fruitless because the extent of variation in economies, cultures, social and political structures and health conditions of different societies at the onset of fertility decline is clearly vast. Why would we expect that a single explanation could be found to cover this vast array of situations? [54]

Thus, despite Globalife analyses not pointing to a universal association between employment uncertainty (including casual contractual arrangements), and reduced likelihood of childbearing, it is pertinent to conduct an Australian-based study. The widespread nature of casual employment in Australia (as explained in Section 1.5) further underpins the need for such a study.

Globalife investigations do not focus on the impact of employment conditions according to maternal *age*. The Globalife research questions and methods thus appear discordant. Whilst researchers explicitly state a focus on the 'age-graded character of …entry into parenthood.',[50, p. 1] analyses concentrate on the actuality of having a first child, rather than the timing of having a child within the life course. Thus, Globalife analyses do not allow reflection on the implications of employment arrangements on maternal age.

Since it is older maternal age, not the act of having a child per se, that is the impetus for public health enquiry in this area, a different sort of analysis is warranted.

There are a range of limitations to the approach taken to Globalife analyses that guided the conduct of my study. The main limitation arises in the way the time dimension was treated with regard to the exposure variables: although datasets contained time-varying exposure data, analyses did not make optimal use of the longitudinal data. Rather, the risk (or likelihood) of having a child was calculated *overall* for each exposure category (refer to Table 1.3). In this way, Globalife analyses can be compared with epidemiological investigations of the impact of a point-in-time exposure on a (lagged) outcome, for example, a twelve month follow-up of the effectiveness of a medical treatment. This approach is simplistic because it ignores the impact of previous labour market history on the outcome of interest, even though the datasets contained such data. Whilst the Globalife approach is a valid first-step approach, incorporating a longitudinal expression of exposure may better elucidate the nature of the impact of employment states on the outcome of interest, given that such states have the potential to change over time.

Taking this issue a step further, the Globalife approach did not allow investigation of the influence of the *timing* of employment arrangements on the outcome of interest. Understanding the stages (for example age periods) at which casual contract arrangements are most *potent* with regard to childbearing may be fruitful in terms of policy-related endpoints of investigations, and is an important analytical approach given that the prevalence of casual employment varies by age (as shown in Figure 1.3, page 13). In summary, the Globalife approach is limited in situations when exposures are experienced longitudinally, such as working arrangements.

Fertility behaviour is known to differ by birth cohort and socioeconomic status,[55] and Globalife studies adjusted for these factors, as seen in Table 1.3.[f] Thus, analyses provide a combined indication of the influence of employment parameters on childbearing. It is, however, pertinent to consider this association separately for individual birth cohorts, and by socioeconomic groups within birth cohorts.

In summary, an Australian study is warranted to investigate the role of casual employment arrangements on the timing of first childbirth. Such a study should build on Globalife analyses by exploring the impact of exposures as they are experienced over time, focusing on maternal *age* at first childbirth, and allowing for exploration of relationships within birth cohorts, and for different socio-economic groups within birth cohorts.

There is no existing Australian dataset that would be appropriate for such an investigation. Existing studies lack longitudinal data on employment arrangements over the reproductive life course. Australian prospective studies collecting contractual arrangement information have not yet been running for the approximately 20 year minimum necessary for such an investigation (to cover the time period from entering the labour market to the late reproductive years). For example, the first waves of the Negotiating the Life Course (NLC)[56 57] and the Household, Income and Labour Dynamics of Australia (HILDA) projects[58] were conducted in 1997 (13 years ago) and in 2001 (9 years ago), respectively. Importantly, none of the prospective studies collected retrospective data regarding the time period prior to the first interview, which would enable a full history to be constructed based on the retrospective data together with prospectively collected data. Furthermore, I do not know of any cross-sectional retrospective study (Australian or otherwise) that collected lifetime contractual

[f] Globalife studies are based on samples of women with heterogeneous ages, and analyses adjust for age and cohort. Analyses are also adjusted by highest educational level achieved and occupational class (as proxies of socioeconomic status).

employment arrangement information. A new dataset was therefore required to conduct this investigation.

The next section discusses life course epidemiology, a sub-discipline of epidemiology that offers a structured approach to the investigation of exposures experienced over time.

1.7 LIFE COURSE EPIDEMIOLOGY

> Time is a fundamental concept in life course epidemiology.[59, p. 781]

This study was designed and conducted from within the paradigm of life course epidemiology. Life course epidemiology has been defined as the study of long term effects on later health or disease risk of physical or social exposures during gestation, childhood, adolescence, young adulthood and later adult life.[60 61 g] A premise of this approach is that various biological and social factors throughout life independently, cumulatively and interactively influence health and disease in adult life. Life course investigations are usually underpinned by one of three interconnected approaches that explore the nature of the influence of the exposure over time. These approaches are described in Table 1.4 (based on the work of Kuh et al.).[59]

[g] See Kuh and Davey Smith for a history of the life course movement within epidemiology.[62]

Table 1.4 Life course approaches that commonly underpin epidemiological investigation[59]

Approach	Description
Cumulative	Life course exposures gradually accumulate through episodes of illness and injury, adverse environmental conditions, and health damaging behaviours.
Critical period	An exposure acting during a critical period of development has effects on the structure or function of organs, tissues or body systems that are not modified in any dramatic way by later experiences, and that precipitate disease in later life.
Pathway	A sequence of linked exposures that raise disease risk because one bad experience or exposure tends to lead to another and then another.

Reflecting back to the Globalife approach, the analytical framework is oriented to the transitions approach, in which transitions are defined as 'short-term and embedded in trajectories, marking a change in social, psychological, or physiological states.'[59, p. 781] Not only does this lack a longitudinal perspective, but the Globalife work appears to focus on a transition in the outcome, not the exposure – the transition from childless to 'with child'.

The critical period approach was defined in Table 1.4. The parallel concept of the 'sensitive period' was coined to describe the impact that a *social* (not biological) exposure may have at a particular life course period or periods. [59] A sensitive period has been defined as *a time period when an exposure has a stronger effect on development and subsequent disease risk than it would at other times*. Outside this time period, excess risk may still be present, but will be weaker.[59] The sensitive period approach is better suited to an exploration of the impact of employment arrangements than the critical period approach.

A range of challenges present when designing and conducting life course investigations from an epidemiological orientation. A long-discussed critique of epidemiology in general is the lack of explicit theorising to underpin the design of studies.[63] In addition, a current area of interest within life course epidemiology lies in combining the life course perspective with the multi-level epidemiological frameworks wherein risk factors at multiple levels (for example, global, national) impact on health outcomes at the level of the individual.[64-66] This is of relevance to my study since the issue of casual

contractual arrangements can be traced to global and national levels of influence. As noted by Ben-Schlomo and Kuh:

> We do not believe that life course poses a 'rival' conceptual approach but rather that both temporal and hierarchical approaches are complementary and mutually inclusive.[60, p. 288]

In life course epidemiology, the nature of the available dataset determines the extent to which life course analyses can be conducted. Datasets containing count or sequence data cannot elucidate life course relationships. Datasets that contain exposure measures at more than one point in time can be used for life course analyses, however often the number of data points is limited, and there is no way of knowing whether potentially important fluctuations in variable states occurred between the points in time that the data describe. Also, when secondary analyses are conducted, as is often the case, the time points may not be theoretically meaningful in relation to the research questions. When a new life course study is designed, important decisions include how many exposure data points to collect, and at what points in time.

A significant challenge lies in complementing the life course approaches with appropriate analytical techniques. It has been acknowledged that analytical techniques fail to keep up with theoretical advances in the area of life course research.[67 68] One option may be to use existing statistical techniques, thus far not widely applied within the field of life course epidemiology, as opposed to developing new techniques.

1.8 RESEARCH QUESTIONS AND STUDY DESIGN

The following research questions are central to this study:

- Does a longer exposure to casual contractual arrangements increase the likelihood of older age at first childbirth?
- Are there particular period(s) of time in which casual contractual arrangements are especially potent in influencing older age at first childbirth?

The first question is underpinned by the cumulative life course approach, and the second by the sensitive period approach. The pathway model is not addressed in this thesis but will be a focus of post-doctoral work. The research questions focus on the age at first childbirth as the outcome of interest. The focus on age complements the public

health interest in health-related risks associated with older maternal age. The focus on *first* childbirth complements existing literature in the area (the Globalife studies). It is likely that determinants of the timing of first childbirth differ to that of subsequent births, so from this perspective it is also relevant to narrow the focus of the study in this manner.

This thesis does not aim to provide answers to these questions. Instead, its intellectual contributions arise from combined work on theoretical, methodological and analytical frameworks, which will form the basis of future (postdoctoral) analyses to be conducted with the entire dataset.

My PhD candidature involved designing and coordinating all aspects of a cross-sectional retrospective study, called the Life Journeys of Young Women Project (LJYWP), including a preliminary analyses with a subset of the data collected (n = 230). The LJYWP was based on an existing birth cohort, known as the Lucina cohort, consisting of Australian women who were born at one metropolitan hospital between 1973 and 1975 (n = 974). Since a key methodological issue in retrospective cross-sectional studies is recall error,[67 69] strategies to support the collection of high quality data became paramount in the design and conduct of this study.

1.9 THESIS OBJECTIVES

The first objective of this thesis is to present a rationale for considering older maternal age from a public health perspective. This objective was addressed in Section 1.3. Other thesis objectives are:

- To design and present a theoretical framework that engages with both life course and hierarchical determinants of age at first childbirth, to underpin an epidemiological study.
- To demonstrate a method for collecting fine-grained retrospective life course data (event history data as opposed to cross-sectional or successive point-in-time measures).
- To demonstrate strategies that facilitate the collection of high quality retrospective life course data.

- To design and demonstrate the use of an analytical framework that adapts existing statistical techniques to capture cumulative and sensitive period life course effects.

These four objectives are oriented to developing a life course theory, data collection methodology, and analytical framework.

1.10 OVERVIEW OF THESIS

This PhD thesis presents and discusses each stage of project development and execution, including theory-building, survey design, fieldwork, and construction and demonstration of an analysis framework.

Chapter 2 presents the theoretical framework and conceptual map that were developed to guide an empirical study of the influence of casual contractual arrangements on age at first childbirth, and discusses how they were built. Key constructs identified in the theory are defined.

Chapter 3 presents important aspects of the study design. Advantages of event history data compared with cross-sectional and panel data are discussed, and the cross-sectional retrospective study design introduced as a means of collecting such data. Innovative survey instruments that aim to improve the quality of retrospective data are introduced. The Lucina cohort, upon which this study is based, is also described in some detail.

Chapter 4 discusses the design and pilot testing of survey instruments. Lessons learnt during pilot testing of the instruments and the interview schedule are outlined.

Chapter 5 describes aspects of fieldwork that differed from standard procedures for interview-based data collection. In particular, facilitating participation in the study, interviewer selection, training and ongoing support, and quality control of the interview processes, are critiqued and reflected upon.

Chapter 6 presents an analytical framework that uses survival analysis techniques to investigate cumulative and sensitive approaches to the impact of casual employment on age at first childbirth. The framework improves upon existing analyses of this relationship.

Chapter 7 presents the results of a demonstration of the analytical framework, with a sub-set of the data collected (n = 230).

Finally, *Chapter 8* reflects on the success of this thesis in meeting the thesis objectives. Implications arising from the work are discussed, as well as limitations of the work undertaken. The chapter concludes with an outline of plans for future work.

There are two important themes pervading this thesis. The first is the presentation of outcomes – for example, the theoretical framework and the survey instruments. The second is a focus on their development. The latter is important because innovative methodologies have been developed regarding theory, data collection and analysis. I have therefore sought to be explicit, and reflective, about the decisions made and processes undertaken in the design and execution of the project. An important component of the intellectual contribution of the thesis arises therein.

CHAPTER 2 Theory

2.1 INTRODUCTION

> Any subject which finds it necessary, or indeed possible, to consider its material divorced from an appropriate body of theory must be in trouble.[70, p. 1]

Theory is said to be essential to population health research.[63, p. 564] However, much research 'lack[s] a robust theoretical base'.[71] This chapter extends existing theory that links non-standard employment arrangements to women having children at older ages, in order to guide the design of the empirical study discussed in subsequent chapters. The life course perspective guided the development of theory in this chapter, and is a unique approach to fertility theory:

> …most theoretical approaches to fertility lack a dynamic perspective… At the level of individual time, further development in this area of life course analysis is likely to occur. Although there is substantive literature in this respect, it has not yet entered mainstream theoretical thinking in demography. [30, p. 563-564]

A number of difficulties confront epidemiologists who seek to draw on, or develop, social theory. First, most epidemiologists have no formal training in the social sciences. Second, there is a paucity of literature available within the epidemiological literature to direct these processes. Third, it is difficult to identify the role of theory in published population health research. In response to such difficulties, the Journal of Epidemiology and Community Health recently published 'A guide and glossary on post-positivist theory building for population health'.[63 h] This paper provided definitions of four concepts that help when considering the role of theory in epidemiological work. These

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[h] Epidemiological enquiry is conducted within the the post-positivist epistemological approach, which is described as 'A theory building approach that attempts to address some critiques of positivism… Research entails making claims and then refining or abandoning some of them…for more strongly warranted claims. Findings are contextually bound and thus are not generalisable to all cases and situations…researchers do not verify a hypothesis (as in positivism), but rather indicate a failure to reject one.'[63, p. 568-569] Further information about this approach is found in Crotty.[72]

definitions, provided in Table 2.1, guided the theory-building exercise described in this chapter.

Table 2.1 Definitions of key concepts pertaining to post-positivist theory building[63]

Term	Description
Framework	A theory building tool that identifies a set of variables and the relations among them that are presumed to account for a set of phenomena.
Theory	Logically related propositions that aim to explain and predict a fairly general set of phenomena. Theories allow for a systematization of knowledge, explanation, and prediction, as well as generating new research hypotheses.
Conceptual model	A tool for theory explication, developed and used to make specific assumptions about a limited set of parameters and variables. These assumptions are then systematically explored and tested on a limited set of outcomes by a particular method or methods.
Construct	Abstract concepts drawn from a theory. Constructs are used to guide the appropriate selection of observed measures or variables.

This chapter describes the process of theory-building in addition to presenting the framework, theory and conceptual models developed to underpin the study. Section 2.2 describes two perspectives that shaped the theory-building process. Section 2.3 presents two existing theoretical frameworks. Section 2.4 highlights gaps in these frameworks and presents possible 'solutions'. The purpose-built 'Theory of Life Course Economic Uncertainty and the Timing of First Childbirth' is presented in Section 2.5. Section 2.6 presents the conceptual models that were developed, and Section 2.7 describes the constructs underpinning the study.

A short note about language: to explain ideas presented in the literature, at times I use the term 'theory' in a way other than that shown in Table 2.1. When this is the case, I enclose the word in quotation marks.

2.2 INFLUENTIAL PERSPECTIVES

De Vaus discusses the role of perspective in theory-building in terms of providing 'lenses' through which to consider an issue.[73, p. 17] This section considers two perspectives influential to the development of theory for this project: (1) a focus on political and institutional determinants, and (2) a specific orientation to the relationship

between structure and agency.

Epidemiological attention from the 1950s largely concentrated on individual-level behaviours as determinants of health, however in the past decade increasing attempts have been made to recognise individuals as situated within broader contexts that profoundly shape health. This is evidenced, for example, by the burgeoning sub-disciplines of social epidemiology[66 74] and eco-epidemiology.[64 75] Political determinants of health have re-emerged as a focus, [76 77] with political epidemiology focusing on studying the 'effects in health of the institutions derived from political power.'[78, p. 1421]

A parallel can be made between political theories of health and institutional theories of fertility.[i] The latter, a relatively new development in demographic theorising, seek to understand institutional constraints to fertility decisions, thus providing space for interest in political and other structural determinants, and responding to the fact that 'political factors have been largely absent from demographic research'.[79, p. 95] Within these theories, the term 'institution' has been variously defined.[j] North's definition as 'any form of constraint that human beings devise to shape human interaction',[83, p. 3] is broad and provides scope for consideration of political factors, as well as national institutions, such as labour markets, and individual-level factors, such as socioeconomic status. In summary, investigations of how political forces and other institutional structures impact on individual-level outcomes are timely within the disciplines of epidemiology and demography.

The structure/agency debate is a long-standing sociological debate over the extent to which human behaviour is determined by social structure or individual choice.[84, p. 20] For this discussion, social structure is defined as the recurring patterns of social interaction

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[i] An overview of the institutional approach to fertility theory is provided by de Bruijn.[30] Greenhalgh and McNicoll are the main proponents of this body of work.[79-81]

[j] Portes provides a discussion on the evolution of this concept.[82]

through which people are related to each other, such as social institutions and social groups.'[84, p. 19] Agency is defined as the ability of people, individually and collectively, to influence their own lives and the society in which they live.[84, p. 20] In line with current sociological thinking, I take as a starting point the fact that *both* social structure and agency contribute to individual-level behaviour and experience, and furthermore, that these aspects are interdependent and inherently inseparable:

> We create society at the same time as we are created by it. [85, p. 4]

It is the nature of the middle-ground between the two which invites discussion, and is the subject of much social theory.[k]

Public health as a discipline has not entered into the structure/agency debate in any depth. Much of the work up to the emergence of social epidemiology in the 1990s appears to be underpinned by an assumption that 'lifestyle' equates to a series of discrete behaviours that can be changed voluntarily (for example, smoking behaviour). Thus, agency is assumed and structure ignored.

Within fertility theory literature, the predominance of agency is reflected in economic fertility theories. These theories, which have been influential since the 1960s, apply rational decision-making models to childbearing decisions. Individuals are seen to engage in a process of rational decision-making premised on a full knowledge of the advantages and disadvantages of childbearing (usually discussed in economic terms). De Bruijn credits Leibenstein with the idea that the number of children in a family is the result of individual decision-making in the economic context of income and prices. [30 l] Economic fertility theories have been heavily critiqued, in part due to their 'strongly individualistic, decontextualised, static [focus] relying on a narrow, substantive notion of rationality, and without a sufficient degree of (psychological) realism'.[30, p. 556]

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[k] Influential theorists in this regard include Bourdieau, Weber, Giddens, Habermas and Goffman.

[l] Becker was also prominent in the development of this body of theory.[86-88]

In contrast, the institutional theories of fertility view structure and agency as being interdependent, and imply a loosening of the rational decision-making model. Within this body of theory, McNicoll draws on the concept of 'bounded rationality', developed by Herbert Simon, in which 'the decision environment facing individuals [is] set up by surrounding institutional forms and cultural patterns.'[81, p. 443] Simon also introduced the concept of the 'administrative man', in contrast to the 'economic man' of the economic rational thinker model. The administrative man encompasses the view that an individual's rationality is bounded or segmented - at any particular decision juncture, only a few of the many available choices come to mind and are evaluated against each other.[81] This perspective rejects the universally applicable, rational decision-making approach to fertility at the individual-level.[m]

My project is underpinned by the orientation taken in institutional theories of fertility towards the role of structure and agency, whereby structural factors constrain fertility decisions, and fertility decisions are not made with a full knowledge of all advantages and disadvantages. This type of fertility theory 'may provide a tangible opening towards psychological and economic choice considerations, and thus a unique opportunity to narrow the gap between macro and micro approaches, structure and agency, and context and choice'.[30, p. 562]

This chapter seeks to specify a theoretical pathway that is cognisant of time (the life course perspective), hierarchical determinants (political and institutional), and the structure/agency relationship.

[m] Other models of non economic decision-making are discussed by Leibenstein.[89]

2.3 EXISTING FRAMEWORKS

> Framework: A theory building tool that identifies a set of variables and the relations among them that are presumed to account for a set of phenomena.[63]

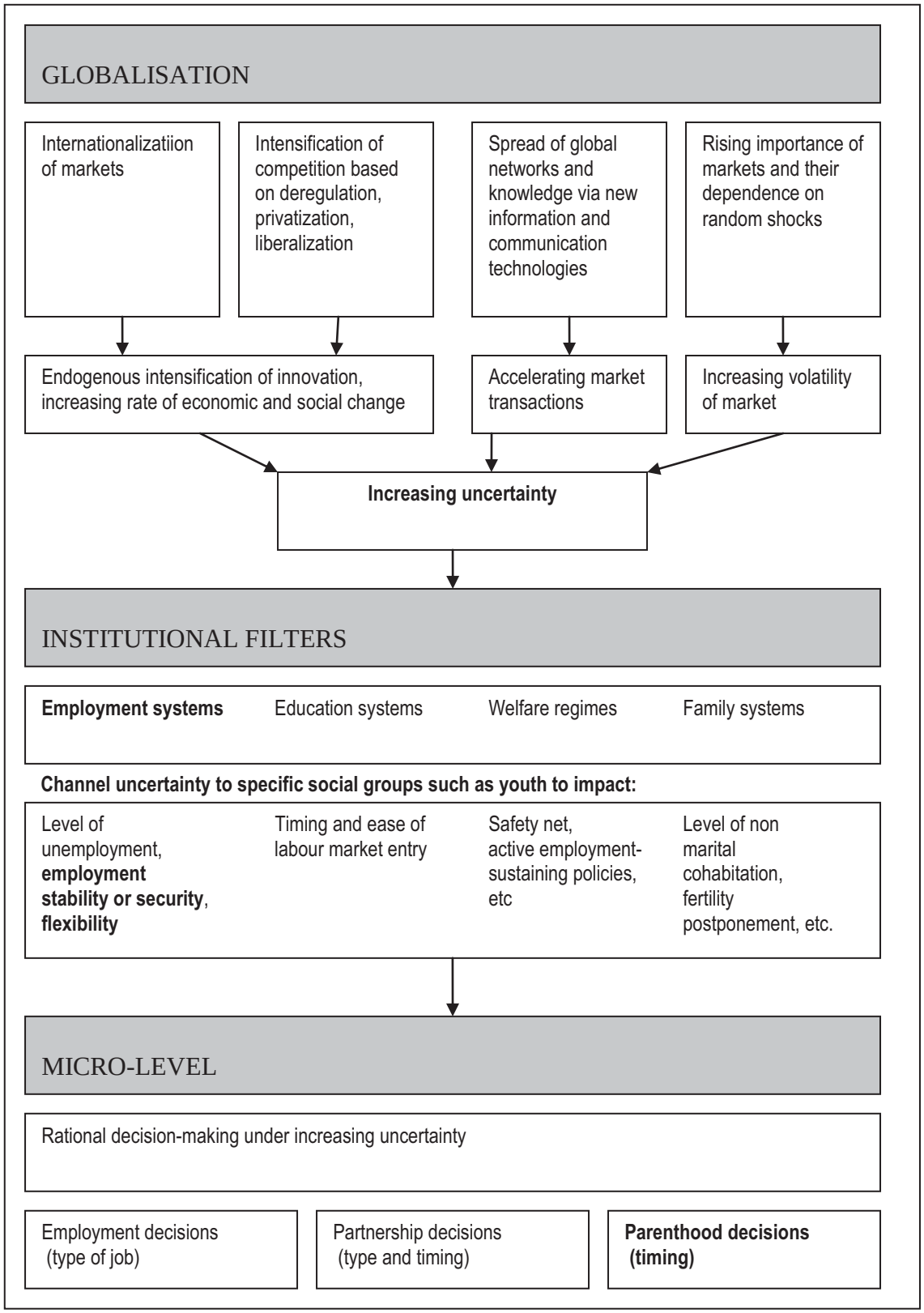
This section describes two existing frameworks that guided the development of the theory underpinning this project. The first framework, used by the Globalife group, (who were introduced in Chapter 1), will be referred to as the Globalife framework, and the second is known as the risk aversion 'theory' and stems from the work of Australian demographer Professor Peter McDonald. Neither framework was developed with a life course perspective (in the sense in which this was discussed in Chapter 1). While related frameworks are described in the literature, these two were chosen because they explicitly consider the influence of contemporary employment arrangements on childbearing, and they provide scope for considering causation from political and institutional, as well as individual, levels.

2.3.1 The Globalife framework

The framework underpinning the 'youth' phase of the Globalife project is shown in Figure 2.1.[50, p. 3] The pathway highlighted in bold is of interest.

The Globalife framework connects attributes of globalisation at the macro-level to changes to national labour markets, which in turn impact on the employment arrangements of individuals. In this framework, individual-level uncertainty is experienced as a result of particular employment arrangements, which influences issues such as parenthood 'decisions' and the timing of childbirth, for some, if not many, individuals. The framework links factors at three levels: macro (globalisation), intermediary (labour market institutions), and micro (individual fertility outcomes). A similar framework has been adopted for this PhD project; thus, the focus on macro-level structures embraced by political epidemiology and the institutional fertility theories is reflected in the project framework.

Figure 2.1 A framework for investigation of the impact of globalisation and employment systems on the timing of parenthood[50, p. 3]



In recent decades, the notion of globalisation has been of interest in many academic disciplines, such as economics, political science and sociology, all of which have a unique orientation to, and interest in, the concept.[90 n] In this project, globalisation is primarily of interest as a trigger for changes to structural institutions such as labour markets, including the changes described in Chapter 1 (which in turn are hypothesised to have led to greater economic uncertainty for individuals as implied in Figure 2.1). For this project it is not necessary to explain why the labour market changes occurred (although some are suggested in the figure), but simply to highlight the presence of the influence of macro-forces connected with globalisation in this process, as is accepted within academic literature.[34 37 50]

The Globalife framework offers an extension to the decision-making model seen in the economic fertility theories. According to this framework, the rational actor model may be less effective under the influence of globalisation than under previous political and economic regimes.[50] Authors suggest that greater uncertainty surrounding the behavioural alternatives that are available, the probability of behavioural outcomes given a certain action, and the amount of information required in order to make a decision, all play a role. Even so, the Globalife approach still assumes that 'typical actors try to act rationally.'[50, p. 16] In summary, the perspective implies the final determinant of behaviour is a decision arrived at through rational thought based on all known options (not necessary all possible options, which was closer to the original economic approach). This opens the possibility for institutional and cultural constraints to decision-making.

From one angle the Globalife approach could be seen to be complementary to the view of structure and agency adopted in this project (and explained in Section 2.2), but at a fundamental level I do not believe that all individuals approach childbearing entirely, or

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[n] Raewyn O'Connell describes sociological theories of globalisation in Chapter 3 of her text 'Southern theory', for example.[90]

even mostly, rationally; some may, but not all. This belief is part of a more general critique of economic fertility theories.

2.3.2 The 'theory' of risk aversion

The risk aversion 'theory' is one of four frameworks presented by Australian demographer Professor Peter McDonald to offer an explanation for low fertility rates in developed countries.[o] Although McDonald focuses on low total fertility rates, not the timing of childbearing, his work is relevant because in principle if women delay childbearing, the total fertility rate falls (see footnote [b] page 3). The core of McDonald's risk aversion 'theory' is as follows:

> Risk theory takes off from the point that the costs and benefits are all future costs and benefits and, accordingly, we cannot know what those costs will be. In having a child, people are making a decision to change their future life course and hence their decision depends upon their future orientation. If there is a perception that economic, social, intimate or personal futures are uncertain, decision makers may err on the side of safety in order to avert risk.[54]

McDonald implies that in times of individual uncertainty, having children may be perceived as being unsafe or non-viable, in turn prompting a delay in childbirth. This suggests that those who are 'secure' are able to have children, whereas those not yet secure will postpone childbearing until security is obtained, thus 'erring on the side of safety'.

Youth has long been viewed as a time of uncertainty. Sociological literature since the 1980s suggests that globalisation has played a role in creating different types of uncertainty at this stage of the life course, in many domains of life such as work and relationships. In part, theorists base these discussions on empirical studies that show a

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[o] The most comprehensive discussion on the risk aversion 'theory' is found in 'Low fertility in Australia: evidence, causes and policy responses', published in 'People and place' in 2000.[2] It was also discussed by McDonald in a conference presentation under the alternative name of 'The theory of risk and opportunity'.[54]

de-standardisation of the order of events traditionally marking the transition to adulthood - that is, finishing education, leaving the parental home, marriage, buying a house, and having a first child - a delay in the timing of such events, and a reduction in their prevalence, particularly marriage and childbearing.[91-95] I focus in this project on the impact of one type of uncertainty, economic uncertainty, while acknowledging that this occurs along with a constellation of other sorts of uncertainty. The meaning of the term 'economic uncertainty', and its relationship to casual contractual arrangements, will be explored in Section 2.7.

Although the name of the risk aversion 'theory' implies an interest in individual-level determinants, such as psychological tolerance of risk, or the concept of resilience, on closer examination of McDonald's work it is clear that he construes institutional factors, and in particular, globalisation and its impact on the labour market, in much the same manner as the Globalife group. Indeed, McDonald points to individual-level experiences of factors such as 'Unemployment, very low wages, increased job insecurity and large increases in the cost of housing….[as] provid[ing] a clear disincentive to people to have children.'[96, p. 10] In this way, the risk aversion 'theory' directs attention to institutional causes of individual-level uncertainty, in a similar vein to the Globalife framework.

In relation to rationality, McDonald's 'theory' of risk aversion provides a not-entirely-rational actor explanation for the influence of individual-level economic (and other types of) uncertainty on delaying childbirth. Unlike the Globalife approach of dynamic rationality, McDonald presents the risk aversion approach as an *alternative*, rather than an addition to, the rational actor perspective:

> The assumption of rational choice theory is that people have a good knowledge or understanding of the costs and benefits of having the next child. Risk aversion theory takes off from the point that the costs and benefits are all future costs and benefits...[54]

A rational choice approach applied to the risk aversion concept suggests that individuals and couples rationally work through a series of questions, such as: How much does it cost to have a child? Will I be able to afford childcare? Will I have any paid maternity leave? Will my partner still have a job next year? In contrast, the approach taken by McDonald, while not denying the role of rationality, does not assume a full weighing up

of options, and in this way aligns with the institutional approach to fertility.

2.4 ELABORATION OF THE PROJECT FRAMEWORK

Having reviewed two existing theoretical frameworks, the following issues required further elaboration for this project, in addition to the life course perspective:

- It is well established that women of lower socio-economic status (SES) have children at younger ages.[97 98] However, at the same time, this group of women are more likely to experience constant or long-term economic uncertainty, at least in an objective sense. This appears to be counter to the risk aversion 'theory'.
- Being in a 'stable' relationship is associated with a majority of pregnancies. It is not clear how this relates to the framework.
- The frameworks imply that all pregnancies are 'planned' or 'wanted' ('non-accidental'), occur at the time of choice, and end in a livebirth. This is a simplistic representation of pathways to childbearing.

This section discusses how each of these issues were incorporated into the current project framework.

The risk aversion 'theory' is unlikely to be relevant to the fertility behaviour of a low SES group. Currently in Australia and most developed countries, low SES women are most likely to be in casual employment (for example, when occupational categories are used to proxy SES)[99] *and* most likely to have children at younger ages (for example when educational attainment is used to proxy SES)[97 98] compared with middle/high SES women.

It is not an aim of this project to explore reasons for the different fertility behaviour of low SES women, but it is useful to mention some relevant theoretical perspectives.[100 101] McDonald offers the following extension of the risk aversion 'theory':

> If there is a perception that economic, social, intimate or personal futures are uncertain, decision makers may err on the side of safety in order to avert risk *or they may pursue an opportunity that is within their reach* [emphasis added].[54]

Therefore, low SES women may consider having a child (not delaying childbirth) to be 'an opportunity that is within their reach',[54] whereas gaining economic security may not be considered in this way. This implies that insecurity is resolved, a process that is not necessarily conscious, in the sense that it is decidedly unobtainable. This could be seen as complementary to the view that early motherhood offers an identity for lower SES women. For example, Professor Hilary Graham (a gender sociologist) says:

> …women's socioeconomic trajectories are fashioned by both gender and socioeconomic inequality, with investment in early motherhood central to the identities of young women negotiating a pathway to adulthood against a backdrop of material and social disadvantage.[102, p. 231]

Whatever the reasons for the behavioural differences, the risk aversion 'theory' is not likely to be relevant to low SES women.

The presence or absence of a stable partner is rarely discussed in fertility theory literature. The risk aversion 'theory' implies that a 'stable' or 'committed' relationship is an important prerequisite for childbearing: 'If there is a perception that… intimate or personal futures are uncertain, decision makers may err on the side of safety in order to avert risk'.[54] There is a considerable literature describing the nature, timing and duration of relationships of contemporary young Australians in comparison with previous generations.[103-105] Important elements include: cohabitation as a normative pathway to marriage, older age at first relationship (either defacto or marital), and higher rates of partnership cessation. Sociological literature often discusses such trends within the context of the precariousness of young people's lives in the globalised milieu. Despite this, little is known about how individuals construe relationship stability, or how this impacts on their experiences of starting a family. Also, quantitative investigations of the determinants of childbirth timing, such as those conducted by the Globalife group, do not consider the role of such relationships.

A multitude of biological and social issues central to human fertility and reproductive 'outcomes' are given scant attention in the theoretical fertility literature, which tends to focus only on livebirths and assume 'free choice' in their timing. An estimated 12-15% of pregnancies do not end in a live birth (according to population-level surveys based on self-reported pregnancy loss; likely to be underestimated due to early pregnancy losses

identified instead as a late period).[106 107] Approximately 15% of all couples in developed countries will experience clinical infertility at some stage in their reproductive lives (defined as the inability to become pregnant after 12 months of unprotected intercourse).[108] While issues related to infertility and pregnancy loss are examined in some bodies of demographic theory (as discussed by Holman and Wood),[109] neither McDonald or the Globalife group mention these elements of the pathway to childbearing. Also, up to 30% of pregnancies are 'unintended' or 'unplanned'.[110 111] Grouping such pregnancies with others in investigations of fertility timing is unsophisticated because of their vastly different paths to childbearing with respect to rationality and decision-making. A focus on the timing of first livebirth without consideration of these other aspects of childbearing is simplistic, although it is difficult to know how this influences results of empirical studies such as those conducted by the Globalife group.

2.5 THE THEORY OF LIFE COURSE ECONOMIC UNCERTAINTY AND THE TIMING OF FIRST CHILDBIRTH

> Theory: logically related propositions that aim to explain and predict a fairly general set of phenomena. Theories allow for a systematization of knowledge, explanation, and prediction, as well as generating new research hypotheses. [63]

I developed the Theory of Life Course Economic Uncertainty and the Timing of First Childbirth to guide this project. The following propositions constitute this theory:

- For some groups of women, economic uncertainty will create a situation in which childbearing is delayed.
- This delay is likely to be created through an aversion to 'risk' whereby having a child is construed as risky in a globalised environment.
- For other groups of women, childbearing is construed as non-risky, and may in fact be central to identity formation. For these women, the concept of risk aversion is irrelevant, economic uncertainty will not influence having a child, and childbearing will occur at younger ages.
- The first group of women (#1 and #2) are likely to be those in middle/high SES groups, whilst the second (#3) are likely to be those in low SES groups.

- The delay or non-delay of childbearing is not necessarily the result of a conscious, rational process of decision-making.
- For most women, having a stable relationship is an important pre-requisite for childbearing.
- The impact of economic uncertainty on the timing of childbirth will accumulate.
- There may be sensitive periods in which economic uncertainty is particularly potent with regard to the impact of the timing of childbirth.

Fertility theories should be context-dependent;[79 112] this theory is relevant to Western, developed nations, from the late 1980s to the current day. (It was in the 1980s that labour market changes enabling the increase in non-standard work schedules, were instigated in Australia).[34]

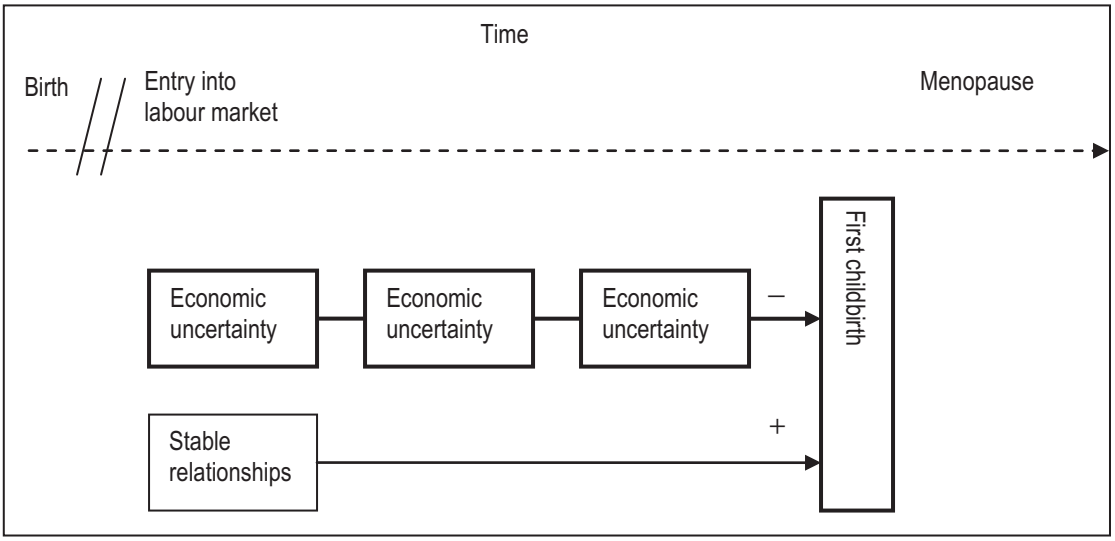
The theory developed here is underpinned by two assumptions: (1) that globalisation has led to changes in labour market institutions that triggered the rise of non-standard work conditions; and (2) that non-standard work conditions have led to an increase in economic uncertainty for some - perhaps many - individuals.

2.6 CONCEPTUAL MODELS

> Conceptual model: a tool for theory explication developed and used to make specific assumptions about a limited set of parameters and variables. These assumptions are then systematically explored and tested on a limited set of outcomes by a particular method or methods.[63]

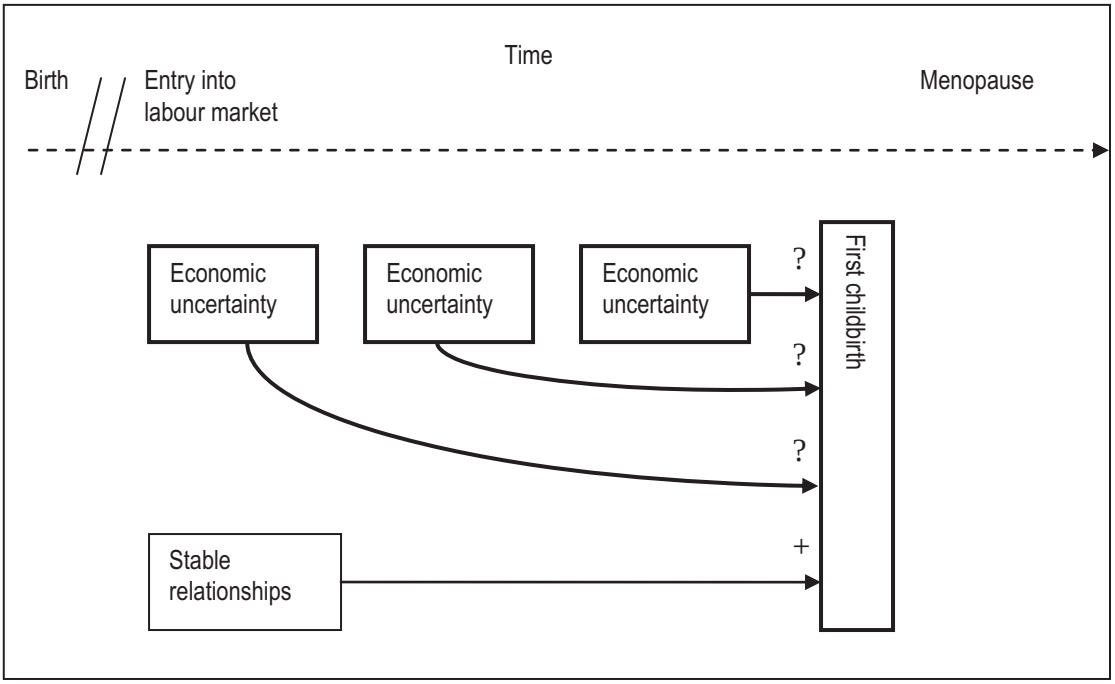
Figure 2.2 presents the conceptual model for the cumulative approach taken in this project, and is a modification of the accumulation model with independent exposure risks presented by Kuh et al.[59] Figure 2.3 presents the conceptual model for the sensitive periods approach. In both figures, the association of focal interest is shown in bold. Since the low SES group is not of theoretical interest, I do not present a model for this group.

Figure 2.2 Conceptual model of the relationship between economic uncertainty and the timing of first childbirth for middle/high socio-economic status women, according to the cumulative life course approach



+ positive association, - negative association

Figure 2.3 Conceptual model of the relationship between economic uncertainty and the timing of first childbirth for middle/high socio-economic status women, according to the sensitive period life course approach



+ positive association, ? unknown direction of association

As shown in the figures, the life course period of interest commences at entry into the labour market and ceases at the time of first childbirth, or, if a woman does not ever give birth, at menopause. Pregnancies that occur prior to entering the labour market fall outside the boundary of this investigation.

Figure 2.2 is designed to convey an interest in how the accumulation of economic uncertainty over time impacts on the timing of first childbirth. Whilst the conceptual model of the accumulation of risk with independent exposures presented by Kuh et al.[59] represented exposure variables with only one 'box' at the start of the timeline, I have repeated the box along the time continuum in an attempt to reflect the interest in accumulation.

Figure 2.3 was designed to convey an interest in the impact of economic uncertainty at different periods of time on the timing of first childbirth. The economic uncertainty 'boxes' are not linked to each other, conveying the fact that it is considered independently in each time period, with the overarching aim to compare the relative impact in each time period.

The primary role of SES in this project is to stratify a population in order to investigate the relationship between economic uncertainty and age at first childbirth within the middle/higher SES group to whom the theory is relevant. The choice of SES indicator (for example, education, income, occupation), and the life course time at which it is applied (for example, age 20, 25 years old), are key issues that will be addressed in this thesis. Identification of the cut-point between the low and middle/high SES groups is integral to an investigation based on these models.

2.7 DELINEATING CONSTRUCTS, CHOOSING VARIABLES

> Construct: Abstract concepts drawn from a theory. Constructs are used to guide the appropriate selection of observed measures or variables.[63]

Four key constructs were identified in the Theory of Life Course Economic Uncertainty and the Timing of First Childbirth: economic uncertainty, socio-economic status, partnering patterns, and childbirth. This section draws on various bodies of literature to explain the constructs for this project, laying the foundations for operationalisation in the empirical study. The complexity of the constructs necessitated identification and

prioritisation of sub-dimensions for measurement, and this is discussed. Further, since subsequent chapters focus only on certain elements of the constructs, I direct attention to those included in the remainder of the thesis.

The life course approach necessitates an element of critical thinking about the measurement of longitudinal constructs (and construction of longitudinal variables) over and above a cross-sectional approach. However, here I generally concentrate on the complexities in choosing (point-in-time) sub-dimensions. Discussions on the construction of the variables in Chapter 6 will explore how variables reflected the time dimension.

2.7.1 Economic uncertainty, employment precariousness: contractual arrangements

> For the mainstream of the population, having children is highly associated with feeling secure about one's financial future. This in turn is related to a sense of security about employment... 113, p. 10

The Theory of Life Course Economic Uncertainty and the Timing of First Childbirth focuses on the role of economic uncertainty (a term used by McDonald) in the timing of childbirth. The analyses described in this thesis focus more narrowly on precarious employment, and operationalises this construct through contractual job arrangements.

McDonald does not provide a definition for economic uncertainty or elucidate the sub-dimensions of this construct. For the purposes of this project I define it as individual-level financial precariousness. I designed a model for this construct as it may relate to the timing of first childbirth in contemporary Western societies. The core aspect of the model is an individual's employment precariousness (to be defined shortly). The model also includes an individual's level of education, income, and occupation; presence or absence of a life partner, and, when relevant, partner's level of education, income, occupation, and employment precariousness; home ownership; level of assets and debts (further differentiated as 'good' and 'bad' debt); and level of financial support from family. Note that all components of the model are capable of change over time and are constructed and measured as such in this project.

In order to limit the scope of this thesis, herein I focus only on the role of an individual's employment precariousness. Future work will involve investigating the

relative importance of other aspects of economic uncertainty on the timing of childbirth. The model of economic uncertainty may also be useful as a basis from which to explore determinants of other outcomes related to health and wellbeing.

The focus on job-related factors is supported by McDonald:

> …the phenomenon of delay or eschewal of family formation … has arisen as a result of the increased level of risk for young people ensuing from the deregulation of labour markets and economies.[114, conf. presn. - no p. no. supplied]

> Greater employment security would … reduce the risks involved in having children [2, p. 15]

Furthermore, a focus on job-related factors and in particular the issue of new types of non-standard work is politically relevant; thus, basing an initial investigation on this aspect of economic uncertainty is clearly justified.

The sociological construct of 'precarious employment' was used as the basis of the exposure variable in this study. The term has been defined as 'the lack of regulations that support the standard employment relationship, making workers more vulnerable'.[115, p. 7] Given the loose nature of this definition, there is considerable challenge in attempting to measure precarious employment within quantitative epidemiological investigations. Benach and Mutaner have been at the forefront of conceptual work in this area. They recently provided the following definition:

> …a multi-dimensional construct defined according to four dimensions: continuity (i.e. temporality), vulnerability (ie powerlessness), protection (ie limited benefits) and income (ie low level of earnings).[49, p. 277]

There are various ways that precarious employment could be examined empirically. On balance, I proposed that the most appropriate option for this project, given the

retrospective study design, was according to contractual job arrangements.[p] This complements many Globalife studies (as summarised in Section 1.5), and situates the project within the body of work considering potentially detrimental impacts of casual contracts. It does not allow the contribution of sub-dimensions of precarious employment to be disentangled, but for the present purposes this does not matter.

Contractual arrangements are most often classified in empirical investigations according to the following four categories: casual, fixed-term, permanent and self-employment. Periods of self-employment do not fit into the project framework because the legislative changes precipitating non-standard work conditions (discussed in Section 1.5) do not apply to the self-employed.[q] The focus away from the self-employed does not substantially limit the applicability of findings of this project at a population-level, since less than 10% of employed women in Australia are self-employed.[116] There are no standard definitions of contractual arrangements, and there is much debate in the literature surrounding their classification.[38 39 117] Chapter 4 discusses the definitions used in this project.

Precarious employment is often discussed as a continuum, with the security provided by a standard permanent employment contract (full-time, year-round, unlimited duration, with benefits) at one end and a high degree of precariousness at the other.[49] When contractual arrangements are used as proxies for employment precariousness, the tendency would be to categorise permanent, fixed term contract and casual arrangements on a continuum from least precarious to most precarious. However, it is not that clear cut. For example, some casual jobs are relatively long-term, giving rise to

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[p] Other aspects of work that complement the notion of precarious employment were collected in this project, such as working in more than one job at once. However, this thesis will focus only on contractual arrangements. Future work (beyond the scope of this thesis) will consider the role of other aspects.

[q] While periods of self-employment are not of theoretical interest, information about the timing of such periods is collected as part of an employment contract history. This is explained in Chapter 4.

the 'permanent casuals',[34, p. 69] and as such may be of a longer duration than many fixed-term contract positions (although, admittedly, the fact that casual work may end without notice is significant). Therefore, I treat contractual arrangements as independent categories as opposed to being ordered across a continuum.

In the context of a relationship, an interesting consideration is the extent to which women's *own* versus their partners' employment circumstances impact on their overall financial well-being. A traditional male 'breadwinner' model of partnering and childbearing would suggest that the partners' resources are more important when it comes to childbearing 'decisions'. Recently academics have commented on the decreasing relevance of this model in contemporary Western society.[118] In this vein, McDonald argues that young women's *own* employment status is extremely important:

> The risk-averse woman of today will ensure that she is able to support herself and, where there is a high probability of a divorce, will be careful not to put herself at the risk of dependency upon a man…there are very few young women in today's modern economies who see their future lives in terms of finding a husband and never thereafter being engaged in market work.[114]

Although the analyses presented in this thesis focus only on women's experiences of precarious employment, data was also collected regarding their live-in partner's employment, income and educational attainment over time. Future work will explore options for modelling financial well-being which include partner factors, and investigate the relative importance of partner versus own factors for different groups of women in the context of the timing of childbirth.

It is important to acknowledge the point at which 'precarious employment' differs from 'job insecurity', a highly visible focus in the discipline of social epidemiology for the past two decades. Within social epidemiology, the concept of job insecurity as a risk factor for health gained momentum in the 1980s, arising from the well-known Whitehall II study.[119 120] Job insecurity in this body of work was defined as the discrepancy between the level of security a person experiences and the level she or he might prefer.[121] While the definition at first appears aligned with McDonald's risk aversion 'theory', a closer reading of the literature and consideration of the economic climate at

the time that the term evolved suggests a mismatch.

The concept of job insecurity arose at a time when the major threat was that of redundancy, or total job loss, associated with the major economic crises of the 1970s to early 1990s. In contrast, when this project was planned (2005-2006), the structural parameters of labour markets in Western countries were entirely different. The world economy was 'booming' and redundancies were not of primary concern, nor had they been for at least a decade. At that time, structural issues of concern (at least to some) were related to the deregulation of labour markets and the subsequent impact on individuals, including the demise of permanent work and increasing prevalence of casual arrangements. Whilst it is possible to consider the impact of job insecurity, as defined above, within the new work environment, presumably individuals entering into a casual contract are not under the illusion that it is an on-going arrangement, and therefore the central focus on the perception of the *threat of loss* of a job is no longer appropriate (at least not until ~ 2008, when the 'Global Financial Crisis' had a widespread impact).[122]

The role of engagement in post-school study needed to be considered when conceptualising the exposure construct for this study. Empirical investigations show that women tend not to have children whilst engaged in such study.[123 124] Thus, information on periods of post-school study were collected in this project.

Considerable numbers of individuals undertake post-school study in a part-time (PT) capacity. In May 2009, 36% of Australians aged 15–64 years enrolled in a course of post-school study were studying PT (the proportion for females only was not published).[36] The influence of full-time (FT) versus PT study on the timing of childbirth has not been investigated. Thus, FT/PT study status was also collected (but is not the focus of investigation here).

2.7.2 Other variables

The notion of SES is central to epidemiological investigations of the social determinants of health. Such investigations usually entail examining differences in health outcomes between SES groups,[125 126]or attempting to understand the impact of life course SES pathways on health. [127-129] The meaning of the SES construct, and the best variable by which to gauge it, are much-contested within epidemiology.[130-132] It is often measured

according to income, occupation, or level of education attained. As has been discussed, the role of SES in this investigation is primarily to differentiate between two groups - a low and a middle/high SES group - groups to which the theoretical propositions outlined in Section 2.5 do and do not apply. Level of educational attainment is arguably the most appropriate of the three traditional variables by which to do this, because it is so closely linked to future labour market expectations, and opportunities. Many of the analyses conducted in the Globalife project also measured SES according to highest level of educational attainment.[52 133 134]

As is clear when referring to the conceptual models in Section 2.6, SES (thus, highest educational attainment) is treated as a time-constant construct, although in reality it is time-varying. This requires choosing a point-in-time at which to apply the construct; for example, educational attainment at a specific age. For analyses presented later in this thesis, the choice of point-in-time was dictated by data availability. The variable used, and its theoretical implications, are described in Chapter 6.

It is integral to this study that *within* a middle/high educational group there is variability in the exposure construct - time spent in various types of contractual arrangements. I do not know of any attempts to quantify this, but it seems likely that this is the case. For example, although it is generally accepted that casual employment is associated with lower SES,[135] a range of higher prestige jobs now often engage employees in this manner:

> Previously, high risk was associated primarily with low-level jobs. What is different now is that high risk has been extended across and up the labour market and restructuring has led to an accompanying shift of jobs to the qualified and credentialed workers.[114, conf. presn. - no p. no. supplied]

On this basis, I proceeded with this study.

The most obvious proxies of a stable relationship which could be collected retrospectively were periods in defacto and marital relationships. Rather than differentiate between the two, I gauged stable relationships as those in which the partners lived together, irrespective of their marital status. I refer to either arrangement as a ‘live-in’ relationship. Of course, not all live-in relationships are considered stable by those involved, and in the reverse, people who deem that they are involved in a

stable relationship do not always live together. However both of these situations are likely to be unusual, and to have limited impact on classification in this study. Furthermore, treating stable relationships as a 'determinant' of childbirth does not deny the fact that pregnancies occur outside such situations, but simply acknowledges that having a child for the most part occurs within such relationships.[r]

It was difficult to decide the best way to create the childbearing (outcome) variable in this investigation, since there are multiple relevant social and biological dimensions, as was highlighted in Section 2.4. I designed a process to identify three outcome variables, namely, the date of conception regarding:

1. First childbirth (the outcome variable used in published studies)
2. First pregnancy, irrespective of pregnancy outcome
3. First 'wanted' pregnancy

For an individual this could result in anything from zero dates (if a woman had never been pregnant) to three dates (if each outcome was related to a different pregnancy). The first outcome is addressed in this thesis, and future work will involve re-running analyses based on the second and third outcomes.

'Wantedness' was chosen over the similar construct 'plannedness' since it is a more stable construct - unplanned pregnancies can be self-reported as 'wanted' when information is collected retrospectively. Any pregnancy that ended in a termination was treated as 'unwanted' for the purpose of this project.[s]

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[r]As a side point, it is difficult to find population-level empirical evidence to directly support this. The ABS reports that 66% of births in Australia in 2008 were to married parents.[99] The proportion of births for which the father did not acknowledge the birth, by not signing the birth registration form, was only 3%. There is a vast spectrum of relationship stability that is not represented in either of these statistics.

[s] Ideally terminations conducted for medical indications would not be grouped with other terminations for this purpose. However, reasons for terminations were not collected in the LJYWP. Since medical

Infertility is also important to the theory. If the decision to become pregnant is considered to be the important point in time, situations in which women do not fall pregnant despite actively trying to do so could be backdated to the time of commencing the attempt to become pregnant. In this project, this was addressed by gauging periods in which women were trying to become pregnant for more than 12 consecutive months without becoming pregnant. However, this is not addressed in this thesis.

2.8 SUMMARY

This chapter extends existing theories regarding the link between economic uncertainty and the timing of first childbirth to formulate the Theory of Life Course Economic Uncertainty and the Timing of First Childbirth. The main innovations of this theory include the life course perspective, the addition of the role of partnering patterns, a more explicit consideration of the role of socio-economic status, and a more sophisticated conceptualisation of biological and social dimensions of pregnancy. This will be the first epidemiological contribution to the body of institutional theories of fertility, to my knowledge. The Theory of Life Course Economic Uncertainty and the Timing of First Childbirth is underpinned by a hierarchical model of the determinants of the timing of childbirth, which includes the role of globalisation, national labour markets, and the individual. Thus, the theory is an example of engaging with the difficulties of combining life course and multi-level determinants within one approach.

Two conceptual models were developed to represent the relationships between the theoretical constructs, from a cumulative and sensitive period approach. The constructs identified in the theory were explored in order to arrive at the sub-dimensions to be measured in this project. In particular, the remainder of this thesis focuses on the role of employment precariousness operationalised according to contractual job arrangements. The process of determining the exposure for this study is an example of the difficulty of

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terminations are likely to be a minority of all terminations conducted, this is not likely to be problematic for this study.

attempting to quantify loosely defined and poorly understood sociological notions. The retrospective nature of the study also limited the amount and nature of information that could be collected, impacting on decisions about how to measure important constructs.

The process of theory development described in this chapter will overcome a paucity of such literature within the epidemiological paradigm.

CHAPTER 3 Study design

3.1 INTRODUCTION

The previous chapter developed a theory and two conceptual models to guide the collection of a novel longitudinal dataset. The detail of the dataset in the time dimension, and best-practice methods to facilitate longitudinal data collection, were central to planning this study. In keeping with this theme, the chapter opens with an introduction to the event history data format (Section 3.2), and outlines the rationale for collecting this type of data within a cross-sectional retrospective design (Section 3.3). Issues surrounding retrospective recall are the focus of Section 3.4. A research instrument designed to facilitate recall, the Event History Calendar, is described in Section 3.5, and Section 3.6 considers how this instrument could be used in telephone interviews. Finally, the study cohort is described, and the theoretical and practical implications of cohort parameters are discussed (Section 3.7). In addition to reporting study design and data collection methodologies as a component of methods, this chapter explains and reflects on choices that were made to demonstrate the decision-making involved in conducting large-scale fieldwork studies. Points of innovation are highlighted throughout the chapter.

3.2 OVERVIEW AND RATIONALE FOR EVENT HISTORY DATA

One of the novelties of this study is the nature of the data collected. Event history data record the precise timing of transitions in and out of various states.[t] Scott and Alwin elaborate:

> … the collection of past events, their timing, their duration and their sequences…within a given domain, an event history would include all transitions from one state to another (e.g., from being unmarried, to married, to marital terminations, to remarriage)…any design that

[t] Information about the development of the event history data research paradigm can be found in the introduction to 'Life and work history analyses: qualitative and quantitative developments',[67] and in the 'Methods of life course research, qualitative and quantitative approaches'.[136]

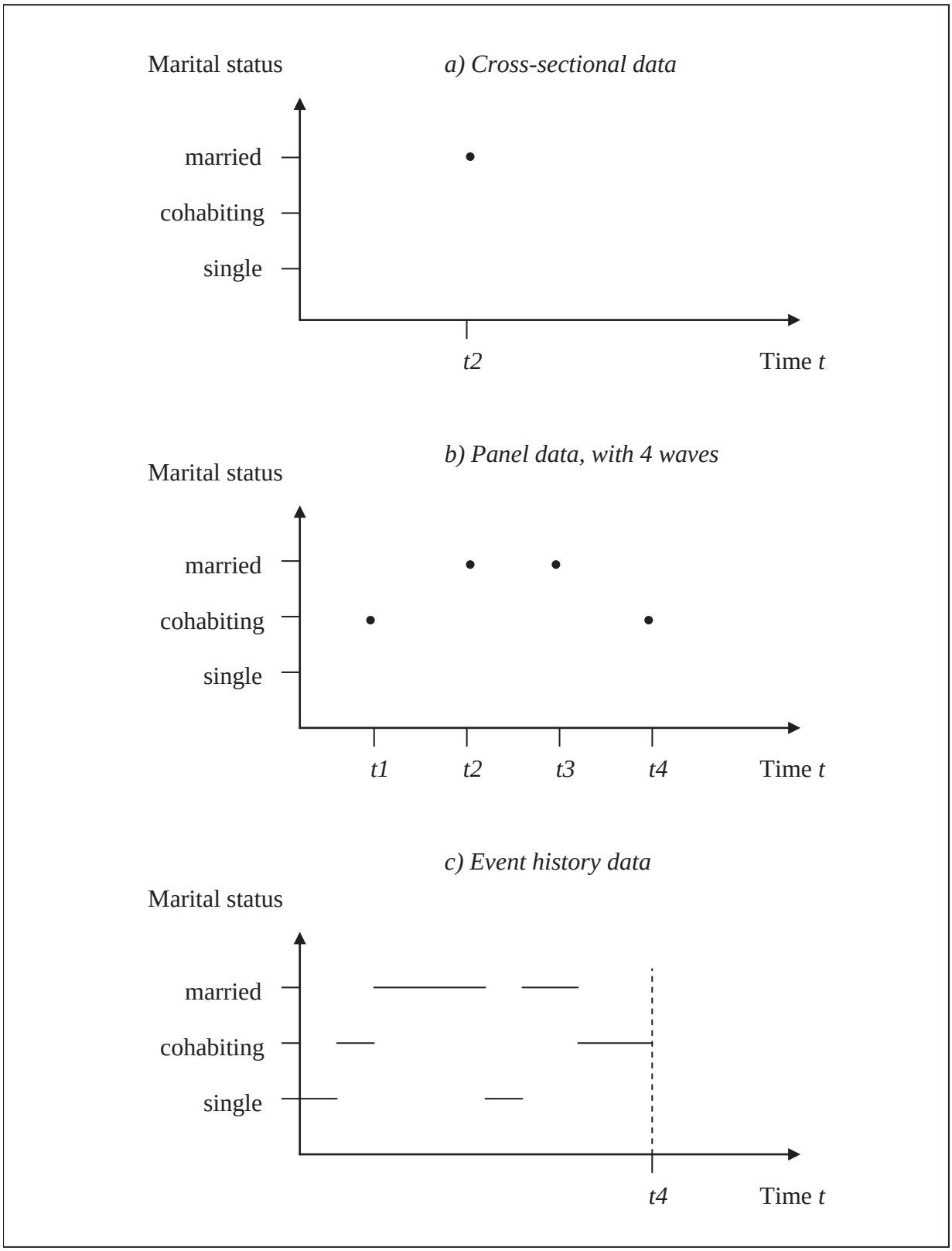
> simply records the "state" a person is in at a distinct time in his or her life, without recording the entire history of events and transitions, falls short of measuring an event history.[137, p. 101]

A strong rationale for collecting event history data is important because greater resources are required for the collection and management of such data than for other data formats. Figure 3.1, (adapted from Blossfeld and Rohwer),[138, p. 5] compares the event history format with cross-sectional and panel data that describe a marital history.

Cross-sectional data describe status at a single point in time, panel data describe status at successive points in time, and event history data attempt to describe status in continuous time, over the *entire period under observation*. Thus, if an investigator is interested in marital history up to *t*4, the three formats provide datasets which are progressively more fine-grained. Given that marital status, like many social phenomena, may change over time, cross-sectional and panel data may miss important aspects of a marital history. The two simpler data formats may lose periods spent in certain states altogether, and will not provide information on *duration* or *timing* of states - thus 'dose-effects' over time cannot be examined.

Investigations based on the cumulative and sensitive period life course approaches concern both duration and timing of exposures. In my project, this corresponds to an interest in the duration and timing of women's contractual job arrangements. Cross-sectional data cannot provide this information. Panel data is inappropriate because the choice of points in the life course at which data should be collected is unclear. Since these forms of employment arrangements are relatively new, longitudinal patterns experienced at an individual-level are not well understood. Likewise, very little is known about how experiences of such arrangements over time might affect the timing of first childbirth. Also, panel data may miss sensitive periods, and this format would offer incomplete data for cumulative models. Thus, event history data is the most appropriate data format for this study, providing fine-grained exposure data and enabling the construction of cumulative life course models and the identification of sensitive periods.

Figure 3.1 Comparison of a marital history in cross-sectional, panel, and event history data formats[138, p. 5 (adapted from)]



The phrase ‘event history dataset’ has arisen within sociological circles, and refers to datasets containing histories of events in several life domains (for example, work, relationships and childbearing). While (limited) event history data may be collected in epidemiological studies (for example, commencement and cessation of smoking within a pre-determined life period), the event history dataset is not well recognised within the sub-discipline of life course epidemiology. This may be because many life course analyses are based on existing data from longitudinal cohort studies, which tend to be in the panel format. Thus, very little epidemiological attention has been directed towards event history dataset design, and analytical discussions and advances have been based on panel, not event history, datasets.

3.3 STUDY DESIGN

The discussion in the previous section was about *dataset* design. This section moves on to consider *study* design. Social science texts discuss two designs that are appropriate for collecting event history datasets - cross-sectional retrospective studies, and prospective cohort studies. Most event history datasets are collected in cross-sectional retrospective studies, [138] in which retrospective data on exposure and outcome are collected simulteneously (usually in a single interview).[u] In prospective cohort studies, an exposed and non-exposed group are selected and followed up over time to ascertain outcome status.[139] Whilst most such studies produce panel data (such as that shown in Figure 3.1 on page 56), it is also possible to collect event history data whereby participants are asked about the time period between interviews, at each wave of data collection.

The Life Journey of Young Women Project (LJYWP) was conducted as a cross-sectional retrospective study, since a prospective study was not possible within the timeframe of a PhD candidature. The feasibility of conducting the cross-sectional study

[u] Not to be confused with the standard cross-sectional design in which a temporal relationship between exposure and outcome is not established, and consequently, causation cannot be investigated.

in the timeframe was enhanced because a new cohort did not have to be established; a cohort created prior to my candidature by two of my PhD supervisors, was available for the project (see Section 3.7).

Cross-sectional retrospective studies that collect event history datasets are often called life history studies in the social sciences.[69] However, this phrase is not used in a standard manner, so I prefer to use the long-hand descriptor of 'cross-sectional retrospective study collecting an event history dataset' (note the use of *dataset*, not data, in the phrase, in line with the discussion on the previous page).

Despite being recognised as the key source of event history data within the social sciences,[138] relatively few cross-sectional retrospective studies that collect event history datasets have been conducted, and until this study, none in Australia, to my knowledge.[v] Further, the design is not well known within the discipline of epidemiology or the sub-discipline of life course epidemiology. The German Life History Study is the most well-known cross-sectional retrospective study that collected an event history dataset, and was initiated by Karl Mayer in the late 1970s.[w] Mayer provided a brief history of the use of this study design in a recent review.[69] To provide a basis for reflection on similarities and differences between the LJYWP and previously conducted studies, Table 3.1 summarises key details of the German Life History Study and two other studies discussed by Mayer.

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[v] In Australia prospective studies such as the HILDA and NLC collect retrospective event history datasets for limited life course durations (the time period between study waves), and for a limited number of variables.

[w]Overviews of the German Life History Study can be found in a chapter entitled 'Collecting Life History Data, experiences from the German Life History Study' (in the text 'Methods of Life Course Research, Qualitative and Quantitative Approaches'),[140] and in a recent working paper by Mayer.[69]

Table 3.1 Select history of cross-sectional retrospective studies that collected event history data

Name of study	Data collection undertaken	Country	Sample	Age of participants	Period of retrospective recall
John Hopkins Retrospective Life History Study[141]	1969	United States of America	Population sample of 'black and white' males, n=1589.	30-39 years old	Age 14 years-time of interview, i.e. 16-25 years
Norwegian Life History Study[142]	1971-1972	Norway	Male birth cohorts: born 1921 (n=1322), 1931 (n=1094), and 1941 (n=1054). Sampling via central population. register.	30, 40 and 50 years old	Age 14 years-time of interview, i.e. 16, 26 and 36 years
German Life History Study[69]	9 periods of data collection, 1981-2005	Germany	Eight West German birth cohorts, born 1919-1971. Five East German birth cohorts, born 1929-1971. All cohorts male and female. Nationally representative. Total n=11 441.	27-65 years old	Birth-time of interview, i.e. minimum 25 years, maximum 68 years[a]

a: Calculated from information provided by Bruckner and Mayer.[140. p. 154]

Two of the three studies shown in Table 3.1 were based on birth cohorts. The age of participants in studies ranged from 27-65 years (the minimum and maximum age of participants in the German Life History Study). The minimum period of retrospective recall was 16 years (for the youngest participants in the Norwegian Life History Study), and the maximum 68 years (the oldest participants in the German Life History Study).

3.4 RETROSPECTIVE DATA COLLECTION

Every study design has particular methodological challenges, and the most pertinent issue for this study was the difficulty associated with retrospective recall of life course

information, and in particular, collection of such information in the event history format. It is widely accepted that retrospective data have a range of quality limitations compared with data collected prospectively.[67 69] In retrospective studies, data are collected after the events themselves have occurred, and data sources may be influenced by random and systematic errors.[143] While most epidemiological surveys elicit some retrospective information (for example, highest level of educational attainment, or childhood socio-economic indicators), the cross-sectional retrospective study that collects an event history datasets is based entirely on collecting continuous records of retrospective information and so the potential for inaccuracy becomes a central methodologic concern. First childbirth (the outcome variable) is a major life event and a relatively simple recall task, so this section will focus on the recall of histories of employment, which form the basis of the exposure variable in this study.

Within the epidemiological literature, there is a large body of analysis of relatively *simple* recall tasks, for example, highest level of education[144] or father's occupation in childhood.[145 146] Of relevance to this project are more *complex* recall tasks with which epidemiology is only beginning to engage. To date the relevant literature lies mainly in the sociological and psychological disciplines. It is difficult to summarise and draw conclusions about this voluminous literature because it concerns a diversity of populations, periods of recall and age at which recall is undertaken (as exemplified, for example, in Table 3.1), as well as a variety of exposures (even within the realm of employment histories).

A problem in drawing on this literature to inform an epidemiological approach is that difficulties and errors are not usually reported in a way that allows them to be apportioned at a population level. For instance, the fact that people can forget major life events is highlighted in the literature, but not necessarily the proportion of a sample that do this and how important these events are to the primary research questions.

The accuracy of recall of contractual job arrangements has not been studied quantitatively, to my knowledge. The most thorough review of 'mistakes' that can occur when employment history data are collected was undertaken by Maike Reimer,[147]who at the time worked at the Max Planck Institute for Demographic Research, and whose analysis was based on data from the German Life History Study. She examined recall of

periods of employment (including details of jobs and occupations), unemployment and labour market inactivity. Rather than repeat the details of the review, I draw attention to important conclusions from an epidemiological perspective.

Reimer provides a discussion of time and dates in 'autobiographical memory', and concludes:

> Dating errors will occur frequently, but will mostly be small and equally often in both directions, possibly with scale effects of one or rarely two years.[147, p. 12]

Scale effects, in this instance, refer to situations whereby dates are reported inaccurately by units of the relevant time-scale (for example, one year out).

In relation to employment histories, Reimer notes that whilst memories are error-prone and events can be forgotten entirely:

> Most at risk [of being forgotten] are events that are short, insignificant and inconsequential for the individuals' biography.[147, p. 12]

> Memory for the broad temporal placement of events and their sequence is usually quite good. Exact calendar dates can be quite reliable for the major life events and transitions and deviations from the actual date seem to be symmetrical.[147, p. 12]

From an epidemiological perspective Reimer's conclusions are reassuring. Epidemiologists have a long tradition of accepting a degree of error so long as it is random. Problems of recalling exact time of events can to some extent be overcome by collapsing the data into larger blocks of time in which it is likely that the event occurred even if its exact date is not known.

Other determinants of recall accuracy include participant age and period of retrospective recall. Reflecting on studies shown in Table 3.1 (page 59), the age of the cohort in this study (32-35 years at time of interview) is at the younger end of cohorts described in the table. In terms of recall period, this project focuses on the life period from the time of *entry into the labour market*. Although it is possible to have a job while at school, the majority of school students are dependent on their parents financially, and the concept of precariousness as defined and measured in this study is unlikely to be relevant to school students. At the time that the study cohort was at school, the minimum age of

school-leaving in South Australia was 15 years.[148] Therefore the period of retrospective recall is age 15 to age at interview i.e. 17 to 21 years (depending on year of birth). Whilst this is also at the lower end relative to studies described in Table 3.1 (page 59), the potential for recall difficulties remains a key methodological issue.

Of greater concern is the possibility for biased recall, meaning a systematic tendency for reporting to be erroneous depending on the outcome. In the present study, we would be concerned if, for the middle/high educational group, women who had children later tended to remember their employment history as being less precarious than it really was (for example, longer duration in permanent work). It is difficult to gauge whether this could happen, but overall the complexity of the determinants of childbirth timing for different individuals may guard against this sort of systematic error. A validation study for the recall of employment arrangement data is planned for the future, and is described in Chapter 8, Section 8.4.

Recall data is never perfect, but for this project there was no practicable alternative and the question was sufficiently important to proceed with an empirical study that collected retrospective data.

3.5 THE EVENT HISTORY CALENDAR (EHC)

When designing a study to collect retrospective information, there is a:

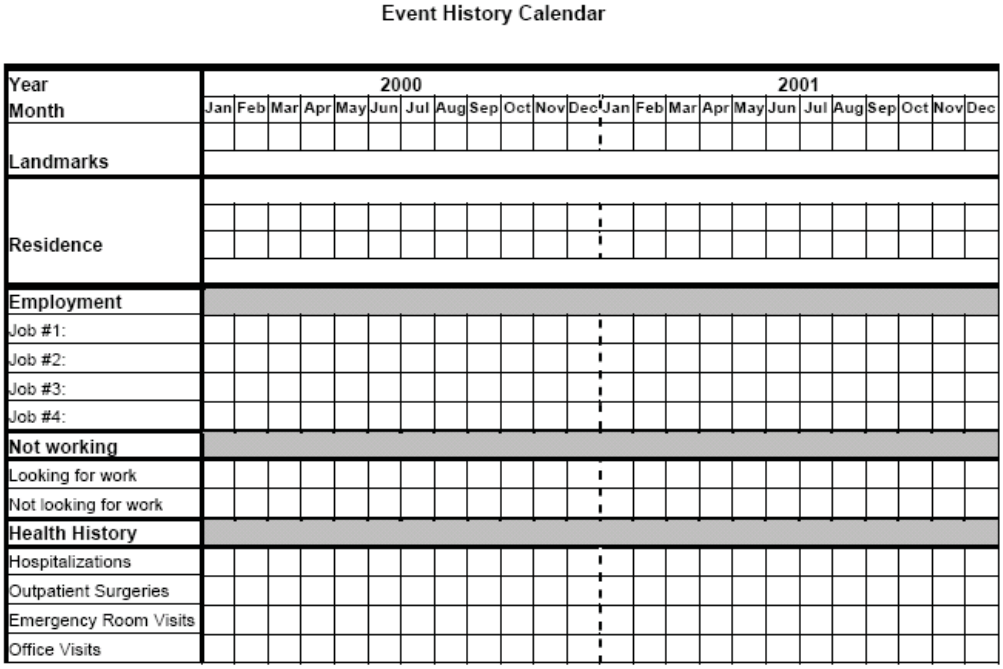
> …need to consider the collection of retrospective data within a framework of a coherent conceptualization of the underlying cognitive processes that permits the identification of variables that determine the nature of the data.[137, p. 111]

Investigations into how information is recalled, what factors predict accurate recall, and how recall can be improved have allowed survey researchers to design and test improved data collection instruments. To this end, a plethora of literature outlines best-practice survey design.[143 149] A promising and relatively recent advance in the collection

of event history data is the event history calendar (EHC).[x] Freedman et al.[150] and Axinn et al.[151] provide the most comprehensive descriptions of the rationale, design and use of EHCs, and guide the description provided in this section.

The EHC is akin to a large grid, or calendar, in which key events in the life domains of interest are recorded. An example of an EHC is provided in Figure 3.2.[152, Appendix D]

Figure 3.2 Example of an Event History Calendar[152, Appendix D]



In this figure, the vertical axis details the life domains being collected (for example, residence, employment, not working), and the horizontal axis is divided into units of time. This particular EHC is designed to collect data at the unit of one month, over a two year period (January 2000 - December 2001). Factors such as life domains, the specific information collected, the life course period of interest (for example, one year,

[x] In published literature, the Event History Calendar is sometimes known as the life history calendar, life event calendar, or life grid tool.

an entire life time), and the minimum unit of time at which data is collected (for example, weekly, monthly), vary according to study aims.

To collect data on an EHC, a recording system is developed. Commonly, symbols are used to mark the beginning and end months for a particular activity, and connected with a straight line to indicate continued activity. Data is recorded on the EHC by the interviewer as the participant provides information in the interview setting.

The advantage of the EHC over a conventional questionnaire is that it allows a skilled interviewer to prompt the participant according to information already collected, and cross-check across domains for consistency of information, thus helping participants recall the timing and sequencing of interconnected events.[151] This is most effective when more complex recall tasks are approached later in the interview, so that details of readily remembered events (such as marital events) can be used as memory cues. Memory recall can be enhanced in this way over and above what is possible if this type of data is collected using a conventional questionnaire, when the interviewer is unable to refer to previously collected information and does not have a visual representation of the participant's life course. When the interview is face-to-face, the participant may also use the calendar as a visual cue to facilitate memory retrieval.

Despite the increase in use of EHCs, comparatively little research has been conducted to quantify the improved data quality arising from their use compared with conventional questionnaires. Glasner and van der Vaart conducted a review of evaluations of EHC data quality,[153] and whilst it is difficult to summarise the results of evaluations (because of different study designs, and foci of evaluation), three experimental studies were identified in which participants were assigned to either a conventional questionnaire or EHC condition, and data from both modes compared with externally validated data. Glasner and van der Vaart concluded that:

> Overall the results of these experimental studies…are…quite promising. They demonstrated that the calendar method exerted positive effects on recall accuracy for different types of data and never led to worse quality data. [153, p. 343]

The LJYWP incorporated the use of an EHC survey instrument. Prior to this study, the tool had only been used a few times within the epidemiological paradigm.[154 155]

3.6 THE USE OF EVENT HISTORY CALENDARS (EHCS) IN TELEPHONE INTERVIEWS

In order to accommodate geographically dispersed participants and to reduce travel costs, data collection was primarily conducted by telephone interview for the LJYWP.[y] In the literature, EHC instruments were initially developed for use in face-to-face interviews in which visual cueing from the calendar facilitated recall.[150 151] Therefore, the benefits of using an EHC for this project required consideration.

A small number of researchers have used EHCs to collect data over the telephone. Freedman et al. administered almost half of their interviews with EHCs in this mode, with the interviewer recording data on the EHC and providing prompts to the participant based on previously collected information, but the participant unable to see the EHC.[150] Although authors concluded that the two modes of data collection produced 'almost the same degree of consistency' (page 65), they do not elaborate on their results, and there is a mismatch between this conclusion and their earlier comment that the visual prompting provided to the participant by the EHC is an important component of its function.[153]

A number of recent studies used a simplified EHC, completed prior to a telephone interview, and referred to throughout.[156 157] I will refer to such instruments as Participant Completed Calendars (PCCs). In these studies, PCCs were not used in conjunction with a standard (interviewer-completed) EHC, so their primary use was to provide participants with an opportunity to recall and record information in their own time, prior to the interview. This project used both an EHC and a PCC to enable high quality event history data to be collected over the telephone. This is the first study to my knowledge to use both instruments.

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[y] At the time of wave 1 Lucina interviews, 60% of the Lucina cohort did not live in metropolitan Adelaide.

The main disadvantage of PCCs is that they may decrease response proportions. Van der Vaart and Glasner conducted a cross-sectional study in which clients of an optometrist were randomised to a PCC or non-PCC study arm and interviewed over the telephone in order to compare self-reported reports about purchases of pairs of glasses with the records kept by the optometrist.[156] Authors found substantially lower response proportion for the PCC group (39% versus 67% for the non-PCC group). Low response proportions associated with the use of PCCs were less likely to be a problem in this study compared with the study by Van der Vaart and Glasner. The study cohort were already participating in a prospective cohort study to which the LJYWP was linked, and were thus more likely to take part compared with a random sample approached for a one-off study. Related to this, staff making initial contact for the LJYWP were known to many of the cohort members and had established a relationship with them already (as will be discussed in a later chapter). Last, the topic area was likely to be of more interest to the cohort (childbearing, women's health), and thus be more likely to incite participation. Nevertheless, from the outset I recognised the risk of losing participants due to the PCC. As such, great attention was paid to the design of this calendar and its instructions (to be discussed in Chapter 4), and a number of strategies were put in place to support and motivate cohort members to participate in this study over and above what would be considered as usual practice in epidemiological fieldwork involving interviews (to be discussed in Chapter 5).

3.7 THE LUCINA COHORT

The study cohort for the LJYWP was the Lucina cohort. The cohort was formulated prior to the commencement of my PhD candidature and has been described elsewhere.[158] The Lucina cohort was based on all consecutive female babies born from January 1973-December 1975 at the Queen Elizabeth Hospital, (Adelaide, South Australia), and surviving to discharge. These females were traced when they were around 30 years of age. In that period, this hospital was one of two major maternity hospitals, delivering approximately 12% of births in the city, with a geographically large catchment area and sociodemographic profile broadly representative of all women giving birth in South Australia.[158] From 2199 birth records, 2046 (93.0%) daughters were traced and of these 62 were deceased or disabled (3.0%), leaving 1984 (90.2%) women invited to enroll in the Lucina cohort, and participate in the longitudinal Lucina

Study. Of this group, 974 women (49%) were enrolled into the study, and are regarded as members of the Lucina cohort. Women participated in the first wave of the longitudinal Lucina Study concurrent with their enrolment in the cohort. All cohort members were invited to participate in the LJYWP, the second wave of the study.[z]

I will consider cohort parameters from epidemiological and theoretical perspectives. The Lucina cohort offers an opportunity to investigate fertility determinants for a particular birth cohort born in a specific location. The birth cohort is an established approach to cross-sectional retrospective studies collecting event history datasets (for example, two of the three studies shown in Table 3.1 [page 59] were based on birth cohorts). A possible disadvantage of this approach is the specificity of the cohort in terms of birth year. However, since age and period are known to influence fertility behaviour,[55] the cohort parameters remove these as potential explanatory factors (in this way, some of the limitations of the Globalife approach as discussed in Section 1.6 are not relevant to the design of analyses based on the Lucina cohort). All members of the cohort have experienced the same macro-level conditions at the same age (for example, national and global economic circumstances, national labour market institutional changes), and their differing micro-level circumstances become the focus of investigation. In some ways this narrowing of focus enables the role of the life course dimension to come to the fore. The German Life History Study used several birth cohorts,[140] thus incorporating the advantages of the birth cohort approach whilst at the same time overcoming the issue of specificity. It was not possible to study more than one birth cohort within the timeframe of my PhD candidature.

The Lucina cohort is ideal for the study of the impacts of employment precariousness since its members entered the labour market in the 1980s, when non-standard

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[z] Duration of time between wave 1 interview and receipt of LJYWP invitation (for those residing at last recorded address) varied markedly, from 8 months, to 6 years and 1 month. This variation arose from a lack of purposive funding for cohort creation, resulting in a staggering of wave 1 interviews from February 2003 to May 2007.

employment conditions began to flourish, as mentioned previously. It is also a relevant cohort for the study of older maternal age, since Australian women currently in their childbearing period are having first children at older ages than preceding birth cohorts (see Table 1.1, page 3).

Similar to the issue of specificity by birth year, the specificity of the Lucina cohort by birth location could limit the ability of the cohort to represent women born in Australia at that time. In order to gauge generalisability of study results, I compared cohort socio-economic status (SES) with national-level SES. The median Socio-Economic Index for Areas (SEIFA) indicator of relative socioeconomic disadvantage for the Lucina cohort is 970 (range 727-1145), while the national median is 1070 (range 137-1300).[159] [aa] Thus, the cohort is relatively representative of national SES. More pertinent to this study is that within the middle/high SES group in the Lucina cohort, women are representative of Australian women of the same age in terms of longitudinal patterns of contractual job arrangements, and age at first childbirth. Future work will compare data collected in this study with national-level data according to these factors.

An advantage of creating the cohort through birth hospital is that geographical location as *adults* is not restricted; a greater variety in life trajectories may be captured than, for example, choosing a group of adults according to workplace or residence.

The cohort is almost entirely Caucasian due to the period of sampling: Asian immigration did not occur in Australia until 1975-1976 following the end of the Vietnam War and the abolishment of the White Australia policy.[160] Since this policy was Australia-wide, this does not raise an issue in terms of the cohort being nationally representative.

[aa] To calculate this, the 1986 SEIFA indicator of relative socioeconomic disadvantage at postcode level[159] was merged to the data record for each cohort member according to postcode during primary school. A lower SEIFA score reflects higher relative disadvantage.

Selection bias is a problem in cross-sectional retrospective studies because individuals must be alive and capable of participation.[138] However, only 3% of women traced for the Lucina Study were unable to participate in wave 1 due to being deceased or disabled (62 of 2046), and given the young age of the cohort, few are likely to have died between wave 1 and the LJYWP.[bb] Thus, selection bias is not a pressing methodologic concern in this study.

Ideally the study cohort for this project would have completed their reproductive careers. However, the Lucina cohort were aged 32-35 years at the time of LJYWP data collection, and some participants who had not yet had a child will have children in years to come. The chief investigators of the Lucina Study plan to continue following the cohort until the end of their reproductive careers, providing an opportunity to pursue the research questions posed in this thesis with completed childbirth data.

3.8 SUMMARY

This chapter highlighted the benefits of event history data for conducting life course studies in that the role of timing and duration of the exposure across a life course can be explored. The cross-sectional retrospective study design was presented as a feasible option for the collection of an event history dataset within the timeframes of a PhD candidature. The issue of recall error was introduced as the key methodological concern within this study design, and to this end, the Event History Calendar survey instrument was discussed as a strategy to facilitate the collection of high quality retrospective data. A second novel instrument, the Participant Completed Calendar, was introduced as a means of taking advantage of the benefits of an Event History Calendar when interviews are conducted over the telephone. The potential for decreasing the response proportion through the use of a Participant Completed Calendar was raised. The study cohort was also discussed in this chapter.

[bb] I plan to quantify this by checking death registries as part of my Postdoctoral work.

To my knowledge this is the first cross-sectional retrospective study that collects an event history dataset to be conducted in Australia. The dataset will therefore provide a unique opportunity to study the lives of Australian women. Also, this is the first time that both an Event History Calendar and a Participant Completed Calendar will be used in the same study, demonstrating a commitment to enhancing data quality in this project.

CHAPTER 4 Survey instruments

4.1 INTRODUCTION

This chapter discusses the development of survey instruments used in the Life Journeys of Young Women Project (LJYWP), with a focus on the development of survey sections that are relevant to the research questions addressed in this thesis. As was outlined in Section 2.7, the exposure variable in this study is the history of contractual employment arrangements, the outcome variable is the timing of first childbirth, and other variables of interest are periods of study (which need to be considered alongside contractual employment histories, as discussed at the end of Section 2.7.1), live-in relationship histories, and the highest level of educational attainment.

In this project, data on the timing of first childbirth were collected in wave 1 of the Lucina Study and updated in the LJYWP. Appendix 2 shows the relevant section of the wave 1 questionnaire; a similar section was included in the LJYWP questionnaire. Data collected in wave 1 were used to construct the highest educational attainment variable for analyses presented in a later chapter; thus, collection of this information is not discussed in this chapter. Data regarding contractual employment arrangements, study, and relationships, were collected on an Event History Calendar, and will be discussed in detail.

While there are many textbooks available on general principles of survey development.[73 161 162] in this chapter I do not dwell on standard aspects, but focus on issues unique to the development of Event History Calendars (EHCs) and Participant Complete Calendars (PCCs), particularly design features which enhance retrospective recall of information. I also highlight attempts to reduce the burden of the interview to participants and interviewers, since interviews involving these instruments are more demanding than typical survey interviews.

Given that the EHC is the most innovative aspect of LJYWP survey instruments, the first few sections of the chapter focus on its development. The unit of time at which data were collected on the EHC is discussed in Section 4.2. The next three sections discuss how key constructs were operationalised, focussing on challenges involved in collecting information in the EHC format (Sections 4.3-4.5). Potential sources of misclassification and bias are also discussed. The design and use of the EHC instrument are the focus of the next section (Section 4.6). Section 4.7 presents the PCC and highlights points of

innovation in its design and use, particularly with respect to its integration with the EHC. Section 4.8 discusses the overall interview schedule. Pilot testing was important at various stages of development of survey instruments, and this is discussed throughout the chapter. Section 4.9 describes the final stage of piloting testing, which involved trialling the entire LJYWP interview, including use of the PCC and EHC instruments, with 19 women.

Note that I will use two abbreviations frequently throughout this chapter: EHC for Event History Calendar, and PCC for Participant Completed Calendar.

4.2 UNIT OF TIME

One of the key decisions guiding the collection of event history data surrounds the unit of time, or time interval, at which data are collected (for example, one day, one week, one month, one year). The decision reflects a balance of various factors, as described by Freedman et al.:

> The time unit used in the calendar… depends primarily on the data needs of the research. The investigator must choose a time unit that is small enough to ascertain with adequate precision the sequence and temporal interrelation of events. To record events that occur fairly frequently or quite close together, it is necessary to divide time rather finely. At the same time, one must consider the respondents' ability to make fine time distinctions and the feasibility of fitting the desired time unit over the required time span of the study onto a calendar of manageable size.[150, p. 44]

Contractual job arrangements, along with other important variables, were collected at the *month-level* in this study. Early pilot work indicated that this was more feasible for participants than asking them to summarise working histories according to larger blocks of time, such as three, six or 12 months. An advantage to data at the month-level is that it provided great flexibility in the construction of exposure variables for analyses. However, the data may not be accurate at this level of detail. I intend to consider this by conducting an assessment of agreement between contractual job arrangement information collected in wave 1 Lucina interviews (point-in-time data) and data collected retrospectively in this project. Since fieldwork for the LJYWP was ongoing at the time of writing this thesis, these analyses will be conducted in my Postdoctoral

period.

Although the choice of the month-level time unit is not unusual amongst EHCs discussed in the literature,[150 152 163] in combination with the ~ 20 year duration of the EHC (from entry into the labour market – current age of the Lucina cohort), the burden to participants is high compared with other studies using EHCs. Thus, I reduced the burden of the interview where possible. One strategy was to collect less important variables at the annual level. Other strategies will be discussed throughout the remainder of this chapter and the next.

4.3 EMPLOYMENT ARRANGEMENTS

4.3.1 Defining variables

Contractual arrangements are the key measure of exposure in this study, and in particular, periods spent in casual, fixed-term contract (FTC) and permanent arrangements. A classification system of six mutually exclusive employment arrangement states was designed: casual, fixed-term, permanent and self-employment, unemployment, and not in the labour force (NILF). The Australian Bureau of Statistics (ABS) routinely collects population-level data regarding all of these arrangements.[164] However, for a variety of reasons which will be outlined, it was not possible to use ABS definitions and question sequences for this project.

There is no precedent for *retrospective* measurement of contractual arrangements to my knowledge. The method of classification of *current* contractual arrangements is contested in the literature. Debate surrounds the basis on which classification should be made - on the presence/absence of access to paid leave entitlements, or on self-reported contractual arrangement.[38 39] My project uses the self-identification method since relying solely on recall of leave entitlements was likely to lead to significant misclassification, and be onerous to participants, particularly given the recall period (17- 21 years, as previously described).

The definitions of contractual arrangements for the LJYWP were adapted from those used in wave 2 of the Negotiating the Life Course (NLC) project (questionnaire obtained through email communication with Sue Trevenar, NLC Data Manager, 20th July 2006). The wording used for both projects can be seen in Table 4.1. On the whole,

definitions of the three arrangements are based on the temporal continuity of job arrangements in addition to access to leave entitlements. The major adaptation made for this project was in deleting 'employed for a fixed period of time' as a descriptor of casual work. It is surprising that this was used in the NLC survey, since it is generally accepted that casual work is associated with the opposite, that is, a job with an unknown duration, in which employers are able to cease employment with very little notice. Other adaptations to the NLC definitions were based on feedback from pilot participants, and were relatively minor: simplifying language (e.g. 'access to …leave', instead of 'pro-rata entitlement to …leave'), adding clarification details (for example '12 months, 2 years' to FTC description), and re-ordering so that the most pertinent information came first.

Table 4.1 Definitions used for contractual arrangements in the Negotiating the Life Course Project and the Life Journeys of Young Women Project

Contractual arrangement	NLC definition[a]	LJYWP definition
Permanent	Generally work for fixed number of hours per week and receive a salary with pro-rata entitlement to sick leave and annual leave	Employed on an ongoing basis and had access to paid annual and sick leave
Fixed-term contract	Employed for a fixed period of time with no guarantee of continuing employment. May or may not get leave entitlements.	Employed for a fixed period of time (e.g. 12 months, 2 years), with no guarantee of continuing employment. May or may not have had access to paid leave.
Casual	Employed for a fixed period of time with no guarantee of continuing employment. May or may not get leave entitlements. Generally receive a casual loading in their hourly rate of pay.	No guarantee of continuing employment. Often receive a casual loading in the hourly rate of pay. May or may not have had access to paid leave.

a: Obtained through email communication with Sue Trevenar, NLC Data Manager, 20th July 2006

Since the state of self-employment was not of theoretical interest in the project, a simple definition was used for the LJYWP compared with definitions used by the ABS (see Table 4.2). The role of this definition in the LJYWP was limited to differentiating between self-employment and employment under a contractual arrangement.

Table 4.2 Definitions of self-employment used by the Australian Bureau of Statistics and for the Life Journeys of Young Women Project

Source	Definition
Australian Bureau of Statistics [164]	Jobs where renumeration depends directly on the profits (or future profits) derived from the goods and services provided'
Life Journeys of Young Women Project	Not working for someone else for a wage

Table 4.3 provides definitions of not in the labour force (NILF), unemployment, and employment used for the LJYWP. Whilst internationally agreed technical definitions and associated question sequences exist for the classification of *current* NILF, unemployment, and employment,[164] question sequences are long and consequently not appropriate for use in a retrospective survey. Definitions used to collect retrospective data in wave 1 of the HILDA project were used in the LJYWP. The definitions are adaptations (simplifications) of the ABS classification system.

Table 4.3 Definitions of unemployed, employed, and not in the labour force used in the Life Journeys of Young Women Project

Employment state	LJYWP definition
Employed	Doing any paid work
Unemployed	Not doing any paid work, looking for work
Not in the labour force	Not doing any paid work, not looking for work

The primary difference between the ABS and HILDA definitions surrounds the measurement of periods of unemployment. The ABS definition is based on fulfilling three criteria at the same point in time: not doing any paid work, looking for work, *and* being available for work, whereas the later criterion is dropped from the HILDA (and thus LJYWP) definition, since it was not practicable for retrospective data collection.

The HILDA survey used the definitions shown in Table 4.3 to collect the *total number of years* employed, unemployed and NILF, from when participants left full-time (FT) education for the first time, to the date of interview. Since this is much less demanding of participants compared with collecting data in the event history format, a key

objective of piloting was to gauge the ability of participants to use the definitions within the context of data collected at the month-level.

A general principle of retrospective measurement is to use the simplest definitions possible without misclassification. In hindsight, it might have been useful to replace 'may or may not have had access to paid leave' (as in Table 4.1), with 'had access to paid leave' for FTCs, and 'did not have access to paid leave' for casual arrangements. Although current literature suggests that *some* casual arrangements include access to paid leave, and that *some* FTCs do not, it appears that these cases are in the minority, and the benefits of simplified definitions might have offset the minor amount of resultant misclassification.

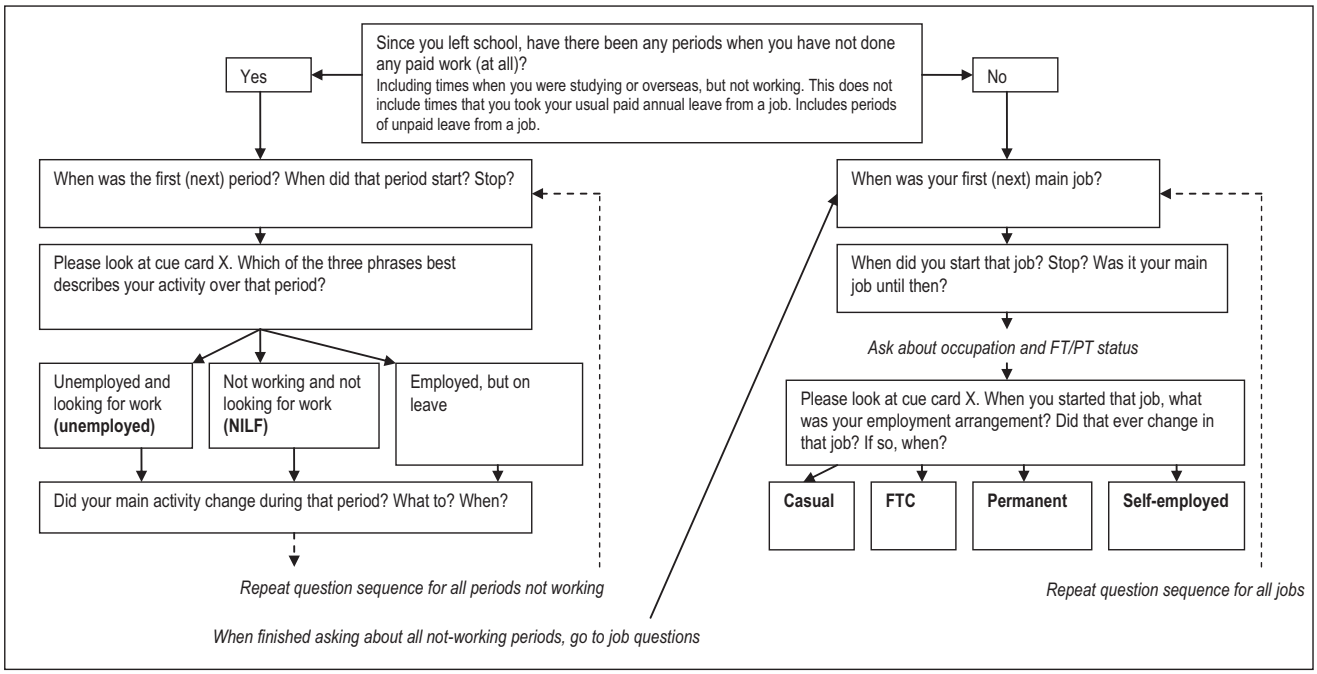
Early piloting for this project emphasised the need to provide definitions to participants for employment arrangements because, at times, technical terms were not familiar to them (for example, NILF), or were used in everyday language to mean something other than the definition used in this project, (for example, the terms 'casual' and 'part-time' were used interchangeably by some pilot participants). Therefore, definitions were provided both on the Participant Completed Calendar (PCC), and in the cue card booklet, both of which will be discussed later in this chapter. Providing participants with written definitions decreased the burden to interviewers who would otherwise have needed to provide them verbally.

4.3.2 Asking questions

> While crystal clear concepts are desirable, definitions might not always fit into the clear-cut, simple sentences a questionnaire calls for.[165, p. 7]

The translation of the employment arrangement definitions into interview questions was not straightforward. This section will discuss the main issues that arose in this process, and how they were managed. Figure 4.1 shows an abbreviated version of the question sequence designed to collect information on employment arrangements. Instructions to interviewers are written in italics.

Figure 4.1 Abbreviated question sequence for employment arrangements



The question sequence shown in Figure 4.1 follows the general principles of collecting event history data, whereby a screening question is used to introduce a topic and determine whether or not it is relevant to the participant.[150 151] If it is, the interviewer asks specific questions and records pertinent information into the EHC. If not, the interviewer moves to the next screening question. This general structure of questioning is used for each topic addressed on the EHC for the LJYWP.

Pilot work showed that the lack of familiarity of participants with employment arrangement terminology needed careful thought as to the best way of introducing the topic at interview. Pilot participants were comfortable talking about their employment histories in terms of periods that they *had* and *had not* worked. Therefore questions were approached based on this dichotomy, with follow-up questions seeking to classify periods according to technical definitions. I originally intended the categories to correspond directly to periods of employment (had worked) and periods of unemployment or NILF (had not worked). However, a category for periods on leave was added to the not-working structure (as in Figure 4.1), despite corresponding to periods of employment, because pilot participants referred to such periods as times that they did not work.

Not-working and working histories were collected separately, as seen in Figure 4.1, rather than interspersed within a chronological employment arrangement history. This allowed greater opportunity for definitional clarification since fewer concepts were being addressed at once. Though it may have facilitated recall to collect a chronological history, the completion of the PCC prior to the interview was the most important step for recall, and on balance this approach appeared to maximise data quality.

The life course focus of the LJYWP was the period *after* leaving school. Thus, we asked about employment arrangements from the month after school-leaving (see screening question, Figure 4.1). Since it is possible to return to school at a mature age, interviewers directed participants to the first time that they left school, when relevant.

Piloting indicated that women do not recall contractual job arrangements as an independent piece of information, so participants were first asked for information on occupation and other job characteristics.

Early pilot work indicated that asking about *all* previous and current jobs was overwhelming for participants. Therefore I decided to ask about *main* jobs only. A main job was defined as that providing the *highest salary* in instances that a participant had more than one job. This definition is suitable for the research questions addressed in this thesis, since presumably it is the main job to which employment precariousness and its impacts are most relevant. While this simplified employment histories collected, it required an initial increase in engagement from participants to understand the 'main job' concept. Pilot testing of interviews suggested that this was not a problem.

During piloting a number of misunderstandings arose in response to the screening question shown in Figure 4.1. Some of these were common enough to warrant adding *clarification notes* to the interview script. The clarification notes are written in small font in the first question box in Figure 4.1. Since it was not possible to incorporate such clarifications into the questions asked of participants, the success of this strategy in avoiding misclassification was dependent on the interviewer's ability to detect when such mistakes were being made and to use the notes to prompt participants. Interviewers were provided with appropriate training.

Early piloting indicated it was important to emphasise that *not-working* meant not working *at all*. Although this was written throughout all documentation, some participants tended to include instances when they worked a minimal amount. Interviewers were alerted to this issue.

4.3.3 Potential sources of misclassification

Despite providing participants with written definitions, there are a range of potential sources of misclassification of employment arrangements which should be acknowledged. Participants may not have referred to, understood, or applied the definitions provided, instead basing responses on their own understanding of terminology, which may differ quite markedly from the technical definitions used in the study. The most likely type of misclassification, based on pilot work and observations of fieldwork, was in participants classifying casual work as permanent. This is counter-intuitive, but some casual work can be long-term – hence the 'permanent casuals'.[34, p. 69] This differential misclassification would result in women being classified as less precarious (more secure) than they are in reality. Other participants may not have

remembered enough details about their job to enable accurate use of the definitions, and therefore guessed their responses. These scenarios reflected the need to support participants in understanding and applying the definitions of contractual arrangements. Despite directing significant efforts towards achieving this (in choice, and training, of interviewers, for example), some unknowable misclassification is likely to have occurred. Other probable sources of misclassification include a greater likelihood of recall error for those with a higher number of job changes, and greater likelihood of forgetting short periods of employment altogether. These issues are more likely to be relevant to low SES women. Since the lower educational stratum is not relevant to the theory underpinning this project, these sources of misclassification are likely to have only a modest effect on the interpretation of data in this project, at most. Within the middle/high educational stratum, I can think of no reason why differential misclassification would occur.

Definitions for contractual arrangements were based on those used in studies collecting current, not retrospective, job parameters. Misclassification could have arisen if they were inappropriate for retrospective measurement. The temporality of contractual arrangements has not changed over the recall period of this study; permanent has always meant ongoing, fixed-term contracts have always meant a fixed duration, and casual employment has never been associated with a guaranteed duration of employment (at least, in a legal sense). Admittedly there has been some changes in access to leave entitlements within contract categories, however temporality information appeared first in definitions (refer to Table 4.1, page 75), and was more likely to be recalled retrospectively. Thus, this is unlikely to be an important source of misclassification.

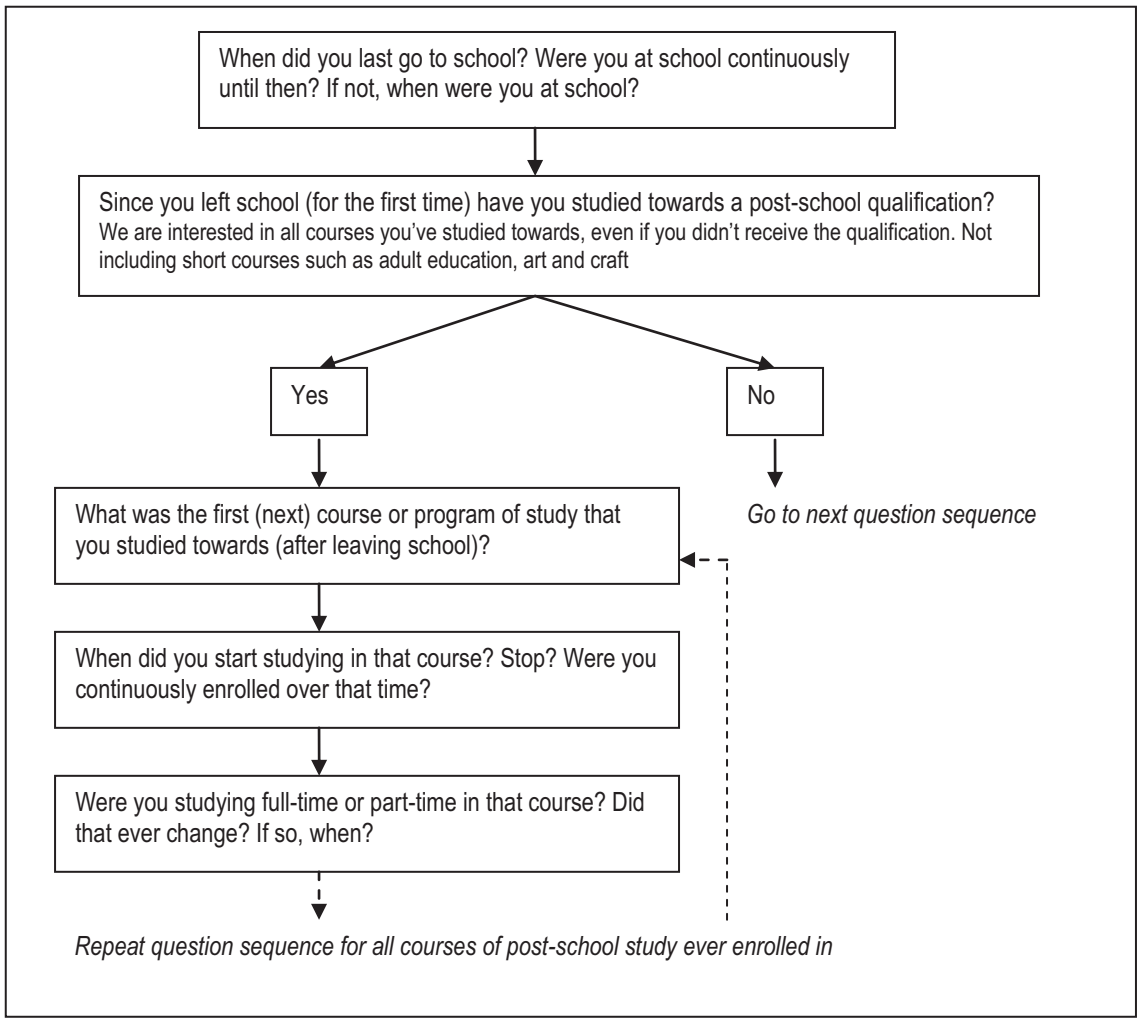
To avoid misclassification as much as possible, great care and time was taken in training interviewers around the most likely sources. Quality monitoring of interviews was also focused accordingly (refer to Section 5.4 for information on quality control strategies).

4.4 POST-SCHOOL STUDY

As discussed in Section 2.7.1, it was important to collect information about periods of post-school study (timing, duration, FT/PT status). Figure 4.2 shows the question sequence relevant to these data. Clarification points are shown in small font. The

timing of school-leaving was first ascertained, and then information on post-school study collected by course.

Figure 4.2 Abbreviated question sequence for periods of study



The phrase 'post-school qualification' was used in NLC survey interviews. The use of 'qualification' aimed to avoid information on hobby-based courses not important for this project. However, it may have increased the likelihood that women from lower SES family backgrounds did not engage with the question, despite having participated in some form of post-school study. Interviewers were trained to be aware of this. My observations of fieldwork suggested this was a reasonable approach.

While piloting this section, it became clear that the FT/PT status of study was more nuanced to measure than I imagined. Initially I planned to collect the *official* enrolment

status, but it became apparent that for a number of courses full enrolment only required a PT hourly commitment. This was especially the case for a range of non-university courses, wherein actual commitment was sometimes as little as five hours per week. Since my interest was primarily in the students' time commitment to the course, categorising such instances as FT study was not ideal. After piloting, the wording of the question was changed in order to be sensitive to this issue: Were you studying FT or PT in this course of study? (As seen in Figure 4.2). My observations of fieldwork and discussions with interviewers indicated that for university courses, participants tended to refer to their official enrolment status. This is not likely to be a problem, since official enrolment status is designed to reflect the entire time commitment to the course of study, including time spent outside the classroom. For non-university courses, interviewers were trained to direct attention to the *time commitment* to the course. There is probably some unknowable misclassification - FT enrolment in non-university courses that required only PT hourly commitment may have been classified as FT. The potential impact on analyses will be discussed in a later chapter when I describe how these data were used to construct the exposure variable. In hindsight, the application of a more precise definition of FT and PT study commitment for the question sequence would have avoided this concern, but would have added to participant burden.

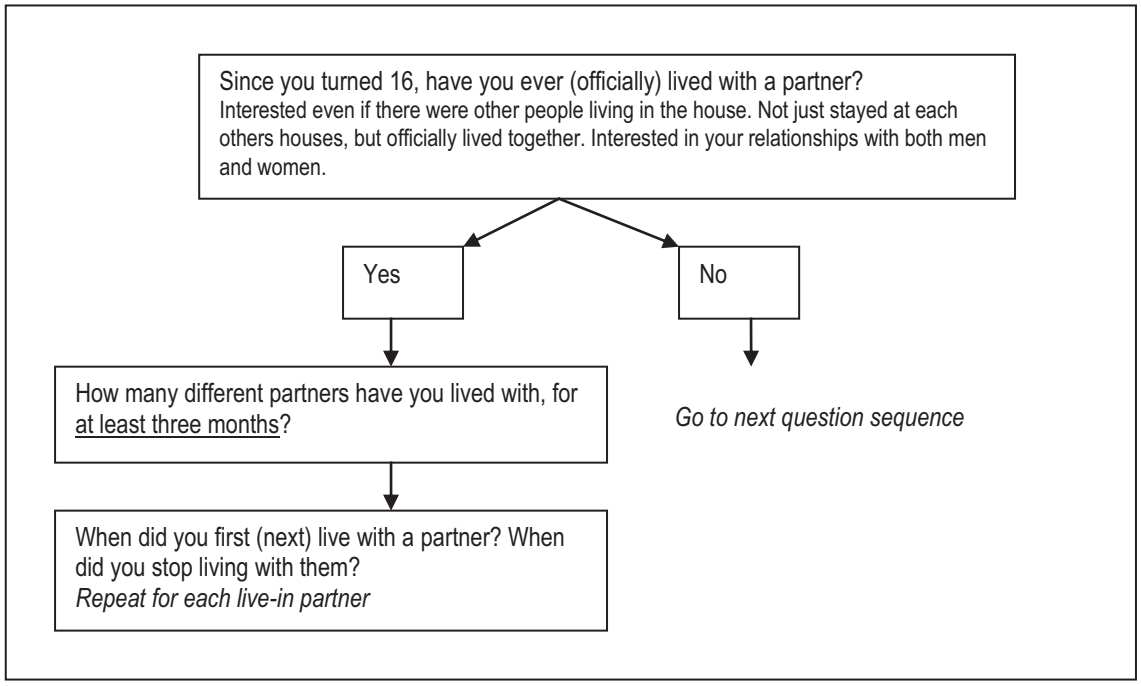
4.5 LIVE-IN RELATIONSHIPS

As described previously, stable relationships were defined according to defacto or marital relationships (called 'live-in' relationships). Live-in relationships of less than three months duration were not recorded. The choice of the three month time span reflected the following: (1) consideration of the burden associated with participation in an interview, (2) the lower priority of this variable compared with the exposure variable, (3) consideration of a useful and reliable measure of the construct, and (4) the minimum period considered reasonable for the commencement of a pregnancy (since the majority of women take more than three cycles of unprotected intercourse to become pregnant).[166]

Information on the timing of marital events (marriage, separation, divorce) was also collected in the interview. However, this information was not used to address the research questions posed in this thesis.

It was relatively simple to translate the concept of a live-in relationship into a question sequence to use with participants. The question sequence is shown in Figure 4.3. Age 16 years, rather than the time of leaving school, was the starting point for data collection on this variable (as noted in the figure). This is because for analyses beyond the scope of this thesis, entire live-in relationship histories were sought, and such periods may start before leaving school, for some individuals.

Figure 4.3 Question sequence for live-in partnering



Pilot testing of the question sequence resulted in some clarification notes being added to the interview schedule. These are shown in small font in Figure 4.3. Table 4.4 outlines the underlying issues, and how they were treated in terms of classification.

Table 4.4 Issues resulting in clarification notes, and resultant classification

Issue	Classified as period in a live-in relationship
A couple live together, other people also live in the house	Yes
A couple live together, one partner travels or works interstate temporarily	Yes
A couple stay at each others' houses regularly, but have not 'officially' moved in together	No
A couple who live together decide to 'break up' (separate, if married), but continue to live together for a period of time after the decision was made	No

Pilot testing also highlighted instances when a relationship ceases (and partners stop living together), but is resumed at a later time (and they live together again). It was important to record that the later live-in relationship was with the *same* partner. The recording system was adjusted to be sensitive to this.

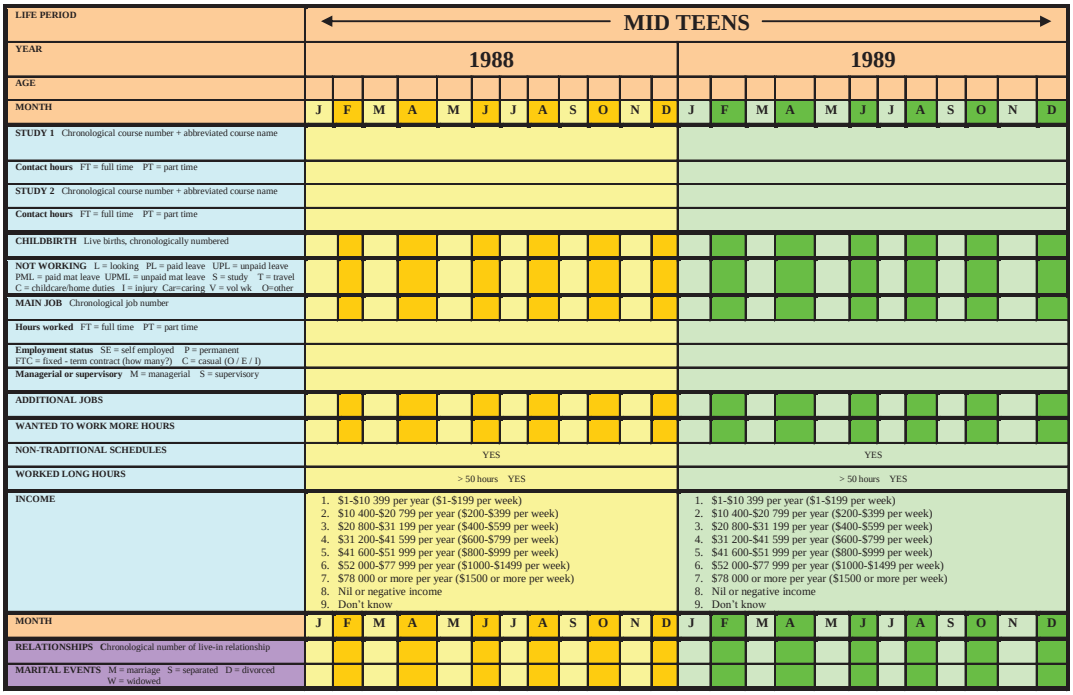
In summary, I have now considered the operationalisation of the main exposure construct (employment precariousness according to state of employment arrangement), and two other important constructs (partnering and study). I will now discuss the development and use of the EHC.

4.6 THE LIFE JOURNEYS OF YOUNG WOMEN PROJECT EVENT HISTORY CALENDAR (EHC)

The rationale for the use of EHCs in empirical research was discussed in Chapter 3. As most LJYWP interviews were conducted over the telephone, the EHC was designed for use by interviewers only.Whilst there is much that I could say about designing the LJYWP EHC, I refer the reader to key papers by Freedman et al.[150] and Axinn et al.[151] for comprehensive descriptions upon which my work was based.

An abbreviated version of the EHC designed for the LJYWP is shown in Figure 4.4. As a space-saving mechanism, EHC rows pertaining to the education, occupation and income of participant's partners are not shown in the figure. For the same reason, whilst Figure 4.4 only shows two calendar years, each page of the EHC recorded information regarding three years.

Figure 4.4 An abbreviated version of the Event History Calendar designed for The Life Journeys of Young Women Project



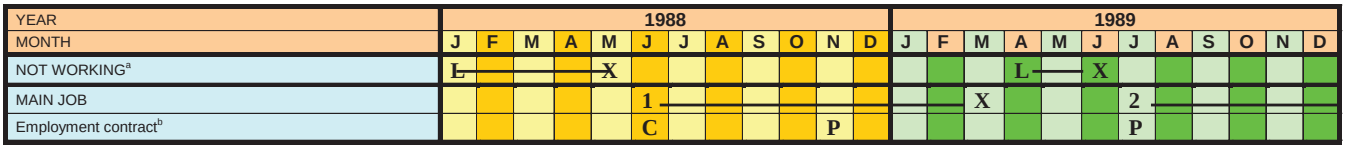
The format of the LJYWP EHC is structurally comparable to that used in other studies[150] in that the vertical axis of the calendar displays the various life domains covered and the categories of interest within each domain. The horizontal axis includes all the months for the calendar years of interest to the study. The final version of the EHC, and the associated recording system, is the culmination of much pilot work, with modifications being made in order to best facilitate the use of the calendar not only to record information, but also to promote visual clarity so that consistency checking could be performed by interviewers.

The life course period of interest in this study started in the month after leaving school (for the first time). Since this could occur any time after the 15th birthday, the calendars start in January of the year in which cohort members turned 15. Accordingly, three versions of the calendar were used, one for each year of birth represented in the cohort (1973, 1974 and 1975). Information was collected up to and including the month of the LJYWP interview. To incorporate the life course duration required for the LJYWP, the EHC was a seven-page (i.e. 3.5 pages double-sided), A3 landscape booklet, which was manageable for interviewers and fitted easily on a standard office desk.

Recording systems were designed to allow interviewers to collect information on the EHC. The mode of recording reflects the type of variable being considered, and how much additional information is required beyond the timing of an activity. The basic notation for recording timing is an 'X' used to indicate both the start and end of a period, with a line drawn between the two symbols to indicate that the activity is ongoing between the two dates. When further information is collected, two methods are usually employed: (1) incorporating a system of symbols, with categorical meanings, to denote the start of the period; and (2) adding additional calendar rows dedicated to that particular life domain (space permitting). Both these methods were used in the EHC used for this project.

Figures 4.5 - 4.7 illustrate the recording systems for employment, partnering and study histories respectively. Note that jobs, live-in relationships and courses of post-school study were chronologically numbered on the EHC (for use in future work).

Figure 4.5 Calendar recording system for periods not working, and periods in main jobs



a: L = looking, PL = paid leave, UPL = unpaid leave, PML = paid maternity leave, UPML = unpaid mat. leave, S = study, T = travel , C = childcare/home duties, I = injured, sickness or disability, Car = caring for an ill/disabled person, V = unpaid volunteer work, O = other.

b: P = permanent, FTC = fixed-term contract, C = casual, SE = self-employed

Figure 4.6 Calendar recording system for periods of live-in relationships

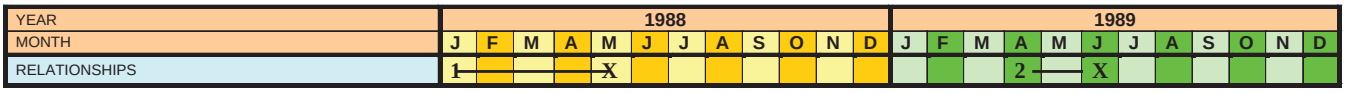


Figure 4.7 Calendar recording system for periods of study

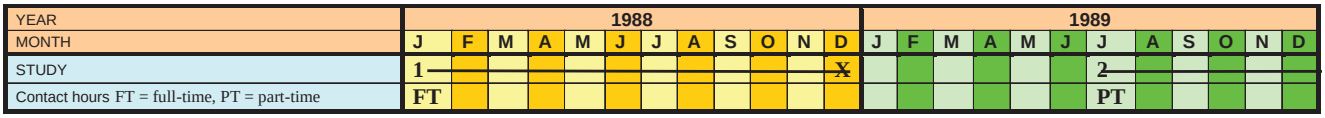


Figure 4.5 describes a situation in which a period of unemployment was followed by working in a job - initially on a casual, followed by a permanent, basis. Another period of unemployment followed, after which a second permanent job was attained.

Figure 4.6 shows the recording system for live-in partnering. The figure shows two discrete periods of 'live-in' relationships. Blank months in this row indicate that the participant was not in a live-in relationship at that time. Since the start symbol was chronological live-in partner number, if a couple ceased and recommenced a live-in relationship, the second (and subsequent) periods were delineated with the same partner number.

Figure 4.7 illustrates the recording system for periods of study. Blank months in the study row indicate that the participant was not enrolled in a course of study at that time. In this example, the participant studied towards the first course FT for one year. The following year, a course was studied PT in the second half of the year.

As seen in Figure 4.5, information about 'not working' and 'main jobs' was collected on separate calendar rows. When the calendar was completed correctly, each month from the month after the participant left school for the first time to the month of the interview, contained an employment activity in either the not working or main job row. Note that the abbreviations for not working periods, as recorded on the EHC, do not correspond directly with technical definitions. Instead they were chosen to complement the language being used in the communication between interviewer and participant.

In Figure 4.7, note that the two study rows are repeated - the EHC contained four rows in which information on courses of study were collected, to allow for two concurrent courses of study. Of course, it is possible to be studying in three or more courses at one time. However, this was felt to be sufficiently rare as to not be necessary on the calendar (when considering the additional space required). In the event that this did occur, interviewers were instructed to ask the standard questions and record the answers in note form on the calendar. These notes were entered into the database in the same manner as data recorded on the calendar would be entered.

Note that no end dates are recorded on calendar rows 'employment contract' (Figure 4.5) and 'contact hours' (Figure 4.7). Information in these rows describes main jobs,

and courses studied, and is recorded at the start time of these periods. When the type of contract or contact hours changed within a job/course, the new arrangement was recorded in the month at which the change occurred.

A calendar year of study was recorded from January to December, whereas single semesters were recorded from January to June and July to December. This recording method reflects the structure of tertiary education in Australia, where most participants pursued their studies. This recording method may slightly over-estimate the number of months spent studying per semester, but any resultant impact on analyses was outweighed by the benefit to interviewers of this simplification, which avoided the need for burdensome questioning regarding precise months of study.

It is useful to reflect on implications of collecting data according to a defined unit of time (one month in this instance). Given that the minimum unit of time on the EHC was one month, an activity period had to apply for *the majority of a calendar month* (i.e. for at least two weeks in that month) for it to be recorded on the EHC. An exception was made for study, since piloting showed that some courses leading to qualifications were very short in duration.

4.6.1 Other design features of the Event History Calendar (EHC)

This section will briefly describe innovations of the EHC compared with those described in the literature. It may be useful to refer back to Figure 4.4 (page 86) when reading this section.

Reference rows, labelled according to time dimensions, are traditionally included at the top of EHCs and used by interviewers to facilitate participant recall. The LJYWP EHC contained four such rows. The ‘life period’ reference row included in the LJYWP EHC was an innovation used to orient participants to broad periods of their life. Seven life course bands were constructed based on age, and the reference row labeled accordingly. For example, years in which participants turned 20 to 23 years old were labeled as ‘early twenties’. Interviewers were trained to use the reference rows as prompts throughout data collection.

The order that calendar rows appeared on the calendar (from top to bottom) was not the order in which information was collected, but an arrangement that facilitated the

interviewer to best use calendar information to prompt the participants and to check for consistency of information. This has not been discussed in the literature, to my knowledge. An example is that the study rows were positioned next to the employment arrangement rows.

For a similar reason, prior to the interview commencing, information collected at wave 1 regarding the timing of childbearing was recorded immediately above the not-working EHC row. This was done despite the fact that childbearing and pregnancy information was collected within the conventional questionnaire for the LJYWP (not the EHC), because it was such an important reference point for cross-checking employment information.

Information about each main job (occupation, main tasks and other descriptive information) was written on the bottom of the calendar in purposively designed rows (not shown in Figure 4.4). This information was not able to fit into the main calendar, but was extremely useful for interviewers to refer to throughout the collection of the job history information, and thus was more appropriately written onto the EHC as opposed to in the questionnaire.

To assist interviewers to record information quickly and accurately, the system of recording symbols was written onto the calendar in the left hand column. Whilst I intended to delete this information after the training period (to avoid extraneous clutter), interviewers found it useful and requested it be retained.

To facilitate use of the EHC, the following features were incorporated:

- The calendar month reference row was repeated mid-way down each calendar page.
- Alternate months were coloured differently, and the colour scheme was alternated between calendar years.[150]
- Colour was used to differentiate between the rows that collected information about cohort members, their relationships, and their partners.
- Lines separating calendar months were removed from some rows, when piloting indicated it was difficult to record information in available space.

4.6.2 Using the Event History Calendar (EHC)

The figures outlining sequences of questions that were presented earlier in the chapter provided the basis from which event history data was collected on the EHC (Figures 4.1 - 4.3). While the precise information, and some design features, of the LJYWP were unique, the way that it was used by interviewers to facilitate recall was typical of examples described in the literature. Interested readers should refer to Freedman et al.[150] and Axinn et al.[151] for such descriptions. Interviewers were trained to make use of the reference row information and other information already recorded on the EHC in order to prompt participants to provide information as accurately as possible. Cross-checking between calendar rows provided the interviewer with an opportunity to notice and correct certain types of inaccuracies in information provided by the participant, and errors that they made in recording information on the EHC. As interviewers gained experience they were able to do increasing amounts of cross-checking whilst maintaining the flow of the interview.

Decisions about how the EHC was integrated into the interview, and how to order interview topics represented a balance between burden to the interviewer and participant. When an EHC is used within an interview also involving a questionnaire, options include collecting all of the EHC data at once (either before or after the other components of the questionnaire), or interspersing the collection of EHC data throughout the questionnaire. There are advantages and disadvantages associated with each option, and Freedman discusses these in some detail.[150] In this project, all of the broad topics covered in the EHC were also addressed in the questionnaire. To assist participant recall, and to avoid repetition in the interview, it was best to complete each topic before moving to the next topic, which necessarily meant that the interviewers needed to seamlessly move back and forth between the two survey instruments. Since there is a precedent for this in the literature[167]and since great care was taken to find appropriately skilled interviewers (as will be discussed in the next chapter), this was a reasonable approach.

The ordering of topics collected on the EHC was standardised for all participants. It has been suggested that ordering questions in the most natural way for each respondent will increase his/her recall ability, for example, by asking them to choose the life domains they remember best, and starting with them.[151] However, this was too burdensome for

interviewers considering that they were also required to alternate between the two survey instruments. Rather, in order to facilitate recall I followed recommendations made by Dex[67] to start with more simple recall tasks and work towards more complex ones. In particular Dex suggests starting with geographical histories, followed by marital histories, and ending with work histories (p. 7). In the LJYWP interview, educational histories were collected prior to work histories since they were likely to be easier to recall.

There is some discussion in the literature regarding the use of 'landmark events' to 'prime' people for life course recall exercises.[cc] Participants are asked to nominate key significant events in their lives (and the timing of such events) at the start of an EHC-based interview. These events are recorded on the EHC, often in the reference rows, and used as key material from which to prompt participants about the timing of other events or life periods. Whilst I considered using landmark events in this way, early piloting suggested that the use of the Participant Completed Calendar (PCC) provided participants with a more effective way to improve the quality of data they could provide, and that the additional time taken in the interview to use landmark events was not warranted.

4.7 THE LIFE JOURNEYS OF YOUNG WOMEN PROJECT PARTICIPANT COMPLETED CALENDAR (PCC)

The second area of innovation in terms of survey instruments for the LJYWP was the use of a PCC which participants were asked to complete prior to their interview. There were three main advantages to the use of the PCC in the LJYWP: (1) it provided participants with an opportunity to think about key dates in their own time, and to check their records such as curricula vitaes (CV); (2) the process of filling in the calendar 'enabled' all the advantages of EHC use, such as detection and correction of dating errors through consistency checking across life domains; and (3) the PCC acted as a

[cc] See Glasner and van der Vaart for a review of how landmark events are used in EHCs.[153]

visual cue for the participants to refer to throughout the interview, facilitating the collection of information on life events not recorded on the PCC.

This section will discuss the design of the LJYWP PCC in some detail. Great care was taken at this stage of project development since a tedious pre-interview undertaking may prompt some individuals to avoid participation in an interview. Discussion of PCC design here is particularly pertinent since there is very little literature on this topic. Integration of the PCC into the interview schedule, and in particular the relationship between the PCC and EHC will also be discussed, given that this is the first study to my knowledge to incorporate both instruments.

An abbreviated version of the PCC designed for this project is shown in Figure 4.8 (calendar years after 2005 are missing). Appendix 3 provides the PCC instructions that were sent to participants.

In general, three types of variables were involved in the PCC exercise: (1) high priority variables - those for which the dating accuracy was especially important (e.g. employment arrangements), (2) information that was easy to recall (e.g. birth of children), in order to assist participants to provide high quality data on the former, and (3) other information that was likely to be contained in personal records (e.g. dates of home ownership, employment records). All constructs used in analysis in this thesis were included on the PCC.

So as not to overburden participants or risk non-participation in the interview, only a subset of information collected at interview was included in the PCC exercise. Importantly, I did not want participants to spend any more than 20-30 minutes completing the calendar. Piloting the PCC was crucial considering that the time taken to complete the calendar was dependent on the complexity of one’s life history.

Figure 4.8 Abbreviated version of the Participant Completed Calendar for the Life Journeys of Young Women Project

	Year	Study	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Income Support
Mid teens	1989		Jan 1989	Feb 1989	Mar 1989	Apr 1989	May 1989	Jun 1989	Jul 1989	Aug 1989	Sep 1989	Oct 1989	Nov 1989	Dec 1989	□
	1990		Jan 1990	Feb 1990	Mar 1990	Apr 1990	May 1990	Jun 1990	Jul 1990	Aug 1990	Sep 1990	Oct 1990	Nov 1990	Dec 1990	□
Late teens	1991		Jan 1991	Feb 1991	Mar 1991	Apr 1991	May 1991	Jun 1991	Jul 1991	Aug 1991	Sep 1991	Oct 1991	Nov 1991	Dec 1991	□
	1992		Jan 1992	Feb 1992	Mar 1992	Apr 1992	May 1992	Jun 1992	Jul 1992	Aug 1992	Sep 1992	Oct 1992	Nov 1992	Dec 1992	□
	1993		Jan 1993	Feb 1993	Mar 1993	Apr 1993	May 1993	Jun 1993	Jul 1993	Aug 1993	Sep 1993	Oct 1993	Nov 1993	Dec 1993	□
Early 20s	1994		Jan 1994	Feb 1994	Mar 1994	Apr 1994	May 1994	Jun 1994	Jul 1994	Aug 1994	Sep 1994	Oct 1994	Nov 1994	Dec 1994	□
	1995		Jan 1995	Feb 1995	Mar 1995	Apr 1995	May 1995	Jun 1995	Jul 1995	Aug 1995	Sep 1995	Oct 1995	Nov 1995	Dec 1995	□
	1996		Jan 1996	Feb 1996	Mar 1996	Apr 1996	May 1996	Jun 1996	Jul 1996	Aug 1996	Sep 1996	Oct 1996	Nov 1996	Dec 1996	□
	1997		Jan 1997	Feb 1997	Mar 1997	Apr 1997	May 1997	Jun 1997	Jul 1997	Aug 1997	Sep 1997	Oct 1997	Nov 1997	Dec 1997	□
Mid 20s	1998		Jan 1998	Feb 1998	Mar 1998	Apr 1998	May 1998	Jun 1998	Jul 1998	Aug 1998	Sep 1998	Oct 1998	Nov 1998	Dec 1998	□
	1999		Jan 1999	Feb 1999	Mar 1999	Apr 1999	May 1999	Jun 1999	Jul 1999	Aug 1999	Sep 1999	Oct 1999	Nov 1999	Dec 1999	□
	2000		Jan 2000	Feb 2000	Mar 2000	Apr 2000	May 2000	Jun 2000	Jul 2000	Aug 2000	Sep 2000	Oct 2000	Nov 2000	Dec 2000	□
Late 20s	2001		Jan 2001	Feb 2001	Mar 2001	Apr 2001	May 2001	Jun 2001	Jul 2001	Aug 2001	Sep 2001	Oct 2001	Nov 2001	Dec 2001	□
	2002		Jan 2002	Feb 2002	Mar 2002	Apr 2002	May 2002	Jun 2002	Jul 2002	Aug 2002	Sep 2002	Oct 2002	Nov 2002	Dec 2002	□
	2003		Jan 2003	Feb 2003	Mar 2003	Apr 2003	May 2003	Jun 2003	Jul 2003	Aug 2003	Sep 2003	Oct 2003	Nov 2003	Dec 2003	□
Early 30s	2004		Jan 2004	Feb 2004	Mar 2004	Apr 2004	May 2004	Jun 2004	Jul 2004	Aug 2004	Sep 2004	Oct 2004	Nov 2004	Dec 2004	□
	2005		Jan 2004	Feb 2004	Mar 2004	Apr 2004	May 2004	Jun 2004	Jul 2004	Aug 2004	Sep 2004	Oct 2004	Nov 2004	Dec 2004	□

One method of reducing burden to participants at this stage was to reduce the amount and precision of information required. For example, regarding live-in relationships, participants were asked to record 'times you have lived with a partner' on the PCC. At interview, interviewers refined this information according to the clarification issues in Table 4.4, page 85. However, I decided not to simplify employment questions. Piloting revealed that participants were unfamiliar with contractual arrangements, and providing definitions during the interview was time consuming. Providing definitions on the PCC increased the burden of the PCC exercise but improved interview data quality. Unfortunately most people seem not to have records regarding contractual arrangements of past jobs.

PCC recall tasks were ordered from simple to complex in line with the principles of recall facilitation discussed previously. For example, instructions regarding periods of study came before those on employment arrangements.

As suggested by Cook et al.,[157] it was important that PCC instructions were as clear and concise as possible. In conversation, Dr Walter van der Vaart, who was at that time working at the Department of Social Research Methodology at VU University Amsterdam (now at Wageningen University and Research Centre), suggested that the entire instruction sheet be limited to one page in dot point form (van der Vaart, oral communication, 4th September 2007). For the LJYWP, dot points were used wherever possible, and all primary instructions fit onto one A4 page. The reverse side was used to supply definitions, and space for participants to record information to supplement that recorded on the PCC. A tactic to shorten instructions and decrease burden was to allow participants to record information on the calendar however they wanted, as opposed to providing instructions about symbols to use.

The PCC was the size of one A3 page, which was appropriate without being cumbersome. To fit all desired information, the orientation of the calendar differed from the EHC. Referring to Figure 4.8, each row of the PCC corresponded to one calendar year, and was divided into months. Timing cues were provided on the calendar in the top row (calendar months), and in the first two columns (life course periods - corresponding to those on the EHC, and calendar years). As a further reference cue, participant age was marked in the relevant month for each calendar year prior to

sending calendars to participants. Based on feedback from pilot participants, month and year cues also appeared (in faint text) in each square of the calendar, to facilitate accurate recording and reduce errors during the interview. As with the EHC, three versions of the calendar were used, reflecting the three birth years of cohort members.

The participant recorded information about various life domains on the calendar. Most information was recorded at the month-level. However, as a space-saving device, information on study was recorded at an annual level in a purposive column (see Figure 4.8, third column); precise timing of study was ascertained at interview. The study column was positioned so as to enable easy reference to study information whilst recording work details in the calendar. Income support information was only required at an annual level and was recorded in a purposive column (see Figure 4.8, last column of calendar).[dd]

I aimed to retain cohort members who had trouble with the PCC. The instruction sheet and PCC provided phone numbers that could be used to seek assistance with filling out the calendar. However, since this required participant effort, instructions indicated problems could instead be discussed at the interview.

The PCC, EHC and interview schedule were designed to co-ordinate such that no information was wasted and there was no repetition in conversation. During an interview, information recorded on PCCs was usually collected at the start of the interview section related to that topic, and then used as a building block to ask participants for further information on the same issue. For example, participants recorded courses of study on the PCC. In the interview the interviewer recorded this information on the EHC, clarified the timing of the study, and asked additional questions, including the FT/PT study status. Interviewers were trained to help participants refer to their PCC when prompted for the timing of events not recorded on

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[dd]Income support was defined as government benefits, allowances, or pensions. This information is not relevant to this thesis.

the PCC. In this way the periods on the PCC were used as visual cues to facilitate recall of other life events, in line with the way that EHCs can be used in face-to-face interviews to facilitate data quality.

Pilot testing was crucial for the PCC since little is known about how these relatively new instruments are best designed and used. A number of rounds of testing the instrument alone were conducted prior to testing it in conjunction with the interview. Pilot tests were conducted with personal contacts with varying life circumstances. Foci of testing were: clarity of instructions, completion time, and participant perception of burden. Final stages of piloting indicated that the majority of participants completed the calendar in 15 to 25 minutes. Piloting resulted in the following strategies that aimed to decrease burden and motivate cohort members:

- Small coloured stickers were used to brighten the PCC instruction sheet and draw attention to the most important section - the employment section.
- Instructions clearly stated the PCC would not be collected by study investigators: 'The calendar is for you only - we won't ever ask to see it.' This was added so participants did not spend unnecessary time neatening PCCs in order that they be legible to others.
- Two brightly packaged tea bags were sent with the calendar with a note suggesting that they have a cup of tea whilst filling it out. This was to create rapport and acknowledge that it was a task that would take some time.
- A pencil with eraser was included with the PCC when sent to cohort members, since it became apparent that pilot participants did not always have these at home, creating difficulty using the calendar in the way in which it was envisaged (i.e. cross-checking, correcting etc).

The next chapter describes the procedure followed in contacting cohort members. The procedure included introducing the concept of the PCC and encouraging participants to complete it. Of course, despite all efforts taken to motivate and encourage participants to do so, the risk remained that some participants declined to participate because of the work entailed in the PCC. The extent to which this occurred is not knowable. Once fieldwork is completed for the LJYWP, it will be instructive to reflect on the LJYWP

response proportion in comparison to second wave interviews of other longitudinal studies based on female cohorts of comparable age.

4.8 THE LIFE JOURNEYS OF YOUNG WOMEN PROJECT INTERVIEW SCHEDULE

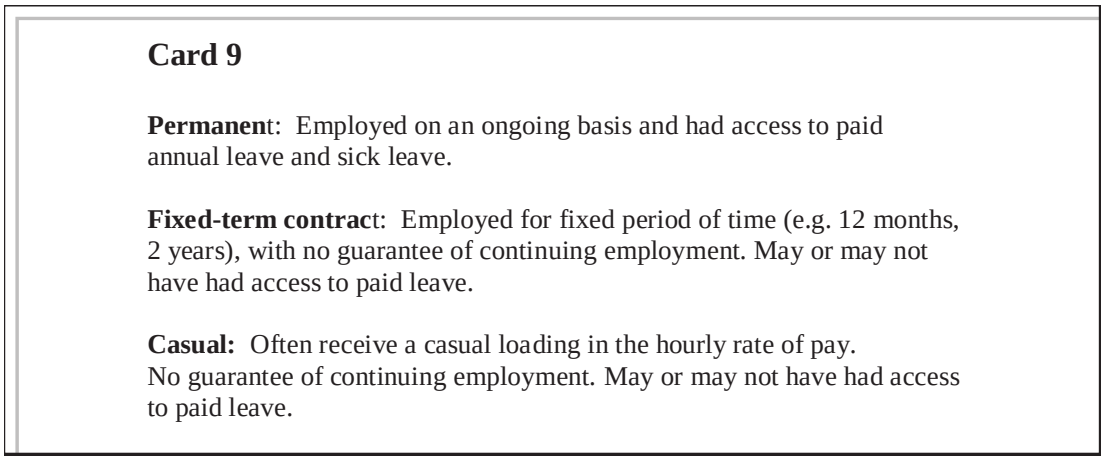
The LJYWP interview schedule was a combination of a conventional questionnaire and instructions to interviewers about the conduct of the interview, including movements between the EHC and questionnaire. The LJYWP interview schedule was 70 pages in length, and while drafted by myself as an integral component of my PhD candidature, contained many more questions than those presented in this thesis. Rather than discuss non-relevant components of the interview, this section will discuss more general issues surrounding the design of interview schedules (and questions) for life course studies, longitudinal studies, and complex interviews.

As with the EHC, the entire LJYWP interview was highly structured and inflexible regarding the ordering of topics. Fertility histories were collected within the interview schedule *after* other recall tasks, despite general recommendations that they be collected early as they are relatively easy.[67] This was because entire reproductive histories were gathered, including details of pregnancies not ending with a live birth (e.g. miscarriages, terminations), and following generic principles of questionnaire design, sensitive questions are best placed towards the end of an interview, when rapport has been established.

It was appropriate that interviewers referred to information collected at wave 1 when LJYWP interviews built upon, or updated, this information. Relevant wave 1 data, such as details of past pregnancies, were included in the LJYWP interview schedule using a mail-merge mechanism, and interviewers were trained in their use.

A booklet of 53 cue cards was used by participants to assist with questions involving multiple answer options. An example of a cue card is shown in Figure 4.9.

Figure 4.9 Example of a cue card used to assist participants to provide question responses in the Life Journeys of Young Women Project



Such devices are commonly used for in-person, but not telephone, interviews. The cue card booklet was sent to participants at the same time as the PCC. Throughout the interview, interviewers directed participants to the appropriate cue cards as required. An interesting lesson learnt in the early stages of fieldwork was that it was important *not* to include the relevant question on the cue card (along with the answer options), because many participants read through the cue cards and circled their 'answers' prior to the interview. Not only did they spend a lot of unnecessary time preparing for the interview, often their interpretation of the questions was not in accord with the meaning, leading to confusion in the interview.

Loxton and Young, based on their experiences with the Longitudinal Study of Australian Women's Health, suggest the survey format has an equal role of importance once the content has been agreed.[168, p. 119] In the case of the LJYWP, specific attention to formatting over and above what is standard in questionnaire design was required in order to facilitate interviewers to manage the complex, lengthy interview. Accordingly, different fonts, coloured texts, and background colours indicated:

- Data imported from wave 1
- Question clarification points
- Use of EHC
- Use of worksheet

- Use of cue cards
- Skip/routing instructions
- Change of topic

The complexity of the interview schedule did not allow for a data entry column, a common technique employed to facilitate data entry. As a result of consultation with the specialist team who conducted data entry for this project, yellow background highlighting was used to bring the attention of data entry staff to information requiring data entry.

4.9 THE FINAL STAGE OF PILOT TESTING

As with any questionnaire development, pilot testing at various stages was important in the development of the LJYWP survey instruments and interview schedule. Throughout this chapter I have reflected on piloting specific to individual stages of survey development. The final stage of piloting incorporated all aspects of the LJYWP interview, including participants completing a PCC prior to their interview. Nineteen interviews were conducted at this stage. Interviews were conducted by the five interviewers who were employed for the LJYWP, as the final component of their training program (which I designed and managed, as discussed in Section 5.3), one month prior to commencing project interviews. Pilot participants were a convenience sample of women of approximately the same age as the Lucina cohort.

This stage of pilot testing highlighted the necessity of putting aside resources for this purpose, particularly when complex interviews (such as LJYWP interviews) are being developed. A number of issues were raised, such as questions that were unexpectedly sensitive or confronting, questions that were not universally understood as intended, and the need for interviewers to be able to provide comprehensive explanations as to why certain questions were being asked. However, the most salient concern at this stage of pilot testing was the need to manage participant fatigue throughout the interview in order to obtain the highest quality data possible.

Due to its likely impact on fatigue and motivation, and potential impact on participation in future Lucina projects, the total duration of interviews was an ongoing concern through the development of survey instruments and piloting of interviews. The

mean length of pilot interviews was one hour and 20 minutes (n=14 pilot interviews completed and timed), minimum was 45 minutes, and maximum was 2 hours. In comparison to the German Life History Study in which some interviews were up to six hours,[69] this was acceptable. However, compared to the first wave of Lucina interviews, and to standard survey interviews, the LJYWP pilot interviews were long (and far more complex). This both highlighted the need to consider carefully how to inform cohort members of likely interview duration, and emphasised the need to manage participant fatigue in the interview. I was particularly concerned that participants not be too fatigued by the time the work history section was reached in the interview.

Observations of pilot interviews suggested skilful handling of collection of EHC data could greatly reduce participant anxiety levels, and in turn influence fatigue and motivation. There was a need to collect the most accurate data possible, whilst at the same time convey to participants an understanding that job histories in particular are difficult to remember. Inserting comments such as 'even if you can't be spot-on', 'as best you can remember', and 'this can be hard, but…' appeared to facilitate communication. Also, presenting the EHC task as a team effort between the participant and interviewer, in which both were working equally to achieve the end result, appeared motivating for the participant. Through cross-checking with other information collected earlier in the interview the interviewer could show that they had not only listened, but were actively engaged in helping the participant throughout this section of the interview.

Participants raised a number of issues that they found burdensome or de-motivating, resulting in a list of suggestions that included ensuring transitions between topics were clear and smooth, that a conversational tone was maintained, and that participants were regularly informed of their progress throughout the interview (for example, 'We're about half way through the interview', or 'Only two more questions to go'). Maintaining a natural conversational tone was particularly challenging since interviews were highly scripted. These issues were of greater importance in LJYWP interviews than standard interviews, given their complexity and length.

A further issue that arose in piloting was the importance of allowing for breaks throughout the interview, both physical breaks (toileting, getting a drink), and

intellectual breaks (short, light-hearted, tangential conversation). Finally, pilot testing over the telephone showed the importance of participants being in a quiet environment where they were unlikely to be interrupted. These issues guided development of pre-interview and interview procedures.

The main limitation of piloting was that women with higher levels of education were over-represented in the pilot group, despite efforts to avoid this. Given the complexity of the interview and in particular the tasks related to the EHC, interview duration and fatigue levels were likely to be a greater concern with women from lower educational backgrounds. Although this group were not important to the theory underlying this project, they are integral to the longitudinal Lucina cohort - reinforcing the need to manage fatigue of participants when data collection was undertaken with the cohort.

A key difference between pilot and fieldwork interviews was that all pilot participants had completed the PCC prior to the interview. The next chapter will discuss how interviewers were trained to manage situations in which the PCC had not been completed, or only partially completed (given that PCC completion was a key strategy for improving data quality).

Fatigue of interviewers was also an issue highlighted in the piloting process. In terms of impact on data quality it was vital that I managed this issue almost as much as it was important for the interviewers to manage the participants' fatigue. Providing a thorough interviewer training program and a multi-facetted interviewer support system were vital, and will also be discussed in Chapter 5.

4.10 SUMMARY

In summary, this chapter described the development of a methodology for collecting event history data, and presented the Event History Calendar (EHC) that was developed for this project. A Participant Completed Calendar (PCC) was also developed and presented, and the relationship between the two instruments was described. Key parameters of the interview schedule were discussed, particularly as they pertain to complex interviews involving EHCs. Lessons learnt in the final stage of pilot testing were outlined, and in particular, resultant strategies designed to reduce participant

fatigue were discussed.

The data collected on the Life Journeys of Young Women Project EHC will result in the most detailed dataset on employment histories of any study of this design, and the only such dataset to collect information on *contractual job arrangements*. Furthermore, it collects more complete *partnering histories* than any study of this design or indeed any large-scale panel study, to my knowledge. This dataset therefore provides unique analytical opportunities in terms of the information collected in combination with the level of detail at which it was collected (event history data at the month-level).

The following descriptions provided in this chapter will make unique contributions to the EHC literature: the challenges involved in collecting data based on technical definitions (such as contractual job arrangements), the design of a PCC, and the manner in which the EHC was used in conjunction with the PCC in this study.

I would like to acknowledge that the processes of developing and piloting survey instruments represents ~ 2 years of work in my PhD candidature. To put this into perspective, it takes over a year to develop a follow-up survey for the Australian Longitudinal Study on Women's Health.[168] However, surveys from that study do not include innovative instruments (such as EHCs or PCCs), and development is performed by a team of academic experts with resources specifically allocated for that purpose (in comparison with the LJYWP survey instruments which were designed and piloted by myself, with guidance from supervisors, and no dedicated funding).

CHAPTER 5 Fieldwork

5.1 INTRODUCTION

Despite response proportions and data quality being fundamental to the conduct of epidemiological research, epidemiological journals appear relatively disengaged from discussions about the influence of fieldwork processes on these matters. This lack of explicit acknowledgement of the importance of, and resultant lack of access to, innovations in fieldwork processes is likely to result in lower quality studies and in inefficiencies as individual studies are conducted without benefiting from lessons learnt elsewhere. It is also likely to exacerbate the lack of support that funding bodies commit to the development of such strategies and the quantification of their benefits.

To collect data of the highest possible quality, retrospective life course studies (and particularly those involving Event History Calendars - EHCs) necessitate more comprehensive and specialised interviewer training,[150] closer monitoring of interviews,[140] and higher levels of interviewer support,[140]than is routinely encountered in epidemiological fieldwork. Also, the use of Participant Completed Calendars (PCC) require skilful management since evidence suggests they may decrease response proportions (as was discussed in Sections 3.6 and 4.7). Although these issues are recognised within the EHC and retrospective life course research literature, there are few detailed descriptions available upon which other researchers can design their study procedures.

This chapter first considers processes designed to enhance data quality: the recruitment and training of interviewers (Sections 5.2 and 5.3), the implementation of a quality monitoring framework (Section 5.4) and efforts taken to support the interviewers throughout the fieldwork phase (Section 5.5). The second part of the chapter discusses the facilitation of study participation in general (Section 5.6), and with regard to cohort sub-groups requiring a more targeted approach (Section 5.7). I focus on the strategies required over and above what would be warranted in more straightforward fieldwork situations. It is outside the scope of the chapter to discuss procedures used for tracing participants or other issues specific to maintaining cohort participation in the context of the longitudinal Lucina Study.

Throughout the chapter I reflect on decisions made, particularly concentrating on issues to be shared with researchers planning to conduct interviews incorporating EHCs, or other complex interviews, in the future. Thus, this chapter forms an integral component of the intellectual contribution and scholarship offered by this thesis.

5.2 INTERVIEWER SELECTION

Compared with more straightforward research interviews which consist of administering questionnaires, the quality of the data collected in retrospective life course studies, and particularly those involving EHCs, is more reliant on high-quality interviewers. Bruckner and Meyer comment that in the German Life History Study, to their surprise 'it was …the interviewers who presented the most difficulties throughout the entire data collection process…although a great deal of effort was made to supervise and support them.'[140, p. 167-8] In addition to the usual inter-personal and technical skills required of interviewers, they need to use scripted (and at times, unscripted) question sequences, move smoothly back and forth between the EHC and questionnaire, fill in the calendar using the correct (specific) symbols, whilst constantly monitoring for consistency of timing between life domains/topics discussed with the participant. Further, due to the complexity and length of the interviews, interviewers need to manage their own and participants' fatigue and motivation levels throughout interviews. Therefore, interviewers for such projects need to be capable of high-level multi-tasking within a tightly structured interview schedule, and need to be extremely motivated, in order to obtain high quality data. In order to achieve this, research investigators need to focus attention on choosing appropriate interviewers, training them thoroughly, and supporting them throughout the fieldwork phase of the project. The first of these issues will be discussed in this section, whilst the others will be the focus of latter sections of this chapter.

Despite the crucial role that interviewers play in obtaining high quality EHC data, there is very little discussion in the EHC literature about their selection. Two research groups mention previous interviewing experience guided the selection of interviewers;[140 150] one group specify the experience was with 'relatively complex' interviews.[140] The same group also mention interviewers' levels of education as being important, but do not specify the relevant criteria.

I designed a recruitment strategy for the LJYWP (with Associate Professor Vivienne Moore), which included carefully worded selection criteria, a higher salary than usually offered for casual fieldworker positions, a targeted advertising campaign, and rigorous interviews conducted with short-listed applicants. The job advertisement and selection criteria used to employ LJYWP interviewers are shown in Appendices 6 and 7. The questions used for interviewing short-listed applicants appear in Appendix 6. Recruitment procedures from Human Resources at the University of Adelaide were followed at all stages in the recruitment of interviewing staff.

Previous interviewing experience was not listed as an essential criterion for the LJYWP interviewer jobs. Given the unique and complex tasks required of interviewers in this project, we felt that the required skill set was vastly different from that necessary for the conduct of standard research interviews. We decided that sophisticated cognitive skills, as opposed to previous interviewing experience (of a straightforward nature) was a more relevant indicator of potential to conduct complex interviews, and several essential selection criteria reflected this.

A university degree in a health or social science field was listed an essential criterion. While a health background may be more likely to convey an understanding and aptitude for quantitative research designs and structured interviewing techniques, a social sciences background would likely encompass an appreciation of the theoretical underpinnings of the project, and experience in complex interviewing for research purposes. Both were likely to be beneficial and thus included in the criteria, with the research team willing to provide support and education in content areas in which interviewers lacked knowledge.

A targeted job advertisement strategy focussed towards postgraduate students in relevant university departments was conducted. Students were targeted because they were likely to be available to conduct interviews at night and on weekends.

Promoting the interviewer role as one which was highly skilled and valued, and renumerated as such, was a useful strategy. Interviewing in the survey industry is often ‘socially and economically constructed as marginal and temporary employment’,[165, p. 9] (particularly with the advent of telemarketing), despite the quality of the data depending

upon the interviewers' enthusiasm for, and commitment towards, their work. Interviewers with high level skills may be attracted and retained in interviewing roles if recruitment strategies and work environment attempt to redress the typically low pay and marginalisation of these roles. Thus, a high wage relative to other interviewing roles in the research setting was offered, and the value placed on the interviewer within this project was emphasised in the job advertisement, the selection processes, and throughout fieldwork (as will be discussed). Continuing with this theme, more resources were directed towards interviewing short-listed applicants than would often be deemed appropriate for the employment of casual fieldwork staff. Short-listed applicants were interviewed by a panel of four, including myself, Associate Professor Vivienne Moore, the Lucina Study project co-ordinator, and an independent team leader with extensive experience of hiring casual staff.

The size of the interviewer team was another consideration at this stage. I decided to engage a small team to allow for more intensive training and support,[140] despite the consequent increase in duration of the fieldwork phase.

As a result of this recruitment processes, 47 people applied for an interviewer job, 13 were interviewed, and five were employed. At the time of employment, one was a post doctorate, two were PhD candidates, one was a Masters student and the other had recently completed an Honours degree. Two of the interviewers had backgrounds in Anthropology, two in Psychology, and the other had a background in Law/Psychology/Health Sciences. Two of the five left the team within two months of employment, in part because the work was not complementary to their skill-set. An additional interviewer left within this timeframe for personal reasons. As a result, a second recruitment process was undertaken and targeted towards postgraduate Psychology students, as a result of our experiences to that time. A further three interviewers were employed: two were studying towards their Masters degrees and the third was completing a double undergraduate degree. Two were studying in the discipline of Psychology, and the third in Law/Social Sciences. The two original interviewers and three new interviewers were retained until the end of the fieldwork period, suggesting our efforts to value them were successful.

Throughout this thesis it is clear that a certain level of creativity and insight was required at most stages in the design and management of this research project. This certainly applied to the selection (and management) of interviewing staff. On reflection our experiences validated the decision to prioritise sophisticated cognitive skills over previous interviewing experience. However, we were not able to be 100% efficient in terms of interviewer selection, and whilst I would recommend following the same basic selection strategy as articulated, there are two points at which the recruitment process could have been improved.

The first concerns the type of previous experiences most indicative of the appropriate cognitive skill-set. Reflecting on the LJYWP, it appears that experience in taking psychological histories, or at least undertaking training in clinical psychology, is a useful proxy. Taking such histories involves following a reasonably structured overall framework, but also involves a large degree of flexibility in terms of the question sequences and wording which will obtain the desired response from each individual. Also, as in LJYWP interviews, in such situations an increasing amount of information must be retained by the interviewer and used for cross-checking as the interview progresses. Ethnographic work, whilst not usually quantitative in nature, also involves similar cognitive skills. Recruitment strategies for similar projects in the future could be more specifically directed to groups of people likely to have such skills (as we did in the second phase of recruitment for this project).

The second point concerns the conduct of referee checks. On reflection, a general reference was not always the most helpful in recruitment for this project. Rather, questions ascertaining applicant's cognitive style were necessary; in particular, mental agility, ability to multi-task, and attention to detail. The specificity of information required from referees may also necessitate asking applicants to provide details of the most appropriate referees, if they are not included in the job application.

5.3 INTERVIEWER TRAINING

Interviews involving EHCs require intensive and comprehensive interviewer training courses. For example, Freedman et al.[150] conducted a study which involved face-to-face interviews using an EHC in conjunction with a standard questionnaire. In addition to a

one week standard interviewer training course, interviewers participated in a six day specialised course, consisting of an initial five day session, followed by a one day review session after interviewing had commenced. Freedman noted that this was triple the training time needed for experienced interviewers on projects not involving EHCs. In the case of the German Life History Study, Bruckner and Meyer found that a small group of interviewers receiving more intensive training resulted in better quality data (fewer interviewer errors) compared with a large group of interviewers with less intensive training (written instructions only).[140] Further, an anonymous survey conducted with interviewers from this study showed that intensively trained interviewers felt more confident and well informed due to having a better knowledge of the research goals and historical context of the project, and were more interested in their work, compared with the other group.

Appendix 7 shows the timetable and contents of the interviewer training program provided to the initial team of five interviewers. The program was conducted part-time over a 3-week period. The structure of the program was based on that provided in Freedman et al.[150] and modified to meet the needs of the LJYWP project. The previous chapter has already mentioned several aspects which were important to the training provided to interviewers. Here I will concentrate on the process of training interviewers with the use of the EHC.

Training began with an exploration of the project rationale, theoretical underpinnings, and important concepts being quantified in the interview. This was supported by a series of readings that interviewers undertook as their paid 'homework'. The main component of training was a step-by-step process which progressively engaged interviewers with the EHC at levels of increasing complexity, and familiarised them with the PCC and interview schedule:

- Interviewers were introduced to the layout and structure of the EHC and provided with an explanation of a filled-in EHC to facilitate familiarisation with the classification, and notation systems.
- Interviewers practiced filling in EHCs as I read aloud progressively more complex mock life stories. I checked their work and corrected it as necessary.

- Then, I conducted a complete interview with an external volunteer who had previously filled out a PCC. Interviewers listened and recorded responses onto survey instruments, which I later checked.
- The interviewers next filled in their own PCCs, and practiced interviewing each other, taking turns at being the interviewer.[ee]
- Finally each interviewer undertook four face-to-face, and three telephone interviews with pilot participants who had filled in PCCs prior to their interview.

Telephone interviewing was seen to be potentially more difficult for interviewers due to a lack of visual cueing to guide communication, and hence was introduced after some practice at face-to-face interviews. I observed and corrected interviewing technique as much as possible throughout practice interviews, and reviewed and corrected completed interview documentation throughout the training program.

Along with standard aspects of interviewer training, such as practicing how to start and finish interviews, specific training was also provided in:

- Responding to participants who did not complete their calendar prior to the interview (to be discussed later in the chapter).
- Responding to situations when participants guessed the dates of events.
- Consistency checking using the EHC and worksheet throughout the interview.
- Handling question responses that did not fit into structured answer categories.
- Maintaining the co-operation and motivation of participants during interviews (and remaining alert to, and managing, participant fatigue).

One of the most challenging aspects of training interviewers was ensuring they could obtain the required information from participants in situations when responses provided did not fit response categories. Usually in interview situations, particularly when

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[ee] Interviewers were supported to withhold sensitive information when acting in the role of interviewee, as they saw fit. We discussed this prior to the exercise. They provided fabricated details when appropriate.

quantitative data is being collected, interviewers are trained to adhere to standardised questions. However, when collecting event history data, the unavoidable complexity surrounding the way that variables are operationalised, and the degree of engagement required from participants in interviews (and subsequent fatigue), makes it more likely that participants ask clarification questions, provide non-standard answers, or misinterpret questions, in comparison with more simple interview situations. Interviewers needed to be able to cope with such situations in order to collect appropriate information.

> … interviewing…is a walk on a knife's edge between allowing 'beneficial' adaptations of the standardised questionnaire to the 'unstandardized' individuals and avoiding bias-generating distortions.[165, p. 17]

In the LJYWP, the clarification notes discussed in Section 4.3.2 were added to help interviewers respond to the more common misinterpretations. However, of course, any number of unforeseen scenarios can occur in interviews. My approach in training interviewers was to ensure they understood the concepts underpinning the questions asked, so that any necessary adaptations were appropriate. Interviewers were therefore given far more responsibility for collecting the required data than in most other interview situations. Throughout training and the entire fieldwork period, interviewers were supported and encouraged to discuss challenging situations that arose.

Significant effort was directed at providing interviewers with enough practice that they reached a stage of comfort and ease with the interview prior to commencing fieldwork. This is particularly important since interviewer's expectations about the ease of asking questions in a particular survey may have significant effects on the quality of responses obtained.[165, p. 14] Interviewers needed to be familiar enough with the interview that they were able to start making connections between the different areas of the life story being offered, assisted by the EHC and the worksheet.

Special tutorial sessions were held in the training period to familiarise interviewers with women's reproductive issues that were likely to arise in interviews. This was particularly important since none of the interviewers had a medical or nursing background.

At the end of the training program, I led an informal feedback session regarding the training sessions. As a result, interviewers requested more training and interview practice with women who had complex pregnancy and reproductive histories. This was provided in a follow-up session by recruiting friends with long reproductive histories as participants in further practice interviews.

On reflection, there were two main limitations of the LJYWP training program. First, interviewers may have benefited from more one-on-one attention during the program. Since I had designed the EHC and interview schedule, it was difficult for anyone else to provide detailed feedback during training. However, this meant that my time was divided among five interviewers. In part to redress this, interviewers received considerable personal attention in the initial period of fieldwork, as described later in this chapter. Second, pilot participants did not provide the spectrum of challenges/experiences to interviewers that cohort members were likely to provide. For example, all volunteers had completed their PCCs prior to the interview, and were co-operative and motivated throughout interviews. Whilst discussion sessions during the training program focussed on how to handle challenging situations which may arise in interviews, such situations did not occur until fieldwork had commenced. I addressed these limitations in the second training program (provided to the additional three interviewers employed in the second recruitment period), which benefited from the three months of fieldwork conducted to that point. The first interviewer team was able to assist in their training, and recordings of genuine LJYWP interviews (recorded with the permission of participants) were used in the training program.

5.4 QUALITY CONTROL

Investigators from the German Life History Study suggest that the complexities of life course retrospective interviews warrant a comprehensive quality control system including monitoring of interviews, and providing interviewers with regular feedback and training, in order to obtain high quality data.[140] However, it is not clear to what extent monitoring processes were instigated in that particular study.

Bruckner distinguishes between visible and invisible errors, where the latter are errors that will not be picked up in the coding or cleaning stages.[165] Two examples of sources of invisible error provided by Bruckner are:

- Coders who in response to a particularly ambiguous coding scheme agreed on a 'default' code. The 'shibboleth' of the group consequently became: 'Make it a 4!' Naturally, the supervisor who used between-coder variability as a device for monitoring reliability never knew what was going on.
- Interviewers who behave as 'recording machines' conveying the impression that it doesn't matter what respondents answer as long as they do give an answer.

Bruckner uses the concepts of visible and invisible errors to distinguish between appearances and meaningfulness of retrospective life course data, suggesting that researchers should be concerned with sources of invisible errors that may alter the meaning of the data, as well as the more traditional focus of quality control, which are the visible errors.[165]

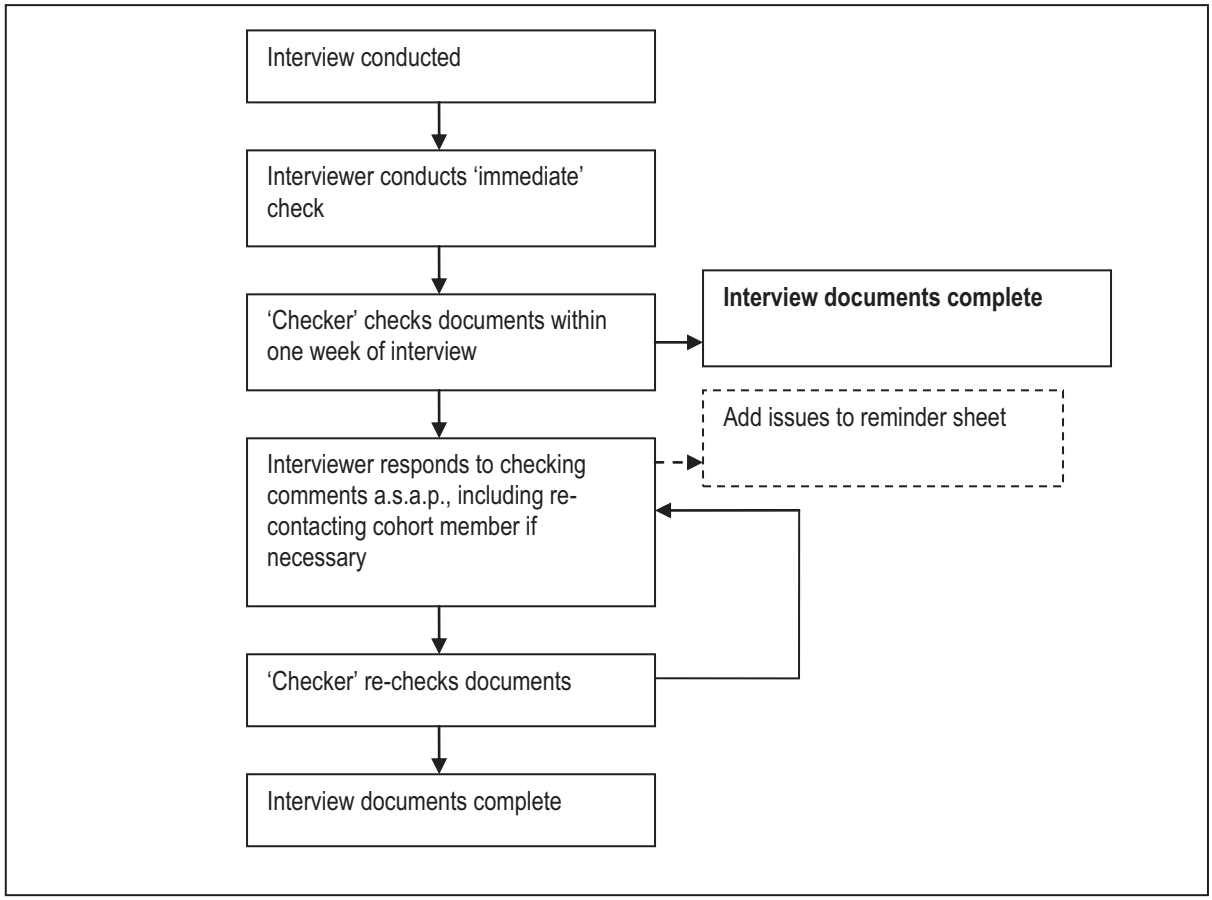
A multi-faceted quality control system was designed for the LJYWP, focussing on both visible and invisible errors. Aspects of the quality control system were initially provided at a high intensity, and then at a lower intensity when interviewers showed that they were competent and confident conducting the interviews. This section will describe the main quality control measures used.

Listening to interviews as they were conducted and subsequently reviewing interview documentation were the most direct methods of evaluating the conduct of interviews. This was particularly important in picking up instances where interviewers were unsure of the concepts being measured, as noted through observation of errors in collecting, interpreting and/or recording information. These are examples of 'invisible' errors which would not otherwise be picked up. Where possible I attended at least one of the training interviews, and the first three cohort interviews for each interviewer. After each of these interviews, I reviewed completed survey documents and provided immediate feedback.

> …improvement of the data collection process does not eliminate the task of editing each individual protocol in detail.[140]

Due to the complexity of the interviews and the EHC recording system, a systematic checking cycle was developed. The checking system is outlined in Figure 5.1. The checking proforma, used to record the checking process and for interviewers and checkers to communicate with each other, is provided in Appendix 8.

Figure 5.1 The checking cycle



It was important that each stage of the checking cycle be conducted in a timely manner for two reasons. First, if participants needed to be called back to double-check responses, this needed to be done as soon as possible. Since 20% of respondents in both the first survey and in the personal interview component of the second survey of the German Life History Study were called back to clarify data errors,[140] it was also likely to be an important issue for this project. Second, interviewers conducted up to ten

interviews each week, and the sooner the checking process was conducted the more likely they were to remember details specific to each interview.

The interviewer's immediate check was important because it was the only point in the checking cycle that invisible errors could be corrected. Instructions for immediate checks were provided on the last page of the interview schedule, and all interviewers received training on this. Interviewers were instructed to perform the checks in the order that the interview was conducted – to 'tell themselves the story from start to finish', and in particular, to check that they had represented the information provided by participants in the most accurate way possible, and that information was consistent between the sections of the interview. In addition, interviewers were trained to flag any issues that they were unsure of for discussion with checkers. Interviewers spent 20 to 30 minutes on immediate checks.

The checker similarly reviewed the documents, providing a double check for legibility, completeness and consistency of responses, and an opportunity to clarify questions asked by interviewers. It was not possible for the checker to pick up invisible errors. I acted in this checking role until the first five interviewers had been conducting cohort interviews for approximately six weeks. After that time, two of the interviewers acted in this role. Any issues that the checkers were unable to resolve were brought to my attention and discussed at fortnightly interviewer team meetings. Along with the correction of any mistakes, the checking processes provided an opportunity to identify issues which required further interviewer training, which I conducted as needed.

Despite implementing the checking cycle, at times interviewers continued to repeat their mistakes – mistakes unique to each interviewer. The reminder sheet was introduced to address this issue. Each interviewer had a personal reminder sheet, which contained notes and reminders about mistakes that they had made more than once. Interviewers updated reminder sheets based on feedback obtained through the checking cycle. Interviewers were instructed to read their reminder sheet prior to interviews, and again when doing their immediate check, to help them to avoid making the mistakes again. When an item was no longer relevant it was deleted from the sheet.

> Even after extensive pretesting researchers cannot always foresee how stimuli are perceived in the field. Hence, the role of the interviewer as a link in the communication between researcher and subject becomes ever more crucial. [165, p. 7]

Interviewer team meetings were held weekly for the first two months of fieldwork, and fortnightly thereafter. They were attended by all fieldwork staff[ff] and formed an important component of quality control for the project, since they were used as an opportunity for interviewers (including checkers) and myself to discuss any complex or unusual instances encountered in interviews, and to decide on protocols or resolutions for these situations.

The quality control strategies were approached in such a way as to avoid intimidating interviewers, and instead, to ensure interviewers felt they were supported to do the best job possible. I believe that this is the most comprehensive quality control system that has been established for fieldwork undertaken with EHCs.

5.5 INTERVIEWER SUPPORT

Whilst not widely documented, it is thought that interviewer commitment and motivation are important to the quality of data collected. In fact, Bruckner comments that 'Reduced task commitment by … interviewers may lead to incomplete, superficial, or faked data.'[165, p. 10] In order to motivate and maintain enthusiasm of interviewers, much effort was directed to supporting them and to creating a shared vision of high quality work. It was an objective to redress some of the negative perceptions of the interviewing experience, in particular the 'hired-hand' mentality, through creating a supportive, participative, working environment where interviewers were appreciated and valued. As a by-product of this objective, we hoped to retain our interviewer team until the end of the fieldwork phase (which anecdotally can be difficult), particularly in

[ff]Fieldwork staff consisted of the LJYWP project co-ordinator and the team of interviewers.

light of the considerable expense and time commitment required to train new interviewers for the project.

All strategies used to support interviews ultimately aimed to facilitate the collection of high quality data. Some focussed on supporting interviewers to conduct interviews, some on providing opportunities for skill-building, and others on morale-building more generally. The main strategies used to support the LJYWP interviewer team were as follows:

- Interviewers were involved in refinement of survey instruments (early in fieldwork phase).
- Team leader was available for immediate post-interview de-briefing.
- Interviewer fatigue management strategy was introduced (to be discussed).
- Snack food was provided for interviewers during interview shifts.
- Number of interview completions were tracked, and milestones celebrated with the project team (for example, 100, 200, 300 interviews completed).
- Interviewers' personal and professional milestones were celebrated with project team (e.g. birthdays, completion of degrees).
- External interest in the project was communicated to interviewers (for example, interest arising from conference presentations, or discussions with academics).

Throughout this thesis there is an ongoing theme around the burden that interviewers carried in conducting LJYWP interviews. Whilst managing participant fatigue was discussed in the previous chapter, interviewers were encouraged and supported to monitor and manage their own fatigue throughout each interview and the immediate post-interview period. The fatigue management strategy for interviewers included leaving the checking of the interview until the start of their next interview shift if the interview finished after 8:30pm, instigating a break mid-interview if they required it, rather than waiting to see if the participant needed or suggested one, and ensuring that they had eaten prior to the interview. Also, fieldworkers avoided booking interviews after 7:30pm if at all possible (in order to finish interviews by ~ 9pm).

An indirect result of having centralised fieldwork offices at which telephone interviews were conducted was that interviewers were often in contact with each other, offering an

indispensable avenue through which to debrief. Further, I was available to interviewers onsite during working hours and over the telephone after hours as needed.

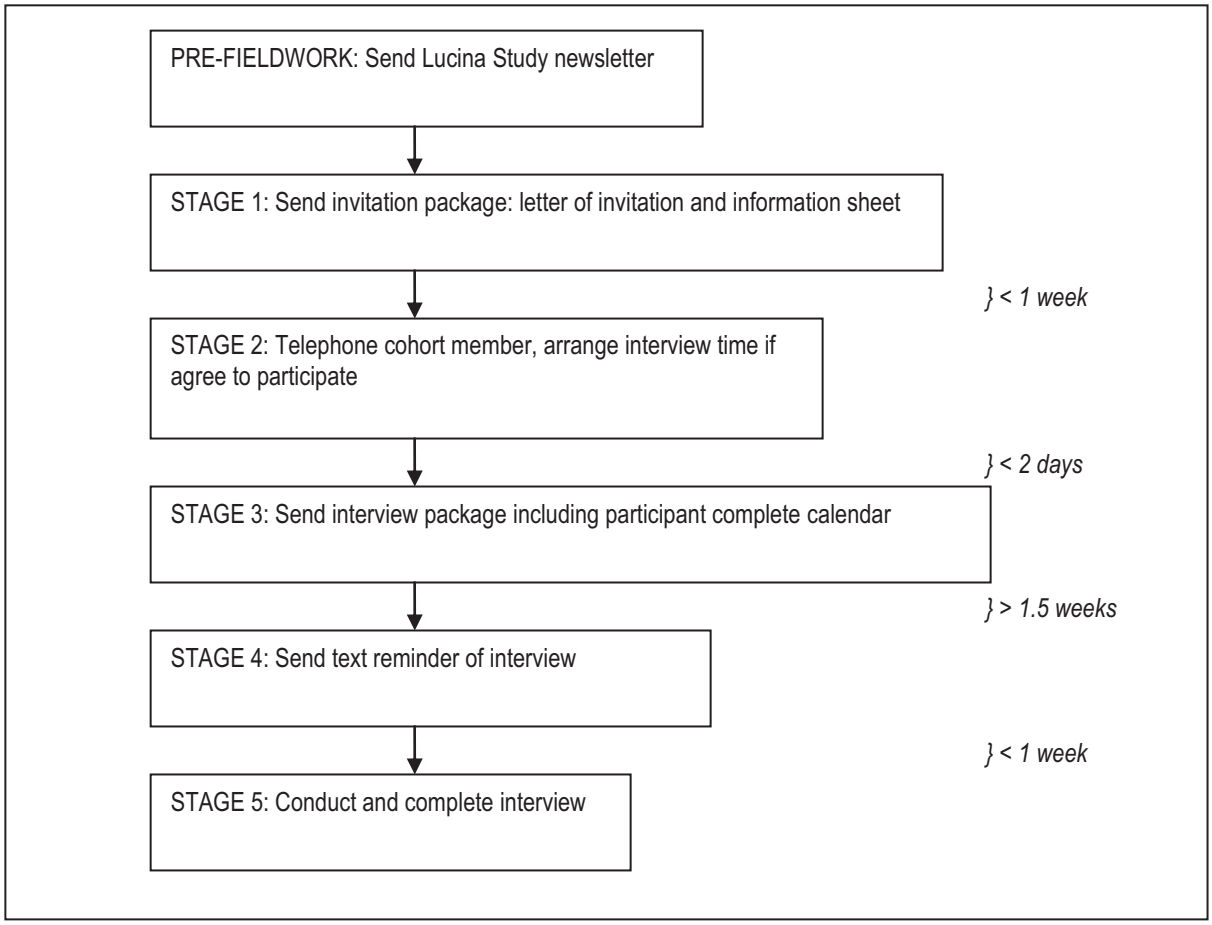
As described, considerable resources were directed to quality monitoring of interviews and support of interviewers within the LJYWP. Whilst it was difficult to know the ideal amount of resources to direct to these tasks, the fact that all five members of the final interviewing team remained on the project for as long as they were required, despite fieldwork continuing for a longer duration than was originally foreseen, is indicative of a special level of motivation and commitment.

5.6 STUDY PARTICIPATION: GENERAL PROCEDURES

Members of the Lucina cohort (n=974) were the target group for the LJYWP. In longitudinal studies such as the Lucina Study, great effort is directed towards retaining participation of cohort members from one wave of fieldwork to the next. The use of a Participant Completed Calendar (PCC) for the LJYWP meant that more resources were directed to facilitation of study participation than what is considered standard for follow-up surveys in longitudinal studies.[gg] An additional threat to participation was the considerable length of LJYWP interviews, which needed to be discussed with participants at the time of making an interview appointment. Rather than outline all strategies undertaken to facilitate participation, this section will focus on considerations and strategies relevant to the unique aspects of this project. As a basis for this discussion, Figure 5.2 shows the stages of contact with cohort members for the LJYWP. The ideal time interval between each stage is shown in italics.

[gg] See Adamson and Chojenta for strategies used to retain participants in a more standard longitudinal study.[169]

Figure 5.2 Stages of contact with cohort members, and ideal time interval between stages



Interviews were booked at least 1.5 weeks after Stage 2 telephone calls to allow time to send the interview package and for the participant to fill out the PCC. Stage 3 was unique to this study, and involved sending a package to those cohort members who had agreed to participate in an interview. Text messages sent at Stage 4 were considered to be an important part of the LJYWP participation strategy due to the time interval between making an interview appointment and conducting the interview.

The drafting and decision-making surrounding documents sent at Stage 1 required much thought. The letter of invitation and information sheet are provided in Appendix 9 and Appendix 10 respectively. Both documents were piloted prior to fieldwork with a number of academic colleagues, as well as volunteer pilot participants. The PCC was mentioned briefly in the interview package: ‘We will ask you prior to the interview to think about and record some key dates and ages (such as the start and end of a

relationship, course of study, or job)'. An unexpected difficulty was highlighted when piloting the documents in terms of the phrasing used to express the focus on childbirth timing. Depending on the wording used, it risked alienating women who had not had children, did not want children (for whatever reason), or had had children at a young age - when in fact these groups were crucial to the study. The final wording used in the letter of invitation was:

> … we are interested in the lives of ***all women*** – those who've ***had children***, those who haven't but ***hope to***, and those who ***don't think they will*** [emphases as original].

Only experienced fieldworkers with specific training conducted Stage 2 telephone calls. Protocols regarding many aspects of the telephone calls were drafted and followed. The PCC was introduced as something that would make the interview 'easier' because 'it is sometimes hard to remember things on the spot.' Fieldworkers emphasised the fact that it should not take any longer than 20 to 30 minutes to complete, that they needed to have it with them at the time of the interview, and that project staff were available to help them complete it either over the telephone or face-to-face, at any time. The interview length was discussed in terms of 'We will be talking about lots of different aspects of your life, from when you left school to now.'

In order to avoid a call centre approach to the telephone calls (which was likely to decrease participation rates), fieldworkers were encouraged to develop a warm and cheerful style and to make reference to wave 1 Lucina interview experiences. Other strategies underpinning Stage 2 included being able to offer interviews at virtually any day of the week and time of day (aside from late at night), and offering delayed participation when life circumstances warranted - such as a recent childbirth. Also, since the LJYWP project co-ordinator was involved in wave 1 data collection, some cohort members received Stage 2 telephone calls from their wave 1 interviewer, an additional factor likely to encourage participation. The regular meetings held throughout the fieldwork phase allowed fieldworkers to share strategies that facilitated communication at this stage.

Other pre-interview strategies designed to facilitate participation included:

- Using personally addressed envelopes, hand-written signatures, and university letterheads in all written communication (all were shown to improve response proportion in a systematic review of methods aiming to increase responses to postal questionnaires).[170]
- Attempting Stage 2 telephone calls up to twenty times at different times of day and days of week prior to re-tracing.
- Offering face-to-face interviews to those who expressed a preference for this as opposed to a telephone interview.
- Providing the name of the relevant interviewer to participants prior to the interview (to personalise the experience).

An interesting risk to participation in an interview occurred when the PCC had not been completed by participants; if the interview was simply re-booked with an understanding that the participant would complete the PCC prior to the next appointment, there was a high risk of non-attendance at the next appointment. Protocols were drafted for such situations, and involved the interviewer deciding between one of four main options, depending on how much of the PCC had been completed and the degree of difficulty the participant had encountered: (1) clarify any problems at the start of the interview, assisting the participant to 'correct' their PCC prior to commencing the formal interview; (2) attempt the interview without first doing step 1; (3) re-book the interview and ask the participant to complete the PCC prior; or (4) re-book a time for a face-to-face interview when the interviewer could assist with completion of the PCC prior to the interview. The interviewer needed to judge the risk of non-participation if an interview was re-booked for another day, and when in doubt, were instructed to follow step (2), in which data of a lower quality may be obtained, but participation would be gained. Lengthy discussions were held with interviewers around these decisions.

Three protocols were drafted to guide other challenging situations as they arose. First, fieldworkers offered a face-to-face interview if participants lived locally and they suspected participants would benefit from the greater help they could provide in this interview mode. These interviews were conducted either at the participant's home, or in the research offices, whichever was the more convenient to the participant. Undertaking a limited number of in-person interviews potentially introduced an undeterminable

degree of information bias to the study; however, it was better than the alternatives: to risk non-participation from cohort members whose preference was for a face-to-face interview, or poor quality data from participants who found a telephone interview too complex.

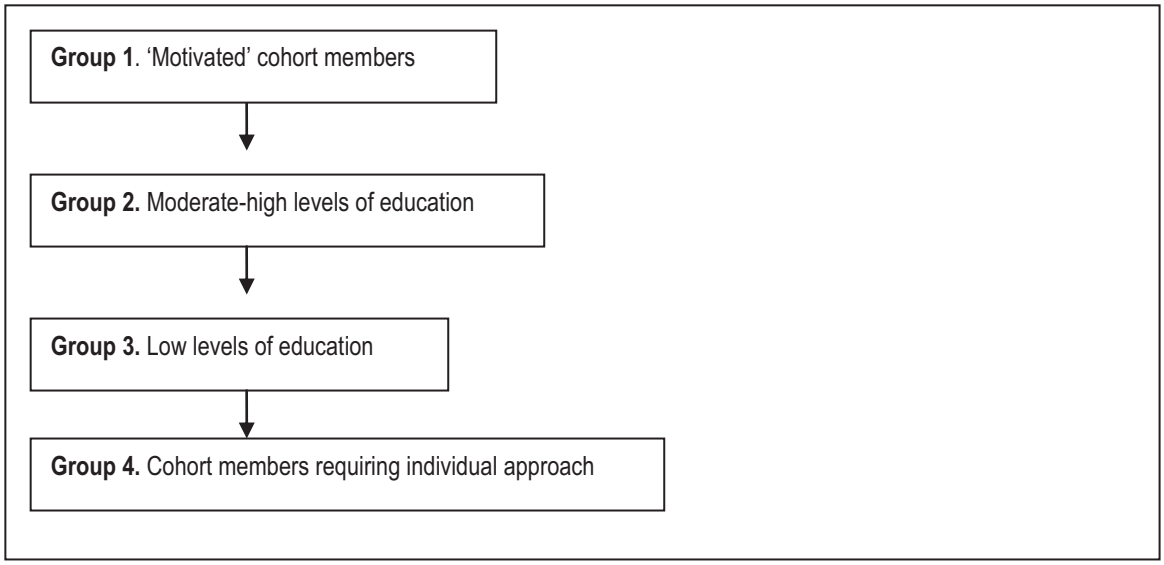
Second, it became apparent partway through the fieldwork period that occasionally interviews were booked with participants for whom the LJYWP interview required a level of engagement that was not possible (for example, participant had a mild intellectual impairment that had not been previously noted). For this reason, a protocol for a shortened version of the interview was developed and used by interviewers as appropriate. Priority was given to collecting information about employment and education histories, and pregnancies since wave 1 interviews.

Third, when participants were not able to complete an interview due to conflicting commitments, interviewers booked another interview session. This sometimes occurred when the interview was longer than expected. Since there was a risk of non-participation in the second session, we tried to avoid the situation by communicating the variability in interview duration at the time of the Stage 2 phone calls so that participants might allow for this on the interview day.

5.7 STUDY PARTICIPATION: TARGETTED PROCEDURES

Population-level surveys engage a range of participants with differing backgrounds and life circumstances. Despite the well-known issues regarding recruitment of lower socio-economic groups in research studies,[171-173] there are few examples in the literature of projects in which participation strategies, or data collection procedures, reflect an understanding or appreciation of such differences. The danger of ignoring this issue is in exaggerating both low participation rates (high attrition, in longitudinal studies), and the poor quality of data potentially collected from certain participant groups. For the LJYWP the degree of engagement required to complete a PCC and to participate in an interview was the impetus for a targeted approach to engaging and facilitating participation of lower SES women and others who for various reasons might have found participation challenging. Cohort members were approached to participate in the LJYWP in a systematic order, as shown in Figure 5.3.

Figure 5.3 Order that cohort members were approached to participate



In conducting interviews in this order, participants who were likely to find the interview most challenging were interviewed late in the fieldwork period, when interviewers were highly experienced in the conduct of the interview. This approach not only capitalised on the interviewer's ever-increasing ability to facilitate interviews, but also allowed for the improvement of processes for pre-interview contact. It was also supportive of interviewers who, in the first months of fieldwork, were building their confidence in conducting interviews and benefited from more straightforward interview experiences. Two assumptions were made in the design of the strategy: that interviews would be easier to facilitate with more motivated participants; and that participants with higher levels of education would find the PCC and cue cards easier to use, and thus provide interviewers with more straightforward interview experiences than those with lower levels of education. The latter assumption is supported by previous experiences of the chief investigators of the Lucina Study using relatively complex questionnaires with this, and other, cohorts. This is further supported by the work of Bruckner with the German Life History Study, which showed a reduction in data errors (for example, consistency of dates) for respondents of higher levels of education, indicating that these interviews may be easier for interviewers and/or participants.[165]

Membership to the four groups outlined in Figure 5.3 was governed by a set of rules. Regarding Group 1, 'motivated' participants were defined as cohort members who had

emailed the Lucina Study co-ordinator to advise of change of address/surname within one month of receiving the Lucina Study newsletter (pre-fieldwork stage as per Figure 5.2 page 121), irrespective of their level of education. Their initiative was taken as a signal that they were interested in the study, and eager to continue their involvement. Regarding Groups 2 and 3, level of education was determined using the educational information obtained during wave 1 of the Lucina Study. Women with moderate-high levels of education were defined as those for whom, at the time of wave 1 interview, had:

- Completed high school, or
- Not completed high school but since completed any post-school qualification , or
- Not completed high school but were enrolled in a post-school qualification.

Therefore, women with low levels of education were those who had not completed high school and had neither completed a post-school qualification, nor were enrolled in one, at the time of wave 1 interviews. Group 4 participants were identified as those requiring an individual approach due to social or medical circumstances at the time of wave 1 interviews that indicated they might have trouble participating in the LJYWP. This group were identified by reviewing data collected at wave 1.

It is useful to describe in some detail the changes made in the approach to, and interview conduct with, Group 3 and 4 cohort members. Group 3 cohort members were likely to require more help with the PCC than those in Group 1 or 2. Thus, relevant cohort members were flagged to fieldworkers prior to the Stage 2 telephone calls (Figure 5.2 page 121), so that this could be kept in mind when encouraging participation. This was also flagged to interviewers prior to the interview, so that they could similarly be aware of the potential for greater difficulty with more complex interview questions.

Discussions with interviewers after commencing work with Group 3 resulted in some changes being made to the start of the interview. For example, the explanation of the study rationale needed to be altered, since ‘to help change working conditions so that women are more able to have children when (and if) they would like to have them’ was

inappropriate for lower SES women who were less likely than others to think about working conditions in relation to childbearing.

The approach taken to contacting and interviewing Group 4 was individualised. Letters of invitation were altered as appropriate. Only the most experienced fieldworkers made the Stage 2 telephone calls to this group, after consideration of the issues that may impact on the participation of the cohort member. When it was unlikely that cohort members would be able to fill out the PCC, either it was not sent to the cohort member at all, and the interviewer helped them fill out the PCC at the time of the interview, or the fieldworker emphasised that they should just do the best they could when they received the PCC, and not concern themselves if they could not complete it. Issues relevant to these cohort members were discussed with interviewers prior to the interview. All Group 4 participants who lived locally were offered a face-to-face rather than a telephone interview.

To encourage Groups 3 and 4 to participate in the project, I considered the option of adding another stage to the fieldwork process in which interviewers helped the participant to fill out the PCC, prior to their interview appointment (that is, participation would occur over two separate appointments). However, as we gained experience with group three cohort members it became clear that in general the burden to participants of attending two separate appointments, and resultant risk of non-attendance at the interview appointment, outweighed the likely gain in data quality. However this strategy was used occasionally, with success.

5.8 SUMMARY

In summary, this chapter outlined fieldwork strategies beyond standard epidemiological procedures that were incorporated in the Life Journeys of Young Women Project. Regarding data quality, the following areas were addressed: recruitment and training of appropriate interviewers, implementation of a quality monitoring framework, and strategies aimed at supporting the interviewers throughout the fieldwork phase. Furthermore, strategies aimed at encouraging participation, and enhancing data quality relevant to lower socio-economic groups were outlined.

Most of the strategies described in this chapter are novel (or at least not described elsewhere), and as a cluster represent significant effort directed to undertaking rigorous epidemiological fieldwork. Many of the strategies will be useful not only for those undertaking fieldwork involving Event History Calendars and Participant Completed Calendars, but also more generally to studies involving long and complex interviews with population-level cohorts.

CHAPTER 6 Methods of analysis

6.1 INTRODUCTION

> Given an event history data set, the typical problem of a social scientist is to use appropriate statistical methods for describing this process of change, to discover the causal relationship among events and to assess their importance.[138, p. 3]

This chapter focuses on the development of an analytical framework based on the research questions outlined in Section 1.8 (page 23), and the theory, conceptual models and constructs discussed in Chapter 2. This framework aims to overcome the limitations of previous studies, which were outlined in Section 1.6 (page 15). Chapter 7 pilot tests the framework and presents preliminary results. The analyses described in this thesis were limited to the data entered within PhD timelines. Thus, analyses are based on a subset of the Lucina cohort (n=230 of a possible 974). As such, the focus of this chapter and the next is on developing and demonstrating an appropriate analytical strategy, and the results of the analyses are not in and of themselves a focus of interest.

The design of appropriate analytical frameworks is a central focus within life course epidemiology. The availability of event history data for such analyses is rare and presents unique opportunities for testing, and allowing for, time variation in covariates.[174] In particular this data format offers great flexibility in the way that variables are constructed across the time dimension, and as such these decisions can be theoretically informed.

Section 6.2 introduces and justifies the use of survival analysis techniques to answer the research questions posed. Section 6.3 provides the rationale for, and construction of, analysis variables, with an emphasis on the exposure variable, and on data management processes required to construct variables using event history data. Section 6.4 provides a description of analyses undertaken. In order to limit analyses presented here, I focus only on the most straightforward outcome variable described in Chapter 2 (first childbirth).

The processes undertaken and decisions made in building the analytical framework are a substantial intellectual contribution arising from this thesis. Therefore decisions made at each stage of building the framework are discussed so that nuances involved at each

stage are explicit and can be critiqued. Implications and limitations of the framework are discussed at the end of Chapter 7.

A power calculation was not conducted at the outset of the Life Journeys of Young Women Project (LJYWP). Power calculations are based on assumptions concerning the underlying population parameter of interest. While information is available in Australia regarding mean age at first childbirth, this is not available according to life course patterns of employment arrangements differentiated by socioeconomic strata. For this reason, a power calculation was not considered feasible.

6.2 SURVIVAL ANALYSIS

Survival analysis, called event history analysis within the social sciences, is a collection of statistical procedures for the analysis of data in which the outcome of interest is time until an event occurs.[138] As the outcome of interest in this study was the age of first childbirth, survival analysis was the most appropriate analytical approach.[hh] Other analytical approaches such as logistic regression were possible with a simplified outcome variable, for example by creating a dichotomous or categorical variable (for example, had live birth by age 35 years: yes/no, or age at first childbirth: 15-19, 20-24, 25-29 years and so on). However, I opted to retain the full information regarding the timing of the outcome.

As suggested by its name, survival analysis is frequently applied when the event of interest is death. However, other events such as disease incidence, mechanical failure or, in the case of this analysis, giving birth for the first time, can also be analysed appropriately with these techniques.[176]

[hh] A number of texts describe in detail the techniques of survival analysis, including Blossfeld and Rohwer[138] and Jenkins.[175] These texts have guided the analytical approaches undertaken and described in this chapter.

In survival analysis, the time variable is typically referred to as 'survival time', and the event of interest is typically referred to as a 'failure' (although a birth is not a 'negative' event). Survival analyses generate a survivor function, denoted by S(*t*), and a hazard function, h(*t*). S(*t*) gives the probability that a person survives longer than some specified time *t*. h(*t*) gives the conditional failure rate; an alternative explanation is that h(*t*) is the instantaneous potential at time *t* for a woman to give birth for the first time, given survival up to time *t* (i.e. not having given birth to time *t*).

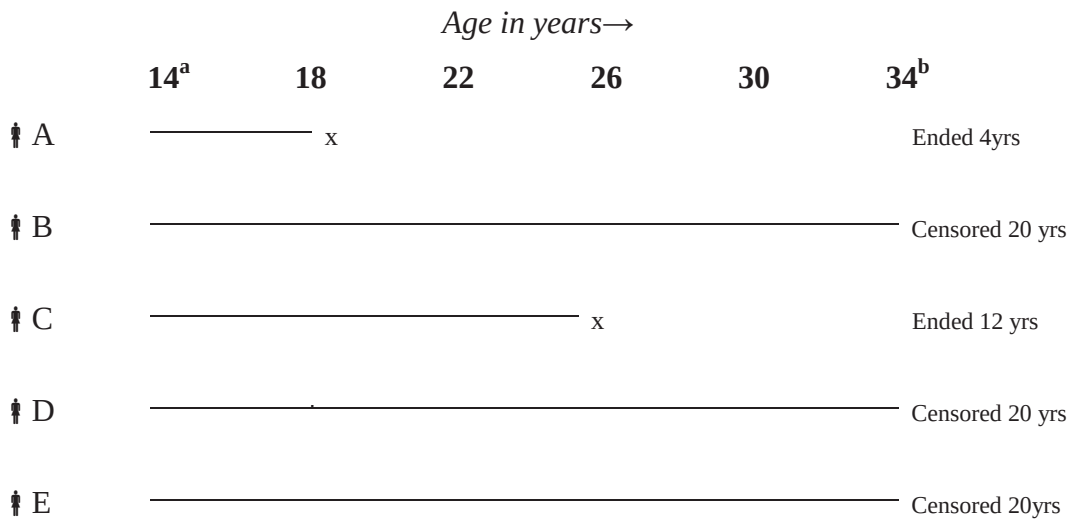
There are two main approaches to fitting a survival model – semi-parametric and parametric models.[176] The Cox proportional hazards model falls under the class of semi-parametric models. This model has gained wide popularity for the analysis of survival data, as it does not rely on distributional assumptions of the underlying hazard for the outcome. However, Cox models do not give an estimate of the baseline survival function and therefore are not as useful in estimating survival time. Because a comparison of the hazard of giving birth for different types of employment precariousness was of primary interest in this thesis, rather than an estimate of when women would give birth, Cox proportional hazards models were more appropriate for the analyses.

As discussed by Pickles and De Stavola,[174] in most studies events are observed for some - but not all - study participants. Aspects of the study design influence how complete this information is for the study cohort. The participants who have not experienced the event by the end of the observation period are said to be 'right censored' i.e. event-free at the time they were last observed. This can occur for a variety of reasons but in the LJYWP it occurred when a woman had *not* given birth by the time of their interview. Importantly, this type of censoring is not problematic because its timing is based on an administrative mechanism and is not dependent on knowledge of a participant's parity. Of course, it is not possible to know at the time of censoring which participants will go on to have children in the future.

To capture entire employment histories from the month after school-leaving, the start point of the period of observation for this suite of analyses was January of the year in which participants turned 15, which was the start point of data collection on EHCs (that is, participants provided information from when they were between 14 years 1 month

and 14 years 11 months, depending on their month of birth). Interviews were conducted when participants were aged ~ 32 – 35 years. Months of observation for analyses therefore included every month from January of the year in which a woman turned 15 years old, through to, and including, the month of giving birth to their first child, (for mothers), or month of interview, (for censored observations). This time period will be referred to as a participant's 'period of observation' in the remainder of the thesis. Figure 6.1 shows example periods of observation for LJYWP participants.

Figure 6.1 Example periods of observation for Life Journeys of Young Women Project participants



x = first childbirth

a: Actual age at commencement of observation period varied (14 years 1 month – 14 years 11 months)

b: Actual age at month of interview varied (~ 32 – 35 years)

In Figure 6.1, with a study period of twenty years, women A and C had children at 18 and 26 years of age respectively, whilst women B, D, and E remained childless at the end of the observation period and were thus censored observations.

The period of observation commenced in January of the year participants' turned 15, but employment histories were collected from the first month after school-leaving. Therefore, a period of schooling (of variable duration) is contained at the start of the period of observation for most participants. The treatment of these periods in the

construction of exposure variables is discussed in Section 6.3.1. The youngest age of first childbirth in the analysis sub-group (n = 230) was greater than 15 years; thus, all events were contained in participants' periods of observation.[ii]

Time-varying covariate data, such as that contained in the LJYWP dataset, can be incorporated into survival analyses:

> The role of a time-dependent covariate in event history models is to indicate that a (qualitative or metric) causal factor has changed its state at a specific time and that the unit under study is exposed to another causal condition.[138, p. 25-6]

Operationally, this corresponds to a new data record for the subject being generated with the current (new) values of the covariate for the interval in question and the status of the outcome in that interval. It is this feature of survival analysis techniques that facilitates the exploration of the impact of timing and duration of exposures (the sensitive period life course approach). Since much LJYWP data were collected at the month-level, in theory the covariate data could be updated at that unit of time. However, decisions surrounding the appropriate time interval at which to construct the exposure variable involve consideration of a number of factors. These issues are highlighted in this chapter.

Table 6.1.shows the original research questions as outlined in Chapter 1, and updated questions, which convey the age of the Lucina cohort at the time of LJYWP interviews, the way that exposure was measured in this study, and the concept of hazard, in line with survival analyses techniques.

[ii] Four members of the Lucina cohort not included in the sub-group of n = 230, had a child before 15 years of age (as collected in wave 1 interviews). They will be excluded from analyses with the entire dataset, since at the time of childbearing they were under the legal school-leaving age, and thus not eligible to enter the exposure state of interest, that is, participation in the labour market from the month after leaving school (for the first time).

Table 6.1 Original and new research questions

Life course approach	Original research questions	Updated research questions
Cumulative	Does a longer exposure to casual contractual arrangements increase the likelihood of older age at first childbirth?	Does a longer duration of exposure to particular employment arrangements[a] increase the hazard of not having a child by age ~ 35 years old?[b]
Sensitive period	Are there particular period(s) of time in which casual contractual arrangements are especially potent in influencing older age at first childbirth?	Are there particular age periods in which a greater duration of exposure to precarious contractual arrangements[a] increases the hazard of not having a child by age ~ 35 years old?

a: The exposure classification system is described in Section 6.3.1

b: The approximate age of the cohort at the time of LJYWP interviews

6.3 ANALYSIS VARIABLES

The outcome variable for these analyses focuses on the timing of conception as opposed to the timing of the birth itself. This is congruent with a number of published survival analyses focussing on structural influences on the timing of childbearing.[133 134] Since work arrangements often change during pregnancy, conceptualising the outcome variable in this way is important. The outcome variable used in these analyses is age at first birth minus one year (AFBM1).

Other variables included in analyses are the exposure variable, variables representing live-in partnering and highest educational attainment, and two other explanatory variables (describing ethnicity and early life socio-economic status). This section provides a rationale for the choice of these variables and explains their construction. Exposure and live-in partnering variables were constructed in multiple formats to explore the best use of the event history data.

Variables collected on the EHC do not suffer from missing data, as a result of the checking procedures undertaken by interviewers at the time of the interview in combination with post-interview quality monitoring. For variables not collected on the EHC, the treatment of missing data is explained.

6.3.1 Exposure variables

Recall from earlier chapters that this thesis is concerned with how experiences of *employment precariousness* may impact on the timing of childbirth. Chapter 2 provided a rationale for considering contractual arrangements as a proxy for categories of employment precariousness. Chapter 4 described the relevant data collected in the LJYWP: event history data regarding six states of employment arrangement over a 20+ year period. The employment arrangements states are: casual, fixed-term, permanent and self-employment, unemployment and not in the labour force (NILF). As was discussed in Chapter 2, the concept of employment precariousness, as operationalised in this way, is not likely to be relevant during periods spent studying. A separate educational history was collected in the event history format, highlighting periods spent in full-time (FT) and part-time (PT) post-school study.

There were a number of options for constructing the exposure variable, given the multiple dimensions of interest, all of which were time-varying and collected at the month-level of detail. I sought to construct the most parsimonious exposure possible, in order to conserve power and create viable analysis models. One option was to construct a *time-constant* variable that classified patterns of employment over time. Such a system could incorporate multiple dimensions of an exposure. For example, Figure 6.2 shows a system designed to classify post-retrenchment working histories (over a period of four years) according to number of jobs and whether they were FT or PT.[177, p. 170]

Figure 6.2 Example time-constant classification system for working histories[177, p. 170]

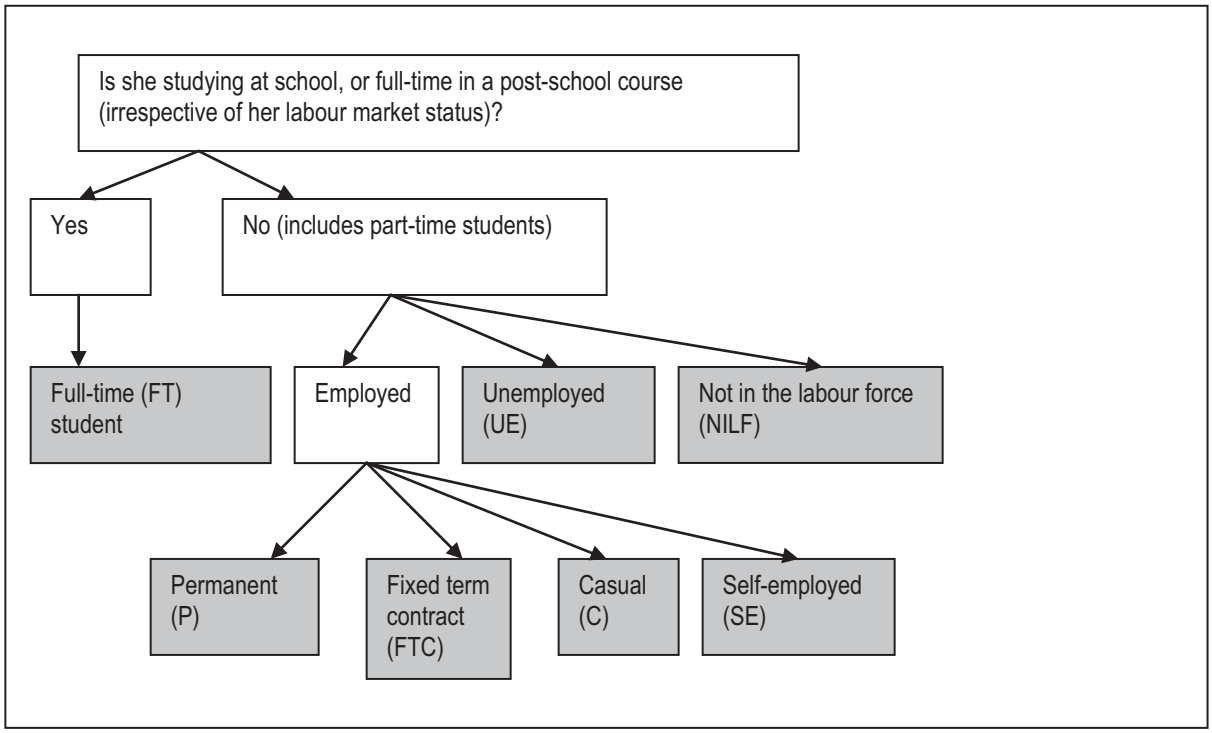
Secure full-time: workers with one or two full-time jobs, or a part-time job followed by 1 or 2 fulltime jobs
Secure part-time: workers with one or two part-time jobs
Insecure full-time: workers with more than 2 full-time jobs but no part time jobs
Insecure part-time: more than 2 part-time jobs but no fulltime jobs
Insecure combinations: multiple fulltime or part time jobs
Exit labour force: workers who never worked after retrenchment

However, since I was interested in exploring the time-varying nature of precarious employment, this type of system was not appropriate. Also, the task of forming one time-constant variable would be difficult with LJYWP data because of the duration of

employment histories (20+ years compared with four years) and a lack of theoretical rationale to direct decisions about how to combine dimensions of interest over time.

Instead, I decided to pursue a classification system that allowed *time-varying* expression of the exposure information. Given the multiple dimensions of interest, the next challenge was how to limit the number of exposure variables. One option was to construct two variables, one classifying labour market status (employed, unemployed, NILF), and the other, contractual arrangements relevant to employed periods (casual, fixed-term, permanent and self-employment). However, to conserve power they were combined into one variable for this analysis. In addition, the category of FT student was included in the variable in recognition of the impact that enrollment in study has on delaying childbirth, as was discussed in Section 2.7.1. Thus, each month of observation was assigned to one of seven states. Figure 6.3 shows the exposure variable model; the seven states are shaded.

Figure 6.3 Model of exposure variable



To my knowledge this is a unique variable construction, but is similar to those used in several Globalife analyses in that it is a single variable that combines several employment/education dimensions.[134 178]

As seen in Figure 6.3, periods of FT study were assigned irrespective of concurrent employment, whereas periods of PT study were classified according to employment status. This appears congruent with most published analyses that combine education with dimensions of employment status in a single variable.[52 133 134 178] PT study enrollment is not mentioned in descriptions of these studies, so I infer that it did not play a role in exposure variable classification, and that these periods were classified by employment status. However, it is likely that the relevant datasets did not contain information on periods of PT study. Connecting back to the theory underlying this project, this treatment of PT study assumes that the role of employment precariousness is more influential to the timing of childbirth in such periods than the role of study. Further work exploring the role of employment status concurrent with PT study on the timing of childbirth is warranted. To simplify the exposure variable, periods of schooling were combined with periods of FT post-school study to form the 'FT student' category. Post-PhD analyses may differentiate between the two types of study.

Recall from Section 4.4 that a source of misclassification of periods of study may arise if FT enrolment in non-university courses requiring only PT hourly commitment were classified as FT. In these periods employment precariousness is important to the timing of childbirth (according to study hypotheses), but periods are misclassified as not exposed to employment precariousness. It is difficult to know what impact that may have on results.

In this project contractual arrangements were not envisaged as lying on a continuum of precariousness (this was discussed in Section 2.7.1). Therefore the seven exposure states were treated as independent, unordered, categories. Another option was to collapse some of the variable categories, the most obvious being to combine non-permanent categories, in line with Bartley and Ferrie's definition of employment precariousness as 'all employment that does not have a permanent contract',[121] and Watson et al.'s comment that 'the most important distinction is…between 'permanent' employment contracts and other types of contracts, particularly casual employment'.[34, p.

[36] However, the differences between FTC and casual contractual arrangements (see LJYWP definitions in Table 4.1, page 75) were great enough to warrant exploration of the effect of each arrangement independently.

Note that the NILF and FT student categories, whilst essential in the construction of the exposure variable, were not a theoretical focus of this enquiry and thus are not a focus of analyses.

In order to create the exposure variable, first, employment arrangement histories were constructed. Figure 6.4 shows an example of an employment arrangement history for a one year period, as collected on the LJYWP EHC.

Figure 6.4 Example employment arrangement history for one calendar year, as recorded on the Life Journeys of Young Women Project Event History Calendar

YEAR	1989											
MONTH	J	F	M	A	M	J	J	A	S	O	N	D
NOT WORKING	L											
MAIN JOB		1 ———				X	2 ———					X
Employment contract		FTC					C					

In this example, the participant experienced one month of unemployment (January 1989). She was then employed in her first job with a FTC from February to June 1989, followed by a period in a second job, in which she was employed on a casual contract, from July to December 1989.[jj] Figure 6.5 shows how this data would appear in the LJYWP database.

[jj] Note that the main job numbers (provided in the main job row) are not applicable to the construction of the exposure variable for this analysis.

Figure 6.5 Simplification of database display screen for employment arrangements

Study ID	Date	NILF[1]	UE	C	FTC	P	SE	End
12345	Jan 1989	N	Y	N	N	N	N	Y
	Feb 1989	N	N	N	Y	N	N	N
	June 1989	N	N	N	N	N	N	Y
	July 1989	N	N	Y	N	N	N	N
	Dec 1989	N	N	N	N	N	N	Y

N = no, Y = yes, End = stop date, NILF = not in the labour force, UE = unemployed, C = casual contract, FTC = fixed-term contract, P = permanent contract, SE = self-employed.

1: The NILF category was created by combining the following periods, as recorded on the EHC: study (S), travel (T), childcare/home duties (C), Injured/sick (I), caring other than childcare (Car), voluntary work (V), other (O).

To construct a history of employment arrangements, data were transformed into a 'long format', whereby binary indicators for each state of employment arrangement were applied to each month under observation. Figure 6.6 shows the expansion of the data from Figure 6.5. Yellow highlighting is used to show the employment arrangement history.

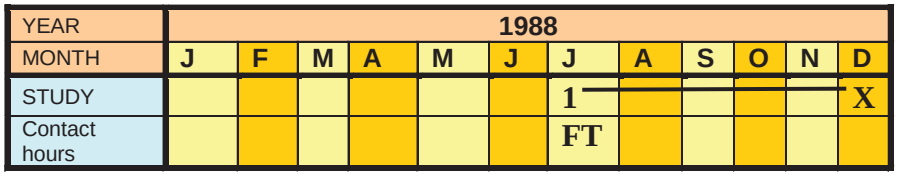
Figure 6.6 Example employment arrangement history

Study ID	Date	NILF	UE	C	FTC	P	SE
12345	Jan 1989	N	Y	N	N	N	N
	Feb 1989	N	N	N	Y	N	N
	March 1989	N	N	N	Y	N	N
	April 1989	N	N	N	Y	N	N
	May 1989	N	N	N	Y	N	N
	June 1989	N	N	N	Y	N	N
	July 1989	N	N	Y	N	N	N
	Aug 1989	N	N	Y	N	N	N
	Sep 1989	N	N	Y	N	N	N
	Oct 1989	N	N	Y	N	N	N
	Nov 1989	N	N	Y	N	N	N
	Dec 1989	N	N	Y	N	N	N

N = no, Y = yes, NILF = not in the labour force, UE = unemployed, C = casual contract, FTC = fixed-term contract, P = permanent contract, SE = self-employed.

A similar process was undertaken to create a FT study history. Figure 6.7 provides an example of a history of study over the same period of time as the employment arrangement example.

Figure 6.7 Example full-time study history for one calendar year, as recorded on the Life Journeys of Young Women Project Event History Calendar



The example shows a six month period in which the participant was not doing any study (January 1989-June 1989), followed by a further six months in which she was studying FT (July 1989-December 1989). An example of the long format of this data is provided in Figure 6.8.

Figure 6.8 Example full-time study history

Study ID	Date	FT study
12345	Jan 1989	N
	Feb 1989	N
	March 1989	N
	April 1989	N
	May 1989	N
	June 1989	N
	July 1989	Y
	Aug 1989	Y
	Sep 1989	Y
	Oct 1989	Y
	Nov 1989	Y
	Dec 1989	Y

N = no, Y = yes, FT = full-time

Last, the two variables were combined, giving priority to FT student status over concurrent employment arrangement. Continuing with the same example, Figure 6.9 shows the combined exposure variable. Whilst the participant was employed with a casual contract concurrent to studying FT in July – December 1989, in the combined variable those months are categorised according to FT student status.

Figure 6.9 Example of combined exposure variable

Study ID	Date	NILF	UE	C	FTC	P	SE	FT study
12345	Jan 1989	N	Y	N	N	N	N	N
	Feb 1989	N	N	N	Y	N	N	N
	March 1989	N	N	N	Y	N	N	N
	April 1989	N	N	N	Y	N	N	N
	May 1989	N	N	N	Y	N	N	N
	June 1989	N	N	N	Y	N	N	N
	July 1989	N	N	N	N	N	N	Y
	Aug 1989	N	N	N	N	N	N	Y
	Sep 1989	N	N	N	N	N	N	Y
	Oct 1989	N	N	N	N	N	N	Y
	Nov 1989	N	N	N	N	N	N	Y
	Dec 1989	N	N	N	N	N	N	Y

N = no, Y = yes, NILF = not in the labour force, UE = unemployed, C = casual contract, FTC = fixed-term contract, P = permanent contract, SE = self-employed, FT = full-time

Continuous and categorical exposure variables were derived for both the cumulative and sensitive period analyses for the exposure states shown in Figure 6.3 (aside from FT student and NILF). Categorical variables were derived because of the skewed distributions of the continuous variables (as presented in the following chapter). All exposure variables were organised according to time since first month of observation. This was expressed as years since that time point (one month = 0.083 years).

For the cumulative approach, *time-constant* variables were constructed in *continuous* form by first aggregating the number of months in each of the seven states to form seven time-constant variables corresponding to the time spent in each state over the

observation period. To aid in interpretation of results, the number of months spent in each state was divided by 12 so that the variables were expressed as the number of years spent in each state for each woman. Dichotomous *categorical* variables were then derived for each employment state by classifying the number of years in each state as < or ≥ the 75th percentile (unemployed 0.5 years, casual 1.5 years, FTC 1.0 year, permanent 9.0 years). The choice of the 75th percentile reflected the markedly skewed distributions for time spent in each employment arrangement state and resulted in a satisfactory number of observations in each category for all employment states except self-employment. These distributions are presented in the following chapter.

To conduct the second suite of analyses focusing on sensitive periods, *time-varying* variables were derived in *continuous* format. Month-level data for each of the states were aggregated to roughly three year periods according to age bands of <18, 18 - <21, 21 - <24, 24 - <27, 27 - <30, 30 - <33, and 33 - <36 years. These age bands were chosen to be in line with life course phases that could be easily communicated when discussing study results – for example, early twenties, mid twenties. Thus variables were formed for each exposure state of interest, each of which consisted of seven observations (one for each age band). The number of months spent in each state per age band was divided by 12 so that the variables were expressed as the number of years spent in each state per age band. *Categorical* variables for the sensitive period analyses were constructed by classifying women as spending no time, or some time in respective employment states per three year period.

I also calculated the total time spent in the labour force as the sum of time spent unemployed, self employed, and in casual, FTC and permanent employment (expressed per year). This variable was included in statistical models to recognise that participants are only at risk of forms of precarious employment during periods that they are in the labour force (i.e. they are not at risk when they are FT students or NILF).

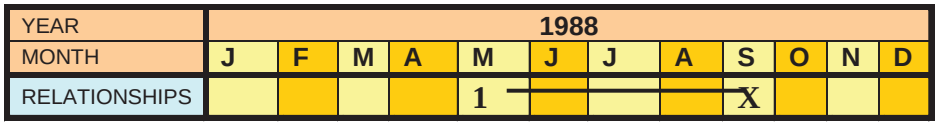
6.3.2 Live-in relationships

It is likely that multiple dimensions of partnering histories are important, including the *duration of time* spent in live-in relationships (as a marker of the degree of opportunity to have a child), and the *number* of live-in relationships over a period of time (a marker of instability in relationship history). Regarding the latter, it may be relevant to consider

intra- versus inter-relationship histories, where the former is defined according to a pattern of dissolving and reforming a live-in relationship with the *same* partner. Whilst the data collected in the LJYWP allows for exploration of all these dimensions, the analyses presented in this thesis are based simply on the duration of time in live-in relationships, which was a logical first step. Future work with this dataset in my post-doctoral period may focus on exploring the impact of other dimensions of partnering histories.

Live-in partnering histories were constructed from the data records using similar processes to that used to construct exposure variables. Continuing with the example started in the previous section, Figure 6.10 provides an example of a live-in relationship history over a one year period.

Figure 6.10 Life-in relationship history for one calendar year, as recorded on the Life Journeys of Young Women Project Event History Calendar



In this example, the participant was involved in a live-in relationship for five months of the calendar year (May-September 1989). Figure 6.11 shows how this data would appear in the LJYWP database. In line with the EHC recording system, start dates are indicated by the chronological partner number. Stop dates are indicated in the 'end' column.

Figure 6.11 Simplification of database display screen for live-in partnering

Study ID	Date	Partner	End
12345	May 1989	1	N
	September 1989	99	Y

N = no, Y = yes, End = stop date, 99 = not applicable.

Figure 6.12 shows these data in the long format. Note that the live-in partner number was not incorporated into the variable.

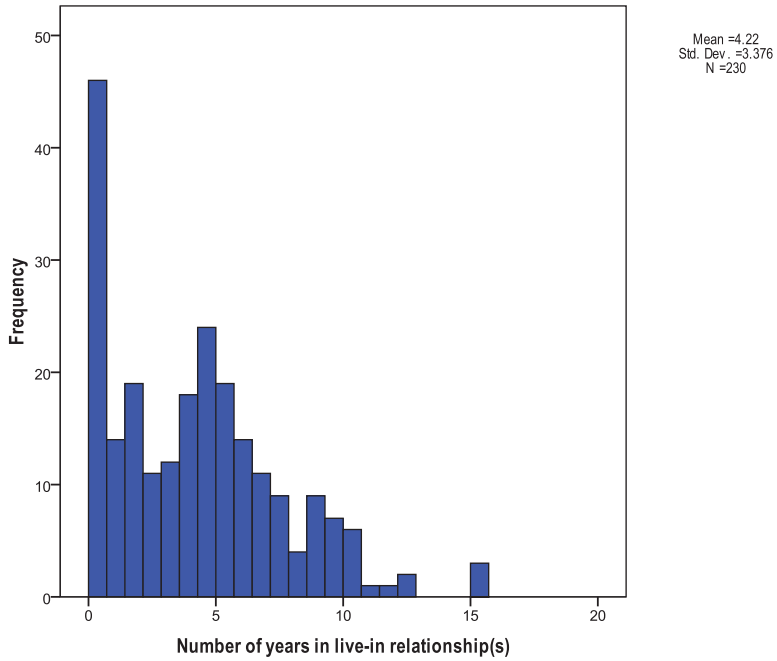
Figure 6.12 Example live-in partnering history

Study ID	Date	Partnered
12345	Jan 1989	N
	Feb 1989	N
	March 1989	N
	April 1989	N
	May 1989	Y
	June 1989	Y
	July 1989	Y
	Aug 1989	Y
	Sep 1989	Y
	Oct 1989	N
	Nov 1989	N
	Dec 1989	N

N = no, Y = yes

A variable was constructed to describe the *duration of time spent in live-in relationships*, and included in analyses as a marker of the degree of opportunity available to the participant to have a child. For the cumulative approach, I aggregated the number of months spent in a live-in relationship for each participant, and divided by 12 to express in the per year format. Figure 6.13 shows the distribution of this variable.

Figure 6.13 Distribution of number of years in live-in relationship(s) over the period of observation, (n=230)



A total of 30 women (13%) reported that they had never been in a live-in relationship. At the other extreme, three women had been in live-in relationship(s) for more than 14 years. A categorical variable was subsequently derived according to the following categories: never been in a relationship, 0.01 - <5 years, ≥5 years. The five year cut-off point was chosen as it was close to the mean value.

For the sensitive periods approach, data was aggregated for each three year period. A categorical variable was constructed to describe each period according to three categories: unpartnered, partnered < total time band, partnered for total time band.

6.3.3 Highest educational attainment

Chapter 2 developed a theory relevant to a middle/high SES group, to be classified according to highest level of educational attainment. At the time of conducting these analyses, data on (time-varying) educational attainment collected in LJYWP had not yet been entered into the database and therefore data collected in wave 1 Lucina interviews were used to construct an educational attainment variable. The two questions regarding

educational attainment from wave 1 interviews are shown in Figure 6.14 and Figure 6.15.

Figure 6.14 Question on high school attainment, wave 1 Lucina interview

What level did you reach at school?
1 Completed primary school
2 Some high school
3 Completed high school

Figure 6.15 Question on tertiary educational attainment, wave 1 Lucina interview

Have you completed any tertiary education?
0 No
1 Qualification from a TAFE college or similar
2 University degree
3 Currently studying for tertiary qualification

Since only one participant in the analysis sub-sample of 230 had not completed high school, only information from the question on tertiary education was used for this analysis. Participants' tertiary educational attainment at the time of Lucina 1 interviews (aged ~ late 20s) was thus included in statistical models. The variable categories were: no tertiary qualifications, Technical and Further Education completion, university degree, currently studying.[kk] To allow exploration of the cut-point of educational attainment below which the Theory of Life Course Economic Uncertainty and the Timing of First Childbirth does not apply, categories were not collapsed.

Since educational attainment achieved by the late 20s may have been achieved *after* first childbirth for some participants, in this analysis educational attainment is not conceptualised as part of the causal pathway to childbearing, but rather as a proxy for

[kk] Technical and Further Education (often referred to as 'TAFE', in Australia) is known in some countries as Polytechnic, Vocational Technical College or Community College.[179]

educational and labour market goals formed in childhood. As such, it is a reasonable means by which to identify the middle/high SES group to whom the theory is relevant. Later analyses could explore the use of an earlier time-point of educational attainment, such as age 23 years – which would reflect attainment through the traditional route of moving quickly from school to post-school education; thus, ignoring the role of returning to study as a mature aged student, which complicates the present variable. Another option would be to construct the educational attainment variable according to relationship to an event (first childbirth), rather than age. For example, the variable could reflect educational attainment one year before first childbirth (for mothers), or at time of interview (for non-mothers). This would reflect a causal influence of educational attainment on the outcome.

6.3.4 Other variables

In life course epidemiology, particularly when social exposure pathways are under investigation, causal pathways are not well defined and may be very complicated. This makes identification of potential confounders and mediating factors difficult. In sociological investigations into the influence of work on family formation, it is usual to refer to 'explanatory variables' which are assumed to be important predictors of the processes under study.[180] Two such variables were included in statistical models, ethnicity and a proxy of early life SES. Data regarding both variables were collected in wave 1 Lucina interviews, and variables were time-constant in nature.

Ethnicity is known to play a role in the fertility behaviour of women living in Australia.[181] While all members of the study cohort were born in Australia, there were no limitations on their parents' place of birth – other than Australian immigration policy. Since cultural values passed on by parents are likely to play a role in influencing attitudes to pregnancy and childbearing,[182] analyses included a variable regarding parental ethnicity.

A combined parents' birth place variable was constructed based on answers from two wave 1 questions that asked whether parents were born in Australia. The relevant questions are shown in Figure 6.16. Data from both questions were combined and then the variable collapsed into the following two categories: both parents born in Australia, one or neither parents born in Australia. In instances when a participant did not know

where one or both parents were born, they were incorporated into the 'one or neither parents born in Australia' category. This variable is called 'parents' birthplace'. Ideally a more nuanced variable differentiating between countries of birth (at least to some degree) would be used. However information on parents' countries of birth has never been collected from Lucina cohort members.

Figure 6.16 Questions on parents' country of birth, wave 1 Lucina interview

Was your father born in Australia?
0 No
1 Yes
9 Don't know
Was your mother born in Australia?
0 No
1 Yes
9 Don't know

According to a number of different theoretical orientations, early life SES may be an important explanatory factor for childbirth timing (for example, the Easterlin hypothesis focuses on the impact of material aspirations formed throughout childhood on fertility as an adult).[101] Within the epidemiological paradigm, several proxies for early life SES are commonly used in analyses, such as father's occupation or educational attainment at a point in time (for example, when participant was aged 15 years).[145 146 183] For this analysis, a variable corresponding to the Socio-Economic Index for Areas (SEIFA) index of socioeconomic disadvantage was constructed from the 1986 SEIFA indicator of relative socioeconomic disadvantage that corresponded to each participant's postcode at primary school.[159] The relevant interview question is shown in Figure 6.17.

Figure 6.17 Question on postcode at primary school, wave 1 Lucina interview

Where did you live when you were in primary school?
Suburb…….. Postcode (if known) __ __ __ __
State……
Details if outside Australia……

Data on other early life SES factors were collected in wave 1 Lucina interviews, and future analyses beyond this thesis may explore the relative impact of such factors.

6.4 APPROACH TO ANALYSES

Descriptive statistics compare the sub-sample included in analyses (n=230) with remaining Lucina cohort members, and the total Lucina cohort, according to key variables. Tests including t-tests, chi-square, and Mann-Whitney were conducted to compare the analysis sub-group with other cohort members. Summary statistics are presented on the sub-sample of n = 230, including distributions of the outcome variable, and the exposure variables in time-constant continuous and categorical formats. Participants who had and had not had a child at the time of the LJYWP interviews were compared according to other analysis variables.

Analyses aimed to elucidate the relationship between states of employment and age at first childbirth minus one year (AFBM1) within educational strata. Two primary approaches to survival analyses were undertaken, the first to investigate the cumulative life course model, and the second to investigate the sensitive periods approach. Models were not fit for NILF or FT student categories, since they were not a focus of this research enquiry, or for self-employment, since so few members of the analysis sub-group were ever self-employed (as is described in the next chapter). The state of unemployment was retained as a comparison to contractual arrangement states.

For the cumulative approach analyses, within educational strata, the effect of the total number of years under observation spent unemployed, employed on a casual, FTC, or permanent contract on the outcome variable was examined through fitting separate Cox proportional hazards models. All variables described in Section 6.3 were included in the models; the relationship variable was included in the time-constant format. Cox proportional hazard models were also fit for the exposure variables in the categorical format ($<$ or $\geq$ the 75^{th} percentile, as was described earlier).

Decisions about the time periods on which to focus sensitive period analyses were central to planning analyses. The month-level unit of data collection for the LJYWP allowed great flexibility in how the exposure variable was constructed for this purpose.

For these analyses, bands of approximately three calendar years were constructed, as described in Section 6.3.1.

For the sensitive period analyses, within educational strata, the effect of the number of years spent in each exposure state per three year period on AFBM1 was then examined through fitting separate Cox proportional hazards models. All variables described in Section 6.3 were included in the models; the relationship variable was included in the time-varying format for this suite of analyses. Cox proportional hazard models were also fit for the time-varying exposure variables in the categorical format.

In both sets of analyses, the assumption of proportional hazards was assessed using a graphical method proposed by Grambsch and Therneau.[184]

6.5 SUMMARY

This chapter developed and presented an analytical framework to guide an investigation of the impact of precarious employment on the age of first childbirth. The framework applies existing survival analysis techniques to explore both cumulative and sensitive period effects of precarious employment. The choice of and construction of variables included in analyses were also described. Construction of the exposure variable was particularly challenging and this was described in some detail. The framework is pilot tested in the next chapter.

CHAPTER 7 Preliminary results

7.1 INTRODUCTION

This chapter presents results of a demonstration of the analysis framework developed in Chapter 6, using a subset of the data collected in the Life Journeys of Young Women Project (n = 230). Section 7.2 compares the analysis subset with the remainder of the Lucina cohort, and Section 7.3 presents further summary statistics relevant to the subset, including distributions of the exposure variables in the time-constant format. Section 7.4 presents results of the cumulative (time-constant) analyses in which the effects of the total time spent in precarious employment states on the timing of childbirth were examined. Section 7.5 presents results of the sensitive period (time-varying) analyses in which time spent in the different employment states was aggregated to three year periods, and the effect of the states in each period on the age at first childbirth were examined. Finally, Section 7.6 summarises the chapter and discusses the implications and limitations of the analysis framework. While Dr Lynne Giles executed the analyses presented in Sections 7.4 and 7.5, to maintain consistency with the rest of the thesis the entire chapter is written in the first person.

While reporting response proportion is usually integral to presenting epidemiological results, this is not relevant to meeting the aim of this chapter. Nor is it possible to calculate a response proportion, since fieldwork was ongoing at the time of writing this thesis.[ll]

7.2 COMPARISON OF ANALYSIS SAMPLE WITH LUCINA COHORT

Analyses for this thesis are limited by the amount of data that had been entered within the PhD timeframe. Although the generalisability of analysis results is not relevant here (since the chapter objective is to highlight a methodological approach to analysis, rather

---

[ll] It is nonsensical to report the response proportion at the time that 230 interviews were completed because of the number of cohort members at varying stages of contact at any point during fieldwork (according to the processes outlined in Figure 5.2, on page 121).

than to obtain results), I will briefly describe the analysis sub-sample compared with the remainder of the Lucina cohort. As noted in Chapter 5, motivated cohort members and those with higher levels of educational attainment were approached first to participate in the LJYWP. Since data were entered in the approximate order of interview completion, the analysis subset differs from other members of the Lucina cohort by level of education and would therefore be expected to differ according to a range of other social characteristics.

Table 7.1 describes the analysis sub-group, other members of the Lucina cohort, and the entire cohort. Results of statistical tests (t-tests, chi-square tests, Mann Whitney tests) comparing the analysis group with others are presented. All data presented in Table 7.1 were collected in *wave 1* Lucina interviews, not in the LJYWP, since LJYWP data for cohort members not included in the analyses sub-group was not available at the time of writing. A lower SEIFA score reflects higher relative disadvantage.

As shown in Table 7.1, the analysis subgroup is similar to the cohort members not included in analyses in terms of place of parents' birth, marital status, SEIFA at primary school and whether or not they had had a child at the time of wave 1 Lucina interviews. There were significant differences between the two groups according to highest level of education, as was expected based on the administrative processes by which the sub-group was chosen. Mean age at first childbirth was significantly higher in the analysis sub-group. This is likely to reflect the empirically observed association between higher levels of education and older age of childbearing (which was discussed in Section 2.4).

As stated earlier, the objective of presenting analyses in this chapter is to demonstrate the use of an analytical framework and hence the results themselves are not of primary importance. Thus, for example, the lack of women who did not finish high school in the analysis sub-group is not problematic for the purposes of this chapter.

Table 7.1 Description of analysis sub-group, other cohort members, and the entire Lucina cohort, and results of statistical tests comparing analysis sub-group and others

Variable	Analysis sub-group n=230	Others n=744	Lucina cohort n=974	*p*-value (Analysis vs. others)
Parents' birthplace				
None overseas	98 (43%)	360 (48%)	458 (47%)	0.12[a]
At least 1 overseas	132 (57%)	383 (51%)	515 (53%)	
Missing	0(0%)	1 (0%)	1 (0%)	
Highest level of education at time of wave 1 interview				< 0.001[a]
Some high school	1(0%)	150 (20%)	151 (16%)	
Completed high school	44 (19%)	110 (15%)	154 (16%)	
Technical and Further Education or equivalent	69 (30%)	294 (40%)	363 (37%)	
University degree	100 (44%)	152 (20%)	252 (26%)	
Currently studying	16 (7%)	37 (5%)	53 (5%)	
Missing	0 (0%)	1 (0%)	1 (0%)	
SEIFA index of relative socioeconomic disadvantage, median (range)	975 (727-1138)	970 (727-1145)	970 (727-1145)	0.76[b]
Given birth at time of wave 1 interview				0.18
No	134 (58%)	396 (53%)	530 (54%)	
Yes	96 (42%)	348 (47%)	444 (46%)	
Age at first birth (years), mean (range)	26.5 (18.3-32.7)	23.9 (14.5-33.1)	24.5 (14.5-33.1)	< 0.001

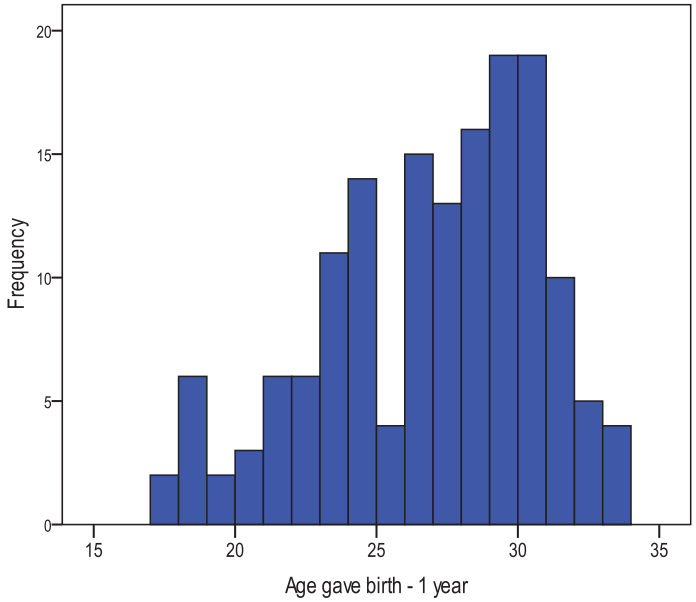
a: n = 973 (one missing observation)

b: n = 971 (three missing observations: two participants were living overseas, one was not able to provide a suburb or postcode)

7.3 DESCRIPTION OF SAMPLE

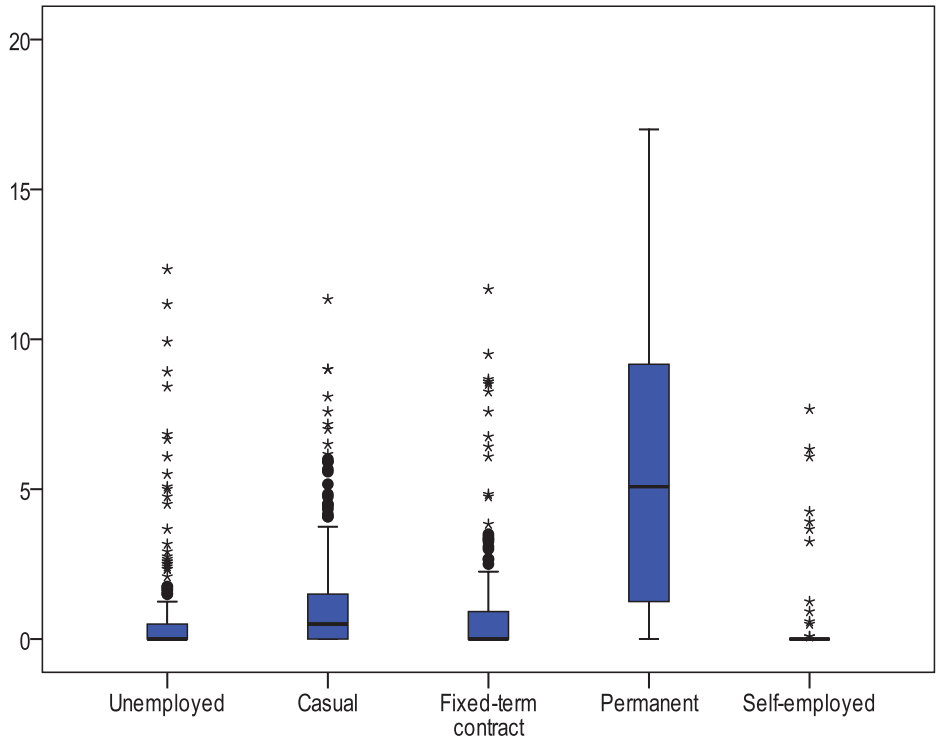
At the time of the LJYWP interviews, 155 participants had given birth to at least one child, and the remaining 75 women were nulliparous. Amongst the mothers, the median age at first birth was 27.8 years (range 17.3 - 33.7 years). Note that the minimum age at first birth is greater than 14 years, when follow-up time commences. A histogram of age at first birth minus one year (AFBM1) is shown in Figure 7.1, and shows a distribution that is skewed to the right.

Figure 7.1 Distribution of age at first birth minus 1 year (n = 155)



The distribution of the time-constant exposure variables corresponding to the time spent in different states of employment over the periods of observation, is presented in Figures 7.2 - 7.5.

Figure 7.2 Boxplot of time (years) spent in key states of employment arrangement (n = 230)



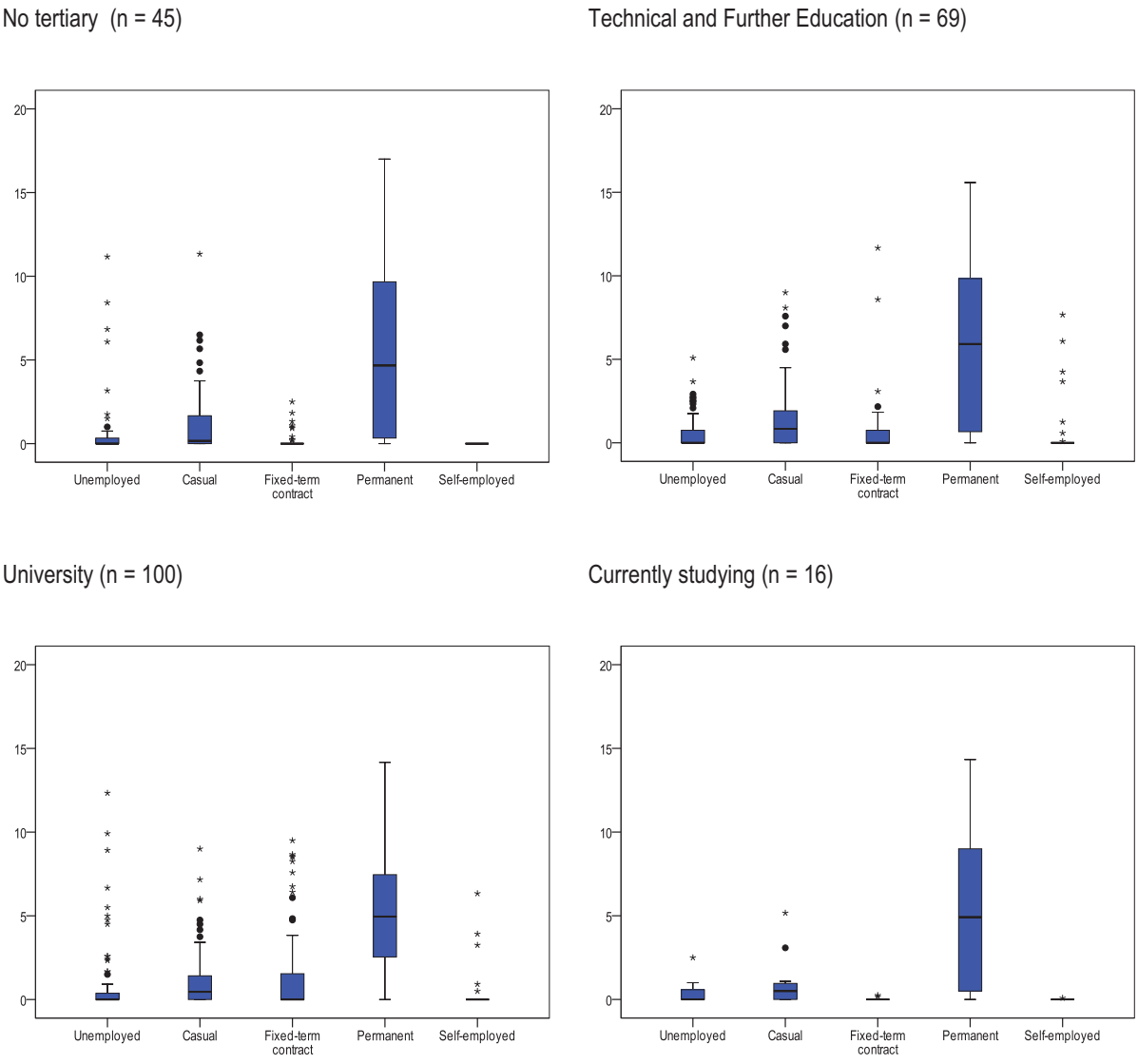
As shown in Figure 7.2, there was considerable variation in the time spent in different states of employment, with permanent employment clearly dominant. The women who had outlying or extreme value are indicated in the figure with a filled circle (for the former) and an asterisk (the latter)[mm]. The figure suggests the distribution of time spent in different employment states (other than permanent) is markedly skewed. Very few participants experienced any time in self-employment (n = 13, 5.7%). The median time spent unemployed, employed with a fixed-term contract (FTC) and self-employed was

[mm] Outliers were defined as cases with values between 1.5 and 3 box lengths from the upper or lower edge of the box. The box length is the interquartile range. Extreme values were defined as cases with values more than 3 box lengths from the upper or lower edge of the box.

zero years. The median time for casual and permanent contracts was 0.5 years, and 5.1 years, respectively.

The states of employment arrangement were stratified according to the four levels of educational attainment, as shown in Figure 7.3.

Figure 7.3 Boxplot of time (years) spent in key states of employment arrangement by educational strata

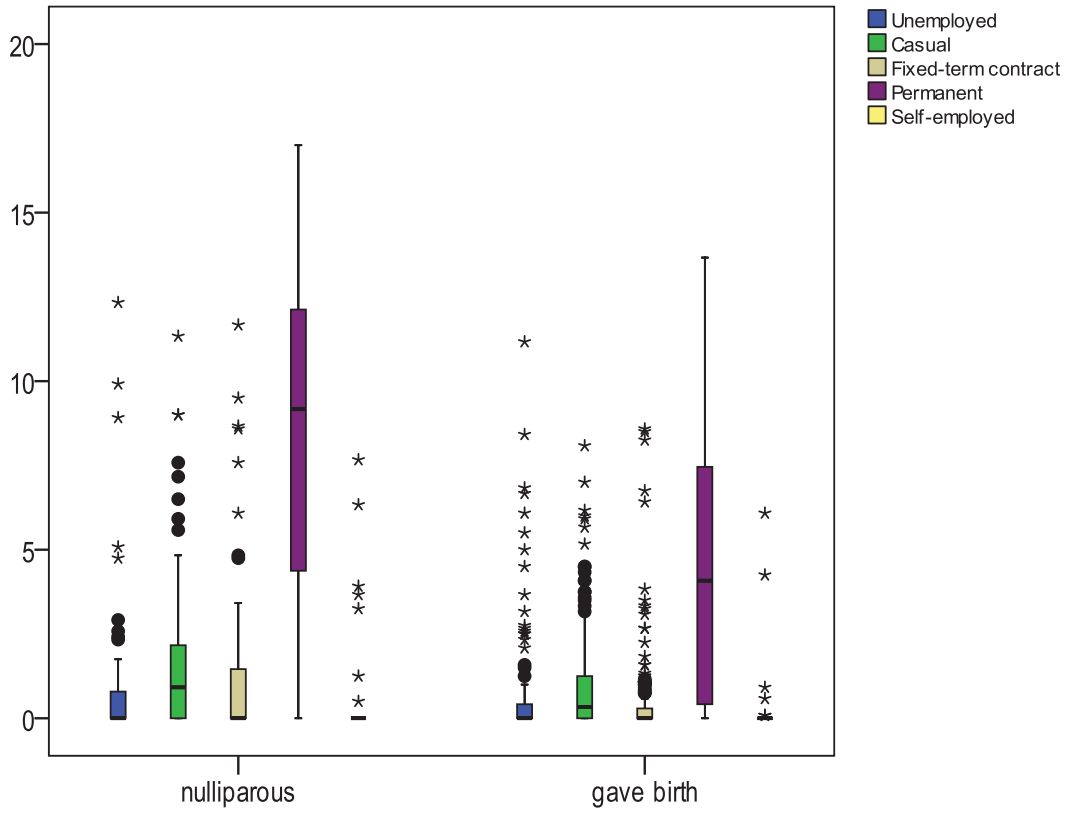


The distributions appear similar for the four categories of educational attainment. The median time spent in casual employment was slightly less for the women without

tertiary qualifications (0.2 years compared with 0.8 for the Technical and Further Education group, 0.5 for the university group).

Figure 7.4 shows the time spent in the different states of employment according to whether participants had given birth or not.

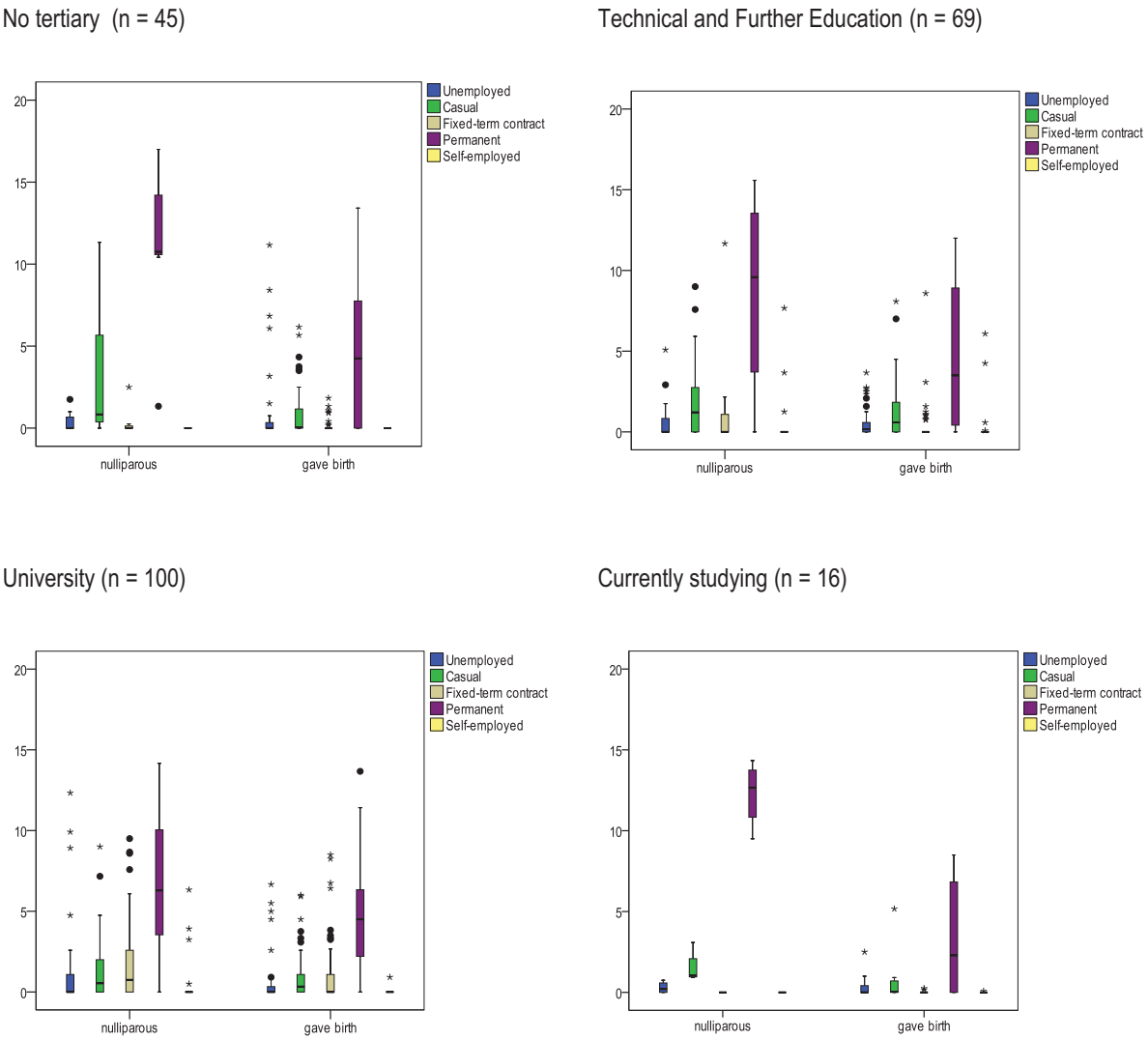
Figure 7.4 Boxplot of time (years) spent in key states of employment arrangement by parity (nulliparous n = 75, gave birth n = 155)



The figure illustrates the marked variation between women in their employment histories, shown by the large spread of observations. The median time spent in casual and permanent states was higher for nulliparous (0.9 years casual and 9.2 permanent) than parous (0.3 casual and 4.1 permanent) women. There was considerable variation in the time spent in unemployed, FTC and self-employment, although relatively few women spent more than one year in any of these states.

Figure 7.5 presents the boxplot of time spent in states of employment arrangement by parity separately for each level of educational attainment.

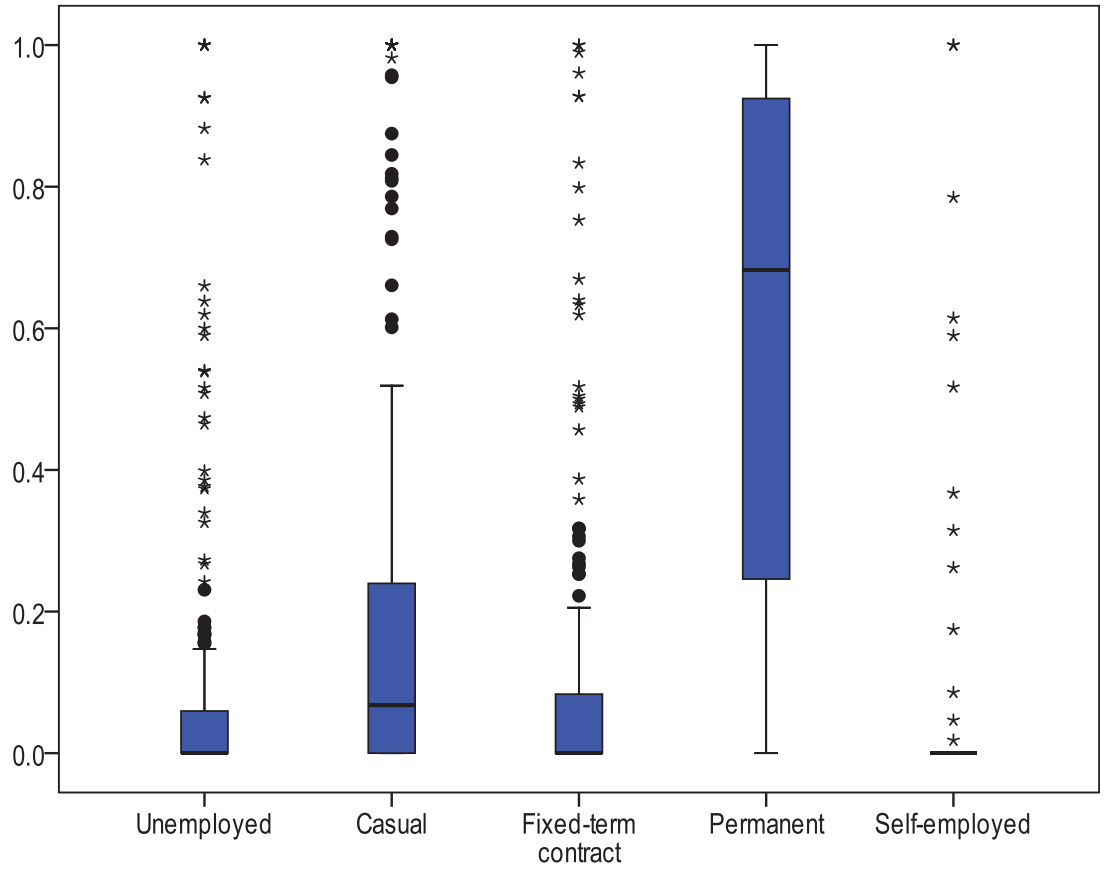
Figure 7.5 Boxplot of time (years) spent in key states of employment arrangement by parity and educational strata



Overall the figure suggests greater time spent in casual and permanent employment for the nulliparous versus parous women within each level of educational attainment. With the exception of permanent employment, the distribution of time spent in the remaining employed states appeared skewed.

Because of the obvious variation in the time period that participants were eligible to be exposed to employment states - that is, time spent in the labour force - the proportion of time spent in each of the employment states out of the total time spent in the labour force over the entire study period was calculated for each participant. Figures 7.6 - 7.9 present the proportion of time spent in the key states of employment arrangement at an aggregate level, and stratified by educational attainment level and parity. Figure 7.6 shows a similar pattern to that shown in Figure 7.2, wherein permanent employment is the dominant state (median = 0.7), and the majority of women spent no time in unemployment (60%), FTC (65%) or self-employment (94%).

Figure 7.6 Boxplot of proportion of time spent in key states of employment arrangement, with respect to total time spent in the labour force (n = 230)



As was seen in Figure 7.3, Figure 7.7 shows the permanent employment state appears predominant in all groups of educational attainment. This figure also demonstrates that amongst women with university qualifications, one quarter of women spent more than 20% of their time in the labour force in FTC employment.

Figure 7.7 Boxplot of proportion of time spent in key states of employment arrangement with respect to total time spent in the labour force, by educational strata

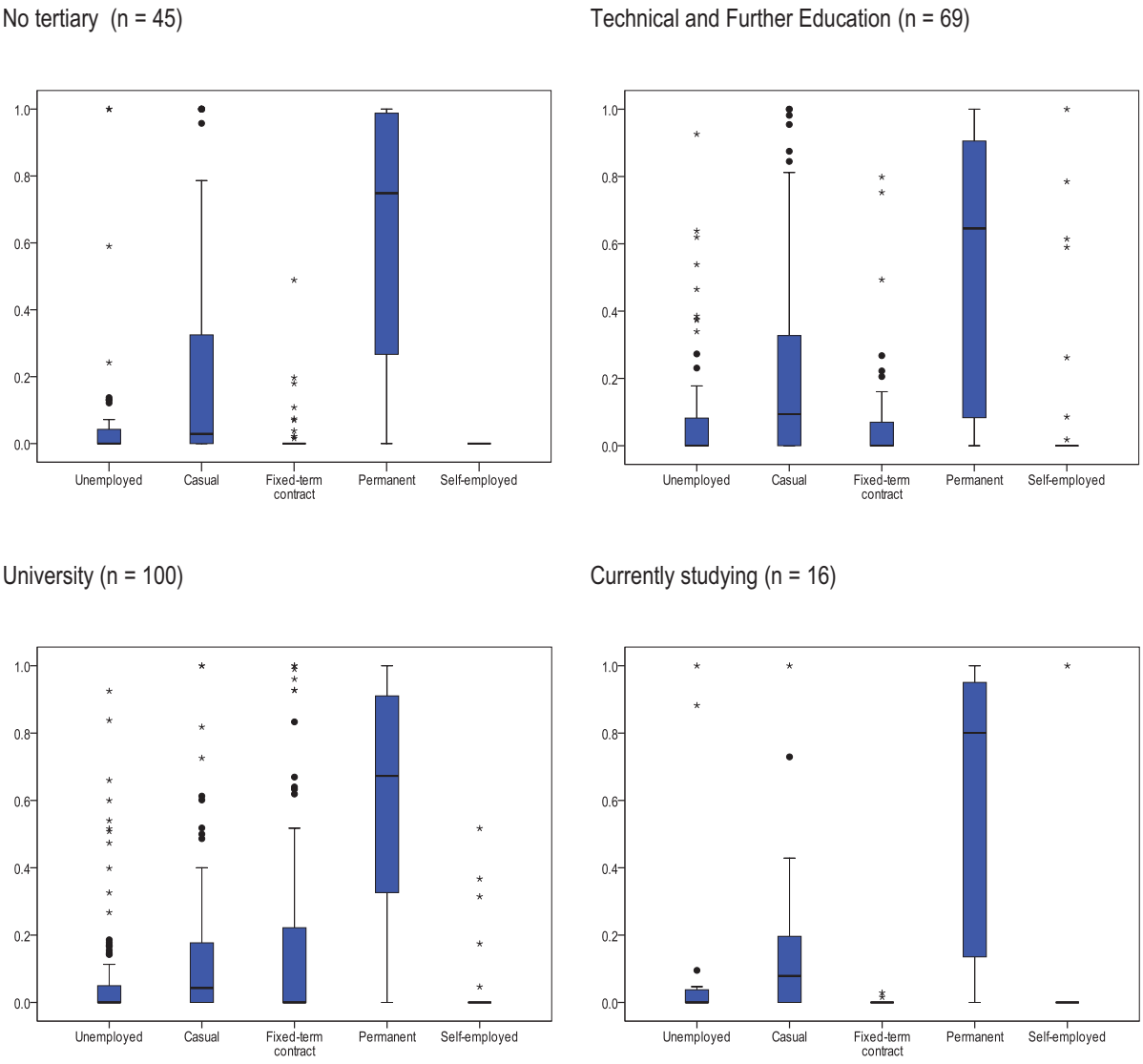


Figure 7.8 shows a boxplot of the proportion of time spent in key employment states by parity. The figure shows that one quarter of the women who had not given birth had spent up to 40% of their time in permanent employment, compared with 7.5% of time for parous women. However the median values for all employment states were very similar between nulliparous and parous women.

Figure 7.8 Boxplot of proportion of time spent in key states of employment arrangement with respect to total time spent in the labour force, by parity (nulliparous: n = 75, gave birth: n = 155)

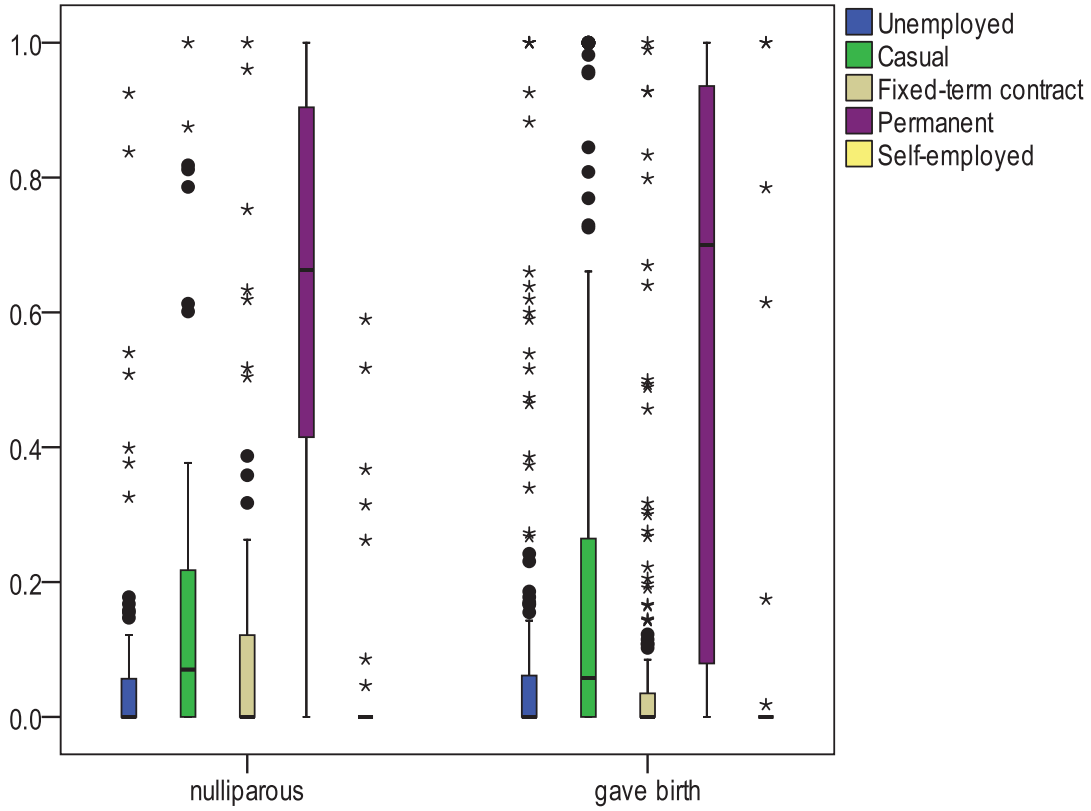
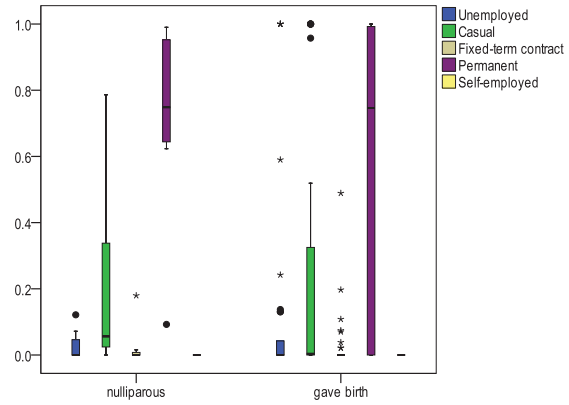


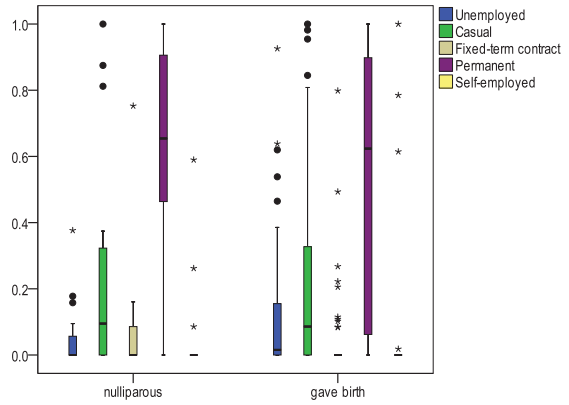
Figure 7.9 provides a boxplot of the proportion of time spent in key employment arrangement states by parity separately for each level of educational attainment. In contrast to Figure 7.5, this figure shows the median proportion of time spent in the different employment states was similar for the women who had and had not given birth within each stratum of educational attainment (aside from the currently studying group, with n = 16).

Figure 7.9 Boxplot of proportion of time spent in key states of employment arrangement with respect to total time spent in the labour force, by parity and education

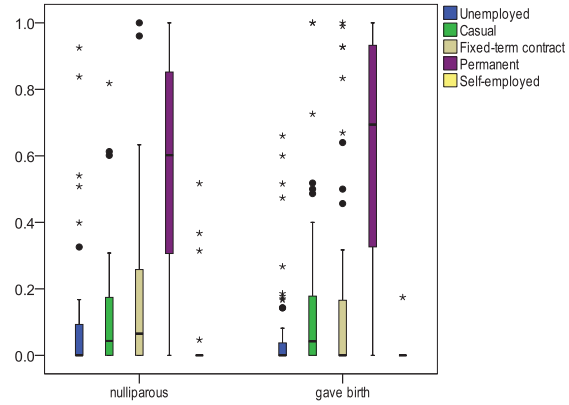
No tertiary (n = 45)



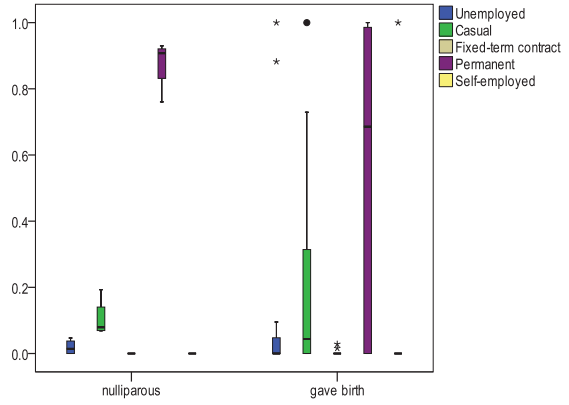
Technical and Further Education (n = 69)



University (n = 100)



Currently studying (n = 16)



Since so few participants ever spent time in self-employment (n = 13, 5.7%), this state was not explored further in analyses presented in this chapter.

An analogous process of data exploration was undertaken for the time-varying exposure variables, wherein distributions for each of the seven age bands were constructed. However, due to the complexity of these visual representations, they are not included here. The time-varying exposure variables in continuous and categorised formats were incorporated into time-varying analyses.

The distribution of the relationship variable in continuous format was presented in Figure 6.13 on page 146. Summary statistics for the mothers and nulliparous women according to other relevant variables are presented in Table 7.2.[nn]

Table 7.2 Description of nulliparous women and mothers according to parents' birthplace, highest level of education and SEIFA index of relative socioeconomic disadvantage. Shown are n (%)

Variable	Had no child n=75	Had ≥1 child n=155	Overall n=230	*p*-value
Parents' birthplace				0.40
None overseas	29 (39%)	69 (45%)	98 (43%)	
At least 1 overseas	46 (61%)	86 (55%)	132 (57%)	
Highest level of education at time of wave 1 interview				0.03
No tertiary qualification	7 (9%)	38 (25%)	45 (20%)	
Technical and Further Education or equivalent	24 (32%)	45 (29%)	69 (30%)	
University degree	40 (53%)	60 (39%)	100 (43%)	
Currently studying	4 (5%)	12 (7%)	16 (7%)	
SEIFA index of relative socioeconomic disadvantage, median (range)	973 (727-1136)	975 (727-1138)	975 (727-1138)	0.97

As this table shows, nulliparous women and mothers are similar in terms of parents' birthplace and SES during primary school. There was a significant association between educational attainment and parity, such that women with no children were more likely to have a university degree than those with one or more children.

[nn] All data provided in this table were collected at the time of wave 1 Lucina interviews, since data on these variables were not available from the LJYWP at the time analyses were undertaken.

7.4 CUMULATIVE APPROACH: TIME-CONSTANT ANALYSES

In this section, the effects of different employment states on the AFBM1 are examined within an accumulated history framework. Separate Cox proportional hazards models for each level of educational attainment were fit. Models included parents' birthplace, SEIFA index of relative socioeconomic disadvantage, number of years in relationships (categorised as never been in relationship, 0.01 - <5 years, ≥5 years) and the number of years in the labour force.

The method proposed by Grambsch and Therneau[184] was used to assess the assumption of proportional hazards in all models. In this method, a plot of scaled Schoenfeld residuals versus a function of time is created and a line fit to the plot. A test of the null hypothesis that the slope of the line is zero can then be conducted, and a non-zero slope is indicative of a departure from proportional hazards.[184 185]

Because the assumption of proportional hazards was not met for the number of years in relationships variable, the Cox proportional hazards model was stratified by this variable, with separate baseline hazard functions estimated. Since there was evidence of non-proportional hazards associated with number of years in the labour force, these models were further stratified by this variable (dichotomised at the median as ≤8.5 or >8.5 years). The fit of the stratified Cox proportional hazards models for each level of educational attainment are shown in Appendix 11 (page 210). As this table shows, the assumption of proportional hazards was met in all of these stratified models.

The effects of the number of years in each different employment state of interest, (that is, unemployed, casual, FTC, and permanent), on AFBM1 were then examined through the fit of separate Cox proportional hazards models for each employment state. Based on the results presented in Appendix 11, separate models were fit for each level of educational attainment, and each model was additionally stratified by years in relationships and years in the labour force. The fit of these models are shown in Appendix 12 (page 211). The sample size of women who were currently studying was very small (n=16), and thus the fitted models did not converge for FTC. There was evidence of non-proportionality in only one instance (no tertiary education, unemployed years: X^2=5.0, p = 0.03). Given that the global test of the proportional hazards assumption was met for this particular model, I continued to the next stage of

analysis. The adjusted hazard ratios and associated 95% confidence intervals for the effect of each employment state on AFBM1 are presented in Table 7.3.

Table 7.3 Summary of adjusted hazard ratios for effect of years in employment state on age at first birth minus 1 year, for each level of educational attainment and each employment arrangement, stratified by number of years in relationships and in the labour force

	Employment arrangement	HR[a]	95%CI	*p*-value
No tertiary (n=45)	Unemployed	1.0	0.9 - 1.2	0.76
	Casual	0.7	0.5 - 0.9	0.02
	Fixed term contract	1.6	0.7 - 3.6	0.29
	Permanent	0.9	0.9 - 1.0	0.14
Technical and Further Education (n=69)	Unemployed	0.9	0.6 - 1.3	0.50
	Casual	0.9	0.8 - 1.1	0.23
	Fixed term contract	0.9	0.7 - 1.1	0.40
	Permanent	1.0	0.9 - 1.1	0.57
University (n=100)	Unemployed	0.9	0.8 - 1.1	0.34
	Casual	0.9	0.8 - 1.1	0.40
	Fixed term contract	0.9	0.8 - 1.0	0.09
	Permanent	1.0	0.9 - 1.1	0.69
Currently studying (n=16)	Unemployed	12.9	0.4 - 456.2	0.16
	Casual	0.7	0.4 - 1.4	0.35
	Fixed term contract	dnc[b]	-	-
	Permanent	0.4	0.2 - 1.0	0.05

a: Hazard ratios show the effect of each additional year in activity. Models include parents' birthplace and SEIFA index of relative socioeconomic disadvantage as covariates, and are stratified by relationship status (never been in relationship, 0.01 - <5 years, ≥5 years), and period in the labour force (≤8.5 or >8.5 years).

b: Did not converge.

As shown in this table, the effect of each year in casual employment among the participants who did not have tertiary educational qualifications was significant (p = 0.02). The adjusted hazard ratio and associated 95% confidence interval (CI) for casual employment was 0.7 (95%CI 0.5 - 0.9), suggesting that each additional year in casual employment reduced the hazard of having a child by the time of the study interview by 30%. The effect of each additional year in casual employment on AFBM1 was not statistically significant for the women with Technical and Further Education or

University qualifications, nor for the women who were studying at the time of interview. The effect of each additional year in permanent employment was marginally statistically significant amongst participants who were currently studying ($p = 0.05$). The adjusted hazards ratio was 0.4 (95%CI 0.2 - 1.00), suggesting that each additional year reduced the risk of having a child by 60%. However, as has already been stated, the sample size for this group was modest and thus the finding should be viewed with caution. Finally, there was some evidence of effect of additional years of FTC employment for those with university qualifications (HR=0.9, 95% CI 0.8 - 1.0; $p = 0.09$). Again, the confidence interval includes one and so some caution should be exercised in the interpretation of this finding.

In summary, when considered across the educational strata, employment states do not show a clear effect on the hazard of giving birth. Of particular interest, casual employment is only associated with a lower risk of having a child for women with the lowest educational qualifications (no tertiary qualifications) - the opposite of what would be expected according to the Theory of Life Course Economic Uncertainty and the Timing of First Childbirth. However, these women had all finished high school, and it may be that women who *did not* finish high school are the low SES group for whom the theory is irrelevant. This will be explored with the complete LJYWP dataset in the future.

As was seen in Figure 7.2, there was a skewed distribution of the time spent in the different employment states. Therefore the number of years in each employment state were classified as $<$ or $\geq$ the 75^{th} percentile (unemployed 0.5 years, casual 1.5 years, FTC 1.0 year, permanent 9.0 years). In this way, dichotomous categorical variables were derived for each state of employment. The same approach was taken to fitting the Cox proportional hazard models with the dichotomised exposure variables. That is, separate models were fit for each level of educational attainment, and each model was additionally stratified (in the sense of allowing baseline hazards to vary) by relationship years and the total period in the labour force. Results of tests of the assumption of proportional hazards are shown in Appendix 13 (page 212). The assumption was not significantly violated for any of these models. Table 7.4 presents the adjusted hazard ratios associated with the categorised employment state variables.

Table 7.4 Summary of adjusted hazard ratios for effect of employment state on age at first birth minus 1 year (dichotomised exposure variables), for each employment arrangement and each level of educational attainment, stratified by number of years in relationships and in the labour force

	Employment arrangement	HR[a]	95%CI	*p*-value
No tertiary (n=45)	Unemployed[b]	1.2	0.5 - 3.1	0.64
	Casual	0.3	0.1 - 0.8	0.01
	Fixed term contract	1.7	0.5 - 5.5	0.41
	Permanent	0.6	0.2 - 2.2	0.48
Technical and Further Education (n=69)	Unemployed	0.7	0.4 - 1.4	0.29
	Casual	0.7	0.4 - 1.5	0.38
	Fixed term contract	0.6	0.2 - 1.4	0.22
	Permanent	0.7	0.3 - 1.9	0.52
University (n=100)	Unemployed	0.8	0.4 - 1.5	0.48
	Casual	0.9	0.5 - 1.7	0.70
	Fixed term contract	0.5	0.3 - 0.9	0.03
	Permanent	0.4	0.1 - 1.3	0.12
Currently studying (n=16)	Unemployed	22.4	0.8 - 606.2	0.06
	Casual	0.3	0.0 - 5.5	0.38
	Fixed term contract	-	-	-
	Permanent	dnc[c]	-	-

a: Hazard ratios show the effect of being in the ≥ 75th percentile group. Models include parents' birthplace and SEIFA index of relative socioeconomic disadvantage as covariates, and are stratified by relationship status (never been in relationship, 0.01 - <5 years, ≥5 years), and period in the labour force (≤8.5 or >8.5 years).

b: Unemployed (< and ≥0.5 years), casual (< and ≥1.5 years), FTC (< and ≥1.0 years), permanent (< and ≥9.0 years).

c: Did not converge.

Broadly speaking, the results from these models are consistent with those from the fitted models based on the continuous exposure variables. Results suggest that for participants without any tertiary qualifications, a history of ≥1.5 years in casual employment reduced the likelihood of having a child by 70% (HR=0.3, 95% CI 0.1 - 0.8, p = 0.01). Also, for participants with a university qualification, ≥1.0 year in fixed-term contract employment reduced the hazard of having a child by 50% (HR = 0.5, CI 0.3 - 0.9, p = 0.03).

7.5 SENSITIVE PERIODS APPROACH: TIME-VARYING ANALYSES

In this section, the effect of different states of employment in roughly three year periods from age 14 through to 34 on the AFBM1 was examined through the fit of Cox proportional hazards models. Parents' birthplace, women's educational attainment, and SEIFA index of relative socioeconomic disadvantage were included as time-constant variables in the analyses. The number of years in relationships (categorised as none, <3, or 3 years) and in the labour force (categorised as <3 or 3 years) in each three year period were included in the analyses as time-varying variables. The assumption of proportional hazards was formally assessed in each analysis using the methods described by Grambsch and Therneau.[184] There were a total of 1,215 time periods of observation from the 230 women included in the analyses.

Separate Cox proportional hazards models for each level of educational attainment were fit. Models included parents' birthplace, SEIFA, time spent in relationships, and time spent in the labour force. Within the educational groups of university level qualifications and current students, the models did not converge. The parameter estimates associated with the time spent in relationships were problematic in these two models. Therefore, similar to the time-constant analyses, the models were stratified by years in relationships, so that separate baseline hazard functions were estimated for the relationships variable. Appendix 14 (page 213) presents the test of the proportional hazards assumption in these revised initial models.

Based on result shown in Appendix 14, separate Cox proportional hazards were fit for each of the employment states and for each of the four educational strata. Summaries of the tests of the proportional hazards assumption are presented in Appendix 15 (page 214). The results from fitting these separate models are summarised in Table 7.5.

Table 7.5 Summary of adjusted hazard ratios for effect of employment arrangements in three year periods on age at first birth minus 1 year, for each employment arrangement and each level of educational attainment, stratified by number of years in relationships

	HR[a]	95%CI	*p*-value
No tertiary (n = 45 with 201 obs.)			
Unemployed	1.4	0.9 - 2.2	0.10
Casual	0.8	0.6 - 1.2	0.30
Fixed term contract	0.0	0.0 - 11.2	0.26
Permanent	0.9	0.7 - 1.2	0.62
Technical and Further Education (n = 69 with 359 obs.)			
Unemployed	1.2	0.4 - 3.3	0.77
Casual	1.1	0.7 - 1.6	0.75
Fixed term contract	0.8	0.4 - 1.7	0.52
Permanent	1.0	0.7 - 1.3	0.91
University (n = 100 with 589 obs.)			
Unemployed	0.7	0.4 - 1.1	0.14
Casual	0.8	0.4 - 1.5	0.51
Fixed term contract	0.9	0.7 - 1.3	0.58
Permanent	1.2	0.9 - 1.5	0.22
Currently studying (n = 16 with 66 obs.)			
Unemployed	1.9	0.4 - 9.2	0.44
Casual	2.0	0.8 - 5.3	0.15
Fixed term contract	dnc[b]	-	-
Permanent	0.6	0.2 - 1.5	0.27

a: Hazard ratios show the effect of each additional year in activity. Models include parents' birthplace, SEIFA index of relative socioeconomic disadvantage, and time spent in the labour force (<3 or 3 years) as covariates, and are stratified by relationship status (none, <3, or 3 years).

b: Did not converge.

None of the tests of the proportional hazards assumption were significant in the separate models for each level of educational attainment, at either the individual variable or global test level. The model looking at the effect of FTCs for participants who were currently studying did not converge. Only one model showed marginal significance: the effect of unemployment within the no tertiary qualification group (HR = 1.4, 95%CI 0.9 - 2.2, $p = 0.1$). This suggests that every additional year of unemployment is associated

with a 40% increased risk of having a child, for women with no tertiary qualification.

As with the time-constant analyses, models were also constructed based on dichotomised exposure variables. Within each three year period, women were classified as spending either no time or some time in the respective employment states. Table 7.6 shows the results of fitting these separate models. Summaries of the tests of the proportional hazards assumption are presented in Appendix 16 (page 215). None of the tests of the proportional hazards assumption were significant in the separate models for each level of educational attainment, at either the individual variable or global test level.

Only one model showed marginal statistical significance – the effect of permanent employment for participants in the currently studying group (HR = 0.0, 95% CI 0.0 - 1.6, p = 0.08). However, as previously stated, the currently studying group is very small and so this result must be viewed with caution.

Note that if statistically significant results are obtained in future time-varying analyses with the entire LJYWP dataset, the next step would be to proceed to using time-varying coefficients to investigate the impact of changing employment states within each time period.

Table 7.6 Summary of adjusted hazard ratios for effect of employment arrangements in three year periods on age at first birth minus 1 year (dichotomised exposure variables), for each employment arrangement and each level of educational attainment, stratified by number of years in relationships

	HR[a]	95%CI	*p*-value
No tertiary (n = 45 with 201 obs.)			
Unemployed[b]	1.6	0.6 - 4.6	0.35
Casual	0.8	0.4 - 1.7	0.56
Fixed term contract	0.4	0.1 - 1.7	0.21
Permanent	0.8	0.4 - 1.5	0.44
Technical and Further Education (n = 69 with 359 obs.)			
Unemployed	1.8	0.8 - 4.2	0.16
Casual	1.2	0.6 - 2.4	0.59
Fixed term contract	0.6	0.2 - 2.0	0.41
Permanent	1.2	0.6 - 2.4	0.65
University (n = 100 with 589 obs.)			
Unemployed	0.5	0.2 - 1.3	0.18
Casual	0.8	0.4 - 1.6	0.12
Fixed term contract	0.7	0.3 - 1.3	0.24
Permanent	1.3	0.7 - 2.4	0.49
Currently studying (n = 16 with 66 obs.)			
Unemployed	2.0	0.2 - 22.9	0.57
Casual	3.4	0.6 - 18.0	0.16
Fixed term contract	dnc[d]	-	-
Permanent	0.0	0.0 - 1.5	0.08

a: Hazard ratios show the effect of being in the $\geq 75^{th}$ percentile group. Models include parents' birthplace, SEIFA index of relative socioeconomic disadvantage, and period in the labour force (<3 or 3 years) as covariates, and are stratified by relationship status (none, <3, or 3 years).

b: Unemployed (< and ≥0.5 years), casual (< and ≥1.5 years), FTC (< and ≥1.0 years), permanent (< and ≥9.0 years).

c: Did not converge.

7.6 SUMMARY AND DISCUSSION

The key objective of chapters 6 and 7 was to design and demonstrate the use of an analytical framework using survival analysis techniques to capture cumulative and sensitive period life course effects, in the context of an investigation of the impact of precarious employment on women's age of first childbirth. Analyses presented in this chapter were not sufficiently powered, and thus results obtained are not consequential to the following discussion.

The analysis framework responds to limitations of the existing body of literature investigating the influence of precarious employment on childbirth, as outlined in Section 1.6. That is: (1) the cumulative and sensitive period life course approaches enable investigation of the *duration* and *timing* of precarious employment experiences, compared with the simpler transitions approach, (2) the outcome variable is *age* at first childbirth, so analysis results can be linked with the public health interest in maternal age – unlike the results of Globalife analyses, as was explained in Chapter 1, and (3) the framework considers the association of interest *within* educational strata. Also, since the Lucina cohort is a birth cohort, the impact of period and age on fertility outcomes are in effect controlled for in these analyses (unlike Globalife analyses which were based on population samples of varying age).

The framework developed brings existing survival analysis techniques and applies them to an investigation within the field of life course epidemiology, in line with a prediction made in 2002 by Ben-Schlomo and Kuh that 'techniques already in existence but perhaps currently underutilised in conventional epidemiological analyses…will become more widespread' in the field.[60, p. 291] As has been demonstrated, the ability of these techniques to incorporate time-varying exposure data complements the current epidemiological challenge of engaging with the complexities of the impact of exposures across the life course.

> In our view, the most important step forward in event history analysis, with respect to the empirical study of social change, has been to explicitly measure and include time-dependent covariates in transition rate models. [138, p. 131]

The framework provides an example of what is possible when event history data is

available for life course analyses, particularly in the flexibility in exposure variable construction. For example, the choice of sensitive periods was theoretically informed, unlike many life course analyses based on panel data when the periods are dictated by the data available. Also, the exploration of continuous *and* categorical formats of the time-constant and time-varying exposure variables demonstrated the flexibility of the dataset.

The analytical framework complements theoretical innovations that were developed in Chapter 2 in two ways. First, the analytical models allow for the potentially variable relationship between precarious employment and age at first childbirth between SES groups by fitting separate Cox proportional hazards models for each level of educational attainment. This approach extends the work of the Globalife group, as already mentioned, since their investigations control for SES and thus do not allow this level of explication. Second, the approach developed also included a time-varying variable for live-in partnering. Since these data are unique, to my knowledge, this is the first time that this has been incorporated in an investigation of the impact of precarious employment on first childbirth.

It is pertinent to reflect on decisions about the exposure variable states (refer to Figure 6.3 page 137). In the design of this exposure model, multiple dimensions (labour force participation, contractual job arrangements, enrollment in courses of study) were simplified into one, seven-state model. Decisions regarding the construction of such models are particularly difficult when an exposure is poorly defined in the literature and little is known about which dimensions of a complex exposure are important to the outcome, as is the case in this project. By explaining my decisions in some detail, I aimed to provide a case-study for other researchers attempting to construct variables regarding complex exposures with multiple sub-dimensions. The discussion on the live-in partnering variable (Section 6.3.2) may be similarly useful.

Exposure variables were constructed as dichotomies for cumulative and sensitive period analyses. In future planned analyses with the entire dataset, it may be possible to use more categories in the exposure variables (which was not feasible in the preliminary analyses due to the small number of cases and limited spread of observed values).

There are several limitations of the analytical approach developed that warrant mention. The approach taken to cumulative and sensitive period analyses involved fitting separate Cox models for each employment arrangement state. However, this is potentially problematic in that there is a circularity between the time spent in each of the employment states: for each individual the sum of time spent in each state equates to the total time spent in the labour force. Therefore, for example, the more time spent out of the labour force, the less time in any contractual arrangement. These relationships are not fully accounted for in the approach taken. A partial solution might lie in including all employment states within one Cox model. With the current dataset (n = 230) the fit of such models did not converge. Thus exploration of this with the full dataset will be an important aspect of future work.

The cumulative period approach was based on a time-constant exposure variable. As such, the influence of the *timing* of precarious employment experiences in the life course is not incorporated in these models. Although this is a simplistic use of the available data, this approach is a logical first step to building a framework around the cumulative life course approach.

Sensitive periods were constructed according to chronological age in the frameworks developed. However, other options for the construction of sensitive periods in line with theoretical ideas in the literature may be fruitful. For instance, since women are at lower risk of childbirth during periods of study,[123 124] categories could be delineated according to number of years since leaving FT education for the first time. Furthermore, since 'social roles and life events have different social meanings …depending on their timing and whether they are typical for a person's age, gender or culture',[59] it may be that the determinants of age at childbirth differ between social groups to the extent that the construction of sensitive periods should be approached entirely differently for separate categories of educational attainment.

When time-varying covariates are incorporated in survival models, as they were in the sensitive period approach, an assumption is made that they are exogenous. That is, that they change for reasons that do not depend on the survival process being investigated.[174] This assumption is not met in this study, since contractual arrangements could change in connection with age at first childbirth. For example, a woman might change to a less

demanding job (including a change in contractual arrangement) if she is having trouble becoming pregnant. This has not been raised, to my knowledge, in the body of literature that uses survival techniques to investigate the timing of first childbirth. It is difficult to know what influence it has on results of these investigations.

A variable representing the total time spent in the labour force was included in statistical models to recognise that individuals are only at risk of precarious employment during these periods; that is, individuals are not at risk of precarious employment during periods not in the labour force, or when undertaking FT study. In this way models 'adjust' for periods not at risk. There may be other methods of dealing with this issue. Alternative options will be explored with the full dataset but did not fall within the scope of the PhD candidature.

While not a limitation of the analytical framework *per se*, a limitation of the educational attainment variable was that the 'currently studying' group was likely to be heterogeneous, combining participants studying towards Technical and Further Education qualifications and university degrees. Also, participants in this group may already have completed a tertiary qualification, but using wave 1 data it was not possible to classify them accordingly. For future analyses, educational attainment data collected in the LJYWP will be used and these problems will be rectified.

Last, the parents' birthplace variable may be problematic. The data collected in wave 1 interviews only allows classification according to whether or not parents were born in Australia, thus treating all non-Australian born parents in the same way, irrespective of their actual country of birth. While parents of Lucina cohort members are almost entirely Caucasian (as was outlined in Section 3.7), the variable may not be meaningful when categorised in this way due to differences in fertility behaviours and beliefs between non-Australian born parents. Whether or not this variable should be included in future analyses requires further consideration.

The decision to collect data at the month-level is likely to have resulted in a certain amount of dating inaccuracy in employment arrangement and study data collected. However, in view of the parameters of the exposure variables (time-constant and time-varying in three year age bands), this is unlikely to have affected the analyses to any great extent. For the time-constant exposure variables, as long as dating errors were

‘small and equally often in both directions’, (as indicated by Reimer with regard to employment histories – see Section 3.4), there will be no impact on the exposure variables, provided this occurs equally for all exposure classification states. The time-varying exposure variables were arranged in three-yearly bands. Given these large blocks of time, problems of recalling exact timing of events are overcome to some extent, and based on Reimer’s conclusions, inaccuracies are unlikely to impact on analyses in an important manner. I acknowledge that Reimer’s conclusions were based on employment histories other than contractual arrangements, which may be more (or less) difficult to recall. Recall accuracy of contractual arrangements will be assessed in my Postdoctoral period; details are discussed in Chapter 8.

The development of the analytical frameworks presented in this thesis represent the first step of a research program that will engage with the use of survival techniques to model life course associations based on the theory developed in this thesis. The next chapter will outline the next stages of the program of research.

CHAPTER 8 Discussion and conclusion

8.1 INTRODUCTION

This PhD thesis has presented and discussed each stage of the development and execution of the Life Journeys of Young Women Project, including theory-building, survey design, fieldwork, and construction and demonstration of the use of an innovative analysis framework. In this thesis the main intellectual contributions arise from the combined work on theoretical, methodological and analytical frameworks. They will form the basis of future (postdoctoral) analyses to be conducted with the entire dataset. Section 8.2 describes the key limitations of the body of work presented. Section 8.3 describes the contributions made by this thesis and their implications, particularly for life course epidemiology. From the outset this PhD candidature was envisaged as the first stage of a larger research initiative, and Section 8.4 outlines the research program that is planned for the future.

8.2 LIMITATIONS

Limitations of each stage of this body of work have been considered in thesis chapters. This section will highlight the main limitations related to the thesis objectives, and comment on limitations of the overall approach taken.

Chapter 1 presented the rationale for the relevance and significance to public health of older age at childbirth. This persuasive argument could be further strengthened by population-level analyses of economic costs and health and social impacts based on current data and predicted trends in maternal age in Australia.

Concepts related to economic uncertainty other than precarious employment might be more influential in terms of the timing of first childbirth. It is also possible that contractual arrangements are not the best indicator of precarious employment, in the context of the research questions being addressed. However, these decisions are in line with the design of Globalife analyses, allowing comparison of results with analyses undertaken regarding a range of other countries, and are also underpinned with valid theoretical rationale, as discussed in Chapter 2.

As is the case for all cross-sectional retrospective studies, the major methodological limitation of this study is related to recall of life course information. This is especially relevant to the Life Journeys of Young Women Project (LJYWP) given the detail of

data collected in combination with the relatively long period of recall. Further, the length and complexity of the interviews are likely to have led to some fatigue of both interviewers and interviewees, which may have impacted on data quality. As has been discussed, a major theme of this body of work has been the development of strategies to ensure the collection of data of the highest possible quality, within the constraints of the study design and nature of the data being collected. In combination, this cluster of strategies is the most comprehensive attempt to collect high quality retrospective data among studies of this design appearing in the literature. It must be noted that although, anecdotally, strategies developed to improve data quality were successful, many were not formally evaluated because methodological sub-studies require withholding strategies from 'control' groups, risking overall data quality.

The factors that potentially impact on the timing of childbirth in women's lives are almost limitless and not able to be measured within one empirical study. It could be argued that the study should have been preceded by qualitative work investigating key determinants of childbearing to inform what was measured. However, this project was approached from an interest in structural determinants that are policy amenable, and not necessarily conscious at the level of the individual. I aimed to shed light on one important potential determinant, precarious employment, chosen from theoretical literature. Results from analyses undertaken with the entire dataset should be considered in the context of results from empirical studies investigating the role of other determinants of the timing of childbirth.

Many of the Event History Calendars (EHCs) described in the literature in the past few years have been computerised[152 186 187] and have inbuilt consistency-checking systems. A lack of resources meant that the EHC used in this study was paper-based. Although stringent quality monitoring systems were put in place to monitor data entry, it is possible this is a source of error in the data. However, such errors are likely to be random and thus not a source of bias.

While the survey instruments developed for this project were piloted extensively (as described in Chapter 4), some minor changes were required after the commencement of fieldwork with the study cohort. Changes made at that stage are not ideal, and resulted in a small amount of discordance within the dataset. However this was preferable to

continuing to use problematic questions that caused confusion to some participants or led to the collection of poor quality data. Though every effort was made to conduct pilot testing with women representative of the socioeconomic spectrum, as is often the case, women from lower SES backgrounds were under-represented in the pilot group. Greater representation of this group might have overcome the need to make changes once fieldwork had commenced.

Analytical limitations were discussed in the previous chapter. From the perspective of linking an analytical framework to life course approaches, this project has treated the cumulative and sensitive period life course approaches as discrete and separate entities, whereas in reality they are likely to overlap in relation to the research questions. That is, precarious employment experiences are likely both to accumulate (in the nature of their impact on the timing of childbirth), and to be more potent at particular periods of a life course. Despite this simplification, these frameworks are more sophisticated than previous life course enquiries into this research issue (for example, the Globalife investigations, as described in Section 1.6).

It is useful to consider whether certain participants should be removed from future analyses. For example, the path to childbearing for women who identify as non-heterosexual may be so different as to warrant treating this group separately. Also, women who cannot biologically conceive, such as those who had a hysterectomy prior to childbearing, should be excluded. These issues were not taken into account in analyses presented, nor have they been considered in published analyses from similar studies. Future work undertaken with the entire dataset will attend to appropriate exclusion criteria.

Although not directly related to thesis objectives, the age of Lucina cohort members at the time of the LJYWP interview is a limitation of the study design. Since cohort members were aged in their early to mid 30s at the time of interviews, they had not yet completed their reproductive life period. Thus, a number of study participants who have not yet had a child will do so in years to come. Considering this group, it is possible that patterns of employment experiences up to the mid 30s may differ between women who will have a child in the future and women who will never have a child (for example, because the desire to have a child in the future may shape choices made regarding

employment). Thus, considering these two groups together may blur associations between the exposure and outcome. Investigators plan to follow the Lucina cohort until the end of the reproductive life course. Therefore it will be possible to conduct analyses with complete reproductive data in the future.

8.3 IMPLICATIONS AND CONTRIBUTIONS

Implications and contributions of work presented in this thesis will be discussed according to the thesis objectives outlined in Section 1.9.

To present a rationale for considering older maternal age from a public health perspective

The Life Journeys of Young Women Project was premised on the rationale developed in Section 1.3 for the relevance and significance of the contemporary trend of older maternal age from the public health perspective. This brings older maternal age firmly within the boundaries of public health enquiry. Furthermore, the rationale meets a gap in fertility literature, advancing the knowledge-base about determinants of older mothering.

The general approach taken to this project counters the dominance of the medicalised, treatment-oriented response to older maternal age by focussing on understanding determinants of the trend with a view to removing structural barriers to earlier childbearing. This approach may be particularly pertinent given the limitations, and costs associated with, the use of assisted reproductive technologies (as documented in Chapter 1). More broadly, underlying this approach is a holistic view of women as social as well as biological entities, in contrast to discussions within the medical paradigm which often focus on physiological aspects of age-related sub-fertility and infertility, without viewing the relevant body parts as belonging to a person in a social context.

To design and present a theoretical framework that engages with both life course and hierarchical determinants of age at first childbirth, to underpin an epidemiological study

Chapter 2 described the development of, and presented, a new theory: The Theory of Life Course Economic Uncertainty and the Timing of First Childbirth. This theory extends existing theories that link economic uncertainty with the timing of childbirth in the inclusion of a life course perspective, a more explicit consideration of the role of socio-economic status, and a more sophisticated conceptualisation of biological and social dimensions of pregnancy by considering pregnancies not ending in a live birth, and unwanted pregnancies. Furthermore, the theory offers an example of both hierarchical (globalisation, national labour markets, the individual) and life course determinants being incorporated within one approach – a challenge acknowledged in recent life course epidemiological literature.[60] The theory will be the first contribution from an epidemiological perspective to the growing body of institutional fertility theories.

Chapter 2 also provided a worked example of the theory-building process that may prove useful for epidemiologists developing or working with theory, since there is a paucity of literature in this area (as discussed by Carpiano and Daley).[63] The chapter drew attention to issues that arise when ideas from various epistemologies guide post-positivist empirical studies. In particular, the decision to focus on precarious employment, and the operationalisation of this through contractual arrangements are examples of challenging decisions made by an epidemiologist considering a social exposure. Whenever social exposure constructs are the focus of social and life course epidemiology this challenge will arise, since it is imperative to draw on social theories to attempt to understand exposure pathways. Thus, the thesis provides an example of the development of measurable and appropriate epidemiological constructs based on 'slippery' concepts arising from sociological disciplines.

To demonstrate a method for collecting fine-grained retrospective life course data (event history data as opposed to cross-sectional or successive point-in-time measures)

This project is methodologically innovative in a range of ways. A cross-sectional retrospective study was conducted to collect an event history dataset. For life course epidemiologists this study design offers an opportunity to collect rich and purposive datasets in a feasible and timely manner (in comparison with the prospective cohort study). Whilst it could be argued that new studies are not needed for epidemiological life course enquiry given the abundance of under-utilised longitudinal datasets, this is naïve: our ever-expanding knowledge base continually leads to new research questions, requiring data not necessarily gathered in previous waves of longitudinal studies.

Data was collected across a 20+ year period, the majority at the month-level unit of time. There are few examples in the inter-disciplinary literature of this study design in combination with the collection of data at this level of detail across time - and, to my knowledge, none within the epidemiological literature. This project provides an example of what is possible in terms of life course data collection within this study design (at least, for a cohort of women aged in their 30s).

The LJYWP dataset is not only unique in terms of its richness (the month-level of data), but it is also the first Australian cross-sectional retrospective study collecting an event history dataset, to my knowledge. Also, a number of the variables in the LJYWP dataset have never before been collected within a study of this design (for example contractual job arrangements). Further, some of the variables collected are not commonly contained in other longitudinal datasets (irrespective of study design) – for example, complete relationship histories and time-varying histories of each partner's education, employment and income (to be considered in future analyses).

To demonstrate strategies that facilitate the collection of high quality retrospective life course data

While EHC instruments have been discussed in the literature for a number of decades, they have not been used often within the epidemiological discipline. Also, this thesis provides for the first time a discussion regarding the difficulties of designing a system to collect EHC data based on pre-existing administrative definitions that are not

necessarily meaningful to research participants. Such issues are crucial to researchers but are little discussed in public forums. Furthermore, this is the first time that an interviewer-administered EHC has been used in combination with a Participant Completed Calendar (PCC). This innovation combines the benefits of in-person EHC-based interviews, with the convenience and reduced costs associated with telephone interviews. The PCC should be considered not only for telephone interviews, but when particularly complex data is being collected, or when participants are likely to have records that the researchers would like them to access prior to interviews. However, until overall response proportions for the study are scrutinised I cannot universally recommend the strategy.

This thesis explicitly discussed the design and use of an EHC and PCC, including how they were used in combination, and thus provides a template for researchers wishing to use one or both instruments in their own work. Of particular relevance, my experience suggests that careful pilot testing of calendar instruments is crucial, over and above what would be considered reasonable for a straight-forward interview questionnaire.

On reflection, the calendar instruments were appropriate to use for a population-level study cohort that included lower SES groups. Although the instruments required a level of engagement from participants which exceeded that required in standard survey interviews, when women from lower SES backgrounds were given adequate support, as has been described, overall the calendars were usable.

Whilst fieldwork procedures are central to the collection of high quality data, particularly in retrospective studies, they are usually ignored or only given cursory attention in published literature. A range of fieldwork strategies described in this thesis were designed to improve the quality of retrospective data collected, and will be useful for researchers planning to conduct this type of study in the future (see particularly Chapter 5). For example, my experiences with this project suggest that the choice of, and quality of training provided for, interviewers is key to successful data collection with these studies.

To design and demonstrate the use of an analytical framework that adapts survival analysis techniques to capture cumulative and sensitive period life course effects

Chapter 6 developed an analytical framework consisting of survival analysis techniques to investigate the influence of precarious employment on the age at first childbirth, from both the cumulative and sensitive period life course perspectives. Chapter 7 used the frameworks with a subset of the LJYWP data (n=230), and discussed the advantages of this framework compared with that used in previous studies. A key advantage of the LJYWP dataset lies in the ability to construct variables that capture the changing nature of the exposure over time, given that data was collected at the month-level. In line with this, the choice of sensitive period time-bands was matched with a theoretical rationale. Therefore, a consistency often absent from life course analyses with non-event history datasets underpins the analysis framework. The frameworks could be applied to a range of research questions considering the role of time-varying exposures on the timing of health, or social, outcomes in the life course.

Various components of this thesis have dealt with the challenge of choosing and building appropriate exposure variables. In reality, when designing studies such as the LJYWP, there is a continuum that includes developing theory, choosing and operationalising constructs to fit the EHC format, and building exposure variables. Discussions of these processes rarely appear in published literature and yet are invaluable for epidemiologists grappling with new forms of social determinants which are multi-dimensional, poorly understood, and operate over time.

In summary, it is useful to reflect on the two themes of this thesis as presented in Chapter 1. With regard to the first – the substantive research project – outcomes arising from this thesis include: a new theory, two conceptual models, two innovative survey instruments (EHC and PCC) and an array of supporting fieldwork strategies, a new analytical framework, and a novel dataset. It is hoped that each of these components can be applied to empirical studies beyond the LJYWP. With regard to the second theme – the description of the development of methods (in particular theory-development, data collection methodologies, and analytical techniques) – this thesis can be viewed as a template for the design and conduct of future cross-sectional retrospective studies involving calendar instruments. Also, many of the discussions are relevant to the design

of any life course investigation.

8.4 FUTURE WORK

Work presented in this thesis is the first step in an ongoing research program. Future work will be undertaken in six key areas: (1) analysis of substantive research questions with the entire Lucina dataset, (2) further development of conceptual and analytical life course approaches, (3) further development of theory and constructs related to theory, (4) linking with policy stakeholders (depending on empirical results obtained), (5) evaluation of retrospective data quality and (6) evaluation of processes related to collecting retrospective life course data. This discussion will highlight main aspects of each of these areas of endeavour. Although it is likely that I will collaborate with others to conduct this program of work, for ease of communication this discussion proceeds as if I will personally conduct the work described.

Analysis of substantive research questions with the entire Lucina dataset

The LJYWP dataset lends itself to a range of research questions, but this section will concentrate on future work related to ideas that guided this thesis. My immediate post-doctoral work will entail applying the analysis framework and variables developed in Chapters 6 and 7 to the entire LJYWP dataset.

Section 2.7.1 mentioned a range of dimensions of employment precariousness and economic uncertainty that may influence the timing of first childbirth. Future work will include exploring them within the analytical framework developed. Of high priority are the role of higher education-related debts and debt in general, and the role of partner factors, such as partner socio-economic status (which could be defined in a number of ways) and partner employment precariousness. Furthermore, it is likely that some of these exposures cluster to influence timing of childbirth – if so, I will consider the role of clustered exposure variables.

The analysis framework presented in Chapter 6 goes part way to unpacking how socioeconomic status (using educational attainment as a proxy) influences the role that precarious employment plays on the timing of first childbirth. The sub-group included in analyses had all finished high school. Future work with the entire dataset will

determine the SES cut-off point above which the Theory of Life Course Economic Uncertainty and the Timing of First Childbirth becomes relevant.

The focus on first *livebirth* in published studies (discussed in Chapter 1) simplifies the complex social and biological dimensions of childbearing. An important layer of future work involves exploration of the research questions with different outcome variables. Based on the analysis frameworks developed, I will analyse the timing of the first 'wanted' pregnancy, and the first pregnancy irrespective of its outcome.

Income and occupation are sub-dimensions of individual-level financial precariousness and are also the obvious alternatives to educational attainment as the SES proxy in analytical models. Future theoretical and analytical work could explore the role of these constructs within the research questions posed. Future work could also include an exploration of the influence of different sorts of relationship histories as explanatory variables in models. This would involve untangling the impact of number and duration of live-in relationships, and of marital versus non-marital live-in relationships.

Further development of conceptual and analytical life course approaches

While the cumulative approach developed was based on time-constant exposure data, future work will use fine-grained time-varying data. Guided by theory, I will explore sensitive periods defined by factors other than age, such as time since specific life events. Furthermore, I will apply different sensitive period time bands to different social groups. I will also try to see whether exposures act both cumulatively and through sensitive periods, as is suggested in Model (c) presented by Kuh et al.[59, p. 77] Last, I may expand this body of work to include the more complex pathways life course approach.

Further development of theory and constructs related to theory

Empirical results will inform the development of theory by reflection on, and refinement of, the Theory of Life Course Economic Uncertainty and the Timing of First Childbirth. Results will also shape models of employment and financial precariousness that highlight influential sub-dimensions in relation to the timing of first childbirth. Furthermore, a model of childbearing will be constructed to include biological sub-dimensions, for example pregnancy loss, sub-fertility and infertility; social sub-

dimensions, for example pregnancy wantedness; as well as the role of time. These models could be applied to research questions beyond those examined in the current project.

Linking with policy stakeholders

> If we want a higher fertility rate we really have to look at what – from a woman's point of view – will make having children more attractive.[5]
>
> *Peter Costello, Treasurer of Australia 1996-2007, Launch of the 2006 Australian Census of Population and Housing*

Outcomes from this project could potentially influence policy and practice at a number of levels. Ultimately it is hoped that study findings may help to shape policy which enables women and their partners to have children (if desired) at the time in the life course most conducive to their and their children's health. Results will also contribute to the growing evidence base highlighting detrimental impacts of recent changes to labour market institutions on the lives of individuals, thus adding weight to an advocacy platform for more secure working conditions. I will direct effort to connect with relevant stakeholders (such as reproductive specialists, labour market policy experts, women's lobby groups and politicians), regarding results of analyses conducted. I have established many of these connections informally throughout my PhD candidature. Since public advocacy is a powerful means of creating impetus for policy change, another important component of future work is to generate public interest in study findings through media engagement. The abundance of recent media attention on childbearing and fertility, and the numerous media requests I have had throughout my candidature, provide reassurance of this possibility.

Evaluation of retrospective data quality

A number of variables were collected in wave 1 Lucina interviews (as point-in-time measures), and retrospectively in the LJYWP, including participant's contractual employment arrangements. The reliability of retrospectively collecting this variable has not been considered to date. This will be assessed using Goodman and Kruskal's τ to measure the agreement for such nominal variables.[188] The results of this assessment of concordance will go part way to quantifying the confidence with which contractual

arrangement data from the LJYWP can be used, contribute to the literature on the quality of retrospective life course data, and may highlight the benefits of using PCC instruments in addition to EHCs. An additional factor to take into account is the varying time interval between the first and second occasions of data collection (as was described in Footnote [z],page 67). One method for taking this into consideration would be to use multinomial logistic regression to regress the variable collected in the LJYWP on the wave 1 variable and a variable reflecting the duration (in months) between the two points in time.

Self-reported accuracy of information provided during the interview was collected from participants at the end of each LJYWP interview (Appendix 17, question 4). This provides a further avenue to assess accuracy of information obtained, although admittedly not a very precise one.

Evaluation of processes related to collecting retrospective life course data using calendar instruments

At the end of LJYWP interviews, study participants were asked a series of questions to gauge the benefits and burden associated with EHC and PCC use (Appendix 17, questions 1-2, 5). Immediately following the end of each interview, interviewers responded to questions gauging the conduct of the interview including the success of using the EHC to identify inconsistent information (Appendix 18). Questions were based on those used in previous EHC-based studies.[150 189] Analysis of responses will contribute to the knowledge-base about EHC and PCC use, and more broadly, the conduct of complex interviews involving retrospective data collection.

As with any epidemiological study, calculation of the response proportions will be an important component of assessing the ability of the results to be generalised beyond the participants. For the LJYWP, this may also provide an indication of the impact of the PCC, when compared with, for example, response proportion for wave 2 in comparable studies.

I will evaluate the process of transferring EHC data from EHCs to electronic format. Although not described in this thesis, data coding was constantly monitored and evaluated and it is possible to quantify the errors. This may be useful for researchers

considering the use of paper-based EHCs –and provides a further avenue to reflect on LJYWP data quality.

8.5 CONCLUSION

This thesis has described multiple stages of the design and execution of a cross-sectional retrospective study conducted (in part) to explore the role of life course precarious employment experiences on age at first childbirth. For the first time within the public health domain, an argument is presented for the relevance and significance of the contemporary social issue of older age at first childbirth. The theoretical, methodological and analytical frameworks that have been developed and presented in this thesis are innovative from a number of perspectives. From an epidemiological perspective, the project offers advances in a number of areas, including theory-building (particularly in the convergence of life course and hierarchical perspectives) and engagement with a relatively new exposure variable (precarious employment). The project contributes substantially to the sub-discipline of life course epidemiology, in the following ways: (1) collection of fine-grained life course data (event history data as opposed to cross-sectional or successive point-in-time measures); (2) improvement of techniques to collect high quality retrospective data (type of survey instruments and fieldwork procedures); and (3) presentation of a framework for the use of survival analysis techniques to complement life course theories. I hope that these contributions will provide a template for other epidemiologists grappling with the challenging tasks of theory-building, collecting retrospective life course data and conducting life course analyses.

Appendices

Appendix 1 Summary and critique of the epidemiological contribution to the study of the role of employment contract in childbearing

Artazcoz et al.[51] examined the role of 'flexible employment' on the 'decision' to become a parent, in the Spanish setting. Secondary analyses were based on data from a cross-sectional survey of a representative population sample aged 16-64 years (n = 998 women), living in Catalonia, a region in the north east of Spain. The exposure variable was employment contract (permanent, fixed term temporary employment, non-fixed term temporary employment, no contract), and the outcome variable, parental status, was operationalised according to whether or not respondents lived with children. To allow for different results by social class, logistic regression models were fit separately for manual and non-manual occupational classes. Analyses were adjusted for age. There were no significant findings regarding the association between employment contract and parenting status for women. However, the lack of association may be explained by the duration of time between childbearing and current job, which could be as much as ~ 50 years, since the oldest cohort members were aged 64 years. Attempting to make a link between current contractual arrangement and childbearing in this context is questionable, given the changing nature of jobs over time within a life course. A range of other methodological issues are apparent in this study, such as the cross-sectional nature of the dataset (time precedence between exposure and outcome is not able to be established, let alone investigation of how patterns of contractual arrangements experienced *over time* influence childbearing); the categorisation of parenting status by whether or not participants lived with children (children may have moved out of home); and the fact that analyses were adjusted for age at time of data collection (fertility behaviour is known to differ by birth cohort,[55] so this may obscure associations present *within* birth cohorts of women, particularly given the large age range of the study cohort). Also, the study question focuses on becoming a parent, not on the age at which this occurs, so there is a theoretical mismatch between the study by Artazcoz et al. and my research interests.

Appendix 2 Wave 1 questionnaire, record of live birth details

Please tell me about your pregnancies

Live births Number of live births __

Date of birth	Sex of baby	Gestational age	Birth weight (either imperial or metric)
__ __ / __ __ / __ __	M / F	__ __ weeks	__ __ __ __ g__ __ lb __ __ oz
__ __ / __ __ / __ __	M / F	__ __ weeks	__ __ __ __ g__ __ lb __ __ oz
__ __ / __ __ / __ __	M / F	__ __ weeks	__ __ __ __ g__ __ lb __ __ oz
__ __ / __ __ / __ __	M / F	__ __ weeks	__ __ __ __ g__ __ lb __ __ oz
__ __ / __ __ / __ __	M / F	__ __ weeks	__ __ __ __ g__ __ lb __ __ oz

Appendix 3 Participant Completed Calendar instructions

During your interview we will be talking about the *timing* of things that you have experienced in your life. This calendar is designed to make the interview easier, by helping you to think about these issues beforehand. The calendar is for you only – we won't ever ask to see it.

If you have any trouble filling out the calendar please don't hesitate to contact Deb [phone number]. Alternatively, we are happy to sort out any issues during the interview.

Now look at the calendar…

Each row represents a year in your life. Your age has been written in the rows for you.

Please write these things on the calendar, if they have happened to you…

Relationships and family:

- Times you have lived with a partner
- Dates of marriage, separation and divorce
- Birth dates of children

Study: (mark in the Study column)

- Years you were at school
- Years you were doing other study - write the course name (even if you didn't finish it)
- HECS debt - write the approximate amount of debt you had at the end of each course
    - Record when you finished paying off this debt, if that has happened

Home ownership: Dates that you bought a house, unit, or block of land (with or without a mortgage)

Travelling: Times you have travelled for *more than two months* (either in Australia, or overseas)

Not working: Times when you did not work *at all* for *more than a month*, since leaving school

Jobs: (if you have a resume, it might be useful for this section)

- Record the jobs you have had since leaving school. If you have ever had more than one job a same time, focus on the main one (the one that paid you the most money)
    - For each job, mark whether it was permanent (P), fixed-term contract (FTC), cas (C), or whether you were self-employed (SE) - **turn the page for definitions to you**

Income Support: (mark in the Income Support column)

- Years that you have received any government benefit, allowance or pension - *not* including the baby bonus. Tick the box even if you only received support for part of the year.

Where you have lived: Turn the page and list the houses that you have lived in *from birth to now,* as best you can remember.

Jobs - contract definitions (from previous page)

- Permanent job: Employed on an ongoing basis and had access to paid annual and sick leave
- Fixed-term contract job: Employed for fixed period of time (e.g. 12 months, 2 years), with no guarantee of continuing employment. May or may not have had access to paid leave.
- Casual job: Often receive a casual loading in the hourly rate of pay. No guarantee of continuing employment. May or may not have had access to paid leave.

Where you have lived (from previous page)

List the houses you have lived in, starting when you were born, up to now. Just record the suburbs.

List them in the order that you lived in them

Don't worry about places where you lived for less than one month

Suburb: 1. …….	11. …….
2 …….	12 …….
3 …….	13 …….
4 …….	14 …….
5 …….	15 …….
6 …….	16 …….
7 …….	17 …….
8 …….	18 …….
9 …….	19 …….
10 ……	20 …….

Appendix 4 Job advertisement for employment of interviewers

We are seeking personable, well-organised and self-motivated individuals to join our research team to conduct interviews for a major research project. After undertaking interviewer training, you will be conducting confidential structured telephone or personal interviews with participants in a women's health study. It will also involve making appointments, preparing interview documents, and being involved in regular quality control and audit exercises.

You should have:

- a degree in relevant health or social science discipline
- excellent written and oral communication skills
- effective interpersonal skills, demonstrating the ability to interact with a wide range of people
- the ability to think systematically and identify inconsistencies in information

Casual Salary: (HEO5) $30.68 per hour, plus an additional loading of 15% after 6pm.

An employer superannuation contribution of 9% applies.

There are 2 casual positions available from November 2007 requiring a minimum of 2 shifts per week from Monday to Friday, with some after hours work available. There will be further positions available in January 2008 and expressions of interest are welcome. We anticipate that the project will continue until mid 2008.

Please refer to the selection criteria or alternatively contact Ms Emily Steele, telephone: 8303 3585 or email: <emily.steele@adelaide.edu.au>.

Deadline: 19 October 2007

Your application must:

- include your résumé/Curriculum Vitae
- briefly address the selection criteria
- quote the relevant reference number
- include residency status
- include the names, addresses and email details of three referees

Appendix 5 Selection criteria attached to job advertisement for interviewers

ESSENTIAL MINIMUM CRITERIA	
1	Degree in relevant health or social science discipline
2	Excellent written and oral communication skills
3	Effective interpersonal skills, demonstrating the ability to interact with a wide range of people
4	Ability to work independently and as part of a team
5	Ability to integrate information
6	Ability to think systematically and identify inconsistencies in information
7	Demonstrated problem solving skills
8	Meticulous attention to detail

DESIRABLE CHARACTERISTICS	
1	Computer skills, in particular spreadsheets and databases
2	Typing skills
3	Knowledge of women's reproductive health and social issues
4	Previous experience in conducting interviews

Appendix 6 Questions asked to potential interviewers at job interview

Q1. Your application indicated that you've worked on at least one research project. Can you tell us something about this experience?

Q2. If specific project referred to ... what was the aim of project XXX and what were the findings?(Alternatively Hons project, PhD.)

Q3. You have indicated that you have had some experience interviewing in the past. What sort of interviews were they? [Prompts: How many? How long? How complex? Any telephone interview experience?]

Q4. What qualities do you have that make you suited to interviewing?

Q5. This job involves asking women about their personal histories, including past partners and pregnancies. What sorts of issues might arise during the interview?

Q6. How would you react if someone told you they had an abortion?

Q7. What do you understand to be the main steps involved in undertaking a survey?

Q8. This is an ongoing study and we hope the women will continue to be involved. What implications does this have for your role as an interviewer?

Q9. Do you have any questions for us?

Appendix 7 Interviewer training program

WEEK 1

Session 1, Tuesday 27th November 10am-1pm

1. Introduction of team members
2. Introduction to the Lucina Study and the Lucina cohort (Michael Davies and Vivienne Moore)
3. Introduction to Life Journeys of Young Women project (Emily Steele)
4. Tour of offices (Emily Steele)
5. Interviewer induction and pay issues (Kendall Smith)
6. Intellectual Property discussion (Emily Steele)

Homework: read paper by McDonald (2001)

Session 2, Wednesday 28th November 10am-1pm

1. Discussion of McDonald paper and the uncertainty (risk aversion) theory of fertility
2. Introduction to life domains which are included in the survey
3. Introduction to the survey instruments and the utility of each component
4. Emily to conduct an interview for demonstration purposes
5. Discussion and questions arising from demonstration

Homework: read paper by Freedman et al (1988)

Session 3, Thursday 29th November 10am-1pm

1. Discussion of issues related to collecting retrospective information
2. Introduction to the Event History Calendar (EHC) and how to use it
3. Interviewers will be provided with the demonstration EHC from Session 2, and the recording technique will be explained
4. Emily will read scripts and interviewers will practice recording information in the EHC.

Homework: interviewers to fill in a self-complete calendar, in preparation for Session 4.

WEEK 2

Session 4, Monday 3rd December 10am-1pm

1. Emily will provide feedback on Session 3 EHC practice
2. Discussion of issues arising re self-complete calendar
3. First run-through of entire interview-practice doing interviews with each other
4. Discussion and debrief about this experience

Session 5, Tuesday 4th December 9am-1pm

1. Detailed discussion on each section of the interview:
    - How to ask questions
    - How to record information
    - Trouble shooting common issues
2. Role playing particular sections of the interview

Session 6: Thursday6th December 9-1pm

1. More practice conducting interviews with each other

Session 7: Friday 7th December 9am-2pm

1. 9-9:45am: Discuss issues that have arisen in practice interviews.
2. 10 am: all interviewers conduct face to face interview with a volunteer
3. 1230pm: all interviewers conduct face to face interview with a volunteer *
4. Debrief

*Will record these interviews so Emily can provide feedback

WEEK 3

Session 8: Monday 10th December 9am-2pm

1. 9-9:45am: Discuss issues that have arisen in practice interviews
2. 10 am: all interviewers conduct face to face interview with a volunteer
3. 1230pm: all interviewers conduct face to face interview with a volunteer
4. Debrief

Session 9: Tuesday 11th December 9am-2pm

1. 9-10am: Discuss issues that have arisen in practice interviews
2. Session with Kendall and Nanette: How to ask personal questions, deal with participant exhaustion, and other issues that may arise. Tricks of the trade for telephone interviews.
3. 12pm: all interviewers conduct first telephone interview with a volunteer
4. Debrief

Session 10: Wednesday 12th December 9am-2pm

1. 9-9:45am: Discuss issues arising in telephone interview practice
2. 10 am: all interviewers conduct telephone interview with a volunteer
3. 1230pm: all interviewers conduct telephone interview with a volunteer*
4. Debrief

*Will record these interviews so Emily can provide feedback

Session 11: Friday 14th December 10am-1pm

1. Feedback from Session 10
2. Procedural issues regarding interviewer role prior to and after an interview
3. Rostering issues
4. Plans for 2008

Appendix 8 Interview checking proforma

Study ID: __ __ __ __ __ __

Interviewer: …….

Interview date: __ __ / __ __ / __ __

Interviewer completed immediate check: __ __ / __ __ / __ __

1st check: __ __ / __ __ / __ __ Checked by: ……

Interviewer response to check: __ __ / __ __ / __ __

Need to call back? Yes / No

If yes, called back + spoke to her on: __ __ / __ __ / __ __

2nd check: __ __ / __ __ / __ __ Checked by: ……

Interviewer response to check: __ __ / __ __ / __ __

Need to call back? Yes / No

If yes, called back + spoke to her on: __ __ / __ __ / __ __

3rd check: __ __ / __ __ / __ __ Checked by: ……

Checking complete: __ __ / __ __ / __ __

Interview docs placed in complete drawer: __ __ / __ __ / __ __ by ……..

Used to update cheat sheet: Yes

Appendix 9 Letter of invitation

[Date]
[Name]
[Address]
[Address]

Dear [Name],

Lucina Study - 'Life Journeys of Young Women' project

We are writing to let you know about the next phase of the Lucina Study and to invite you to take part.

The focus of this project is the ***timing of childbirth in women's lives***. You have probably heard media reports about women delaying motherhood or not having children at all. There are lots of different views about why this is occurring. We are particularly interested in the part that ***financial security and job security*** might play in a woman's decision to start a family or to postpone motherhood.

The idea is to obtain a ***map of your life since leaving school*** (jobs, study, partners you have lived with, home ownership, finances and so forth). Then we'll compare maps for women who've had children and those who haven't. So we are interested in the lives of ***all women*** - those who've ***had children***, those who haven't but ***hope to***, and those who ***don't think they will***.

Details of the project are given in the enclosed Information Sheet. We understand the sensitive nature of this information and assure you that your confidentiality will be protected.

Contributing your time to this project will help us to understand the complex lives of young women. Every woman has a different journey, and we would very much like to include yours.

To complete a map of your adult life will take some time - up to 90 minutes, depending on how complicated your life journey has been. For your convenience, we suggest doing this mapping in a telephone interview, at a time that would suit you (after hours is fine). Alternatively, we can see you in person if you prefer.

A researcher from the Lucina Study team will contact you soon to answer any questions you may have and make an appointment, if you are able to be involved.

Thank you again for being part of the Lucina Study.

Yours faithfully,

Emily Steele, Project Leader
[Lucina study team contact details provided here]

Appendix 10 Information sheet

The 'Life Journeys of Young Women' project is being undertaken by the Lucina Study team, as part of our continuing work on reproductive health and related issues experienced by young women today.

The aim of the 'Life Journeys of Young Women' Project

Statistics show that increasing numbers of Australian women are not having their first child until they are over the age of 30. There has been much discussion in newspapers and on radio and TV about why this might be happening, but little formal research has been done on this topic.

With your help, we would like to put together a portrait of the lives and experiences of young women. We hope to highlight the diversity in patterns of work and study, in financial security, and in establishing relationships. We suspect this diversity means that, for some women, it is not realistic to have children until later (if they have children at all). But some women do have children before 30, and we'd like to know more about the circumstances in which that happens.

The results of this project will overcome a lack of evidence that currently exists about the factors that influence when and if Australian women have children. As well as informing public discussion, we hope our findings will be used to design policies to support women to have children when they want to.

Why are we inviting you to take part in the project?

All young women who are members of the Lucina Study are being invited to take part in this project.

In the first phase of our research, we were particularly interested in polycystic ovary syndrome. The syndrome can be a cause of infertility, outside of a woman's control. Now we are considering fertility decisions that women make, and the way women's reproductive lives are shaped by non-biological influences, particularly economic factors.

From the information you have already given us, we can see that there is a lot of variety in women's lives. We would like to build on this, and obtain a more detailed picture of the way you spent your 20s as well as an update on your present situation.

What would taking part involve?

Taking part would involve a ***telephone interview***, lasting approximately 1 hour, a bit longer if you have a complicated work or relationship history. The interview can be done at a time that suits you (including after hours or on weekends). If you prefer, we can do the interview in person.

We will ask you a series of questions about your life, focusing on the period from 15 years of age to the present. We will ask about aspects of your life, including:
- periods of time spent studying
- different jobs you've had and periods of unemployment
- an indication of your income and wealth at different times (loans, assets and debts)
- relationships that involved living together, including some aspects of partner's jobs and financial security that may have affected your decisions
- children
- health issues

Confidentiality and assurances

All information that you provide will be strictly confidential. You will not be identified by name in any publications. As always, you are free to withdraw from the project at any time, and you do not have to answer any question you are not comfortable with.

Should you wish to speak to a person not involved with this project, you can contact the Secretary of the Human Research Ethics Committee at Adelaide University on 8303 6028. The Ethics Committee also has an independent complaints procedure, which is described at the bottom of this page.

Further information

If you have any questions or comments about this project, Ms Emily Steele, the project leader, would be happy to talk with you confidentially.

Alternatively, feel free to contact any other member of the Lucina Study team.

[Lucina study team contact details provided here]

ETHICS COMMITTEE - INDEPENDENT COMPLAINTS PROCEDURE

The Human Research Ethics Committee is obliged to monitor approved research projects. In conjunction with other forms of monitoring it is necessary to provide an independent and confidential reporting mechanism to assure quality assurance of the institutional ethics committee system. This is done by providing research participants with an additional avenue for raising concerns regarding the conduct of any research in which they are involved.

The above study has been reviewed and approved by the University of Adelaide Human Research Ethics Committee.

1) If you have questions or problems associated with the practical aspects of your participation in the project, or wish to raise a concern or complaint about the project, then you should consult the study co-ordinator, Kendall Smith (contact details above).

2) If you wish to discuss with an independent person matters related to
    a. making a complaint, or
    b. raising concerns on the conduct of the project, or
    c. the University policy on research involving human participants, or
    d. your rights as a participant

contact the Human Research Ethics Committee's Secretary on phone 8303 6028.

Appendix 11 Summary of test of proportional hazards assumption in Cox proportional hazard models for each level of educational attainment, stratified by number of years in relationships and in the labour force

	$X^{2, a}$	*p*-value
No tertiary qualification (n=45)		
Parents' birthplace ≥1 overseas[b]	0.7	0.40
SEIFA	0.5	0.47
Global[c]	1.2	0.54
Technical and Further Education or equivalent (n=69)		
Parents' birthplace ≥1 overseas	1.9	0.16
SEIFA	0.0	0.95
Global	2.0	0.37
University degree (n=100)		
Parents' birthplace ≥1 overseas	0.2	0.63
SEIFA	0.0	0.90
Global	0.2	0.89
Currently studying (n=16)		
Parents' birthplace ≥1 overseas	0.9	0.33
SEIFA	0.2	0.64
Global	1.7	0.43

a: Models were stratified by number of years in relationships (never been in relationship, 0.01 - <5 years, ≥5 years), and number of years in the labour force (≤8.5 or >8.5 years).

b: Reference category = none overseas.

c: Global test of proportional hazards assumption is χ^2 on 2 df; other tests 1 df.

Appendix 12 Summary of test of proportional hazards assumption in Cox proportional hazard models for each employment arrangement and each level of educational attainment, stratified by number of years in relationships and in the labour force

		No tertiary		Technical and Further Education		University		Currently studying	
Employment argmt.	**Variable**	**$X^{2, a}$**	***p*-value**	**X^2**	***p*-value**	**X^2**	***p*-value**	**X^2**	***p*-value**
Unemployed	Parents' birthplace ≥1 overseas[b]	1.6	0.21	2.5	0.12	0.3	0.61	0.3	0.59
	SEIFA[c]	0.2	0.66	0.0	0.95	0.0	1.00	0.0	0.92
	Unemployed years	5.0	0.03	0.5	0.49	1.3	0.25	0.0	0.95
	Global[c]	6.1	0.11	3.0	0.40	1.6	0.67	0.5	0.92
Casual	Parents' birthplace ≥1 overseas	0.9	0.33	1.8	0.18	0.2	0.68	0.3	0.60
	SEIFA	0.1	0.77	0.0	0.98	0.1	0.82	0.3	0.58
	Casual years	0.7	0.40	0.7	0.41	0.0	0.93	0.0	0.90
	Global	1.4	0.71	2.4	0.50	0.2	0.98	1.7	0.64
FTC	Parents' birthplace ≥1 overseas	0.2	0.69	2.0	0.16	0.3	0.61	0.4	0.54
	SEIFA	0.2	0.70	0.1	0.81	0.0	0.88	0.0	0.87
	FTC years	1.9	0.17	0.1	0.80	0.6	0.43	dnc[d]	-
	Global	2.8	0.43	2.3	0.52	1.0	0.80	0.4	0.94
Permanent	Parents' birthplace ≥1 overseas	1.1	0.30	2.2	0.14	0.3	0.58	0.2	0.68
	SEIFA	1.0	0.31	0.0	0.87	0.2	0.69	0.9	0.34
	Permanent years	0.7	0.39	0.1	0.71	1.8	0.18	0.0	0.91
	Global	2.8	0.42	2.3	0.51	2.0	0.57	1.0	0.81

Argmt. = arrangement. a: Models were stratified by number of years in relationships (never been in relationship, 0.01 - <5 years, ≥5 years), and number of years in the labour force (≤ 8.5 or >8.5 years). b: Reference category = none overseas; c: Global test of proportional hazards assumption is χ^2 on 3 df; other tests 1 df ; d: Did not converge.

Appendix 13 Summary of test of proportional hazards assumption in Cox proportional hazard models (dichotomised exposure variables), for each employment arrangement and each level of educational attainment, stratified by number of years in relationships and in the labour force

		No tertiary		Technical and Further Education		University		Currently studying	
Employment argmt.	**Variable**	**$X^{2, a}$**	***p*-value**	**X^2**	***p*-value**	**X^2**	***p*-value**	**X^2**	***p*-value**
Unemployed[b]	Parents' birthplace ≥1 overseas[c]	0.9	0.33	2.6	0.11	0.3	0.61	0.4	0.54
	SEIFA	0.4	0.52	0.0	1.00	0.0	0.93	0.1	0.72
	Unemployed years	0.5	0.48	0.1	0.76	0.0	0.91	0.7	0.39
	Global[d]	1.7	0.63	2.6	0.46	0.3	0.97	1.1	0.78
Casual	Parents' birthplace ≥1 overseas	0.7	0.39	1.7	0.19	0.3	0.60	0.1	0.76
	SEIFA	0.1	0.75	0.0	0.93	0.1	0.81	0.6	0.44
	Casual years	0.1	0.73	0.0	0.87	0.4	0.54	0.1	0.82
	Global	0.9	0.84	1.8	0.62	0.6	0.91	1.9	0.59
FTC	Parents' birthplace ≥1 overseas	0.2	0.67	1.6	0.21	0.3	0.57	dnc[e]	-
	SEIFA	0.4	0.54	0.1	0.77	0.0	0.93	dnc	-
	FTC years	0.9	0.35	1.0	0.31	0.7	0.41	dnc	-
	Global	1.9	0.60	2.9	0.41	1.0	0.81	dnc	-
Permanent	Parents' birthplace ≥1 overseas	0.9	0.34	2.7	0.10	0.1	0.76	0.4	0.54
	SEIFA	0.5	0.48	0.0	0.88	0.0	0.88	0.0	0.87
	Permanent years	0.1	0.79	0.3	0.59	0.1	0.83	0.0	1.0
	Global	1.5	0.70	2.7	0.44	0.2	0.98	0.4	.094

Argmt. = arrangement. a: Models were stratified by yrs. in relationships (never, 0.01 - <5 years, ≥5 years), and yrs. in the labour force (≤ 8.5 or > 8.5 years). b: Unemployed (< and ≥0.5 years), casual (< and ≥1.5 years), FTC (< and ≥1.0 years), permanent (< and ≥ 9.0 years). c: Ref. cat. = none overseas; d: Global test of proportional hazards assumption is χ^2 on 3 df; other tests 1 df. e: Did not converge.

Appendix 14 Summary of test of proportional hazards assumption in Cox proportional hazard models in three year periods, for each employment arrangement and each level of educational attainment, stratified by numbers of years in relationships

	$X^{2, a}$	*p*-value
No tertiary qualification (n=45)		
Parents' birthplace ≥1 overseas[b]	0.2	0.67
Period in labour force = 3[b]	0.3	0.57
SEIFA	1.0	0.32
Global[c]	1.3	0.72
Technical and Further Education or equivalent (n=69)		
Parents' birthplace ≥1 overseas	2.4	0.12
Period in labour force = 3	0.5	0.47
SEIFA	0.1	0.75
Global	2.9	0.40
University degree (n=100)		
Parents' birthplace ≥1 overseas	0.2	0.65
Period in labour force = 3	0.1	0.74
SEIFA	0.3	0.58
Global	0.5	0.93
Currently studying (n=16)		
Parents' birthplace ≥1 overseas	0.0	0.86
Period in labour force = 3	0.0	0.87
SEIFA	0.6	0.44
Global	0.7	0.87

a: Models were stratified by yrs. in relationships (none, <3, or 3 years in each three year period).

b: Reference categories: parents' birthplace = none overseas, period in labour force <3 years.

c: Global test is χ^2 on 3 df; other tests 1 df.

Appendix 15 Summary of test of proportional hazards assumption in Cox proportional hazard models in three year periods, for each employment arrangement and each level of educational attainment, stratified by number of years in relationships

	$X^{2, a}$	*p*-value
No tertiary (n = 45 with 201 obs.)		
Unemployed	1.0	0.91
Casual	1.6	0.82
Fixed term contract	1.8	0.77
Permanent	2.4	0.66
Technical and Further Education (n = 69 with 359 obs.)		
Unemployed	4.0	0.40
Casual	3.0	0.60
Fixed term contract	4.4	0.36
Permanent	3.1	0.53
University (n = 100 with 589 obs.)		
Unemployed	0.7	0.95
Casual	1.3	0.86
Fixed term contract	-	-
Permanent	1.8	0.78
Currently studying (n = 16 with 66 obs.)		
Unemployed	0.6	0.96
Casual	1.4	0.85
Fixed term contract	1.0	0.80
Permanent	1.0	0.91

a: Models were stratified by years in relationships (none, <3, or 3 years in each three year period).

Appendix 16 Summary of test of proportional hazards assumption in Cox proportional hazard models in three year periods (dichotomised exposure variables), for each employment arrangement and each level of educational attainment, stratified by number of years in relationships

	$X^{2, a}$	*p*-value
No tertiary (n = 45 with 201 obs.)		
Unemployed[b]	1.7	0.79
Casual	1.6	0.81
Fixed term contract	3.0	0.57
Permanent	3.0	0.56
Technical and Further Education (n = 69 with 359 obs.)		
Unemployed	3.3	0.51
Casual	5.1	0.27
Fixed term contract	3.2	0.52
Permanent	3.2	0.53
University (n = 100 with 589 obs.)		
Unemployed	1.0	0.91
Casual	2.2	0.70
Fixed term contract	-	-
Permanent	1.6	0.81
Currently studying (n = 16 with 66 obs.)		
Unemployed	0.9	0.93
Casual	0.8	0.95
Fixed term contract	0.8	0.94
Permanent	1.1	0.89

a: Models were stratified by years in relationships (none, <3, or 3 years in each three year period).

b: Within each three year period, women were classified as spending either no time or some time in the respective employment states.

Appendix 17 Participant evaluation

How long did it take to fill out your personal calendar? __ __ minutes

Did you look up any records to help you fill out the calendar? (eg CV, HECS debt records, home
ownership records)

0 No
1 Yes - provide details ……
……

Please look at cue card 52. How useful was your personal calendar in helping you to answer the questions that I asked you?
1 Very useful
2 Useful
3 Somewhat useful
4 Not at all useful

Please look at cue card 53. In the interview, how accurate do you think you were able to be about the timing of your jobs (and the periods that you weren't working)?
1 Very accurate
2 Accurate
3 Somewhat accurate
4 In between
5 Somewhat inaccurate
6 Inaccurate
7 Very inaccurate

How hard did you find the interview, on a scale of 0 (not at all hard), to 10 (extremely hard)? __

Appendix 18 Interviewer evaluation

On the whole, do you feel that the participant had understood the personal calendar instructions and filled in their calendar as envisaged by researchers?
0 No
1 Yes
2 Other - somewhere in between

Additional comments …….....
…….

How would you rate the participant's cooperation during the interview?
1 Excellent
2 Good
3 Fair
4 Poor

How much effort did the participant put into answering the questions?
1 A lot
2 A reasonable amount
3 A little
4 None

How would you rate the participants' ability to understand the questions that were asked throughout the interview?
1 Excellent
2 Good
3 Fair
4 Poor
5 Very poor

Overall, how accurate do you think the participant was about the timing of their jobs, and timing of periods of not working (within a month)?
1 Very accurate
2 Accurate
3 Somewhat accurate
4 In between
5 Somewhat inaccurate
6 Inaccurate
7 Very inaccurate

Approximately how many times did the main calendar assist you to pick up inconsistencies in the information the participant provided? __ __

How would you rate how much you liked or enjoyed the interview with this participant?

1 Very much enjoyed
2 Enjoyed
3 Quite enjoyed
4 Indifferent
5 Sort of disliked
6 Disliked
7 Very much disliked

Overall, how easy or difficult was it to conduct this interview?

1 Very easy
2 Easy
3 Quite easy
4 In between
5 Somewhat difficult
6 Difficult
7 Very difficult

Make a note of any other issues which may have impacted on the quality of the information provided during the interview (e.g. participant was sick, other people were present with the participant throughout interview)

.....

.....

.....

.....

.....

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