

GYNECOLOGY

Association between depression and the likelihood of having children: a nationwide register study in Finland



Kateryna Golovina, PhD; Marko Elovainio, PhD; Christian Hakulinen, PhD

BACKGROUND: Depression may be associated with a lower likelihood of having children, but the findings are inconsistent. Previous population-based studies on this topic are limited.

OBJECTIVE: We examined associations between depression and the likelihood of having children, the number of children, and the parental age at first birth. We also evaluated whether these associations differ for people with low, middle, and high educational levels.

STUDY DESIGN: We conducted a nationwide register cohort study including all individuals born in Finland from 1960 to 1980 ($n=1,408,951$). Depression diagnoses were identified from the Care Register for Health Care (containing records of inpatient hospital episodes for the period 1969 to 2017 and of specialist outpatient visits for the period 1996 to 2017). The main outcomes—having biological children, the number of biological children, and the parental age at first birth—were identified from the Population Register of Statistics Finland and were defined either in the last year of the follow-up in 2017 or the last year alive or living in Finland. The association between depression and the likelihood of having children was examined using a logistic regression analysis; the association between depression and the number of children was evaluated using Poisson regression analyses, and the association between depression and the age at first birth was evaluated using a linear regression analysis. All analyses were conducted separately for men and women.

RESULTS: For both men and women, secondary care—treated depression was associated with a lower likelihood of having children

(odds ratio, 0.66; 95% confidence interval, 0.64–0.67 for men; odds ratio, 0.84; 95% confidence interval, 0.82–0.85 for women) and with having fewer children (incidence rate ratio, 0.86; 95% confidence interval, 0.86–0.87 for men; incidence rate ratio, 0.96; 95% confidence interval, 0.96–0.96 for women). Depression was associated with a slightly lower parental age at first birth (33.1 vs 34.0; $P<.001$ for men; 31.3 vs 32.1; $P<.001$ for women). Dose-response associations between the severity of depression and a decreased likelihood of having children, as well as having fewer children, were observed. Earlier onset of depression was related to a lower likelihood of having children and to having fewer children. Among men and women in middle- and high-level educational groups, depression was associated with a lower likelihood of having children and with having fewer children. Among men with a low level of education, no associations were observed. Among women with a low level of education, depression was associated with a higher likelihood of having children and with having more children.

CONCLUSION: Both men and women with secondary care—treated depression have a lower likelihood of having children and have fewer children. Our findings suggest that depression may be one of the factors that contribute to the likelihood of having children, which should be addressed by policy makers.

Key words: depression, education, likelihood of having children, number of children, register-based study, socioeconomic status

Introduction

Depression is a common mental disorder with an onset during early adulthood, and it is associated with a substantial burden and disability over the life course.^{1–3} The median age of depression onset is 30 years,⁴ which coincides with the average age men and women become parents (in 2019 in Finland, the average age for first-time mothers was 29.4 years and for first-time fathers it was 31.4 years⁵). Depression may also contribute to a decreased

likelihood of having children.^{6,7} In a Swedish register-based study with >2.3 million participants, depression was associated with having fewer children among men, whereas women with depression did not differ from the general population in terms of the number of children.⁸ This association that was found for men was further supported by the longitudinal study from the Northern Swedish Cohort that showed that men with depression at 16 years of age were less likely to become fathers by 43 years, whereas no associations were observed for women.⁹ In contrast to this, a study based on the US National Comorbidity Survey of more than 8000 participants has shown that depression is related to decreased fertility among both men and women.¹⁰ Previous studies also have suggested that the course of depression may alter the association between depression and fertility with more

severe symptoms and an earlier age of onset being associated with reduced fertility, at least among women.^{11,12}

The link between low socioeconomic status (SES) and depression is well established.^{13–16} Because depression with an onset before an age of 25 years is associated with persistent poor socioeconomic outcomes over the life course,^{1,17} it seems plausible that depression will also be linked to a decreased likelihood of having children. Moreover, previous studies have consistently shown that SES is associated with differences in fertility rates.^{18,19} In the Nordic countries, men with a low level of education have fewer children than men with a high level of education; women with a low level of education tend to have more children than women with a high level of education but only in Finland, whereas in other Nordic countries, the effect of educational differences among women on the number

Cite this article as: Golovina K, Elovainio M, Hakulinen C. Association between depression and the likelihood of having children: a nationwide register study in Finland. *Am J Obstet Gynecol* 2023;228:211.e1–11.

0002-9378

© 2022 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).
<https://doi.org/10.1016/j.ajog.2022.10.016>

AJOG at a Glance

Why was this study conducted?

Depression may be associated with a lower likelihood of having children, but the findings are inconsistent, and previous population-based studies on the topic are limited.

Key findings

Drawing on Finnish population-based register data, secondary care-treated depression was associated with a lower likelihood of having children and having fewer children among both men and women. Earlier onset of depression was related to a lower likelihood of having children and having fewer children. The following educational differences were observed: depression was associated with a lower likelihood of having children and having fewer children among men and women with secondary and higher education; among people with basic education, depression was related to a higher likelihood of having children and having more children among women, but it was not related to the likelihood of having children among men.

What does this add to what is known?

Our findings suggest that depression may be one of the factors that contribute to the likelihood of having children and the number of children among both men and women.

of children disappeared.^{20,21} However, the association among SES, depression, and the likelihood of having children has not been addressed previously using representative population-based data. Currently, in Finland, the childlessness rates are especially high among people with lower education levels, but a comprehensive explanation for this is still lacking.²⁰ It is possible that depression may contribute to this association. Knowing more about the role of educational differences in the relationship between mental health issues and the likelihood of having children will contribute to the development of family policies in Finland that take social inequalities into account.²²

In this study, we sought to clarify and expand on previous studies by examining the associations between depression and the likelihood of having children among both men and women born in 1960 to 1980 using nationwide Finnish population-based register data. Specifically, our first aim was to examine to what extent depression is related to (1) the likelihood of having children, (2) the number of children, and (3) the age at first birth. We also studied how a

diagnosis of depression before the first birth, severity of depression diagnosis, and age at depression onset are related to the likelihood of having children, which may help to explain why previous studies have found associations mainly for men, but not for women. Our second aim was to investigate whether the associations between depression and the likelihood of having children differ for people with low, middle, and high educational levels, a question that was not previously addressed. To eliminate the effects of infertility-related diseases of the genitourinary system on the likelihood of having children,²³ we conducted a sensitivity analysis in which we excluded men and women with those diseases. Given that other mental health disorders may contribute to a lower likelihood of having children as evidenced by previous research,⁸ we repeated the main analyses by excluding individuals diagnosed with (1) substance misuse or psychotic disorders or (2) anxiety disorders.

Materials and Methods**Study population**

Using unique personal numbers that have been assigned to all Finnish

residents starting from 1969, this cohort study comprised individual-level register data from the Population and the Causes of Death registers of Statistics Finland linked with the Care Register for Health Care. All individuals born in Finland from 1960 to 1980 with a Finnish background were included to have a full overview of reproductive history for most of them. The total sample size for the general population comprised 1,408,951 men and women, among which 106,725 were diagnosed with depression. The measures used in this study were defined either in the last year of the study period in 2017 or the last year alive or living in Finland. The ethics committee of the Finnish Institute for Health and Welfare (THL/730/6.02.01/2018) approved the study. Data were linked with the permission of Statistics Finland (TK-53-1696-16) and the Finnish Institute for Health and Welfare.

Measures**Exposure**

Persons diagnosed with depressive disorders were identified from the Care Register for Health Care, which included inpatient hospital episodes (for the period 1969–2017) and specialist outpatient visits (for the period 1996–2017) in Finland. Depression diagnoses were identified based on the International Statistical Classification of Diseases and Related Health Problems (ICD-8, ICD-9 with Diagnostic and Statistical Manual of Mental Disorders Third Edition criteria, and ICD-10) using the following codes (and their corresponding ICD-8 and ICD-9 codes): F32-33 and F34.1. The severity of depression (mild, moderate, severe, and severe with psychotic symptoms) was defined according to the ICD-10 diagnostic codes.

Outcome

The outcomes were as follows: whether a person had biological children (1) or not (0), the number of biological children (used as a count variable), and the age at first birth (used as a continuous variable). The outcomes were defined either at the last year of the study period in 2017 or the last year alive or last year living in Finland.

Modifiers

The level of education was defined either at the last year of the study period in 2017 or the last year alive or last year living in Finland from the population register of Statistics Finland. Education was coded as an ordinary variable and comprised the following levels: less than upper secondary, upper secondary, or tertiary.

Control variables

Year of birth (used as a continuous variable), defined from the population register of Statistics Finland, was included as a control variable.

Confounders

The following diseases of the genitourinary system²³ were identified using ICD-10 codes from the Care Register for Health Care inpatient hospital episodes (1994–2017): male infertility (N46); endometriosis (N80); absent, scanty and rare menstruation (N91); and female infertility (N97). Diagnoses of substance misuse, psychotic disorders, and anxiety disorders were also identified from the Care Register for Health Care (inpatient hospital episodes 1969–2017; specialist outpatient visits 1996–2017) using the following ICD-10 codes (and their corresponding ICD-8 and ICD-9 codes): F10-19, F20-F29, and F40-F48.

Statistical analysis

We examined the association between depression and the likelihood of having children using a logistic regression analysis. The association between depression and the number of children was evaluated using Poisson regression analyses with a robust variance estimator. The association between depression and the age at first birth was evaluated only for those persons who had children using a linear regression analysis. All analyses were conducted separately for men and women and adjusted for the participants' year of birth. To examine the direction of the association between depression and the likelihood of having children, we repeated these analyses in a subgroup of people who were diagnosed with depression before the birth of a first

child. To examine the potential role of reverse causality, we evaluated whether having children was associated with depression. In additional analyses, we also examined how the severity of depression and age at depression onset were related to the likelihood of having children and the number of children among men and women. To investigate whether the association between depression and fertility differed by educational level, we repeated the main analyses for subgroups of participants in the low, middle, and high education groups. Likewise, a logistic regression analysis was used to determine the likelihood of having children, a Poisson regression analysis was used to evaluate the number of children, and a linear regression analysis was used to evaluate the age at first birth. Finally, we performed sensitivity analyses to examine whether the association between depression and the likelihood of having children differed from those in the total sample when persons with (a) infertility-related diseases of the genitourinary system, (b) substance misuse and/or psychotic disorders, and (c) anxiety disorders were excluded. All statistical analyses were conducted in Stata, version 16.1 (StataCorp, College Station, TX).²⁴

Results

Table 1 shows the characteristics of the study population. A total of 1,408,951 individuals (48.9% were women) were included in the analyses. The mean age of the participants in the total population was 47.5 years (standard deviation, 6.13). The prevalence of depression was 7.7% in the total sample (9.2% for women and 6.2% for men). Almost three-quarters of participants in the general population had children (74.0%) compared with 69.4% of participants diagnosed with depression (78.3% vs 75.4%; $P < .001$ for women; 69.8% vs 61.0%; $P < .001$ for men). The mean number of children was lower among people diagnosed with depression than among the general population (1.63 vs 1.72; $P < .001$), and this difference was especially pronounced among men (1.41 vs 1.61; $P < .001$).

Table 2 shows the associations between depression and the likelihood of

having children, the number of children, and the age at first birth. For both men and women, depression was related to a lower likelihood of having children and to having fewer children. Depression was also associated with a slightly lower age at first birth. To illustrate, for men, the mean age was 33.1 years for those diagnosed with depression compared with 34.0 years for those without depression ($P < .001$); for women, the corresponding numbers were 31.3 vs 32.1 ($P < .001$), respectively. Likewise, when these analyses were repeated for the subgroup of people with a depression diagnosis before the birth of a first child, both men and women were even less likely to have children and had fewer children (Table 3). However, a depression diagnosis before the birth of a first child was associated with a higher age at first birth (33.9 vs 36.4; $P < .001$ for men and 32.0 vs 34.7; P value $< .001$ for women). Finally, not having children was associated with an increased risk for depression among men (odds ratio [OR], 0.66; 95% confidence interval [CI], 0.64–0.67) and women (OR, 0.84; 95% CI, 0.82–0.85).

We also observed dose-response associations between the severity of depression and a decreased likelihood of having children (Figure 1). For men, more severe depression was associated with a lower likelihood of having children and with having fewer children; even mild depression was related to a decreased likelihood of having children when compared with those men who did not have depression. Among women, mild or moderate depression was not associated with the likelihood of having children; only severe depression and severe depression with psychosis were related to both a lower likelihood of having children and having fewer children. In addition, an earlier age at depression onset was associated with a lower likelihood of having children and with having fewer children among men and women. On the contrary, an older age at depression onset was associated with an increased likelihood of having children (Supplemental Table 1).

Figure 2 shows the associations between depression and different fertility outcomes by educational levels. Among

TABLE 1
Characteristics of the sample

Characteristics	Total population		Women		Men	
	General population	Diagnosed with depression	General population	Diagnosed with depression	General population	Diagnosed with depression
	n=1,408,951	n=109,066	n=689,359	n=63,271	n=719,592	n=44,398
Age (y)	47.47 (6.13)	47.42 (6.22)	47.48 (6.13)	47.34 (6.44)	46.57 (7.08)	47.53 (6.22)
Being a parent, %	73.99	69.39	78.33	75.44	69.83	61.02
Number of children	1.72 (1.47)	1.63 (1.54)	1.84 (1.45)	1.80 (1.53)	1.61 (1.48)	1.41 (1.52)
Education, %						
Basic	11.58	18.33	7.71	13.58	15.28	24.90
Secondary	44.23	48.72	39.10	45.61	49.15	53.02
Higher	44.19	32.94	53.19	40.80	35.57	22.98
Depression, %	7.74		9.18		6.17	
Depression subtype, %						
Mild		18.99		20.40		17.06
Moderate		52.62		56.79		46.86
Severe		31.49		32.07		30.69
Severe with psychosis		8.08		7.84		8.40

Data are presented as the mean (standard deviation) unless otherwise are indicated.

Golovina. Links between depression and the likelihood of having children. *Am J Obstet Gynecol* 2023.

men with a low level of education (ie, less than secondary education), there were no associations between depression and

the likelihood of having children or the number of children, whereas among women with a low level of education,

depression was associated with an increased likelihood of being a parent (OR, 1.44; 95% CI, 1.36–1.52) and with having more children (incidence rate ratio, 1.13; 95% CI, 1.11–1.15). Among both men and women with secondary and higher education, depression was associated with a decreased likelihood of having children and with having fewer children (Figure 2, A and B). Finally, depression was associated with a younger age at first birth both for men and women across all educational groups (Figure 2, C).

The results from the sensitivity analyses showed that the association between depression and the likelihood of having children was nearly identical when persons with infertility-related diseases of the genitourinary system were excluded (Supplemental Table 2). The strength of the associations was, however, attenuated when persons with substance misuse and/or psychotic disorders (Supplemental Table 3) were excluded, but remained the same when

TABLE 2
The associations between depression and (A) the likelihood of having children, (B) the number of children, and (C) the age at first birth for men (n = 719,592) and women (n = 689,359)

A. Outcome: having children	OR	95% CI
Men	0.66	0.64–0.67
Women	0.84	0.82–0.85
B. Outcome: number of children	IRR	95% CI
Men	0.86	0.86–0.87
Women	0.96	0.96–0.96
C. Outcome: age at first birth	Beta	95% CI
Men	–0.93	–0.99 to –0.86
Women	–0.81	–0.85 to –0.76

Model A was analyzed using a logistic regression analysis; Model B was analyzed using a Poisson regression analysis; and Model C was analyzed using a linear regression analysis. All models were adjusted for age.

beta, unstandardized regression coefficient; CI, confidence intervals; IRR, incidence rate ratio; OR, odds ratio.

Golovina. Links between depression and the likelihood of having children. *Am J Obstet Gynecol* 2023.

TABLE 3

The associations between a depression diagnosis before the birth of a first child and (A) the likelihood of having children, (B) the number of children, and (C) the age at first birth (n = 1,408,951)

A. Outcome: having children	OR	95% CI
Men	0.19	0.18–0.19
Women	0.21	0.21–0.22
B. Outcome: number of children	IRR	95% CI
Men	0.49	0.48–0.50
Women	0.56	0.55–0.57
C. Outcome: age at first birth	Beta	95% CI
Men	2.89	2.76–3.01
Women	2.75	2.66–2.85

Model A was analyzed using a logistic regression analysis; Model B was analyzed using a Poisson regression analysis; and Model C was analyzed using a linear regression analysis. All models were adjusted for age.

beta, unstandardized regression coefficient; CI, confidence intervals; IRR, incidence rate ratio; OR, odds ratio. Golovina. Links between depression and the likelihood of having children. Am J Obstet Gynecol 2023.

individuals with anxiety disorders were excluded (Supplemental Table 4).

Comment

Principal findings

This cohort study from Finland found that depression was associated with a decreased likelihood of having children and with having fewer children among both men and women born in 1960 to 1980 based on population-based

nationwide register data. Men diagnosed with depression had a 33% reduction in the odds of having a child when compared with men without depression; whereas women diagnosed with depression had a 15% reduction in the odds of having a child when compared with women without depression. The severity of depression was associated with a decreased likelihood of having children and with having fewer

children in a dose-response manner: for men, even mild depression was associated with a decrease in the likelihood of having children, whereas for women, the associations were observed only for severe depression or severe depression with psychosis. We also found that an earlier age at depression onset was associated with a lower likelihood of having children and with having fewer children among both men and women. Finally, educational differences in the association between depression and the likelihood of having children were observed: depression was associated with a decreased likelihood of having children and with having fewer children among men and women with secondary and higher education, but not among those with basic education.

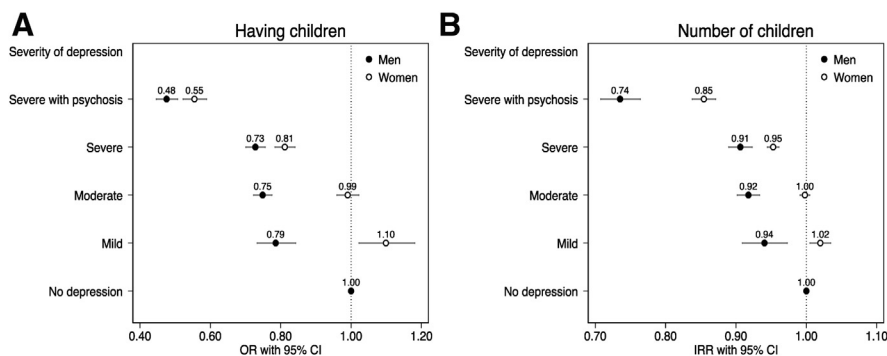
Results in the context of what is known

In line with our hypothesis and consistent with previous population-based studies showing that depression is associated with a decreased likelihood of having children,^{8,10} we observed that men and women diagnosed with depression are less likely to become parents than those without the diagnosis; they also tend to have fewer children. In contrast with the previous register-based study from Sweden,⁸ which showed associations for depression only among men, we found that depression is linked to a decreased likelihood of having children among women as well. Previous longitudinal studies have shown no differences in the likelihood of becoming parents for former depressed and nondepressed adolescents; however, former depressed females had a higher risk for miscarriage and abortion than nondepressed females.¹²

Severity of depression was related to a decreased likelihood of having children in a dose-response manner. Among men, even mild depression was related to a decreased likelihood of having children and to having fewer children when compared with those without depression, and the associations became stronger with a more severe type of depression. Among women, we found no associations between mild or

FIGURE 1

Associations between severity of depression and the likelihood of having children



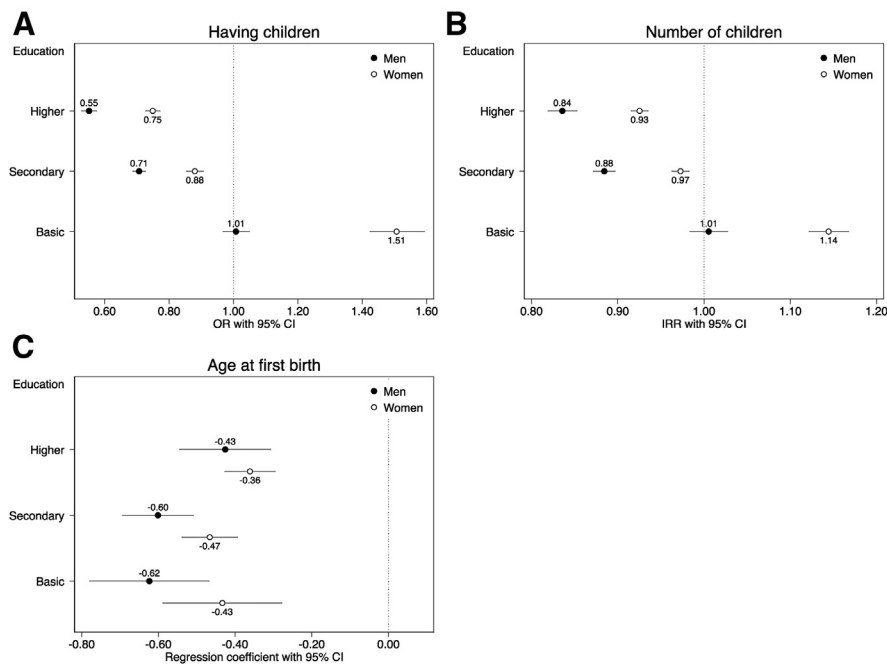
A, shows the ORs with 95% CIs for the likelihood of having children based on a logistic regression analysis. B, shows the IRRs with 95% CIs for the number of children based on a Poisson regression analysis. The reference category is no depression for men and women.

CI, confidence interval; IRR, incidence rate ratios; OR, odds ratio.

Golovina. Links between depression and the likelihood of having children. Am J Obstet Gynecol 2023.

FIGURE 2

Associations between depression and the likelihood of having children by education



A, shows the ORs with 95% CIs for the likelihood of having children based on a logistic regression analysis. **B**, shows the IRR with 95% CIs for the number of children based on a Poisson regression analysis. **C**, shows the unstandardized regression coefficients with 95% CIs for the age at first birth based on a linear regression analysis. The reference category is always the same education group and the same gender with no depression (eg, women with basic education who are depressed are compared with women with basic education who are not depressed).

CI, confidence interval; IRR, incidence rate ratios; OR, odds ratio.

Golovina. Links between depression and the likelihood of having children. *Am J Obstet Gynecol* 2023.

moderate depression and a decreased likelihood of having children, and only severe depression or severe depression with psychosis was related to both a decreased likelihood of having children and having fewer children. Our results are consistent with a previous study¹¹ showing that women with severe depressive symptoms, but not mild or moderate symptoms, had decreased fecundability. These findings may provide some clues as to why previous studies have consistently observed associations between depression and the likelihood of having children for men, but not so much for women—it seems that the severity of depression is an important risk factor for a decreased likelihood of having children among women, which should be considered.

Depression was also associated with a slightly lower age at first birth: for men diagnosed with depression, the mean age was 33 years vs 34 years for those without depression; for women, the ages were 31.3 vs 32.1 years, respectively. However, when the sample was restricted to those with a depression diagnosis before the birth of a first child, depression was linked to an increased age at first birth, which is an expected finding. The associations between depression and the likelihood of having children and the number of children remained the same in terms of direction in the total sample and in the subgroup of people with a depression diagnosis before the birth of a first child. Moreover, an earlier age at depression onset was associated with a decreased likelihood of having children

and with having fewer children among both men and women, whereas an older age at depression onset was linked with an increased likelihood of having children.

We also observed educational differences in the association between depression and the likelihood of having children. Among men with less than secondary education, there were no differences between those diagnosed with depression and those without a diagnosis in terms of the likelihood of becoming a parent and the number of children. It is therefore possible that some factors other than depression play a role in the decreased likelihood of having children among men with lower levels of education, for example, difficulties in forming a union or a higher likelihood of union dissolution.^{25,26} Given that depression is much more common among people with a low SES,^{14,15} it is possible that this association was diluted or changed by it. As for women with less than secondary education, depression was associated with a higher likelihood of becoming a parent, and with having more children. Risky health behaviors (including unprotected sex) are more common among those with low SES,²⁷ which may be one of the explanations for this finding. In contrast, among both men and women with secondary and higher education, depression was associated with a decreased likelihood of having children and with having fewer children. Regarding the age at first birth, depression was related to a decrease in the estimates both for men and women across all educational levels.

Potential mechanisms and research implications

Although identifying the mechanisms linking depression with the likelihood of having children was not an aim of this study, there are several potential explanations for this observed association. We found that the strength of the association between depression and the likelihood of having children, as well as the number of children, was attenuated when persons with substance misuse and/or psychotic disorders (but not anxiety disorders) were excluded, indicating that these

comorbid disorders are partially responsible for these findings. Future studies should examine the extent to which depression is related to the likelihood of having children with exclusion of other mental disorders as well. In addition, specific symptoms of depression may lead to a decreased likelihood of having children (eg, decreased energy, loss of interest, and suicidal ideation),^{6,28} therefore, future studies should examine the symptom-level associations between depression and the likelihood of having children. Moreover, some studies suggested that psychotropic medication use may be associated with a decreased likelihood of having children.^{11,29} Therefore, the effect of the use of psychotropic medication and other depression treatments (eg, psychotherapy) on the likelihood of having children needs to be assessed in future studies. Finally, given that postpartum depression is a common mental disorder among mothers,³⁰ bidirectional associations between depression and the likelihood of having children should be addressed.

Clinical implications

Our findings suggest that depression is one of the factors that contribute to the likelihood of having children, which should be addressed by policy makers. Depression is prevalent among women of reproductive age, but a substantial portion of them remain undiagnosed and untreated.³¹ Timely screening for depression during preconception and on-time treatment may be one way to address this issue, which can be achieved by increasing the availability of mental health professionals or by encouraging obstetrician-gynecologists and women's health providers to assess their current mental status. In addition, the severity of depression and the differences between men and women also should be considered by policy makers. We found that even mild depression was related to a decreased likelihood of having children and to having fewer children only among men, which highlights the importance of also having low-threshold health and social care resources available to men. Despite the lower prevalence of reported

and diagnosed depression among men, even milder depression symptoms may have more negative health and behavioral effects among men than among women. Overall, prevention and treatment of depression early in life has been reported to be beneficial for many life outcomes^{32–34} and therefore may also be beneficial in terms of the likelihood of having children.

Strengths and limitations

The main strength of the present study was the use of the Finnish nationwide registers, which allowed us to examine the associations with high statistical precision and minimal health-related selection biases. However, some limitations should be considered. First, individuals who did not seek treatment or who were treated only in primary care were not included in this study. This implies that our data are likely to contain more severe cases and the present estimates may therefore be conservative. Second, the information on antidepressant use and other types of depression treatment was not available in our data set. Third, because the current study was based solely on registry data, we could not consider psychosocial factors such as the partnership status, social support from relatives, or desire to have children, which could partially explain the present findings. Fourth, information on pregnancy intervals was not available in our data. Fifth, although the absolute differences in some of our outcomes were small, our main findings showed that there was a considerable absolute difference in having children between the general population (74%) and persons diagnosed with depression (69.4%). Last, causality cannot be proven in an observational study like the present one, and the direction of association between depression and having children is likely complex. For example, although the present results showed that early onset depression could contribute to not having children, it has been estimated that up to 15% of new mothers suffer from postpartum depression,³⁵ indicating that at certain stages of life having children is likely to increase the risk for depression.

Conclusions

Drawing on Finnish population-based register data, this study showed that both men and women with secondary care-treated depression have a decreased likelihood of having children and have fewer children. Persons with a more severe depression diagnosis or earlier onset depression had a decreased likelihood of having children and had fewer children. This study also showed that there were educational differences in these associations: depression was linked to a decreased likelihood of having children and to having fewer children among men and women with secondary and higher education, but not among men with basic education. ■

References

1. Hakulinen C, Musliner KL, Agerbo E. Bipolar disorder and depression in early adulthood and long-term employment, income, and educational attainment: a nationwide cohort study of 2,390,127 individuals. *Depress Anxiety* 2019;36:1080–8.
2. Laursen TM, Musliner KL, Benros ME, Vestergaard M, Munk-Olsen T. Mortality and life expectancy in persons with severe unipolar depression. *J Affect Disord* 2016;193:203–7.
3. Liu Q, He H, Yang J, Feng X, Zhao F, Lyu J. Changes in the global burden of depression from 1990 to 2017: findings from the Global Burden of Disease study. *J Psychiatr Res* 2020;126:134–40.
4. Solmi M, Radua J, Olivola M, et al. Age at onset of mental disorders worldwide: large-scale meta-analysis of 192 epidemiological studies. *Mol Psychiatry* 2022;27:281–95.
5. Statistics Finland. Official Statistics of Finland (OSF): births. 2022. Available at: http://www.stat.fi/til/synt/index_en.html. Accessed March 2, 2022.
6. Williams KE, Marsh WK, Rasgon NL. Mood disorders and fertility in women: a critical review of the literature and implications for future research. *Hum Reprod Update* 2007;13:607–16.
7. Worly BL, Gur TL. The effect of mental illness and psychotropic medication on gametes and fertility: a systematic review. *J Clin Psychiatry* 2015;76:974–85.
8. Power RA, Kyaga S, Uher R, et al. Fecundity of patients with schizophrenia, autism, bipolar disorder, depression, anorexia nervosa, or substance abuse vs their unaffected siblings. *JAMA Psychiatry* 2013;70:22–30.
9. Kalucza S, Hammarström A, Nilsson K. Mental health and parenthood - a longitudinal study of the relationship between self-reported mental health and parenthood. *Heal Sociol Rev* 2015;24:283–96.
10. Jacobson NC. Current evolutionary adaptiveness of psychiatric disorders: fertility rates,

parent-child relationship quality, and psychiatric disorders across the lifespan. *J Abnorm Psychol* 2016;125:824–39.

11. Niilni YI, Wesselink AK, Gradus JL, et al. Depression, anxiety, and psychotropic medication use and fecundability. *Am J Obstet Gynecol* 2016;215:453.e1–8.

12. Jonsson U, Bohman H, Hjern A, et al. Intimate relationships and childbearing after adolescent depression: a population-based 15 year follow-up study. *Soc Psychiatry Psychiatr Epidemiol* 2011;46:711–21.

13. Hakulinen C, Mok PLH, Horsdal HT, et al. Parental income as a marker for socioeconomic position during childhood and later risk of developing a secondary care-diagnosed mental disorder examined across the full diagnostic spectrum: a national cohort study. *BMC Med* 2020;18:323.

14. Lorant V, Deliège D, Eaton W, Robert A, Philippot P, Ansseau M. Socioeconomic inequalities in depression: a meta-analysis. *Am J Epidemiol* 2003;157:98–112.

15. Sareen J, Afifi TO, McMillan KA, Asmundson GJG. Relationship between household income and mental disorders: findings from a population-based longitudinal study. *Arch Gen Psychiatry* 2011;68:419–27.

16. Suokas K, Koivisto AM, Hakulinen C, et al. Association of income with the incidence rates of first psychiatric hospital admissions in Finland, 1996–2014. *JAMA Psychiatry* 2020;77:274–84.

17. Hakulinen C, Elovainio M, Arffman M, et al. Mental disorders and long-term labour market outcomes: nationwide cohort study of 2 055 720 individuals. *Acta Psychiatr Scand* 2019;140:371–81.

18. Balbo N, Billari FC, Mills M. Fertility in advanced societies: a review of research: la fécondité dans les sociétés avancées: un examen des recherches. *Eur J Popul* 2013;29:1–38.

19. Dribe M, Breschi M, Gagnon A, et al. Socio-economic status and fertility decline: insights

from historical transitions in Europe and North America. *Popul Stud (Camb)* 2017;71:3–21.

20. Jalovaara M, Neyer G, Andersson G, et al. Education, gender, and cohort fertility in the Nordic countries. *Eur J Popul* 2019;35:563–86.

21. Nisén J, Martikainen P, Myrskylä M, Silventoinen K. Education, other socioeconomic characteristics across the life course, and fertility among Finnish men. *Eur J Popul* 2018;34:337–66.

22. Valtioneuvosto Statsradet. Syntyvyyden Toipuminen ja Pitenevä Elinikä: Linjauksia 2020-Luvun Väestöpolitiikalle [Recovery of the Birth Rate and Longer Life Expectancy – population Policy Guidelines for the 2020s]. 2021. Available at: <http://urn.fi/URN:ISBN:978-952-383-073-8>. Accessed February 12, 2022.

23. National Institute for Health and Care Excellence. Fertility problems: assessment and treatment. 2013. Available at: www.nice.org.uk/guidance/cg156. Accessed December 2, 2021.

24. StataCorp. Stata statistical software. Release 16. College Station, TX: StataCorp LLC; 2019.

25. Jalovaara M. Socioeconomic resources and the dissolution of cohabitations and marriages. *Eur J Population* 2013;29:167–93.

26. Jalovaara M, Fasang AE. From never partnered to serial cohabitators: union trajectories to childlessness. *Demogr Res* 2017;36:1703–20.

27. Pampel FC, Krueger PM, Denney JT. Socioeconomic disparities in health behaviors. *Annu Rev Sociol* 2010;36:349–70.

28. Calzeroni A, Conte G, Pennati A, Vita A, Sacchetti E. Celibacy and fertility rates in patients with major affective disorders: the relevance of delusional symptoms and suicidal behaviour. *Acta Psychiatr Scand* 1990;82:309–10.

29. Casilla-Lennon MM, Meltzer-Brody S, Steiner AZ. The effect of antidepressants on fertility. *Am J Obstet Gynecol* 2016;215:314.e1–5.

30. Meltzer-Brody S, Howard LM, Bergink V, et al. Postpartum psychiatric disorders. *Nat Rev Dis Primers* 2018;4:18022.

31. Farr SL, Bitsko RH, Hayes DK, Dietz PM. Mental health and access to services among US women of reproductive age. *Am J Obstet Gynecol* 2010;203:542.e1–9.

32. Fusar-Poli P, Correll CU, Arango C, Berk M, Patel V, Ioannidis JPA. Preventive psychiatry: a blueprint for improving the mental health of young people. *World Psychiatry* 2021;20:200–21.

33. Hoare E, Collins S, Marx W, et al. Universal depression prevention: an umbrella review of meta-analyses. *J Psychiatr Res* 2021;144:483–93.

34. Kraus C, Kadriu B, Lanzenberger R, Zarate CA, Kasper S. Prognosis and improved outcomes in major depression: a review. *Focus (Am Psychiatr Publ)* 2020;18:220–35.

35. O'Hara MW, McCabe JE. Postpartum depression: current status and future directions. *Annu Rev Clin Psychol* 2013;9:379–407.

Author and article information

From the Helsinki Collegium for Advanced Studies, University of Helsinki, Helsinki, Finland (Dr Golovina); Research Program Unit, Faculty of Medicine, University of Helsinki, Helsinki, Finland (Dr Elovainio); Faculty of Medicine, Department of Psychology and Logopedics, University of Helsinki, Helsinki, Finland (Drs Elovainio and Hakulinen); and Finnish Institute for Health and Welfare, Helsinki, Finland (Drs Elovainio and Hakulinen).

Received March 28, 2022; revised Oct. 3, 2022; accepted Oct. 8, 2022.

The authors report no conflict of interest.

This study was supported by the Helsinki Collegium for Advanced Studies at the University of Helsinki (to K.G.) and by the Academy of Finland (to M.E.) under grant number 339390.

Corresponding author: Kateryna Golovina, PhD. kateryna.golovina@helsinki.fi

SUPPLEMENTAL TABLE 1

The associations between the age at depression onset with having children and the number of children among men and women who have been diagnosed with depression

A. Outcome: having children	OR	95% CI
Men		
<20	0.64	0.57–0.72
20–30	0.63	0.60–0.66
30–40	1.00 (Reference)	
40–50	1.39	1.32–1.46
>50	1.66	1.51–1.82
Women		
<20	0.57	0.50–0.64
20–30	0.68	0.65–0.72
30–40	1.00 (Reference)	
40–50	1.32	1.26–1.39
>50	1.36	1.24–1.49
B. Outcome: number of children	IRR	95% CI
Men		
<20	0.78	0.72–0.84
20–30	0.76	0.74–0.79
30–40	1.00 (Reference)	
40–50	1.17	1.15–1.20
>50	1.23	1.18–1.28
Women		
<20	0.83	0.80–0.87
20–30	0.90	0.88–0.91
30–40	1.00 (Reference)	
40–50	1.06	1.05–1.07
>50	1.07	1.05–1.09

Model A was analyzed using a logistic regression analysis; Model B was analyzed using a Poisson regression analysis.

CI, confidence intervals; IRR, incidence rate ratio; OR, odds ratio.

Golovina. Links between depression and the likelihood of having children. *Am J Obstet Gynecol* 2023.

SUPPLEMENTAL TABLE 2

The associations between depression and different fertility outcomes among men (n = 718,740) and women (n = 654,600) without a history of diseases of the genitourinary system

A. Outcome: having children	OR	95% CI
Men	0.66	0.64–0.67
Women	0.85	0.83–0.86
B. Outcome: number of children	IRR	95% CI
Men	0.86	0.86–0.87
Women	0.96	0.96–0.97
C. Outcome: age at first birth	Beta	95% CI
Men	–0.93	–1.00 to –0.87
Women	–0.79	–0.84 to –0.74

Model A was analyzed using a logistic regression analysis; Model B was analyzed using a Poisson regression analysis; and Model C was analyzed using a linear regression analysis. All models were adjusted for age.

beta, unstandardized regression coefficient; *CI*, confidence intervals; *IRR*, incidence rate ratio; *OR*, odds ratio.

Golovina. Links between depression and the likelihood of having children. Am J Obstet Gynecol 2023.

SUPPLEMENTAL TABLE 3

The associations between depression and different fertility outcomes among men (n = 662,277) and women (n = 660,251) without a history of substance misuse and/or psychotic disorders

A. Outcome: having children	OR	95% CI
Men	0.75	0.73–0.77
Women	0.93	0.91–0.95
B. Outcome: number of children	IRR	95% CI
Men	0.93	0.92–0.94
Women	0.98	0.98–0.99
C. Outcome: age at first birth	Beta	95% CI
Men	–0.51	–0.59 to –0.44
Women	–0.56	–0.61 to –0.51

Model A was analyzed using a logistic regression analysis; Model B was analyzed using a Poisson regression analysis; and Model C was analyzed using a linear regression analysis. All models were adjusted for age.

beta, unstandardized regression coefficient; *CI*, confidence intervals; *IRR*, incidence rate ratio; *OR*, odds ratio.

Golovina. Links between depression and the likelihood of having children. Am J Obstet Gynecol 2023.

SUPPLEMENTAL TABLE 4**The associations between depression and different fertility outcomes among men (n = 662,477) and women (n = 660,402) without a history of anxiety disorders**

A. Outcome: having children	OR	95% CI
Men	0.66	0.64–0.68
Women	0.85	0.83–0.87
B. Outcome: number of children	IRR	95% CI
Men	0.87	0.86–0.88
Women	0.96	0.96–0.97
C. Outcome: age at first birth	Beta	95% CI
Men	–0.93	–1.01 to –0.85
Women	–0.77	–0.83 to –0.71

Model A was analyzed using a logistic regression analysis; Model B was analyzed using a Poisson regression analysis; and Model C was analyzed using a linear regression analysis. All models were adjusted for age.

beta, unstandardized regression coefficient; *CI*, confidence intervals; *IRR*, incidence rate ratio; *OR*, odds ratio.

Golovina. Links between depression and the likelihood of having children. Am J Obstet Gynecol 2023.