**The Impact of Perinatal Exposure to Paternal Anxiety on Offspring: A Prospective Study Using the Avon Longitudinal Study of Parents and Children (ALSPAC) Cohort**

**Online Appendix**

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## Appendix S1. eMethods: Multiple Imputation for Missing Data

We imputed missing data to prevent the bias that would result by the assumption that data are missing completely at random (White, Royston, & Wood, 2011). Given that there is substantial information on socio-demographic variables in ALSPAC which predict missingness, missing information can be assumed dependent on observed data. Thus, we employed a fully conditional specification using the mice() function from the MICE package (Van Buuren & Groothuis-Oudshoorn, 2011) (which stands for stands for multivariate imputation by chained equations) in R.

For each variable included in our adjusted models, we used the default imputation method in the mice() function, which is predictive mean matching (pmm) for continuous variables and logistic regression for binary variables (logreg). Two distinct imputed datasets were created, one for the analyses looking at the child outcomes at 3 years, 6 months (n=6,404) and one for the analyses looking at the child outcomes at 7 years, 7 months (n=5,426). Each imputation model used all variables in the analyses to predict missing data across 32 imputed datasets, based on the rule of thumb that the number of imputations should at least equal the percentage of missing cases (White et al., 2011). We checked whether convergence was achieved in the imputed datasets examining diagnostic plots and ran diagnostics to check the plausibility of the datasets with the stripplot() function. Analyses for the adjusted models were conducted post-imputation, combining estimates across the 32 imputed data sets using Rubin’s rules (White et al., 2011).

## Appendix S2. eTables

**Table S1** Descriptive characteristics of the sample used in the analyses looking at outcomes at 3 years, 6 months, without imputations for missing values.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Factor** | **All sample** | **Non-anxious group** | **Prenatal only** | **Postnatal only** | **Anxious-at-both-times group** |
| Father age (mean and SD) | 31.20 (5.55) | 31.15 (5.46) | 30.98 (6.03) | 31.45 (6.10) | 31.79 (5.74) |
| Number of other children (mean and SD)a | .76 (.89) | .74 (.86) | .72 (.85) | .85 (.97) | .95 (1.14) |
| Paternal prenatal anxiety(mean and SD)a,b | 2.92 (2.70) | 2.14 (1.79) | 8.13 (1.43) | 4.10 (1.71) | 9.40 (2.16) |
| Paternal postnatal anxiety (mean and SD)a,c | 2.48 (2.57) | 1.69 (1.54) | 3.29 (1.44) | 7.45 (1.84) | 8.57 (2.35) |
| Paternal Ed. Level (n and % with degree)d | 1439 (22.76%) | 1200 (22.624%) | 67 (22.408%) | 88 (22.680%) | 84 (25.225%) |
| Racial identity (n and % White)  | 6186 (98.27%) | 5195 (98.37%) | 292 (97.99%) | 380 (98.19%) | 319 (96.96%) |
| Social class (n and % I and II)a,e | 3037 (50.68%) | 2529 (50.21%) | 160 (57.35%) | 175 (48.08%) | 173 (55.45%) |
| Child sex (n and % females)  | 3129 (48.94%) | 2624 (48.92%) | 129 (42.86%) | 207 (52.81%) | 169 (50.30%) |
| Marital status (n and % married)a | 4918 (85.53%) | 4199 (86.38%) | 212 (80.30%) | 267 (78.30%) | 240 (84.51%) |
| Past history of severe depression in fathers (n and %)a | 314 (5.51%) | 162 (3.35%) | 38 (14.67%) | 48 (14.41%) | 66 (24.35%) |
| Past history of other psychiatric problems in fathers (n and %)a | 92 (1.61%) | 45 (0.93%) | 7 (2.68%) | 12 (3.63%) | 28 (10.18%) |
| Past history of severe depression in mothers (n and %)a | 467 (7.40%) | 365 (6.89%) | 31 (10.51%) | 36 (9.23%) | 35 (10.57%) |
| Past history of other psychiatric problems in mothers (n and %)  | 131 (2.08%) | 103 (1.94%) | 5 (1.70%) | 15 (3.85%) | 8 (2.44%) |
| Paternal prenatal depression (n and %)a,f | 209 (3.26%) | 39 (0.73%) | 52 (17.16%) | 15 (3.81%) | 103 (30.66%) |
| Paternal postnatal depression (n and %)a,g | 212 (3.31%) | 31 (0.58%) | 10 (3.31%) | 69 (17.51%) | 102 (30.45%) |
| Maternal prenatal depression (n and %)a,f | 643 (10.64%) | 480 (9.44%) | 53 (18.86%) | 57 (15.36%) | 53 (17.38%) |
| Maternal postnatal depression (n and %)a,g | 530 (8.31%) | 386 (7.22%) | 37 (12.21%) | 62 (15.86%) | 45 (13.43%) |
| Maternal prenatal anxiety (n and %)a,h | 868 (14.46%) | 659 (13.04%) | 68 (24.29%) | 68 (18.58%) | 73 (24.09%) |
| Maternal postnatal anxiety (n and n and %)a,i | 894 (14.04%) | 655 (12.26%) | 67 (22.11%) | 89 (22.82%) | 83 (24.78%) |
| High emotional problems in offspring (n and %)a,j | 397 (6.20%) | 306 (5.70%) | 38 (12.54%) | 26 (6.60%) | 27 (8.04%) |
| High behavioural problems in offspring (n and %)a,k | 728 (11.37%) | 583 (10.86%) | 44 (14.52%) | 54 (13.71%) | 47 (13.99%) |
| High total problems in offspring (n and %)a,l | 563 (8.79%) | 436 (8.12%) | 42 (13.86%) | 42 (10.66%) | 43 (12.80%) |

a Significant difference between the four groups (F value or Pearson’s Chi-squared test, p < .05).

b Continuous score in the Crown-Crisp Experiential Index at the 18-week gestation assessment.

c Continuous score in the Crown-Crisp Experiential Index at the 8-week postnatal assessment.

d Education level was analysed in 5 categories of attainment, although only the percentage gaining a degree is presented here for ease of reading.

e I=professional occupations; II= managerial and technical occupations.

f Score > 12 in the Edinburgh Postnatal Depression Scale at the 18-week gestation assessment.

g Score > 12 in the Edinburgh Postnatal Depression Scale at the 8-week postnatal assessment.

h Score in the top 15% in the Crown-Crisp Experiential Index at the 18-week gestation assessment.

i Score in the top 15% in the Crown-Crisp Experiential Index at the 8-week postnatal assessment.

j Score in the top 10% in the emotional problems scale of the Revised Rutter Parent Scale for Preschool Children at 3 years, 6 months.

k Score in the top 10% in either the conduct or hyperactivity (or both) scales of the Revised Rutter Parent Scale for Preschool Children at 3 years, 6 months.

l Score in the top 10% in the total problems scale of the Revised Rutter Parent Scale for Preschool Children at 3 years, 6 months.

**Table S2** Paternal anxiety and child high (top 10%) emotional and behavioural problems at 3 years, 6 months, unadjusted and adjusted models, with odds ratios and 95% confidence intervals, male offspring only (n=3,264).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Subscale of RRPSPC | Regression model | Non-anxious vs prenatal only | Non-anxious vs postnatal only | Non-anxious vs anxious-at-both-times | Prenatal only vs postnatal only | Prenatal only vs anxious-at-both-times | Postnatal only vs anxious-at-both-times |
| Total problems (behavioural/emotional) | Unadjusted model | **1.72 [1.08, 2.64], p=.016** | **1.66 [1.05, 2.52], p=.023** | **1.62 [1.00, 2.52], p=.023** | 0.96 [.53, 1.75], p=.897 | 0.94 [.51, 1.73], p=.841 | 0.98 [.53, 1.79], p=.939 |
|  | Model 1 | **1.72 [1.10, 2.68], p=.017** | **1.63 [1.05, 2.52], p=.029** | **1.62 [1.02, 2.57], p=.040** | 0.95 [.52, 1.72], p=.862 | 0.94 [.51, 1.74], p=.855 | 1.00 [.54, 1.83], p=.988 |
|  | Model 2 | **2.16 [1.05, 2.70], p=.031** | **2.21 [1.06, 2.68], p=.027** | 0.75 [.74, 1.97], p=.452 | 1.00 [.53, 1.88], p=.997 | 0.72 [.37, 1.38], p=.317 | 0.72 [.38, 1.36], p=.309 |
|  | Model 3 | 1.47 [.93, 2.32], p=.098 | 1.40 [.89, 2.19], p=.144 | 1.25 [.78, 2.01], p=.354 | 0.95 [.52, 1.75], p=.872 | 0.85 [.46, 1.60], p=.617 | 0.90 [.48, 1.67], p=.729 |
|  | Model 4 | 1.25 [.77, 2.03], p=.365 | 1.13 [.69, 1.84], p=.625 | 0.74 [.40, 1.36], p=.330 | 0.90 [.47, 1.73], p=.759 | 0.59 [.29, 1.19], p=.139 | 0.66 [.33, 1.30], p=.229 |
| Behavioural problems\* | Unadjusted model | 1.31 [.84, 1.97], p=.214 | **1.53 [1.02, 2.23], p=.035** | 1.42 [.91, 2.13], p=.105 | 1.17 [.67, 2.05], p=.589 | 1.08 [.61, 1.93], p=.790 | 0.93 [.53, 1.61], p=.791 |
|  | Model 1 | 1.28 [.84, 1.97], p=.255 | 1.46 [.98, 2.17], p=.060 | 1.38 [.90, 2.11], p=.138 | 1.14 [.65, 1.99], p=.645 | 1.08 [.60, 1.92], p=.806 | 0.94 [.54, 1.65], p=.836 |
|  | Model 2 | 1.32 [.84, 2.07], p=.224 | 1.50 [.99, 2.28], p=.059 | 1.09 [.69, 1.71], p=.711 | 1.14 [.63, 2.05], p=.674 | 0.82 [.45, 1.52], p=.535 | 0.73 [.40, 1.31], p=.287 |
|  | Model 3 | 1.17 [.76, 1.80], p=.485 | 1.35 [.90, 2.01], p=.150 | 1.16 [.75, 1.78], p=.514 | 1.15 [.65, 2.03], p=.623 | 0.99 [.55, 1.78], p=.973 | 0.86 [.49, 1.51], p=.599 |
|  | Model 4 | 1.07 [.68, 1.69], p=.754 | 1.24 [.81, 1.90], p=.315 | 0.93 [.55, 1.57], p=.787 | 1.16 [.64, 2.09], p=.630 | 0.87 [.46, 1.62], p=.652 | 0.75 [.41, 1.38], p=.351 |
| Emotional problems | Unadjusted model | **2.18 [1.30, 3.49], p=.002** | 1.57 [.88, 2.61], p=.101 | **1.76 [.99, 2.93], p=.041** | 0.72 [.36, 1.44], p=.352 | 0.81 [.40, 1.61], p=.541 | 1.12 [.54, 2.33], p=.761 |
|  | Model 1 | **2.19 [1.33, 3.60], p=.002** | 1.58 [.92, 2.72], p=.098 | **1.95 [1.13, 3.37], p=.016** | 0.72 [.36, 1.45], p=.362 | 0.89 [.44, 1.80], p=.750 | 1.23 [.59, 2.57], p=.573 |
|  | Model 2 | **2.10 [1.27, 3.49], p=.004** | 1.64 [.94, 2.84], p=.080 | 1.56 [.90, 2.73], p=.116 | 0.78 [.38, 1.58], p=.488 | 0.74 [.36, 1.52], p=.416 | 0.96 [.45, 2.01], p=.905 |
|  | Model 3 | **1.93 [1.17, 3.19], p=.010** | 1.36 [.79, 2.35], p=.272 | 1.40 [.81, 2.45], p=.230 | 0.70 [.35, 1.43], p=.330 | 0.73 [.36, 1.48], p=.378 | 1.03 [.49, 2.17], p=.932 |
|  | Model 4 | 1.58 [.92, 2.70], p=.095 | 1.17 [.65, 2.10], p=.593 | 0.85 [.42, 1.71], p=.652 | 0.74 [.35, 1.58], p=.438 | 0.54 [.25, 1.18], p=.121 | 0.73 [.32, 1.63], p=.439 |

Note. The first group in each contrast was the reference group in the analyses. p-values have not been corrected for multiple-hypothesis testing.

Model 1 was adjusted for sociodemographic variables that were significantly different between the groups of comparison (i.e., number of other children, father social class, father marital status).

Model 2 was adjusted for child temperament (assessed via the Carey Infant Temperament Scale).

Model 3 was adjusted for maternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal and 8-week postnatal, maternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal and 8-week postnatal, maternal history of severe depression and other psychiatric problems).

Model 4 was adjusted for maternal and paternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal and 8-week postnatal, maternal and paternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal and 8-week postnatal, maternal and paternal history of severe depression and other psychiatric problems).

In the adjusted models, missing values in covariates are imputed via multiple imputation.

Significant results are in bold (p < .05).

\*Scale created by the authors, considering those who scored in the top 10% in the conduct and/or hyperactivity scales.

RRPSPC = Revised Rutter Parent Scale for Preschool Children.

**Table S3** Paternal anxiety and child high (top 10%) emotional and behavioural problems at 3 years, 6 months, unadjusted and adjusted models, with odds ratios and 95% confidence intervals, female offspring only (n=3,129).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Subscale of RRPSPC | Regression model | Non-anxious vs prenatal only | Non-anxious vs postnatal only | Non-anxious vs anxious-at-both-times | Prenatal only vs postnatal only | Prenatal only vs anxious-at-both-times | Postnatal only vs anxious-at-both-times |
| Total problems (behavioural/emotional) | Unadjusted model | **1.81 [1.02, 3.04], p=.032** | 1.07 [.61, 1.77], p=.795 | **1.72 [1.03, 2.74], p=.030** | 0.59 [.28, 1.24], p=.159 | 0.95 [.47, 1.93], p=.881 | 1.60 [.80, 3.24], p=.181 |
|  | Model 1 | **1.81 [1.05, 3.13], p=.033** | 1.10 [.65, 1.88], p=.714 | **1.78 [1.09, 2.91], p=.022** | 0.61 [.29, 1.27], p=.186 | 0.98 [.48, 1.98], p=.956 | 1.61 [.80, 3.22], p=.179 |
|  | Model 2 | 1.52 [.85, 2.72], p=.161 | 0.92 [.53, 1.60], p=.761 | 1.40 [.83, 2.37], p=.206 | 0.60 [.28, 1.31], p=.202 | 0.92 [.44, 1.95], p=.835 | 1.53 [.74, 3.17], p=.254 |
|  | Model 3 | 1.48 [.84, 2.60], p=.174 | 0.90 [.52, 1.55], p=.700 | 1.46 [.88, 2.42], p=.141 | 0.61 [.29, 1.29], p=.194 | 0.99 [.48, 2.03], p=.971 | 1.62 [.80, 3.29], p=.179 |
|  | Model 4 | 1.37 [.76, 2.48], p=.295 | 0.95 [.54, 1.67], p=.863 | 1.47 [.81, 2.65], p=.205 | 0.69 [.32, 1.50], p=.355 | 1.07 [.50, 2.30], p=.863 | 1.54 [.74, 3.23], p=.252 |
| Behavioural problems\* | Unadjusted model | 1.39 [.78, 2.32], p=.228 | 1.11 [.68, 1.74], p=.660 | 1.25 [.74, 2.00], p=.383 | 0.80 [.40, 1.61], p=.521 | 0.89 [.44, 1.84], p=.758 | 1.12 [.58, 2.17], p=.731 |
|  | Model 1 | 1.41 [.82, 2.42], p=.216 | 1.09 [.68, 1.75], p=.721 | 1.24 [.76, 2.05], p=.387 | 0.77 [.39, 1.55], p=.470 | 0.88 [.44, 1.80], p=.734 | 1.14 [.59, 2.21], p=.692 |
|  | Model 2 | 1.10 [.62, 1.96], p=.745 | 0.98 [.60, 1.61], p=.934 | 1.03 [.61, 1.74], p=.919 | 0.89 [.43, 1.85], p=.755 | 0.93 [.44, 1.98], p=.859 | 1.05 [.52, 2.10], p=.891 |
|  | Model 3 | 1.19 [.69, 2.07], p=.529 | 0.98 [.61, 1.59], p=.947 | 1.10 [.66, 1.82], p=.716 | 0.82 [.41, 1.66], p=.590 | 0.92 [.45, 1.89], p=.820 | 1.12 [.57, 2.17], p=.746 |
|  | Model 4 | 1.20 [.68, 2.13], p=.521 | 1.01 [.61, 1.66], p=.973 | 1.15 [.64, 2.06], p=.643 | 0.84 [.41, 1.72], p=.628 | 0.95 [.45, 2.02], p=.900 | 1.14 [.57, 2.28], p=.715 |
| Emotional problems | Unadjusted model | **2.67 [1.54, 4.41], p<.001** | 0.84 [.41, 1.53], p=.596 | 1.15 [.58, 2.07], p=.669 | **0.31 [.13, .69], p=.005** | **0.43 [.19, .93], p=.036** | 1.37 [.56, 3.37], p=.482 |
|  | Model 1 | **2.70 [1.58, 4.58], p<.001** | 0.89 [.46, 1.72], p=.731 | 1.23 [.65, 2.32], p=.528 | **0.33 [.15, .75], p=.008** | 0.46 [.21, 1.01], p=.053 | 1.38 [.57, 3.35], p=.477 |
|  | Model 2 | **2.55 [1.47, 4.43], p=.001** | 0.73 [.37, 1.44], p=.366 | 0.97 [.50, 1.86], p=.919 | **0.29 [.12, .66], p=.004** | **0.38 [.17, .86], p=.021** | 1.32 [.53, 3.26], p=.549 |
|  | Model 3 | **2.26 [1.31, 3.90], p=.003** | 0.70 [.36, 1.37], p=.297 | 0.97 [.51, 1.85], p=.923 | **0.31 [.14, .71], p=.006** | **0.43 [.19, .96], p=.040** | 1.38 [.56, 3.38], p=.478 |
|  | Model 4 | **2.15 [1.22, 3.81], p=.009** | 0.67 [.33, 1.34], p=.253 | 0.90 [.42, 1.92], p=.791 | **0.31 [.13, .73], p=.007** | 0.42 [.18, 1.00], p=.049 | 1.36 [.53, 3.44], p=.520 |

Note. The first group in each contrast was the reference group in the analyses. p-values have not been corrected for multiple-hypothesis testing.

Model 1 was adjusted for sociodemographic variables that were significantly different between the groups of comparison (i.e., number of other children, father social class, father marital status).

Model 2 was adjusted for child temperament (assessed via the Carey Infant Temperament Scale).

Model 3 was adjusted for maternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal and 8-week postnatal, maternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal and 8-week postnatal, maternal history of severe depression and other psychiatric problems).

Model 4 was adjusted for maternal and paternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal and 8-week postnatal, maternal and paternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal and 8-week postnatal, maternal and paternal history of severe depression and other psychiatric problems).

In the adjusted models, missing values in covariates are imputed via multiple imputation.

Significant results are in bold (p < .05).

\*Scale created by the authors, considering those who scored in the top 10% in the conduct and/or hyperactivity scales.

RRPSPC = Revised Rutter Parent Scale for Preschool Children.

**Table S4** Paternal anxiety and child high (top 10%) emotional and behavioural problems at 3 years, 6 months, unadjusted and adjusted models, with odds ratios and 95% confidence intervals, families where the biological father was still living with the family at the 3-year assessment only (n=5,439).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Subscale of RRPSPC | Regression model | Non-anxious vs prenatal only | Non-anxious vs postnatal only | Non-anxious vs anxious-at-both-times | Prenatal only vs postnatal only | Prenatal only vs anxious-at-both-times | Postnatal only vs anxious-at-both-times |
| Total problems (behavioural/emotional) | Unadjusted model | **1.56 [1.01, 2.32], p=.037** | 1.42 [.96, 2.04], p=.069 | **1.66 [1.11, 2.41], p=.010** | 0.91 [.53, 1.57], p=.735 | 1.07 [.62, 1.85], p=.811 | 1.17 [.70, 1.97], p=.545 |
|  | Model 1 | **1.55 [1.02, 2.35], p=.039** | 1.43 [.98, 2.08], p=.065 | **1.70 [1.16, 2.50], p=.007** | 0.92 [.54, 1.58], p=.763 | 1.10 [.64, 1.90], p=.738 | 1.19 [.71, 2.00], p=.504 |
|  | Model 2 | 1.43 [.92, 2.22], p=.114 | 1.36 [.92, 2.02], p=.126 | 1.29 [.86, 1.95], p=.222 | 0.95 [.54, 1.69], p=.873 | 0.91 [.51, 1.62], p=.737 | 0.95 [.55, 1.64], p=.849 |
|  | Model 3 | 1.39 [.91, 2.13], p=.124 | 1.21 [.83, 1.78], p=.326 | 1.41 [.95, 2.09], p=.090 | 0.87 [.50, 1.51], p=.622 | 1.01 [.58, 1.76], p=.972 | 1.16 [.68, 1.96], p=.581 |
|  | Model 4 | 1.26 [.81, 1.95], p=.307 | 1.12 [.75, 1.68], p=.574 | 1.19 [.74, 1.91], p=.471 | 0.89 [.51, 1.58], p=.694 | 0.95 [.52, 1.71], p=.854 | 1.06 [.60, 1.86], p=.839 |
| Behavioural problems\* | Unadjusted model | 1.31 [.87, 1.89], p=.173 | 1.29 [.91, 1.79], p=.141 | 1.36 [.93, 1.92], p=.095 | 0.99 [.60, 1.63], p=.958 | 1.04 [.63, 1.74], p=.880 | 1.05 [.65, 1.70], p=.828 |
|  | Model 1 | 1.32 [.89, 1.93], p=.163 | 1.27 [.91, 1.79], p=.162 | 1.34 [.94, 1.93], p=.109 | 0.97 [.59, 1.59], p=.898 | 1.02 [.61, 1.70], p=.936 | 1.05 [.65, 1.70], p=.827 |
|  | Model 2 | 1.22 [.81, 1.83], p=.342 | 1.20 [.84, 1.72], p=.310 | 1.10 [.75, 1.61], p=.640 | 0.99 [.59, 1.67], p=.966 | 0.90 [.52, 1.55], p=.702 | 0.91 [.55, 1.51], p=.715 |
|  | Model 3 | 1.18 [.80, 1.75], p=.396 | 1.15 [.81, 1.62], p=.437 | 1.18 [.82, 1.71], p=.369 | 0.97 [.59, 1.60], p=.900 | 1.00 [.60, 1.67], p=.999 | 1.03 [.64, 1.67], p=.897 |
|  | Model 4 | 1.13 [.76, 1.69], p=.534 | 1.08 [.76, 1.55], p=.657 | 1.05 [.68, 1.61], p=.829 | 0.95 [.57, 1.59], p=.860 | 0.92 [.54, 1.59], p=.776 | .97 [.58, 1.61], p=.899 |
| Emotional problems | Unadjusted model | **2.17 [1.40, 3.25], p<.001** | 1.09 [.65, 1.71], p=.737 | **1.68 [1.06, 2.56], p=.020** | **0.50 [.27, .92], p=.027** | 0.78 [.43, 1.38], p=.389 | 1.55 [.83, 2.93], p=.169 |
|  | Model 1 | **2.13 [1.40, 3.26], p<.001** | 1.12 [.69, 1.82], p=.643 | **1.84 [1.18, 2.86], p=.007** | **0.53 [.28, .97], p=.041** | 0.86 [.48, 1.55], p=.617 | 1.64 [.87, 3.08], p=.124 |
|  | Model 2 | **2.15 [1.39, 3.32], p=.001** | 1.06 [.65, 1.74], p=.814 | 1.44 [.91, 2.27], p=.118 | **0.49 [.26, .93], p=.028** | 0.67 [.37, 1.22], p=.189 | 1.36 [.71, 2.58], p=.355 |
|  | Model 3 | **1.92 [1.25, 2.95], p=.003** | 0.96 [.59, 1.57], p=.876 | 1.41 [.90, 2.21], p=.130 | **0.50 [.27, .93], p=.029** | 0.73 [.41, 1.32], p=.303 | 1.47 [.78, 2.76], p=.235 |
|  | Model 4 | **1.72 [1.10, 2.68], p=.017** | 0.83 [.50, 1.38], p=.472 | 0.99 [.57, 1.72], p=.974 | **0.48 [.25, .92], p=.027** | 0.58 [.30, 1.10], p=.094 | 1.19 [.61, 2.35], p=.606 |

Note. The first group in each contrast was the reference group in the analyses. p-values have not been corrected for multiple-hypothesis testing.

Model 1 was adjusted for sociodemographic variables that were significantly different between the groups of comparison (i.e., number of other children, father social class, father marital status).

Model 2 was adjusted for child temperament (assessed via the Carey Infant Temperament Scale).

Model 3 was adjusted for maternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal and 8-week postnatal, maternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal and 8-week postnatal, maternal history of severe depression and other psychiatric problems).

Model 4 was adjusted for maternal and paternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal and 8-week postnatal, maternal and paternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal and 8-week postnatal, maternal and paternal history of severe depression and other psychiatric problems).

In the adjusted models, missing values in covariates are imputed via multiple imputation.

Significant results are in bold (p <.05).

\*Scale created by the authors, considering those who scored in the top 10% in the conduct and/or hyperactivity scales.

RRPSPC = Revised Rutter Parent Scale for Preschool Children.

**Table S5** Descriptive characteristics of the sample used in the analyses looking at outcomes at 7 years, 7 months, without imputations for missing values.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Factor** | **All sample**  | **Non-anxious group**  | **Prenatal only**  | **Postnatal only** | **Anxious-at-both-times group**  |
| Father age (mean and SD) | 31.47 (5.46) | 31.42 (5.41) | 31.33 (5.41) | 31.57 (5.99) | 32.21 (5.62) |
| Number of other children (mean and SD)a | 0.74 (0.88) | 0.73 (0.86) | 0.71 (0.81) | 0.80 (0.93) | 0.95 (1.20) |
| Paternal prenatal anxiety (mean and SD)a,b | 2.92 (2.68) | 2.14 (1.80) | 8.12 (1.45) | 4.17 (1.67) | 9.23 (2.01) |
| Paternal postnatal anxiety (mean and SD)a,c | 2.46 (2.53) | 1.69 (1.53) | 3.31 (1.43) | 7.40 (1.76) | 8.44 (2.24) |
| Paternal Ed. Level (n and % with degree)d | 1317 (24.57%) | 1099 (24.40%) | 58 (22.66%) | 83 (26.02%) | 77 (27.40%) |
| Paternal racial identity (n and % White)  | 5259 (98.39%) | 4417 (98.44%) | 252 (98.05%) | 317 (98.75%) | 273 (97.50%) |
| Paternal social class (n and % I and II)e | 2678 (52.41%) | 2224 (51.82%) | 137 (56.38%) | 158 (51.97%) | 159 (58.67%) |
| Child sex (n and % females)  | 2670 (49.29%) | 2242 (49.24%) | 116 (45.14%) | 173 (53.56%) | 139 (48.94%) |
| Marital status of fathers (n and % married)a | 4270 (86.67%) | 3640 (87.50%) | 186 (81.94%) | 228 (79.17%) | 216 (85.71%) |
| Past history of severe depression in fathers (n and %)a | 252 (5.16%) | 130 (3.14%) | 31 (13.90%) | 37 (13.26%) | 54 (22.41%) |
| Past history of other psychiatric problems in fathers (n and %)a | 77 (1.57%) | 41 (0.99%) | 7 (3.11%) | 9 (3.24%) | 20 (8.23%) |
| Past history of severe depression in mothers (n and %)a | 359 (6.69%) | 282 (6.24%) | 20 (7.91%) | 28 (8.70%) | 29 (10.43%) |
| Past history of other psychiatric problems in mothers (n and %)a | 114 (2.12%) | 90 (1.99%) | <5 (<2.00%) | 16 (4.97%) | 6 (2.16%) |
| Paternal prenatal depression (n and %)a,f | 174 (3.21%) | 35 (0.77%) | 39 (15.06%) | 13 (4.01%) | 87 (30.63%) |
| Paternal postnatal depression (n and %)a,g | 169 (3.12%) | 25 (0.55%) | 7 (2.71%) | 56 (17.28%) | 81 (28.52%) |
| Paternal depression at 73 months (n and %)a,h | 195 (5.64%) | 97 (3.30%) | 17 (10.56%) | 37 (19.07%) | 44 (26.83%) |
| Maternal prenatal depression (n and %)a,f | 510 (9.93%) | 371 (8.58%) | 45 (18.60%) | 46 (14.94%) | 48 (18.25%) |
| Maternal postnatal depression (n and %)a,g | 446 (8.24%) | 324 (7.12%) | 32 (12.36%) | 52 (16.15%) | 38 (13.43%) |
| Maternal depression at 73 months (n and %)a,h | 626 (12.58%) | 486 (11.62%) | 38 (16.03%) | 56 (19.05%) | 46 (17.56%) |
| Maternal prenatal anxiety (n and %)a,i | 667 (13.29%) | 515 (12.01%) | 49 (20.33%) | 53 (17.49%) | 60 (22.99%) |
| Maternal postnatal anxiety (n and %)a,j | 739 (13.67%) | 535 (11.77%) | 59 (22.78%) | 74 (22.98%) | 71 (25.09%) |
| Maternal anxiety at 73 months (n and %)a,k | 586 (11.79%) | 450 (10.77%) | 35 (14.71%) | 51 (17.35%) | 50 (19.16%) |
| Paternal anxiety at 73 months (n and %)a,k | 504 (14.59%) | 273 (9.30%) | 51 (31.68%) | 68 (35.05%) | 112 (68.71%) |
| Any diagnosis (n and %)a,l | 342 (6.30%) | 265 (5.81%) | 20 (7.72%) | 21 (6.48%) | 36 (12.68%) |
| Any behavioural disorder diagnosis (n and %)a,l | 227 (4.18%) | 174 (3.82%) | 12 (4.63%) | 15 (4.63%) | 26 (9.16%) |
| Any emotional disorder diagnosis (n and %)l | 148 (2.73%) | 118 (2.59%) | 8 (3.09%) | 9 (2.78%) | 13 (4.58%) |
| Any anxiety disorder diagnosis (n and %)l | 142 (2.62%) | 113 (2.48%) | 8 (3.09%) | 8 (2.47%) | 13 (4.58%) |

a Significant difference between the four groups (F value or Pearson’s Chi-squared test, p <.05).

b Continuous score in the Crown-Crisp Experiential Index at the 18-week gestation assessment.

c Continuous score in the Crown-Crisp Experiential Index at the 8-week postnatal assessment.

d Education level was analysed in 5 categories of attainment, although only the percentage gaining a degree is presented here for ease of reading.

e I=professional occupations; II= managerial and technical occupations.

f Score > 12 in the Edinburgh Postnatal Depression Scale at the 18-week gestation assessment.

g Score > 12 in the Edinburgh Postnatal Depression Scale at the 8-week postnatal assessment.

h Score > 12 in the Edinburgh Postnatal Depression Scale at the 73-month assessment.

i Score in the top 15% in the Crown-Crisp Experiential Index at the 18-week gestation assessment.

j Score in the top 15% in the Crown-Crisp Experiential Index at the 8-week postnatal assessment.

k Score in the top 15% in the Crown-Crisp Experiential Index at the 73-month assessment.

l Assessed via the Development and Wellbeing Assessment - Parent Questionnaire at the assessment at 7 years, 7 months.

**Table S6** Paternal anxiety and child psychiatric diagnoses at 7 years, 7 months, unadjusted and adjusted models, with odds ratios and 95% confidence intervals, male offspring only (n=2,747).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| DAWBA diagnoses | Regression model | Non-anxious vs prenatal only | Non-anxious vs postnatal only | Non-anxious vs anxious-at-both-times | Prenatal only vs postnatal only | Prenatal only vs anxious-at-both-times | Postnatal only vs anxious-at-both-times |
| Any disorder | Unadjusted model | 1.50 [.86, 2.62], p=.155 | 1.40 [.80, 2.44], p=.236 | **2.62 [1.66, 4.15], p<.001** | 0.93 [.44, 1.99], p=.858 | 1.75 [.88, 3.48], p=.111 | 1.88 [.94, 3.72], p=.072 |
|  | Model 1 | 1.48 [.85, 2.59], p=.169 | 1.34 [.77, 2.35], p=.302 | **2.49 [1.57, 3.96], p<.001** | 0.91 [.42, 1.94], p=.801 | 1.68 [.84, 3.36], p=.141 | 1.86 [.93, 3.71], p=.080 |
|  | Model 2 | 1.49 [.84, 2.63], p=.169 | 1.32 [.75, 2.33], p=.336 | **2.26 [1.41, 3.63], p=.001** | 0.89 [.41, 1.92], p=.760 | 1.52 [.75, 3.07], p=.245 | 1.71 [.85, 3.46], p=.135 |
|  | Model 3 | 1.38 [.78, 2.43], p=.271 | 1.13 [.63, 2.01], p=.683 | **2.38 [1.48, 3.83], p<.001** | 0.82 [.38, 1.78], p=.615 | 1.73 [.85, 3.49], p=.128 | **2.11 [1.04, 4.29], p=.040** |
|  | Model 4 | 1.26 [.69, 2.28], p=.448 | 1.01 [.54, 1.86], p=.987 | **2.14 [1.19, 3.87], p=.012** | 0.80 [.36, 1.78], p=.583 | 1.70 [.81, 3.59], p=.164 | 2.13 [1.00, 4.54], p=.050 |
| Behavioural disorders | Unadjusted model | 1.33 [.68, 2.60], p=.397 | 1.52 [.82, 2.82], p=.183 | **3.13 [1.92, 5.10], p<.001** | 1.14 [.48, 2.73], p=.770 | **2.34 [1.07, 5.15], p=.034** | 2.06 [.98, 4.33], p=.058 |
|  | Model 1 | 1.32 [.67, 2.57], p=.420 | 1.46 [.78, 2.72], p=.233 | **3.01 [1.84, 4.94], p<.001** | 1.11 [.46, 2.66], p=.818 | **2.29 [1.04, 5.05], p=.040** | 2.06 [.97, 4.38], p=.058 |
|  | Model 2 | 1.34 [.68, 2.64], p=.396 | 1.43 [.76, 2.69], p=.263 | **2.63 [1.59, 4.37], p<.001** | 1.07 [.44, 2.60], p=.885 | 1.96 [.88, 4.40], p=.101 | 1.84 [.86, 3.95], p=.119 |
|  | Model 3 | 1.23 [.62, 2.42], p=.554 | 1.27 [.67, 2.40], p=.459 | **2.85 [1.72, 4.72], p<.001** | 1.04 [.43, 2.52], p=.938 | **2.32 [1.04, 5.17], p=.039** | **2.24 [1.04, 4.81], p=.038** |
|  | Model 4 | 1.24 [.61, 2.50], p=.556 | 1.23 [.63, 2.43], p=.544 | **3.12 [1.66, 5.89], p<.001** | 1.00 [.40, 2.49], p=.997 | **2.53 [1.09, 5.89], p=.032** | **2.53 [1.13, 5.68], p=.024** |
| Emotional disorders | Unadjusted model | 1.27 [.50, 3.21], p=.613 | 1.44 [.61, 3.38], p=.402 | 1.49 [.63, 3.50], p=.359 | 1.13 [.34, 3.80], p=.839 | 1.17 [.35, 3.94], p=.795 | 1.04 [.33, 3.29], p=.952 |
|  | Model 1 | 1.25 [.49, 3.16], p=.638 | 1.37 [.58, 3.23], p=.476 | 1.40 [.59, 3.33], p=.443 | 1.09 [.33, 3.68], p=.885 | 1.12 [.33, 3.80], p=.853 | 1.03 [.32, 3.30], p=.965 |
|  | Model 2 | 1.23 [.48, 3.12], p=.667 | 1.38 [.58, 3.26], p=.468 | 1.32 [.56, 3.14], p=.528 | 1.12 [.33, 3.81], p=.855 | 1.08 [.32, 3.66], p=.905 | 0.96 [.30, 3.10], p=.947 |
|  | Model 3 | 1.10 [.43, 2.83], p=.844 | 0.99 [.40, 2.42], p=.974 | 1.26 [.52, 3.05], p=.612 | 0.90 [.26, 3.13], p=.863 | 1.14 [.33, 3.95], p=.832 | 1.28 [.38, 4.23], p=.690 |
|  | Model 4 | 0.85 [.32, 2.30], p=.751 | 0.73 [.27, 1.96], p=.534 | 0.73 [.24, 2.24], p=.585 | 0.86 [.23, 3.19], p=.821 | 0.86 [.22, 3.31], p=.827 | 1.00 [.27, 3.66], p=.998 |
| Anxiety disorders | Unadjusted model | 1.31 [.52, 3.32], p=.566 | 1.23 [.49, 3.11], p=.661 | 1.54 [.65, 3.62], p=.322 | 0.94 [.27, 3.31], p=.921 | 1.17 [.35, 3.94], p=.795 | 1.25 [.37, 4.20], p=.716 |
|  | Model 1 | 1.28 [.51, 3.25], p=.598 | 1.16 [.46, 2.95], p=.756 | 1.48 [.63, 3.51], p=.369 | 0.90 [.26, 3.20], p=.875 | 1.16 [.34, 3.90], p=.815 | 1.28 [.38, 4.33], p=.691 |
|  | Model 2 | 1.27 [.50, 3.22], p=.621 | 1.17 [.46, 2.99], p=.737 | 1.38 [.58, 3.28], p=.469 | 0.93 [.26, 3.32], p=.907 | 1.09 [.32, 3.69], p=.893 | 1.17 [.35, 3.99], p=.798 |
|  | Model 3 | 1.14 [.44, 2.94], p=.785 | 0.82 [.31, 2.18], p=.694 | 1.30 [.53, 3.15], p=.567 | 0.72 [.20, 2.66], p=.623 | 1.14 [.33, 3.92], p=.841 | 1.58 [.45, 5.54], p=.478 |
|  | Model 4 | 0.92 [.34, 2.48], p=.865 | 0.68 [.24, 1.93], p=.469 | 0.91 [.30, 2.73], p=.861 | 0.74 [.19, 2.87], p=.664 | 0.99 [.26, 3.75], p=.985 | 1.33 [.35, 5.09], p=.674 |

Note. The first group in each contrast was the reference group in the analyses. p-values have not been corrected for multiple-hypothesis testing.

Model 1 was adjusted for sociodemographic variables that were significantly different between the groups of comparison (i.e., number of other children, father marital status).

Model 2 was adjusted for child temperament (assessed via the Carey Infant Temperament Scale).

Model 3 was adjusted for maternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal, 8-week postnatal and 73 months, maternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal, 8-week postnatal and 73 months, maternal history of severe depression and other psychiatric problems).

Model 4 was adjusted for maternal and paternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal, 8-week postnatal and 73 months, paternal anxiety in the Crown-Crisp Experiential Index at 73 months, maternal and paternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal, 8-week postnatal and 73 months, maternal and paternal history of severe depression and other psychiatric problems).

In the adjusted models, missing values in covariates are imputed via multiple imputation.

Significant results are in bold (p <.05).

DAWBA = Development and Wellbeing Assessment - Parent Questionnaire.

**Table S7** Paternal anxiety and child psychiatric diagnoses at 7 years, 7 months, unadjusted and adjusted models, with odds ratios and 95% confidence intervals, female offspring only (n=2,670).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| DAWBA diagnoses | Regression model | Non-anxious vs prenatal only | Non-anxious vs postnatal only | Non-anxious vs anxious-at-both-times | Prenatal only vs postnatal only | Prenatal only vs anxious-at-both-times | Postnatal only vs anxious-at-both-times |
| Any disorder | Unadjusted model | 1.03 [.41, 2.58], p=.951 | 0.82 [.35, 1.90], p=.645 | **1.96 [1.03, 3.76], p=.042** | 0.80 [.24, 2.68], p=.714 | 1.91 [.64, 5.66], p=.244 | 2.39 [.86, 6.64], p=.094 |
|  | Model 1 | 1.02 [.40, 2.55], p=.975 | 0.83 [.36, 1.93], p=.670 | **1.98 [1.03, 3.79], p=.040** | 0.82 [.24, 2.76], p=.749 | 1.95 [.66, 5.78], p=.230 | 2.37 [.85, 6.60], p=.098 |
|  | Model 2 | 0.89 [.35, 2.26], p=.807 | 0.71 [.30, 1.65], p=.423 | 1.65 [.85, 3.20], p=.137 | 0.79 [.23, 2.70], p=.712 | 1.85 [.62, 5.58], p=.272 | 2.33 [.83, 6.55], p=.107 |
|  | Model 3 | 0.86 [.34, 2.22], p=.760 | 0.65 [.27, 1.53], p=.320 | 1.53 [.78, 3.02], p=.219 | 0.75 [.22, 2.59], p=.648 | 1.77 [.58, 5.43], p=.314 | 2.37 [.83, 6.76], p=.107 |
|  | Model 4 | 0.66 [.24, 1.83], p=.428 | 0.55 [.22, 1.35], p=.194 | 0.89 [.35, 2.26], p=.803 | 0.83 [.23, 3.01], p=.777 | 1.34 [.40, 4.50], p=.639 | 1.61 [.51, 5.08], p=.416 |
| Behavioural disorders | Unadjusted model | 0.80 [.19, 3.34], p=.762 | 0.81 [.25, 2.62], p=.720 | 1.35 [.48, 3.81], p=.566 | 1.01 [.17, 6.12], p=.995 | 1.69 [.30, 9.40], p=.549 | 1.68 [.37, 7.63], p=.502 |
|  | Model 1 | 0.77 [.18, 3.22], p=.722 | 0.79 [.24, 2.57], p=.696 | 1.34 [.48, 3.78], p=.578 | 1.02 [.17, 6.25], p=.979 | 1.74 [.31, 9.69], p=.528 | 1.70 [.37, 7.74], p=.494 |
|  | Model 2 | 0.65 [.15, 2.77], p=.564 | 0.69 [.21, 2.27], p=.543 | 1.10 [.38, 3.13], p=.864 | 1.06 [.17, 6.54], p=.952 | 1.68 [.30, 9.48], p=.559 | 1.58 [.34, 7.29], p=.555 |
|  | Model 3 | 0.68 [.16, 2.89], p=.602 | 0.62 [.19, 2.07], p=.441 | 1.04 [.36, 3.04], p=.944 | 0.92 [.15, 5.75], p=.927 | 1.53 [.27, 8.73], p=.633 | 1.67 [.35, 7.84], p=.519 |
|  | Model 4 | 0.49 [.11, 2.33], p=.373 | 0.50 [.14, 1.77], p=.284 | 0.58 [.13, 2.49], p=.463 | 1.01 [.15, 6.81], p=.989 | 1.17 [.18, 7.72], p=.870 | 1.16 [.21, 6.40], p=.869 |
| Emotional disorders | Unadjusted model | 1.10 [.34, 3.56], p=.878 | 0.73 [.23, 2.36], p=.597 | 2.19 [.98, 4.91], p=.057 | 0.66 [.13, 3.35], p=.621 | 2.00 [.50, 7.91], p=.324 | 3.01 [.76, 11.85], p=.116 |
|  | Model 1 | 1.11 [.34, 3.60], p=.866 | 0.76 [.23, 2.46], p=.644 | 2.23 [.99, 5.02], p=.051 | 0.68 [.14, 3.46], p=.647 | 2.02 [.51, 8.01], p=.317 | 2.95 [.75, 11.64], p=.122 |
|  | Model 2 | 0.99 [.30, 3.24], p=.982 | 0.63 [.19, 2.05], p=.444 | 1.88 [.83, 4.27], p=.129 | 0.64 [.13, 3.26], p=.591 | 1.91 [.48, 7.64], p=.361 | 2.98 [.75, 11.86], p=.120 |
|  | Model 3 | 1.01 [.30, 3.39], p=.982 | 0.56 [.17, 1.84], p=.339 | 1.78 [.77, 4.13], p=.179 | 0.55 [.11, 2.86], p=.478 | 1.76 [.43, 7.17], p=.433 | 3.19 [.79, 12.94], p=.104 |
|  | Model 4 | 0.84 [.23, 3.02], p=.790 | 0.53 [.16, 1.82], p=.315 | 1.14 [.36, 3.60], p=.825 | 0.63 [.12, 3.46], p=.599 | 1.35 [.29, 6.23], p=.697 | 2.14 [.47, 9.77], p=.328 |
| Anxiety disorders | Unadjusted model | 1.16 [.36, 3.79], p=.801 | 0.77 [.24, 2.51], p=.669 | **2.32 [1.03, 5.23], p=.041** | 0.66 [.13, 3.35], p=.621 | 2.00 [.50, 7.91], p=.324 | 3.01 [.76, 11.85], p=.116 |
|  | Model 1 | 1.17 [.36, 3.82], p=.793 | 0.80 [.25, 2.61], p=.716 | **2.37 [1.05, 5.34], p=.037** | 0.69 [.14, 3.47], p=.648 | 2.02 [.51, 8.03], p=.315 | 2.95 [.75, 11.64], p=.122 |
|  | Model 2 | 1.07 [.33, 3.51], p=.913 | 0.68 [.21, 2.21], p=.518 | 2.04 [.90, 4.63], p=.089 | 0.63 [.12, 3.23], p=.583 | 1.91 [.48, 7.62], p=.361 | 3.01 [.76, 11.94], p=.117 |
|  | Model 3 | 1.07 [.32, 3.58], p=.918 | 0.58 [.18, 1.93], p=.377 | 1.86 [.80, 4.35], p=.149 | 0.55 [.10, 2.85], p=.474 | 1.75 [.43, 7.18], p=.437 | 3.20 [.79, 13.02], p=.104 |
|  | Model 4 | 0.91 [.25, 3.30], p=.887 | 0.57 [.17, 1.95], p=.370 | 1.27 [.40, 4.09], p=.684 | 0.63 [.11, 3.44], p=.590 | 1.40 [.30, 6.47], p=.668 | 2.23 [.48, 10.33], p=.304 |

Note. The first group in each contrast was the reference group in the analyses. p-values have not been corrected for multiple-hypothesis testing.

Model 1 was adjusted for sociodemographic variables that were significantly different between the groups of comparison (i.e., number of other children, father marital status).

Model 2 was adjusted for child temperament (assessed via the Carey Infant Temperament Scale).

Model 3 was adjusted for maternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal, 8-week postnatal and 73 months, maternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal, 8-week postnatal and 73 months, maternal history of severe depression and other psychiatric problems).

Model 4 was adjusted for maternal and paternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal, 8-week postnatal and 73 months, paternal anxiety in the Crown-Crisp Experiential Index at 73 months, maternal and paternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal, 8-week postnatal and 73 months, maternal and paternal history of severe depression and other psychiatric problems).

In the adjusted models, missing values in covariates are imputed via multiple imputation.

Significant results are in bold (p < .05).

DAWBA = Development and Wellbeing Assessment - Parent Questionnaire.

**Table S8** Paternal anxiety and child psychiatric diagnoses at 7 years, 7 months, unadjusted and adjusted models, with odds ratios and 95% confidence intervals, families where the biological father was still living with the family at the 3-year assessment only (n=4,729).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| DAWBA diagnoses | Regression model | Non-anxious vs prenatal only | Non-anxious vs postnatal only | Non-anxious vs anxious-at-both-times | Prenatal only vs postnatal only | Prenatal only vs anxious-at-both-times | Postnatal only vs anxious-at-both-times |
| Any disorder | Unadjusted model | 1.41 [.85, 2.36], p=.187 | 0.98 [.57, 1.68], p=.951 | **2.15 [1.41, 3.27], p<.001** | 0.70 [.34, 1.43], p=.323 | 1.52 [.80, 2.87], p=.199 | **2.18 [1.13, 4.21], p=.020** |
|  | Model 1 | 1.39 [.83, 2.33], p=.207 | 0.96 [.56, 1.64], p=.867 | **2.12 [1.39, 3.23], p=.001** | 0.69 [.33, 1.41], p=.305 | 1.52 [.80, 2.88], p=.199 | **2.22 [1.15, 4.28], p=.018** |
|  | Model 2 | 1.34 [.80, 2.26], p=.264 | 0.90 [.52, 1.55], p=.710 | **1.84 [1.19, 2.83], p=.006** | 0.67 [.32, 1.39], p=.282 | 1.37 [.72, 2.62], p=.343 | **2.04 [1.05, 3.97], p=.036** |
|  | Model 3 | 1.34 [.80, 2.26], p=.268 | 0.81 [.47, 1.40], p=.451 | **1.83 [1.18, 2.83], p=.007** | 0.60 [.29, 1.25], p=.176 | 1.36 [.71, 2.61], p=.354 | **2.26 [1.15, 4.43], p=.018** |
|  | Model 4 | 1.29 [.75, 2.21], p=.362 | 0.76 [.43, 1.34], p=.337 | 1.65 [.96, 2.85], p=.070 | 0.59 [.28, 1.24], p=.164 | 1.29 [.64, 2.57], p=.477 | **2.18 [1.08, 4.43], p=.030** |
| Behavioural disorders | Unadjusted model | 1.26 [.65, 2.42], p=.495 | 1.11 [.59, 2.08], p=.741 | **2.02 [1.20, 3.39], p=.008** | 0.88 [.37, 2.12], p=.783 | 1.61 [.72, 3.59], p=.248 | 1.82 [.83, 3.96], p=.134 |
|  | Model 1 | 1.24 [.64, 2.39], p=.522 | 1.08 [.58, 2.02], p=.814 | 1.99 [1.18, 3.35], p=.010 | 0.87 [.36, 2.09], p=.755 | 1.60 [.72, 3.59], p=.251 | 1.84 [.84, 4.03], p=.125 |
|  | Model 2 | 1.19 [.61, 2.32], p=.602 | 1.01 [.54, 1.90], p=.972 | 1.67 [.98, 2.85], p=.059 | 0.85 [.35, 2.06], p=.715 | 1.40 [.62, 3.17], p=.419 | 1.65 [.75, 3.65], p=.213 |
|  | Model 3 | 1.20 [.62, 2.33], p=.588 | 0.93 [.49, 1.75], p=.811 | **1.74 [1.02, 2.97], p=.041** | 0.77 [.32, 1.87], p=.565 | 1.45 [.64, 3.28], p=.369 | 1.89 [.85, 4.17], p=.117 |
|  | Model 4 | 1.26 [.64, 2.50], p=.501 | 0.93 [.48, 1.79], p=.827 | **2.09 [1.10, 3.97], p=.025** | 0.74 [.30, 1.81], p=.504 | 1.65 [.70, 3.88], p=.250 | 2.25 [.98, 5.15], p=.056 |
| Emotional disorders | Unadjusted model | 1.24 [.57, 2.70], p=.587 | 0.71 [.29, 1.75], p=.452 | **2.17 [1.20, 3.92], p=.010** | 0.57 [.18, 1.82], p=.342 | 1.75 [.68, 4.47], p=.243 | **3.07 [1.09, 8.75], p=.036** |
|  | Model 1 | 1.22 [.56, 2.65], p=.624 | 0.69 [.28, 1.71], p=.420 | **2.16 [1.19, 3.91], p=.011** | 0.57 [.18, 1.81], p=.338 | 1.78 [.69, 4.56], p=.230 | **3.14 [1.10, 8.96], p=.032** |
|  | Model 2 | 1.18 [.54, 2.58], p=.681 | 0.65 [.26, 1.62], p=.357 | **1.90 [1.04, 3.46], p=.036** | 0.55 [.17, 1.78], p=.321 | 1.61 [.63, 4.15], p=.322 | **2.91 [1.02, 8.33], p=.046** |
|  | Model 3 | 1.17 [.53, 2.58], p=.697 | 0.54 [.22, 1.37], p=.195 | 1.74 [.94, 3.22], p=.078 | 0.47 [.14, 1.51], p=.203 | 1.49 [.57, 3.88], p=.417 | **3.19 [1.10, 9.26], p=.033** |
|  | Model 4 | 1.00 [.44, 2.27], p=.995 | 0.48 [.19, 1.24], p=.130 | 1.18 [.53, 2.64], p=.688 | 0.48 [.14, 1.61], p=.235 | 1.18 [.42, 3.34], p=.751 | 2.45 [.80, 7.54], p=.117 |
| Anxiety disorders | Unadjusted model | 1.30 [.60, 2.84], p=.504 | 0.74 [.30, 1.84], p=.519 | **2.28 [1.26, 4.13], p=.007** | 0.57 [.18, 1.82], p=.342 | 1.75 [.68, 4.47], p=.243 | **3.07 [1.08, 8.75], p=.036** |
|  | Model 1 | 1.27 [.58, 2.77], p=.547 | 0.72 [.29, 1.79], p=.481 | **2.28 [1.26, 4.13], p=.007** | 0.57 [.18, 1.82], p=.340 | 1.79 [.70, 4.60], p=.223 | **3.16 [1.11, 9.01], p=.032** |
|  | Model 2 | 1.25 [.57, 2.73], p=.583 | 0.69 [.28, 1.71], p=.424 | **2.02 [1.11, 3.67], p=.022** | 0.55 [.17, 1.78], p=.321 | 1.62 [.63, 4.16], p=.317 | **2.92 [1.02, 8.36], p=.046** |
|  | Model 3 | 1.23 [.55, 2.71], p=.615 | 0.56 [.22, 1.42], p=.223 | 1.80 [.97, 3.35], p=.062 | 0.46 [.14, 1.50], p=.198 | 1.47 [.56, 3.84], p=.430 | **3.20 [1.10, 9.28], p=.033** |
|  | Model 4 | 1.08 [.48, 2.48], p=.847 | 0.52 [.20, 1.35], p=.182 | 1.32 [.59, 2.98], p=.499 | 0.48 [.14, 1.61], p=.236 | 1.22 [.43, 3.46], p=.709 | 2.53 [.82, 7.80], p=.107 |

Note. The first group in each contrast was the reference group in the analyses. p-values have not been corrected for multiple-hypothesis testing.

Model 1 was adjusted for sociodemographic variables that were significantly different between the groups of comparison (i.e., number of other children, father marital status).

Model 2 was adjusted for child temperament (assessed via the Carey Infant Temperament Scale).

Model 3 was adjusted for maternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal, 8-week postnatal and 73 months, maternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal, 8-week postnatal and 73 months, maternal history of severe depression and other psychiatric problems).

Model 4 was adjusted for maternal and paternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal, 8-week postnatal and 73 months, paternal anxiety in the Crown-Crisp Experiential Index at 73 months, maternal and paternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal, 8-week postnatal and 73 months, maternal and paternal history of severe depression and other psychiatric problems).

In the adjusted models, missing values in covariates are imputed via multiple imputation.

Significant results are in bold (p < .05).

DAWBA = Development and Wellbeing Assessment - Parent Questionnaire.

**Table S9** Paternal anxiety and outcomes at 3 years, 6 months and 7 years, 7 months, using continuous anxiety scores as predictors.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Subscale ofRRPSPC | Regression models | Paternal prenatal anxiety (continuous score) as predictora | Paternal postnatal anxiety (continuous score) as predictorb | DAWBA diagnoses | Regression models | Paternal prenatal anxiety (continuous score) as predictora | Paternal postnatal anxiety (continuous score) as predictorb |
| Total problems (behavioural/emotional) | Unadjusted model | **1.07 [1.04, 1.10], p<.001** | **1.07 [1.04, 1.10], p<.001** | Any disorder | Unadjusted model | **1.06 [1.02, 1.10], p=.004** | **1.06 [1.02, 1.10], p=.003** |
|  | Model 1 | **1.07 [1.04, 1.10], p<.001** | **1.07 [1.04, 1.10], p<.001** |  | Model 1 | **1.05 [1.01, 1.10], p=.006** | **1.06 [1.02, 1.10], p=.005** |
|  | Model 2 | **1.05 [1.01, 1.08], p=.006** | **1.04 [1.00, 1.07], p=.037** |  | Model 2 | **1.04 [1.00, 1.08], p=.041** | 1.04 [1.00, 1.08], p=.070 |
|  | Model 3 | **1.04 [1.01, 1.07], p=.007** | **1.04 [1.00, 1.07], p=.033** |  | Model 3 | 1.03 [.99, 1.08], p=.087 | 1.03 [.98, 1.07], p=.219 |
|  | Model 4 | 1.02 [.99, 1.06], p=.253 | 1.01 [.97, 1.05], p=.526 |  | Model 4 | 1.01 [.96, 1.06], p=.821 | 0.99 [.94, 1.05], p=.800 |
| Behavioural problems\* | Unadjusted model | **1.04 [1.01, 1.07], p=.003** | **1.06 [1.03, 1.09], p<.001** | Behavioural disorders | Unadjusted model | **1.06 [1.01, 1.11], p=.021** | **1.06 [1.01, 1.11], p=.016** |
|  | Model 1 | **1.04 [1.01, 1.07], p=.005** | **1.06 [1.03, 1.09], p<.001** |  | Model 1 | **1.05 [1.00, 1.10], p=.033** | **1.06 [1.01, 1.11], p=.028** |
|  | Model 2 | 1.02 [.99, 1.05], p=.151 | **1.04 [1.01, 1.07], p=.021** |  | Model 2 | 1.04 [.99, 1.09], p=.121 | 1.03 [.98, 1.08], p=.191 |
|  | Model 3 | 1.02 [.99, 1.05], p=.133 | **1.04 [1.01, 1.07], p=.007** |  | Model 3 | 1.03 [.99, 1.08], p=.156 | 1.03 [.98, 1.08], p=.266 |
|  | Model 4 | 1.01 [.98, 1.05], p=.372 | **1.04 [1.00, 1.07], p=.025** |  | Model 4 | 1.02 [.97, 1.09], p=.414 | 1.01 [.95, 1.08], p=.731 |
| Emotional problems | Unadjusted model | **1.05 [1.02, 1.09], p=.003** | **1.05 [1.01, 1.09], p=.011** | Emotional disorders | Unadjusted model | **1.06 [1.00, 1.12], p=.036** | **1.06 [1.00, 1.13], p=.034** |
|  | Model 1 | **1.06 [1.03, 1.10], p=.001** | **1.06 [1.02, 1.10], p=.003** |  | Model 1 | **1.06 [1.00, 1.12], p=.042** | **1.06 [1.00, 1.13], p=.040** |
|  | Model 2 | **1.04 [1.00, 1.08], p=.039** | 1.03 [.99, 1.07], p=.140 |  | Model 2 | 1.05 [.99, 1.11], p=.109 | 1.05 [.99, 1.11], p=.141 |
|  | Model 3 | 1.03 [.99, 1.07], p=.112 | 1.02 [.98, 1.06], p=.335 |  | Model 3 | 1.03 [.98, 1.10], p=.253 | 1.02 [.96, 1.08], p=.587 |
|  | Model 4 | 1.00 [.96, 1.04], p=.988 | 0.99 [.94, 1.03], p=.630 |  | Model 4 | 0.99 [.92, 1.07], p=.875 | 0.98 [.90, 1.06], p=.539 |
|  |  |  |  | Anxiety disorders | Unadjusted model | **1.07 [1.01, 1.13], p=.016** | **1.07 [1.01, 1.13], p=.029** |
|  |  |  |  |  | Model 1 | **1.07 [1.01, 1.13], p=.019** | **1.07 [1.01, 1.13], p=.033** |
|  |  |  |  |  | Model 2 | **1.06 [1.00, 1.12], p=.050** | 1.05 [.99, 1.11], p=.110 |
|  |  |  |  |  | Model 3 | 1.04 [.98, 1.11], p=.160 | 1.02 [.96, 1.08], p=.572 |
|  |  |  |  |  | Model 4 | 1.02 [.94, 1.09], p=.676 | 0.99 [.91, 1.07], p=.789 |

Note. Model 1 was adjusted for sociodemographic variables that were significantly different between the groups of comparison (i.e., number of other children, father marital status).

Model 2 was adjusted for child temperament (assessed via the Carey Infant Temperament Scale).

Model 3 was adjusted for maternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal, 8-week postnatal and 73 months, maternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal, 8-week postnatal and 73 months, maternal history of severe depression and other psychiatric problems).

Model 4 was adjusted for maternal and paternal current and past mental health (maternal anxiety in the Crown-Crisp Experiential Index at 18-week prenatal, 8-week postnatal and 73 months, paternal anxiety in the Crown-Crisp Experiential Index at 73 months, maternal and paternal depression in the Edinburgh Postnatal Depression Scale at 18-week prenatal, 8-week postnatal and 73 months, maternal and paternal history of severe depression and other psychiatric problems). The 73-month scores assessments were not included in the adjusted models for the RRPSPC outcomes.

In the adjusted models, missing values in covariates are imputed via multiple imputation.

Significant results are in bold (p <.05).

\*Scale created by the authors, considering those who scored in the top 10% in the conduct and/or hyperactivity scales.

a Measured via the anxiety subscale of the Crown-Crisp Experiential Index at 18-week prenatal

b Measured via the anxiety subscale of the Crown-Crisp Experiential Index at 8-weeks postnatal

RRPSPC = Revised Rutter Parent Scale for Preschool Children; DAWBA = Development and Wellbeing Assessment - Parent Questionnaire.

## eReferences

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