The Life Journeys of Young Women Project is the first population-based study to examine the role of economic uncertainty throughout early adulthood on age at first childbirth. A retrospective cross-sectional component was added to an existing cohort study that is based on a birth cohort of women born during 1973–1975 in Adelaide, South Australia (n ~ 1,000). An event history calendar instrument was used to obtain data regarding a range of life domains including partnering, educational attainment, home ownership, higher education debt, employment, and pregnancies over a 20-year period (sometimes as detailed as at monthly intervals). Interviews were conducted between 2007 and 2009. An analysis framework applying time-varying and time-constant survival analysis techniques within a life-course framework was developed that will guide analyses to examine the role of duration and life-course timing of economic uncertainty on age at first childbirth. This paper discusses study objectives and design, fieldwork procedures, planned statistical analyses, and recruitment outcomes, focusing on novel features that would facilitate analogous epidemiologic research.

In recent decades, declines in fertility have been documented in younger women in the majority of Western countries (1). It has been suggested that these trends indicate a postponement of first childbirth to older ages, rather than an intention to remain childless (2–5). From a public health perspective, older maternal age has a raft of well-known health consequences for women and children, including increased risks of gestational diabetes, miscarriage, and birth defects (6–8). Furthermore, the use of assisted reproductive technologies associated with older childbearing carries risks in pregnancy and adverse outcomes in offspring, in addition to considerable financial and emotional costs (9–12). Thus, it is imperative to understand barriers to childbearing at “optimal” ages. Because evidence also suggests that women now have fewer children than they would like to have (13), it is particularly important to investigate underlying structural determinants of older motherhood and foreshortened reproductive careers.

Recent fertility theory suggests that individual-level economic uncertainty, brought about via the impact of globalization on national institutional structures, is associated with a delay in having children (14–18). In this vein, factors likely to contribute to economic uncertainty for young people in Western countries include nonpermanent employment arrangements for individuals and, where relevant, their partners; higher education debt; and the high cost of home ownership (and consequent delay in, or nonattainment of, first home ownership). Few such factors have been considered empirically with regard to their influence on childbirth timing. Extant studies do not adequately consider economic exposures across adulthood, either disregarding or not sufficiently capturing the role of life-course timing and duration of time spent in economically uncertain states (19–22)—both of which are likely to be influential in this context.

We designed the Life Journeys of Young Women Project to address the major methodological limitations of studies...
conducted to date. The project will provide the first empirical evidence of the contribution of several dimensions of economic uncertainty to the timing of first childbirth. This paper discusses study objectives and design, fieldwork procedures, planned statistical analyses, and recruitment outcomes.

**MATERIALS AND METHODS**

**Study objectives and design**

The Life Journeys of Young Women Project (LJYWP) aimed to examine the influence of economic uncertainty in adulthood on age at first childbirth. The study design was guided by 2 complementary life-course approaches. The cumulative approach considers life-course exposures as incrementally accumulating through episodes of illness and injury, adverse environmental conditions, and health-damaging behaviors (23). The sensitive period approach examines exposures within windows of susceptibility during which excess risk may be present (23). The concomitant research questions were as follows: Does a longer exposure to economic uncertainty increase the likelihood of older age at first childbirth, and is there a particular period(s) of time in which economic uncertainty is especially potent in influencing the timing of first childbirth? Figure 1 presents the conceptual models that guided this study. The models are not relevant to women with very low socioeconomic status; these women are unlikely to have high material aspirations (24) and are therefore unlikely to delay childbearing in the presence of economic uncertainty (17). In fact, for this group of women, early childbearing may be central to identity formation (25).

The LJYWP was a cross-sectional study in which much of the exposure data was collected retrospectively in the event history format (26–28); that is, exposure status was ascertained in continuous time, rather than at a single point in time or as successive point-in-time measures. The study population was drawn from a cohort study that investigates the prevalence and social and biologic determinants of a range of women’s reproductive health issues (29). The LJYWP was approved by the Ethics Committee of The University of Adelaide, and all participants gave written consent at wave 1 to be contacted for further study interviews. Participants were not paid for their participation in this project.

**Study population**

The study cohort \(n = 974\) was based on all consecutive female babies born from January 1973 to December 1975 at the Queen Elizabeth Hospital in Adelaide, South Australia, who survived to discharge. Information about the stages of recruitment and cohort representativeness can be found elsewhere (29). Cohort members participated in wave 1 of the study between 2003 and 2007. All cohort members were subsequently invited to participate in the LJYWP, which corresponded to wave 2 of the longitudinal study. Cohort members were excluded if they were not able to participate in an interview because of illness or disability. Interviews were conducted between December 2007 and July 2009, when participants were aged 32–35 years. Figure 2 shows a flow diagram of participation in the LJYWP.

**Constructs and variables**

The 4 key constructs identified in the development of this project were economic uncertainty (exposure construct), first childbirth (outcome construct), “stable” relationships, and socioeconomic status.

The relative contribution of different aspects of economic uncertainty with regard to the timing of first childbirth has not been reported to date. A model for this construct was designed, and data were collected on all components. The model included employment precariousness (which is concerned with the lack of regulations supporting standard employment relations, in turn making workers more vulnerable) (30), education, income, and occupation; presence or absence of a stable relationship and, when relevant, partner’s level of education, income, occupation, and employment precariousness; home ownership status; level of assets and debts, including higher education debt; and presence and level of financial and social support from family. All components of the model are capable of change over time and were conceptualized and measured as such in this project. Schemas were designed for the more complex dimensions of economic uncertainty in order to guide construction of exposure variables. For example, Figure 3 shows the schema for point-in-time employment precariousness. Each month of observation will be categorized according to 1 of the 7 activity states shown in the figure.

Because literature suggests that women tend not to have children while engaged in courses of study (31, 32), periods of (full-time) study were designated as such, irrespective of concurrent employment status. Of the 7 shaded states shown in Figure 3, casual employment is of greatest interest in this study.

Age at first childbirth was the primary outcome variable in this study. However, the focus on livebirths ignores a multitude of social and biologic dimensions of the pathway(s) to childbearing, such as pregnancies that do not result in a livebirth and “unplanned” or “unwanted” pregnancies. Thus, the ages at first pregnancy (irrespective of pregnancy outcome) and at first “wanted” pregnancy were also collected.

Although fertility theory implies that a “stable” or “committed” relationship is an important prerequisite for childbearing for most women (17), little is known about how individuals construe relationship stability or how this impacts on their experiences of starting a family. The most obvious proxy for a stable relationship that could be collected retrospectively was a relationship in which partners live together (irrespective of marital status); thus, information on periods of time spent in live-in relationships was collected in the LJYWP.

Socioeconomic status will be gauged according to the highest level of educational attainment at the time of study interviews. The role of this variable is 2-fold. First, it will provide a means of identifying the very low socioeconomic group to whom the conceptual models shown in Figure 1 do not apply. Second, analyses will be stratified by this

variable, because educational attainment is a well-known determinant of fertility behavior (33).

Survey instruments

An event history calendar was developed to collect retrospective data in this study. Web Figure 1, which is posted on the Journal's Web site (http://aje.oupjournals.org/), shows an abbreviated version of the event history calendar used for the LJYWP.

Event history calendars are acknowledged to have positive effects on the recall accuracy of life-course information (34), and they consist of a large calendar on which the timing of key events or states of interest is recorded by an interviewer, using a predetermined system of symbols. Advantages of event history calendars stem from interviewers being able to easily prompt participants according to information already collected and to cross-check across domains for consistency of information (35). In the LJYWP, information was collected from participants from the age of 15 years to the time of the study interview, a period of 18–20 years. Fifteen years of age was chosen as the start point so as to capture the timing of school-leaving for all participants, and this was the minimum age of school-leaving in Australia in the 1980s and 1990s, when cohort members were teenagers (36). Information on key constructs was collected at the month level (although broader periods were applied for some other data). A conventional questionnaire was used in the LJYWP to record information not suited to the event history calendar format. To enhance data quality, we sent a simplified version of the event history calendar to participants to fill out prior to study interviews (called a participant-completed calendar). Because participant-completed calendars may deter participation in research interviews (37), substantial efforts were directed to ensuring that the participant-completed calendar was visually appealing, that associated instructions were straightforward, and that it took under 20 minutes to fill out. To our knowledge, this is the first time that an event history calendar and

Figure 1. Conceptual models developed to guide the Life Journeys of Young Women Project, 2007–2009, Australia, showing the relation between economic uncertainty and the timing of first childbirth according to the cumulative (A) and sensitive (B) period life-course approaches. In A, “+” indicates a positive association, and “−” indicates a negative association; in B, “+” indicates a positive association, “−” indicates a negative association, and “?” indicates an unknown association.
a participant-completed calendar have been used in the same study. All survey instruments were piloted extensively prior to the commencement of study interviews, with attention paid to participant burden for women with varying life-course experiences.

**Interviews**

The order of topics in the structured interview was standardized for all participants. In line with recommendations in the literature (27), the simpler recall tasks were completed before those likely to be more complex; for example, educational and partnering histories were taken before work histories. In order to accommodate geographically dispersed participants and to reduce travel costs, interviews were conducted primarily via the telephone. When participants attended an interview without having filled in a participant-completed calendar, interviewers assisted this process before commencing a formal interview. Interviewers were trained to manage participants’ fatigue levels throughout interviews, which was particularly important given the greater complexity of the LJYWP interviews compared with standard survey interviews.

**Facilitation of interview participation**

Substantial efforts were directed to facilitating cohort participation in this study. Cohort members were approached in a systematic order, such that participants who were likely to find the interview most challenging (on the basis of very low levels of education or specific medical or social circumstances ascertained at wave 1) were interviewed late in the fieldwork period, when interviewers were most experienced in the conduct of the interview. These women were also offered a face-to-face interview if they lived locally, so that interviewers could better facilitate the use of the participant-completed calendar instrument with women who may potentially find it most challenging.

**Interviewer selection and training**

High-quality interviewers are integral to high-quality data collection in retrospective life-course studies. The recruitment strategy for LJYWP interviewers included carefully worded selection criteria, a higher salary than usually offered for casual fieldworker positions, a targeted advertising campaign, and thorough discussions conducted with short-listed applicants. A small team of 5 interviewers was employed, allowing for more intensive training and a higher level of interviewer support throughout the fieldwork phase than if a larger team had been employed (38).

Interviews involving event history calendars require extensive interviewer training (38, 39). Interviewers were paid to participate in a part-time training program over a 3-week period for this study. The structure of the program was based on that provided in Freedman et al. (39) and modified to meet the needs of the LJYWP. 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 next and main component of training was a step-by-step process that engaged interviewers at levels of increasing complexity, moving through observing mock interviews and recording answers to conducting interviews with volunteers with progressively more complex life histories. Each interviewer completed approximately 4 face-to-face interviews and 3 telephone interviews with volunteers who were not in the cohort, throughout the training program.

**Quality control procedures**

It has been suggested that life-course retrospective interviews warrant a detailed quality control system (38). The first author observed training and fieldwork interviews until a stage of adequate comfort, ease, and accuracy was reached.
for each interviewer (~2–4 interviews per interviewer). A procedure was developed for checking and editing all completed questionnaires and event history calendars. Interviewers spent 20–30 minutes checking interview documents immediately following an interview. A second check of documents was then undertaken by another member of the interview team. In addition to the identification and correction of any mistakes, the quality-monitoring processes provided an opportunity to identify issues that required further interviewer training. Interviewers were encouraged and supported to monitor and manage their own fatigue throughout each interview and the immediate postinterview period.

**Statistical analyses**

The event of interest for initial analyses will be age at first childbirth. Time-constant and time-varying survival analysis techniques (to investigate cumulative and sensitive effects, respectively) will be applied to examine the effects of different dimensions of economic uncertainty on the likelihood of having had a child by the time of the study interview, within educational strata and taking into account other influential factors such as stable relationship histories. The period of observation will start in the month that participants turned 15 years of age (in order to capture school-leaving for all participants) and end in the month of first childbirth minus 1 year for women who are mothers or month of study interview for those who had not had a child. The period of observation is lagged for mothers in order to capture the timing of conception as opposed to the timing of the birth itself; lagging by 1 year (rather than 9 months) is consistent with data from a number of studies that investigated the structural determinants of childbearing (20, 21).

Taking the example of precarious employment as the exposure construct, investigators are to label all months in the period of observation according to the schema in Figure 3. For the cumulative analyses, within each educational stratum, the effect of the total number of years under observation spent unemployed or employed with a casual, fixed-term, or permanent contact on the outcome variable will be examined through fitting separate Cox proportional hazards regression models. (Note: although “not in the labor force” and “full-time student” activities were important components of the exposure schema in Figure 3, they are not to be investigated in initial models.) For sensitive period analyses, within educational strata, the effect of the number of years spent in each exposure state per 3-year period on the outcome variable will be examined through fitting separate Cox proportional hazards models. Age bands in 3-year periods are to be used (<18, 18–<21, 21–<24, 24–<27, 27–<30, 30–<33, and 33–<36 years). These age bands were chosen to complement life-course phases that could be easily communicated when discussing study results—for example, early twenties, mid twenties. Future analyses are planned to explore other options for construction of sensitive periods. STATA, version 10.0, software (StataCorp LP, College Station, Texas) is planned for use in the conduct of all analyses.

As noted, the relations between employment arrangements and age at first childbirth are to be explored within groups with different levels of educational attainment. The cutpoint of educational attainment below which the conceptual models shown in Figure 1 no longer apply will be identified.

A variable representing partnering status will be included in models. The total time in the labor force will be included to recognize that participants are at risk of forms of economic uncertainty only during the periods in which they are in the labor force. These variables will be time constant in cumulative analyses and time varying in sensitive period analyses. Time-constant variables representing parental ethnicity and childhood socioeconomic status will be included in both analyses, because they are thought to be determinants of fertility behavior (24, 40). Because the study cohort is a birth cohort, period and age will not need to be accounted for in the models.

**RESULTS**

**LJYWP cohort participation rates**

An overview of LJYWP participation is presented in Figure 2. Of 974 cohort members, 970 were eligible to participate, and 663 completed an interview, resulting in overall participation of 68%. Among the 290 eligible nonparticipants, 26 withdrew from the cohort study, 223 declined participation in the LJYWP but continued their cohort membership, 11 could not be contacted, and 30 did not participate for other reasons. Among the LJYWP participants, 451 (68%) had at least 1 child at the time of interview.

**Description of LJYWP participants**

Table 1 describes some of the demographic characteristics of LJYWP participants and nonparticipants, as well as the overall study cohort, according to data collected at wave 1 interviews. Results of statistical tests (2-sided chi-square and Mann-Whitney tests) comparing participants and nonparticipants are presented. A variable corresponding to the Socio-Economic Index for Areas (SEIFA) indicator of relative socioeconomic disadvantage was constructed from the 1986 SEIFA indicator of relative socioeconomic disadvantage that corresponded to each participant’s postal code at primary school (41). A lower SEIFA score reflects higher relative disadvantage.

At wave 1, the majority of LJYWP participants were employed (74%) and in a relationship (67%). Approximately 10% of participants did not finish high school and had not received further qualifications. Over one-third of participants had attained a technical and further education qualification, and a further third had received a university qualification. Participants and nonparticipants were similar in terms of marital status and parents’ birthplace; however, there were significant differences in labor market status, highest level of education, and SEIFA index of socioeconomic disadvantage, with participants more likely to be employed, to have a university qualification, and to have lived in a less disadvantaged area in primary school.

Table 2 describes, for LJYWP participants, women who had and had not had a child, as well as the median age at first childbirth.
childbirth, according to highest level of education at the time of LJYWP interview.

As expected, participants in the “some high school” and “completed high school” groups were more likely to have had a child than those with technical and further education or university qualifications (88.3%, 80.2%, 69.6%, and 54.9%, respectively). The median age at first childbirth was lowest for the some high school group (23.3 years) and highest for the university group (29.4 years).

**DISCUSSION**

The LJYWP will contribute to a growing international literature investigating the impact of economic uncertainty on the timing of childbirth in women’s lives. The study responds to limitations of existing literature by collecting data concerning a broad range of economic factors across the time dimension and by applying an analytical framework enabling investigation of the duration and timing of economic uncertainty across the life course. Moreover, this will be the first Australian study to investigate the influence of any form of economic uncertainty on the timing of first childbirth, to our knowledge.

The LJYWP is methodologically innovative within the paradigm of life-course epidemiology in several ways. First, the collection of fine-grained life-course data (event history data) is more sophisticated than cross-sectional or successive point-in-time measures. Second, the project builds on existing techniques aimed at collecting high-quality retrospective data, in terms of type of survey instrument and fieldwork procedures. Third, the development of a framework for the use of survival analysis techniques to complement life-course theories is an important contribution of this

**Table 1.** Description of Participants, Nonparticipants, and Study Cohort at Baseline (2003–2007) and Comparison of Participants and Nonparticipants, Life Journeys of Young Women Project, Australia

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participants (n = 663)</th>
<th>Nonparticipants (n = 311)</th>
<th>Study Cohort (n = 974)</th>
<th>P Value* (Participants vs. Nonparticipants)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parents’ birthplace</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None overseas</td>
<td>325 49</td>
<td>153 49</td>
<td>478 49</td>
<td>0.96</td>
</tr>
<tr>
<td>At least 1 overseas</td>
<td>338 51</td>
<td>158 51</td>
<td>496 51</td>
<td></td>
</tr>
<tr>
<td>Highest level of education</td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Some high school</td>
<td>74 11</td>
<td>77 25</td>
<td>151 16</td>
<td></td>
</tr>
<tr>
<td>Completed high school</td>
<td>98 15</td>
<td>57 18</td>
<td>155 16</td>
<td></td>
</tr>
<tr>
<td>Technical and further education</td>
<td>248 37</td>
<td>115 37</td>
<td>363 37</td>
<td></td>
</tr>
<tr>
<td>University degree</td>
<td>207 31</td>
<td>45 15</td>
<td>252 26</td>
<td></td>
</tr>
<tr>
<td>Currently studying</td>
<td>36 5</td>
<td>17 5</td>
<td>53 5</td>
<td></td>
</tr>
<tr>
<td>Status in the labor market</td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Employed</td>
<td>491 74</td>
<td>184 59</td>
<td>675 69</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>11 2</td>
<td>14 5</td>
<td>25 3</td>
<td></td>
</tr>
<tr>
<td>Not in the labor market</td>
<td>161 24</td>
<td>113 36</td>
<td>274 28</td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>Single (never married)</td>
<td>176 27</td>
<td>95 31</td>
<td>271 28</td>
<td></td>
</tr>
<tr>
<td>Engaged/married/de facto</td>
<td>447 67</td>
<td>188 60</td>
<td>635 65</td>
<td></td>
</tr>
<tr>
<td>Separated/divorced</td>
<td>39 6</td>
<td>28 9</td>
<td>67 7</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>1 0</td>
<td>0 0</td>
<td>1 0</td>
<td></td>
</tr>
<tr>
<td>SEIFA index of relative socioeconomic disadvantage at primary school</td>
<td>976 735–1,153</td>
<td>967 735–1,133</td>
<td>976 735–1,153</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Abbreviation: SEIFA, Socio-Economic Index for Areas.

* A Mann-Whitney test was used to investigate the association between participation and the SEIFA variable; 2-sided chi-square tests were applied in all other instances.

† If a participant did not know where 1 or both parents were born, the parent(s) were incorporated into the “at least 1 overseas” category.

‡ Known in some countries as polytechnic, vocational technical college, or community college.

§ “Not in the labor market” includes students, those on home duties, those permanently unable to work/ill, and other.

Several limitations of this study are of note. As is the case for all cross-sectional studies with a major retrospective component, a key methodological limitation is related to recall of life-course information. This is especially relevant to the LJYWP given the detailed data collected in combination with the relatively long period of recall. However, a major aim of project investigators was the development of strategies to ensure the collection of data of the highest possible quality through the use of event history calendar and participant-completed calendar survey instruments, careful choice and comprehensive training of interviewers, and rigorous quality monitoring of interviews. In combination, the cluster of strategies is the most comprehensive attempt to collect high-quality retrospective data among published studies of this design. Future analyses may include checking the agreement of retrospective data among published studies of this design.

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REFERENCES


