

Relative contribution of maternal adverse childhood experiences to understanding children’s externalizing and internalizing behaviours at age 5: findings from the All Our Families cohort

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Abstract

Background: The negative effect of adverse childhood experiences (ACEs) on physical and mental health has led to calls for routine screening for ACEs in primary care settings. We aimed to examine the association between maternal ACEs and children’s behaviour problems (externalizing and internalizing) at age 5 in the context of other known predictors.

Methods: We analyzed data from mother-and-child dyads participating in the All Our Families cohort in Calgary, Canada, between 2011 and 2017. Data were collected for factors related to the individual child (sex, age, temperament and behaviour), the mother (adverse childhood experiences, mental health, personality and parenting) and sociodemographic characteristics (family income, ethnicity and family structure) when the children were 3 and 5 years of age. We used logistic regression models to estimate crude and adjusted associations between maternal ACEs and children’s externalizing (hyperactivity and aggression) and internalizing (anxiety, depression and somatization) behaviours.

Results: Data were available for 1688 mother-and-child dyads. In the crude models, the presence of 4 or more maternal ACEs was associated with children’s externalizing and internalizing behaviours at age 5. However, these associations were attenuated with adjustment. Persistent maternal mental health symptoms were associated with both externalizing and internalizing behaviours at age 5 (adjusted odds ratio [OR] 4.20, 95% confidence interval [CI] 2.50–7.05, and adjusted OR 2.52, 95% CI 1.66–3.81, respectively). High levels of ineffective parenting behaviours were also associated with both externalizing and internalizing behaviours at age 5 (adjusted OR 6.27, 95% CI 4.30–9.14, and adjusted OR 1.43, 95% CI 1.03–1.99, respectively).

Interpretation: The association between maternal ACEs and children’s behaviour at age 5 was weakened in the presence of other maternal and family-level factors. Assessments of maternal mental health and parenting behaviours may be better targets for identifying children at risk of behavioural problems.

Since the publication of the landmark Adverse Childhood Experiences (ACEs) study in 1998, by Felitti and colleagues,¹ there has been growing evidence about how experiences of abuse, neglect and household dysfunction before the age of 18 years relate to health outcomes over a person’s life course.^{2,3} Recently, researchers have begun to investigate whether ACEs may have intergenerational effects. For example, a retrospective study of 500 families in Oregon found that parental ACEs were associated with increased risk of suspected developmental delay in 2-year-old children.⁴ Additional evidence from larger studies has suggested that maternal adversity is associated with children’s increased behavioural challenges, including hyperactivity and conduct problems.^{5,6}

In 2012, the American Academy of Pediatrics called for routine screening in the pediatric setting for risk factors for early adversity, and asked pediatricians to take a leading role in

preventing its potential impact.⁷ Since then, the practice of routine screening for ACEs has grown across North America, accompanied by rigorous debate over the utility and potential harm associated with screening children and families for ACEs.^{8–12} However, the intergenerational influence of parental ACEs on child behaviour and development is complex, and research to date has not adequately addressed whether asking about other risk factors would be a more effective approach to identifying

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families at risk.^{13,14} For example, a parent's mental health and parenting behaviours are more proximal to the child than the parent's past childhood experiences, and these factors may therefore have a more substantial association with children's functioning. Thus, understanding the association between parental ACEs and child behaviour in the context of other individual, family and sociodemographic factors is important to gain clarity about the most important targets for assessment.

Ecological systems theory suggests that child development is influenced by factors at various levels, including those unique to the child, to the family and to the broader socioenvironmental context.¹⁵ At the child level, male sex has been consistently associated with externalizing behaviours in children, including hyperactivity and physical aggression.^{16–18} Conversely, internalizing behaviours, including anxiety and depression, are more commonly found in girls.^{19,20} Child temperament, particularly negative affect, has been associated with both externalizing and internalizing behaviours in young children.^{21–23} At the family level, maternal mental health and personality (particularly neuroticism) and parenting have been consistently linked to child behaviour.^{17,18,24–27} At the broader social level, children from families with higher levels of chaos or lower levels of income tend to exhibit more behavioural challenges.^{28–32}

We examined the association between maternal ACEs and children's behavioural difficulties in the context of individual, family and sociodemographic risk factors, including child sex and temperament, maternal mental health and affect, parenting style, family income and family composition. Specifically, we considered the role of these factors in children's externalizing difficulties (e.g., aggression and hyperactivity) and internalizing problems (e.g., anxiety and depression) at age 5, which tend to be precursors for psychopathology in later childhood.^{31,33,34}

Methods

Setting

This study was a secondary data analysis using information from women and children who participated in the All Our Families cohort in the city of Calgary, Canada.³⁵ The All Our

Families cohort is an ongoing longitudinal pregnancy cohort with rich information about a variety of repeated measures in relation to early maternal experiences, mental health, parenting and child behaviour. Given its large sample, high retention and rich psychosocial information, this data set offered an opportunity to examine factors contributing to child development in the early years.

Participants

Detailed recruitment methods are described elsewhere.^{35,36} Briefly, pregnant women were recruited from low-risk maternity clinics, by means of posters and through centralized laboratory services, between 2008 and 2010 and followed longitudinally. Inclusion criteria were age 18 or older, ability to understand English and residence in Calgary. At each data collection point, a questionnaire was sent to eligible women by mail, and the women completed and returned the questionnaire in the prepaid return envelope supplied. Participants were contacted by telephone and email to provide additional opportunities to respond or resolve unclear responses. All questionnaires were developed in consultation with experts, clinicians and community organizations serving young families, and validated instruments were used whenever possible. The questionnaires were pilot tested with mothers similar to participants (for more details, see www.allourfamiliesstudy.com). Self-reported data were collected on a wide variety of sociodemographic, maternal mental and physical health, and child development variables. For the current analysis, we used data from the 3- and 5-year follow-up waves, collected between 2011 and 2017.

Figure 1 presents information on recruitment and follow-up for relevant follow-up waves of the All Our Families cohort. Of the 3387 women originally recruited into the study, 478 (14.1%) were lost to follow-up at the 3-year point. As such, 2909 women were eligible for the 3-year follow-up, of whom 1994 (68.5%) responded. Between 3 and 5 years, a further 64 women (1.9% of the original cohort) were lost to follow-up. At 5 years, 2845 women were eligible for follow-up, of whom 1992 (70.0%) responded. For this analysis, we included information only from women who responded to

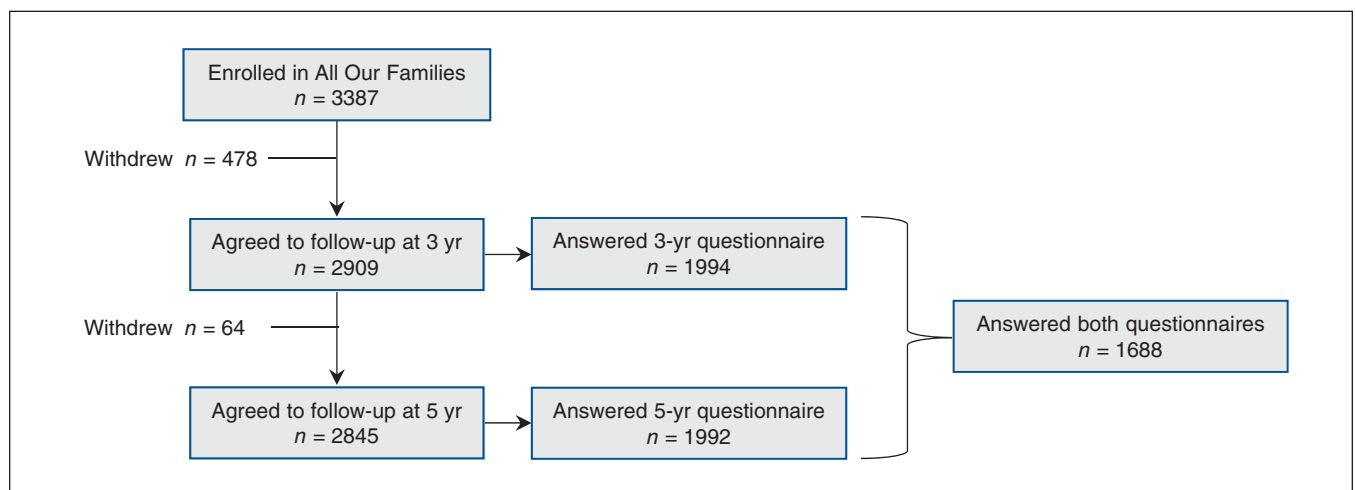


Figure 1: Flow chart for participant enrolment and response rate.

both waves of data collection ($n = 1688$), which represents 59.3% of eligible participants at 5 years. Respondents were more likely to have higher incomes, report their ethnicity as white and be older than nonrespondents, features that are common in longitudinal cohorts.³⁷

Outcome variables

We measured children's externalizing and internalizing behaviours at 5 years of age using the Behavior Assessment System for Children, second edition,³⁸ a clinical tool that is widely used to assess child behaviours. The 5-year follow-up questionnaire included the parent report version of the Behavior Assessment System for Children, which contains 124 questions about the child's behaviour, rated on a 4-point Likert scale. Scores are standardized (mean 50, standard deviation [SD] 10) and compared with a normed reference population. Children who score 60 or above are considered to be at risk for the outcome. The tool contains 2 composite scales for measuring externalizing behaviours (hyperactivity and aggression) and internalizing behaviours (anxiety, depression and somatization). For this sample, the Cronbach α for externalizing behaviours was 0.86 and for internalizing behaviours 0.88.

Primary exposure variable

We measured maternal ACEs by asking 11 questions from the original ACE questionnaire, to capture childhood experiences of physical, verbal and sexual abuse and household dysfunction (Appendix 1, available at www.cmajopen.ca/content/8/2/E352/suppl/DC1).³⁹ To be consistent with the original scoring of Felitti and colleagues,¹ and in response to All Our Families pilot testing, we simplified some of the original questions to elicit yes/no responses instead of frequencies (often/very often) for behaviours. Interpretation of an ACE score remains controversial, with some researchers treating each event as equivalent, and others noting that some events (e.g., abuse) are likely more detrimental than others (e.g., parental divorce).⁴⁰ For the primary analysis, we grouped women who experienced 4 or more ACEs as having a "high ACE score" relative to those with 3 or fewer ACEs; however, estimates for each additional ACE are also presented in our supplementary analyses.^{1,6,40}

Other variables

We included other factors known to be associated with children's behavioural outcomes, according to the literature and ecological systems theory, as described above. In the current study, factors unique to the child were child age, sex and temperament. We measured child temperament on the 3-year questionnaire using the negative affect subscale of the Rothbart Children's Behavior Questionnaire – Very Short Form.⁴¹ With this scale, parents rate their children's reactions to 12 situations about anger, sadness and fear on a 7-point Likert scale. The Cronbach α for this sample was 0.69.

At the family level, variables were maternal mental health, maternal neuroticism and parenting behaviour. Given that mental health conditions are often comorbid and can be either persistent or periodic, mental health was operationalized as the mother having depressive or anxiety symptoms

when the child was 3 years of age, 5 years of age, at both 3 and 5 years of age or at neither age.⁴² Anxiety was measured with the Spielberger State-Trait Anxiety Inventory.⁴³ We used the 20-item version of the scale at 3 years, and we considered a score of 40 or higher to be clinically significant. We used a shortened 6-item version at 5 years, which has been shown to have good validity and reliability in our sample.⁴⁴ We measured maternal depressive symptoms using the Center for Epidemiologic Studies — Depression Scale,⁴⁵ with a score of 16 or above considered clinically significant.

We measured maternal neuroticism using the 12-item Eysenck Personality Questionnaire Revised Short Scale.⁴⁶ Higher scores on this scale correspond to higher levels of neuroticism and lower emotional stability, with Cronbach α in this sample of 0.81. We measured parenting behaviour when children were 5 years of age, using the ineffective/hostile parenting subscale of the National Longitudinal Survey of Children and Youth (for a list of the questions, see Appendix 2, available at www.cmajopen.ca/content/8/2/E352/suppl/DC1).⁴⁷ On a 5-point Likert scale, parents were asked questions about the frequency of a set of parenting behaviours, including negative reinforcement, repeated discipline for the same issue and disciplining a child when angry. The Cronbach α in this sample was 0.78.

Factors at the broader social level were family income, ethnicity and family composition. Family income was reported in Canadian dollars, in \$50 000 increments from less than \$50 000 to \$200 000 or more. Ethnicity was self-reported. Because of small numbers, we collapsed minority groups for comparison with women who self-identified as "white." Family composition was categorized as "2-parent family with both biological parents," "2-parent family with 1 biological parent," "single parent" or "other." To capture family structure, we collapsed these categories to "2-parent family with both biological parents" and "single-parent or blended family." Respondents who chose "other" ($n = 27$) were categorized into 1 of the 2 categories according to the description they provided.

Statistical analysis

We first estimated crude associations between each variable and children's externalizing and internalizing behaviours using logistic regression. We then ran a fully adjusted model with all covariables and model-fit statistics. Among those who completed both the 3- and the 5-year questionnaires ($n = 1688$), there were fewer than 2% missing data for any given variable, so we used complete case analysis. We dichotomized the anxiety and depression scales at clinical cut-points. For consistency and ease of interpretation, we dichotomized all scales without clinical cut-points at 1 SD above or below the mean, as appropriate. To confirm that dichotomization of variables did not oversimplify associations, we reran the fully adjusted models with continuous predictors. For all analyses, we used STATA IC version 16 (StataCorp LLC).

Ethics approval

This study received ethics approval from the Conjoint Health Research Ethics Board at the University of Calgary.

Results

Data were available for 1688 mother-and-child dyads. Characteristics for the entire sample and subdivided according to mothers whose children had externalizing behaviours ($n = 158/1670$, 9.5%) or internalizing behaviours ($n = 273/1668$, 16.4%) are presented in Table 1. None of the children in our sample exhibited both externalizing and internalizing behaviours. Among the women, 62.0%

(1042/1682) had experienced at least 1 ACE, and 13.7% (231/1682) experienced 4 or more ACEs.

Unadjusted (crude) and adjusted odds ratios (ORs) for the associations between all variables and externalizing and internalizing behaviours at age 5 are shown in Table 2 and Table 3, respectively. The crude models showed a statistically significant association between 4 or more maternal ACEs and child behaviour at age 5. However, in the adjusted models, this association was weakened, and

Table 1: Sample characteristics					
Characteristic	Children's behaviour group; no. (%) of participant dyads*				
	Total $n = 1688$	Externalizing		Internalizing	
		Yes $n = 158$	No $n = 1512$	Yes $n = 273$	No $n = 1395$
No. of maternal adverse childhood experiences					
0	640 (38.0)	43 (27.2)	591 (39.2)	89 (32.6)	545 (39.2)
1	407 (24.2)	30 (19.0)	373 (24.8)	59 (21.6)	343 (24.7)
2	246 (14.6)	24 (15.2)	218 (14.5)	41 (15.0)	201 (14.5)
3	158 (9.4)	19 (12.0)	139 (9.2)	33 (12.1)	124 (8.9)
≥ 4	231 (13.7)	42 (26.6)	185 (12.3)	51 (18.7)	176 (12.7)
Child covariables					
Child's age, mo, mean ± SD	62 ± 3	61 ± 3	62 ± 3	61 ± 3	61 ± 3
Male sex	889 (52.9)	113 (71.5)	764 (50.7)	135 (49.5)	741 (53.3)
Negative affect (≥ 1 SD on Rothbart scale)	277 (16.4)	54 (34.2)	221 (14.6)	90 (33.0)	185 (13.3)
Maternal covariables					
Maternal age, yr, mean ± SD	36.4 ± 4.3	36.3 ± 4.5	36.4 ± 4.3	36.0 ± 4.3	36.5 ± 4.3
Depression or anxiety†					
None	1148 (69.5)	68 (43.3)	1080 (72.2)	136 (50.4)	1011 (73.3)
Depression or anxiety at 3 yr only	136 (8.2)	15 (9.6)	121 (8.1)	23 (8.5)	113 (8.2)
Depression or anxiety at 5 yr only	200 (12.1)	30 (19.1)	170 (11.4)	47 (17.4)	152 (11.0)
Depression or anxiety at 3 and 5 yr	168 (10.2)	44 (28.0)	124 (8.3)	64 (23.7)	104 (7.5)
High maternal neuroticism (≥ 1 SD on Eysenck scale)	260 (15.4)	45 (28.5)	210 (13.9)	85 (31.1)	169 (12.1)
High ineffective/hostile parenting (≥ 1 SD on parenting scale) at 5 yr	312 (18.8)	89 (57.1)	223 (14.8)	78 (28.8)	233 (16.8)
Sociodemographic covariables					
Family income, Can\$					
< 50 000	83 (5.0)	12 (7.6)	71 (4.7)	21 (7.7)	61 (4.4)
50 000 – 99 999	438 (26.4)	48 (30.4)	390 (25.9)	79 (28.9)	358 (25.8)
100 000 – 149 999	506 (30.5)	53 (33.5)	453 (30.1)	81 (29.7)	425 (30.7)
150 000 – 199 999	292 (17.6)	24 (15.2)	268 (17.8)	46 (16.8)	246 (17.7)
≥ 200 000	342 (20.6)	21 (13.3)	321 (21.4)	46 (16.8)	296 (21.4)
Minority ethnicity	295 (17.6)	28 (17.7)	264 (17.5)	66 (24.2)	225 (16.2)
Single-parent or blended family	107 (6.4)	15 (9.5)	92 (6.1)	23 (8.4)	84 (6.0)
Note: Eysenck scale = Eysenck Personality Questionnaire Revised, parenting scale = National Longitudinal Survey of Children and Youth, Rothbart scale = Rothbart Child Temperament Scale, SD = standard deviation. *Except where indicated otherwise, there were less than 2% missing data. †For data on maternal depression or anxiety, age refers to the child's age.					

Table 2: Factors associated with externalizing behaviour at age 5

Factor	Analysis type; OR (95% CI)	
	Unadjusted	Fully adjusted*
Maternal ACEs, ≥ 4	2.59 (1.75–3.80)	1.98 (1.26–3.11)
Child covariables		
Child age, mo	1.00 (0.94–1.06)	1.02 (0.96–1.08)
Male sex	2.43 (1.70–3.49)	2.88 (1.92–4.34)
Negative affect (≥ 1 SD on Rothbart scale)	3.03 (2.12–4.34)	2.41 (1.59–3.67)
Maternal covariables		
Maternal age, yr	0.99 (0.96–1.03)	0.99 (0.95–1.04)
Depression or anxiety†		
None (baseline)	1.0 (Ref.)	1.0 (Ref.)
Present at 3 yr only	1.97 (1.09–3.55)	1.53 (0.78–3.03)
Present at 5 yr only	2.80 (1.77–4.43)	2.14 (1.27–3.59)
Present at 3 and 5 yr	5.64 (3.69–8.60)	4.20 (2.50–7.05)
High maternal neuroticism (≥ 1 SD on Eysenck scale)	2.47 (1.69–3.58)	0.97 (0.60–1.57)
High ineffective/hostile parenting (≥ 1 SD on parenting scale) at 5 yr	7.61 (5.38–10.78)	6.27 (4.30–9.14)
Sociodemographic covariables		
Family income, per \$50 000 increase	0.81 (0.70–0.93)	0.86 (0.72–1.02)
Minority ethnicity	1.01 (0.66–1.56)	0.87 (0.52–1.42)
Single-parent or blended family	1.62 (0.91–2.86)	1.17 (0.59–2.32)

Noted: ACE = adverse childhood experience, CI = confidence interval, Eysenck scale = Eysenck Personality Questionnaire Revised, OR = odds ratio, parenting scale = National Longitudinal Survey of Children and Youth, Ref. = reference category, Rothbart scale = Rothbart Child Temperament Scale, SD = standard deviation.
 *Mutually adjusted for all variables in the model. In the adjusted model, $n = 1613$, C statistic = 0.8123, Hosmer–Lemeshow goodness-of-fit p value = 0.9.
 †For data on maternal depression or anxiety, age refers to the child's age.

became nonsignificant at the 0.05 level for internalizing behaviours.

Among the other child-level variables, male sex was associated with increased odds for externalizing behaviour (adjusted OR 2.88, 95% confidence interval [CI] 1.92–4.34); this association was nonsignificant at the 0.05 level for internalizing behaviour (adjusted OR 0.82, CI 0.63–1.10). Child negative affect was associated with increased odds for both externalizing and internalizing behaviours.

Among the maternal variables, mental health (particularly persistent symptoms) was associated with increased adjusted odds of children's externalizing and internalizing behaviours. High levels of maternal neuroticism were associated with increased adjusted odds of children's internalizing behaviours, but not externalizing behaviours. High levels of ineffective/hostile parenting behaviours were associated with increased adjusted odds of both externalizing and, to a lesser extent, internalizing behaviours.

The sensitivity analysis with continuous predictors showed consistent results (Appendix 3, available at www.cmajopen.ca/content/8/2/E352/suppl/DC1).

Interpretation

We found that a modest association between maternal ACEs and children's behaviours at 5 years was attenuated with adjustment for other factors at the child, maternal and family levels. Current exposures, such as parenting behaviour and maternal mental health, were associated with increased odds of child behaviour problems and consequently may be better sources of information for identifying children at risk than maternal ACEs.

The acceptability and appropriateness of the ACEs questionnaire as a screening tool remains controversial, and this questionnaire can increase patients' discomfort.^{48,49} Conversely, there are many low-cost, effective, nonstigmatizing community-based interventions to improve parenting practices, parental mental health and child behaviour, and the Canadian Paediatric Society has provided guidance on discussing parenting in the context of well-child visits.^{50–52}

Our results are consistent with other findings that the influence of maternal ACEs on child outcomes is minor relative to the influence of other factors.^{53,54} For example, research by the

Table 3: Factors associated with internalizing behaviour at age 5

Factor	Analysis type; OR (95% CI)	
	Unadjusted	Adjusted
Maternal ACEs, ≥ 4	1.58 (1.12–2.23)	1.19 (0.82–1.73)
Child covariables		
Child age, mo	1.02 (0.98–1.07)	1.02 (0.98–1.07)
Male sex	0.86 (0.65–1.11)	0.82 (0.63–1.10)
Negative affect (≥ 1 SD on Rothbart scale)	3.21 (2.39–4.32)	2.42 (1.77–3.34)
Maternal covariables		
Maternal age, yr	0.97 (0.94–1.00)	0.97 (0.94–1.01)
Anxiety or depression†		
None (baseline)	1.0 (Ref.)	1.0 (Ref.)
Present at 3 yr only	1.51 (0.93–2.45)	0.96 (0.56–1.63)
Present at 5 yr only	2.30 (1.58–3.33)	1.91 (1.28–2.84)
Present at 3 and 5 yr	4.57 (3.19–6.55)	2.52 (1.66–3.81)
High maternal neuroticism (≥ 1 SD on Eysenck scale)	3.27 (2.41–4.43)	2.21 (1.54–3.19)
High ineffective/hostile parenting (≥ 1 SD on parenting scale) at 5 yr	2.00 (1.48–2.69)	1.43 (1.03–1.99)
Sociodemographic covariables		
Family income, per \$50 000 increase	0.86 (0.78–0.97)	0.96 (0.85–1.09)
Minority ethnicity	1.65 (1.21–2.25)	1.59 (1.13–2.23)
Single-parent or blended family	1.62 (0.91–2.86)	1.22 (0.71–2.08)

Note: ACE = adverse childhood experience, CI = confidence interval, Eysenck scale = Eysenck Personality Questionnaire Revised, OR = odds ratio, parenting scale = National Longitudinal Survey of Children and Youth, Ref. = reference category, Rothbart scale = Rothbart Child Temperament Scale, SD = standard deviation.
 *Mutually adjusted for all variables in the model. In the adjusted model, *n* = 1611, C statistic = 0.7128, Hosmer–Lemeshow goodness-of-fit *p* value = 0.5.
 †For data on maternal depression or anxiety, age refers to the child's age.

Avon Longitudinal Study of Parents and Children suggested that the association between maternal ACEs and conduct problems, hyperactivity and other child behaviour was fully mediated by more proximal influences of child trauma and changes in family structure.⁵ Our study is also consistent with longitudinal and cross-sectional research showing that high levels of ineffective/hostile parenting practices are associated with child behaviour problems.²⁷ Although we cannot infer causality from observational data, this association was robust and suggests that parenting, particularly hostile parenting behaviour, is a strong indicator of child behaviour problems. Our study measured parenting and child behaviour concurrently, but our findings are consistent with longitudinal research showing that hostile parenting practices are associated with later internalizing and externalizing problems for the child.^{55,56}

Other research has suggested that maternal adversity may be associated with more parenting stress, which can negatively affect children's outcomes, or that mothers exposed to childhood abuse may be more likely to live in lower-income, unstable situations, which can increase the risk of conduct problems.^{5,54} In addition, maternal mental health, measured

by internalizing symptoms of depression and anxiety, were associated with both externalizing and internalizing behaviours in children. These findings are consistent with the literature and may be important biological and psychosocial avenues through which maternal ACEs are transmitted to children's social and emotional problems.^{17,25,57,58}

Additional research formally exploring a causal association between maternal abuse history and children's behavioural problems, with consideration of mediating effects such as parenting and mental health, will improve our understanding of potential intergenerational transmission of risk.

Limitations

This study had several limitations, including the absence of measures of fathers' mental health, personality and parenting. In addition, mothers reported their own mental health, personality and parenting, as well as the behaviour and temperament of their children. This self-reporting could lead to reporting bias; for example, mothers with mental health challenges may be more likely to report that a child has behavioural problems.⁵⁹

Some of our covariables were measured concurrently, and there is likely a bidirectional association between mental health, parenting behaviours, child affect and behavioural problems.^{60,61}

Our study was strengthened by the large sample size and high response rates over 5 years of follow-up; however, of the 2845 women eligible for follow-up at 5 years, we had complete information for only 1688 (59.3%). Nonrespondents were more likely to have lower income and to be of a minority ethnicity. We expect both maternal ACEs and child behavioural problems to be higher in these groups, which would mean that our study underestimated associations and potentially biased our results toward the null.³⁵ However, research from longitudinal child behaviour studies has suggested that the magnitude of bias from differential attrition is minimal in adjusted analyses.⁶² Our results may be considered broadly generalizable to middle or upper income families, but may not be applicable to higher-risk groups, including lower-income, single-parent or minority families.

Conclusion

We sought to understand whether maternal ACEs were associated with children's behaviour difficulties when individual, parent and family factors were considered. Our results indicate that mothers' mental health and parenting behaviour may be better targets for assessment and intervention within the pediatric setting than parental ACEs. Using a trauma-informed approach with all families, one that considers past parental experiences while focusing on the current presentation, strengths and sources of support, may be the optimal way to support parents and children.

References

1. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med* 1998;14:245-58.
2. 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.
3. Shonkoff JP, Garner AS, Siegel BS, et al.; Committee on Psychosocial Aspects of Child and Family Health; Committee on Early Childhood, Adoption, and Dependent Care; Section on Developmental and Behavioral Pediatrics. The lifelong effects of early childhood adversity and toxic stress. *Pediatrics* 2012; 129:e232-46.
4. Folger AT, Eismann EA, Stephenson NB, et al. Parental adverse childhood experiences and offspring development at 2 years of age. *Pediatrics* 2018; 141:e20172826.
5. Collishaw S, Dunn J, O'Connor TG, et al.; Avon Longitudinal Study of Parents and Children Study Team. Maternal childhood abuse and offspring adjustment over time. *Dev Psychopathol* 2007;19:367-83.
6. McDonald SW, Madigan S, Racine N, et al. Maternal adverse childhood experiences, mental health, and child behaviour at age 3: the All Our Families community cohort study. *Prev Med* 2019;118:286-94.
7. Garner AS, Shonkoff JP; Committee on Psychosocial Aspects of Child and Family Health; Committee on Early Childhood, Adoption, and Dependent Care; Section on Developmental and Behavioral Pediatrics. Early childhood adversity, toxic stress, and the role of the pediatrician: translating developmental science into lifelong health. *Pediatrics* 2012;129:e224-31.
8. Dube SR. Continuing conversations about adverse childhood experiences (ACEs) screening: a public health perspective. *Child Abuse Negl* 2018;85:180-4.
9. Finkelhor D. Screening for adverse childhood experiences (ACEs): cautions and suggestions. *Child Abuse Negl* 2018;85:174-9.
10. McLennan JD, MacMillan HL, Afifi TO, et al. Routine ACEs screening is NOT recommended. *Paediatr Child Health* 2019;24:272-3.
11. Watson P. Moving upstream: the case for ACEs screening. *Paediatr Child Health* 2019;24:274-5.
12. Racine N, Killam T, Madigan S. Trauma-informed care as a universal precaution: beyond the Adverse Childhood Experiences Questionnaire. *JAMA Pediatr* 2020;174(1):5-6.

13. Bair-Merritt MH, Zuckerman B. Exploring parents' adversities in pediatric primary care. *JAMA Pediatr* 2016;170:313-4.
14. Christakis DA. Focusing on the smaller adverse childhood experiences: the overlooked importance of ACEs. *JAMA Pediatr* 2016;170:725-6.
15. Bronfenbrenner U, editor. Ecological systems theory (1992). In: *Making human beings human: bioecological perspectives on human development*. Thousand Oaks (CA): Sage Publications; 2005:106-73.
16. Entwisle DR, Alexander KL, Olson LS. Early schooling: the handicap of being poor and male. *Sociol Educ* 2007;80:114-38.
17. Romano E, Tremblay RE, Farhat A, et al. Development and prediction of hyperactive symptoms from 2 to 7 years in a population-based sample. *Pediatrics* 2006;117:2101-10.
18. Hetherington E, McDonald S, Racine N, et al. Risk and protective factors for externalizing behavior at three years: results from the All Our Families (AOF) pregnancy cohort. *J Dev Behav Pediatr* 2018;39:547-54.
19. Liu J, Chen X, Lewis G. Childhood internalizing behaviour: analysis and implications. *J Psychiatr Ment Health Nurs* 2011;18:884-94.
20. Keiley MK, Bates JE, Dodge KA, et al. A cross-domain growth analysis: externalizing and internalizing behaviors during 8 years of childhood. *J Abnorm Child Psychol* 2000;28:161-79.
21. Eisenberg N, Valiente C, Spinrad TL, et al. Longitudinal relations of children's effortful control, impulsivity, and negative emotionality to their externalizing, internalizing, and co-occurring behavior problems. *Dev Psychol* 2009;45:988-1008.
22. Crawford NA, Schrock M, Woodruff-Borden J. Child internalizing symptoms: contributions of child temperament, maternal negative affect, and family functioning. *Child Psychiatry Hum Dev* 2011;42:53-64.
23. Hentges RF, Graham SA, Plamondon A, et al. A developmental cascade from prenatal stress to child internalizing and externalizing problems. *J Pediatr Psychol* 2019;44:1057-67.
24. Tremblay RE, Nagin DS, Séguin JR, et al. Physical aggression during early childhood: trajectories and predictors. *Pediatrics* 2004;114:e43-50.
25. Madigan S, Oatley H, Racine N, et al. A meta-analysis of maternal prenatal depression and anxiety on child socio-emotional development. *J Am Acad Child Adolesc Psychiatry* 2018;57:645-57.e8.
26. Côté SM, Vaillancourt T, LeBlanc JC, et al. The development of physical aggression from toddlerhood to pre-adolescence: a nation wide longitudinal study of Canadian children. *J Abnorm Child Psychol* 2006;34:71-85.
27. Browne DT, Oduyungbo A, Thabane L, et al. Parenting-by-gender interactions in child psychopathology: attempting to address inconsistencies with a Canadian national database. *Child Adolesc Psychiatry Ment Health* 2010;4:5.
28. Hardaway CR, Wilson MN, Shaw DS, et al. Family functioning and externalizing behaviour among low-income children: self-regulation as a mediator. *Infant Child Dev* 2012;21:67-84.
29. Coldwell J, Pike A, Dunn J. Household chaos — links with parenting and child behaviour. *J Child Psychol Psychiatry* 2006;47:1116-22.
30. Evans GW, Kim P. Childhood poverty, chronic stress, self regulation, and coping. *Child Dev Perspect* 2013;7:43-8.
31. Mesman J, Koot HM. Early preschool predictors of preadolescent internalizing and externalizing DSM-IV diagnoses. *J Am Acad Child Adolesc Psychiatry* 2001;40:1029-36.
32. McCulloch A, Joshi HE. Child development and family resources: evidence from the second generation of the 1958 British birth cohort. *J Popul Econ* 2002;15:283-304.
33. Pihlakoski L, Sourander A, Aromaa M, et al. The continuity of psychopathology from early childhood to preadolescence: a prospective cohort study of 3-12-year-old children. *Eur Child Adolesc Psychiatry* 2006;15:409-17.
34. Morgan PL, Farkas G, Wu Q. Kindergarten predictors of recurring externalizing and internalizing psychopathology in 3rd and 5th grade. *J Emot Behav Disord* 2009;17:67-79.
35. Tough SC, McDonald SW, Collisnoff BA, et al. Cohort profile: the All Our Babies pregnancy cohort (AOB). *Int J Epidemiol* 2017;46:1389-90k.
36. McDonald SW, Lyon AW, Benzies KM, et al. The All Our Babies pregnancy cohort: design, methods, and participant characteristics. *BMC Pregnancy Childbirth* 2013;13(Suppl 1):S2.
37. Young AF, Powers JR, Bell SL. Attrition in longitudinal studies: Who do you lose? *Aust N Z J Public Health* 2006;30:353-61.
38. Kamphaus RW. Behavior Assessment System for Children, second edition (BASC 2). In: *The encyclopedia of clinical psychology*. John Wiley & Sons, Inc.; 2014:1-6.
39. National Center for Injury Prevention and Control, Division of Violence Prevention. *Behavioral risk factor surveillance system ACE data*. Atlanta: Centers for Disease Control and Prevention; 2009.
40. LaNoue MD, Cunningham AT, Kenny LC, et al. What do adults think about their adverse childhood experiences (ACEs), and does it matter? *Community Ment Health J* 2020 Feb. 17 [Epub ahead of print]. doi: 10.1007/s10597-020-00580-0.
41. Putnam SP, Rothbart MK. Development of short and very short forms of the Children's Behavior Questionnaire. *J Pers Assess* 2006;87:102-12.
42. Hetherington E, McDonald S, Williamson T, et al. Social support and maternal mental health at 4 months and 1 year postpartum: analysis from the All Our Families cohort. *J Epidemiol Community Health* 2018;72:933-9.
43. Spielberger CD, Gorsuch RL, Lushene R, et al. *Manual for the State-Trait*

- Anxiety Inventory*. Palo Alto (CA): Consulting Psychologist's Press; 1983.
44. Bayrampour H, McDonald S, Fung T, et al. Reliability and validity of three shortened versions of the State Anxiety Inventory scale during the perinatal period. *J Psychosom Obstet Gynaecol* 2014;35:101-7.
 45. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas* 1977;1:385-401.
 46. Eysenck SB, Eysenck HJ, Barrett P. A revised version of the psychoticism scale. *Pers Individ Dif* 1985;6:21-9.
 47. *National Longitudinal Survey of Children and Youth (NLSCY): detailed information for 2000-2001 (Cycle 4)*. Ottawa: Statistics Canada; modified 2017 Oct. 24.
 48. Skar AMS, Ormhaug SM, Jensen TK. Reported levels of upset in youth after routine trauma screening at mental health clinics. *JAMA Netw Open* 2019;2:e194003.
 49. Flanagan T, Alabaster A, McCaw B, et al. Feasibility and acceptability of screening for adverse childhood experiences in prenatal care. *J Womens Health (Larchmt)* 2018;27:903-11.
 50. Williams RC, Biscaro A, Clinton J. Relationships matter: how clinicians can support positive parenting in the early years. *Paediatr Child Health* 2019;24:340-57.
 51. Perrin EC, Sheldrick RC, McMenamy JM, et al. Improving parenting skills for families of young children in pediatric settings: a randomized clinical trial. *JAMA Pediatr* 2014;168:16-24.
 52. Furlong M, McGilloway S, Bywater T, et al. Behavioural and cognitive behavioural group based parenting programmes for early onset conduct problems in children aged 3 to 12 years. *Cochrane Database Syst Rev* 2012;(2):CD008225.
 53. Racine NM, Madigan SL, Plamondon AR, et al. Differential associations of adverse childhood experience on maternal health. *Am J Prev Med* 2018;54:368-75.
 54. Steele H, Bate J, Steele M, et al. Adverse childhood experiences, poverty, and parenting stress. *Can J Behav Sci* 2016;48:32-8.
 55. Edwards RC, Hans SL. Infant risk factors associated with internalizing, externalizing, and co-occurring behavior problems in young children. *Dev Psychol* 2015;51:489-99.
 56. Taylor CA, Manganello JA, Lee SJ, et al. Mothers' spanking of 3-year-old children and subsequent risk of children's aggressive behavior. *Pediatrics* 2010;125:e1057-65.
 57. Goodman SH, Rouse MH, Connell AM, et al. Maternal depression and child psychopathology: a meta-analytic review. *Clin Child Fam Psychol Rev* 2011;14:1-27.
 58. Barker ED, Jaffee SR, Uher R, et al. The contribution of prenatal and postnatal maternal anxiety and depression to child maladjustment. *Depress Anxiety* 2011;28:696-702.
 59. Durbin CE, Wilson S. Convergent validity of and bias in maternal reports of child emotion. *Psychol Assess* 2012;24:647-60.
 60. Plamondon A, Browne DT, Madigan S, et al. Disentangling child-specific and family-wide processes underlying negative mother-child transactions. *J Abnorm Child Psychol* 2018;46:437-47.
 61. Nicholson JS, Deboeck PR, Farris JR, et al. Maternal depressive symptomatology and child behavior: transactional relationship with simultaneous bidirectional coupling. *Dev Psychol* 2011;47:1312-23.
 62. Wolke D, Waylen A, Samara M, et al. Selective drop-out in longitudinal studies and non-biased prediction of behaviour disorders. *Br J Psychiatry* 2009;195:249-56.

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