

# Social support and maternal mental health at 4 months and 1 year postpartum: analysis from the All Our Families cohort

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## ABSTRACT

**Background** Low social support is consistently associated with postpartum depression. Previous studies do not always control for previous mental health and do not consider what type of support (tangible, emotional, informational or positive social interaction) is most important. The objectives are: to examine if low social support contributes to subsequent risk of depressive or anxiety symptoms and to determine which type of support is most important.

**Methods** Data from the All Our Families longitudinal pregnancy cohort were used (n=3057). Outcomes were depressive or anxiety symptoms at 4 months and 1 year postpartum. Exposures were social support during pregnancy and at 4 months postpartum. Log binomial models were used to calculate risk ratios (RRs) and absolute risk differences, controlling for past mental health.

**Results** Low total social support during pregnancy was associated with an increased risk of depressive symptoms (RR 1.50, 95% CI 1.24 to 1.82) and anxiety symptoms (RR 1.63, 95% CI 1.38 to 1.93) at 4 months postpartum. Low total social support at 4 months was associated with an increased risk of anxiety symptoms (RR 1.65, 95% CI 1.31 to 2.09) at 1 year. Absolute risk differences were largest among women with previous mental health challenges resulting in a number needed to treat of 5 for some outcomes. Emotional/informational support was the most important type of support for postpartum anxiety.

**Conclusion** Group prenatal care, prenatal education and peer support programmes have the potential to improve social support. Prenatal interventions studies are needed to confirm these findings in higher risk groups.

## INTRODUCTION

As many as 20% of women experience depressive symptoms or elevated anxiety in the first year postpartum, and these symptoms often co-occur.<sup>1–4</sup> Maternal mental health problems can be debilitating for mothers, partners and for children, who are at increased risk of emotional and behavioural problems.<sup>5</sup> In recent reviews, factors consistently associated with postpartum depression and anxiety include, but are not limited to: depression or anxiety during pregnancy, history of depression, early life adversity or stressful life events, parity, lower socioeconomic status, marital relationship, low social capital and low levels of social support.<sup>6–11</sup>

For the purposes of this paper, we define social support as the resources obtained from social relationships, primarily friends and family.<sup>12</sup> This support can be in the form of emotional or informational support (ie, someone to ask advice of or talk to about problems), tangible support (someone to help with practical needs) or interaction support (someone to do fun things with).<sup>13</sup>

Previous studies have typically measured mental health symptoms and social support at the same time period.<sup>4 7 9 10</sup> However, women who are already experiencing depressive symptoms may be less likely to socialise and may perceive that less social support is available. To understand the potential benefit of increased social support, it is important to assess this relationship prospectively.<sup>14</sup>

Considering that past mental health influences current mental health and that mental health symptoms such as anxiety and depression often co-occur, longitudinal studies are critical to understanding the effect of social support on current mental health independent of previous mental health.<sup>2 15 16</sup> While some longitudinal studies fail to control for previous mental health altogether,<sup>17</sup> other studies only control for either previous depression or anxiety,<sup>14 18</sup> which does not account for the cumulative and clustering nature of mental health challenges.<sup>2 15 19 20</sup> For example, a study of 877 women in Japan found that women with more people in their support networks during pregnancy had lower levels of postpartum depression, controlling for earlier depression symptoms, but this study did not control for earlier anxiety or history of depression.<sup>14</sup>

Qualitative evidence suggests that different ethnic or socioeconomic groups may prioritise different types of support.<sup>21</sup> Some quantitative studies have examined types of support individually.<sup>22–24</sup> For example, a study of first-time mothers in Ireland found moderate inverse correlations between several types of support (tangible, emotional and so on) and depressive symptoms; however, this analysis was cross-sectional and only examined each type of support in isolation.<sup>22</sup> Because different support types overlap,<sup>13</sup> comparing them at the same time can reveal whether one type is more important than another. For example, does a woman with low tangible support have a higher risk of postpartum depression regardless of availability of other types of support?

This study has two aims. First to understand if low levels of total social support contribute to



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subsequent risk of maternal mental health problems (depressive symptoms and elevated anxiety) at 4 months and 1 year postpartum. Second to determine which type of support (if any) is most important for the risk of later mental health problems.

## METHODS

### Participants

This study used data from the All Our Families (AOF—previously All Our Babies) pregnancy cohort from Calgary, Canada. Details of the study design, recruitment and retention are described in detail elsewhere.<sup>25</sup> Briefly, women were recruited between 2008 and 2010 during the second trimester of pregnancy. Participants had to be 18 years or older, understand English well enough to complete the questionnaires and live in Calgary. Women were given questionnaires twice in pregnancy and at 4 months and 1 year postpartum. At each follow-up, eligible women were provided with a questionnaire and prepaid return envelope. Participants were contacted by telephone to resolve missing or unclear data. Non-responders were contacted by telephone and email to provide additional opportunities to respond. At 4 months postpartum, 3057 women completed questionnaires, a response rate of 90%. At 1 year, 1573 of 1942 eligible women (81%) completed the questionnaire (online supplementary file 1). Compared with the target population, the women in these samples have higher incomes, are more educated and more likely to identify as white.<sup>25</sup> Women were asked sociodemographic questions, repeated psychosocial measures of current anxiety, depression, social support as well as past mental health and early life experiences. All questionnaires were developed with input from healthcare providers, epidemiologists and community programme staff. All participants provided informed consent to participate. The study received ethical approval from the University of Calgary and complies with the STROBE statement for reporting on cohort studies.

### Variables

#### Primary outcomes

Depression and anxiety symptoms were assessed at 4 months and 1 year postpartum, resulting in four outcomes. Depressive symptoms were measured using the Edinburgh Postnatal Depression Scale.<sup>26</sup> A cut-off of 10 or more is recommended for community settings and indicates a risk of minor or major depression.<sup>27</sup> Anxiety was measured using the Spielberger State Anxiety Index, with a score of 40 or more representing clinically significant levels of anxiety.<sup>28 29</sup>

#### Exposure

The Medical Outcome Survey Social Support Scale was used to measure total perceived support and three types of support: tangible, positive social interaction and emotional/informational support.<sup>13</sup> For example, items ask respondents how often they had someone 'to help you if you were confined to bed' (tangible); 'to confide in or talk to about yourself or your problems' and 'to give you good advice about a crisis' (emotional/informational) and 'to do something enjoyable with' (positive interaction). There are 19 items and responses were measured on a five-point Likert scale. There is no validated cut-point for this scale and responses were skewed. Therefore, the lowest 20% of responses of the total scale, and of each subscale, were considered to be 'low support'. Perceived support captures what resources women think they have available to them, regardless of the need to use the support (ie, received support) or how many people provide the support.<sup>13</sup> Also, because evidence suggests

that women perceive support differently after giving birth,<sup>30</sup> we used the most recent measure of support as our exposure. Specifically, for 4-month outcomes, the exposure was low social support at any time during pregnancy. For 1-year outcomes, the exposure was low social support at 4 months postpartum.

### Covariates

Based on the previous literature, we developed a list of potential covariates for inclusion: income, self-reported ethnic background, parity and previous mental health. We did not consider marital status or relationship quality as these variables are embedded in how supported a woman feels.<sup>12</sup> In addition, almost all of the women in our sample (94%) were married, leading to limited variability in this measure.

Household income was reported at baseline and dichotomised at \$60 000. This cut-off represents approximately 65% of the median income in Calgary at the time and is the level at which residents become eligible for low-income housing.<sup>31</sup> Household income is a proxy measure for socioeconomic status and may directly impact postpartum mental health or may moderate the type of support that is most important.

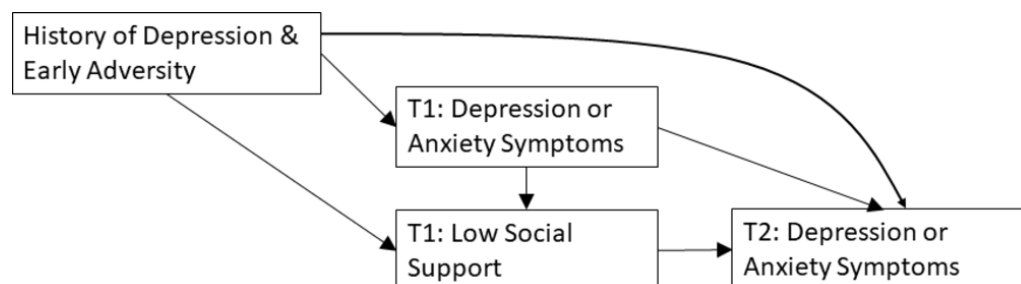
Self-reported ethnic background information was collected at baseline and categorised into white and minority. Although validated cross-culturally, screening tools may operate differently in minority ethnic groups. Ethnic background may also moderate which type of support is considered most important.

Women with a previous live birth were multiparous and those for whom the All Our Families child was their first live birth were primiparous.

We used a life course approach to operationalise previous mental health.<sup>2 15 16</sup> A cumulative risk score can account for the aggregate and overlapping nature of mental health challenges,<sup>16 32</sup> including possible collinearity between variables as well as the cumulative effect of past mental health on current mental health.<sup>2 6 7 16</sup> We developed a separate cumulative mental health risk variable for each of the two outcome time-points. We summed four variables: history of treatment of depression, having experienced four or more Adverse Childhood Experiences (ACEs) and recent symptoms of anxiety and depression. ACEs include maternal report of abuse, neglect or family dysfunction in her own childhood and a threshold of 4 or more is recommended as a cut-off for the at risk category.<sup>33</sup> Recent symptoms for 4-month outcomes were elevated anxiety or depressive symptoms at any time during pregnancy. For 1-year outcomes, we included anxiety or depressive symptoms at 4 months postpartum. Cumulative mental health risk scores ranged from 0 to 4. A model outlining the association between social support and mental health is illustrated using a directed acyclic graph in figure 1.

### Analysis

We calculated descriptive statistics for all variables described above. For aim one, our exposure was low total support. For aim two (the relative importance of support type), our exposure was three support subscales. All exposures and covariates were measured at time points prior to the outcome. Log-binomial regression models were built to estimate risk ratios (RRs) for each outcome.<sup>34</sup> We first assessed possible effect modification by stratifying by income, ethnic background, parity and cumulative mental health risk. We then eliminated covariates that were not statistically associated with the outcome and did not change the point estimate of our exposure by more than 10%, which would indicated confounding.<sup>35</sup>



**Figure 1** Directed acyclic graph to demonstrate cumulative risk. For outcomes 1 and 2: T1 is pregnancy and T2 is 4 months postpartum. For outcomes 3 and 4: T1 is 4 months postpartum and T2 is 1 year postpartum. The cumulative risk variable is the sum of history of depression, early adversity and T1 depressive or anxiety symptoms. Analysis which controls for cumulative risk allows for the isolation of the effect of low social support at T1 on depression or anxiety symptoms at T2, independent of previous mental health. Other hypothesised possible confounding effects (age, ethnicity, income and parity) are not depicted for reasons of simplification.

Results are reported as crude and adjusted RRs. We calculated risk differences based on the estimated prevalence in each exposure group. Based on risk differences, we calculated a number needed to treat (NNT) to inform possible interventions. Cumulative effects and risk differences were depicted graphically. All analyses were carried out in STATA IC V.13.

## RESULTS

The mean age of women at delivery was 31 years (SD 4.4), and the majority of the women had higher income and self-identified as white. Approximately half the samples (50.3%) were primiparous (table 1). At 4 months postpartum, 12.1% reported depressive symptoms and 14.9% reported elevated anxiety. At 1 year postpartum, 12.4% of women reported depressive symptoms and 16.9% reported elevated anxiety. Both prenatal and postpartum cumulative mental health scores followed expected patterns, with the majority reporting 0, and decreasing numbers reporting higher levels.

For all four outcomes, there were substantial changes in the point estimate for low social support from the crude to the adjusted models, which indicates confounding by previous mental health risk factors (as depicted in figure 1). In the adjusted model, low total support during pregnancy was associated with an adjusted 1.5-fold increased risk (95% CI 1.24 to 1.82) of depressive symptoms at 4 months (table 2). Increasing numbers of prenatal cumulative mental health risk factors were associated with increased adjusted risk of depressive symptoms, with one, two and three or four risk factors being associated with a RR of 2.52 (95% CI 1.86 to 3.41), 4.60 (95% CI 3.45 to 6.13) and 7.64 (95% CI 5.71 to 10.20), respectively. The results were similar for elevated anxiety at 4 months postpartum.

Adjusted RR estimates for the association between low social support at 4 months and depressive symptoms at 1 year were similar, but not statistically significant. There was a statistically significant association between low total support at 4 months and elevated anxiety at 1 year (RR 1.65, 95% CI 1.31 to 2.09). Postpartum cumulative mental health risk factors showed similar patterns for both 1 year outcomes with increasing risks associated with an increasing number of mental health risk factors.

Age, income, ethnic background and parity were not associated with any of the outcomes and did not substantially affect any of the point estimates and are therefore not included in the models. There was no evidence of effect modification by any of the covariates, including number of cumulative mental health factors.

To illustrate the multiplicative nature of the log-binomial models, figure 2 shows the adjusted RRs (primary axis) and

associated CIs for each outcome. Because there is no effect modification, at each level of mental health risk, low social support in pregnancy adds an additional 63% risk of elevated anxiety at 4 months postpartum (panel B). This translates into

**Table 1** Sample characteristics

Demographic variables	n=3057	%*
Age mean (SD)	31.2	4.4
Income (<60K)	478	16.3
Self-identified white ethnic background	2412	79.6
First child	1537	50.3
4-month outcome variables	n=3057	%
Depressive symptoms at 4 months (EPDS $\geq$ 10)	366	12.1
Anxiety symptoms at 4 months (SSAI $\geq$ 40)	438	14.9
Low total support in pregnancy	748	24.5
Low tangible support in pregnancy	789	25.9
Low interaction support in pregnancy	683	22.4
Low emotional/informational support in pregnancy	713	23.4
Prenatal cumulative mental health†		
0 mental health factors	1609	52.8
one mental health factors	734	24.1
2 mental health factors	470	15.4
3 or 4 mental health factors	232	7.6
1-year outcome variables	n=1573	%
Depressive symptoms at 1 year (EPDS $\geq$ 10)	193	12.4
Anxiety symptoms at 1 year (SSAI $\geq$ 40)	256	16.9
Low total support at 4 months	279	18.8
Low tangible support at 4 months	305	20.2
Low interaction support at 4 months	257	17.0
Low emotional/info support at 4 months	237	15.8
Postpartum cumulative mental health‡		
0 mental health factors	1024	65.1
1 mental health factors	346	22.0
2 mental health factors	138	8.8
3 or 4 mental health factors	65	4.1

\*Percentages may vary due to missing data (<5%) in the denominator.

†History of treatment of depression, four or more ACEs, depressive or anxiety symptoms during pregnancy.

‡History of treatment of depression, four or more ACEs, depressive or anxiety symptoms at 4 months postpartum.

ACE, Adverse Childhood Experiences; EPDS, Edinburgh Postnatal Depression Scale; SSAI, Spielberger State Anxiety Index.

**Table 2** Total support log-binomial regression models for 4 month and 1 year outcomes

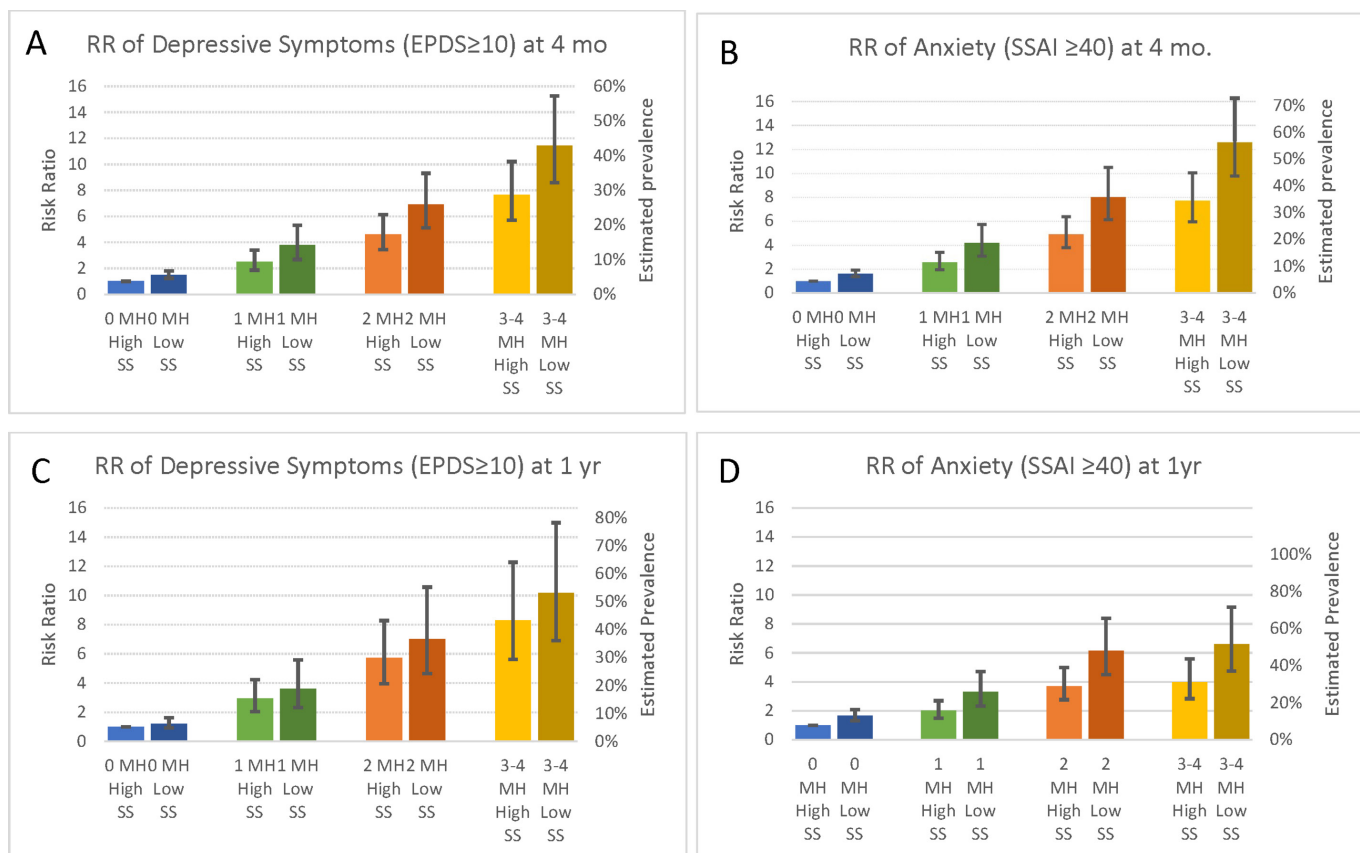
4-month outcomes	Depressive symptoms (EPDS $\geq$ 10) at 4 months				Elevated Anxiety (SSAI $\geq$ 40) at 4 months			
	Crude		Adjusted*		Crude		Adjusted*	
	RR (95% CI)	P>z	RR (95% CI)	P>z	RR (95% CI)	P>z	RR (95% CI)	P>z
Low total support in pregnancy	2.67 (2.21 to 3.22)	<0.001	1.50 (1.24 to 1.82)	<0.001	2.93 (2.47 to 3.46)	<0.001	1.63 (1.38 to 1.93)	<0.001
Prenatal Cumulative Mental Health Risk Factors (0 baseline) <sup>†</sup>	1.00		1.00		1.00		1.00	
1	2.61 (1.94 to 3.53)	<0.001	2.52 (1.86 to 3.41)	<0.001	2.71 (2.06 to 3.57)	<0.001	2.58 (1.96 to 3.41)	<0.001
2	5.27 (3.99 to 6.94)	<0.001	4.60 (3.45 to 6.13)	<0.001	5.83 (4.54 to 7.49)	<0.001	4.93 (3.80 to 6.39)	<0.001
3 or 4	9.13 (6.95 to 11.98)	<0.001	7.64 (5.71 to 10.20)	<0.001	9.66 (7.56 to 12.35)	<0.001	7.74 (5.96 to 10.05)	<0.001
1-year outcomes	Depressive Symptoms (EPDS $\geq$ 10) at 1 year				Elevated Anxiety (SSAI $\geq$ 40) at 1 year			
	Crude		Adjusted*		Crude		Adjusted*	
	RR (95% CI)	P>z	RR (95% CI)	P>z	RR (95% CI)	P>z	RR (95% CI)	P>z
Low total support at 4 months	2.30 (1.74 to 3.04)	<0.001	1.23 (0.93 to 1.62)	0.154	2.49 (1.98 to 3.13)	<0.001	1.65 (1.31 to 2.09)	<0.001
Postpartum Cumulative Mental Health Risk Factors (0 baseline) <sup>‡</sup>	1.00		1.00		1.00		1.00	
1	2.82 (2.00 to 3.98)	<0.001	2.94 (2.04 to 4.23)	<0.001	2.14 (1.62 to 2.84)	<0.001	2.01 (1.50 to 2.70)	<0.001
2	5.80 (4.12 to 8.16)	<0.001	5.73 (3.96 to 8.29)	<0.001	4.34 (3.31 to 5.70)	<0.001	3.71 (2.77 to 4.98)	<0.001
3 or 4	8.64 (6.10 to 12.23)	<0.001	8.31 (5.63 to 12.28)	<0.001	5.07 (3.71 to 6.90)	<0.001	3.98 (2.84 to 5.59)	<0.001

\*Adjusted for all variables presented. No evidence of confounding or effect modification was found by age, income, ethnic background or parity. No evidence of effect modification was found by cumulative mental health.

<sup>†</sup>History of treatment of depression, four or more ACEs, depressive or anxiety symptoms during pregnancy.

<sup>‡</sup>History of treatment of depression, four or more ACEs, depressive or anxiety symptoms at 4 months postpartum.

ACE, Adverse Childhood Experiences; EPDS, Edinburgh Postnatal Depression Scale; RR, risk ratio; SSAI, Spielberger State Anxiety Index.



**Figure 2** Risk ratios and estimated prevalence: Showing the risk ratios and estimated prevalence by level of mental health risk and level of social support: of depressive symptoms at 4 months (panel A); elevated anxiety at 4 months (panel B); depressive symptoms at 1 year (panel C); elevated anxiety at 1 year (panel D). EPDS, Edinburgh Postnatal Depression Scale; MH, mental health; RR, risk ratio; SS, social support; SSAI, Spielberger State Anxiety Index.



**Table 3** Types of support log-binomial regression models for 4-month and 1-year outcomes

4-month outcomes	Depressive symptoms (EPDS $\geq$ 10) at 4 months				Elevated Anxiety (SSAI $\geq$ 40) at 4 months			
	Crude		Adjusted*		Crude		Adjusted*	
	RR (95% CI)	P>z	RR (95% CI)	P>z	RR (95% CI)	P>z	RR (95% CI)	P>z
Low Tangible Support in preg.	1.93 (1.60 to 2.31)	<0.001	1.02 (0.82 to 1.26)	0.874	2.18 (1.84 to 2.59)	<0.001	1.08 (0.90 to 1.30)	0.419
Low Interaction Support in preg.	2.53 (2.10 to 3.06)	<0.001	1.20 (0.93 to 1.55)	0.163	2.79 (2.36 to 3.30)	<0.001	1.05 (0.85 to 1.30)	0.661
Low Emotional/Info. Support in preg.	2.59 (2.14 to 3.13)	<0.001	1.28 (0.99 to 1.65)	0.063	3.16 (2.68 to 3.73)	<0.001	1.64 (1.32 to 2.05)	<0.001
Prenatal Cumulative Mental Health Risk Factor† (0 baseline)	1.00		1.00		1.00		1.00	
1	2.61 (1.94 to 3.53)	<0.001	2.53 (1.87 to 3.42)	<0.001	2.71 (2.06 to 3.57)	<0.001	2.58 (1.95 to 3.40)	<0.001
2	5.27 (3.99 to 6.94)	<0.001	4.56 (3.42 to 6.10)	<0.001	5.83 (4.54 to 7.49)	<0.001	4.72 (3.64 to 6.14)	<0.001
3 or 4	9.13 (6.95 to 11.98)	<0.001	7.57 (5.65 to 10.14)	<0.001	9.66 (7.56 to 12.35)	<0.001	7.30 (5.61 to 9.51)	<0.001
1-year outcomes	Depressive symptoms (EPDS $\geq$ 10) at 1 year				Elevated Anxiety (SSAI $\geq$ 40) at 1 year			
	Crude		Adjusted*		Crude		Adjusted*	
	RR (95% CI)	P>z	RR (95% CI)	P>z	RR (95% CI)	P>z	RR (95% CI)	P>z
Low Tangible Support at 4 months	1.68 (1.26 to 2.25)	<0.001	0.81 (0.59 to 1.10)	0.178	1.91 (1.51 to 2.42)	<0.001	0.97 (0.75 to 2.00)	0.828
Low Interaction Support at 4 months	2.47 (1.88 to 3.25)	<0.001	1.39 (0.97 to 1.99)	0.076	2.57 (2.05 to 3.21)	<0.001	1.48 (1.09 to 2.00)	0.012
Low Emotional/Info. Support at 4 months	2.38 (1.79 to 3.16)	<0.001	1.26 (0.88 to 1.79)	0.204	2.50 (1.98 to 3.14)	<0.001	1.42 (1.06 to 1.90)	0.020
Postpartum Cumulative Mental Health Risk Factors‡ (0 baseline)	1.00		1.00					
1	2.82 (2.00 to 3.98)	<0.001	2.90 (2.02 to 4.17)	<0.001	2.14 (1.62 to 2.83)	<0.001	1.94 (1.44 to 2.60)	<0.001
2	5.80 (4.12 to 8.16)	<0.001	5.94 (4.15 to 8.52)	<0.001	4.34 (3.31 to 5.70)	<0.001	3.87 (2.92 to 5.13)	<0.001
3 or 4	8.64 (6.10 to 12.23)	<0.001	7.39 (4.95 to 11.02)	<0.001	5.07 (3.71 to 6.90)	<0.001	3.57 (2.54 to 5.01)	<0.001

\*Adjusted for all variables presented. No evidence of confounding or effect modification was found by age, income, ethnic background or parity. No evidence of effect modification was found by cumulative mental health.

†History of treatment of depression, four or more ACEs, depressive or anxiety symptoms during pregnancy.

‡History of treatment of depression, four or more ACEs, depressive or anxiety symptoms at 4 months postpartum.

ACE, Adverse Childhood Experiences; EPDS, Edinburgh Postnatal Depression Scale; RR, risk ratio; SSAI, Spielberger State Anxiety Index.

a low absolute increase for women with no mental health risk factors (RR of 1.63 for low social support compared with baseline of 1); for women with three or four mental health risks, the increase is from 7.74 (95% CI 5.96 to 10.05) for high support to 12.62 (95% CI: 9.79 to 16.26) for low support. Absolute differences can also be seen by comparing the estimated prevalence of elevated anxiety in each group (secondary axis in figure 2—details in supplementary file 2). Among women with a cumulative mental health risk score of 0, only 4.5% of women with high social support and 7.3% of those with low social support are expected to have elevated anxiety at 4 months postpartum (RD=2.8%). Among women with a cumulative mental health risk score of 3 or 4, estimated prevalences are 34.7% for high support and 56.5% for low support (RD=21.9%).

These same absolute differences can also be understood using a 'NNT' analysis (NNT=1/RD) (online supplementary file 2). The RD between high and low support in women with 0 mental health risk factors is 2.8% compared with 21.9% for women with 3–4 mental health risk factors, translating into an NNT of 36 or 5, respectively. Other outcomes show similar trends (online supplementary file 2).

To understand the relative importance of support types (aim 2), all four models were re-run with the three support types as exposures (table 3). Crude estimates show that each type of support is associated with increased risk. In the adjusted model, no one type of support during pregnancy appeared more important

for depressive symptoms at 4 months. For anxiety at 4 months, only low emotional/informational support during pregnancy was associated with an increased risk (RR 1.64, 95% CI 1.32 to 2.05).

Crude estimates of the associations between low support type and depressive symptoms at 1 year become non-significant after adjustment. For anxiety at 1 year, both low interaction support and low emotional/informational support at 4 months were associated with an increased risk (RR 1.48, 95% CI 1.09 to 2.00 and RR 1.42, 95% CI 1.06 to 1.90, respectively).

## DISCUSSION

Our analyses show that low total support in pregnancy was associated with an increased risk of both depressive symptoms and anxiety symptoms at 4 months. This is consistent with previous research which suggested a greater number of support persons in pregnancy reduced postpartum depressive symptoms.<sup>14</sup> Our study complements this finding as we considered social support to comprise the availability of different resources provided by support people, not only the number of people.

In terms of 1-year outcomes, low total support at 4 months was associated with an increased risk of anxiety symptoms (RR 1.65, 95% CI 1.31 to 2.09). The results for depressive symptoms at 1 year were similar, but not statistically significant. Martini *et al* found that higher levels of support throughout pregnancy and

postpartum were correlated with reduced levels of both anxiety and depression up to 16 months postpartum.<sup>20</sup> Currently, most perinatal mental health programmes in Canada occur during the postpartum period,<sup>36</sup> which misses the opportunity for women to build support prenatally. Prenatal education classes, group prenatal care and pregnancy outreach workers have all been shown to improve support prenatally.<sup>37,38</sup> Support interventions specifically targeted to women with multiple mental health risks should be evaluated.

Our analysis also clearly shows the cumulative nature of mental health risk, as women with increasing cumulative mental health risk scores had increasing risks of postpartum anxiety and depression at both 4 months and 1 year. For 3 of our 4 outcomes, low social support was associated with increased risks of poor subsequent mental health across all levels of our cumulative mental health index. We posit that social support is beneficial for everyone but provides the most absolute benefit to those with the highest mental health risks (figure 2). Moreover, increased social support is protective for multiple outcomes. If seven women with low support and high mental health risk (score of 3 or 4) were provided with additional support in pregnancy, we could prevent one case of postpartum depression, and one case of postpartum anxiety (NNT for anxiety being 5). This could result in very cost-effective targeted strategies to decrease symptoms for subsequent mental health problems.

The crude analysis (table 3) also shows that when considered independently, each type of support is important. However, when mutually adjusted for multiple support types, our results are less consistent. For both time points, low emotional/informational support was associated with increased risk of postpartum anxiety, whereas no single type of support was clearly superior for postpartum depression. We suggest that while interventions that provide only emotional/information support may be beneficial for some outcomes, a more holistic approach to providing support may be warranted. Previous studies show that group prenatal care and group prenatal education can provide multiple types of support.<sup>37,38</sup> A randomised control trial of pregnancy outreach workers in the UK designed to provide tangible, emotional and informational support to vulnerable women showed a reduction in depressive symptoms.<sup>39</sup> For areas where in-person support is not feasible, randomised clinical trials have shown that peer support interventions delivered over the phone or internet during the postnatal period can provide emotional and informational support and reduce depressive symptoms.<sup>36</sup> Further studies focusing on interventions in the prenatal period and measuring anxiety outcomes are needed.

A study by Bassuk *et al*<sup>40</sup> in the USA found that lack of tangible support during pregnancy was the most strongly associated with symptoms of postpartum depression. However, that study was conducted in a high-risk population of women, who may have more immediate tangible support needs than our study population. We found no evidence of modification of type of support by any of our demographic variables or previous mental health risk. However, we did have a comparatively homogeneous sample with relatively educated, higher income women, which may limit the generalisability of our results to more vulnerable populations.

### Strengths and limitations

One of our study's strengths is its large sample size, with over 3000 women for our 4-month outcomes, and over 1500 for our 1-year outcomes. While sample size decreases at 1 year, the samples at both time points remain generally representative of

the pregnant and parenting population in urban Canada and levels of mental health outcomes were similar in our study to previous studies.<sup>1-4</sup> However, our sample was slightly more educated, more likely to self-identify as white and have a higher income. Our sample may not be fully representative of the target population and may not be generalisable to more vulnerable groups. As with all observational studies, our study could not measure all potential confounders and may be subject to residual confounding or omitted variable bias. In addition, our mental health measures were self-reported, which may be less accurate than those measured by trained professionals. However, our study uses validated screening tools which are widely used in perinatal populations in community settings.<sup>25,27,29</sup> Our study takes full advantage of its longitudinal design, with all exposures preceding outcomes, which mitigates challenges associated with measuring social support and mental health concurrently. Finally, our life-course approach allowed us to account for the cumulative nature of mental health risks, considering both past and more proximal measures of mental health, while avoiding the challenges associated with over-controlling for mental health which occur when multiple mental health measures are entered independently in a model. Our results show consistent patterns over four outcomes, which lends support to our approach and findings.

### CONCLUSION

This study provides evidence that low levels of social support are associated with increased risk of both depression and anxiety at 4 months and with increased risk of anxiety at 1-year postpartum, taking into account previous mental health risk. Clinicians and prenatal education resources should promote developing strong support networks before birth, not just postnatally. Furthermore, optimising social support for all women has benefit, but may have a larger absolute risk reduction for those with high mental health risk. Low emotional/informational support is consistently associated with increased risk for elevated anxiety at both 4 months and 1 year postpartum, whereas only low total support impacts postpartum depression. Group-based care and

#### What is already known on this subject

- ▶ Up to one in five women experiences symptoms of depression or anxiety in the first year postpartum.
- ▶ Low social support is consistently associated with mental health challenges in cross-sectional studies, but the longitudinal association is less clear.
- ▶ There is little information on what type of support is most important to improve postpartum mental health outcomes.

#### What this study adds

- ▶ Low social support contributes to a subsequent risk of postpartum anxiety and depressive symptoms, across multiple levels of previous mental health challenges.
- ▶ Emotional/informational support has the largest impact on subsequent anxiety symptoms, but all types of support are important.
- ▶ Interventions should focus on encouraging women to develop strong support networks prenatally to prevent mental health problems postpartum.

other group activities that promote positive social networks and holistic support may provide the most benefit compared with interventions that focus on one type of support. Further studies that focus on providing support in the prenatal period and that include measures of perinatal anxiety are needed. Intervention studies that focus on women with high levels of previous mental health challenges, not just social or demographic risk, are needed to confirm findings.

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**Data sharing statement** The All Our Families questionnaires is stored at Secondary Analysis for Generating Evidence (SAGE), a secure data repository managed by PolicyWise for Children and Families. Requests for data and collaborations are welcome. For further information, please visit: <https://policywise.com/initiatives/sage/>

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## REFERENCES

- 1 Woody CA, Ferrari AJ, Siskind DJ, *et al.* A systematic review and meta-regression of the prevalence and incidence of perinatal depression. *J Affect Disord* 2017;219:86–92.
- 2 Heron J, O'Connor TG, Evans J, *et al.* The course of anxiety and depression through pregnancy and the postpartum in a community sample. *J Affect Disord* 2004;80:65–73.
- 3 Goodman JH, Watson GR, Stubbs B. Anxiety disorders in postpartum women: a systematic review and meta-analysis. *J Affect Disord* 2016;203:292–331.
- 4 Lanes A, Kuk JL, Tamim H. Prevalence and characteristics of postpartum depression symptomatology among Canadian women: a cross-sectional study. *BMC Public Health* 2011;11:302.
- 5 Tough SC, Siever JE, Leew S, *et al.* Maternal mental health predicts risk of developmental problems at 3 years of age: follow up of a community based trial. *BMC Pregnancy Childbirth* 2008;8:16.
- 6 Biaggi A, Conroy S, Pawlby S, *et al.* Identifying the women at risk of antenatal anxiety and depression: a systematic review. *J Affect Disord* 2016;191:62–77.
- 7 Robertson E, Grace S, Wallington T, *et al.* Antenatal risk factors for postpartum depression: a synthesis of recent literature. *Gen Hosp Psychiatry* 2004;26:289–95.
- 8 Plant DT, Barker ED, Waters CS, *et al.* Intergenerational transmission of maltreatment and psychopathology: the role of antenatal depression. *Psychol Med* 2013;43:519–28.
- 9 Pilkington PD, Milne LC, Cairns KE, *et al.* Modifiable partner factors associated with perinatal depression and anxiety: a systematic review and meta-analysis. *J Affect Disord* 2015;178:165–80.
- 10 Norhayati MN, Hazlina NH, Asrenee AR, *et al.* Magnitude and risk factors for postpartum symptoms: a literature review. *J Affect Disord* 2015;175:34–52.
- 11 Eastwood JG, Jalaludin BB, Kemp LA, *et al.* Bayesian hierarchical spatial regression of maternal depressive symptoms in South Western Sydney, Australia. *Springerplus* 2014;3:55.
- 12 Berkman LF, Krishna A. Social network epidemiology. In: Berkman LF, Kawachi I, Glymour M, eds. *Social epidemiology*. Oxford: Oxford University Press, 2014:234–89.
- 13 Sherbourne CD, Stewart AL. The MOS social support survey. *Soc Sci Med* 1991;32:705–14.
- 14 Morikawa M, Okada T, Ando M, *et al.* Relationship between social support during pregnancy and postpartum depressive state: a prospective cohort study. *Sci Rep* 2015;5:10520.
- 15 Lee AM, Lam SK, Sze Mun Lau SM, *et al.* Prevalence, course, and risk factors for antenatal anxiety and depression. *Obstet Gynecol* 2007;110:1102–12.
- 16 Evans GW. A multimethodological analysis of cumulative risk and allostatic load among rural children. *Dev Psychol* 2003;39:924–33.
- 17 Xie RH, He G, Koszycki D, *et al.* Prenatal social support, postnatal social support, and postpartum depression. *Ann Epidemiol* 2009;19:637–43.
- 18 Collins NL, Dunkel-Schetter C, Lobel M, *et al.* Social support in pregnancy: psychosocial correlates of birth outcomes and postpartum depression. *J Pers Soc Psychol* 1993;65:1243–58.
- 19 Giardinelli L, Innocenti A, Benni L, *et al.* Depression and anxiety in perinatal period: prevalence and risk factors in an Italian sample. *Arch Womens Ment Health* 2012;15:21–30.
- 20 Martini J, Petzoldt J, Einsle F, *et al.* Risk factors and course patterns of anxiety and depressive disorders during pregnancy and after delivery: a prospective-longitudinal study. *J Affect Disord* 2015;175:385–95.
- 21 Negron R, Martin A, Almog M, *et al.* Social support during the postpartum period: mothers' views on needs, expectations, and mobilization of support. *Matern Child Health J* 2013;17:616–23.
- 22 Leahy-Warren P, McCarthy G, Corcoran P. First-time mothers: social support, maternal parental self-efficacy and postnatal depression. *J Clin Nurs* 2012;21:388–97.
- 23 Cutrona CE. Social support and stress in the transition to parenthood. *J Abnorm Psychol* 1984;93:378–90.
- 24 Jeong HG, Lim JS, Lee MS, *et al.* The association of psychosocial factors and obstetric history with depression in pregnant women: focus on the role of emotional support. *Gen Hosp Psychiatry* 2013;35:354–8.
- 25 Tough SC, McDonald SW, Collisson BA, *et al.* Cohort Profile: the All Our Babies pregnancy cohort (AOB). *Int J Epidemiol* 2017;dyw363.
- 26 Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry* 1987;150:782–6.
- 27 Gibson J, McKenzie-McHarg K, Shakespeare J, *et al.* A systematic review of studies validating the Edinburgh Postnatal Depression Scale in antepartum and postpartum women. *Acta Psychiatr Scand* 2009;119:350–64.
- 28 Spielberger CD, Gorsuch RL, Lushene R, *et al.* Manual for the state-trait anxiety inventory (form Y): self-evaluation questionnaire. Consulting Psychologists Press Palo Alto. CA 1983.
- 29 Grant KA, McMahon C, Austin MP. Maternal anxiety during the transition to parenthood: a prospective study. *J Affect Disord* 2008;108:101–11.
- 30 Baker D, Taylor H. The relationship between condition-specific morbidity, social support and material deprivation in pregnancy and early motherhood. ALSPAC Survey Team. Avon Longitudinal Study of Pregnancy and Childhood. *Soc Sci Med* 1997;45:1325–36.
- 31 City of Calgary. *Foundations for home: calgary's corporate affordable housing strategy*. City of Calgary, 2016.
- 32 Kuh D, Ben-Shlomo Y, Lynch J, *et al.* Life course epidemiology. *J Epidemiol Community Health* 2003;57:778–83.
- 33 Anda RF, Felitti VJ, Bremner JD, *et al.* The enduring effects of abuse and related adverse experiences in childhood. *Eur Arch Psychiatry Clin Neurosci* 2006;256:174–86.
- 34 Williamson T, Eliasziw M, Fick GH. Log-binomial models: exploring failed convergence. *Emerg Themes Epidemiol* 2013;10:14.
- 35 Kleinbaum D, Nizam M. *Applied regression analysis and other multivariable methods*. 4th edn. Belmont, Calif, 2008.
- 36 Dennis C, Dowswell T. Psychosocial and psychological interventions for preventing postpartum depression (Review). *Cochrane Database Syst Rev* 2013;2.
- 37 Gagnon AJ, Sandall J. Cochrane Pregnancy and Childbirth Group. Individual or group antenatal education for childbirth or parenthood, or both. *Cochrane Database Syst Rev* 2007;6.
- 38 McNeil DA, Vekved M, Dolan SM, *et al.* Getting more than they realized they needed: a qualitative study of women's experience of group prenatal care. *BMC Pregnancy Childbirth* 2012;12:17.
- 39 Kenyon S, Jolly K, Hemming K, *et al.* Evaluation of Lay Support in Pregnant women with Social Risk (ELSPIS): a randomised controlled trial. *BMC Pregnancy Childbirth* 2012;12:11.
- 40 Bassuk EL, Mickelson KD, Bissell HD, *et al.* Role of kin and nonkin support in the mental health of low-income women. *Am J Orthopsychiatry* 2002;72:39–49.