Journal of Biosocial Science (2020), 52: 1, 78–96
doi:10.1017/S0021932019000257

CAMBRIDGE UNIVERSITY PRESS

RESEARCH ARTICLE

Childlessness and union histories: evidence from Finnish population register data

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(Received 22 October 2018; revised 9 January 2019; accepted 5 March 2019; first published online 06 June 2019)

Abstract

From an evolutionary perspective, childlessness may be considered a failure, as it implies that there will be no direct transmission of one's genetic material to later generations. It is also a pressing social issue, because in many contemporary advanced societies, levels of childlessness have increased, and particularly so among men. The absence of a partner is naturally a fundamental determinant of childlessness. Empirical evidence on how childlessness relates to individuals' partnership histories is nevertheless limited. This issue was analysed with Finnish population register data, which allow the complete cohabitation and marriage histories of individuals from age 18 years to be observed. For women and men born between 1969 and 1971, logistic regression models were estimated for childlessness at age 40 by partnership histories in terms of various stages in the process of union formation and dissolution, and accounting for several socioeconomic variables. A strong link between union histories and childlessness was found, with short partnership spells raising the risk of not becoming a parent. Later age when leaving the parental home raised female childlessness, while a short first-union duration related more strongly to male childlessness. These findings may be considered as providing insights into how specific life-history strategies affect reproductive outcomes, and highlight the need to develop new approaches to understand this feature of social inequality.

Keywords: Childlessness; Union histories; Population registers

Introduction

From an evolutionary perspective, childlessness may represent a decisive failure, as it implies that there will be no direct transmission of one's genetic material to later generations (Mace, 2000; Colleran, 2016). It is also a pressing social issue, because in many contemporary advanced societies levels of childlessness have increased, and the increase in male childlessness is particularly marked (Miettinen *et al.* 2015; Beaujouan *et al.*, 2017). In both the United States and Norway, for instance, about one in four men aged 40 years are childless, compared with around one in seven among women (Pew Research Center, 2010; Martinez *et al.*, 2012; Statistics Norway, 2018). In some East Asian societies, including Japan, childlessness is close to 30% among women born in the late 1960s (Frejka *et al.*, 2010). In Europe, corresponding numbers range from 8% in Bulgaria and the Czech Republic to 23% in Germany (Jasilioniene *et al.*, 2016).

High levels of childlessness tend to coincide with low overall fertility levels (Sobotka, 2017). Finland provides an exception, and constitutes an appealing study case because of its skewed fertility distribution. Cohort fertility in Finland has been almost the same as in the neighbouring country Sweden, while the level of childlessness has been notably higher (Jalovaara *et al.*, 2017; Rotkirch & Miettinen, 2017). In both countries, total fertility has been fairly insensitive to business cycle variations (Aaberge *et al.*, 2000; Gorodnichenko *et al.*, 2012), which stands in

contrast to the situation in many other societies, where fertility generally is pro-cyclical (Sobotka *et al.*, 2011). A likely reason is the extensive transfer system directed towards families, which weakens the relation between unemployment and total fertility (Adsera, 2005; Hilgeman & Butts, 2009). In both Finland and Sweden, the average number of children has fluctuated modestly around 1.9 for female cohorts born in 1940–1969, and around 1.8 for men in the same birth cohorts. The population shares with three or more children have also been relatively stable over the last 35 years. However, in Finland, childlessness has increased notably since the 1970s, from approximately 14% to 22% for women aged 40 years, and for same-aged men from approximately 22% to 32%. In Sweden, the current levels of childlessness correspond to those that prevailed in Finland in the 1970s (Jalovaara *et al.*, 2017; Statistics Finland, 2018).

Thus, the Finnish case, in which high rates of childlessness have coincided with modest variations in overall fertility, makes it particularly important to understand what type of women and men end up childless. Although much research has been conducted on childlessness in Finland and other countries (Kreyenfeld & Konietzka, 2017), little is known about how childlessness relates to people's partnership histories, which this paper is concerned with. Like in many other secularized societies, unmarried cohabitation, marriage after childbirth and separation from marriages and cohabiting unions are common events in Finland. It is therefore necessary to incorporate information on partnership histories into analyses of childlessness. This opportunity has been sparsely utilized, however.

Not having a partner is naturally a central determinant of childlessness (Rotkirch & Miettinen, 2017). Evidence on how individuals end up single, and in particular how partnership histories affect the likelihood of ending up childless, is nevertheless scarce. One primary reason is that most countries lack suitable data to study these interrelations. In life course analysis of demographic behaviours, researchers have regularly used retrospective surveys (Freedman *et al.*, 1988; Billari, 2001; Keizer *et al.*, 2008). However, it is well known that recall bias is of concern for any investigation of individuals' life courses based on retrospective data, and particularly so when partnership histories are to be reconstructed (Bradburn *et al.*, 1987; Kreyenfeld & Bastin, 2016). This is primarily because retrospective surveys rely on the ability and willingness of individuals to recall when various life events took place.

In this study, data deficits of this kind were avoided by utilizing information from the Finnish population registers. These provide full coverage of individuals living in the same household, irrespective of marital status or the presence of any children, and contain no loss due to follow-up or recall bias. Another important contribution of the study is that women and men were analysed separately. Few studies on childlessness to date have studied men, because data on men's retrospective histories are particularly unreliable, as men are less likely to report children with non-co-resident partners. As this study makes use of prospective register data, it does not suffer from this problem.

There has been only one previous study (Jalovaara & Fasang, 2017) that has analysed the interrelation between childlessness and union histories with similar data to those used here. Being descriptive in nature, it used sequence analyses to compare graphically union trajectories of people who end up with or without children in their early forties, and cluster analyses to identify typical union trajectories for the childless persons. Four clusters were identified: one with never-partnered individuals, who constituted 45% of all childless persons, and three others, consisting of people who had briefly cohabited (25%), serial cohabiters (19%) and married people (11%). Multinomial regression models were estimated to see how educational attainment and the degree of urbanization of the place of residence affected the likelihood of being found in each cluster.

The aim of the current study was to assess how childlessness relates to union histories by undertaking more detailed analyses based on similar population register data. For the female and male cohorts born in 1969–1971, the complete partnership histories of individuals since they became 18 years old were observed. Based on these features, logistic regression models for childlessness at age 40 were estimated. The approach facilitated interpretation of the mechanisms

https://doi.org/10.1017/S0021932019000257 Published online by Cambridge University Press

involved, and made the results verifiable against theoretically based arguments. Several socioeconomic variables that are known to be associated with childlessness were controlled for, and the net (independent) effects of the union histories variables were consequently assessed. From a broader evolutionary perspective, the paper can therefore be considered to provide knowledge about how specific life-history strategies focused on partnering relate to reproductive behaviour.

The link between union histories and childlessness

Most childbearing takes place within either formal or informal unions, although marriage is more closely related to parenthood than cohabitation (Laplante & Fostik, 2015). The last few decades have seen a rapid growth in cohabitation, not only in Europe and North America, but also in many other parts of the world (Ellison *et al.*, 2012; Esteve *et al.*, 2016; Jones, 2018). This growth in cohabitation has taken place along with the postponement and decline in fertility (Lesthaeghe, 2010; Balbo *et al.*, 2013). Later-born cohorts are more likely to cohabit, they cohabit for a longer time before marriage, many postpone childbearing, greater shares end up never marrying and growing shares end up without children. Hence, studying the relationship between childlessness and partnership status is necessary for understanding overall fertility variation and the changing context of childbearing, which is of central relevance for how human populations evolve over time. It is important also from the perspective that childlessness is linked to worse health and shorter longevity (Burger *et al.*, 2012; Frisch & Simonsen, 2013; Chiu *et al.*, 2018), while having a partner may potentially offset some of the negative health effects of having no children (Umberson *et al.*, 2010; O'Flaherty *et al.*, 2016). Therefore, understanding the mechanisms behind childlessness necessitates a proper investigation of the role played by cohabitation and marital histories.

Finland can be considered a forerunner in terms of partnering dynamics and the adaption of new family forms. Only about 10% of the Finnish women born in the 1960s, 1970s and 1980s were married at the start of their first union, and even after childbearing, cohabitation has become a more long-term arrangement (Nikander, 1992, 1996; Jalovaara, 2012). Thus, union histories are evidently important factors in explaining trends in childlessness, and they therefore need to be considered as individual-level determinants (Dykstra & Hagestaad, 2007; Dykstra & Wagner, 2007). As will be discussed below, the primary reasons relate to stability and exposure, which are partly overlapping features.

As opposed to unmarried cohabitation, marriage implies higher union stability and, thus, greater commitment. Also in Finland, fertility has for long been positively predicted by marriage (Moring, 1995). A stable partnership is commonly viewed as a precursor to childbearing, while partnership instability tends to depress fertility (Jalovaara & Fasang, 2017). Cohabitation generally relates to a lower likelihood of childbearing compared with marriage, where fertility intensities of people in consensual unions often lie in between those who are single and those who are married (Laplante *et al.*, 2016; Zaidi & Morgan, 2017; Jones, 2018).

'Exposure' refers to the notion that the longer time a person spends with a partner, irrespective of marital status, the less likely he or she is to end up childless. Deciding to have a child is one of the strongest commitments a couple can decide on, requiring immense investments in time and great social and economic responsibilities, and many would not commit unless they were certain about the relationship. If either part is uncertain about the quality, durability and relative worth stemming from the relationship, childbearing is far less likely (Rijken & Thomson, 2011). Many people nevertheless see that a central purpose of entering a marriage is to have children (Thornton & Young-DeMarco, 2001; Thornton *et al.*, 2012). Not wanting children may therefore depress marriage rates, and being single or having undergone a divorce may therefore depress fertility (Keizer, 2010; Bavel *et al.*, 2012).

It needs to be recognized as well that, for many people, having children is a key life outcome, driven by social and biological factors (Balbo *et al.*, 2013), and not reproducing may represent a

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failure to achieve a fundamental aim in life. Exposure may therefore be relevant also from the perspective of several partners. If one relationship is broken, compatibility with other potential life partners may be tested. This would mean that spell length in a broader perspective may matter, and not only time in the union with the first partner. It is therefore plausible that, the sooner one leaves the parental home, and the sooner the first partnership is entered, the less likely is a person to be childless at higher age. Early in adulthood, before most people initiate childbearing, few say that they prefer to be childless (Miettinen & Szalma, 2014). Many nevertheless adjust their view about their ideal family size according to how life turns out, particularly if it does not include children (Dey & Wasoff, 2010; Miettinen *et al.*, 2011). Since partner histories are reflective of various life events, such as conflicting opportunities during the reproductive years and failure to find a long-term partner, they can be assumed to be strongly associated with childlessness.

In general, women leave the parental home at an earlier age than men do, they enter their first union at an earlier age, and more often so with a partner that is older (Davis, 1998; Hayes & Adamo, 2014; Kolk, 2015). Women also have a shorter reproductive window than men and may therefore not postpone their fertility to the same extent. Additionally, children are a greater responsibility for women than for men. This means that women require a greater commitment from their partner and a higher degree of presumed stability in order to initiate childbearing. Thus, before establishing a family with children, women can be assumed to be more perceptive to relationship problems and more likely to end a relationship if they consider the partner to be incompatible. Furthermore, men have to a greater extent than women children with multiple partners, which would leave other men, who have difficulties in establishing lengthier relationships, childless (Keilman *et al.*, 2014; Rostgaard & Møberg, 2014). Although the overall associations between partner histories and childlessness are expected to be similar in sign for women and men, they may consequently differ in strength between the sexes.

Empirical support for the following arguments was therefore expected from the current study: i) marriage suppresses childlessness, and more so for women than for men, ii) partnership length suppresses childlessness, and more so for men than for women; iii) high age when leaving the parental home and short time in the lengthiest partnership are factors that are more strongly associated with childlessness for women than for men; iv) high age at entry into the first partnership and short time with the first partner are factors that are more strongly associated with childlessness for men than for women.

Methods

Data

The data used were extracted from the Finnish national longitudinal population registers (with permission number TK-53-768-12). The register data have individual linkage to various other registries, including data on housing, child births, educational attainment, employment and income. These data sources had been merged for each individual by Statistics Finland using personal identification numbers. Since the data were drawn from the population registers, and all variables came from register-based sources, there was no problem with data coverage or selection.

The data accessed consisted of a 5% random sample of all persons who lived in Finland in 1988–2011, who were Finnish speakers or had another mother tongue than Finnish or Swedish. For Swedish speakers, who amount to 5.5% of the total population, and represent a native group with equal rights to Finnish speakers, there was a similar 20% random sample. In the analyses, each sample was weighted according to its sampling proportion. Each (index) person could be observed longitudinally on an annual basis between 1st January 1988 and 31st December 2011. For each person, there was a link to the children and to the potential partner. They could be observed over the same period as the index person. Partner identification was by a standard procedure performed by Statistics Finland, where a partner was considered to be a

https://doi.org/10.1017/S0021932019000257 Published online by Cambridge University Press

person living in the same dwelling as the index person, who was of opposite sex, was not a close relative and whose age did not differ by more than 20 years from that of the index person.

By restricting the data to people born in 1969–1971, the complete partnership histories of each index person during ages 18–40 years could be observed. This meant that each study person was observed from the calendar year in which he or she became 18 years old, and whether he or she had a partner, meaning that the two persons lived in the same household at the end of the calendar year. The setup implies that, at the calendar year basis, it is known when persons left the parental home, when they initiated and ended each new union with a partner and the birth year of each child. The outcome in focus was whether or not a person was childless at age 40 years.

Since complete partnership histories at ages 18–40 years were needed, people who lived abroad during any of the years were excluded from the analyses, and so also were the few persons who died before age 41 years. Since migration abroad of native-born persons was modest, over 95% of all persons excluded were foreign-born immigrants. Of the remaining persons, 0.1% had a mother tongue other than Finnish or Swedish, and they were also excluded. With these restrictions, there were in total 4893 women and 5103 men, of which 20.9% of the women and 33.3% of the men were childless at age 40 years.

Considering that the data covered the period 1988–2011 and partnership histories from age 18 years were included, childlessness had to be measured at age 40 years, which is before women reach the end of their reproductive life. This is not a major impediment for either women or men, because few have their first child after age 40. By observing the older birth cohorts, one could see that the proportion of women who were childless was reduced by less than one percentage unit when comparing age 45 with age 40. For men, the reduction in childlessness was somewhat higher, but still modest, as less than 2.5% attained parenthood from age 40 to age 45.

Analysis

Logistic regression models for the odds of being childless at age 40 were estimated separately for women and men. The focus was on the associations between childlessness and union histories, which were captured by seven variables. (1) *Partner status, marital status and union length* combined information about the current family with time spent in the current or latest union. It consequently has a retrospective character that expands the common typology of categorizing persons according to whether they are married, not married, previously married and never married. Thus, separated are not only married and unmarried people with a partner, previously married and never married persons, but within each category, persons were also differentiated according to how long they had been in the current or latest union. (2) *Age when leaving the parental home*, (3) *Age at entry into the first union* and, (4) *Time spent in the first union* reflect stages in the process of partnership formation, while (5) *Lengthiest union*, (6) *Total time spent in unions*, and (7) *Number of unions* are summary measures of the union histories.

Two additional groups of individuals were considered: persons who never left the parental home, and persons who left the parental home but never entered any union. In these groups, childlessness rates were naturally close to unity, and they will therefore not be discussed in any greater detail, although they were included in the analyses.

The socioeconomic control variables used were each person's birth year, educational level, educational field, labour market status, income, home ownership, mother tongue, region of residence and degree of urbanization of the area of residence. All are measured at age 40. Any unemployment experience in ages 18–40 years and all income in ages 18–40 years were also taken into account. Distributions and estimates related to the control variables were in line with previous research (Fieder *et al.*, 2011; Barthold *et al.*, 2012; Kruk & Reinhold, 2014). For the sake of brevity and clarity, this part of the empirical findings is not displayed, but it is available upon request.

https://doi.org/10.1017/S0021932019000257 Published online by Cambridge University Press

Results

Descriptive statistics

Table 1 presents a description of the union history variables, their distributions and the proportion childless in each category by sex. By age 40, more than half of both women and men were married. The great majority, or about three-quarters, of these had been living with this partner for at least 10 years. Less than one-fifth lived in a cohabiting union at age 40 (that is, with partner, not married). Slightly more women than men, or just over one-tenth, were single but had been previously married, while more men than women, or just over one-fifth, had no partner and had never been married. Very few, or 0.6% of all women and 3.6% of all men, had never left the parental home. One in twenty of the women and one in ten of the men had left the parental home but never entered any union.

Variation in childlessness across these categories was considerable. Childlessness was least common among those who were married, followed by previously married with no current partner, cohabitants and never-married individuals without a partner. Furthermore, there was a strong interrelation between union length and childlessness. Married women and men with short unions were notably more likely to be childless than married persons who had lived for many years with the same partner. A similar pattern can be seen for cohabiting men and men with no current partner, while for non-married women, union duration seemed to matter only for the never-married those with no current partner.

For women, having left the parental home at a very early age, or before age 20, was associated with a low level of childlessness at age 40, while this was not the case for men. Two-thirds of the women, and less than half of the men, had entered their first union before age 25. The later individuals entered a partnership, the more likely they were to become childless. Particularly among men who entered their first union at age 30 or later, the level of childlessness was very high, or 44%. Approximately one-third of each sex spent at most 3 years in their first union, and the shorter time they spent in the first union, the more likely they were to be childless at age 40. About 45% of the women and 55% of the men spent at most 5 years in their lengthiest union, and they had notably higher rates of childlessness than others. Over 70% of the women and almost 60% of the men spent more than 10 years in unions in total, and childlessness was notably smaller for those with longer total time in unions. Well over half of all women and men entered only one union, and approximately a quarter two unions, while the rest had three unions or more. However, childlessness varied only marginally with the number of unions.

Multivariate regressions results

The associations discussed above generally support the outlined expectations. A remaining issue was whether they could be discerned also when all the union history variables were included in the same model and the socioeconomic control variables were adjusted for. Multivariate logistic regression models were therefore estimated, and the results are summarized in Table 2 for women and in Table 3 for men. In the tables, Model 1 includes only the variable that refers to partner status, marital status and union length. Model 2 includes the variables that represent stages in the union formation process and the summary measures of the union histories. Model 3 includes all variables from Model 1 and Model 2, while Model 4 adds the control variables.

Since Model 1 includes only one variable, the estimated odds ratios correspond fully to the shares of childlessness reported for the same variable in Table 3, and therefore they need not be repeated. More interesting is that, albeit the estimated associations diminish in effect size when the other union history variables were included (Model 3), the conclusions remain similar with respect to how childlessness relates to partner status, marital status and union length. Furthermore, including all the control variables (Model 4) has only a modest influence on these associations. In the fully adjusted models, married and previously married women and men had

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Table 1. Distribution of variables representing partnership histories, and proportion childless in each category at age 40 years, Finnish women and men born 1969–1971

	Women		Men	
	%	% childless	%	% childless
Partner status, marital status and union length				
With partner, married				
15–22 years in union	27.6	6.2	18.5	6.4
10–14 years in union	15.4	8.0	17.4	9.7
5–9 years in union	8.5	14.9	9.4	19.9
<5 years in union				
With partner, not married				
15–22 years in union	5.2	20.8	5.5	27.8
10–14 years in union	3.2	22.5	3.1	25.7
5–9 years in union	4.6	24.4	4.5	34.5
<5 years in union	6.2	26.4	6.9	43.1
No partner, previously married				
1–5 years since latest union	6.2	12.8	5.6	16.3
6–10 years since latest union	2.8	9.4	2.0	21.0
>10 years since latest union	1.6	16.4	0.8	37.4
No partner, never married				
1–5 years since latest union	3.3	40.1	3.8	53.6
6–10 years since latest union	2.7	47.4	3.2	62.1
>10 years since latest union	3.5	60.1	3.4	72.8
Age when leaving parental home				
<20 years	27.7	14.6	10.8	27.0
20–21 years	29.3	17.2	21.3	23.5
22–23 years	20.1	19.1	24.4	26.5
24–26 years	15.9	27.4	23.8	32.0
27+ years	6.5	45.9	16.5	50.2
Age at entry into first union				
18–20 years	30.3	11.6	9.5	15.3
21–24 years	34.9	15.0	34.6	18.0
25–29 years	21.0	20.1	28.4	22.4
30+ years	7.8	32.6	13.8	44.2
Time spent in first union				
1 year	16.7	25.4	16.4	36.1
2–3 years	15.4	22.8	13.8	32.2
4–9 years	18.1	19.0	18.2	30.3
10–14 years	12.2	12.4	14.6	15.4

(*Continued*)

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Table 1. (*Continued*)

	Women		Men	
	%	% childless	%	% childless
15+ years	31.4	8.7	23.3	8.6
Lengthiest union				
1–5 years	12.8	45.3	16.6	55.8
6–10 years	20.5	19.4	20.6	26.3
11–15 years	24.8	11.1	25.5	13.8
16–23 years	35.7	8.1	23.5	8.2
Total time spent in unions				
1–5 years	8.2	54.5	11.3	63.8
6–10 years	13.6	25.2	15.8	36.0
11–15 years	25.6	14.0	28.2	16.0
16–23 years	46.4	8.6	31.0	8.8
Number of unions				
1	54.0	16.3	52.7	23.0
2	26.6	15.9	22.9	22.5
3	9.1	19.8	7.7	26.7
4+	4.1	15.6	3.0	27.5
Never in a union but left parental home	5.5	86.4	10.6	96.2
Never left parental home	0.6	100.0	3.2	94.6
Total	100.0	20.9	100.0	33.3
Total number of persons	4893		5103	

the lowest odds of being childless, while those of cohabitants and never-married people with no partner were several-fold higher. Union length remained important for childlessness in married women, but not for childlessness in cohabiting women. Among men, union length tended to matter also for cohabitants and those with no current partner. As an illustration, the odds of being childless for married women with union lengths of 10–14 years were 16% higher than for married women with union lengths of 15–22 years (OR: 1.16, 95% CI: 0.65–2.07), while those for married women with union lengths of 5–9 years and <5 years, respectively, were 87% higher (OR: 1.87, 95% CI: 1.04–3.36) and 109% higher (OR: 2.09, 95% CI: 1.16–3.77). Corresponding estimates for men were 0.99 (95% CI: 0.53–1.88), 1.76 (95% CI: 0.91–3.38) and 2.04 (95% CI: 1.05–3.98).

For women, the odds of being childless increased close to monotonously with age when leaving the parental home (Model 2), and these estimates changed little when effects of other variables were controlled for (Model 3 and Model 4). As compared with women who left the parental home before age 20, women who left at age 20–23 years were approximately 20% more likely to become childless, while those who left at 24–26 years were about 60% more likely to become childless, and those who left at age 27+ were almost twice as likely. For men, a similarly strong pattern could not be discerned when the other union history variables were included. Age at entry into the first union, on the other hand, was notably more important for male childlessness than for female childless in the multivariate models. When all variables were included (Model 4), men who entered their first union at age 21–24 were almost 30% more likely to be childless than those who

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Table 2. Odds ratios for childlessness at age 40 years in models with differents sets of variables, Finnish women born 1969–1971 ($N = 4893$)

	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Partner status, marital status and union length								
With partner, married								
15–22 years in union	1*				1*		1*	
10–14 years in union	1.33	(0.96–1.85)			1.17	(0.66–2.08)	1.16	(0.65–2.07)
5–9 years in union	2.66	(1.91–3.72)			1.90	(1.06–3.40)	1.87	(1.04–3.36)
<5 years in union	3.99	(2.76–5.76)			2.18	(1.22–3.89)	2.09	(1.16–3.77)
With partner, not married								
15–22 years in union	4.11	(2.69–6.29)			4.28	(2.79–6.56)	4.38	(2.82–6.79)
10–14 years in union	4.41	(2.93–6.64)			4.17	(2.25–7.73)	4.11	(2.19–7.70)
5–9 years in union	4.92	(3.40–7.12)			3.42	(1.87–6.28)	3.69	(1.99–6.85)
<5 years in union	5.44	(3.93–7.54)			3.11	(1.79–5.41)	3.09	(1.76–5.44)
No partner, previously married								
1–5 years since union	2.24	(1.50–3.35)			1.74	(1.01–3.01)	1.80	(1.02–3.15)
6–10 years since union	1.57	(0.84.2.95)			0.90	(0.41–2.00)	0.84	(0.37–1.91)
>10 years since union	2.98	(1.52–5.84)			1.09	(0.44–2.65)	0.93	(0.37–2.34)
No partner, never married								
1–5 years since union	10.17	(6.97–14.86)			5.19	(2.94–9.17)	4.87	(2.69–8.80)
6–10 years since union	13.71	(9.22–20.39)			5.47	(2.89–10.36)	5.29	(2.73–10.25)
>10 years since union	22.95	(15.86–33.20)			6.27	(3.16–12.45)	5.56	(2.74–11.28)
Age when leaving parental home								
<20 years			1*		1*		1*	
20–21 years			1.19	(0.93–1.52)	1.21	(0.94–1.56)	1.18	(0.91–1.52)

(*Continued*)

Table 2. (*Continued*)

	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
22–23 years			1.12	(0.83–1.50)	1.18	(0.87–1.59)	1.17	(0.85–1.60)
24–26 years			1.51	(1.11–2.05)	1.61	(1.17–2.20)	1.57	(1.12–2.19)
27+ years			1.76	(1.20–2.56)	1.90	(1.29–2.79)	1.97	(1.32–2.95)
Age at entry into first union								
18–20 years			1		1		1	
21–24 years			1.25	(0.96–1.61)	1.29	(0.99–1.69)	1.20	(0.92–1.58)
25–29 years			1.21	(0.87–1.67)	1.30	(0.91–1.84)	1.18	(0.82–1.69)
30+ years			0.96	(0.65–1.42)	1.16	(0.72–1.89)	0.99	(0.60–1.62)
Time spent in first union								
1 year			1		1		1	
2–3 years			0.87	(0.67–1.12)	0.88	(0.67–1.16)	0.91	(0.69–1.21)
4–9 years			0.70	(0.53–0.94)	0.70	(0.52–0.95)	0.73	(0.53–0.99)
10–14 years			0.62	(0.42–0.92)	0.66	(0.44–0.99)	0.68	(0.45–1.02)
15+ years			0.66	(0.44–0.99)	0.78	(0.50–1.20)	0.83	(0.53–1.28)
Lengthiest union								
1–5 years			1*		1		1	
6–10 years			0.59	(0.40–0.89)	0.69	(0.44–1.07)	0.64	(0.41–1.01)
11–15 years			0.32	(0.18–0.56)	0.49	(0.26–0.93)	0.50	(0.26–0.96)
16–23 years			0.24	(0.12–0.51)	0.47	(0.20–1.08)	0.44	(0.19–1.04)
Total time spent in unions								
1–5 years			1*		1		1	
6–10 years			0.49	(0.32–0.75)	0.56	(0.36–0.89)	0.55	(0.35–0.88)

https://doi.org/10.1017/S0021932019000257 Published online by Cambridge University Press

Table 2. (*Continued*)

	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
11–15 years			0.40	(0.22–0.72)	0.49	(0.25–0.93)	0.44	(0.23–0.86)
16–23 years			0.37	(0.18–0.76)	0.47	(0.21–1.03)	0.46	(0.21–1.03)
Number of unions								
1			1*		1		1	
2			0.68	(0.51–0.91)	0.74	(0.54–1.01)	0.71	(0.51–0.97)
3			0.78	(0.51–1.18)	0.86	(0.55–1.36)	0.80	(0.51–1.28)
4+			0.54	(0.30–0.96)	0.64	(0.34–1.20)	0.63	(0.33–1.19)
Socioeconomic variables included	No		No		No		Yes	

Categories for 'Never in a union, but left parental home' and 'Never left parental home' were also included in each model, but the estimates are not displayed here.
*Variable improved the model fit at $p < 0.05$.

Table 3. Odds ratios for childlessness at age 40 years in models with differents sets of variables, Finnish men born 1969–1971 ($N = 5103$)

	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Partner status, marital status and union length								
With partner, married								
15–22 years in union	1*				1*		1*	
10–14 years in union	1.57	(1.14–2.18)			1.05	(0.56–1.97)	0.99	(0.53–1.88)
5–9 years in union	3.65	(2.63–5.07)			1.94	(1.01–3.71)	1.76	(0.91–3.38)
<5 years in union	5.64	(3.94–8.08)			2.22	(1.15–4.30)	2.04	(1.05–3.98)
With partner, not married								
15–22 yrs in union	3.18	(1.89–5.37)			3.24	(1.92–5.48)	3.20	(1.88–5.44)
10–14 years in union	5.07	(3.33–7.72)			3.42	(1.75–6.67)	3.15	(1.60–6.20)
5–9 years in union	7.74	(5.38–11.15)			3.81	(1.95–7.48)	3.45	(1.75–6.81)
<5 years in union	11.12	(8.05–15.37)			4.62	(2.45–8.73)	4.39	(2.31–8.33)
No partner, previously married								
1–5 years since union	2.85	(1.91–4.25)			1.47	(0.77–2.81)	1.37	(0.71–2.64)
6–10 years since union	3.91	(2.23–6.85)			1.48	(0.66–7.30)	1.32	(0.58–3.03)
>10 years since union	8.77	(4.28–17.97)			2.76	(1.05–7.30)	2.42	(0.89–6.55)
No partner, never married								
1–5 years since union	16.97	(11.68–24.65)			6.31	(3.27–12.16)	5.98	(3.07–11.68)
6–10 years since union	23.99	(15.95–36.09)			6.65	(3.27–13.54)	5.99	(2.90–12.38)
>10 years since union	39.19	(25.71–59.74)			8.79	(4.05–19.11)	7.84	(3.55–17.35)
Age when leaving parental home								
<20 years			1		1		1	
20–21 years			0.94	(0.69–1.27)	0.90	(0.66–1.22)	0.88	(0.64–1.21)

Table 3. (*Continued*)

	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
22–23 years			0.96	(0.70–1.31)	0.94	(0.68–1.29)	0.92	(0.66–1.28)
24–26 years			1.02	(0.74–1.41)	1.03	(0.74–1.43)	1.03	(0.74–1.45)
27+ years			0.98	(0.69–1.39)	1.02	(0.71–1.46)	1.01	(0.70–1.46)
Age at entry into first union								
18–20 years			1		1		1	
21–24 years			1.26	(0.90–1.76)	1.30	(0.92–1.84)	1.29	(0.91–1.83)
25–29 years			1.29	(0.89–1.88)	1.55	(1.05–2.30)	1.55	(1.05–2.30)
30+ years			1.33	(0.88–2.01)	1.93	(1.20–3.12)	1.98	(1.22–3.21)
Time spent in first union								
1 year			1*		1*		1*	
2–3 years			0.77	(0.61–0.99)	0.78	(0.60–1.01)	0.77	(0.60–1.00)
4–9 years			0.79	(0.61–1.02)	0.79	(0.60–1.04)	0.79	(0.60–1.04)
10–14 years			0.59	(0.42–0.83)	0.58	(0.41–0.83)	0.57	(0.40–0.81)
15+ years			0.55	(0.36–0.82)	0.60	(0.39–0.93)	0.58	(0.37–0.90)
Lengthiest union								
1–5 years			1*		1		1	
6–10 years			0.67	(0.47–0.95)	0.76	(0.51–1.12)	0.79	(0.53–1.18)
11–15 years			0.54	(0.32–0.92)	0.98	(0.54–1.75)	1.00	(0.56–1.81)
16–23 years			0.49	(0.23–1.02)	1.00	(0.43–2.34)	0.99	(0.42–2.34)
Total time spent in unions								
1–5 years			1*		1*		1*	
6–10 years			0.49	(0.33–0.71)	0.71	(0.47–1.07)	0.68	(0.45–1.03)

(*Continued*)

Table 3. (*Continued*)

	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
11–15 years			0.24	(0.14–0.41)	0.41	(0.22–0.74)	0.41	(0.22–0.74)
16–23 years			0.16	(0.08–0.32)	0.31	(0.15–0.65)	0.32	(0.15–0.68)
Number of unions								
1			1		1		1	
2			0.80	(0.62–1.04)	0.80	(0.60–1.07)	0.79	(0.59–1.05)
3			0.97	(0.65–1.43)	0.97	(0.64–1.49)	0.98	(0.64–1.51)
4+			0.84	(0.49–1.46)	0.90	(0.50–1.63)	0.88	(0.48–1.59)
Socioeconomic variables included	No		No		No		Yes	

Categories for 'Never in a union, but left parental home' and 'Never left parental home' were also included in each model,but the estimates are not displayed here.
*Variable improved the model fit at $p < 0.05$.

entered at age 18–20, those who entered at age 25–29 over 50% more likely, and those entered at age 30+ twice as likely. For women, there was no such clear pattern. Shorter time in the first union and shorter total time in unions were associated with higher childlessness in both sexes, but the pattern was more pronounced for men than for women. Short time in the lengthiest union and having been in one union only tended to be stronger associated with female childlessness than with male childlessness.

Perhaps most noteworthy still was that practically none of the estimated associations between the union history variables and childlessness changed to any considerable degree when the socioeconomic variables were included (Model 4). This suggests that, although related to one another, the union history variables had effects on childlessness that were independent of those related to the socioeconomic variables. Thus, childlessness at age 40 is highly dependent on individuals' life course experience in terms of factors that reflect the partnership patterns at ages 18–40.

Discussion

There are many reasons why people do not reproduce. A central set of explanations lies in the pathways that lead from union histories, which have been the concern of this paper on Finland. In contrast to most previous research on the link between partnership histories and childlessness, population register data were utilized in this study. The merit of this approach lies in the fact that individuals' union histories at ages 18–40 years were covered, and the aim was to understand how these relate to childlessness at age 40. Thus, the analyses incorporated the life course histories on cohabitation patterns starting from late adolescence. The findings suggest that these factors are highly important for childlessness, and that the effects are only modestly dependent on the influence of socioeconomic characteristics. The study reveals that union characteristics, the length of different partnerships experienced, age when leaving the parental home and age at entry into the first union are strongly linked to childlessness at age 40.

It is often argued that the antecedents of female and male childlessness are notably different (Fieder & Huber, 2007; Keizer *et al.*, 2008; Yates *et al.*, 2010; Tanturri, 2013). This paper found that, on the contrary, in terms of how childlessness relates to union dynamics across the life course, women and men are fairly similar. Married women and men who had lived with their current partner for very many years were the least likely to be childless. Childlessness decreased with partnership length, in terms of both the time spent in the first union and the total time spent in unions. Never-married women and men were the most likely to be childless, even if they previously had been in a union. For women, childlessness increased with age when they left the parental home. For men, childlessness increased with age at entry into first union. Time spent in the lengthiest partnership was inversely related to childlessness for women in particular, while the association between childlessness and number of unions was less clear. Thus, empirical support for the theoretically based arguments is generally strong. The study found that: (i) marriage suppresses childlessness, and particularly so for women; (ii) length of partnership suppresses childlessness, and slightly more so for men than for women; (iii) high age when leaving the parental home and short time in the lengthiest relationship are important for female childlessness; while (iv) high age at entry into the first relationship and short time in the first relationship are more strongly associated with male childlessness than female childlessness.

In contemporary developed countries, the transition to parenthood depends on other and partly different factors than what was the case in the past. There is greater emphasis on individual choice in reproductive and family behaviours, with universal contraception and fewer unplanned births, higher opportunity costs of childbearing and life aims that conflict with childbearing, such as travel, lengthy studies and activities focused on self-realization (Balbo *et al.*, 2013; New *et al.*, 2017). It is also known that socioeconomic variation in fertility tends to be more pronounced at intermediate stages of the demographic transition than at advanced stages (Skirbekk, 2008; Dribe

https://doi.org/10.1017/S0021932019000257 Published online by Cambridge University Press

et al., 2014). Finland is at a very advanced stage of the demographic transition, and has over the past decades experienced increasing levels of childlessness. When union histories were accounted for, the current findings revealed that socioeconomic factors had only modest effects on childlessness. This suggests that childlessness occurs in different social layers, and that it is heavily driven by the timing and speed of life course events, rather than by just socioeconomic factors (Allen *et al.*, 2017; Beckman *et al.*, 2018).

Finland can in many respects be considered one of the most modern countries in the world, and a forerunner in terms of new demographic behaviours. The results presented here may also therefore have great relevance for other societies that are currently or in the near future transitioning to a similar demographic context. The findings highlight the need to develop new approaches to understand and model childlessness. Reproductive success can be seen as a fundamental measure of social equality. Childlessness constitutes a dimension of social inequality that may be equally as important as traditional factors, such as education or income. The high share of childless persons who live without a partner in mid-life will soon be reflected in many persons without grandchildren. This may, in turn, have large consequences for health care support, social activity and the role of public intervention.

Recent research argues that human reproductive behaviour is influenced by genetic factors, and that heritable traits affect the characteristics of future generations (Barban *et al.*, 2016; Beauchamp, 2016; Hugh-Jones *et al.*, 2016; Stulp & Barrett, 2016). If individuals with and without offspring differ on genetically transmitted traits, persistent high levels of childlessness will over time affect the genetic make-up of human populations (Boyd & Richerson, 1985; Smith & Winterhalder, 1992). In contexts where individual choice matters strongly for childbearing, reproductive patterns and other population challenges (Bergstrom *et al.*, 2013; Hayes & Adamo, 2014) may therefore become increasingly more dependent on the partnering dynamics of the kind studied here.

Funding. This research was supported by Högskolestiftelsen i Österbotten (JS) and Svenska Litteratursällskapet i Finland (JS).

Conflicts of Interest. The authors have no conflicts of interest to declare.

Ethical Approval. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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Cite this article: Saarela J and Skirbekk V (2020). Childlessness and union histories: evidence from Finnish population register data. *Journal of Biosocial Science* **52**, 78–96. https://doi.org/10.1017/S0021932019000257