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

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1. Condensation: This nationwide register study from Finland shows that both men and women with secondary-care treated depression have lower likelihood of having children, with educational differences in these associations.

2. Short Title: Links between depression and likelihood of having children.

3. AJOG at a Glance:

A. Why was this study conducted? Depression may be associated with lower likelihood of having children, but the findings are inconsistent and previous population-based studies on the topic are limited.

B. What are the key findings? Drawing on the Finnish population-based register data, secondary-care treated depression was associated with the lower likelihood of having children and a lower number of children both among men and women. Earlier onset of depression was related to a lower likelihood of having children and a lower number of children. Educational differences were observed: depression was associated with a lower likelihood of having children and a lower number of children among men and women with secondary and higher education; among people with basic education, depression was related to higher likelihood of having children and higher number of children among women and not related to the likelihood of having children among men.

C. What does this study add to what is already known? Our findings suggest that depression may be one of the factors contributing to the likelihood of having children and the number of children both among men and women.

Abstract

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

Objectives: We examined associations between depression and the likelihood of having children, the number of children, and the age at first birth; and 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 (i.e., inpatient hospital episodes 1969–2017 and specialist outpatient visits 1996–2017). The main outcomes – having biological children, the number of biological children, and the age at first birth – were identified from the Population register of Statistics Finland and defined either at 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 were examined using logistic regression analysis; the association between depression and the number of children was tested using Poisson regression analyses, and the association between depression and the age at first birth – using linear regression analysis. All analyses were conducted separately for men and women.

Results: Both for men and women, secondary-care treated depression was associated with a lower likelihood of having children (odds ratio [OR]=0.66; 95%CI, 0.64–0.67 for men; OR=0.84; 95%CI, 0.82–0.85 for women) and with the lower number of children (incidence rate ratio [IRR]=0.86; 95%CI 0.86–0.87 for men; IRR=0.96; 95%CI, 0.96–0.96 for women). Depression was related to slightly lower age at first birth (33.1 vs. 34.0, *P*-value < 0.001 for men; 31.3 vs. 32.1, *P*-value < 0.001 for women). Dose-response associations between severity of depression and decreased likelihood of having children and a lower number of children were observed. Earlier onset of depression was related to a lower likelihood of

having children and a lower number of children. Among men and women in middle and high educational groups, depression was associated with a lower likelihood of having children and a lower number of children. Among low-educated men, no associations were observed. Among low-educated women, depression was associated with higher likelihood of having children and a higher number of children.

Conclusion: Both men and women with secondary-care treated depression have lower likelihood of having children and a lower number of children. Our findings suggest that depression may be one of the factors contributing to the likelihood of having children which should be addressed by policy makers.

Keywords: depression, likelihood of having children, number of children, register-based study, socioeconomic status, education.

Introduction

Depression is a common mental disorder with an onset in early adulthood, and it is associated with a substantial burden and disability over the life course.¹⁻³ The median age of onset of depression is 30 years⁴, which coincides with the average age when men and women become parents (in Finland, the average age for first-time mothers was 29.4 years and for first-time fathers – 31.4 years in 2019⁵). Depression may also contribute to the decreased likelihood of having children.^{6,7} In a Swedish register-based study with over 2.3 million participants, depression was associated with fewer children but only among men, whereas women with depression did not differ from the general population.⁸ This association found for men was further supported by the longitudinal study from the Northern Swedish Cohort showing that men with depression at 16 years 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 over 8000 participants has shown that depression is related to decreased fertility both among men and women.¹⁰ Previous studies have also suggested that the course of depression may alter the association between depression and fertility with more severe symptoms, and earlier age of onset being associated with reduced fertility, at least in women.^{11,12}

The link between low socioeconomic status (SES) and depression is well established.¹³⁻¹⁶ Since depression with onset before age 25 is associated with persistent poor socioeconomic outcomes over the life course,^{1,17} it seems plausible that depression will be also linked to the 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, low-educated men have fewer children compared to highly educated men; low-educated women tend to have more children than highly educated women, but only in Finland, whereas in other Nordic countries educational differences in the number of children

among women disappeared.^{20,21} However, the association between SES, depression, and the likelihood of having children has not been previously addressed with representative population-based data. Currently in Finland the childlessness rates are especially high among lower educated people, but comprehensive explanation of 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 relation between mental health issues and the likelihood of having children will contribute to the development of family policy in Finland which accounts for social inequalities.²²

In the present study, we sought to clarify and extend previous studies by examining the associations between depression and the likelihood of having children of both men and women born in 1960–1980 using Finnish population-based nationwide register data. Specifically, our first aim was to examine to what extent depression is related to (A) the likelihood of having children, (B) a number of children, and (C) the age at first birth. We also studied how the diagnosis of depression before the first birth, severity of depression diagnosis, and age of 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 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, the question which was not previously addressed. To eliminate the effects of the infertility related diseases of the genitourinary system to the likelihood of having children,²³ we conducted the sensitivity analysis by excluding men and women with those diseases. Given that other mental health disorders may contribute to a lower likelihood of having children as evident by previous research⁸, we repeated the main analyses by excluding individuals diagnosed with (a) substance misuse and/or psychotic disorders and (b) anxiety disorders.

Materials and Methods

Study population

Using unique personal numbers, which have been assigned to all Finnish residents starting from 1969, this cohort study comprises 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 at 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 includes inpatient hospital episodes (1969-2017) and specialist outpatient visits (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 DSM-III-R 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 the following: whether a person has 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 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 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 included year of birth (used as a continuous variable) defined from the population register of Statistics Finland.

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 logistic regression analysis. The association between depression and the number of children was tested using Poisson regression analyses with robust variance estimator. The association between depression and the age at first birth was conducted only among those persons who had children using 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 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 analyzed whether having children was associated with depression. In additional analyses, we also examined how the severity of depression and age of depression onset are 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 differs by educational level, we repeated the main analyses for subgroups of participants in low, middle, and high education groups. Likewise, logistic regression analysis was used for the likelihood of having children, Poisson regression analysis for the number of children, and linear regression analysis for the age at first birth. Finally, we performed sensitivity analyses to examine whether the association between depression and the likelihood of having children will differ 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 16.1.²⁴

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 participants in the total population was 47.5 years (SD = 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 to 69.4% of participants diagnosed with depression (78.3% vs. 75.4%, P -value < 0.001 for women; 69.8% vs. 61.0%, P -value < 0.001 for men). The mean number of children was lower among people diagnosed with depression compared to the general population (1.63 vs. 1.72, P -value < 0.001), and this difference was especially pronounced among men (1.41 vs. 1.61, P -value < 0.001).

Table 2 shows the associations between depression and the likelihood of having children, number of children, and the age at first birth. Both for men and women, depression

was related to a lower likelihood of having children, as well as to a lower number of children. Depression was also associated with a slightly lower age at first birth. To illustrate, for men, mean age was 33.1 for those diagnosed with depression compared to 34.0 for those without depression, P -value < 0.001 ; for women, the corresponding numbers were 31.3 vs. 32.1, P -value < 0.001 , respectively. Likewise, when these analyses were repeated in the subgroup of people where depression was diagnosed before the birth of a first child, both men and women were even less likely to have children and had a lower number of children (**Table 3**).

However, depression diagnosis before the birth of a first child was associated with a higher age at first birth: 33.9 vs. 36.4, P -value < 0.001 for men and 32.0 vs. 34.7, P -value < 0.001 for women. Finally, not having children was associated with an increased risk of depression among men (OR=0.66, 95% 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 decreased likelihood of having children (**Figure 1**). For men, more severe depression was associated with a lower likelihood of having children and a lower number of children; even mild depression was related to decreased likelihood of having children compared to those men who do 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 the lower likelihood of having children and a lower number of children. To continue, earlier age of depression onset was associated with a lower likelihood of having children and a lower number of children among men and women. On the contrary, higher age of depression onset was associated with higher likelihood of having children (**Supplementary Table 1**).

Figure 2 shows the associations between depression and different fertility outcomes by educational levels. Among low-educated men (i.e., less than secondary education), there were no associations between depression and the likelihood of having children, as well as the

number of children. Whereas among low-educated women, depression was related to a higher likelihood of being a parent (OR = 1.44, 95% CI 1.36, 1.52) and a higher number of children (IRR = 1.13, 95% CI 1.11, 1.15). Among both men and women with secondary and higher education, depression was associated with a lower likelihood of having children and a lower number of children (**Figure 2A and B**). Finally, depression was related to a lower age at first birth both for men and women across all educational groups (**Figure 2C**).

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 (**Supplementary Table 2**). The strength of the associations was, however, attenuated when persons with substance misuse and/or psychotic disorders (**Supplementary Table 3**) were excluded, but remained the same when individuals with anxiety disorders were excluded (**Supplementary Table 4**).

Comment

Principal Findings

This cohort study from Finland found that depression was related to a lower likelihood of having children and a lower number of children both for men and women born in 1960–1980 using population-based nationwide register data. Men diagnosed with depression had 33% lower odds of having a child compared to men without depression; whereas women diagnosed with depression had 15% lower odds of having a child than women without depression. The severity of depression was associated with the lower likelihood of having children and a lower number of children in a dose-response manner: for men, even mild depression was related to a lower likelihood of having children, whereas for women the associations were observed only for severe depression or severe depression with psychosis. We also found that earlier age of depression onset was associated with a lower likelihood of

having children and a lower number of 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 the lower likelihood of having children and a lower number of children among men and women with secondary and higher education, but not 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 decreased likelihood of having children,^{8,10} we observed that men and women diagnosed with depression are less likely to become parents compared to those without the diagnosis; they also tend to have a lower number of children. In contrast to the previous register-based study from Sweden,⁸ which showed associations for depression only for 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 non-depressed adolescents; however, the former depressed females had a higher risk of miscarriage and abortion compared to non-depressed 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 the lower likelihood of having children and a lower number of children compared to those without depression, and the associations became stronger with the more severe type of depression. Among women, we found no associations between mild or moderate depression with decreased likelihood of having children, and only severe depression or severe depression with psychosis was related to both the lower likelihood of having children and a lower number of children. Our results are consistent with previous study¹¹ showing that women with severe depressive symptoms,

but not mild or moderate symptoms, had decreased fecundability. These findings may provide some clues 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 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 – 31.3 vs. 32.1 years, respectively. However, when the sample was restricted to depression diagnosis before the birth of a first child, depression was linked to the higher age of 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 direction in the total sample and in the subgroup of people with the depression diagnosis before the birth of a first child. Moreover, earlier age of depression onset was associated with a lower likelihood of having children and a lower number of children among both men and women, whereas higher age of depression onset was linked to higher likelihood of having children.

We also found the 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 the diagnosis in terms of the likelihood of becoming a parent and a number of children. It is, therefore, possible that some factors other than depression play a role in the decreased likelihood of having children among low-educated men: 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 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, as well as a higher number of children. Risky health behaviors (including unprotected sex) are more common in 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 lower likelihood of having children and a lower number of children. Regarding the age at first birth, depression was related to decreased estimates both for men and women across all educational levels.

Potential Mechanisms and Research Implications

Although identifying the mechanisms linking depression and the likelihood of having children was not directly examined in this study, there are several potential explanations for this association. We found that the strength of the association between depression with the likelihood of having children and the number of children was attenuated when persons with substance misuse and/or psychotic disorders (but not anxiety disorders) were excluded, which indicates that comorbidity between depression with these disorders partially explains the present findings. Future studies should examine to which extent depression is related to the likelihood of having children above and beyond other mental disorders. To continue, specific symptoms of depression may lead to lower likelihood of having children (e.g., 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 decreased likelihood of having children.^{11,29} Therefore, the use of psychotropic medication and other depression treatment (e.g., psychotherapy) needs to be assessed in further studies about the likelihood of having children. 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 contributing 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 implemented by increasing the availability of mental health professionals or by encouraging obstetrician-gynecologists and women's health providers to assess their current mental status. To continue, the severity of depression and the differences between men and women should be also considered by policy makers. We found that only among men even mild depression was related to lower likelihood of having children and a lower number of children, which highlights that the importance of low thresholds health and social care resources availability also for men. Despite the lower prevalence of reported and diagnosed depression in men, already milder depression symptoms may have more negative health and behavioral effects in them compared to women. Overall, prevention and treatment of depression early in life has been seen as beneficial for many life outcomes,³²⁻³⁴ and therefore may also be beneficial for 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 about antidepressant use or some other type of depression treatment was not available in our data. Third, as 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, whereas the present results show that an 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 of depression.

Conclusions

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

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Table 1. Characteristics of the Sample (n = 1,408,951).

| | Total Population | | Women | | Men | |
|-----------------------|--|---|--------------------------------------|--|--------------------------------------|--|
| | General Population n = 1,408,951 | Diagnosed with Depression n = 109,066 | General Population n = 689,359 | Diagnosed with Depression n = 63,271 | General Population n = 719,592 | Diagnosed with Depression n = 44,398 |
| Age | 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 psychotic | | 8.08% | | 7.84% | | 8.40% |

Note. Mean (standard deviation) is shown, unless otherwise are indicated.

Table 2. The Associations Between Depression and (a) Likelihood of Having Children, (b) Number of Children, and (c) 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 | -0.86 |
| Women | -0.81 | -0.85 | -0.76 |

Note. OR = odds ratio, IRR = incidence rate ratio, 95% CI = 95% confidence intervals, beta = unstandardized regression coefficient. Model A was analyzed using logistic regression analysis; Model B was analyzed using Poisson regression analysis; and Model C was analyzed using linear regression analysis. All models were adjusted for age.

Table 3. The Associations Between Depression Diagnosis Before the Birth of a First Child and (a) Likelihood of Having Children, (b) Number of Children, and (c) 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 |

Note. OR = odds ratio, IRR = incidence rate ratio, 95% CI = 95% confidence intervals, beta = unstandardized regression coefficient. Model A was analyzed using logistic regression analysis; Model B was analyzed using Poisson regression analysis; and Model C was analyzed using linear regression analysis. All models were adjusted for age.

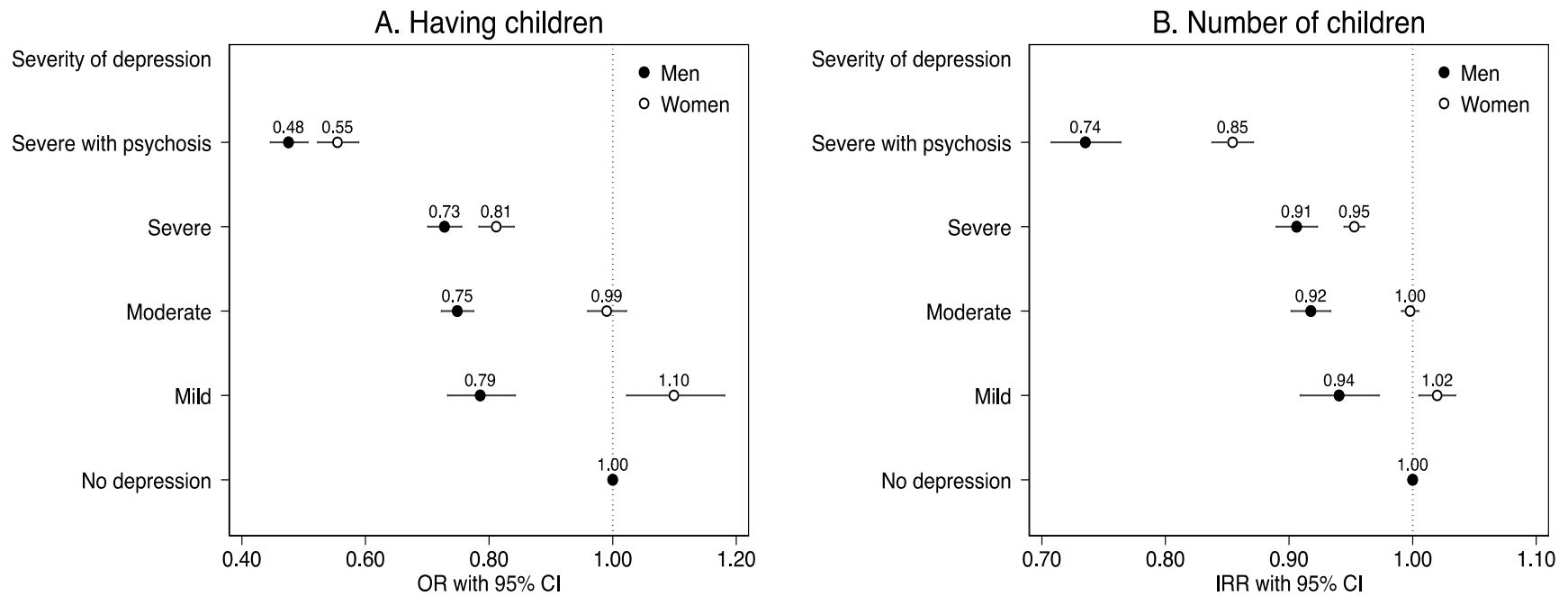
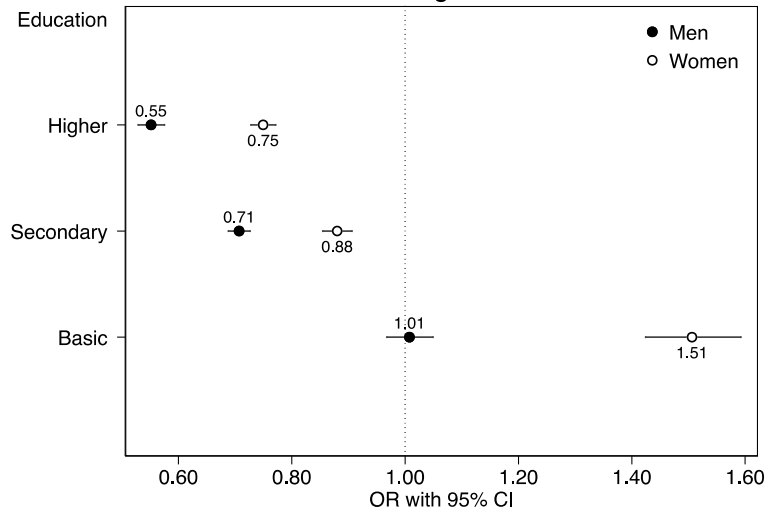


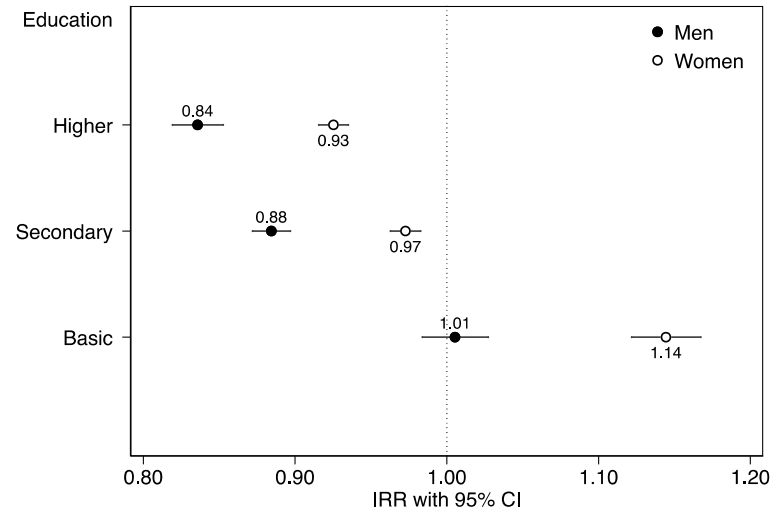
Figure 1. The associations between the severity of depression and (a) likelihood of having children and (b) number of children for men and women.

Note. Figure 1A shows the odds ratios (OR) with 95% confidence intervals (CI) for the likelihood of having children from a logistic regression analysis. Figure 1B shows the incidence rate ratios (IRR) with 95% confidence intervals (CI) for the number of children from a Poisson regression analysis. The reference category is “no depression” for men and women.

A. Having children



B. Number of children



C. Age at first birth

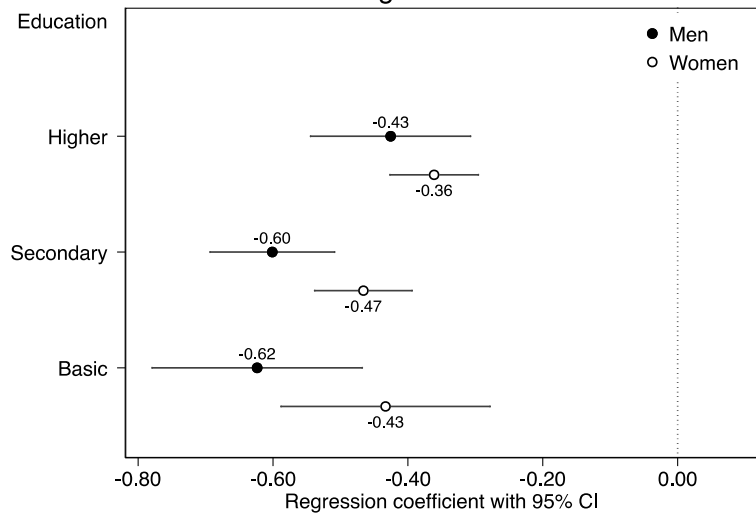


Figure 2. The associations between depression and (a) likelihood of having children, (b) number of children, and (c) age at first birth for men and women by the level of education (subgroup analyses).

Note. Figure 2A shows the odds ratios (OR) with 95% confidence intervals (CI) for the likelihood of having children from a logistic regression analysis. Figure 2B shows the incidence rate ratios (IRR) with 95% confidence intervals (CI) for the number of children from a Poisson regression analysis. Figure 2C shows the unstandardized regression coefficients with 95% confidence intervals (CI) for the age at first birth from a linear regression analysis. The reference category is always the same education group and the same gender with no depression (e.g., women with basic education who are depressed are compared to women with basic education who are not depressed).

Supplementary Table 1. The Associations Between the Age of Depression Onset With Having Children and Number of Children Among Men and Women Who Have Been Diagnosed with Depression.

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

Note. OR = odds ratio, IRR = incidence rate ratio, 95% CI = 95% confidence intervals. Model A was analyzed using logistic regression analysis; Model B was analyzed using Poisson regression analysis. All models were adjusted for age.

Supplementary Table 2. The Associations Between Depression and Different Fertility Outcomes for Men (n = 718,740) and Women (n = 654,600) without 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 | -0.87 |
| Women | -0.79 | -0.84 | -0.74 |

Note. OR = odds ratio, IRR = incidence rate ratio, 95% CI = 95% confidence intervals, beta = unstandardized regression coefficient. Model A was analyzed using logistic regression analysis; Model B was analyzed using Poisson regression analysis; and Model C was analyzed using linear regression analysis. All models were adjusted for age.

Supplementary Table 3. The Associations Between Depression and Different Fertility Outcomes for Men (n = 662,277) and Women (n = 660,251) without 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 | -0.44 |
| Women | -0.56 | -0.61 | -0.51 |

Note. OR = odds ratio, IRR = incidence rate ratio, 95% CI = 95% confidence intervals, beta = unstandardized regression coefficient. Model A was analyzed using logistic regression analysis; Model B was analyzed using Poisson regression analysis; and Model C was analyzed using linear regression analysis. All models were adjusted for age.

Supplementary Table 4. The Associations Between Depression and Different Fertility Outcomes for Men (n = 662,477) and Women (n = 660,402) without 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 | -0.85 |
| Women | -0.77 | -0.83 | -0.71 |

Note. OR = odds ratio, IRR = incidence rate ratio, 95% CI = 95% confidence intervals, beta = unstandardized regression coefficient. Model A was analyzed using logistic regression analysis; Model B was analyzed using Poisson regression analysis; and Model C was analyzed using linear regression analysis. All models were adjusted for age.