Parity and men’s mortality risks

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Introduction

There is a growing recognition that reproductive patterns may have long-term health implications. Thus far, most studies on associations between parity and mortality focus on women.¹ Few studies have addressed the impact of parity on men’s mortality risks, which provides mixed evidence. Some Israeli and US studies find a U-shape pattern.²,³ Norwegian data show enhanced mortality risks only for childless men.²,³ However, this association attenuated to non-significance after adding socio-economic position (SEP), health behaviours and partner status.⁴ American data show a protective impact of childless men for men’s mortality risks.⁵ Finally, there are studies that show no impact of parity on men’s mortality risks.⁶-⁸

Several factors may explain the association between parity and mortality. First, the association between having children and mortality might be attributable to men’s socio-economic position (SEP). Fathers generally have a higher SEP compared with childless men,⁹ and as those with a higher SEP have lower mortality risks,¹⁰ differences in SEP between parity groups may explain the association. Second, having children may affect mortality risks by encouraging men to behave in healthy ways. Having children means that men refrain from health-compromising behaviour.¹¹ Therefore, differences in health behaviours between parity groups may explain the association. Third, the higher likelihood of fathers as compared with childless men to have a partner may explain the link between parity and mortality, as having a partner is protective against mortality, especially for men.¹² Therefore, differences in partner status between parity groups may explain the association. Few studies have explicitly explored the role of these factors; inclusion of these intermediary factors in some but not all studies may be one reason for mixed evidence in the literature.

As evolutionary models suggest¹³ that the number of children, rather than having had children per se, matters for mortality risks, we compare childless men with three categories of fathers: those with one child, those with two or three children and those who have four or more children to find out whether it is having children or the number of children men have fathered that influences men’s mortality risks. The aim of this article is to explore the association between parity and all-cause mortality among Dutch adult men, and to investigate potential mechanisms underlying this association.

Methods

Data from a Dutch prospective cohort study, the GLOBE study, were used to examine the association between parity and mortality among men. GLOBE is the Dutch acronym for Health and Living Conditions of the Population of the city Eindhoven and surroundings. The study started in 1991 with a baseline postal survey in which 18 973 individuals participated (response rate = 70%).¹⁴ For the current analysis, the sample was restricted to men >45 years at baseline. We chose to omit individuals <45 years of age at the time of the interview because their parity status may not yet be permanent. Note, however, that the likelihood of having a first child at the age of ≥45 years is small,¹⁵ especially for the men studied here (born between 1916 and 1946).

The age restrictions left us with a total of 5659 male respondents. In 2008, the data of all respondents were matched with population registry data from Statistics Netherlands. The Netherlands has a population register in which a unique number identifies every resident. Record linkage, performed by means of this unique identification number, provided us with information on vital status almost 17 years after the interviews were held. Given that all respondents living in The Netherlands have this unique identification number, the matching procedure led to near-perfect, confirmed matches for all survey respondents living in The Netherlands. Persons who emigrated during follow-up were no longer in the population registers; and for those individuals, our observation period ends at the time of emigration (n = 79). After excluding persons with missing values on the variables of interest, the population for analysis consisted of 4965 men.

Variables

‘Mortality’ is the dependent variable of interest, coded 1 if the respondent had passed away, 0 if still alive. Both the month and the year of death were obtained from Statistics Netherlands. We calculated the number of months respondents were alive between the baseline measurement (1 April 1991) and death or the last month of observation, 31 December 2007.
Parity
In the baseline survey, respondents were asked: ‘Do you have children? And if so, how many?’ No distinctions between biological, step- or adopted children were made. Four categories were constructed: (i) men with one child, (ii) men with two or three children and (iii) men with ≥4 children and (iv) childless men (reference category).

We incorporated two measures of SEP, namely occupational class and educational attainment, to account for different aspects of SEP.

Occupational class
If respondents were employed, they were asked to report on their current occupational status. If they were not employed, they were asked to report on the occupational status of their last job. Respondents received an occupational prestige score according to the Erikson Golthorpe Portocarero classification scheme and were subsequently divided into six groups ranging from manual unskilled workers (1) to higher professionals and managers (6).

Educational attainment
Respondents were asked about the highest level of education they had finished with a diploma. Four groups were distinguished: those with (i) primary school only (reference category), (ii) lower vocational or lower general secondary education, (iii) intermediate general secondary education or upper general secondary education and (iv) higher vocational education or university.

Alcohol use
Alcohol use was measured with two questions. The first focused on the average number of days a week the respondent consumed alcohol. The second focused on the average number of alcoholic beverages the respondent consumed on drinking days. Respondents were coded as total abstainers when they reported to never consume alcohol. Respondents were coded as light drinkers when they consumed six or more alcoholic beverages once a week, four to five alcoholic beverages twice a week, two to three alcoholic beverages 3 × a week or one alcoholic beverage every day of the week. Respondents were coded as moderate drinkers when they consumed six or more alcoholic beverages twice a week, four to five alcoholic beverages 3 or 4 days a week or two to three alcoholic beverages 4 or 5 days a week. Respondents were coded as heavy drinkers when they consumed six or more alcoholic beverages 3 to 4 days a week or four to five alcoholic beverages ≥5 days a week. Respondents were coded as very heavy drinkers when they consumed six or more alcoholic beverages ≥5 days a week. Because of the low number of respondents who fell into the last category, these respondents were combined with the heavy drinkers. Light drinkers were used as the reference category.

Smoking
Respondents were asked whether they had ever smoked, whether they currently smoked and how many cigarettes/cigars they smoked. Respondents who never smoked were coded as never-smokers (reference category). Respondents who indicated that they used to smoke but had quit were coded as former smokers. Respondents who indicated that they smoke pipe or cigars and respondents who reported to smoke <20 cigarettes a day were coded as moderate smokers. Respondents who indicated that they smoked ≥20 cigarettes a day were coded as heavy smokers.

Partner status
Men living with and without a partner were distinguished. In separate analyses, we tested whether the inclusion of marital status provided a better explanation of mortality than partner status alone, but this was not the case.

We included the number of chronic health illnesses, a potentially confounding factor, to account for health status at the time of interview. Number of chronic conditions was the number of chronic conditions respondents report to have (had). They include asthma, myocardial infarction, high blood pressure, stroke, ulcer, gallstones, severe abdominal disorders, kidney stones, severe kidney diseases, prostate enlargements, diabetes, hernia, Ischia, arthrosis, rheumatism, Parkinson, multiple sclerosis, epilepsy, migraine, depression, cancer, chronic skin disease, prolapses and varicose veins. Because of the low number of respondents who indicated suffering from four or more chronic diseases, respondents with three or more chronic conditions were combined. Finally, we included men’s age as mortality risks increase significantly with increasing age. ‘Age’ was measured in years.

Preliminary statistical analyses
Occupational class and educational attainment are both indicators of SEP. Correlation between the two indicators might be high, giving rise to concerns about multicollinearity. Preliminary analyses revealed a correlation of 0.57. To avoid multicollinearity and to examine non-linear effects of educational attainment on mortality, we used a set of dummy variables. Correlations between the different educational levels and occupational class did not go beyond 0.44 (the correlation between occupational class and high level of education), removing concerns about multicollinearity. Therefore, educational attainment and occupational class can be entered simultaneously in the model.

Preliminary analyses also revealed that age had a non-linear effect on mortality risks. Therefore, we introduced age as a set of dummy variables. The youngest age group (45–50 years) is the reference category.

Primary statistical analyses
Cox proportional hazard regression models that account for censoring were used to assess the relationship between parity and mortality. Several models were calculated. The base model (Model 1) included parity, the five age-group dummies and chronic health conditions. Model 2 through Model 5 incorporated different blocks of explanatory variables to test specific mechanisms. SEP (occupational class and educational attainment) was added in Model 2, health behaviours (smoking and drinking) were added in Model 3 and partner status was added in Model 4. The final model, Model 5, incorporated all blocks of variables.

Results
Table 1 shows the distribution of the variables in our models by parity. Childless men appear to be worst off: they have the lowest occupational class (a characteristic they share with the one child fathers), the highest percentages of heavy drinkers and smokers, the fewest partnered men and the highest percentage with only primary school. Table 2 shows the impact of parity on men’s mortality risks, and the predictors underlying this association. The base model shows that fathers with two or three children [hazard rate ratio (HR) 0.85; 95% CI 0.74–0.99] and especially fathers with four or more children (HR 0.81; 95% CI 0.69–0.95) have lower mortality risks in comparison to childless men (the reference category). Occupational class is not significantly associated with men’s mortality risks. Educational attainment is, however, significantly associated with mortality risks: compared with men who have finished primary school only, men with higher levels of education have significantly lower mortality risks (Model 2). With the inclusion of SEP, the impact of parity on men’s mortality risks becomes non-significant. Results show that men who do not drink alcohol and heavy alcohol drinkers have higher mortality risks compared with men who are considered light drinkers. Furthermore, the more men smoke, the higher their mortality risks. A comparison of Models 1 and 3 shows that with the inclusion of information on men’s health behaviours, the impact of parity on men’s mortality risks becomes insignificant. Living with a partner significantly lowers men’s mortality risks (HR 0.74; 95% CI 0.65–0.85). A comparison of Models 1 and 4 shows that with the inclusion of this factor, the impact of parity on men’s mortality risks is reduced to insignificance. Not surprisingly, given the previous results, when all the variables are included in the full model, parity no longer has a significant impact on men’s mortality risks.
against the backdrop of increases in unmarried cohabitation and rising divorce rates, the impact of partner status deserves further attention. Our results showed that sharing a household with a partner is protective for childless men. The mortality risks of fathers of one child differ from fathers of multiple children: they come from low occupational classes and have low levels of educational attainment.

Future research would benefit from examining in more detail why fathers with one child differ from fathers of multiple children: they come from low occupational classes and have low levels of educational attainment. Future research would benefit from examining in more detail why fathers with one child differ from fathers of multiple children: they come from low occupational classes and have low levels of educational attainment. Future research would benefit from examining in more detail why fathers with one child differ from fathers of multiple children: they come from low occupational classes and have low levels of educational attainment. Future research would benefit from examining in more detail why fathers with one child differ from fathers of multiple children: they come from low occupational classes and have low levels of educational attainment. Future research would benefit from examining in more detail why fathers with one child differ from fathers of multiple children: they come from low occupational classes and have low levels of educational attainment. Future research would benefit from examining in more detail why fathers with one child differ from fathers of multiple children: they come from low occupational classes and have low levels of educational attainment. Future research would benefit from examining in more detail why fathers with one child differ from fathers of multiple children: they come from low occupational classes and have low levels of educational attainment.
behaviours and have increased mortality risks. With more and more relationship dissolutions, policies that aim to enhance healthy behaviours among childless and unpartnered men should be welcomed. In our sample, we were unfortunately unable to separate the impact of biological parenthood from step-parenthood in the analyses. Given that the prevalence of stepfathers among the men in the sample (born between 1916 and 1946) was quite low, the implications of this limitation for our conclusions are likely to be small. Nevertheless, answering the question of whether the healthier behaviour of fathers is based on selection or adaptation, the findings show that this behaviour leads these fathers to adapt into parenthood but also lowered their mortality risks. Regardless of who never actively fathered their children have a higher likelihood of becoming parents, were already engaging in more healthy behaviour than childless men, and that their healthy behaviours not only selected them into parenthood but also lowered their mortality risks. Regardless of whether the healthier behaviour of fathers is based on selection or adaptation, the findings show that this behaviour leads these fathers to have lower mortality risks compared with childless men.

A second limitation of this study is that it was not possible to separate biological parenthood from step-parenthood in the analyses. Given that the prevalence of stepfathers among the men in the sample (born between 1916 and 1946) was quite low, the implications of this limitation for our conclusions are likely to be small. Nevertheless, answering the question of whether the impact of parity on men’s mortality risks is different for fathers who have social or biological ties to their children is becoming more relevant, as the number of stepfamilies has substantially increased in recent decades.

The third limitation of this study is the lack of information on paternal co-residence throughout the child’s life. Research has shown that living with one’s children is protective against premature mortality. Fathers who never actively fathered their children have a higher likelihood of

<table>
<thead>
<tr>
<th>Parity*</th>
<th>Base model HR ratio (95% CI)</th>
<th>M2 HR ratio (95% CI)</th>
<th>M3 HR ratio (95% CI)</th>
<th>M4 HR ratio (95% CI)</th>
<th>Full model HR ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 child</td>
<td>0.89 (0.75–1.08)</td>
<td>0.88 (0.72–1.07)</td>
<td>0.90 (0.74–1.08)</td>
<td>0.97 (0.80–1.18)</td>
<td>0.94 (0.77–1.18)</td>
</tr>
<tr>
<td>2–3 children</td>
<td>0.85* (0.74–0.99)</td>
<td>0.92 (0.79–1.07)</td>
<td>0.92 (0.79–1.06)</td>
<td>0.95 (0.82–1.10)</td>
<td>1.02 (0.87–1.20)</td>
</tr>
<tr>
<td>≥4 children</td>
<td>0.81** (0.69–0.95)</td>
<td>0.88 (0.74–1.05)</td>
<td>0.85 (0.72–1.00)</td>
<td>0.89 (0.75–1.05)</td>
<td>0.94 (0.78–1.13)</td>
</tr>
</tbody>
</table>

Age groups (years)

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Base model HR ratio (95% CI)</th>
<th>M2 HR ratio (95% CI)</th>
<th>M3 HR ratio (95% CI)</th>
<th>M4 HR ratio (95% CI)</th>
<th>Full model HR ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>51–55</td>
<td>1.56*** (1.24–2.01)</td>
<td>1.61*** (1.27–2.06)</td>
<td>1.71*** (1.35–2.17)</td>
<td>1.62*** (1.28–2.06)</td>
<td>1.84*** (1.43–2.36)</td>
</tr>
<tr>
<td>56–60</td>
<td>3.38*** (2.75–4.16)</td>
<td>3.40*** (2.74–4.21)</td>
<td>3.52*** (2.86–4.34)</td>
<td>3.38*** (2.73–4.18)</td>
<td>3.63*** (2.90–4.53)</td>
</tr>
<tr>
<td>61–65</td>
<td>5.76*** (4.71–7.05)</td>
<td>5.69*** (4.61–7.03)</td>
<td>6.13*** (5.00–7.53)</td>
<td>5.87*** (4.79–7.20)</td>
<td>6.28*** (5.05–7.81)</td>
</tr>
<tr>
<td>66–70</td>
<td>9.02*** (7.41–10.99)</td>
<td>9.13*** (7.42–11.25)</td>
<td>9.93*** (8.11–12.17)</td>
<td>9.08*** (7.43–10.09)</td>
<td>10.05*** (8.08–12.49)</td>
</tr>
<tr>
<td>Chronic conditions</td>
<td>1.18*** (1.13–1.23)</td>
<td>1.21*** (1.15–1.28)</td>
<td>1.21*** (1.15–1.26)</td>
<td>1.18*** (1.13–1.24)</td>
<td>1.22*** (1.17–1.29)</td>
</tr>
<tr>
<td>Occupational class</td>
<td>0.97 (0.93–1.00)</td>
<td>0.84*** (0.73–0.96)</td>
<td>0.87 (0.73–1.02)</td>
<td>0.68*** (0.56–0.82)</td>
<td>0.99 (0.95–1.03)</td>
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</tbody>
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Drinking

<table>
<thead>
<tr>
<th>Drinking</th>
<th>Base model HR ratio (95% CI)</th>
<th>M2 HR ratio (95% CI)</th>
<th>M3 HR ratio (95% CI)</th>
<th>M4 HR ratio (95% CI)</th>
<th>Full model HR ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low education</td>
<td>0.80*** (0.70–0.91)</td>
<td>0.84** (0.73–0.96)</td>
<td>0.87 (0.73–1.02)</td>
<td>0.68*** (0.56–0.82)</td>
<td>0.99 (0.95–1.03)</td>
</tr>
<tr>
<td>Medium education</td>
<td>0.81** (0.70–0.95)</td>
<td>1.34*** (1.18–1.53)</td>
<td>1.28*** (1.11–1.47)</td>
<td>1.22*** (1.06–1.42)</td>
<td>1.16*** (1.00–1.34)</td>
</tr>
<tr>
<td>High education</td>
<td>0.63*** (0.52–0.75)</td>
<td>0.96 (0.84–1.08)</td>
<td>0.97 (0.84–1.11)</td>
<td>0.68*** (0.56–0.82)</td>
<td>0.99 (0.95–1.03)</td>
</tr>
<tr>
<td>Smoking</td>
<td>1.30*** (1.14–1.49)</td>
<td>1.50*** (1.22–1.84)</td>
<td>1.56*** (1.25–1.95)</td>
<td>2.65*** (2.12–3.31)</td>
<td>3.29*** (2.51–4.31)</td>
</tr>
<tr>
<td>Lives with partner</td>
<td>3.30*** (2.58–4.22)</td>
<td>0.74*** (0.65–0.85)</td>
<td>0.78*** (0.67–0.91)</td>
<td>0.78*** (0.67–0.91)</td>
<td>0.78*** (0.67–0.91)</td>
</tr>
</tbody>
</table>

Log likelihood | −14 548 | −12 860 | −13 893 | −14 114 | −12 204
dying young; implying that in our sample, fathers who ever lived with their children are over-represented. Given their lower mortality risks, the differences between childless men and fathers found in this study may be over-estimated. The literature would benefit from studies including information on residence with children throughout the children’s lives.

In conclusion, childless men show an increased risk of mortality over a follow-up period of 17 years. Health behaviours, partner status and educational attainment mediate the relationship between parity and mortality risks among men. This study provides evidence that men’s reproductive patterns have long-term health implications.

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Conflicts of interest: None declared.

Key points

- Several studies have reported an inverse association or U-shaped pattern between parity and mortality among women. Few studies are available on the association between parity and mortality among men and underlying mechanisms of a potential association are unclear.
- This study explores the association between parity and all-cause mortality among Dutch adult men, and investigates potential mechanisms underlying this association.
- Fathers of two and three children and especially fathers of four and more children are found to have lower mortality risks compared with childless men. Health behaviours, partner status and SEP mediate the relationship between men’s parity and their mortality risks.

References

1 Hurt LS, Ronsmans C, Thomas SL. The effect of number of births on women’s mortality: systematic review of the evidence for women who have completed their childbearing. Pop Stud 2006;60:55–71.
3 Penn DJ, Smith KR. Differential fitness costs of reproduction between the sexes. Proc Natl Acad Sci USA 2007;104:553–8.

Spatiotemporal association between deprivation and mortality: trends in France during the nineties

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Background: Monitoring the time course of socio-economic inequalities in mortality is a key public health issue. The aim of this study is to analyse this trend at an ecological level, in mainland France, over the 1990s, using a deprivation index enabling time comparisons. Methods: Deprivation indexes (FDep) were built using the 1990 and 1999 data and the same methodology. The indices were defined as the first component of a principal component analysis including four specific socio-economic variables. The time course of the association between mortality and deprivation was evaluated on the ‘commune’ geographic scale (36 000 U in mainland France), without considering spatial autocorrelation and on the larger ‘canton’ scale (3700 U), considering spatial autocorrelation. The analysis was carried out by gender, age...