The associations between childhood maltreatment and pregnancy complications: a systematic review and meta-analysis

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Abstract

Introduction. Childhood maltreatment is associated with pregnancy complications. This study aimed to systematically review and quantitatively synthesize the strength of the associations between maternal histories of childhood maltreatment and the risk of preterm delivery, low birth weight, and gestational diabetes.
Methods. Subject Headings and keywords for childhood maltreatment and the pregnancy outcomes were searched in MEDLINE (Ovid; 1946-Present), PsycINFO (Ovid; 1806-Present), and Web of Science Core Collection. Original studies or dissertations that reported quantitative associations between childhood maltreatment and any of the pregnancy outcomes of interest were included. Two independent reviewers selected the pertinent studies, assessed the risk of bias, and extracted data. Pooled effect sizes were calculated for the three outcomes.
Results. Twenty-eight studies were reviewed and 22 were meta-analysed. Maternal childhood maltreatment was associated with preterm birth (OR = 1.27 95% CI: 1.06–1.52, $p = 0.001$), low birth weight (OR = 1.42 95% CI: 1.10-1.83, $p = 0.001$), and gestational diabetes (RR = 1.37 95% CI: 1.02-1.83, $p = 0.03$), however high levels of heterogeneity were found. Findings were insignificant for studies examining gestational age and birth weight as continuous variables.
Discussion. Findings confirm that under certain conditions, childhood maltreatment is associated with pregnancy outcomes. Future research should prioritize mediation and moderation models to clarify the mechanisms underlying these relationships. Trauma-informed care is needed to tailor the appropriate care for expecting mothers.

Keywords. Childhood maltreatment, preterm birth, low birth weight, and gestational diabetes

Childhood maltreatment (CM; emotional, physical, and sexual abuse, physical and emotional neglect, and exposure to intimate partner violence) prevalence estimates range from a quarter to a third of adults in higher-income countries[1] and greater than half of the adults in lower-income countries[2]. The widespread occurrence of CM is concerning because, in addition to its immediate effects, it can predict deleterious health outcomes in adulthood including psychopathology[3,4] and cardiovascular disease[5]. Further, a growing body of literature examined the impact of CM on the prenatal (before birth) and the perinatal (immediately before and after birth) periods revealing that CM is associated with preterm birth[6], low birth weight[7], and gestational diabetes[8]. Preterm birth and low birth weight can impact the child's development leading to cognitive and mental health difficulties[9,10]. Furthermore, untreated gestational diabetes can increase the child's risk of obesity during childhood and adolescence[11]. While by no means is the mother responsible for the possible pregnancy outcomes attributed to the maltreatment, understanding these relationships is essential for prevention initiatives.

For all expecting families, pregnancy is a critical period for psychological reorganization which can affect one's physical and emotional health. Slade and colleagues[12] theorized that, for pregnant women, becoming a parent activates their own internalized parental identity which is directly shaped by their relationship with their caregiver. The more strained this relationship is, the more fraught the psychological reorganization experience can be[12]. Pregnancy may evoke painful memories of being parented for CM survivors, which may, in turn, elicit negative emotions surrounding thoughts of becoming a parent and managing stressors associated with pregnancy and parenting[13]. This can lead pregnant survivors to be particularly vulnerable to chronic stress and psychopathology [12,14,15]. This theory has been supported by empirical work suggesting that pregnant survivors of CM were found to experience more

depression and anxiety symptoms than pregnant individuals with other or no experiences of childhood adversity[16].

Furthermore, CM can have physiological and behavioural impacts during the prenatal and perinatal periods. Greater hair cortisol levels have been found in pregnant women with a history of CM compared to counterparts without such histories[17]. High cortisol levels during pregnancy is notable as it can activate pathways involved in the timing of parturition (e.g., hypothalamic–pituitary–adrenal axis and infection/inflammatory pathways[15]). Additionally, stress is associated with smoking and substance use, and, when done in pregnancy, these are risk factors for adverse birth outcomes[18]. Finally, elevated stress hormones can trigger insulin resistance in the mother thereby increasing the risk for gestational diabetes[19].

Nonetheless, primary investigations on the effects of CM on pregnancy complications are contradictory; some evidence supports these relationships[8,20,21] and others do not[22,23,24]. Indeed, a systematic review of six studies examining the effects of childhood sexual abuse on preterm birth discovered some evidence for and against the relationship[25]. Furthermore, a meta-analysis (N = 16 studies) examining the effects of maternal trauma prior to conception (i.e., adult abuse, CM) on the infant found that trauma during childhood increased the risk of infant low birth weight by 57% [26].

This area of study has expanded over the past few years with at least seven new articles on CM and pregnancy complications since 2017. An updated synthesis of the literature will provide a needed overview of the up-to-date knowledge. A preliminary search of the literature revealed that multiple types of CM, beyond childhood sexual abuse, are associated with pregnancy complications[27], and that preterm birth, low birth weight, and gestational diabetes are the most commonly studied complications concerning CM[6,8]. Accordingly, this paper aims to

systematically review and quantitatively synthesize the literature on the association between maternal histories of CM and preterm birth, low birth weight, and gestational diabetes. This literature review will notify healthcare workers of the importance of trauma-screening to provide informed supports for expecting mothers and help orient future research on CM and pregnancy complications through identified gaps in the literature.

Methods

Search Strategy and Inclusion Criteria

In collaboration with a librarian, subject headings and keywords for CM, gestational length, birth weight, and gestational diabetes were searched on May 22, 2020, in 1) MEDLINE (Ovid; 1946-Present); 2) PsycINFO (Ovid; 1806-Present); and 3) Web of Science Core Collection. In the current paper, the definition of CM included experiences of physical abuse, sexual abuse, psychological abuse, physical neglect, emotional neglect, as well as exposure to intimate partner violence before the age of 18. Searches were limited to quantitative or mixed methods published studies or dissertations/theses written in English or French. The search strategy was peer-reviewed and approved by Dr. Megan Smith, DrPH, an Associate Professor in the Yale School of Medicine and the Yale School of Public Health. See Appendix A for the complete search strategy. Three additional records were identified through handsearching.

All abstracts were imported into Rayyan software[28]. Titles and abstracts were screened by three raters until raters reached 100% agreement. Then, two raters continued screening titles and abstracts independently. When disagreements occurred, they were discussed and resolved. The full-text articles were screened simultaneously by two researchers until they reached 100% agreement. Articles were excluded from the review if they: (1) did not report at least a bivariate association between CM and one of the three outcomes; (2) did not have a control group of non-

maltreated individuals; and (3) did not differentiate between CM and other adverse childhood experiences (e.g., natural disaster and parental separation). Studies were excluded from the meta-analysis if they reported insufficient information to compute an effect size and authors did not respond to our request for additional data. Study findings were combined for analysis if they used the same sample as another study in the same outcome. An updated search was done on February 4, 2022 and yielded no additional studies fitting our inclusion criteria.

Assessment of risk of bias

The National Heart, Lung, and Blood Institute's Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools) was used to assess the risk of bias in the studies. Items cover the sampling procedure, the reliability and validity of the measures, and the measurement of confounding variables in the analyses. The overall quality rating was indicated by a qualitative label of good, fair, and poor. Two researchers conducted the quality assessments for each article independently and then combined their ratings.

Data extraction

A researcher-constructed data extraction sheet was utilized to record data from the studies. Information was extracted from each study on (1) study aims; (2) study characteristics (e.g., study design); (3) sample characteristics (e.g., recruitment strategy); (4) exposure and outcome variables and measures; (5) principal results; and (6) study limitations. Corresponding authors were contacted for missing data. One researcher from our team extracted the data and another researcher independently reviewed it.

Data synthesis

Five meta-analyses were conducted using Comprehensive Meta-analysis[29]. Studies varied on reporting preterm birth and low birth weight as dichotomous and continuous variables. Accordingly, effect sizes were calculated for preterm birth (dichotomous), low birth weight (dichotomous), gestational diabetes (dichotomous), gestational age (continuous), and birth weight (continuous).

For all studies examining CM and preterm birth or low birth weight as dichotomous variables, the Odds Ratio, 95% confidence interval, and *p*-value were computed. For studies examining gestational diabetes, the Risk Ratio, 95% confidence interval, and *p*-value were computed for each study. Finally, for all studies examining CM and gestational age or birth weight as continuous variables, Hedge's g, 95% confidence interval, and *p*-value were computed.

To calculate the mean effect size for each pregnancy complication, individual effect sizes were pooled using a random-effect model as study characteristics varied (e.g., study design and predictors). Heterogeneity was assessed among each group using I^2 and chi-squared statistics (Q). Given the potential impact on studies' findings, four moderators were investigated if the sample size was sufficient (greater than 3 studies): abuse type, age of mothers, study quality, and sample size. To be succinct, only significant moderators were reported below. A funnel plot and adjusted N were used to measure publication bias.

Results

The initial search yielded 4645 results, and after the deduplication process, 4166 results were screened for eligibility based on their titles and abstracts. One-hundred and seventy-seven articles remained for full-text examination. For the final sample, a total of 28 studies were reviewed and 22 were included in the meta-analyses. See Figure 1 for a PRISMA flow diagram.

Characteristics of each study can be found in Table 1. Fourteen studies examined the association between CM and preterm birth or gestational age; 19 studies reported an association between CM and birth weight; and two studies examined the relationship between CM and gestational diabetes. Most studies were conducted in the United States (n = 15; 68%); two were conducted in both Brazil and Germany; one study was conducted in each Norway, South Africa, and Australia. Even though most studies were conducted in the United States, ethnocultural demographics were mostly diverse (e.g., studies with 70-100% African American or Hispanic samples, or samples that were 40-65% Caucasian). Four studies (18%) reported having primarily Caucasian samples (90%+ Caucasian). Studies had a wide range of sample sizes (n = 17 -150 000). Five studies (23%) had small samples of less than 100 participants, seven (32%) had medium samples of 100 to 500 participants, and 10 (45%) had large samples of more than 500 participants. Four of the large studies had samples of more than 30 000 participants. Finally, most studies (n = 13; 60%) included adult mothers (Mage = 28); nine studies (40%) were with adolescent mothers (Mage = 17).

Preterm Birth

Eleven studies examined preterm birth (dichotomous) and three examined gestational age (continuous) (Table 1). Three studies used the same sample and methods[27,30,31] and were combined for the analysis. See Table 1 for a summary of all reviewed studies.

For the meta-analysis on preterm birth (dichotomous), a total of 88,831 participants were included. Pooled OR for preterm birth among the nine studies was 1.27 (95% CI: 1.06–1.52, $p <$ 0.001); however, there was a large level of heterogeneity (I^2 = 75%, Q = 32.44). Main analyses for each outcome were presented in Table 2. Analyses within sub-groups (Table 3) revealed that childhood sexual abuse (n = 6) increased the odds of preterm birth by 23% (OR = 1.23 95% CI:

1.04-1.47, $p = 0.02$, $I^2 = 65\%$, $Q = 15.70$) compared to women without such histories. Other abuse types were non-significant. Studies were additionally stratified by maternal age. The pooled OR for preterm birth among three studies with adolescent samples was 1.43 (95% CI: 1.00-2.04, $p = 0.05$, $I^2 = 50.42$, $Q = 4.03$), while the adult sub-group analysis was non-significant. To determine whether large samples were overestimating the pooled effect size, they were removed from the analysis ($n = 3$). The effect of CM on preterm birth remained and was higher than whole group analysis (OR = 1.82 95% CI: 1.20-2.75, $p = 0.01$, $I^2 = 42.35$, $Q = 8.67$). The effect size for all controlled analyses corresponded to a z-value of 5.98 ($p < .01$); signifying at least 75 studies with a null effect would be needed to invalidate our findings. Using Duval and Tweedie's Trim and Fill method, four additional studies would need to fall on the left of the mean effect size for a symmetrical funnel plot (see Figure 2). The new imputed effect size was OR = 1.17 (95% CI: 0.98-1.41, Q = 39.12). This is significantly smaller than the original effect size, indicating publication bias is present and findings should be interpreted with caution.

Among studies examining the continuous relationship between CM and gestational age, 973 participants were included. No effect was found between CM and gestational age (Hedge's g = -0.08 95% CI: -0.26-0.10, $p = 0.37$, $I^2 = 34.14\%$, $Q = 3.04$).

Summary of the Risk of Bias Appraisals

Five of the 14 reviewed studies were rated of good methodological quality, eight fair, and one poor. Twelve out of the 14 studies used a longitudinal design. However, only 43% of studies used robust measures (Table 1). No study, with the exception of one[30], justified their sample size through a power analysis raising concerns for statistical power, particularly for studies with less than 30 participants[20,32]. Finally, seven studies documented the association between CM and preterm birth using bivariate analyses (Table 1). The remaining used multivariate analyses,

however, only three articles controlled for important covariates (e.g., substance use and smoking during pregnancy[33,34,35]).

Low Birth Weight

Eight of the included studies examined low birth weight as a dichotomous outcome variable and 11 examined infant birth weight as a continuous variable (Table 1). Three studies were combined for the meta-analysis for having the same sample and methods[23,36,37]. Two studies were excluded from the meta-analysis for having insufficient data to compute an effect size[38,39]. See Table 1 for a summary of studies that were excluded from the meta-analysis.

A total of 186,906 participants were included in the analysis examining CM and low birth weight (dichotomous). Pooled OR for low birth weight among the six studies was 1.42 (95% CI: 1.10-1.83, $p = 0.001$, $I^2 = 80.82\%$, $Q = 26.07$). Similar to preterm birth, sexual abuse was the only abuse sub-group that was significant ($n = 4$, OR = 1.44 95% CI: 1.25-1.65, $p < 0.001$, $I^2<0.01$, $Q = 2.49$). Additionally, in adolescent samples, the odds of low birth weight were significantly higher for mothers with abuse histories ($n = 4$; OR = 1.53 95% CI: 1.13-2.07), $p = 0.01$, $I^2 = 88.44$, $Q = 25.95$), however, not in adult sub-samples ($n = 2$). When studies with large sample sizes were removed from the analysis ($n = 2$), the effect was non-significant (OR = 1.73 95% CI: (0.97-3.08), $p = 0.06$, $I^2 = 63.89$, $Q = 8.31$). The effect size for all controlled analyses corresponded to a z-value of 6.28 ($p < .001$); signifying at least 56 studies with a null effect would be needed to invalidate our findings. Using Duval and Tweedie's Trim and Fill method, one additional study would need to fall on the left of the mean effect size for a symmetrical funnel plot (See Figure 3). The new imputed effect size was OR = 1.35 (95% CI: 1.04-1.75, $Q = 30.50$). Findings for this outcome remained significant and are, therefore, robust.

An analysis of 5 356 participants revealed a non-significant relationship between CM and birth weight (continuous variable; Total Hedge's g = -0.02 95% CI: -0.18-0.15, $p = 0.86$, $I^2 = 84.55\%$, $Q = 58.25$). Interestingly, two studies produced findings counter to the hypothesis[40,41], although neither of these studies controlled for covariates (e.g., gestational diabetes).

Summary of the Risk of Bias Appraisals

Four studies' methodological qualities were rated good, 11 fair, and four poor. No studies justified their sample size and two studies had sample sizes of less than 30 participants[20,40]. Forty-two percent of studies used valid and reliable measures (Table 1). Five of the 19 studies conducted multivariate analyses, controlling for socio-demographic characteristics, substance use, smoking, stress, and psychopathology as covariates in the relationship (Table 1).

Gestational Diabetes

Two studies examined the effects of CM on gestational diabetes[8,42], and a total of 51,867 participants were included in the analysis. Both studies were of good quality: longitudinal design, large sample sizes, used valid and reliable measures, and conducted multivariable analyses. Pooled Risk Ratio (RR) revealed that pregnant women with a history of CM, specifically physical abuse, were 37% more likely of being diagnosed with gestational diabetes compared to women without such histories (RR = 1.37 95% CI: 1.02-1.83, $p = 0.03$; $I^2 = 58.44\%$, $Q = 2.41$).

Discussion

This study aimed to quantitatively synthesize the relationships between CM and preterm birth, low birth weight, and gestational diabetes. When outcomes were dichotomized, women with CM histories had a 27% greater chance of having a preterm birth, a 42% greater chance of having a low birth weight infant, and a 37% greater risk of gestational diabetes compared to women without CM histories. However, when outcomes were continuous, findings were non-

significant. High variability among studies' results was detected for preterm birth and low birth weight, which could be partially accounted for by abuse type and maternal age. This suggests that sexual abuse history and adolescent pregnancy could uniquely increase maltreated mothers' vulnerability to delivering prematurely or having a low birth weight infant. Overall, this study is unable to confirm the relationships between CM and preterm birth and low birth weight, given the discrepancy between dichotomous and continuous findings. Potential explanations for these discrepancies will be further explored.

First, statistical implications can present when continuous variables are dichotomized[43]. While dichotomizing continuous variables can ease interpretation and results presentation[44], drawbacks include reduced statistical power and effect size, loss of information for individuals close to the cutpoint, and increased occurrence of spurious significant findings[44,45]. It is not rare for statistical significance to increase after dichotomization[43]. In the reviewed studies, dichotomizing gestational age and birth weight could have possibly introduced bias. Hence, findings with dichotomous outcomes may overestimate the effects of CM on pregnancy complications.

Additionally, childhood sexual abuse may be of central importance in predicting pregnancy complications and potentially contribute to the discrepancies of the results. In sub-group analyses, childhood sexual abuse was the only significant abuse type for both preterm birth and low birth weight. Indeed, three studies analysed different abuse types as predictors and determined that an effect only existed when a sexual element was involved in the abuse[6,33,34]. Nonetheless, 87% of studies examining continuous gestational age or birth weight tested non-specified CM as the exposure variable. Given the evidence for the strong association between childhood sexual abuse and pregnancy complications, grouping all abuse types into one exposure

variable may be flushing out the effect of childhood sexual abuse and nullifying results. Although some studies included in this meta-analysis found non-significant links between childhood sexual abuse and continuous birth weight[40,41], they were limited by small sample sizes and lack of valid measures. Future studies should examine the role of childhood sexual abuse specifically in relation to pregnancy complications using robust statistical analyses.

Furthermore, it is important to consider the nature of samples when exploring potential explanations for the discrepancies between dichotomous and continuous results. The majority of continuous studies examined community samples. Contrarily, the majority of dichotomous studies examined at-risk samples including clinical, child protection services (CPS), or adolescent mothers' samples. These samples are considered at-risk as they can be exposed to increased levels of risk factors at multiple levels of the social ecology than the general population. For instance, they are at greater risk for a history of polyvictimization[46], cumulative adverse childhood experiences[47], intimate partner violence[48], and health concerns[33], all of which can result in greater stress levels. Additionally, in adolescent samples, participants may have been more proximal to the maltreatment. As aforementioned, maternal stress is the hypothesized mechanism in the relationship between CM and pregnancy complications[15]. Accordingly, these at-risk mothers could experience more pregnancy complications due to their higher stress levels in general, rather than the stress purely derived from their CM histories. Taken together, it may be warranted to examine childhood sexual abuse *in addition* to other stressful experiences when studying the impacts of CM on pregnancy complications.

In terms of the gestational diabetes outcome, only two studies were included. However, the aggregate sample of these studies contained 51,867 participants and they were both appraised to be of good methodological quality. Both studies determined that survivors of CM, specifically

physical and sexual abuse, are at greater risk of developing gestational diabetes and that maltreatment severity and polyvictimization can further increase this risk. These findings remained significant after controlling for preconception weight, suggesting that weight status alone does not explain this association. Schoenaker and colleagues[42] alluded to the potential role of adult mental health in mediating this relationship based on their findings that only women with histories of physical abuse and antenatal depression displayed a greater risk of having gestational diabetes. Nevertheless, findings suggested that CM status could have the potential to identify women at increased risk for gestational diabetes and should be further explored as a determinant of pregnancy health concerns. This small body of research supports the notion of this paper which raises the importance of tailoring prenatal interventions to address the psychological and social sequelae of early maltreatment exposures in order to prevent cascading effects of CM onto the next generation.

Limitations and Implications

Although this study is unique in meta-analytically identifying the relationships between CM and preterm birth, low birth weight, and gestational diabetes, some limitations are worthy of discussion. Interpretation of significant findings should be done with caution considering the substantial levels of heterogeneity. All sources of heterogeneity were not explored as per the lack of information provided by the studies (e.g., demographic backgrounds and nulliparity). In addition, publication bias was identified in the preterm birth outcome. As preterm birth was limited by sample size (as well as the other outcomes examined), more studies would be needed to more accurately determine the effect size of CM on these outcomes. Furthermore, included studies ranged in quality with only 40% rated as good and therefore having low risks of bias. Although the sub-group analyses found study quality as non-significant for each outcome,

shortcomings of the included studies impact the overall quality of the meta-analyses. For instance, studies (n = 12) were limited by a lack of control variables (e.g., smoking and substance use[49]). Only two studies within the sample examined adult victimization as a covariate[7,34]. This is notable given the high revictimization rates for CM survivors[50] as well as the widely supported relationship between victimization during pregnancy and adverse birth outcomes, including preterm birth and low birth weight[51]. Moreover, in some studies examining child sexual abuse in adolescent mothers, authors did not clarify whether the abuse lead to the conception. Finally, CM could have been underreported given the stigmatization of survivorship status. Forty-six percent of studies did not use robust measures of CM, possibly impacting participant disclosure[52].

Future research on this topic should compose of longitudinal designs with validated measurements of CM, ideally using both sound self-report and official CPS data[53], and pregnancy outcomes (e.g., birth charts). Studies examining mediators (e.g., health problems and cumulated stress[26,54]) and moderators (e.g., psychopathology[55], smoking[49], and intimate partner violence[51]) in these relationships will help understand the pathways in which these relationships exist. To clarify further the effect of dichotomizing pregnancy outcomes, studies could analyze both continuous and dichotomous variables to determine whether the nature of the outcome variable influences the effect. Furthermore, childhood sexual abuse in addition to other types of childhood stressors could be further examined as predictors of preterm birth and low birth weight. Finally, this study explored select pregnancy outcomes and further research could benefit from examining the effects of CM on other important outcomes such as infant mortality. As we only identified two studies examining the association between CM and gestational diabetes, more research is additionally needed on this topic.

Despite the inconsistent findings surrounding CM's impact on pregnancy complications, the magnitude of their potential consequences is too grand to not explore clinical recommendations. As maternal CM has the possibility to affect the health and development of the mother and infant, routine screening for trauma history is essential to tailor the appropriate prenatal and postnatal care[56]. Many current prenatal interventions for gestational diabetes, for instance, seem to largely focus on nutrition, exercise, and weight control[57], and could benefit from a trauma-informed perspective as well. A recent feasibility study on trauma-screening in prenatal settings discovered that the majority of patients found sharing their CM experiences with healthcare providers was acceptable and comfortable, and clinicians felt that it worked well into a standard workflow and paired well with referral resources[58].

Conclusion

Overall, understanding a pregnant woman's abuse history can inform prenatal care practices considering the potential risk of pregnancy complications. Given the high prevalence rates of CM and traumatic experiences in general across all strata of society, implementing trauma-informed practices with expecting mothers should become a priority of healthcare organizations.

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Competing Interest Statement

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Authors have no competing interests to report.

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Table 1.
Included studies documenting association between CM and preterm birth, low birth weight, and gestational diabetes

Reference	Study Aims	Study Setting and Quality Appraisal	Sample	Relevant Exposure and Measure	Relevant Outcome and Measure	Principal Results
Preterm Birth						
Bublitz et al. [20] USA	Determine the relationship between CM, immune and hypothalamic–pituitary–adrenal axis regulation, and insulin resistance in pregnant women diagnosed with gestational diabetes.	**Design:** Longitudinal **Quality Appraisal:** Fair	**Total sample:** 24 pregnant women with gestational diabetes (Median age = 30.6; *SD* = 4.4). Clinical sample. 54% Caucasian	**Exposures:** Childhood sexual abuse and/or physical abuse (grouped) **Measure:** Adverse Childhood Experiences Questionnaire	**Outcome:** Preterm birth (for past pregnancies and current pregnancy) **Measure:** Unvalidated interview and confirmed by medical charts	CM was associated with past preterm birth deliveries but not current preterm birth deliveries. Covariates: None
Cammack et al.[59] USA	Examine whether perinatal experiences affect mothers' report of their childhood trauma.	**Design:** Prospective cohort study **Quality Appraisal:** Good	**Total sample:** 230 pregnant women with mental health conditions (*M* = 32.61; *SD* = 4.49). Clinical sample. 90% Caucasian	**Exposures:** Emotional, physical, and sexual abuse, and physical and emotional neglect **Measure:** Childhood Trauma Questionnaire	**Outcome:** Preterm birth **Measure:** Medical charts	No CM types were associated with preterm birth. Covariates: weeks from delivery, depressive symptomatology, denial scores, maternal age, gravidity, race/ethnicity, maternal education, and marital status.
Cammack et al. [6]	Determine the effects of CM on	**Design:** Longitudinal study	**Total Sample:** 4181 women and first child (*M age at delivery* =	**Exposures:** Emotional, physical, and	**Outcome:** Preterm birth	Sexual abuse with physical force by a non-caregiver

USA Sub-sample of *The National Longitudinal Study of Adolescent to Adult Health ("Add Health")*	preterm birth and very preterm birth.	**Quality Appraisal:** Good	21.7; *M age at interview* = 29.0). Community sample. 64.6% Caucasian	sexual abuse by a caregiver and sexual abuse with physical threat and sexual abuse without physical threat by non-caregiver. **Measure:** Unvalidated interview	and very preterm birth **Measure:** Unvalidated interview	predicted very preterm birth but not preterm birth. Other types of CM did not predict preterm birth or very preterm birth. Covariates: Race and childhood socio-economic status.
Costa Veloso Souto et al. [60] Brazil	Determine the effects of rape on pregnancy and childbirth for mothers up to 13 years old.	**Design:** Comparative study **Quality Appraisal:** Fair	**Total sample:** 31 611 teen mothers less than 13 years old. Community sample. 67.5% Black or mixed race	**Exposure:** Rape **Measure:** Violence & Accidents Vigilance (VIVA) System survey	**Outcome:** Preterm birth **Measure:** Medical records	Rape was associated with preterm birth. Covariates: None *Unclear whether rape caused pregnancy in some instances.*
Ferri et al. [33] Brazil	Determine the effects of violence and depression during pregnancy on the infant.	**Design:** Cross-sectional study **Quality Appraisal:** Good	**Total sample:** 930 pregnant mothers 11 to 19 years old. Community sample. (low SES)	**Exposure:** Lifetime violence (i.e., sexual, physical, or emotional abuse) **Measure:** Californian Perinatal Assessment	**Outcome:** Preterm birth **Measure:** Measured and recorded once the baby was born	Lifetime violence did not predict preterm birth. Covariates: Age, education, SES, living arrangements, number of pregnancies, alcohol or tabacco use during pregnancy, diabetes, and pregnancy complications. *Unclear whether sexual abuse caused*

						pregnancy in some instances.
Leeners et al. [30] Germany	Examine the effects of childhood sexual abuse on pregnancy complications.	**Design:** Cohort Study **Quality Appraisal:** Fair	**CM:** 85 adult women. (*M* = 38.4, *SD* = 8.1). CPS sample. 98.8% Caucasian **Control:** 170 adult women (*M* = 38.9, *SD* = 6.5). Community sample. 99.4% Caucasian	**Exposures:** Child sexual abuse **Measures:** Unvalidated interview and questionnaire	**Outcome:** Preterm birth **Measure:** Medical records	Women with a history of child sexual abuse were more likely to give birth to a preterm child. Covariates: Other adverse childhood experiences
Leeners et al. [27] Germany *(Results were combined with Leeners et al., 2010 for analysis)*	Determine the effects of different types of CM on obstetric outcomes.	**Design:** Cohort Study **Quality Appraisal:** Good	**CM:** 85 adult women. (*M* = 38.4, *SD* = 8.1). CPS sample. 98.8% Caucasian **Control:** 170 adult women (*M* = 38.9, *SD* = 6.5). Community sample. 99.4% Caucasian	**Exposures:** Childhood sexual and physical abuse **Measures:** Unvalidated interview and questionnaire	**Outcome:** Preterm birth **Measure:** Medical records	Childhood sexual abuse and physical abuse were both associated with preterm birth. Covariates: participants' occupation
Leeners et al. [31] Germany *(Results were combined with Leeners et al., 2010 for analysis)*	Examine whether childhood sexual abuse affects labor experiences.	**Design:** Cohort Study **Quality Appraisal:** Fair	**CM:** 85 adult women. (*M* = 38.4, *SD* = 8.1). CPS sample. 98.8% Caucasian **Control:** 170 adult women (*M* = 38.9, *SD* = 6.5). Community sample. 99.4% Caucasian	**Exposures:** Childhood sexual **Measures:** Unvalidated interview and questionnaire	**Outcome:** Preterm birth **Measure:** Medical records	Childhood sexual abuse was associated with preterm birth. Covariates: None
Noll et al. [61] USA	Determine the association between childhood sexual	**Design:** Prospective	**CM:** 40 mothers 18-29 years old (*M* age at birth = 21.14, *SD* =	**Exposure:** Childhood sexual abuse	**Outcome:** Preterm birth	Childhood sexual abuse predicted preterm birth, with

	abuse, Hypothalamic Pituitary Adrenal (HPA) Axis disruptions, substance use, and infant preterm birth.	longitudinal study **Quality Appraisal:** Fair	2.54) and their offspring. CPS sample. **Control:** 31 mothers 18-29 years old (*M* age at birth = 21.97, *SD* = 2.33) and their offspring. Community sample. 49% Caucasian	**Measure:** Unvalidated interview	**Measure:** Medical records	offspring of sexually abused women being 2.8 times more likely to be born premature. Covariates: Minority status and number of children.
Selk et al. [36] USA *Sub-sample of Nurses' Health Study II*	Determine the effects of CM on preterm birth.	**Design:** Longitudinal cohort study **Quality Appraisal:** Good	**Total sample:** 51 434 mothers who are registered nurses (*M* = 27, *SD* = 5). Community sample. 95% Caucasian	**Exposures:** Sexual, physical, and verbal abuse **Measures:** Revised Conflict Tactics Scale and unvalidated questionnaire	**Outcome:** Preterm birth **Measure:** Unvalidated questionnaire	Childhood sexual abuse, specifically forced sexual activity, predicted preterm birth. Maltreatment involving sexual touch, physical abuse or harsh parenting did not predict preterm birth. Covariates: maternal age, childhood socio-economic status, maternal race, prenatal alcohol use, prenatal cigarette use, age at menarche, marital status, income 2001, BMI at 18, and physical abuse in pregnancy.

Steven-Simon. [35] USA	Determine whether CM is associated with pregnancy outcomes in adolescent mothers.	**Design:** Longitudinal prospective study **Quality Appraisal:** Fair	**CM:** 42 pregnant adolescents (*M* = 16.1, *SD* = 1.6). Community sample. **Control:** 85 pregnant adolescents (*M* = 16.2, *SD* = 1.5). Community sample. 100% African American	**Exposure:** Childhood sexual abuse prior to conception **Measures:** Unvalidated interview	**Outcome:** Preterm birth **Measure**: Medical records	Childhood sexual abuse was associated preterm birth. Covariates: maternal stress, depression, social support, and substance abuse
Gestational age						
Bublitz et al. [32] USA	Determine the relationship between CM, momentary stress, cortisol levels, and gestational length of the infant.	**Design:** Longitudinal **Quality Appraisal:** Poor	**CM:** 6 pregnant adult women (*M* = 24; *SD* = 4). Community sample. 67% Caucasian **Control:** 11 pregnant adult women (*M* = 26; *SD* = 3). Community sample. 36% Caucasian	**Exposure:** Childhood sexual abuse and/or physical abuse **Measure:** Adverse Childhood Experiences Questionnaire	**Outcome:** Gestational age **Measure:** Medical records	Gestational length of infants did not differ between mothers who experienced childhood physical or sexual abuse and mothers who experienced, neglect, no abuse, or witnessed family violence. Covariates: None
Madkour et al. [41] USA *Sub-sample from the National Longitudinal Study of*	Examine the effects of pre-pregnancy violence on birth outcomes for adolescent mothers.	**Design:** Longitudinal study **Quality Appraisal:** Fair	**Total sample:** 558 mothers 13 to 19 years old (*M* = 17.87, *SD* = 0.09). Community sample. 30% Black	**Exposure:** Childhood physical and sexual abuse prior to conception **Measure:** Unvalidated interview	**Outcome:** Gestational age **Measure:** Unvalidated interview	No association was found between physical abuse or sexual abuse and gestational age in black and non-black mothers. Covariates: None

Adolescent to Adult Health						
McDonnell & Valentino. [62] USA	Examine the association between childhood trauma, depressive symptoms, and infant outcomes.	**Design:** Prospective longitudinal study **Quality Appraisal:** Fair	**Total sample:** 398 pregnant women 15-46 years old (*M* = 24.76, *SD* = 5.43). At-risk sample. 53% Caucasian	**Exposure:** CM (unspecified) **Measures:** Family health history questionnaire	**Outcome:** Gestational age **Measure:** Maternal self-report and medical records	No association between CM and gestational age. Covariates: None
Low birth weight						
Cammack et al.[59] USA	Examine whether perinatal experiences affect mothers' report of their childhood trauma.	**Design:** Prospective cohort study **Quality Appraisal:** Good	**Total sample:** 230 pregnant women with mental health conditions (*M* = 32.61; *SD* = 4.49). Clinical sample. 90% Caucasian	**Exposures:** Emotional, physical, and sexual abuse, and physical and emotional neglect **Measure:** Childhood Trauma Questionnaire	**Outcome:** Low birth weight **Measure:** Medical charts	No CM types were associated with low birth weight. Covariates: weeks from delivery, depressive symptoms, denial scores, maternal age, gravidity, race/ethnicity, maternal education, and marital status.
Cederbaum et al.[21] USA	Examine the association between CM and infant birth weight in adolescent mothers.	**Design:** Population-based study/Chart review **Quality Appraisal:** Good	**Total sample:** 153 762 births from mothers between the ages of 12 and 19 years old. CPS and community samples. 72.4% Hispanic	**Exposure:** Childhood maltreated (unspecified) **Measure:** Child Protective Services records	**Outcome:** Low birth weight **Measure:** Medical records	CM was associated with a 6% increased risk of infant low birth weight. Covariates: Maternal age, birth order of infant, race, cigarette smoking, SES, prenatal care, and infant gender

Costa Veloso Souto et al. [54] Brazil	Determine the effects of rape on pregnancy and childbirth for mothers up to 13 years old.	**Design:** Comparative study **Quality Appraisal:** Fair	**Total sample:** 31 611 mothers less than 13 years old. Community sample. 67.5% Black or mixed race	**Exposure:** Rape **Measure:** Violence & Accidents Vigilance (VIVA) System survey	**Outcome:** Low birth weight **Measure:** Medical records	Rape was associated with low birth weight infants. Covariates: None *Unclear whether rape caused pregnancy in some instances.*
Ferri et al. [33] Brazil	Determine the effects of violence and depression during pregnancy on the infant.	**Design:** Cross-sectional study **Quality Appraisal:** Good	**Total sample:** 930 pregnant mothers 11 to 19 years old. Community sample (low SES).	**Exposures:** Sexual, physical, and emotional abuse **Measure:** Californian Perinatal Assessment	**Outcome:** Low birth weight **Measure:** Measured and recorded once the baby was born	Threat to physical violence was associated with low birth weight. Other types of maltreatment were not. Covariates: Age, education, baby gender, parity, health conditions, gestational age, complications during pregnancies, and alcohol or tabaco use during pregnancy *Unclear whether rape caused pregnancy in some instances.*
Grimstad et al.[23] Norway	Examine the relationships between sexual abuse, alcohol and cigarette use, and low birth weight.	**Design:** Case Control study **Quality Appraisal:** Poor	**Total Sample:** 175 nulliparous adult pregnant women. Community sample.	**Exposure:** Childhood sexual abuse **Measure:** Unvalidated interview	**Outcome:** Low birth weight **Measure:** Medical records	Childhood sexual abuse was not associated with low birth weight. Covariates: None

Grimstad et al. [36] Norway *(Results were combined with* Grimstead et al.[23] *for analysis)*	Determine the relationships between sexual abuse, anxiety, and low birth weight.	**Design:** Case Control study **Quality Appraisal:** Poor	**Total Sample:** 177 nulliparous adult pregnant women. Community sample.	**Exposure:** Childhood sexual abuse **Measure:** Unvalidated interview	**Outcome:** Low birth weight **Measure:** Medical records	Childhood sexual abuse was not associated with low birth weight. Covariates: None
Grimstad & Schei.[34] Norway *(Results were combined with* Grimstad et al.[23] *for analysis)*	Investigate whether childhood sexual abuse predicts low birth weight.	**Design:** Case Control study **Quality Appraisal:** Poor	**Total Sample:** 173 nulliparous adult pregnant women. Community sample.	**Exposure:** Childhood sexual abuse **Measure:** Unvalidated interview	**Outcome:** Low birth weight **Measure:** Medical records	Childhood sexual abuse was not associated with low birth weight. Covariates: Educational level
Steven-Simon. [35] USA	Determine whether CM is associated with pregnancy outcomes in adolescent mothers.	**Design:** Longitudinal prospective study **Quality Appraisal:** Fair	**CM:** 42 pregnant adolescents (M = 16.1, SD = 1.6). Community sample. **Control:** 85 pregnant adolescents (M = 16.2, SD = 1.5). Community sample. 100% African American	**Exposure:** Childhood sexual abuse prior to conception **Measures:** Unvalidated interview	**Outcome:** Low birth weight **Measure**: Medical records	Childhood sexual abuse was associated with both low birth weight infants. Covariates: maternal stress, depression, social support, and substance abuse
Birth weight						
Benedict et al.[38] USA	Investigate the effects of maternal childhood sexual abuse on depressive	**Design:** Prospective cohort study	**Total sample:** 357 first time pregnant adults. Community sample.	**Exposure:** Childhood sexual abuse	**Outcome:** Birth weight	Maternal childhood sexual abuse experiences did not

	symptoms throughout the pregnancy period.	**Quality Appraisal:** Fair	Modal age at delivery: 20-24 74% African American	**Measure:** Conflicts Tactics Scale	**Measure:** Medical records	affect infant birth weight. Covariates: None
Bublitz et al. [20] USA	Determine the relationship between CM, immune and hypothalamic–pituitary–adrenal axis regulation, and insulin resistance in pregnant women diagnosed with gestational diabetes.	**Design:** Longitudinal **Quality Appraisal:** Fair	**Total sample:** 24 pregnant women with gestational diabetes (Median age = 30.6; *SD* = 4.4). Clinical sample. 54% Caucasian	**Exposures:** Childhood sexual abuse and/or physical abuse (grouped) **Measure:** Adverse Childhood Experiences Questionnaire	**Outcome:** Birth weight **Measure:** Medical charts	Maternal experiences of childhood sexual and/or physical abuse was not associated with infant birth weight. Covariates: None
Gavin et al. [22] USA	Examine maternal early life predictors to infant birth weight.	**Design:** Longitudinal study **Quality Appraisal:** Fair	**Total sample:** 132 mothers and their first child. Community sample. 47% Caucasian	**Exposure:** CM (unspecified) **Measure:** Childhood trauma questionnaire	**Outcome:** Birth weight **Measure:** Maternal self-report	CM was not directly associated with infant birth weight. Covariates: None
Gavin et al. [63] USA *Sub-sample from the National Longitudinal Study of Adolescent to Adult Health*	Examine the mediators in the relationship between CM, SES, and infant birth weight.	**Design:** Longitudinal study **Quality Appraisal:** Fair	**Total Sample:** 1897 mothers and their eldest child (*M* = 21.9, *SD* = 1.6). Community sample.	**Exposure:** CM (unspecified) **Measure:** Unvalidated interview	**Outcome:** Birth weight **Measure:** Unvalidated interview	CM did not predict infant birth weight. Covariates: None

Jacobs. [40] USA	Examine the pregnancy outcomes of mothers seeking mental health services who were sexually abused.	**Design:** Cross-sectional study **Quality Appraisal:** Poor	**CM:** 15 adult women (*M* = 33). Clinical sample. **Control:** 13 adult women (*M* = 34.4). Community sample.	**Exposures:** Childhood sexual abuse, incestual child sexual abuse, and sexual touch **Measure:** Unvalidated questionnaire	**Outcome:** Birth weight of first pregnancy and all pregnancies **Measure:** Unvalidated questionnaire	Incest was positively associated with infant birth weight for all pregnancies. Other types of childhood sexual abuse were not significant. Covariates: None
Madkour et al.[41] USA *Sub-sample from the National Longitudinal Study of Adolescent to Adult Health*	Examine the effects of pre-pregnancy violence on birth outcomes for adolescent mothers.	**Design:** Longitudinal study **Quality Appraisal:** Fair	**Total sample:** 558 mothers 13 to 19 years old (*M* = 17.87, *SD* = 0.09). Community sample. 30% Black	**Exposure:** Childhood physical and sexual abuse prior to conception **Measure:** Unvalidated interview	**Outcome:** Birth weight **Measure:** Unvalidated interview	Black mothers with a history of childhood sexual abuse gave birth to larger infants than non-abused black mothers. No association was found between physical abuse and birth weight. In non-black mothers, no association was found between physical and birth weight. Covariates: None
McDonnell & Valentino. [62] USA	Examine the association between childhood trauma, depressive symptoms, and infant outcomes.	**Design:** Prospective longitudinal study **Quality Appraisal:** Fair	**Total sample:** 398 pregnant women 15-46 years old (*M* = 24.76, *SD* = 5.43). At-risk sample. 53% Caucasian	**Exposure:** CM (unspecified) **Measures:** Family health history questionnaire	**Outcome:** Birth weight **Measure:** unvalidated questionnaire	No association between CM and birth weight. Covariates: None

Möhler et al. [24] Germany	Determine whether CM affects the prenatal, delivery, and postnatal periods.	**Design:** Longitudinal study **Quality Appraisal:** Fair	**CM:** 58 mothers. Community sample. **Control:** 61 mothers. Community sample.	**Exposure:** CM (unspecified) **Measures:** Childhood Trauma Questionnaire	**Outcomes:** Birth weight **Measure:** Medical records	Infant birth weight did not differ between abused mothers and controls. Covariates: None
Myers et al. [7] South Africa *Sub-sample from the Drakenstein Child Health Study (DCHS)*	Examine the association between alcohol use, psychosocial stressors, and infant outcomes.	**Design:** Birth cohort study **Quality Appraisal:** Good	**Total sample:** 986 pregnant women greater than 18 years old (Median age = 25.75). Community sample (low SES). 53% African	**Exposure:** CM (unspecified) **Measures:** Childhood Trauma Questionnaire	**Outcome:** Birth weight **Measure:** Medical records	CM was not associated with infant birth weight for gestational age. Covariates: maternal age, ancestry, education level, household income, HIV-seropositive, BMI, abuse status, alcohol/ tobacco/ drug use, depression, number of stressful life events.
Nerum et al. [39] Norway	Examine the effects of childhood sexual abuse and rape on labour.	**Design:** Case-control study **Quality Appraisal:** Fair	**CM:** 185 mothers 14-37 years old (*M age at first childbirth* = 24.3) and their first born. Clinical sample. **Raped during adulthood:** 47 mothers 19-37 years old (*M age at first childbirth* = 27.4) and their first born. Clinical sample.	**Exposure:** Childhood sexual abuse **Measure:** Disclosure during medical consultation	**Outcome:** Birth weight **Measure:** Medical records	No difference in infant birth weight was found between mothers with childhood sexual abuse histories, raped as adults, and controls. Covariates: No

			Control: 141 mothers 19-37 years old (*M age at first childbirth* = 27.4) and their first born. Clinical sample.			
Walsh et al. [64] USA	Examine the associations between CM, depression, levels of inflammatory markers, and perinatal health in adolescents.	**Design:** Longitudinal study **Quality Appraisal:** Fair	**Total sample:** 133 pregnant adolescents 14 to 19 years old (*M* = 17.8, *SD* = 1.22). Community sample. 89.5% Hispanic	**Exposure:** Childhood abuse (unspecified) **Measures:** Childhood trauma questionnaire	**Outcome:** Birth weight **Measure**: Medical charts	There was no association between CM and birth weight. Covariates: None *sample excluded participants who used any recreational drugs or smoked
Gestational diabetes						
Mason et al. [8] USA *Sub-sample of Nurses' Health Study II*	Determine if CM is a risk factor for gestational diabetes.	**Design:** Cohort study **Quality Appraisal:** Good	**Total sample:** 45 550 mothers who are registered nurses 25-42 years old (*M* = 28.5, *SD* = 4.8). 95% Caucasian	**Exposure:** Physical abuse and sexual abuse **Measures:** Revised Conflict Tactics Scale and non-specified questionnaire	**Outcome:** Gestational diabetes **Measure:** Unvalidated questionnaire	A dose-response association was found between physical abuse severity and gestational diabetes. Rape in childhood increased risk of gestational diabetes by 30%. Covariates: maternal age, year of birth, race, education (mother and father), professional occupation (mother and father), parental home ownership, age 5 body size, and parental history of diabetes.

Schoenaker et al.[42] Australia	Examine the relationship between maternal psychosocial environment, mental health, and gestational diabetes.	**Design:** Prospective longitudinal study **Quality Appraisal:** Good	**Total sample:** 6,317 women who reported on 11 556 pregnancies (*M* = 29.7, *SD* = 5.0). Community sample.	**Exposures:** Physical, sexual, emotional abuse, and neglect **Measure:** Adverse Childhood Experiences Checklist	**Outcome:** Gestational diabetes **Measure:** Unvalidated questionnaire	Physical abuse was associated with risk of developing gestational diabetes among women with preconception depressive symptoms, but not among women without. Other types of abuse were not associated with gestational diabetes. Covariates: family history of diabetes, age at menarche, polycystic ovary syndrome, preconception BMI, unhealthy diet, parity, maternal age, antenatal depression, and all other subcategories of adverse childhood experiences.

**Note:* Rows coloured grey were excluded or combined with other studies for the meta-analyses.
***Note:* Childhood maltreatment (CM); Child Protective Services (CPS); Mean (*M*); Socio-economic Status (SES); Standard Deviation (*SD*)

Table 2.
Meta-analyses of childhood maltreatment and preterm birth, low birth weight, and gestational diabetes

Study Name	Effect Size	*p*-value
Preterm birth (dichotomous)	*Odds Ratio*	
Bublitz et al., 2017	9.00 (0.78-103.72)	0.07
Cammack et al., 2018	1.34 (0.86-2.10)	0.19
Cammack et al., 2019	1.03 (0.88-1.21)	0.69
Costa Veloso Souto et al., 2017	1.36 (1.19-1.56)	<0.01
Ferri et al., 2007	1.21 (0.78-1.88)	0.39
Leeners et al., 2010	2.58 (1.47-5.60)	0.02
Noll et al., 2007	2.16 (0.77-6.06)	0.14
Selk et al., 2015	1.03 (0.99-1.07)	0.12
Stevens-Simon et al., 1994	4.77 (1.34-16.89)	0.01
Total	**1.27 (1.06-1.52)**	**0.01**
Gestational age (continuous)	*Hedge's G*	
Bublitz et al., 2016	0.41 (-0.55-1.36)	0.40
Madkour et al., 2014	-0.01 (-0.18-0.15)	0.90
McDonnell & Valentino, 2016	-0.20 (-0.40- -0.01)	0.05
Total	**-0.08 (-0.26-0.10)**	**0.37**
Low birth weight (dichotomous)	*Odds Ratio*	
Cammack et al., 2018	1.09 (0.60-1.96)	0.77
Cederbaum et al. 2013	1.11 (1.05-1.17)	<0.001
Costa Veloso Souto et al., 2017	1.43 (1.24-1.65)	<0.001
Ferri et al., 2007	2.18 (1.46-3.27)	<0.001
Grimstead et al., 1998	1.03 (0.44-2.41)	0.95
Steven-Simon et al., 1994	5.52 (1.59-19.19)	0.01
Total	**1.42(1.10-1.83)**	**0.01**
Birth weight (continuous)	*Hedge's G*	
Bublitz et al., 2017	-0.63 (-1.69-0.42)	0.24
Gavin et al., 2010	-0.02 (-0.36-0.31)	0.89
Gavin et al., 2012	-0.08 (-0.17-0.01)	0.07
Jacobs, 1992	-0.49 (-0.81- -0.16)	<0.01
Madkour et al., 2014	-0.09 (-0.26-0.07)	0.27
McDonnell & Valentino, 2016	-0.08 (-0.28-0.12)	0.43
Mohler et al., 2008	-0.02 (-0.38-0.34)	0.90
Myers et al., 2018	0.30 (0.18-0.43)	<0.01
Walsh et al., 2016	-0.10 (-0.44-0.24)	0.57
Total	**-0.02 (-0.18-0.15)**	**0.86**
Gestational Diabetes	*Risk Ratio*	
Mason et al., 2016	1.24 (1.17-1.30)	<0.001
Schoenaker et al., 2019	1.7 (1.16-2.48)	<0.001
Total	**1.37 (1.02-1.83)**	**0.03**

Table 3.
Subgroup analyses for preterm birth and low birth weight dichotomous outcomes

Division Criteria	Study Group	Studies	OR	95%CI	*p*	I^2	*Q*
Preterm Birth (dichotomous)							
	all	6	1.42	(1.1-1.83)	0.01	80.82	26.07
Abuse type	sexual abuse	4	1.44	(1.25-1.65)	<0.001	0	2.49
	physical abuse	2	1.58	(0.87-2.85)	0.13	0	0.652
Mother's age	adult	2	1.07	(0.66-1.75)	0.77	0	0.01
	adolescent	4	1.53	(1.13-2.07)	0.01	88.44	25.95
Sample size	small and medium	4	1.73	(0.97-3.08)	0.06	63.89	8.31
	large	2	1.25	(0.98-1.6)	0.08	90.35	10.37
Study Quality	good	3	1.38	(0.87-2.18)	0.17	81.14	10.61
	fair	2	2.42	(0.66-8.84)	0.18	77.67	4.48
	poor	1	1.03	(0.44-2.41)	0.95	0	0
Low Birth Weight (dichotomous)							
	All	9	1.27	(1.06-1.52)	0.01	75.00	32.44
Abuse type	sexual abuse	6	1.23	(1.04-1.47)	0.02	68.25	15.75
	physical abuse	3	0.99	(0.94-1.04)	0.65	0	1.06
Mother's age	adult	6	1.16	(0.96-1.39)	0.12	57.11	11.66
	adolescent	3	1.43	(1.00-2.04)	0.05	50.42	4.03
Sample size	small and medium	6	1.82	(1.2-2.75)	0.01	42.35	8.67
	large	3	1.13	(0.95-1.34)	0.18	87.22	15.65
Study Quality	good	5	1.09	(0.96-1.25)	0.19	44.33	7.18
	fair	4	2.25	(1.09-4.66)	0.02	55.03	6.67

Figure 1.

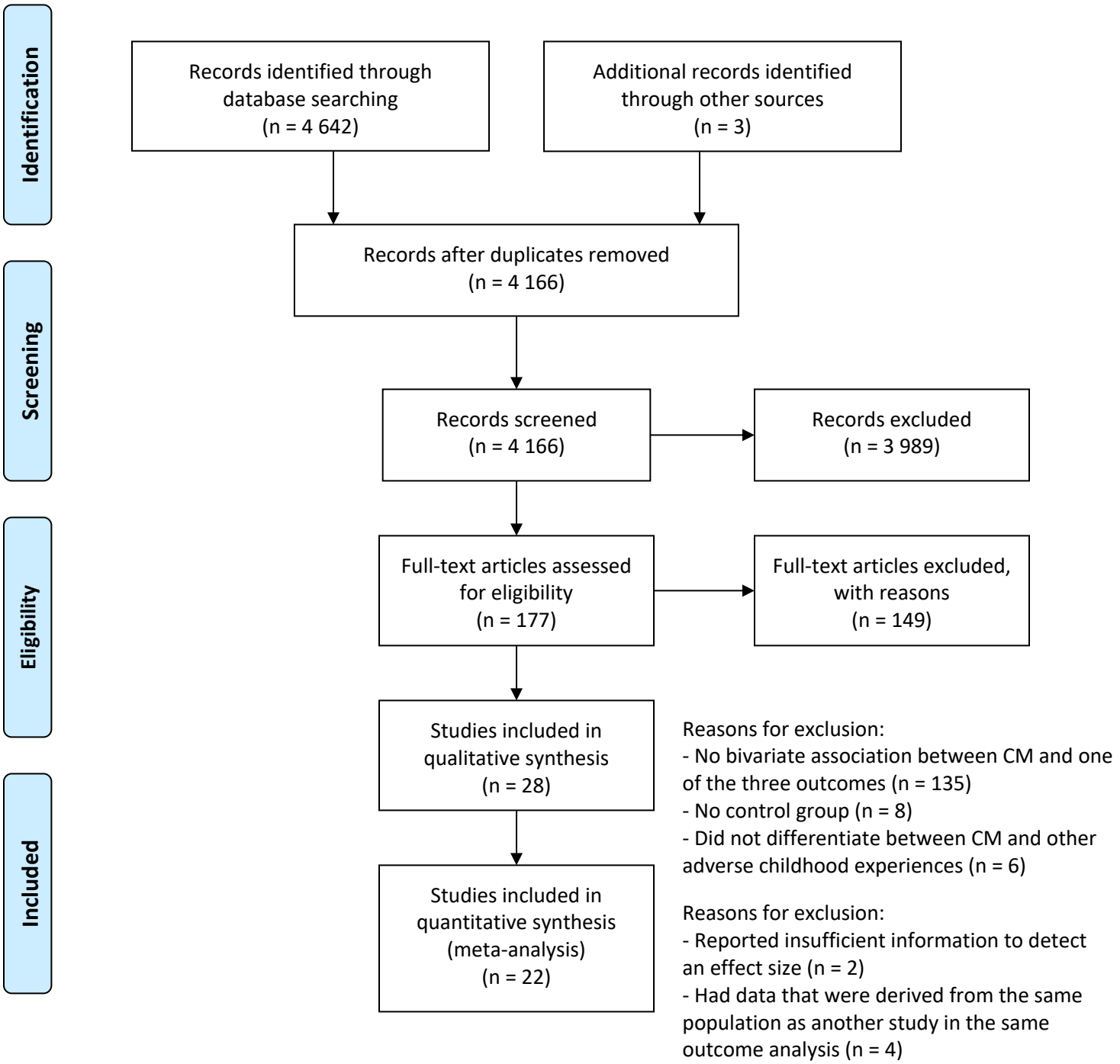

Figure 1. PRISMA 2009 Flow Diagram of study selection process.

Figure 2.

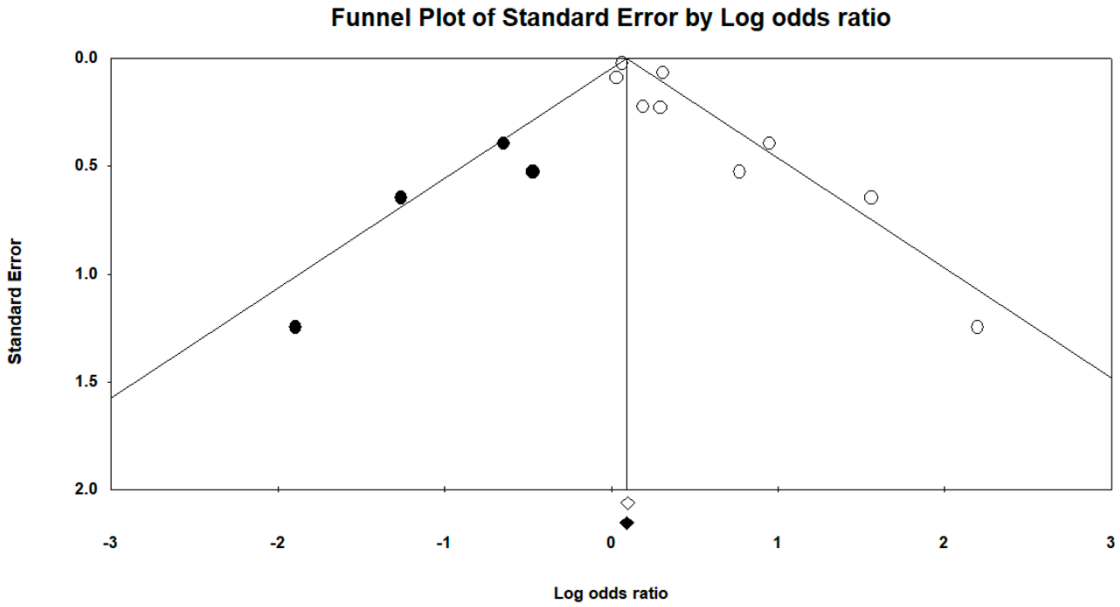

Figure 2. A funnel plot of standard error by log odds ratio for studies examining preterm birth as the outcome variable.

Figure 3.

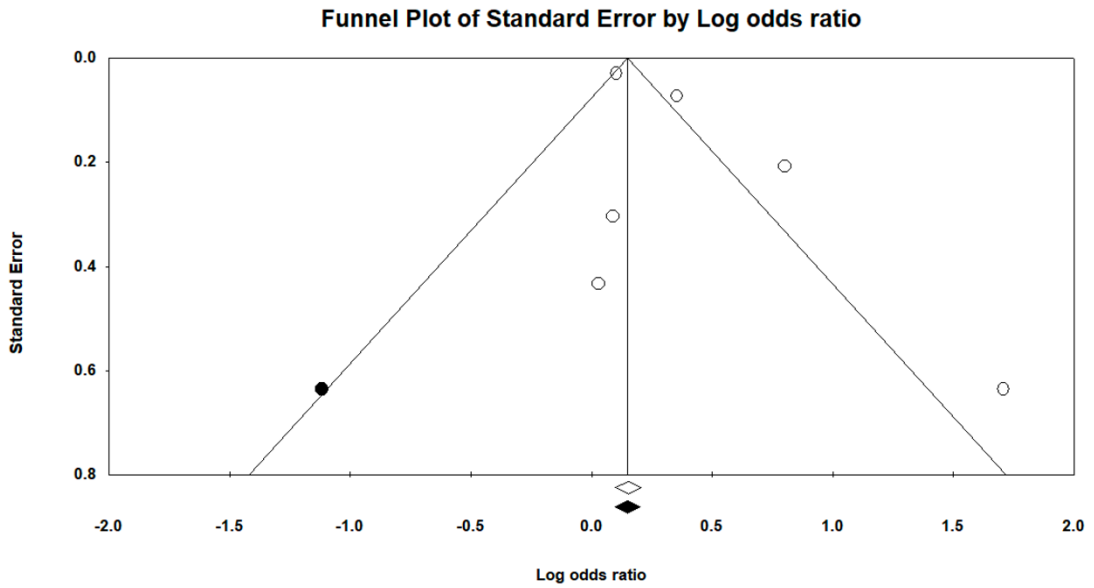

Figure 3. A funnel plot of standard error by log odds ratio for studies examining low birth weight as the outcome variable.

Appendix A

Ovid MEDLINE(R) ALL <1946 to May 22, 2020>			
#	**Search Statement**	**Results**	**Annotation**
1	*Child Abuse/	16898	
2	*Child Abuse, Sexual/	7498	
3	*Domestic Violence/	4705	
4	*Physical Abuse/	344	
5	*Humans/ or verbal abuse.mp.	986	
6	emotional abuse.mp.	2050	
7	*Rape/	4368	
8	*Exposure to Violence/	504	
9	*Intimate Partner Violence/	2070	
10	*Spouse Abuse/	6165	
11	*Incest/	970	
12	*Battered Women/	2130	
13	neglect.mp.	20051	
14	psychological violence.mp.	443	
15	psychological maltreatment.mp.	128	
16	physical assault.mp.	869	
17	physical aggression.mp.	1864	
18	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17	58763	
19	limit 18 to "all child (0 to 18 years)"	33411	
20	exp Pregnancy/	889049	
21	exp Pregnancy Outcome/	73229	
22	exp Parturition/	16979	
23	exp Pregnancy Complications/ (contains gestational diabetes under subject heading)	423416	

24	exp Obstetric Labor Complications/	67939	
25	exp Birth Weight/	41108	
26	exp Birth Injuries/	5550	
27	exp Premature Birth/	13607	
28	exp Labor, Obstetric/	45944	
29	16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24	934629	
30	**19 and 29**	1894	

APA PsycInfo <1806 to May Week 3 2020>			
#	**Search Statement**	**Results**	**Annotation**
1	*Child Abuse/	25100	
2	*Child Neglect/	2990	
3	*Emotional Abuse/	1620	
4	psychological violence.mp.	447	
5	psychological maltreatment.mp.	611	
6	emotional maltreatment.mp.	329	
7	*Verbal Abuse/	319	
8	*Physical Abuse/	3734	
9	physical assault.mp.	1149	
10	physical aggression.mp.	3780	
11	physical victimization.mp.	378	
12	*Domestic Violence/	9873	
13	*Intimate Partner Violence/	10102	
14	Partner Abuse.mp.	1194	
15	*Battered Females/	2463	
16	battered women.mp.	3216	
17	battered woman.mp.	285	
18	*Sexual Abuse/	17113	

19	*Incest/	2201	
20	*Rape/	4475	
21	*Sex/	2313	
22	*Violence/	24660	
23	*Victimization/	14565	
24	21 and 22	36	
25	21 and 23	13	
26	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 24 or 25	64388	
27	limit 26 to 200 adolescence <age 13 to 17 yrs>	11202	
28	*Pregnancy/	17807	
29	*Pregnancy Outcomes/	843	
30	*Birth/	5567	
31	*Obstetrical Complications/ (contains gestational diabetes under subject heading)	1018	
32	*Spontaneous Abortion/	705	
33	*Birth Weight/	2495	
34	*Birth Injuries/	144	
35	*Premature Birth/	4795	
36	*"Labor (Childbirth)"/	894	
37	28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36	30609	
38	**27 and 37**	**114**	

Web of Science

TOPIC: ("child abuse" OR "sexual abuse" OR "domestic violence" OR "physical abuse" OR "physical violence" OR "verbal abuse" OR "emotional abuse" OR rape OR "exposure to violence" OR "intimate partner violence" OR "spouse abuse" OR incest OR "child neglect" OR "battered wom*n")
AND
TOPIC:(pregnan* OR parturition OR "obstetric labo*r complicat*" OR "birth weight" OR "birth injur*" OR "premature birth" OR "gestational diabetes" OR "spontaneous abortion")

AND
TOPIC: (child* OR kid* OR youth OR infant* OR baby OR babies OR infant* OR toddler* OR teen* OR adolescen*)
Refined by: DOCUMENT TYPES: (ARTICLE OR EARLY ACCESS OR BOOK CHAPTER)
Timespan: All years.

Results: 2,634