Associations between factors in childhood and young adulthood and childlessness among women in their 40s: A national prospective cohort study

Introduction

In most high-income countries, an increasing number of women are ending their reproductive years without having biological children[1]. In Australia, for example, the percentage of women aged 45-49 years with no biological children has nearly doubled from 9% in 1986 to 16.4% in 2021[2]. The reasons for childlessness can vary[3]. Some women desire to have children but are unable to due to infertility issues or other circumstances, such as lacking a suitable partner or facing financial constraints. On the other hand, there are women who actively choose not to have children, which is often referred to as voluntary childlessness.

Numerous studies have been conducted to understand the determinants of childlessness, with a particular focus on involuntary childlessness. Various early life factors, such as adverse childhood experiences[4] and childhood health[5], as well as factors in adulthood like socio-demographic characteristics, health behaviours, and health conditions[6], have been associated with infertility. However, limited attention has been given to identifying the predictors of voluntary childlessness. Our previous systematic review showed associations between several socio-demographic factors (e.g., race, religion, partner status) and psychosocial factors (e.g., gender role attitudes) with voluntary childlessness[7]. However, most of the included studies used cross-sectional data, and factors in childhood were rarely examined[7].

Fertility decisions can be made early in life, influenced by family environment and individual circumstances during childhood. These decisions then interact with experiences in adulthood, such as education and marital status, leading to actual childbearing behaviours[8]. Therefore, adopting a life

course perspective to analyse how characteristics in different life stages are associated with the different types of childlessness can provide valuable insights into childlessness. Previous studies have shown that parental socioeconomic status and family structure during childhood may influence the choice to not have children[8-10]. However, there is limited understanding of whether other factors in childhood, such as health status and adverse experiences, which are known risk factors for infertility[4, 5], may also be associated with voluntary childlessness.

In this study, we aim to use data from a national, prospective cohort of Australian women to understand the associations between factors in childhood and young adulthood and different types of childlessness as women approach the end of their reproductive years.

Methods

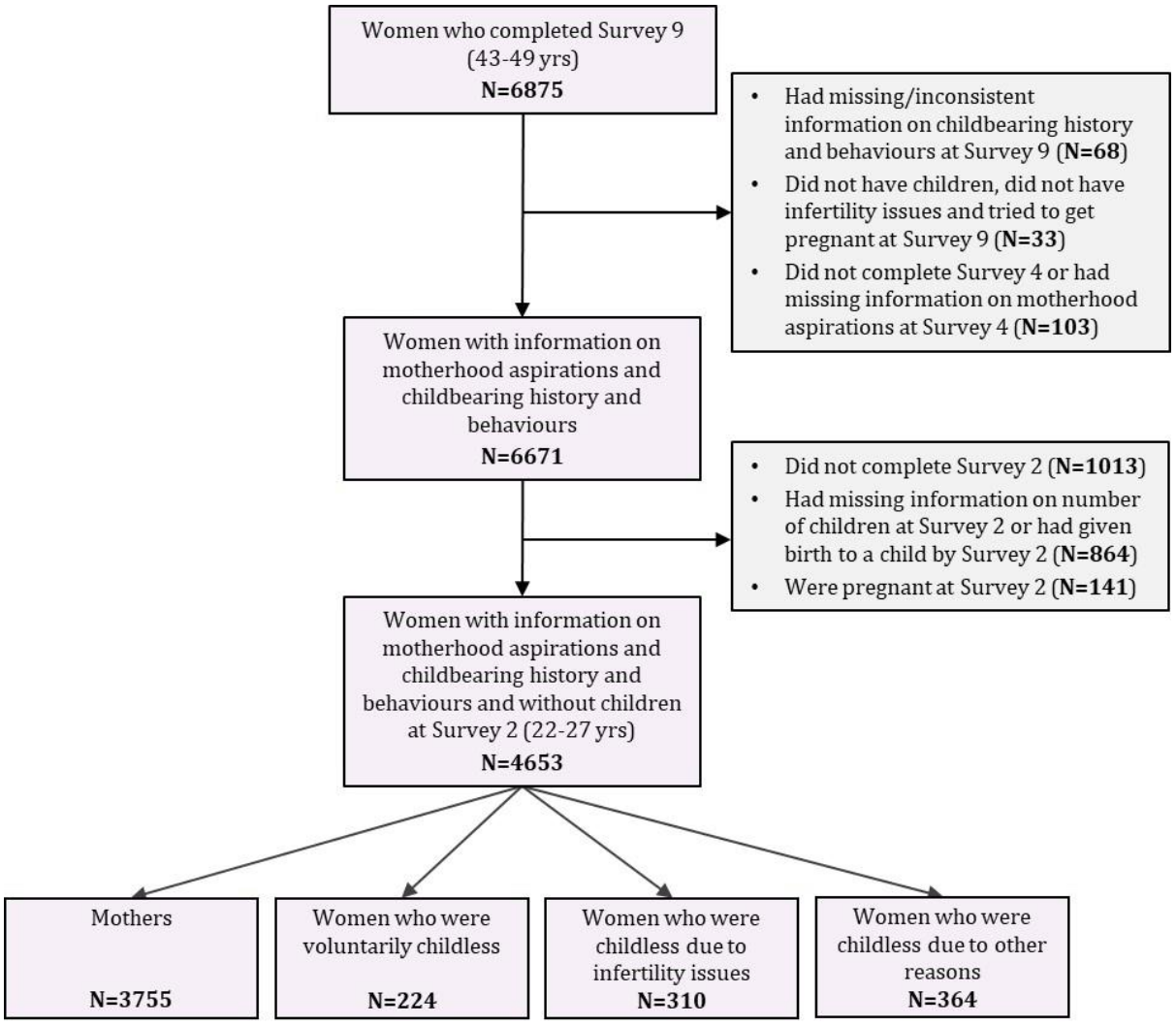
Sample

We used data from the Australian Longitudinal Study on Women's Health (ALSWH), a longitudinal study that began in 1996 by recruiting three age cohorts: women born between 1973-78, 1946-51, and 1921-26. Participants were selected from the database of the then Health Insurance Commission that ran the national health insurance scheme (now called Medicare), with women randomly sampled, and oversampling of those from rural and remote areas. Mailed questionnaires have been sent to each cohort approximately every 3 years. In 2013, a new cohort of women born between 1989-95 was established, with recruitment done through various strategies, such as social media and peer referral. They were followed annually for the first five surveys and are currently on a 3-year follow-up cycle. Detailed methods of the ALSWH have been published elsewhere[11, 12]. The study was approved by the Human Research Ethics Committees of the Universities of Queensland and Newcastle in Australia. All women provided informed consent.

The sample for this study was drawn from the 1973-78 cohort. Participants were aged between 18-23 when recruited at baseline in 1996 and at their 9th survey in 2021, they were aged 43-49. Information on factors in childhood was retrospectively collected in Survey 1 (1996), Survey 2 (2000), Survey 7

(2015), and Survey 8 (2018). For factors in young adulthood, to minimise the effects of reverse causality, we extracted information from Survey 2, when women were aged 22-27. Women who had given birth by Survey 2 or were pregnant in Survey 2 were excluded. We did not use baseline data (Survey 1) since some variables of interest (e.g., sexual orientation and social support) were not collected at that time. A total of 4653 women who were childless at Survey 2 and had information on motherhood aspirations and childbearing history and behaviours were included in the analysis (Figure 1).

Figure 1. Flow chart of the selection of the study population



Outcome variable: childlessness

Childlessness was defined based on women's responses regarding their motherhood aspirations in Survey 4 (when they were 28-33 years old) and their childbearing history and behaviours in Survey 9 (when they were 43-49 years old). Motherhood aspirations were assessed with the question 'When you are 35, would you like to have no children/1 child/2 children/3 or more children?'. Information collected on childbearing history and behaviours included the number of biological children, whether the woman was pregnant, whether she tried to get pregnant, and whether she had infertility issues. Infertility issues were defined as meeting one or more of the following criteria: self-reporting having problems with fertility; answering 'yes' to the questions 'I cannot have children', 'I am using/have used In Vitro Fertilisation (IVF)', or 'I am using/have used fertility hormones (e.g., Clomid)'. Based on these questions, women without biological children by Survey 9 were classified into three groups: (1) *Women who were voluntarily childless* – women who reported no motherhood aspirations in Survey 4, had never tried to get pregnant, and did not have infertility issues in Survey 9; (2) *Women who were childless due to infertility issues* – women who were not pregnant and had infertility issues in Survey 9; and (3) *Women who were childless due to other reasons* – women who wanted to have one or more children in Survey 4, had never tried to get pregnant, and did not have infertility issues in Survey 9. Mothers were defined as women who had biological children by Survey 9.

Exposure variables

To understand the multifaceted nature of the path to childlessness, factors at different life stages and domains were selected based on previous literature[4-10]. Potential childhood and young adulthood predictors of childlessness were classified into different categories. Factors in childhood were classified into three categories: (1) individual factors, (2) parental socioeconomic characteristics, and (3) family environment. Factors in young adulthood were classified into five categories: (1) demographic characteristics, (2) socioeconomic characteristics, (3) health status, (4) health behaviours, and (5) social support. Table 1 presents the variables and their response categories. Supplemental Table 1 provides further details on how these variables were measured.

Statistical analysis

For descriptive analyses, categorical variables were presented as numbers and percentages, and differences across groups were examined using the chi-square test. Since continuous variables (parenting style scores and age) were not normally distributed, they were presented as medians and quartiles, with differences across groups examined using the Kruskal-Wallis test. Multinomial logistic regression models were used to estimate the univariable association between each factor and childlessness, with the outcome variable coded as: 0 = mothers, 1 = women who were voluntarily childless, 2 = women who were childless due to infertility issues, and 3 = women who were childless due to other reasons. Variables that were statistically significant at the 0.05 level (i.e., *P*-value < 0.05) were then included in the multivariable multinomial logistic regression model to estimate their independent association with childlessness. Multiple imputations were used to address missing data in factors in childhood and adulthood for the 4653 women included in the analysis. Twenty imputed datasets were generated using PROC MI in SAS. These datasets were analysed separately, and the results were pooled using PROC MIANALYZE. To ensure there were no problems with multicollinearity, the variance inflation factor of all variables was computed, and all values were below two. We did sensitivity analyses to repeat the main analyses using the sample including women who had given birth by Survey 2 to examine whether excluding them would introduce bias. Analyses were performed using SAS (version 9.4), and the statistical significance level was set at a two-sided *P*-value < 0.05.

Results

Of the 4653 women included in the analysis, 3755 (80.7%) were mothers, 224 (4.8%) were voluntarily childless, 310 (6.7%) were childless due to infertility issues, and 364 (7.8%) were childless due to other reasons in Survey 9 (43-49 years old). Most women (93.2%, n = 4309) were born in Australia. During young adulthood (22-27 years old), 37.2% (n = 1724) of women were partnered (i.e., married or in a de facto relationship), about half of the women (53.4%, n = 2416) obtained a university degree or higher, and half of the women (54.3%, n = 2520) reported that it was

easy or not too bad to manage on their income. Descriptive characteristics of the participants are presented in Table 1.

Table 1 Descriptive statistics of factors in childhood and young adulthood among mothers and women who were childless at Survey 9 (2021, 43-49 years old)

Factors	Mothers (N=3755)	Voluntarily childless (N=224)	Childless due to infertility issues (N=310)	Childless due to other reasons (N=364)	*P* value[α]
Factors in childhood					
Individual factors					
Country of birth					0.5
Australia	3478 (93.1)	212 (95.5)	288 (92.9)	331 (92.5)	
Outside Australia	256 (6.9)	10 (4.5)	22 (7.1)	27 (7.5)	
Self-rated health before age 16					<0.01
Excellent	1808 (54.9)	81 (39.7)	103 (36.8)	145 (44.3)	
Very good	1034 (31.4)	77 (37.8)	110 (39.3)	95 (29.1)	
Good	339 (10.3)	32 (15.7)	44 (15.7)	62 (19.0)	
Fair or poor	110 (3.3)	14 (6.9)	23 (8.2)	25 (7.7)	
Perception of body weight at age 10					<0.01
Underweight	967 (26.0)	41 (18.4)	63 (20.5)	65 (18.1)	
Average	1964 (52.8)	122 (54.7)	153 (49.7)	191 (53.1)	
Overweight	790 (21.2)	60 (26.9)	92 (29.9)	104 (28.9)	
Parental socioeconomic characteristics					
Mother's education					0.01
<=12 years	1991 (54.4)	125 (57.1)	160 (53.7)	175 (49.0)	
Trade/certificate/diploma	759 (20.7)	34 (15.5)	43 (14.4)	78 (21.9)	
Degree/higher	634 (17.3)	42 (19.2)	61 (20.5)	65 (18.2)	
Don't know	277 (7.6)	18 (8.2)	34 (11.4)	39 (10.9)	
Father's education					0.07
<=12 years	1388 (38.2)	81 (37.0)	104 (35.4)	137 (38.5)	
Trade/certificate/diploma	1074 (29.6)	60 (27.4)	97 (33.0)	83 (23.3)	
Degree/higher	799 (22.0)	49 (22.4)	56 (19.1)	85 (23.9)	
Don't know	369 (10.2)	29 (13.2)	37 (12.6)	51 (14.3)	
Family environment					
Family type at age 10					0.4
Parents and sibling(s)	2347 (71.3)	145 (70.7)	187 (66.8)	235 (71.9)	
Parents only	368 (11.2)	18 (8.8)	30 (10.7)	32 (9.8)	
Other type	578 (17.6)	42 (20.5)	63 (22.5)	60 (18.4)	
Parenting style score[β]					
Maternal care	7 (6, 8)	7 (5, 8)	7 (5, 8)	8 (5, 8)	0.7
Maternal overprotection	3 (2, 4)	3 (1, 5)	3 (2, 5)	3 (1, 5)	0.5
Paternal care	7 (5, 8)	6 (5, 8)	7 (5, 8)	7 (5, 8)	0.3
Paternal overprotection	3 (2, 4)	3 (1, 4)	3 (2, 5)	3 (2, 5)	0.8
Adverse childhood experiences					
Psychological abuse	428 (14.2)	33 (17.5)	60 (23.4)	63 (20.3)	<0.01
Physical abuse	161 (5.3)	11 (5.8)	40 (15.6)	30 (9.7)	<0.01
Sexual abuse	448 (14.9)	26 (13.8)	55 (21.4)	49 (15.8)	0.04
Household substance abuse	461 (15.3)	33 (17.5)	46 (17.9)	39 (12.5)	0.3
Household mental illness	479 (15.9)	33 (17.5)	69 (26.9)	59 (19.0)	<0.01
Household violent treatment	227 (7.5)	15 (7.9)	34 (13.2)	23 (7.4)	0.01

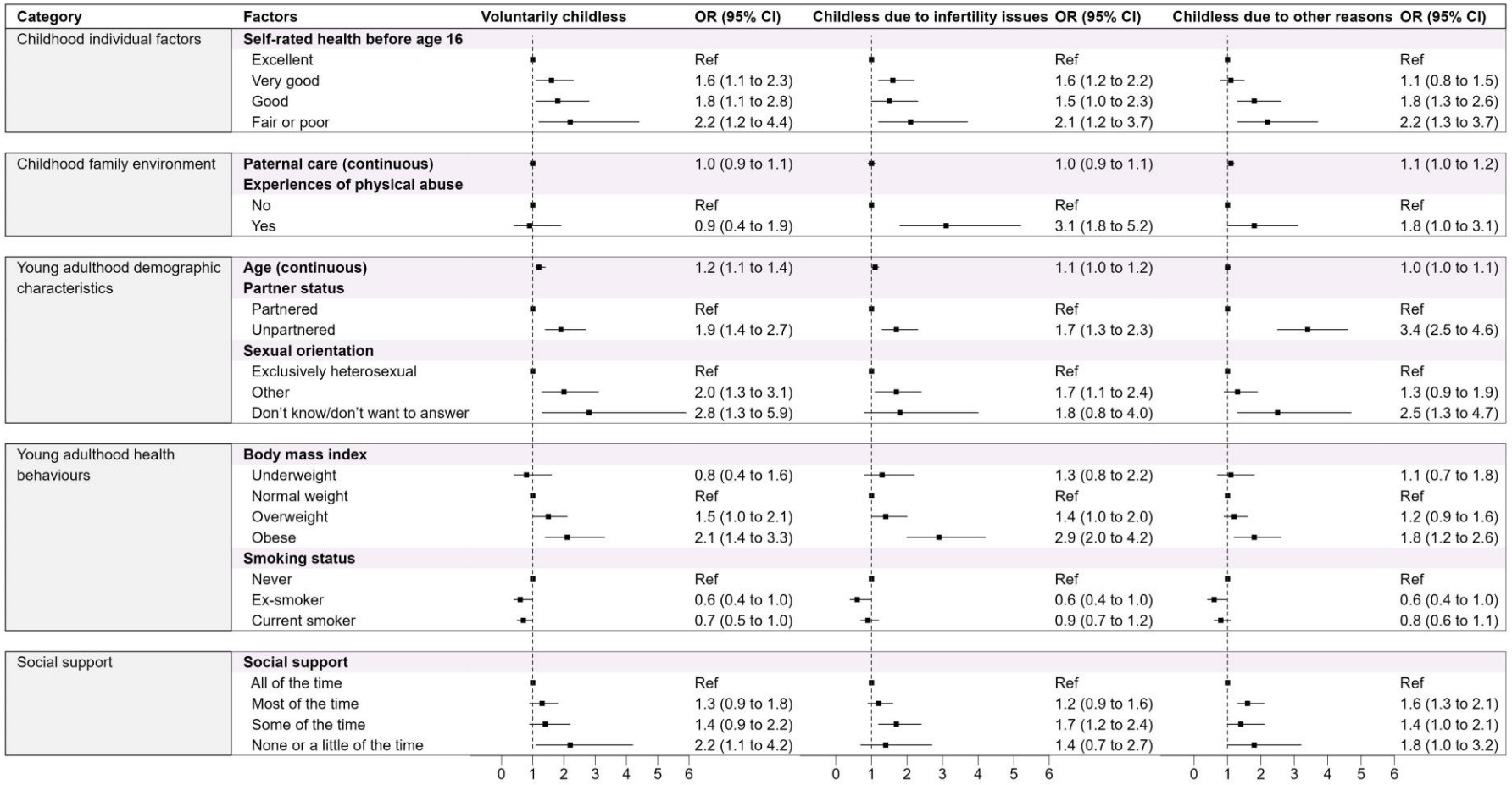
of mother/father					
Household criminal behaviour	33 (1.1)	3 (1.6)	6 (2.3)	4 (1.3)	0.4
Factors in young adulthood					
Demographic characteristics					
Age [β]	24.4 (23.2, 25.7)	24.8 (23.6, 26.0)	24.4 (23.3, 25.8)	24.3 (23.1, 25.5)	<0.01
Partner status					<0.01
Partnered	1526 (40.8)	58 (25.9)	85 (27.6)	55 (15.1)	
Unpartnered	2217 (59.2)	166 (74.1)	223 (72.4)	309 (84.9)	
Sexual orientation					<0.01
Exclusively heterosexual	3392 (91.2)	180 (81.8)	255 (83.3)	308 (85.8)	
Other [γ]	286 (7.7)	30 (13.6)	42 (13.7)	36 (10.0)	
Don't know/don't want to answer	41 (1.1)	10 (4.6)	9 (2.9)	15 (4.2)	
Socioeconomic characteristics					
Education					0.01
≤12 years	872 (23.9)	68 (30.9)	82 (27.3)	95 (26.5)	
Trade/certificate/diploma	794 (21.8)	43 (19.6)	83 (27.7)	75 (20.9)	
Degree/higher	1983 (54.3)	109 (49.6)	135 (45.0)	189 (52.7)	
Ability to manage on income [δ]					0.07
Easy/not too bad	2026 (54.1)	122 (54.7)	161 (52.1)	211 (58.3)	
Sometimes difficult	1187 (31.7)	68 (30.5)	90 (29.1)	90 (24.9)	
Impossible/difficult always	535 (14.3)	33 (14.8)	58 (18.8)	61 (16.9)	
Health status					
Self-rated health					<0.01
Excellent	540 (14.4)	35 (15.6)	33 (10.7)	54 (14.8)	
Very good	1667 (44.5)	72 (32.1)	109 (35.2)	133 (36.5)	
Good	1205 (32.2)	81 (36.2)	112 (36.1)	129 (35.4)	
Fair or poor	334 (8.9)	36 (16.1)	56 (18.1)	48 (13.2)	
Health behaviours					
Body mass index					<0.01
Underweight	225 (6.1)	10 (4.5)	19 (6.3)	23 (6.4)	
Normal weight	2544 (68.8)	122 (55.2)	155 (51.2)	205 (57.4)	
Overweight	667 (18.0)	53 (24.0)	66 (21.8)	76 (21.3)	
Obese	264 (7.1)	36 (16.3)	63 (20.8)	53 (14.9)	
Physical activity					0.2
None	267 (7.3)	25 (11.4)	23 (7.6)	27 (7.5)	
Low	1044 (28.4)	56 (25.5)	98 (32.6)	110 (30.7)	
Moderate	953 (25.9)	48 (21.8)	63 (20.9)	85 (23.7)	
High	1419 (38.5)	91 (41.4)	117 (38.9)	136 (38.0)	
Alcohol consumption					<0.01
Non-drinker	204 (5.5)	21 (9.4)	24 (7.8)	30 (8.4)	
Rarely drinker	824 (22.1)	54 (24.1)	83 (26.9)	89 (24.8)	
Low-risk drinker	2562 (68.6)	137 (61.2)	186 (60.2)	227 (63.2)	
Risky drinker	144 (3.9)	12 (5.4)	16 (5.2)	13 (3.6)	
Smoking status					0.02
Never	2332 (62.5)	151 (68.3)	190 (62.5)	239 (67.0)	
Ex-smoker	472 (12.7)	20 (9.1)	26 (8.6)	29 (8.1)	
Current smoker	925 (24.8)	50 (22.6)	88 (29.0)	89 (24.9)	
Social support					<0.01
All of the time	2306 (62.3)	104 (47.5)	146 (48.2)	160 (44.2)	
Most of the time	962 (26.0)	68 (31.1)	94 (31.0)	135 (37.3)	
Some of the time	354 (9.6)	33 (15.1)	51 (16.8)	48 (13.3)	
None or a little of the time	77 (2.1)	14 (6.4)	12 (4.0)	19 (5.3)	

[α] Differences across groups were examined using the chi-square test for categorical variables and the Kruskal-Wallis test for continuous variables.
[β] Presented as medians and quartiles.
[γ] Including mainly heterosexual, bisexual, mainly homosexual, and exclusively homosexual.
[δ] The data collected in Survey 1 were used since this variable was not collected in Survey 2.

The univariable multinomial logistic regression showed that ten factors during childhood and nine factors in young adulthood were associated with childlessness. Factors in childhood included childhood self-rated health, perception of body weight at age 10, mother's education, father's education, paternal care, and experiences of childhood psychological abuse, physical abuse, sexual abuse, household mental illness, and household violent treatment of mother/father. Factors in young adulthood included age, partner status, sexual orientation, education, self-rated health, body mass index, alcohol consumption, smoking status, and social support.

The results from the multinomial logistic regression models are presented in Figure 2 (only variables associated with childlessness are presented). For factors in childhood, regardless of the type of childlessness, compared with mothers, being childless in 40s was associated with poorer self-rated health during childhood. Having experienced childhood physical abuse was associated with childlessness due to infertility issues and other reasons. Being childless was associated with having been unpartnered and living with obesity during young adulthood (22-27 years old), and ex-smokers in young adulthood had lower odds of childlessness in 40s. Voluntary childlessness and childlessness due to infertility issues were associated with having identified as non-exclusively heterosexual. Additionally, women who were voluntarily childless and childless due to other reasons were more likely to have reported that social support was available to them none or a little of the time. After including women who had given birth by Survey 2, the direction of the associations was similar to the main results.

Figure 2 Factors associated with childlessness (N = 4653; reference group: mothers)[α]



[α] Multinomial logistic regression (0 = mothers, 1 = women who were voluntarily childless, 2 = women who were childless due to infertility issues, 3 = women who were childless due to other reasons); Only factors that were significant at 0.05 level were presented.

Discussion

This study examined factors in childhood and young adulthood associated with childlessness as women neared the end of their reproductive years. In our analytical sample, 19.3% did not have biological children by the time they were in their mid to late 40s. Specifically, 4.8% were voluntarily childless, 6.7% were childless due to infertility issues, and 7.8% were childless due to other reasons. Regarding factors in childhood, compared to mothers, women without children were more likely to have had poorer childhood self-rated health, regardless of the type of childlessness. Experiences of physical abuse during childhood were associated with childlessness due to infertility issues and other reasons, but not with voluntary childlessness. In young adulthood, no matter the type of childlessness, women without children were more likely to have been unpartnered and living with obesity than mothers, and mothers were more likely to have been ex-smokers than women without children. In addition to these shared characteristics, women who were voluntarily childless and childless due to infertility issues were more likely to have identified as non-exclusively heterosexual in their 20s, and women who were voluntarily childless and childless due to other reasons were more likely to have reported social support is available to them none or a little of the time.

While both biological (e.g., childhood health[5]) and psychological (e.g., adverse childhood experiences [4]) factors during childhood have been linked to infertility, which is consistent with our findings, none of the previous studies have examined the associations between these factors in childhood and voluntary childlessness. Our study revealed that poorer self-rated health during childhood was associated with voluntary childlessness. It is possible that women who were voluntarily childless and reported having poor childhood health may have long-lasting chronic conditions from childhood. As a result, they may decide not to have children to avoid worsening their health or passing these conditions on to their offspring. For example, in a Danish study[13], researchers investigated the impact of early onset diabetes (diagnosed before the age of 30) on women's desire to have children. The study revealed that half of the participants expressed a negative attitude toward having children due to concerns such as pregnancy and delivery complications, difficulties in managing diabetes during pregnancy, and the potential risk of the child developing

diabetes. Furthermore, it is worth mentioning that the association between poor self-rated health during childhood and childlessness persisted even after controlling for factors in young adulthood like socioeconomic status, self-rated health, and health behaviours, which underscores the significance of childhood attributes in shaping motherhood aspirations and childbearing behaviours.

We found that in young adulthood, regardless of the type of childlessness, women without children tended to have been unpartnered compared to mothers, which is consistent with previous studies[7, 14]. We also observed that women without children were more likely to have been living with obesity in young adulthood than mothers. Similarly, Frisco and Weden[15], using data from the 1979 National Longitudinal Survey of Youth (US), also found that women who were living with obesity during young adulthood (aged 20-25 years) had 4.4 times higher odds of remaining childless when they were 44-49 years old, compared with women who had a normal weight during this life course stage. Another cross-sectional study of multiethnic middle-aged women in the US revealed that girls living with obesity in high school were more likely to be childless in their 40s, and this association remained when including the decisions to remain voluntarily childless in the models[16]. The prospective association between obesity and childlessness may be explained by the cumulative effects of obesity on both physiological and social determinants of fertility outcomes. Physiologically, obesity is a recognised risk factor for infertility primarily due to its profound effects on sex hormone secretion and metabolism[17]. Socially, obesity may impair a woman's ability to find a suitable partner or prolong the time it takes to do so, which may be a key factor contributing to unachieved childbearing desires[15, 18]. However, these reasons could not explain why living with obesity in young adulthood was also associated with voluntary childlessness, which needs to be examined in future studies.

Our study revealed women who were voluntarily childless in their 40s were more likely to have identified themselves as non-exclusively heterosexual (e.g., bisexual, homosexual) in their 20s. This finding aligns with previous research[19-21]. Influenced by societal norms regarding motherhood and traditional family structures, coupled with the possible practical and logistical challenges (e.g.,

historical legal barriers, access to reproductive technologies), women who fall into the non-exclusively heterosexual group may choose a childfree lifestyle[22]. We also found an association between sexual orientation and infertility. It is possible that women in the non-exclusively heterosexual group may experience higher rates of mental health conditions such as depression and anxiety[23], which have been found to be risk factors for infertility[24].

In our study, we discovered an association between lower social support during young adulthood and two types of childlessness among middle-aged women: voluntary childlessness and childlessness due to other reasons. We speculate that inadequate emotional and practical support from one's social network may influence the decision to remain childless and impede women with a desire for children from realising their motherhood aspirations. It is also worth noting that voluntary childlessness may contribute to reduced social support. Women who opt not to have children may face an increased risk of social exclusion under the pronatalist norms which encourage having children[25].

The key strength of this study is the use of longitudinal data from a nationally representative cohort to prospectively examine the associations between factors in childhood and young adulthood and childlessness. Several limitations should also be acknowledged. First, when defining childlessness, the question regarding motherhood aspirations was about the number of children women would like to have before age 35, instead of in their lifetime. It is possible that some women in the voluntarily childless group may want to have children after age 35 or may have changed their minds between their 30s and 40s, which could result in misclassification. However, in our analytical sample, 82% of mothers had their first birth before age 35, so the possibility of misclassification is low. Second, factors in childhood were self-reported and collected retrospectively, which may be subject to recall bias. Third, although we have tried to minimise the potential for reverse causality by excluding women who had given birth before the time we collected factors in adulthood, it is still possible that the decision not to have children was made earlier in life, and some adult factors, such as partner status and social support, were results of this decision. Fourth, in our study, we used motherhood aspirations (the number of children wanted at age 35) from Survey 4, when women were aged 28-33

years, to define childlessness. While motherhood aspirations can be dynamic and change over time, due to the small sample size in each childlessness group, we were unable to further compare women who did not change their motherhood aspirations across surveys with those who did, within each group.

In conclusion, our study revealed that factors in childhood, such as poorer self-rated health and experiences of physical abuse, have a far-reaching impact on childlessness as women approach the end of their reproductive years, and these associations cannot be fully explained by characteristics observed in young adulthood. Furthermore, some factors in young adulthood, such as partner status, sexual orientation, body mass index, and social support, were also linked to various types of childlessness. These findings highlight the multifaceted nature of the path to childlessness and underscore the importance of considering both childhood and adulthood attributes when examining childlessness.

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Supplemental Table 1 Measurements and classification of independent variables

Variable	Measurement
Factors in childhood	
Individual factors	
Country of birth	Coded as (1) Australia and (2) outside Australia.
Self-rated health before age 16	Measured by the question 'In general, would you say that your health during childhood was…(childhood means from when you were born up until, and including, when you were age 15)". The responses were coded as (1) excellent, (2) very good, (3) good, and (4) fair/poor.
Perception of body weight at age 10	Measured by the question 'When you were a child (say age 10) how would you describe your weight?' The responses were coded as (1) underweight, (2) average, and (3) overweight.
Parental socioeconomic characteristics	
Mother's education	Coded as (1) <=12 years, (2) trade/certificate/diploma, (3) degree/higher, and (4) don't know.
Father's education	
Family environment	
Family type at age 10	Measured by the question 'who lived with you when you were 10' and coded as (1) parents and sibling(s), (2) parents only, and (3) other type.
Parenting style	Measured separately for maternal and paternal caregiver using the seven-item Parental Bonding Instrument (PBI)[1]. The PBI includes 3 items about parental care: understood my problems and worries, emotionally cold, and made me feel not wanted; and 4 items about overprotection: let me do things I liked, liked me to make decisions, made me feel dependent on them, and were overprotective. Each question is rated on a 4-point scale ranging from 'strongly agree' to 'strongly disagree'. Four sum scores were calculated to represent maternal care, maternal overprotection, paternal care, and paternal overprotection. A higher score in care and a lower score in overprotection indicate better parenting styles.
Adverse childhood experiences	Measured by a set of questions adapted from the questionnaire used in the Adverse Childhood Experiences study[2]. The original scale has 17 items, measuring 7 categories under two domains: domain 1 – childhood abuse, including psychological abuse (2 items), physical abuse (2 items), and sexual abuse (4 items); domain 2 – childhood household dysfunction, including household substance abuse (2 items), household mental illness (2 items), household violent treatment of mother (4 items), and household criminal behaviour (1 item). In ALSWH, another 4 items about household violent treatment of father were added as requested by the participants in the pilot study. Answering 'yes' to one or more items under each category was considered as having experienced that type of childhood adversity.
Factors in young adulthood in Survey 2 (22-27 years old)	
Demographic characteristics	
Age	Age at completing the survey, continuous variable.

Partner status	Coded as (1) partnered (including married and de facto), and (2) unpartnered (including single, separated, divorced, and widowed).
Sexual orientation	Measured by the question 'Which of these most closely describes your sexual orientation?" and coded as (1) exclusively heterosexual, (2) other (including mainly heterosexual, bisexual, mainly homosexual [lesbian], and exclusively homosexual [lesbian]), and (3) I don't know.
Socioeconomic characteristics	
Education	Coded as (1) <=12 years, (2) trade/certificate/diploma, (3) degree/higher.
Ability to manage on income [α]	Measured by the question 'How do you manage on the income you have available?' and coded as (1) easy/not too bad, (2) sometimes difficult, and (3) impossible/difficult always.
Health status	
Self-rated health	Measured by the question 'In general, would you say your health is…' and coded as (1) excellent, (2) very good, (3) good, and (4) fair/poor.
Health behaviours	
Body mass index	Self-reported height without shoes and weight without clothes and shoes were collected. Body mass index was calculated as weight in kilograms divided by height in meters squared and coded as (1) underweight (<18.5 kg/m^2), (2) normal weight (18.5-24.9 kg/m^2), (3) overweight (25-29.9 kg/m^2), and (4) obese (≥30 kg/m^2) [3].
Physical activity	Measured by items from the Active Australia survey[4]. The frequency and duration of 3 types of activities performed in last week were collected: walking for recreation, exercise, or transport; moderate intense leisure activity; and vigorous intense leisure activity. The metabolic equivalent value (MET minutes/week) was calculated and coded as (1) nil/sedentary (0-39 MET minutes/week), (2) low (40-599 MET minutes/week), (3) moderate (600-1199 MET minutes/week), and (4) high (≥1200 MET minutes/week).
Alcohol consumption	Measured by women's reports on their frequency of drinking alcohol and quantity of alcohol consumed and coded as (1) non-drinker, (2) rarely drinker, (3) low-risk drinker, and (4) risky drinker[5].
Smoking status	Measured by women's reports on their current and previous smoking behaviours and coded as (1) never, (2) ex-smoker, and (3) current smoker.
Social support	
Social support	Measured by the Medical Outcomes Study Social Support Survey 6-item measure across 4 domains: tangible support, emotional support, positive social interaction, and affectionate support[6, 7]. Each item is rated on a 5-point scale ranging from 'none of the time (score = 1)' to 'all of the time (score = 5)'. Based on the mean score of the six items, social support was coded as social support is available (1) all of the time (mean score >4 and ≤ 5), (2) most of the time (mean score >3 and ≤ 4), (3) some of the time (mean score >2 and ≤ 3), and (4) none or a little of the time (mean score ≤ 2).

[α] The data collected in Survey 1 were used since this variable was not collected in Survey 2.

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