Pattern of childbearing and mortality in married women—a national prospective study from Norway

Eliv Lund, Egil Arnesen, Jens-Kristian Borgan

Abstract

Study objective—The aim of the study was to investigate the effect of different pattern of childbearing on total mortality.

Design—A cohort study with all currently married women aged 25 years or more at the Norwegian census in 1970 with follow up to the end of 1985. Information on childbearing was obtained by questionnaires collected by enumerators. Follow up on death was found by a linkage based on the unique Norwegian identification number, between census information and the death register in the Central Bureau of Statistics.

Setting—The study was a national population survey.

Participants—A total of 822 593 women with 11·5 million years of follow up and 112 023 deaths.

Main results—Nulliparous women had higher mortality than parous women in all age groups. Parity showed a weak association with increasing mortality among high parous women. Lowest mortality was found for parous women with 2–4 children and a late first and last birth, adjusted for socioeconomic group by level of women’s education.

Conclusion—The findings indicate that postponed childbearing may benefit the health of women.

Childbearing is a major biological and social event in the lives of most women, but very little is known about the relationship between the pattern of childbearing and total mortality. One large study, based on information from death certificates in England and Wales 1938–1960, showed that parous women had higher mortality than nulliparous, but the effect of different parity could not be studied. Another study with data from the Office of Population Censuses and Surveys found no relationship between parity and total mortality in a sample of women aged under 60.

The aim of this study was to analyse total mortality rates for married women in relation to different patterns of childbearing, i.e., number of children (parity) and age at first and last birth.

Methods

The 1970 Norwegian census included all inhabitants of the country based on information from the Central Population Register of the Central Bureau of Statistics. The Central Population Register is a main source for administrative information and the key is the unique 11 digit identification number given to all persons alive at the Census in 1960, and to those born or immigrated later. The identification number consists of date of birth, sex, and control numbers. The Central Population Register is computerised and updated regularly with information on migration, immigration, emigration, and death.

The preprinted census questionnaires containing identification number, name, address, and marital status were sent to each local population registration office. The enumerators visited every household for delivery of the questionnaires. The informants had to correct any errors in the preprinted information. Shortly after the census date, 1 November 1970, the questionnaires were collected by the enumerators and returned to the Central Bureau of Statistics.

The questions on parity were only put to currently married women. The married women were asked about the age at marriage, the number of children in the present marriage, and the age of each child (stillborn not included). Information from the census about occupation, education, and type of employment was used by the Central Bureau of Statistics to construct a standard classification of socioeconomic status. In this analysis the socioeconomic status of the husband was used, divided into five broad groups; worker (unskilled or skilled), functionary (non-manual), self employed, farmer, and pensioner. As another measure of socioeconomic status the women’s own level of education was used: primary school (7 years) or higher education (8 years or more).

Follow up on mortality was obtained by a linkage based on the identification number between the files of the census and all deaths registered in the Central Bureau of Statistics for the period 1.11.1970 to 31.10.1985. Information on emigration was achieved by linking census information with emigration reports to the Central Population Register up to 31.10.85.

Mortality rates were based on exact person-years of follow up computed for each woman. Individuals were censored from calculation of follow up at time of emigration. Women who immigrated were included until death or until censored on 30.10.85.

The analysis was restricted to 822 593 married women aged 25 years or more at the census with a total of 11 533 686 years of observation and 112 023 deaths. For only 245 women information on either parity or age of children was missing. Direct standardisation was based on the WHO European population7 truncated to the age group 35–84 years. The number of women 85 years or older was too small for calculation of standardised
rates (1407 married women). Relative risk was computed according to the method of Mantel-Haenszel with confidence interval proposed by Miettinen. 8

Results
Married nulliparous women had higher mortality rates than parous women in all age groups (table I). Nulliparous women aged 35–44 years had a relative risk (RR) of 1.60 (95% confidence interval 1.48–1.74). The effect of nulliparity decreased regularly with increasing age.

Age specific total mortality after number of children showed that nulliparous women had a higher mortality than women with 2–4 children (fig 1). Women with five children or more also had a higher mortality rate than women with 2–4 children. This effect was more pronounced in younger age groups, but can also be seen for the curve based on age adjusted mortality rate. The relative risk for nulliparous women versus women with three children was 1.39 (95% CI 1.35–1.44), for women with six children versus women with three children 1.07 (95% CI 1.01–1.14), and for women with 10 versus three children 1.48 (95% CI 1.22–1.79). The relationship between parity and mortality was consistent for different age groups and for different socioeconomic groups (fig 2).

In order to look at different patterns of childbearing, an analysis stratified for parity and age at first birth was performed (table II). The lowest mortality was found for women with 3–4 children and first birth at the age of 25–29 years with relative risks of 0.65 (95% CI 0.63–0.68) and 0.67 (95% CI 0.64–0.71). There were no consistent trends in all groups of parity decreasing risks with increasing age at first birth.

The effect on mortality of education, parity, and age at first birth and at last birth showed the

<table>
<thead>
<tr>
<th>Table I</th>
<th>Age specific total mortality per 1000 years of observation, relative risk (RR) with 95% confidence interval (95% CI). Married women at the Norwegian census 1970 with follow up 1970–1985</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
<td>Married Nulliparous Parous</td>
</tr>
<tr>
<td>23–34 years</td>
<td>Rate 0.04 0.79</td>
</tr>
<tr>
<td>95% CI</td>
<td>1.06–1.36 Reference</td>
</tr>
<tr>
<td>35–44 years</td>
<td>Rate 3.32 2.07</td>
</tr>
<tr>
<td>95% CI</td>
<td>1.60 1.00 Reference</td>
</tr>
<tr>
<td>45–54 years</td>
<td>Rate 7.50 5.07</td>
</tr>
<tr>
<td>95% CI</td>
<td>1.48–1.54 Reference</td>
</tr>
<tr>
<td>55–64 years</td>
<td>Rate 16.56 14.01</td>
</tr>
<tr>
<td>95% CI</td>
<td>1.15–1.22 Reference</td>
</tr>
<tr>
<td>65–74 years</td>
<td>Rate 45.28 42.83</td>
</tr>
<tr>
<td>95% CI</td>
<td>1.86 1.00 Reference</td>
</tr>
<tr>
<td>75–84 years</td>
<td>Rate 110.23 106.57</td>
</tr>
<tr>
<td>95% CI</td>
<td>0.93–1.08 Reference</td>
</tr>
<tr>
<td>25–84 years</td>
<td>Rate 14.74 8.90</td>
</tr>
<tr>
<td>95% CI</td>
<td>1.63–1.68 Reference</td>
</tr>
</tbody>
</table>

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![Figure 1](http://jech.bmj.com/10.1136/jech.44.3.237)  
**Figure 1** Mortality per 1000 years of observation by age group and parity with directly standardised mortality rates (adjusted). Women aged 35–84 years at the Norwegian census 1970 with follow up 1970–1985

![Figure 2](http://jech.bmj.com/10.1136/jech.44.3.237)  
**Figure 2** Mortality by parity, socioeconomic group, and age. Currently married women at the 1970 census in Norway with follow up 1970–1985
nullipara first of school — and birth RR

Years follow

Nullipara 1:00 reference

Table III Relative risk (RR) and 95% confidence interval (95% CI) for death of all causes according to years of education, parity, age at first and last birth. Norwegian married women 35-64 years at the census in 1970 with follow up 1970-1985

Nullipara 1:00 (reference)
The findings in this study indicate that small family size and postponed childbearing may have beneficial effects on women’s health by decreasing their mortality.

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