**Association of Preterm Birth/Low Birth Weight with Romantic Partnership, Sexual Intercourse and Parenthood in Adulthood: A Systematic Review and Meta-Analysis**

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**Abbreviations:** LBW (Low Birth Weight), VPT (Very Preterm), MLPT (Moderate-to-Late-Preterm), PT/LBW (Preterm/Low Birth Weight), VPT/VLBW (Very Preterm/Very Low Birth Weight), CI (Confidence Interval)

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**Key Points**

**Question:** Are preterm and low birth weight born-adults less likely to experience social transitions normative of adulthood, such as romantic partnerships, sexual intercourse or parenthood?

**Findings:** In this meta-analysis with summary data describing up to 4.4 million participants, preterm/low birth weight born-adults were less likely to experience a romantic partnership, sexual intercourse or parenthood than their full term born peers. The likelihood to experience these social transitions decreased with lower gestational age/birth weight, and was similar in both young and middle adulthood.

**Meaning:** Preterm and low birth weightborn-adults are less likely to have sexual or partner relationships than full term born-adults, which might put them at increased risk of lower well-being, and poorer physical and mental health.

**Abstract**

**Importance:** Social relationships are important determinants of wellbeing, health and quality of life. There are conflicting findings regarding the association between preterm birth/low birth weight and experiences of social relationships in adulthood.

**Objective:** To systematically investigate the association between preterm birth/low birth weight and social outcomes in adulthood.

**Data Sources:** PubMed, PsycINFO, Web of Science, and Embase were searched for peer-review articles published through August 5, 2018.

**Study Selection:**Prospectivelongitudinal and registrystudies reporting onselectedsocial outcomes in preterm/low birth weight born-adults (mean sample age ≥18 years) compared with term-born controls.

**Data Extraction and Synthesis:** The meta-analysis followed PRISMA guidelines.The data was collected and extracted by two independent reviewers. Pooled analyses were based on odds ratios (95% CIs) and Hedges’ g, which were meta-analyzed using random-effects models.

**Main Outcomes and Measures:** Ever being in a romantic partnership, ever having experienced sexual intercourse, parenthood, quality of romantic relationship and peer social support.

**Results:** Twenty-one studies, of the 1829 articles screened, were included. Summary data describing a maximum of 4,423,798 adult participants (preterm/low birth weight=179,724) were analyzed. Preterm/low birth weight born-adults were less likely to have ever experienced a romantic partnership (OR=0.72; 95% CI=0.64 – 0.81), to have had sexual intercourse (OR=0.43; 95% CI=0.31 – 0.61), or to had become parents (OR=0.78; 95% CI=0.67–0.90), than full terms. A dose-response relationship according to degree of prematurity was found for romantic partnership and parenthood. Overall, effect sizes did not differ with age and sex. When preterm/low birth weight born-adults were in a romantic partnership or had friends, the quality of these relationships was not poorer compared to adults born full-term.

**Conclusions and relevance:** Our findings suggest thatpreterm/low birth weight born-adults are less likely to experience a romantic partnership, sexual intercourse, or to become parents, however preterm birth/low birth weight does not seem impair the quality of relationships with partners and friends. Lack of sexual or partner relationships might increase the risk of lower well-being, and poorer physical and mental health.

**Introduction**

Preterm birth or low birth weight (PT/LBW) is associated with an increased risk for disability,1,2 neurocognitive impairment,3-6 learning difficulties3,6 and mental health problems7-9, with the association being stronger for those with lower gestational age.3,10-12 These functional deficits have been found to adversely impact preterm born adults’ socio-economic life chances13. Yet, little is known whether those born preterm master social transitions into adulthood, such as building a supportive peer group, establishing romantic partnerships, having sexual intercourse or becoming a parent.

Close, intimate and supportive relationships have been found to increase happiness and well-being14,15, good physical16 and mental health17. Studies have shown that social relationships are more challenging for children born PT/LBW18. Indeed, prematurity has been associated with a behavioral phenotype18-20 and personality profile21-24 that includes being timid, socially withdrawn, over-controlling and low in risk-taking or fun-seeking. These differences may predispose PT/LBW to face greater difficulties in establishing romantic and peer relationships.

In contrast, research on social outcomes of adults born preterm is not conclusive. While Scandinavian registry studies have found that adults born PT/LBW were less likely to ever be in a registered partnership12,25,26 or to be parents12,26, prospective studies have reported conflictive findings across27-29 and within2,30 studies. Regarding the latter, a Canadian cohort study of extreme low birth weight (ELBW) reported different findings for social outcomes at distinct time points: While, no differences were found in rates of marriage/cohabitation and parenthood30 between ELBW and full terms at ages 22 to 26 years, ELBW adults were less likely to being married/cohabitating and to having children during the fourth decade of life 2.

Additionally, there is a lack of research that has analyzed the impact of preterm birth on the quality of close relationships, such as with partners2,31,32 and friends2,31,33-35.

Hence, there are inconsistent and scarce findings about the social lives of PT/LBW adults. The present meta-analysis systematically investigates the association between being born PT/LBW and social outcomes in adulthood, such as ever being in a romantic partnership, ever having had sexual intercourse, parenthood, quality of romantic relationship, and peer social support. Furthermore, we investigate whether there is a dose-response effect according to degree of prematurity, and whether outcomes are moderated by type of study (i.e. cohort or registry), age, or sex.

**Methods**

This meta-analysis followed PRISMA guidelines36 and was registered with PROSPERO International prospective register of systematic reviews (CRD42017078286).

**Search Strategy**

A systematic search for articles published in the electronic databases - PubMed, PsycINFO, Web of Science, and Embase - was performed from inception through August 5, 2018, for publications in English, using the following keywords: (preterm\* OR “low birth weight”) AND (partner\* OR roman\* OR marri\* OR sexual\* OR reprod\* OR fertility OR intercourse OR parent\* OR social\* OR peer OR friend\*) AND (adult\*).

**Study Selection Criteria**

Studies were eligible for review according to the following criteria: (1) the sample included individuals PT (<37 weeks gestation) or LBW (<2500g at birth); (2) term control group; (3) adult participants (i.e. mean sample age ≥ 18 years; (4) measured at least one of the following social outcomes in adulthood: romantic partnership (e.g. dating, cohabitation, marriage), quality of romantic relationship (e.g. satisfaction, intimacy), sexual intercourse (i.e. if ever experienced sexual intercourse ), parenthood (i.e. if any live biological child), or social support (i.e., positive and supportive relationships with friends); and (5) the study was published in a peer-reviewed journal.

If data from the same sample were published in multiple works for same social outcome, we retained the study with: (1) the longest follow-up interval (i.e., oldest age at assessment); and (2) the study with the largest sample size and the broadest concept coverage.

**Data Collection Process**

Two authors (MM and AB) reviewed titles and abstracts of traced articles. The title and abstract screening was followed by the analyses of full texts to check inclusion criteria. Discordances were resolved by discussion among all authors. When reported information was unclear or numerical data were not obtainable, relevant corresponding authors were contacted for clarification.

**Data Extraction**

Studies reporting on preterm birth or low birth weight were grouped into the same category since infants with low birth weight are mostly born preterm37. When information was available, we used four different gestational age subgroups: extreme preterm (EPT; <28 weeks/<1000g), 2) very preterm (VPT; 28-31 weeks/1000-1500g), 3) moderate to late preterm (MLPT; 32-36 weeks; 1500-2500g), and 4) full term (FT; >36 weeks; >2500g). When studies referred to preterm birth without mentioning gestational weeks, data was included in the MLPT subgroup.

A standardized form was used to extract data from each study that included: publication details, country, characteristics of participants (year of birth, sample size, gestational age/birth weight, percentages of men, age,), type of study (i.e. cohort or registry), type of social outcome, and outcome data (i.e. means and SDs, or numbers and frequencies) (Table 1). The extraction was conducted independently by two authors (MM and AB) and information was cross-checked for consistency. When inconsistencies emerged information was checked on the original study.

**Quality Assessment**

Study quality was assessed independently by two investigators (MM and AB) using the Newcastle-Ottawa Scale38 (Supplemental Table 1). Scores could range from 0 to 9. The average of ratings for the studies quality was 7.3 (ranged from 4-9), indicating overall good quality.

**Data Analysis**

Meta-analysis of the overall comparison between PT/LBW born-adults and their FT peers was carried out with Comprehensive Meta-Analysis (CMA) version 2 software39 for each social outcome. We used pooled odds ratios (ORs) with 95% confidence intervals (CIs) for studies presenting dichotomous outcomes (e.g. frequencies) and Hedges’ g for studies presenting continuous outcomes (e.g. means and standard deviations), with random effects. Heterogeneity among studies was assessed with Cochran’s *Q* (p value)*,*  Higgins *I2* and *T*2. Low heterogeneity was defined as an *I2* value of 0-25%, moderate heterogeneity as an *I2* of 25-75% and high heterogeneity as an *I2* of 75-100%.

In order to explore heterogeneity, we conducted subgroup analyses (dependent on data availability) for degree of prematurity (i.e. EPT, VPT, MLPT), type of study (i.e. cohort or registry), age groups (i.e., young adulthood: 18-25 years or middle adulthood: ≥26 years) and sex.

Publication bias analysis was assessed through: (1) the trim and fill procedure to examine the symmetry of effect sizes plotted by the inverse of the SE.40 Ideally, effect sizes should mirror one another on either side of the mean; (2) the Begg and Mazumdar rank correlation test to examine the likelihood of bias in favor of small sample size studies.41 Non-significance of correlation indicates no publication bias; (3) Egger’s test to examine whether publication bias was related to the direction of study findings.42 The intercept value provided by this test shows the level of funnel plot asymmetry from the standard precision.

Since PT and LBW were combined into one group, it is essential to prove that the findings of the meta-analysis are not dependent on this decision. Therefore, a sensitivity analysis was undertaken, in which we repeated the analysis excluding the studies that reported on low birth weight only.

**Results**

**Study Characteristics**

Twenty-one studies were eligible for quantitative analysis (Figure 1). According to our selection criteria, it was possible to identify 14 studies for romantic partnership, 9 for sexual intercourse, 11 for parenthood, 3 for quality of romantic relationship, and 5 for peer social support. We also identified 5 studies for number of friends 33-35,43,44, however they were not included in the quantitative synthesis (meta-analysis) due to the different way the number of friends was assessed across studies. The studies included in the meta-analysis were conducted in 12 countries (Germany, Denmark, Norway, Sweden, Finland, UK, Netherlands, Israel, Canada, USA, New Zealand, and Australia). The number of participants included in each analysis of summary data ranged from 4,423,798 (PT/LBW=179,724) for parenthood to 648 (PT/LBW=276) for peer social support (Table 2). Study characteristics are summarized in Table 1. The average percentage of occurrence of the social transition across the studies is in Supplemental Table 2.

**Differences in Social Outcomes between Adults born PT/LBW and FT**

Meta-analysis results (Table 3/Figure 2) revealed that adults born preterm were less likely to have ever been involved in a romantic partnership than those born FT (OR= 0.74; 95% CI= 0.66-0.83). Heterogeneity analysis indicated high variation in effects between studies (*Q* = 234.38; *I 2* = 94.45%). Subgroup analysis according to the degree of prematurity revealed a dose-response relationship of degree of prematurity and romantic partnership (*Q* = 11.07, p <.01) with the EPT subgroup being the least likely to have ever been in a romantic partnership. Comparisons of type of study indicated that in both cohort (OR= 0.65; 95% CI= 0.57-0.73) and registry studies (OR= 0.88; 95% CI= 0.80-0.97) preterm birth was associated with decreased likelihood of romantic partnership when compared with individuals born FT, but this effect was stronger in cohort studies. In both age groups, PT/LBW were less likely to experience a romantic partnership (18-25y: OR= 0.69; 95% CI= 0.55-0.85 and ≥26y: OR=0.73; 95% CI= 0.64-0.85). Finally, subgroup analysis for sex revealed that both males and females born PT/LBW were less likely to ever be involved in a romantic partnership than their same sex FT counterpart (men: OR = 0.62; 95% CI= 0.45-0.86; women: OR = 0.71; 95% CI= 0.53-0.95).

Being born PT/LBW was associated with being less likely to ever have experienced sexual intercourse (OR = 0.43; 95% CI= 0.31-0.61; p< 0.001) (Table 3/ Supplemental Figure 1). Heterogeneity analysis indicated high variation in sexual activity effects between studies (*Q* = 33.80; p < 0.01; *I2* = 76.33,). Subgroup analysis for degree of prematurity revealed that both the EPT and VPT subgroups were less likely to ever have had sexual intercourse than the FT adults (EPT: OR= 0.36; 95% CI= 0.15-0.82 and VPT: OR= 0.49; 95% CI= 0.30-0.83), however adults born MLPT did not differ from FT. In both age groups, PT/LBW were less likely to ever have had sexual intercourse than full terms and this association was stronger for the older age group. Subgroup analysis for sex revealed that both men and women born PT/LBW were less likely to have experienced sexual intercourse, than their same sex counterparts born FT (men: OR=0.49; 95% CI= 0.32-0.78 and women: OR=0.45; 95% CI= 0.29-0.69).

There was also a significant association between PT/LBW and parenthood (OR= 0.78; 95% CI= 0.67-0.90) with adults born PT/LBW less likely to be parents than FT. Heterogeneity analysis indicated significant and high variation in parenthood effects between studies (Q = 555.77; I2 = 98.20, p < 0.001). Subgroup analysis for degree of prematurity revealed a dose-response relationship of degree of prematurity and parenthood (*Q* = 22.30, *p* <.001) with the EPT subgroup being the least likely to have become a parent (EPT: OR= 0.31; 95% CI= 0.23-0.42; VPT: OR=0.67, 95% CI= 0.55-0.82 and MLPT: OR=0.79, 95% CI= 0.65-0.96). When comparing the type of study, preterm adults were less often reported to be parents in cohort studies (OR= 0.71; 95% CI= 0.60-0.85), but not in registry studies. Subgroup analysis for age groups revealed that no differences between PT/LBW and FT in the younger age group, but PT/LBW in the older age group were less likely to be parents (OR=0.76; 95% CI= 0.64-0.93) compared to FT of the same age. No moderation effect was found for sex.

Significant differences between PT and FT born adults were found for the quality of romantic relationship (Table 3/Figure 2). PT/LBW born adults perceived the relationship with their partner as significantly more satisfying or intimate than FT (*Hedges*’ *g =* 0.04; 95% CI= 0.02-0.07; *z* = 3.23, *p* = 0.01). Heterogeneity was not significant for this variable.

Furthermore, we observed no significant differences between PT/LBW and FT adults regarding the peer social support.

**Publication Bias**

Under the random effects model, the point estimate (95% confidence interval) for the combined studies is 0.70 (0.67, 0.73) for romantic partnership, 0.04 (0.02, 0.07) for quality of romantic relationship, 0.54 (0.39, 0.74) for ever having experienced sexual intercourse, 0.78 (0.66, 0.93) for parenthood and 0.15 (-0.32, 0.01) for peer social support. With the use of trim and fill, these values remained unchanged for all relational outcomes indicating no publication bias. The Begg and Mazumdar rank correlation and Egger’s test were not statistically significant for all outcomes, indicating no evidence of publication bias.

**Sensitivity Analysis**

Results remained the same after excluding studies that reported on birth weight. Hence, preterm born adults were less likely to be in a partnership (OR= 0.75; 95% CI= 0.66-0.85), to have ever had sexual intercourse (OR= 0.48; 95% CI= 0.31-0.76), and to be parents (OR= 0.80; 95% CI= 0.67-0.97) in comparison to full-term born adults.

**Discussion**

Our findings revealed that adults born PT/LBW are less likely to experience romantic partnerships, sexual intercourse, or parenthood. Nevertheless, when they were in a romantic partnership or had friends, the quality of these relationships was not impaired by being born PT/LBW.

Using summary data from prospective studies with over 4 million of participants provided evidence for a temporal relationship between being born PT/LBW and establishing social transitions into adulthood, here defined as romantic partnership, sexual intercourse and parenthood. The associations were robust across degree of prematurity, age groups, and sex. These findings are consistent with the increasing recognition of the impact that early life influences have on subsequent life chances in adulthood13,45,46. Furthermore, it is in line with evidence of a “preterm behaviour phenotype” that follows into adulthood21,22,24, which might make engaging in these transitions more challenging for individuals born PT/LBW.

We verified that the strength of the associations between PT/LBW and social transitions were in general small for romantic partnership and parenthood, and moderate for sexual intercourse, and diverged depending on degree of prematurity, type of study and age group. The sub-group analysis for degree of prematurity revealed that the likelihood of PT/LBW experiencing a romantic partnership, sexual intercourse or parenthood decreased with lower gestational age. Indeed, a significant dose-response relationship was found between degree of prematurity and rates of romantic partnership and parenthood, with adults born EPT being respectively 67% and 69% less likely group to have experienced these transitions than those born FT.

With respect to the type of study, we found that PT/LBW were less likely to have experienced romantic partnership or parenthood in cohort compared to registry studies. This difference may be related to the fact that cohort studies included mainly individuals born at less than 32 weeks of gestational age, whereas registry studies included the full range of preterm birth and the likelihood of occurrence of these transitions decreases with lower gestational ages.

It has been suggested that PT/LBW born individuals might take longer to accomplish the milestones normative of adult life, such as employment, romantic partnership and parenthood29. The current findings do not support this hypothesis. We verified that the difference of experiencing these transitions in comparison to FT did not alter in the older age group, and in some cases, it was even higher in the older age group. To illustrate, while at ages 18 to 25 years, individuals born PT/LBW were 50% less likely than full terms to ever having experienced sexual intercourse, after the age of 25 years the decreased likelihood for PT/LBW went up to 95%. These findings may be cautiously interpreted, as only two studies2,9 could be included in the older age group for this analysis. Alternatively, we may speculate that new ways of dating such as dating applications may be used more often by the younger age group of PT/LBW47.

PT/LBW were overall found to be less likely than FT to be parents. However, this difference was not significant in the younger age group, but in the older age group. This finding is in line with the ones reported in the Canadian study by Saigal et al.2 A likely explanation is that, consistent with the general trend for first parenthood to take place in the late twenties or early 30s48, that also few in the FT group were parents, and thus no difference was found between the two groups. However, once parenthood was assessed in middle adulthood, the differences between PT/LBW and FT emerged. At a societal or population level it suggests that prematurity is associated with a cross-generational fertility loss. PT/LBW adults are less likely to become parents and their parents were already less likely to have subsequent children after their preterm child was born.49

Overall, rather than a delay, our findings suggest persistent difficulties in making these social transitions that have been associated with negative outcomes later in life50,51, such as lower wealth, social isolation, and poorer physical and mental health. Both biological and environmental factors, such as alterations in the “social brain” as part of the neurodevelopmental sequelae of preterm birth 52 or parental stress in the early stages of life53 have been found to contribute to social difficulties in PT/LBW, such as being more timid and withdrawn. However, more investigation are required to shed light into the mechanisms through which biological and environmental factors interplay during PT/LBW’s development. Together, this highlights, on the one hand, the need for more prospective studies over the life course of PT/LBW and the analysis of early predictors of social outcomes, and on the other hand, the continued monitoring and adequate support of PT/LBW throughout life.

With respect to sex, it was only possible to include four to five studies in these subgroup analyses. We verified that both men and women born PT/LBW were less likely to have experienced romantic partnerships or sexual intercourse than their counterparts born FT. No differences were found for parenthood, however it is important to note that there were few participants with children in this subgroup analysis. Previous studies have not been consistent when analyzing the role of sex on social outcomes2,27,29. Although, it was possible to pool data from over 1,200 participants in these analyses, the lack of studies reporting on sex highlight the need for future research to clarify its moderating role.

Finally, we found that PT/LBW individuals perceived their romantic relationship slightly more positively than FT, and that there was no difference for perceptions of peer social support between both groups. Although it was not possible to assess the amount of friends in this meta-analysis, most studies found that PT/LBW had fewer friends43,44,54 than FT. In addition, studies on PT/LBW children and adolescents reported poorer quality relationships with peers18,55 than term born, including being more often bullied by peers56. Hence, our findings suggest, that despite fewer close relationships, the quality was not poorer when PT/LBW had friends or a partner, or the quality of relationships in PT/LBW improves into adulthood. Longitudinal studies are required to unpack these alternative explanations.

**Limitations**

This comprehensive study of social outcomes of premature birth uses large sample sizes of PT/LBW in comparison to FT, particularly in the analysis of romantic partnership and parenthood. However, there are limitations for the other outcome measures - having ever experienced sexual intercourse, quality of romantic relationships and peer social support - which included a smaller number of studies and PT/LBW participants. There are also considerable variations of how peer support and quality of romantic relationships were measured across studies. For example, quality of romantic relationship included studies reporting on satisfaction with partner and intimacy, and social support included studies reporting on emotional closeness with friends to self-reported quality of social network. We recommend individual studies to use similar valid measures in order to make comparisons less problematic.

Furthermore, the degree of prematurity is associated with physical and mental health, and cognitive development12,13,25,46 and information on disability of the participants was not available for the majority of studies. Thus, it could not be assessed whether functional deficits or disability moderated the association between PT/LBW and social outcomes. In this study premature birth and low birth was treated as one factor. Although, these constructs occur under high comorbidity and our sensitivity analyses revealed consistent results, it would be important to disentangle the effects of PT and LBW, and its possible additive effects on social outcomes. This would involve considering data on birth weights appropriate for gestational age/small for gestational age, which most studies included in the meta-analyses lacked to report. Future research should address these limitations by conducting of individual participant meta-analysis and obtaining data directly from the study authors.

The heterogeneity was high indicating considerable variation between studies. This might arise from incorporating cohort and registry studies with various sample sizes. To address this possibility, we used random-effects model in the analysis and conducted moderator analyses. Nevertheless, our moderator analysis explained only some of the heterogeneity. Thus, the findings from the current study should be interpreted with caution and analysis should be repeated when more adulthood data becomes available from the cohort studies. Finally, only English publications were considered in this meta-analysis and therefore potential of language bias should be taken into account.

**Conclusions**

This review provides a qualitative and quantitative overview of the current state of knowledge concerning social outcomes in adults born PT/LBW. Pooling data from multiple cohort and registry studies provided evidence that fewer adults born PT/LBW experience romantic partnerships, sexual intercourse, or parenthood. These associations are stronger the lower the gestational age and were found in young and middle adulthood. However, when PT/LBW were in a romantic partnership or having friends, the quality of these relationships was at least as good in PT/LBW compared to FT. Hence, analysing both objective indicators about the occurrence of social transitions, and subjective measures about the quality of close relationships, provided distinct and complementary information on the social lives of adults born preterm. The implications of the current findings are that PT/LBW are at increased risk of never experiencing sexual intercourse, being without a supportive partner and being less likely to experience parenthood. Lack of sexual activity57 and lack of romantic partner support9 is associated with lower happiness, and poorer physical and mental health. Future research is needed to identify the predictors and promotive factors of social outcomes in PT/LBW to allow for timely interventions in aiding the transition into adulthood.

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**Access to Data and Data Analysis**

DrMendonçahad full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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**Figure Legends**

Figure 1. Meta-Analysis Flow Diagram

**Table 1.** Summary of the Studies Included in the Meta-Analysis of Social Outcomes in Adulthood after preterm birth/low birth weight (18 years or above)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Author(s)(Year) | Country | Year of Birth | Number of Participants | Male N(%) | Age Outcome | Degree of PT/LBW | Registry/Cohort (Name) | SocialOutcome(s) | Measures |
|  |  |  | PT | FT | PT | FT |  |  |  |  |  |
| Batsvik et al. (2015)58  | Norway | 1982-1985 | 37  | 46 | 19 (51.4%) | 25 (54.4%) | 24y | EPT | Cohort-NA | Partnership  |

|  |
| --- |
| Marriage/cohabitation |

 |
| Cooke (2004)27  | UK | 1980-1983 | 79 | 71 | 35 (44.3%) | 30 (42.3%) | 19 to 22y | PT | Cohort-NA | PartnershipSex. Interc.Parenthood | Ever in relationship |
| Dalziel et al. (2007)59  | New Zealand | 1969-1974 | 126  | 66 | 66 (52.3%) | 33 (50%) | 31y | PT | Cohort-The Auckland Steroid Trial | Partnership | Marriage/cohabitation |
| Darlow, Horwood, Pere-Bracken & Woodward (2013)44  | New Zealand | 1986 | 230  | 69 | 104 (45.2%) | 33 (47.8%) | 22 to 23y | VLBW | Cohort- NA | Sex. Interc. |  |
| D’Onofrio (2013)25  | Sweden | 1973–2008 | 154322 | 3,146,386 | 85195 (55.2%) | 1618442 (51.4%) | Up to 38y | EPT, VPT& MLPT | Registry | PartnershipParenthood | Ever partnered |
| Drukker et al. (2018)60 | Israel | 1982-1997 | 4,005 | 53,906 | 1,788(45%) | 26,825(49%) | NA | VPT & MLPT | Cohort - NA | Parenthood |  |
| Hack et al. (2002)61  | USA | 1977-1979 | 242  | 233 | 116 (48%) | 108 (46%) | 20y | VLBW | Cohort- NA | Sex. Interc. Parenthood |  |
| Hallin & Stjernqvist (2010)33 | Sweden | 1985-1986 | 51 | 52 | 19 (37.3%) | 23 (42.6%) | 18y | EPT | Cohort - NA | P. Soc. Supp. | Adaptive functioning for friends (ASR) |
| Hille et al. (2008)23 | The Netherlands | 1983 |  656 | 418 | 294(44.8%) | 220 (52.6%) | 19y | VPT | Cohort- The POPS study & Dutch General Population | PartnershipSex. Interc.  | In relationship |
| Husby et al. (2016)34 | Norway | 1986-1988 | 35 | 37 | 14 (40%) | 15 (40.5%) | 23y | VLBW | Cohort – The University Hospital Trondheim | P. Soc. Supp. | Adaptive functioning for friends (ASR) |
| Jaekel, et al. (2017)9 | Germany | 1985-1986 | 200  | 197 | 106 (53%) | 94 (47.7%) | 26y | VPT/VLBW | Cohort- Bavarian Longitudinal Study | PartnershipSex. Interc. | In relationship |
| Kajantie et al. (2008)29  | Finland | 1978-1985 | 162  | 188 | 68 (42%)  | 75 (39.9%) |  22.3y  | VLBW | Cohort: Helsinki Study of Very Low Birth Weight Adults | Partnership Sex. Interc.Parenthood | Ever partnered |
| Kroll et al. (2017)62  | UK | 1979-1984 | 122  | 89 | 76 (62%) | 42(47%) | 28 to 34y | VPT | Cohort-NA | Partnership Parenthood | In relationship |
| Mannisto et al.\* (2015)63  | Finland | 1985-1989 | 397 | 356 | 189 (47.6%) | 170 (47.8%) | 23.2y | MLPT | Cohort-ESTER | PartnershipSex. Interc.Parenthood | Ever partnered |
| Mathiasen et al. (2009) 26 | Denmark | 1974-1976 | 1422  | 192233 | 736 (51.8%) | 98240 (51.1%) | 27 to 29y | VPT | Registry | Partnership Parenthood | In relationship |
| Moster, et al. (2008)12 | Norway | 1967-1983 | 39465 | 828,227  | 21715 (55%) | 421568 (50.9 %) | 20 to 36y | EPT, VPT & MLPT | Registry  | Partnership Parenthood | Marriage/cohabitation |
| Odberg & Elgen (2011)35 | Norway | 1986-1988 | 134  | 135 | 61 (54%) | 64 (53%) |  19y | LBW (<2000 gr) | Cohort - NA | PartnershipP. Soc. Supp. | In relationshipSelf-reported quality of the social network |
| Roberts et al. (2013)64 | Australia | 1991-1992 | 194 | 148 | 84 (45,2%) | 60 (43.5%) | 18y | EPT/ELBW | Cohort- Victorian Infant Collaborative Study | Sex. Interc. |  |
| Saigal, Day et al. (2016)2\* | Canada | 1977-1982 | 100  | 89 | 39 (39.0%)  | 33 (37.1%) | 32.3y | ELBW | Cohort-McMaster ELBW Cohort | PartnershipQRR Sex. Interc.ParenthoodP. Soc. Supp.  | Marriage/cohabitationSatisfaction with partnerYoung adult social support index |
|  Scharf & Cohen (2013)31 | Israel | NA | 57 | 57 | NA | NA | 26.6y | PT | Cohort-NA | QRRP. Soc. Supp. | Intimacy in relationship Emotional closeness  |
| Winstanley, Lamb, Ellis-Davies, & Rentfrow (2015)32  | UK | NA | 11,592 | 51,460 | 3554 (30.7%) | 8038 (69.3%) | 31.4y | PT | Cohort-NA | Partnership ParenthoodQRR | Marriage/cohabitation Satisfaction with partner |
|  |  |  |  |  |  |  |  |  |  |  |  |

PT: Preterm, FT: Full Term, EPT: Extreme Preterm (< 28 weeks gestation), VPT: Very Preterm (28-31 weeks gestation), MLPT: Moderate-to-Late Preterm (32-36 weeks); LBW: Low Birth Weight (<2500 gr); ELBW: Extreme Low Birth Weight (<1000gr), VLBW: Very Low Birth Weight (1000-1500 gr), VPT/VLBW: Very Preterm/Very Low Birth Weight, ASR: Adult Self Report, Sex. Interc.: Sexual Intercourse, P. Soc. Support: Peer Social Support; QRR: Quality of Romantic Relationship, NA: not available.

\* This study reported on an early preterm (<34 weeks) subgroup overlapping with MLPT subgroup. We excluded this subsample of <34 weeks gestation from the analysis.

**Table 2.** Number of Participants Included in Meta-Analysis

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Social outcome | Total *N* Studies | Total *N* cases | *N* analyzed by degree of prematurity | *N* analyzed by type of study | *N* analyzed by age group | *N* analyzed by sex |
| Romantic Partnership | 14 | 4,367,489 (PT=176,632) | EPT=6,244; VPT=13,606;MLPT=156,782 | Cohort=66,566 (PT=13,456); Registries=4,300,923(PT=163,176) | 18-25y=2,531 (PT=1,326); ≥ 26y=3,56,824 (PT=175,304) | M=793 (PT=435);F=967 (PT=559) |
| Sexual Intercourse  | 9 | 3,730 (PT=2,029) | EPT=286; VPT=1,420;MLPT=323 | NA | 18-25y=3,147 (PT=1,732); ≥ 26y=583 (PT=297) | M=1,023 (PT=551);F=1,214 (PT=685) |
| Parenthood | 11 | 4,423,798 (PT=179,724) | EPT= 6,207; VPT=13,369; MLPT=160,148 | Cohort=122,952(PT=16,560);Registries=4,300,917(PT=163,164) | 18-25y=1,589 (PT = 741);≥ 26y=4,364,369 (PT=174,978) | M=34,531 (PT=2,045); F=33,101 (PT=2,540) |
| Quality of Romantic Relationship | 3 | 63,238 (PT=11,688) | NA | NA | NA | NA  |
| Peer Social Support | 5 | 648 (PT=276)  | NA | NA | NA | NA |

PT: Preterm, EPT: Extreme Preterm (< 28 weeks gestation), VPT: Very Preterm (28-31 weeks gestation), MLPT: Moderate-to-Late Preterm (32-36 weeks), M: Male, F; Female, NA: not analyzed

**Table 3.** Associations between PT/LBW and Social Outcomes

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Social Outcomes | Data Points | ORa /Hedges’s gb (95% CI) | Cochran’s Q | Test for heterogeneity (*p* value) | T2  | *I2* (95% CI) |
| **Romantic Partnership** |  |  |  |  |  |  |
| All Studies | 14 | 0.72a (0.57-0.77) | 234.39 | <0.001 | 0.02  | 94.45 (92.2-96.05\_ |
| *Degree of Prematurity\** |  |  |  |  |  |  |
|  MLPT (32-36 wks GA) | 7 | 0.79a | 256.61 | <0.001 | 0.03  | 9 |
|  VPT (28-31 wks GA) | 7 | 0.64a (0.48-0.77) | 19.88 | <0.01 | 0.04 | 80.803 |
|  EPT (< 28 wks GA) | 4 | 0.33a (0.24-0.50) | 23.76 | <0.001 | 0.39 | 87.38 |
| *Study Type* |  |  |  |  |  |  |
|  Cohort | 11 | 0.65 (0.57-0.73 | 20.13 | <0.001 | 0.07 | 68.77 |
|  Registry | 3 | 0.88 (0.80-0.97) | 38.6024.01 | <0.001 | 0.004 | 91.67 |
| *Age Group* |  |  |  |  |  |  |
|  18 - 25y | 6 | 0.69a (0.54-0.90) | 5.79 | .33 | 0.008 | 13.61 |
|  ≥ 26y | 8 | 0.73a (0.53-0.78) | 217.18 | <0.001 | 0.02 | 96.77 |
| *Sex* |  |  |  |  |  |  |
|  Men | 4 | 0.62a (0.45-0.86) | 4.38 | 0.22 | 0.14 | 31.52 |
|  Women | 4 | 0.71a (0.53-0.95) | 2.25 | 0.52 | 0.00 | 0 |
| **Sexual Intercourse** |  |  |  |  |  |  |
| All Studies | 9 | 0.43a (0.31-0.61) | 24.81 | <0.01 | 0.16 | 67.76 |
| *Degree of Prematurity* |  |  |  |  |  |  |
|  MLPT (32-36 weeks GA) | 2 | 0.58a (0.25-1.35) | 0.28 | 0.60 | 0 | 0 |
|  VPT (< 32 weeks GA) | 5 | 0.37a (0.22-0.66) | 18.32 | 0.01 | 0.28 | 78.16 |
|  EPT | 2 | 0.32a (0.13-.87) | 5.37 | <0.05 | 1.37 | 81.41 |
| *Age Group* |  |  |  |  |  |  |
|  18-25y | 7 | 0.50a (0.42-0.59) | 6.35 | 0.38 | 0.003 | 5.54 |
|  ≥ 26y | 2 | 0.05a (0.02-0.15) | 0.86 | 0.35 | 0.00 | 0 |
| *Sex* |  |  |  |  |  |  |
|  Men | 5 | 0.49a (0.32-0.78) | 9.98 | <0.05 | 0.22 | 59.98 |
|  Women | 5 | 0.45a (0.29-0.69) | 3.71 | 0.45 | 0.00 | 0 |
| **Parenthood** |  |  |  |  |  |  |
| All Studies | 11 | 0.78a (0.67-0.90) | 555.98 | <0.001 | 0.04 | 98.20 |
| *Degree of Prematurity\** |  |  |  |  |  |  |
|  MLPT (32-36 wks GA) | 5 | 0.79a (0.65-0.96) | 562.88 | <0.001 | 0.05 | 99.11 |
|  VPT (28-31 wks GA) | 6 | 0.67a (0.55-0.82) | 65.83 | <0.001 | 0.07 | 90.11 |
|  EPT (< 28 wks GA) | 3 | 0.31a (0.23-0.42) | 55.26 | <0.001 | 0.57 | 96.38 |
| *Study Type* |  |  |  |  |  |  |
|  Cohort | 8 | 0.71a (0.60-0.85) | 182.58 | <0.001 | 0.09 | 96.16 |
|  Registry | 3 | 0.85a (0.71-1.01) | 131.92 | <0.001 | 0.01 | 98.49 |
| *Age Group* |  |  |  |  |  |  |
|  18 - 25y | 4 | 0.76a (0.55-1.31) | 2.43 | 0.48 | 0.00 | 0 |
|  ≥ 26y | 6 | 0.76a (0.64-0.93) | 552.86 | <0.001 | 0.12 | 99.06 |
| *Sex* |  |  |  |  |  |  |
|  Men | 5 | 0.63a (0.36-1.09) | 1.68 | 0.79 | 1.02 | 0 |
|  Women | 5 | 0.65a (0.41-1.04) | 10.88 | <0.05 | 0.00 | 63.07 |
| **Quality of Romantic Relationship**  |  |  |  |  |  |  |
| All Studies | 3 | 0.04b (0.02-0.07) | 0.41 | 0.81 | 0.00 | 0 |
| **Peer Social Support** |  |  |  |  |  |  |
| All Studies | 5 | -0.15b (-0.32-0.01) | 5.10 | 0.28 | 0.008 | 21.63 |

\* Please note that the number of data points are higher in the degree of prematurity analysis since some studies reported on more than one degree of prematurity. MLPT: Moderate to Late Preterm; VPT: Very Preterm; EPT; Extreme Preterm;wks: weeks; GA: Gestational Age.