

Age- and Parity-Specific Fertility Intensities calculated from date of Previous Birth.

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ABSTRACT

In the last years, methods for the analysis of fertility based on the age and parity fertility model have been proposed (Rallu-Toulemon; Kohler-Ortega). Data requirements for such analysis are, however, hard to fulfill, since the distribution of women by parity and age is seldom observed.

A new method is introduced to calculate age-and-parity-specific fertility intensities based on questions regarding date of previous birth from civil registration microdata. Such data is available for a number of countries. The basic idea is to track births over time from cohorts of women defined by cohort, parity, and date of previous birth. This procedure has important advantages over currently used reconstruction procedures: the estimates are more reliable and stable than those based on sample surveys; and contrary to methods based on extrapolation from census, they do not deteriorate over time. The method is applied to fertility of Spanish nationals in the period 1980-2001.

EXTENDED ABSTRACT

Motivation

Age- and parity- (or duration) specific intensity rates, also called rates of the first kind, or occurrence-exposure rates, are a key element for the analysis of fertility (Rallu and Toulemon, 1993). They also form the basis for recently proposed methods of tempo adjustment (Kohler and Ortega, 2002a, 2004). Unfortunately, they are not easily available. This is the basic reason why many researchers have used in their analysis incidence rates (also called rates of the second kind) despite the fact that they are not true rates, since they do not control for the women exposed to risk (Bongaarts and Feeney, 1998; Sobotka, 2004; see also Van Imhoff and Keilman, 2000, for a similar point). This is unfortunate, since rates of the second kind fail to incorporate basic demographic constraints.

For these reasons, effort is needed to overcome data availability (and reliability) problems regarding the distribution of women by parity and age (and possibly duration as well), since this is the missing element needed to estimate the childbearing intensities. This is not a problem for countries with population registers which include parity, like Sweden or Norway. For other countries, either the distribution of women by parity has been reconstructed from an observed census distribution (Kohler and Ortega, 2002b for Spain), or birth probabilities have been directly calculated from large sample surveys (Rallu and Toulemon, 1993). Both procedures have problems: extrapolation from a Census deteriorates as time goes by after the census. This is, for instance, a critical issue in Spain, where only the 1991 census distribution is available since a question regarding parity was not included in the 2001 census. Merging information from different censuses can also create artificial dynamics. On the other hand, sample survey calculations have a problem of stability, even if the sample survey is big (100

000, 200 000), since the proportions of women at particular categories of parity and age (i.e: young women at higher parities) are generally very small.

Our proposal tries to overcome these problems for countries where vital registration is of good quality and where vital registration microdata is available. It makes full use of the information regarding current parity, cohort, and date of previous birth in order to create cohorts of women that are followed over time. An application to the fertility of Spanish national is provided. Other countries where these requisites are met include the Czech Republic and the United States

Methods

Let us define a cohort of not childless women defined by their cohort of birth, c , their parity, $p > 0$, and the last year when they gave birth, l . At the end of year t , the size of such cpl -cohort is given by $w_{c,p,l}(t)$. Entry into cpl -cohorts occurs only through giving birth. Exit from cpl -cohorts occurs either through death (or migration), which means exiting the population altogether, or by giving birth, which means progressing to a cohort $w_{c,p+1,l}(t)$. As we see, only information from vital registration is required to create and update such cohorts of women. The basic update equation is:

$$w_{c,p,l}(t) = [w_{c,p,l}(t-1) - b_{c,p+1,l}(t)] [1 - q_c(t)]$$

where

$b_{c,p+1,l}(t)$ = Number of births of order $p+1$ in year t to women of birth cohort c , who had their previous birth in year l .

$q_c(t)$ = Probability of dying during year t for a woman of birth cohort c .

Note that a simplified treatment is given of mortality since mortality rates by parity are rarely available. A more sophisticated treatment is probably not worthwhile since countries with good civil registration microdata generally have very reduced mortality rates for women during childbearing years.

Note that new cpl -cohorts are created every year (cohorts cpt). Published information from vital registration is not enough since the number of births is not usually cross-tabulated according to these three dimensions. That is why information included in the vital registration microdata is needed. Note also that, if information is available, such cohorts can be defined more specifically (e.g: including education categories, region of birth, ethnic origin, ...). Note also that the same information regarding new births is used to update all the previous cpl -cohorts ($l < t$).

The distribution of women by parity is obtained by aggregation over dates of previous birth:

$$w_{c,p}(t) = \sum_{\{l\}} w_{c,p,l}(t)$$

This is the key quantity needed to estimate the birth intensities: the distribution of women by parity and age. Note also that, actually, also the distribution by parity, age **and** duration is known, so that fertility measures such as Rallu and Toulemon's PADTFR could also be calculated. Rallu and Toulemon's (1993) experience big problems of stability in such task, even using a very large sample survey. That is not the case in our approach since we are working with all vital events.

Note also that the procedure is applicable only to women of parity 1 and above. The number of childless women needs generally to be obtained by complementing women of parities 1 and above to the total population of women by cohort.

Results

We illustrate some of the results in an application to the fertility of Spanish nationals based on vital registration microdata (MNP) for the period 1980-2001.

Fig. 1: Examples of last birth cohorts: Exit from parity 1 cohorts.

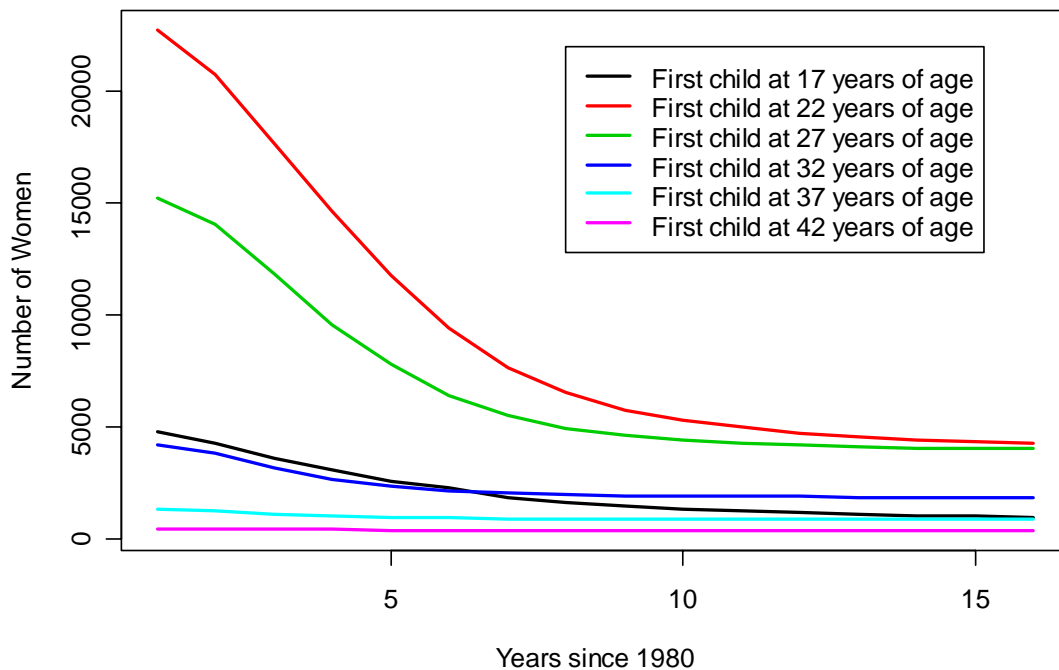


Figure 1 shows examples of such cpl-cohorts (or last birth cohorts). We see how the size of the cohort and the fast of the decline depend on the age at which the last birth occurred. Figure 2 shows the distribution of women by parity and age at the end of 2001, and figure 3 the perspective birth intensities by parity and age for year 2001. Note that even the intensities are remarkably stable. Only when estimating fifth and higher order intensities, where the numbers are extremely small, the observed rates are not very smooth.

Figure 4 shows the evolution of second birth intensities over time. It is to be emphasized how a clear process of postponement, such as the one occurring for first births, is not observed. This would not be observed if rates of the second kind were used. Finally, the results are compared [Not available yet] to estimates based on a large sample survey (Encuesta Sociodemográfica) and on extrapolation from the 1990 census.

Fig. 2: Distribution of women by parity and cohort in 2001

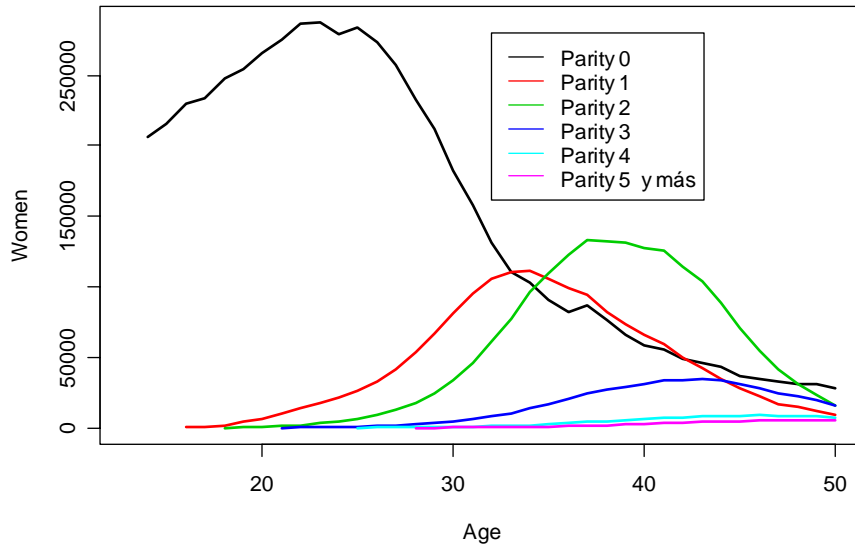


Fig. 3: Childbearing Intensities by age and parity, Spain 2001

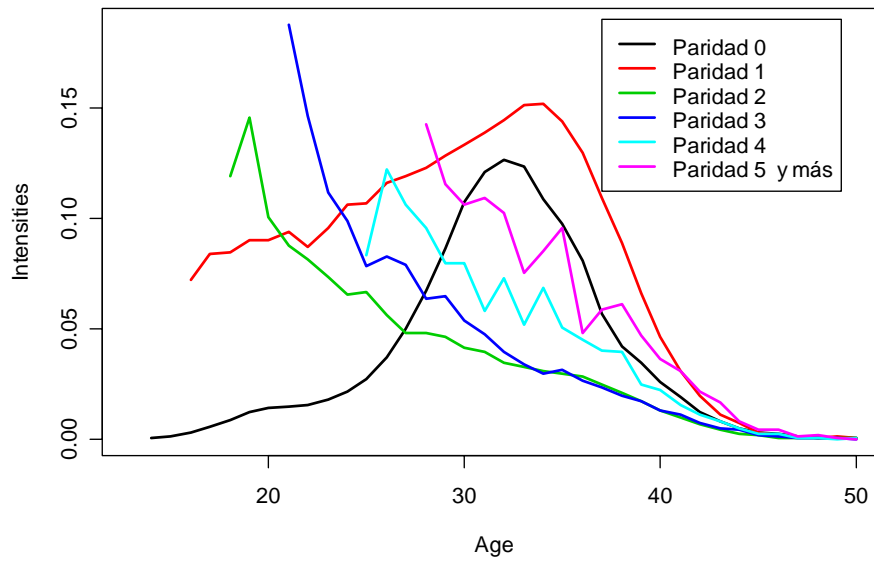
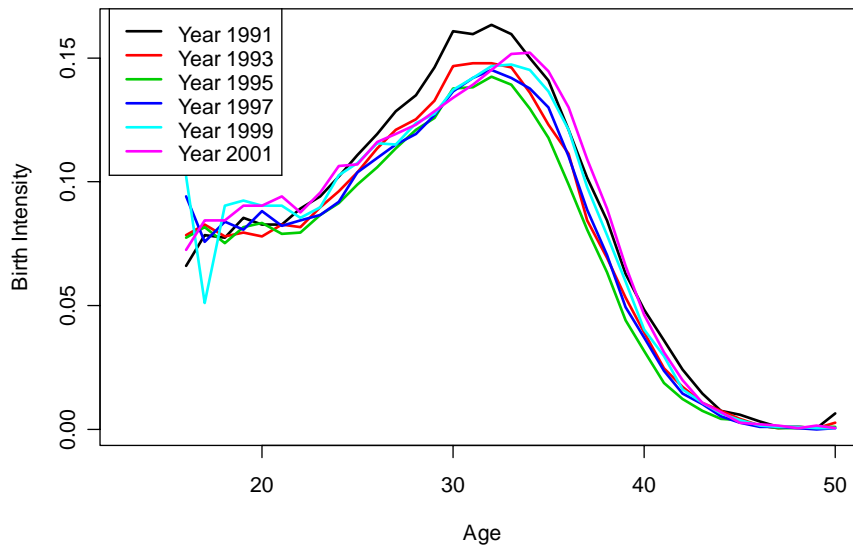


Fig. 4: Second birth intensities in Spain



Data

MNP (Movimiento Natural de la Población): Years 1980-2000. Birth registration microdata. Instituto Nacional de Estadística, Madrid.

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