



## Research Paper

# Gender discrimination and depressive symptoms among child-bearing women: ELSPAC-CZ cohort study

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## ABSTRACT

**Background:** Depression is approximately two-fold more prevalent among women than men. Social theories suggest that discrimination is a pathway through which gender inequalities affect women's lives, but data are lacking. This cohort study evaluates whether perceived gender discrimination is linked to depressive symptoms among child-bearing women.

**Methods:** Data were obtained from 4,688 participants enrolled in pregnancy in 1991–92 in the European Longitudinal Cohort Study of Pregnancy and Childhood, Czech Republic. Perceived gender discrimination was assessed in mid-pregnancy, year seven, and year eleven. Depressive symptoms were assessed using the Edinburgh Postnatal Depression Scale at eight time-points between mid-pregnancy and year eleven post-delivery. Linear mixed error-component models of depressive symptoms were estimated.

**Findings:** Perceived gender discrimination, reported by 10.7% of women, was related to higher depressive symptoms, both in the unadjusted analysis ( $b = 0.15$  [95% confidence interval (CI): 0.12, 0.19],  $p < 0.001$ ) and in the fully adjusted model ( $b = 0.12$  [95% CI: 0.09, 0.16],  $p < 0.001$ ). Covariates linked to higher depressive symptoms included financial hardship ( $b = 0.12$  [95% CI: 0.10, 0.14],  $p < 0.001$ ), childhood emotional/physical neglect ( $b = 0.18$  [95% CI: 0.14, 0.22],  $p < 0.001$ ), and childhood sexual abuse ( $b = 0.04$  [95% CI: 0.03, 0.06],  $p < 0.001$ ); an inverse relationship was evident for social support ( $-0.05$  [95% CI:  $-0.07$ ,  $-0.04$ ],  $p < 0.001$ ) and having a partner who performs female-stereotypical household tasks ( $b = -0.03$  [95% CI:  $-0.05$ ,  $-0.01$ ],  $p = 0.001$ ).

**Interpretation:** The findings provide the first evidence that perceived gender discrimination is associated with depressive symptoms among child-bearing women. Social intervention programs aimed at reducing gender discrimination can potentially contribute to better mental health of women.

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## 1. Introduction

Depression is among the leading chronic conditions and causes of disability globally, affecting more than 260 million people worldwide [1]. Compared to men, women are about twice as likely to suffer from depression [2]. Female preponderance is evident in self-reported symptoms and medical diagnoses of depressive episodes [3,4] and burden of disability due to depressive disorder [1]. The gender gap in depression emerges as early as ages eleven to fifteen years [5] and persists for the

duration of reproductive age. Pregnancy, postpartum, and peri-menopausal periods show increased risk of morbidity due to depression [6,7].

Reasons for the gender gap in depression remain poorly understood but gender inequality likely plays a role. Socio-cultural theories emphasize the persistence of female disadvantage in economic, political, social, and health-related areas [8]. Globally, women have less schooling, lower rates of employment [9], less political power [10], and higher rates of poverty [11] and illiteracy [9] than men. Working women are over-represented in occupations with lower pay and women are paid less than men for the same job [12]. In families, women typically shoulder the burden of childcare and household tasks; many employed women consequently experience stress and strain due to competing demands of work vs. home life – “the second shift” or “time poverty” phenomenon [13]. In many countries, the

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## Research in Context

### *Evidence before this study*

Depression is about two-fold more prevalent among women than men. Racial/ethnic discrimination has been linked to depressive disorders among women but evidence on the link between gender discrimination and depressive symptoms is scant. Literature review was performed using PubMed database and search terms 'gender discrimination', 'gender bias' and 'sexism' in combination with 'depression' and 'depressive symptoms.'

### *Added value of this study*

The findings provide the first evidence that perceived gender discrimination was associated with depressive symptoms among child-bearing women. Moreover, women reporting gender discrimination had other risks, including financial hardship, lower social support, and exposure to neglect and abuse during their childhood, suggesting that gender discrimination intersects with other axes of disadvantage. Social support and having a partner who performs female stereotypical household tasks were protective.

### *Implications of all the available evidence*

Social intervention programmes aimed at reducing gender discrimination can potentially contribute to better mental health of women.

education and opportunities in professional, financial, and political realms; inequitable treatment within family, on the job, and in interactions with institutions; as well as micro-aggressions, sexual objectification, sexist language, and assumptions of intellectual and physical inferiority of women [25,26]. Importantly, like other forms of discrimination, perceived gender discrimination is stressful for the victim. In fact, it was argued that perceived discrimination as a stressor is more damaging compared to other stressful events and circumstances because it is uncontrollable and "because it is tied to valued and unchangeable social identities." [21] Building on the idea that stress is an inherent aspect of the discrimination experience that has adverse mental health consequences, we hypothesized that perceived gender discrimination is related to an increased risk of depressive symptoms.

The objective of this study was to test this hypothesis using longitudinal data from a population-based cohort of Czech women who were followed for approximately eleven years, starting in mid-pregnancy. The data enabled us to consider long-term consequences of perceived gender discrimination for the mental health of child-bearing women, while also accounting for a number of demographic and health-related covariates that vary across women's lives.

## 2. Methods

### 2.1. Data statement

Data may be requested at [www.elspac.cz](http://www.elspac.cz).

### 2.2. Sample

Data were obtained from the Czech portion of the European Longitudinal Cohort Study of Pregnancy and Childhood (ELSPAC-CZ). A series of ELSPAC studies were initiated by the World Health organization to investigate maternal and child health in several European countries. To include rural and urban populations, ELSPAC-CZ selected for study sites Brno, a large metropolis, and Znojmo, a small nearby town. Eligible births were the entire population of births in Brno and Znojmo between March 1, 1991 and June 30, 1992. Health records were available for 7589 births, 96% of all eligible births [27]. A subsample of pregnant women ( $n = 4811$ ) was contacted at twenty weeks (henceforth mid-pregnancy) and completed baseline questionnaires. 4688 women (97%) responded to the depression measurements in the baseline survey and were included in our analytical sample. Follow-up questionnaires were mailed at fifteen time points between birth and child age nineteen years, in intervals ranging from six months to four years. Of the original baseline sample, 4689 women (97%) responded to one or more questions at six months, 3645 (76%) at five years, 2609 (54%) at eleven years, and 1712 (36%) at fifteen years. Because of high attrition at the latter age, we used data collected during the interval between mid-pregnancy and eleven years after delivery. Piler et al. [27], and [www.elspac.cz](http://www.elspac.cz) provide detailed information on cohort profile and ELSPAC-CZ methodology.

### 2.3. Measures

Depressive symptoms, the main outcome, were measured using the Edinburgh Postnatal Depression Scale (EPDS), originally designed to assess depression during pregnancy and the first year postpartum [28] and later validated also in other populations [29] including adolescents [30], young adults [31], women age twenty years and older [32], and peri-menopausal women [33]. EPDS respondents rate their experiences in the previous seven days using ten items such as "I have felt sad or miserable" and "I have felt so unhappy that I have been crying" (0="Never", 3="Most of the time"). Scores of 12–13 or more are interpreted as probable clinically significant depression, though cut-offs of 10–11 are recommended for screening by general

majority of women's work is in the informal sector, where safeguards are lacking and pay is low.

A recent *Lancet* Series on Gender Equality, Norms and Health highlighted the adverse implications of gender inequality and restrictive norms for the health of women, men, boys, girls, and gender minorities [14]. Gender discrimination was advanced as a potential pathway through which gender inequality "gets under the skin" and harms women's health [15]. Discrimination refers to unfair treatment based on membership in a subordinated social group that rises from patterns of social domination and struggle to maintain power and privilege [16]. Most studies of discrimination focus on racial/ethnic factors, documenting their links to depression, anxiety, alcohol abuse, smoking, and poorer general health [17]. Poorer mental health has also been observed among individuals reporting discrimination based on language [18], obesity [19], and non-heterosexual identity [20].

Notably, discrimination based on gender has rarely been studied. No study, to our knowledge, has specifically considered perceived gender discrimination in relation to health consequences such as depressive symptomatology in a population-based sample, although studies with smaller convenience samples suggest harmful effects of gender discrimination. Perceived sexism in a sample of college women was linked to binge drinking and smoking [21]. In another study, college women reporting more sexist events had higher average anger, lower comfort, and lower self-esteem [22]. In a community-based sample of socio-economically disadvantaged African American women, scoring higher on a scale combining racist and sexist events was related to lower existential wellbeing and higher anxiety; this study, however, did not distinguish between racial and gender discrimination [23]. Another study of African American women reported that sexist events but not racist events predicted psychological distress [24].

Gender discrimination overlaps with sexism, although the latter is a broader concept that includes beliefs, attitudes, and social norms in addition to discriminatory practices and actions. Gender discrimination manifests in a variety of ways, such as gender-biased interpersonal behavior; unfair institutional policies; structural barriers to

practitioners [29]. In the present study, EPDS scores were not dichotomized but rather were treated as continuous (range 0–30) to account for the full range of depressive symptoms in a general population of women and to improve statistical power. EPDS has been used for long-term follow-up of pregnant women and the assessment of longitudinal trajectories of depression [34]. In a population of British women, it showed relative stability between pregnancy and years eight to eleven postpartum and a slight increase between years eleven and eighteen [35]. EPDS has been used in high-, middle-, and low-income countries, including the Czech Republic [36–41]. The present study used EPDS scores collected at baseline (mid-pregnancy), after delivery, at child age six months, eighteen months, three years, five years, seven years, and eleven years.

Perceived gender discrimination, the main predictor, was assessed in mid-pregnancy and at years seven and eleven after delivery. Respondents were asked, “Would you say that during the past twelve months, someone treated you unfairly because of your gender?” The measure captures respondents’ perceptions of whether they have experienced any gender discrimination (“yes”) vs. no gender discrimination (“no”). Self-reports of perceived discrimination are commonly used to assess discrimination in observational studies [17]. Similar measures have been applied to discrimination based on race, ethnicity, language, religion, sexual identity, and obesity [17,19,42].

Background characteristics considered to be potential confounders included marital status (single, married, divorced/separated, widow) and age at delivery. To proxy parity, we used women’s reports of whether they already had children, collected in mid-pregnancy. Pregnancy with the first child was coded as 1; second/high-order child as 0. Characteristics of the delivery were extracted from medical documentation and included child sex (male vs. female), low birthweight (<2500 g), and singleton vs. twin birth. Socioeconomic status was represented by years of education at baseline and a financial hardship scale administered at three, five, and seven years after delivery. Women rated how difficult it was to provide for their family food, clothing, heating, rent/mortgage payments, and things for their child. Each of these items was rated on a four-point scale from 0=“Not difficult” to 3=“Very difficult”. A mean was used to represent overall financial hardship. Alpha coefficients for reliability ranged from 0.88 to 0.93 across time points, indicating good to excellent reliability.

Perceived social support (hence social support) was measured at baseline using a scale consisting of five items, “How many people can you talk to about your personal problems?” “How many people talk to you about their inner feelings?” “When you need to make an important decision, with how many people can you discuss it?” “How many people in your family would lend you 1000 Czech crowns if you needed them?” and “How many people in your family would help you in the time of need?” Response categories for each item were “nobody,” “one person,” “two to three persons,” and “more than three persons,” coded as 0, 1, 3, and 5, respectively, to represent the number of supportive individuals. A mean across items was used to indicate the average number of supportive individuals in the respondent’s life. The alpha coefficient for reliability (0.78) indicated acceptable reliability.

Gender division of household labor was assessed at eighteen months, three years, five years, seven years, and eleven years using questions on participation in household tasks. Respondents were asked who performed grocery shopping, cooking, cleaning, watching children, and household repairs. Response categories were “1=Always I,” “2=Mostly I,” “3=Sometimes I, sometimes my partner,” “4=Mostly my partner”, and “5=Always my partner.” Higher values indicate higher participation of the partner in each chore. Household repairs were coded as male-stereotypical tasks. The remaining chores were coded as female-stereotypical tasks.

Neglect during childhood was assessed using the following questions: “Did you feel emotionally neglected as a child?” and “Were you physically neglected as a child, e.g., not fed or clothed properly?”

Childhood neglect was coded as 1 for women who responded “yes” to either question and 0 for others.

Sexual abuse during childhood was assessed using nine questions, such as, “During your childhood and adolescence, did anyone try to have sexual intercourse with you without you understanding it and consenting?” (“yes” vs. “no”). A sexual abuse indicator was calculated as a count of “yes” answers, yielding a 0–9 scale with higher scores indicating higher exposure to sexual abuse.

#### 2.4. Statistical analysis

Analyses were conducted using Stata statistical software, version 15. After calculating descriptive statistics and performing bivariate tests, we estimated a series of linear mixed error-component models to account for time trends and repeated measurements. The outcome, EPDS score, indicates depressive symptomatology and was transformed using natural logarithm to approximate a normal distribution. The main explanatory variable was perceived gender discrimination. For time-varying predictors that were not collected in all waves of data collection, the nearest value for that variable in time was assumed. For example, perceived gender discrimination six months after delivery (not collected) was assumed to be the same as perceived gender discrimination at mid-pregnancy (collected), and perceived gender discrimination at five years after delivery (not collected) was assumed to be the same as perceived gender discrimination at seven years after delivery (collected). This technique allowed us to use all possible data and to have the covariates that were assessed in selected waves only to vary over time. This was done with all predictors so that all waves where EPDS was collected could be included in the analyses. Model 1 investigated the relationship between depressive symptoms and perceived gender discrimination, controlling for the time indicator coded as years since baseline. Model 2 added socio-demographic characteristics listed in Table 1 to control for confounding. Model 3 retained the covariates with statistically significant effects at  $p < 0.05$ , which included financial difficulties, social support, childhood maltreatment, parity, and child gender. Additional analyses assessed whether the relationship between perceived gender discrimination and depressive symptoms varied by clinically significant depression at baseline (CSDB), defined as  $EDPS \geq 11$  [28]. The purpose was to check whether this relationship was limited to women who were already depressed at baseline as they may have heightened perceptions of gender discrimination. Interaction between perceived gender discrimination and CSDB was included in the full models and an additional model was estimated with a subsample of women without CSDB. To account for loss to follow-up and missing data, all analyses used multiple imputations with chained equations [43], also known as sequential regression multivariate imputation [44]. Imputations were conducted on the wide version (one observation per individual) of the data. Following best practices, we did not impute missing values for the dependent variable [45].

### 3. Results

Participants were primarily married women (86.7%, 95% confidence interval [CI]: 85.2, 88.3) with about twelve years of education (mean=11.87 years, standard error (std err): 0.04) (Table 1). Around forty percent of participants were expecting their first child at baseline (95% CI: 38.5, 41.3). Most pregnancies resulted in a singleton birth (98.0%, 95% CI: 97.5, 98.4) of normal-weight children (95.1%, 95% CI: 94.5, 95.8). More than a quarter (28.2%, 95% CI: 26.6, 29.9) of women reported emotional or physical neglect during childhood and the mean on the sexual abuse scale was 0.50 (std err: 0.02).

The average of depressive symptoms on the EPDS scale at baseline was 6.53 (std err: 0.07) and was similar several days after delivery (mean=6.52, std err: 0.07). It reached a nadir at one year (mean=6.03,

**Table 1**  
Characteristics of the sample at baseline: Women in the ELSPAC-CZ cohort.

Variable (Range)	Gender discrimination						All		
	Yes (n = 508)			No (n = 4180)			(n = 4688)		
	Mean	SE	95% CI	Mean	SE	95% CI	Mean	SE	95% CI
Depressive symptoms (0–30)	8.41	0.23	7.97–8.86	6.30	0.07	6.17–6.44	6.53	0.07	6.40–6.66
Depressive symptoms, logged (0–3.43)	2.07	0.03	2.00–2.13	1.77	0.01	1.75–1.79	1.80	0.01	1.78–1.82
Perceived gender discrimination %							10.7		9.8–11.6
<i>Socio-Demographic Characteristics</i>									
Age, years	26.09	0.23	25.63–26.55	25.10	0.07	24.95–25.24	25.20	0.07	25.06–25.34
Education, years (8–18)	12.42	0.12	12.17–12.66	11.81	0.04	11.73–11.88	11.87	0.04	11.80–11.94
Financial hardship (0–3) <sup>a</sup>	0.62	0.04	0.53–0.71	0.51	0.01	0.48–0.53	0.52	0.01	0.50–0.54
<i>Marital status %</i>									
Married	83.5		77.7–89.2	87.1		85.6–88.7	86.7		85.2–88.3
Single	8.6		6.0–11.2	9.6		8.7–10.5	9.5		8.7–10.4
Widowed	1.2		0.3–2.2	0.1		0.01–0.2	0.2		0.1–0.4
Divorced/Separated	6.7		4.5–8.9	3.1		2.6–3.7	3.5		3.0–4.0
Social support (0–5)	3.05	0.05	2.96–3.15	3.16	0.02	3.13–3.19	3.15	0.01	3.12–3.18
<i>Partner's Participation in Household Tasks</i>									
Female-stereotypical tasks (1–5) <sup>b</sup>	1.88	0.03	1.81–1.94	1.96	0.02	1.92–1.99	1.95	0.01	1.92–1.98
Male-stereotypical tasks (1–5) <sup>b</sup>	3.72	0.07	3.57–3.86	4.02	0.02	3.98–4.05	3.98	0.02	3.95–4.02
<i>Maltreatment during Childhood</i>									
Sexual abuse (0–9)	0.84	0.07	0.72–0.98	0.46	0.02	0.42–0.50	0.50	0.02	0.47–0.54
Emotional/physical neglect %	41.4		36.2–46.7	26.7		25.0–28.4	28.2		26.6–29.9
<i>Characteristics of Pregnancy and Delivery</i>									
First child %	36.1		31.8–40.4	40.3		38.8–41.8	39.9		38.5–41.3
Low birth weight %	4.2		2.4–5.9	5.0		4.3–5.6	4.9		4.2–5.5
Boy child %	53.3		48.9–57.8	52.7		51.1–54.2	52.7		51.3–54.2
Singleton delivery %	98.5		97.3–99.6	97.9		97.5–98.4	98.0		97.5–98.4

Data source: ELSPAC-CZ. CI=confidence interval. SE=standard error.

<sup>a</sup> Measured roughly 41 months since baseline.

<sup>b</sup> Measured roughly 11 months since baseline.

std err: 0.07), then increased slightly and reached a similar nadir at five years (mean=6.04, std err: 0.09).

Depressive symptoms were significantly higher among women reporting perceived gender discrimination (mean=8.41, std err: 0.23) compared to women with no perceived gender discrimination (mean=6.30, std err: 0.07,  $p < 0.001$ ).

Approximately one in ten women (10.7%, 95% CI: 9.8, 11.6) reported having experienced perceived gender discrimination at baseline. Compared to women reporting no perceived gender discrimination, women reporting perceived gender discrimination were more educated on average (mean=12.42 years, std err: 0.12), were less commonly pregnant with their first child at baseline (36.1%, 95% CI: 31.8, 40.4), had less social support (mean=3.05, std err: 0.05) and more financial difficulties (mean=0.62, std err: 0.04), and more commonly reported neglect (41.4%, 95% CI: 36.2, 46.7) and sexual abuse (mean=0.84, std err: 0.07) during childhood.

Table 2 shows the results from bivariate tests of depressive symptoms at baseline with independent explanatory measures. All variables had a statistically significant association with depressive symptoms except for maternal age at childbirth, being a widow, low birth weight, and singleton birth, as shown by corresponding t and p-values.

### 3.1. Models of depressive symptoms

Higher depressive symptoms scores were found among women who reported perceived gender discrimination in mixed error-component models that accounted for repeated observations and time (Table 3, Model 1:  $b = 0.15$  [95% CI: 0.12, 0.19],  $p < 0.001$ ). After

adjusting for covariates in Model 3, the relationship between perceived gender discrimination and depressive symptoms scores was similar, with only slight reduction in magnitude ( $b = 0.12$  [95% CI: 0.09, 0.16],  $p < 0.001$ ). Covariates related to higher depressive symptoms included financial hardship ( $b = 0.12$  [95% CI: 0.10, 0.14],  $p < 0.001$ ), childhood neglect ( $b = 0.18$  [95% CI: 0.14, 0.22],  $p < 0.001$ ), and sexual abuse ( $b = 0.04$  [95% CI: 0.03, 0.06],  $p < 0.001$ ). Having social support ( $b = -0.05$  [95% CI:  $-0.07$ ,  $-0.04$ ],  $p < 0.001$ ), and having a partner who participated in female stereotypical tasks ( $b = -0.03$ , [95% CI:  $-0.05$ ,  $-0.01$ ],  $p = 0.001$ ) were linked to lower depressive symptoms. To illustrate these results, Fig. 1 offers a comparison of unadjusted vs. adjusted relationships between depressive symptoms and each predictor included in Model 3. It demonstrates that attenuation of the examined relationships after adjustment was generally small and the relationships remained statistically significant.

Additional analyses limited to women without CSDB (EDPS < 11) yielded results that were substantively similar to the whole sample, indicating that perceived gender discrimination was associated with higher depressive symptoms ( $b = 0.09$  [95% CI: 0.05, 0.13],  $p < 0.001$ ). Women with vs. without CSDB did not significantly differ in the magnitude of this relationship, as evidenced by the statistically non-significant interaction coefficient ( $b = -0.01$  [95% CI:  $-0.09$ , 0.07],  $p = 0.852$ ).

## 4. Discussion

Prior research considered perceived discrimination more generally but health implications of perceived gender discrimination

**Table 2**  
Bivariate relationships between depressive symptoms and predictor variables for women in the ELSPAC-CZ cohort (n = 4688).

Predictor	t-value	p-value
Perceived gender discrimination (RC=no perceived gender discrimination)	8.70	<0.001
<i>Socio-Demographic Characteristics</i>		
Age, years	0.6	0.55
Education, years	-4.71	<0.001
Financial hardship <sup>a</sup>	10.78	<0.001
<i>Marital status</i>		
Married	-	
Single	4.95	<0.001
Widowed	0.92	0.358
Divorced/Separated	4.61	<0.001
Social support	-8.03	<0.001
<i>Partner's Participation in Household Tasks</i>		
Female-stereotypical tasks <sup>b</sup>	-3.44	0.001
Male-stereotypical tasks <sup>b</sup>	-3.57	0.001
<i>Maltreatment during Childhood</i>		
Sexual abuse <sup>c</sup>	7.68	<0.001
Emotional/physical neglect (RC=No emotional/physical neglect)	9.83	<0.001
<i>Characteristics of Pregnancy and Delivery</i>		
First pregnancy (RC=second/higher-order pregnancy)	-3.27	0.001
Low birth weight (RC=normal birth weight)	-0.34	0.733
Boy child (RC=girl child)	-2.36	0.019
Singleton delivery (RC=twin delivery)	0.71	0.477

Data source: ELSPAC-CZ. RC=Reference category.

<sup>a</sup> 0–3 scale.

<sup>b</sup> 0–5 scale.

<sup>c</sup> 0–9 scale. t-values are obtained from linear mixed error-component models using multiple imputations, with each predictor entered separately. Depressive symptoms are measured on a 0–30 scale and transformed using natural logarithm.

specifically have not been systematically studied. Here we offer initial evidence of significant associations between women's perceptions of gender discrimination and depressive symptoms during longitudinal follow-up from mid-pregnancy to eleven years post-delivery of the

index child. Overall, about one in ten women in the ELSPAC-CZ cohort reported a perception of gender discrimination, which may be an under-estimate given that discrimination is often subtle and ambiguous and reporting discrimination can be psychologically costly [46]. Accurate data on the prevalence are not available but evidence suggests that gender discrimination is common. In one study, American college women reported that one to two times a week, on average, they experienced a sexist event, such as gender role stereotyping, prejudice, sexual objectification, and demeaning comments [22]. The mechanism through which perceived gender discrimination is linked to mental health is unclear but may be mediated through stress responses; however, this requires further investigation. On the other hand, the impact of addressing gender discrimination as a means of mitigating mental health morbidity in women is unexplored and merits further exploration.

In addition to showing higher depressive symptoms, women reporting perceived gender discrimination in our study had other risks, including financial hardship, lower social support, and exposure to neglect and abuse during their childhood. This suggests a pattern of clustered disadvantage among victims of gender discrimination. Multiple axes of social disadvantage have proved useful in understanding discrimination among African American women, gay HIV-positive African American males, and low-income Latina lesbians [46]. Prior evidence, for instance, shows correlations between perceived sexism/racism and negative life events among African American women [23]. Thus, the effects of perceived gender discrimination may be compounded by, and interact with, other axes of disadvantage, although this also is unexplored. Interestingly, education represents an exception to the pattern of clustered disadvantage. Women reporting perceived gender discrimination in our sample were significantly more, not less, educated compared to their counterparts. Prior evidence indicated higher prevalence of perceived racial discrimination among more vs. less educated African American women [47] and a stronger association between everyday discrimination and psychological distress among college-educated Asian Americans compared to their less-educated counterparts [48]. We speculate that highly

**Table 3**  
Linear mixed error-component models for depressive symptoms, women in ELSPAC-CZ cohort (n = 4688).

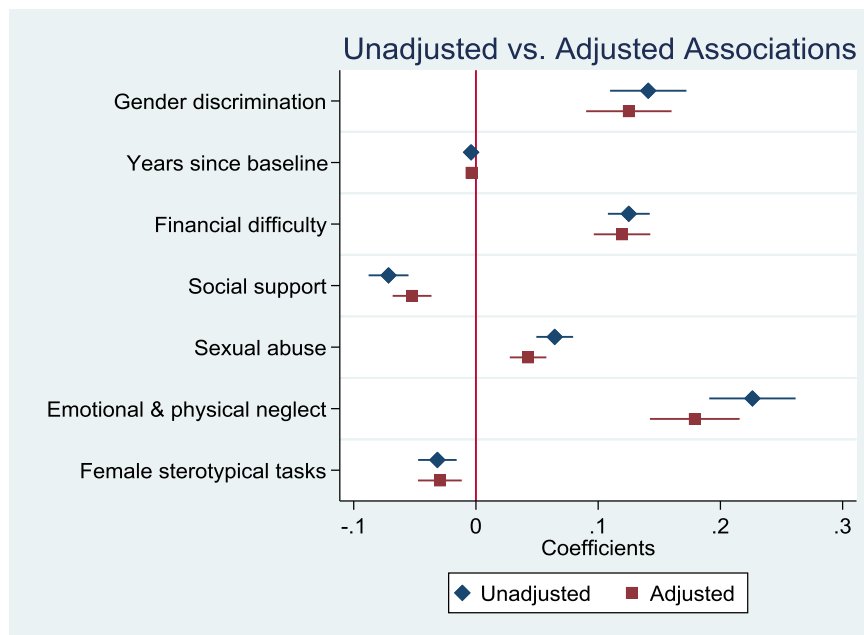
	Model 1			Model 2			Model 3						
	b	p-value	95% CI	b	p-value	95% CI	b	p-value	95% CI				
Perceived gender discrimination (RC=no perceived gender discrimination)	0.15	<0.001	0.12	0.19	0.12	<0.001	0.09	0.16	0.12	<0.001	0.09	0.16	
Time, years since baseline	-0.004	0.001	-0.007	-0.002	-0.004	0.003	-0.006	-0.001	-0.004	0.004	-0.006	-0.001	
<i>Socio-Demographic Characteristics</i>													
Age at delivery, years				0.00		0.392	0.00	0.01					
Education, years				0.00		0.341	-0.01	0.00					
Financial hardship <sup>a</sup>				0.12		<0.001	0.09	0.14	0.12	<0.001	0.10	0.14	
<i>Marital status (RC=married)</i>													
Single				0.05		0.074	-0.01	0.11					
Widowed				0.00		0.984	-0.33	0.32					
Divorced/Separated				0.08		0.095	-0.01	0.17					
Social support <sup>b</sup>				-0.05		<0.001	-0.06	-0.03	-0.05	<0.001	-0.07	-0.04	
<i>Partner's Participation in Household Tasks</i>													
Female-stereotypical tasks <sup>b</sup>				-0.03		0.004	-0.05	-0.01	-0.03	0.001	-0.05	-0.01	
Male-stereotypical tasks <sup>b</sup>				-0.01		0.159	-0.02	0.00					
<i>Maltreatment during Childhood</i>													
Sexual abuse <sup>c</sup>						0.04	<0.001	0.03	0.06	0.04	<0.001	0.03	0.06
Emotional/physical neglect (RC= No emotional/physical neglect)			0.17	<0.001	0.14	0.21	0.18	0.06	<0.001		0.14	0.22	
<i>Characteristics of Pregnancy and Delivery</i>													
First pregnancy (RC=second/higher-order pregnancy)			-0.02	0.225	-0.06	0.01							
Low birth weight (RC=normal birth weight)			-0.03	0.445	-0.11	0.05							
Boy child (RC=girl child)				-0.03		0.086	-0.06	0.00					
Singleton delivery(RC=twin delivery)				-0.02		0.751	-0.14	0.10					

Data source: ELSPAC-CZ. CI=confidence intervals. RC=Reference category.

<sup>a</sup> 0–3 scale.

<sup>b</sup> 0–5 scale.

<sup>c</sup> 0–9 scale. Depressive symptoms are measured on a 0–30 scale and are transformed using natural logarithm. Multiple imputations used to account for missing data.



**Fig. 1.** Unadjusted and adjusted unstandardised b-coefficients (including 95% confidence intervals) for predictors of women's depressive symptoms.

educated women, especially those working in male-dominated professions, have more exposure to discrimination, and at the same time, are more aware and less tolerant of discrimination. They may also be more willing to report discrimination in surveys.

Of interest is also the finding that the average trajectory of depressive symptoms among Czech women was relatively stable over the eleven-year-long observation period. We know of few studies of depression that followed childbearing women for such an extended period of time. Among longer cohorts, EDEN mother-child study identified five types of trajectories among French women over five years following childbirth [49]. The largest group of women (60%) was consistently free of symptoms. Women with intermediate symptoms that persisted over the observation period represented the second largest group (25%). High depressive symptoms during pregnancy only or during the child's preschool years only were much less common (5% and 5%, respectively). In a Brazilian Pelotas cohort, 81% of participants showed trajectories of stable low, stable moderate, or stable high depressive symptoms over the six-year-long period starting in mid-pregnancy [50]. In contrast, shorter cohort studies ranging from one to 3.5 years have suggested that symptoms decrease over time among women with postpartum depression, though this decrease is not always statistically significant [51].

Our study had several limitations. The sample was limited to women who were pregnant at the inception of the study. The results thus cannot be generalised to women who have never been pregnant and women whose pregnancies ended before the fourth month, when the recruitment took place. Good generalisability to the population from which the sample was drawn is suggested by comparing socio-demographic composition of the baseline sample vs. the entire population of births in Brno and Znojmo regions [27], though some small differences exist (e.g., college education 16.3% vs. 13.7%, respectively; maternal age <20 9.9% vs. 13.3%, respectively). Generalisability to other societies, however, is unknown. The study was conducted during the post-communist transition, when the health status of the Czech population differed from western-European nations [52]. Consequently, we expect that the estimates of the prevalence of health-related characteristics have limited generalisability to western societies; generalisability to other post-communist nations of Eastern and Central Europe may be better, given similarities in the socio-historical context but data are lacking. At the same time, we argue that the relationship between perceived gender discrimination and depressive

symptoms likely exists across different nations and societies. Prior studies, mostly in western contexts, amply document adverse health outcomes of various forms of discrimination, e.g., based on race/ethnicity, language, sexual orientation, and weight status [17-20]. Importantly, theoretical work argues that perceived discrimination acts as a prominent stressor and, as such, may harm mental health much like other stress sources [17].

Both perceived gender discrimination and depressive symptoms were measured using self-report. Assessment of depressive symptomatology in large population-based samples is rarely feasible with methods other than survey self-reports (e.g., clinical interview). The EPDS, which was used to assess depressive symptoms, is reliable, valid, and well-established in non-western contexts. Similarly, self-reports are well-established for perceived discrimination [17]; assessment of discrimination using other methods, such as experiment or audit, is difficult or impossible in population-based studies. Nevertheless, the possibility of perception bias remains, including minimisation bias and vigilance bias, i.e., perceiving less or more discrimination than actually exists, respectively [46].

Caution in interpretation of the observed statistical effects is needed since the study relies on observational data. Randomization of gender discrimination is neither practical nor ethical. Data were longitudinal and statistical methods controlling for multiple confounders were applied; yet, causal interpretation is not warranted. Theoretical work suggests that gender discrimination leads to depressive symptoms but it is also possible that depressive symptoms lead to more negative perceptions, increasing the likelihood of perceiving gender discrimination. We included analyses checking whether the link between perceived gender discrimination and depressive symptoms was limited to women who were already depressed at baseline. The results did not support this hypothesis; instead, they suggested that gender discrimination was related to higher depressive symptoms in initially depressed and non-depressed women alike. This evidence is consistent with prior work suggesting that perceived discrimination causally contributes to depression and other health problems [46]; yet, reverse causality cannot be ruled out in the absence of experimental manipulation.

Policy implications must consider these limitations. While the direction of causality remains unclear, the observed associations do indicate that women who experience gender discrimination are at higher risk for depression. Programmes supporting mental health of

victims of gender discrimination are needed. Disparities in numerous health outcomes disproportionately affecting women persist worldwide despite years of efforts to reduce gender inequalities in global health. Long-term objectives of comprehensive population-level programmes to improve women's health should target mental health as an important aspect of disparities by gender. On the level of communities and society, efforts should be made to dismantle restrictive gender norms and eliminate gender injustices in health systems, work-places, and education. From the perspective of social justice and human rights, discrimination and restrictive gender norms are unethical and unjust. They remain under-recognized and poorly addressed as a public health issue in industrialized and developing societies alike. Consistent efforts to eliminate gender hierarchies are worthwhile as they stand to benefit not only girls and women but also boys, men, and sexual/gender minorities, whose health is also harmed when social systems surrounding them perpetuate injustices based on gender [14].

### Declaration of Competing Interest

Dr. Stepanikova has nothing to disclose. Mr. Acharya has nothing to disclose. Dr. Abdalla has nothing to disclose. Dr. Baker has nothing to disclose. Dr. Klanova has nothing to disclose. Dr. Darmstadt has nothing to disclose.

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### Ethical Approval

ELSPAC-CZ was approved by the Scientific Committee of Masaryk University. All participants provided written informed consent. The study was also approved by the Stanford University Institutional Review Board protocol # 42971.

### Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

### Author contributions

Irena Stepanikova participated in all aspects of the study, including conceptualization and design, literature review, data analysis,

interpretation, and writing of all sections. Elizabeth Baker participated in the design, supervision of the statistical analyses, interpretation of results, and writing of the methods and results sections. Sanjeev Acharya prepared the data for analysis and performed the statistical analyses. He participated in interpretation and assisted in writing the results and methods. Safa Abdalla participated in the development of the idea, review of the literature and the data, statistical analysis strategy, and critical review of the manuscript. Jana Klanova participated in acquiring and preparing the data. Gary Darmstadt participated in conceptualizing and designing the study, interpreting the results, and writing. All authors read and approved the final version of the manuscript.

Data source: ELSPAC-CZ. Linear mixed error-component models with multiple imputations are used. Depressive symptoms are transformed using natural logarithm. Adjusted models include gender discrimination, years since baseline, financial difficulty, social support, sexual abuse, neglect, and partner performs female stereotypical tasks.

### Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:[10.1016/j.eclinm.2020.100297](https://doi.org/10.1016/j.eclinm.2020.100297).

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