

**PARENTS' PRENATAL MENTAL HEALTH AND THE SOCIAL, EMOTIONAL
AND BEHAVIORAL DEVELOPMENT OF THEIR CHILDREN**

Running head: Parent's mental health and child development

Key words: Mental health, parents, child development, Norwegian Mother and Child Cohort
Study

Abstract

Objective: Does psychological distress in expectant parents affect their children's development.

Methods: A prospective population study based on the Norwegian Mother and Child Cohort Study (MoBa), N=31,663. Logistic regression models were used to assess whether high scores (cutoff ≥ 2.00) on the Symptom Checklist-5 (SCL-5) in parents predicted higher odds ratios for high level (cutoff ≥ 90 percentile) developmental problems in children.

Results: Compared with families where the parents did not report high level of psychological distress, the risk for emotional difficulties in children was significantly higher when fathers only, and mothers only, had high levels of psychological distress, fully adjusted OR = 1.42 (95 % CI = 1.12, 1.79), and OR = 1.98 (95 % CI = 1.70, 2.31), respectively. Notably, the risk for children was highest when both parents recorded high levels of psychological distress, fully adjusted OR = 2.35 (95 % CI = 1.36, 4.07).

Conclusion: Psychological distress in expectant parents predicts higher risk of emotional difficulties in children at age 36 months.

Keywords: Child development, mental health, parents, The Norwegian Mother and Child Cohort Study

INTRODUCTION

Children of mothers suffering from high levels of psychological distress have an increased risk of developmental difficulties (S. H. Goodman & Gotlib, 1999), and there is growing evidence of similar associations between fathers' mental health and child development (Ramchandani et al., 2008). Depressive symptoms in fathers have been associated with conduct and socio-emotional problems in their children (Ramchandani et al., 2008) but most of these studies have looked at the effect of parents' mental health in the postnatal period and how it affects parenting (Lamb, 2012; Paulson, Dauber, & Leiferman, 2006). Recent work has also drawn attention to mothers' mental health during pregnancy and the effect maternal prenatal depression and stress may have on the fetus (Field, Diego, & Hernandez-Reif, 2006). Furthermore, attention has also been drawn to fathers' mental health during pregnancy and the potential mechanisms for transmission of risk, including genetic transmission of risk and the impact of fathers' mental health on pregnant mothers' mental health (Field, Diego, Hernandez-Reif, et al., 2006).

An association between fathers' prenatal mental health and child development has been confirmed in our earlier study (Kvalevaag et al., 2013). Further, in a separate cross-sectional study of the effects of both parents' postnatal mental illness on child development, Kahn et al. (Kahn, Brandt, & Whitaker, 2004) found the most severe problems for child development when both parents had poorer mental health. However, whether, and to what extent, the co-existence of paternal and maternal mental distress affects their children's development still needs further exploration.

A review (Wee, Skouteris, Pier, Richardson, & Milgrom, 2011) showed that the most common correlates of paternal depression before and after birth were having a spouse with elevated levels of depressive symptoms as well as poor relationship satisfaction. The quality

of the relationship between the parents raising the child can have implications for the child's development and wellbeing (Lamb, 2012). A meta-analysis found that paternal depression showed a moderate positive correlation with maternal depression (Paulson & Bazemore, 2010). Additionally, whether a pregnancy is planned or not can be a confounding factor in the association between a parent's mental health and early child development (Schumacher, Zubaran, & White, 2008).

Developmental psychopathology provides a broad, integrative framework for this study (D. Cicchetti & Valentono, 2006), and refers to the interplay between biological, psychological, and social contextual aspects of normal and abnormal development across the lifespan (D. Cicchetti, 2006). The aim of this study is to examine whether high levels psychological distress in expectant parents represents a risk for their children's development, assessed at 36 months of age. In the present study we assess the predictive value of high level of psychological distress in three groups; fathers only affected, mothers only, and where both parents are affected (all measured at week 17 or 18 in pregnancy). Associations between parental and child psychopathology are known to be bi-directional, the design used in this study, studying parental psychological distress before the child is born, offers an opportunity to minimize child to parent effect.

METHODS

Participants

This study is based on data from the Norwegian Mother and Child Cohort Study (MoBa) conducted by the Norwegian Institute of Public Health. Participants were recruited from across Norway from 1999-2008 through a postal invitation after they signed up for the routine ultrasound examination in their local hospital, and 38.7 % of the women invited consented to

participate (Magnus et al., 2006). The cohort (October, 2012) now includes 109,000 children, 91,000 mothers and 71,700 fathers. The current study is based on version V of the quality-assured data files released for research. Informed consent was obtained from each MoBa participant upon recruitment. The study was approved by the Regional Committee for Medical and Health Research Ethics, Health Region South-Eastern Norway, February 18, 2011.

Only participants having filled out the mothers' questionnaire at 17 or 18 weeks of gestation, fathers' questionnaire at 17 or 18 weeks of gestation, and mothers' report when the children were 36 months old were included.

Measures

Demographic co-variables

The following socio-demographic variables reported by the parents at week 17 or 18 of gestation were included in the analyses in (Table 1): fathers' and mothers' age and level of education and marital status, both parents' self-reported somatic health problems (including diabetes, cancer, cardiovascular disease, epilepsy, neck /shoulder/ lower back pain, high blood pressure, Bechterew's disease/rheumatoid arthritis) and other long-term physical illness (yes/no) and lifestyle variables such as cigarette smoking (yes/no) or use of alcohol (never/seldom, 1-3 times /month, 2-7 times/week). One item about the pregnancy was included as an adjustment variable: "Was this pregnancy planned or not? "(yes / no).

Predictor variables

Hopkins Symptom Checklist – 5 (SCL-5): The SCL-5 is an indicator of global mental distress and used as a screening measure of psychological distress in several studies (Holm, Tyssen, Stordal, & Haver, 2010; Tambs et al., 2009). The checklist mainly screens for symptoms of

anxiety and depression (Tambs & Moum, 1993). SCL-5 correlates highly with SCL-25 (Person's correlation=0.92). The SCL-5 has five items: (1) Feeling fearful, (2) Nervousness or shakiness inside, (3) Feeling hopeless about the future, (4) Feeling blue and (5) Worrying too much about things. Each of the five items is scored on a scale of 1 to 4, depending on how bothered the participants have been the last 14 days prior to the time of self-reporting: The rating of distress are as follows: 1 = not bothered, 2 = a little bothered, 3 = quite bothered and 4 = very bothered. The SCL-5 total scale is dichotomized at a raw score of 2.00 for both fathers and mothers. Sensitivity for SCL-5 was found to be 68% and specificity 96% (Strand, Dalgard, Tambs, & Rognerud, 2003).

Of the N=31,663 fathers who had completed the SCL-5 questionnaire at 17 or 18 weeks in pregnancy, 1% (n=205) had missing information on one or more items on the SCL-5, and of the N=31,655 mothers, 0.3% (n=8) had missing items on the SCL-5. The Cronbach's alpha for the fathers' SCL-5 was 0.79 and for the mothers' SCL-5 it was 0.80.

Missing responses on the predictor variables and the outcome variables are excluded from the analysis, leaving N = 28,695 in the total sample in the inferential analyses below (Table 2).

A variable with four levels indicating the combinations of parents' scores above or below the cut-off of ≥ 2.00 (Strand et al., 2003) on the SCL-5 total scale was created; i.e. neither of the parents above cut-off (F-/M-), = reference category in the inferential analysis below, n = 26,435 (92.1%); only the fathers above cut-off (F+/M-), n = 706 (2.5%); only the mothers above cut-off (F-/M+), n = 1,471 (5.1%); or both parents above cut-off (F+/M+), n = 83 (0.3%).

Marital Satisfaction Scale (MSS): The MoBa questionnaire contained five items from MSS (Blum & Mehrabian, 1999): (1) My partner and I have problems in our relationship, (2) I am very happy in my relationship, (3) My partner is usually understanding, (4) I am satisfied with

my relationship to my partner and (5) we agree about how children should be raised. Each of the items was scored on a six point scale: 6 = totally agree, 5 = agree, 4 = slightly agree, 3 = slightly disagree, 2 = disagree and 1 = totally disagree. The negatively worded item (N= 1) in MSS is inverse-scaled and a summary scale is computed by adding up the item scores. Higher scores on the summary scale indicated a more positive relationship with the spouse. Both parents answered this self-report instrument in week 17 or 18 of gestation. Regarding the internal consistency, Cronbach's alpha for fathers' MSS is 0.71 and for mothers' the Cronbach's alpha is 0.77.

Outcome variables

Strength and Difficulties Questionnaire (SDQ): SDQ is a parent reported instrument used to assess mental health in children (R. Goodman, 1997, 2001). The questionnaire contains 25 items. MoBa included the following five items from this scale: (1) Considerate of other people's feelings; (2) Shares readily with other children (treats, toys, pencils etc.); (3) Helpful if someone is hurt, upset or feeling ill; (4) Kind to younger children; and (5) Often volunteers to help others (parents, teachers, other children). SDQ is rated on a three-point scale: 0 = not true, 1 = somewhat true and 2 = very true/often true.

Infant Toddler Social and Emotional Assessment (ITSEA): The ITSEA is an adult reported measurement of socio-emotional problems and competencies, in one- to three- year- old children (Carter, Brigg-Growan, Jones, & Little, 2003). The complete ITSEA includes 166 items. Twenty-six items are included in the MoBa questionnaires (e.g. becomes aggressive when he/she is frustrated, mood varies greatly from day to day, wakes up several times during the night). Items were rated on a three point scale: 0 = not-true/rarely true, 1 = somewhat true/sometimes true and 2 = very true/often true.

Child Behavioral Checklist Revised (CBCL-R): The CBCL-R is an adult reported instrument used to assess manifestations of internalized and externalized psychopathology in children from one and a half to five years of age (Achenbach & Ruffle, 2000). The CBCL-R contains 100 items rated on a three point scale: 0 = not true, 1= somewhat or sometimes true and 2 = very true/often true. Forty-four items from the CBCL-R are included in the MoBa questionnaires (e.g., gets into many fights, is defiant, cannot concentrate, too fearful or anxious).

As not all items from these instruments were included in the MoBa questionnaire, the items could not be summed up to produce the usual sub- or total scales, and a procedure of operationalization of the available outcome measures was undertaken. A total of seventy-five items; from the SDQ; five items, ITSEA; 44 items, and CBCL; 26 items, were entered as input variables in a Principal Component Analysis (PCA) with Varimax rotation. Three factors emerged: behavioral difficulties, emotional difficulties, and social functioning, together with eigenvalues ≥ 2.8 , and explaining 21 % of the item variance. Three summary scales representing these factors were computed. Moderate internal consistency as measured by Cronbach's alphas of 0.65, 0.62, and 0.72 for the resulting factors behavioral difficulties (21 items), emotional difficulties (19 items), and social functioning (8 items), respectively, suggesting that the summary scales representing these domains could be produced. The three summary scales was dichotomized at the 90th percentile, as scores above cut-off presumably indicated problems of clinical relevance (Kane & Garber, 2004), and were used as outcome variables in the logistic regression analysis described below.

Statistical analyses

Logistic regression models with a categorical variable with four levels representing fathers, mothers, and both parents, respectively, scoring above cut-off for high level psychological

distress on the SCL-5 as predictor variable and the three summary scales of children's social, emotional and behavioral difficulties above cut-off at 90th percentile, as outcome variables were employed.

All analyses were adjusted for fathers' and mothers' age, education, civil status, somatic health, lifestyle variables such as cigarette smoking and use of alcohol, marital satisfaction, and if the pregnancy was planned or not, as these variables could confound the relationship studied (separate adjustments).

Tests were two-tailed with the significance level set at $p < 0.001$ in order to avoid Type I errors due to the multiple comparisons performed. All analyses are conducted using SPSS PASW 18.0 for Windows.

RESULTS

Socio-demographic and clinical characteristics of fathers and mothers of children in the total valid sample (N = 28,695) are presented in Table 1.

- Please insert Table 1 here -

At 17 or 18 weeks gestation fathers' SCL-5 total score had mean = 1.1, standard deviation (SD) = 0.3 and range = 1 to 4 while the mothers' SCL-5 total score had mean = 1.2, SD = 0.3 and range = 1 to 4.

In the overall logistic regression analysis using the categorical variable with four levels described above as predictor variable and the three summary scales of children as outcome variables, the crude models with emotional and behavioral difficulties as the outcome

variables were statistically significant ($p < 0.001$), while the model with social functioning was not ($p = 0.009$).

A significantly higher risk of emotional difficulties, as compared to the reference category F-/M-, is found for the category F+/M- (only fathers' above cut-off), fully adjusted OR = 1.42 (95% CI = 1.12, 1.79); for the category F-/M+ (only mothers' above cut-off), fully adjusted OR = 1.98 (95% CI = 1.70, 2.31); and for the category F+/M+ (both parents' above cut-off), fully adjusted OR = 2.35 (95% CI = 1.36, 4.07).

No significantly higher risk of scoring above cut-off on the 90th percentile on the summary scale for behavioral difficulties, as compared to the reference category, was found for the category F+/M-, fully adjusted OR = 1.14 (95% CI = 0.88, 1.46). However, the risk of behavioral difficulties was significantly higher in the category F-/M+, fully adjusted OR = 1.97 (95% CI = 1.70, 2.30), and for the category F+/M+, fully adjusted OR = 2.65 (95% CI = 1.56, 4.48), as compared to the reference category, in this model.

Furthermore, no significantly higher risk of scoring above cut-off on the 90th percentile on the summary scale for social functioning, as compared to the reference category, was found for the category F+/M-, fully adjusted OR = 1.17 (95% CI = 0.92, 1.50), further, for the category F-/M+, OR = 1.17 (95% CI = 0.98, 1.40), and for the category F+/M+, fully adjusted OR = 1.38 (95% CI = 0.72, 2.63) in this model.

- Please insert Table 2 here -

Adjusted odds ratio for behavioral, emotional and social difficulties in children by parents' categories according to whether they scored above 2.00 on the SCL-5 or not (reference category = F-/M-), is shown in Figure 1.

- Please insert Figure 1 here -

DISCUSSION

In this study we found that when one or both parents had high levels of psychological distress during pregnancy, the risk of emotional problems in their children at 36 months of age was significantly increased, compared to those children whose parents did not experience psychological distress during pregnancy. Irrespective of whether group differences were statistically significant or not, there was a general pattern across the parent categories and children's development: The risk of developmental difficulties for children was higher when mothers had high level psychological distress compared to when fathers' exhibited similar elevated levels of distress. Additionally, the risk of difficulties for children was highest in the groups where both parents had high levels of psychological distress on the SCL-5, indicating an additive effect of parents' mental distress on their children's development.

The findings in this study are in accordance with earlier findings that the most severe problems for children's development are found when both parents have poorer mental health (Kahn et al., 2004). The present study however, suggests that the risk that both parents' psychological distress represents for their children's development is evident in early pregnancy as well. Although the risk that mothers' and fathers' pre and postnatal psychological distress represents for children's development are documented in earlier studies (Field, Diego, & Hernandez-Reif, 2006; S. H. Goodman & Gotlib, 1999; Kvalevaag et al., 2013; Ramchandani et al., 2008), the present study also demonstrates that there is an additive effect of parents' mental distress during pregnancy for children's subsequent development, particularly their emotional health, thus offering new information to the field. This new knowledge, particularly that mothers' and fathers' mental health are important during

pregnancy, should be taken into account in future investigations and intervention development concerning preventive health-care for expectant parents.

In this Norwegian cohort study we found a significantly higher risk of emotional problems, but not behavioral or social problems, when only the fathers' in the family report high level psychological distress. This is in contrast to other studies showing that fathers' mental distress is associated mainly with conduct problems and social problems in their children (Ramchandani et al., 2008). We found, however, that when mothers' only or both the mothers' and fathers' reported high levels of psychological distress there were a significant risk for behavioral problems.

In a study comparing questionnaire data from population surveys in Norway and Britain, it was found that the Norwegian questionnaire scores for externalizing problems in children were lower than the British scores, and that the Norwegian parents' seemed to report fewer psychological problems in their children, reflecting substantial differences between the two countries in parents report on questionnaires (Heiervang, Goodman, & Goodman, 2008). One interpretation of these findings may be that the Norwegian parents take a more normalizing view of emotional symptoms, but not of externalizing problems, when filling out screening questionnaires. This may also be the case in our study, which would affect the prevalence of reported developmental problems and weaken the strength of the associations found between parents' psychological distress and their children's emotional difficulties.

Heritability

We have looked at the combined effect of parents' mental health during the antenatal period, while the majority of earlier studies have looked at the postnatal effect of parents' mental health on child development and the effects of psychological distress on parenting (Paulson et al., 2006). We found the risk for developmental difficulties in children to be higher with

maternal rather than paternal exposure, pointing to a possible biological direct component in the transmission of risk from the mother to the foetus during pregnancy. Further, a prenatal effect of parental psychological distress, in contrast to the postnatal effect, may also, in part reflect a genetically transmitted risk to the child (Velders, Dieleman et al. 2011). While this genetically transmitted risk may account for some of the association found between parents' psychological distress and their children's development in our study, other mechanisms are also possible explanations of our findings: Parents' mental health can affect children with particular genetic endowments, i.e. epigenetic processes can be influenced by traumatic and environmental experiences throughout childhood. Further, depression in expectant fathers, in particular, is likely to have an impact on the mental health of their pregnant partners and thereby exerts indirect negative effects on neonatal outcomes in their children (Field, Diego et al. 2006). However and maybe more likely, parents' mental health may also have an effect on the their parenting, explaining some of the effects found (Lamb, 2012; Matthey et al., 2000). Depressive moods, irritability, hopelessness, and reduction of energy in depressed parents are likely to affect their ability to care for their children, and depressed fathers' and mothers' parenting can be a mediating factor in the associations found between parents' mental health and child development (Ramchandani and Psychogiou 2009).

Stability of parental psychological distress symptoms

Further, parents' mental health problem are likely to show some stability from the prenatal period to the postnatal period (Matthey, Barnett et al. 2000, (Paulson & Bazemore, 2010). However, the MoBa study does not provide information on fathers' postnatal psychological distress and so we are unable to test this. This limits, to some extent, our ability to draw specific causal inferences about the effect of fathers' prenatal mental health on their children's social, emotional and behavioral development.

Strengths and limitations of the study

By utilizing a large population-based sample, the effects of paternal and maternal mental health on their children's development is given sufficient statistical power in the present study to detect even the smallest of effect sizes. Further, the prospective design used makes a child-to-parent effect less likely to be the cause of the effect found. Rather, the relationship found represents evidence for parent-to-child directionality.

A weakness of the study is the modest participation rate of 39 %. Participation rates in health population studies are commonly lower for men and women with psychiatric illness (Hansen, Jacobsen, & Arnesen, 2001), and we assume that the modest participation rate may influence the prevalence of reported psychological distress by the parents on the SCL-5 in this study. Nilsen et al. (Nilsen et al., 2009) did a study comparing data from the MoBa study with information from the Medical Birth Registry for Norway (all women giving birth in Norway) and found that whilst the prevalence estimates of exposures and outcomes are biased, exposure-outcome associations are not. We assume that in this study the modest participation rate may have an effect on the prevalence estimates of the parents' psychological distress. The strength of the associations may have been reduced, and the prevalence estimates may have been biased and this in turn may have an effect on generalizability of the results. In accordance with Nilsen et al (Nilsen et al., 2009), we assume, however, that this bias has not affected the validity of the exposure-outcome associations studied.

A further limitation of this study is the lack of information about factors present in the postnatal period that may confound the studied associations between expectant parents' and their children's development. This limits the ability to draw any causal inferences about the effect of parents' prenatal mental health on their children's subsequent social, emotional and behavioral development.

It is also important to note that the measures of the predictor variables in the present study were self-reported and the outcome variables of children's development were based on mothers' report. The results from self-report scales may be affected by rater bias, i.e. fathers and mothers can over- or underreport their symptoms of psychological distress, and this may lead to over- or underestimates of the strength of the associations between parents' mental health and child development, and also affect the validity of the study. It has also been argued that men tend to underreport symptoms when assessed by self-report measures specifically targeting depression, but may provide more accurate reports when general symptom measures of stress, anxiety and depression are used, as is the case with the SCL-5 used in the present study (Giallo et al., 2012). However, the SCL-5 has not been validated specifically for use in pregnancy (Adams, Eberhard-Gran et al. 2011) and this may raise some questions on the validity of the SCL-5 in accessing the expectant fathers' and mothers' mental health. It is also important to note that SCL-5 is only a screening tool for anxious and depressive symptoms and cannot be used for diagnosing depression or anxiety (Adams, Eberhard-Gran et al. 2011), and this must be taken into account when interpreting the present findings.

Further, the outcome variables of children's development were based on mothers' report. Others have found that mothers' perceived parental stress may influence their perception and rating of child behavior (Østberg & Hagekull, 2013). For instance the stronger associations with maternal psychological distress compared to paternal psychological distress found may be due in part to the child outcome being maternally reported. However, previous studies have also shown that parental reports on their children are highly reflective of problems as assessed by independent raters, and thus valid (Glascoe FP 1997, Filipek, Accardo et al. 2000, Filipek PA 2000(Richters, 1992).

One final point is that the MoBa study used only selected items from each of the original outcome instruments. The exploratory factor analysis procedure was performed to strengthen the construct validity of the outcome variables in the study.

CONCLUSION

This study shows that there is a significantly higher risk of emotional and behavioral problems in children at 36 months of age when both of their parents had reported high levels of psychological distress during pregnancy. There is still a need for further studies to explore the circumstances of parents who exhibit high levels of psychological distress during pregnancy and its effect on their children's early development, and to more fully understand the mechanisms of risk transmission. However, the results of this study should draw attention to the possibility of offering early psychological intervention to both expectant mothers and fathers, where they present with psychological distress.

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ABBREVIATIONS

MoBa - the Norwegian Mother and Child Cohort Study

SCL-5 - Symptom Checklist – 5

MSS - Marital Satisfaction Scale

SDQ - Strength and Difficulties Questionnaire

CBCL - Child Behavioral Checklist Revised

ITSEA - Infant Toddler Social and Emotional Assessment

PCA – Principal component analysis

REFERENCES

- Achenbach, T. M., & Ruffle, T. M. (2000). The Child Behavior Checklist and Related Forms for Assessing Behavioral/Emotional Problems and Competencies. *Pediatrics, 21* (8), 265-271.
- Blum, J. S., & Mehrabian, A. (1999). Personality and temperament correlates of marital satisfaction. *Journal of personality, 67*(1), 93-125.
- Carter, A. S., Brigg-Growan, M. J., Jones, S. M., & Little, T. D. (2003). The Infant-Toddler Social and Emotional Assessment (ITSEA): Factor Structure, Reliability, and Validity. *Journal of Abnormal Child Psychology, 31*, 495-514.
- Cicchetti, D. (Ed.). (2006). *Development and Psychopathology* (Vol. 1). United States of America: John Wiley Sons
- Cicchetti, D., & Valentono, K. (Eds.). (2006). *An Ecological-Transactional Perspective on Child Maltreatment: Failure of the Average Expectable Environment and Its Influence on Child Development* (Vol. 3). USA: John Wiley & Sons, Inc.
- Field, T., Diego, M., & Hernandez-Reif, M. (2006). Prenatal depression effects on the fetus and newborn: a review. *Infant Behavior and Development, 29*(3), 445-455.
- Field, T., Diego, M., Hernandez-Reif, M., Figueiredo, B., Deeds, O., Contogeorgos, J., & Ascencio, A. (2006). Prenatal paternal depression. *Infant Behavior and Development, 29*(4), 579-583.
- Giallo, R., D'Esposito, F., Christensen, D., Mensah, F., Cooklin, A., Wade, C., . . . Nicholson, J. M. (2012). Father mental health during the early parenting period: results of an Australian population based longitudinal study. *Sosial Psychiatry Psychiatric Epidemiology, 47*, 1907-1916.
- Goodman, R. (1997). The Strengths and Difficulties Questionnaire: A Research Note. *J. Child Psychol. Psychiat.*, 38 (5), 581-586.
- Goodman, R. (2001). Psychometric Properties of the Strengths and Difficulties Questionnaire. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*(11), 1337-1345.
- Goodman, S. H., & Gotlib, I. H. (1999). Risk for Psychopathology in the Children of Depressed Mothers: A developmental Model for Understanding Mechanisms of Transmission. *Psychological Review, 106* (3), 458-490.
- Hansen, V., Jacobsen, B. K., & Arnesen, E. (2001). Prevalence of serious psychiatric morbidity in attenders and nonattenders to a health survey of a general population. *American Journal of Epidemiology, 154*(10), 891.
- Heiervang, E., Goodman, A., & Goodman, R. (2008). The Nordic advantage in child mental health: separating health differences from reporting style in cross-cultural comparison of psychopathology. *Journal of Child Psychology and Psychiatry, 49* (6), 678-685.
- Holm, M., Tyssen, R., Stordal, K. I., & Haver, B. (2010). Self-development groups reduce medical school stress: a controlled intervention study. *BMC Medical Education, 10*: 23.
- Kahn, R. S., Brandt, D., & Whitaker, R. C. (2004). Combined effect of mothers' and fathers' mental health symptoms on children's behavioral and emotional well-being. *Archives of Pediatrics and Adolescent Medicine, 158*(8), 721.
- Kane, P., & Garber, J. (2004). The relations among depression in fathers, children's psychopathology, and father-child conflict: a meta-analysis. *Clinical Psychology Review, 24*(3), 339-360.

- Kouros, C. D., Papp, L. M., & Cummings, E. M. (2008). Interrelations and Moderators of Longitudinal Links Between Marital Satisfaction and Depressive Symptoms Among Couples in Established Relationship. *Journal of Family Psychology, 22* (5), 667-677.
- Kvalevaag, A. L., Ramchandani, P. G., Hove, O., Assmus, J., Eberhard-Gran, M., & E., B. (2013). Paternal Mental health and Socioemotional and Behavioral Development in Their Children. *Pediatrics*. doi: 10.1542/peds.2012-0804
- Lamb, M. E. (2012). Mothers, Fathers, Families, and Circumstances: Factors Affecting Children's Adjustment. *Applied Developmental Science, 16*(2), 98-111.
- Magnus, P., Irgens, L. M., Haug, K., Nystad, W., Skjærven, R., & Stoltenberg, C. (2006). Cohort profile: the Norwegian mother and child cohort study (MoBa). *International Journal of Epidemiology, 35*(5), 1146.
- Matthey, S., Barnett, B., Ungerer, J., & Waters, B. (2000). Paternal and maternal depressed mood during the transition to parenthood. *Journal of Affective Disorders, 60*(2), 75-85.
- Nilsen, R. M., Vollset, S. E., Gjessing, H. K., Skjærven, R., Melve, K. K., Schreuder, P., . . . Magnus, P. (2009). Self selection and bias in a large prospective pregnancy cohort in Norway. *Paediatric and Perinatal Epidemiology, 23*(6), 597-608.
- Paulson, J. F., & Bazemore, S. D. (2010). Prenatal and postpartum depression in fathers and its association with maternal depression. *JAMA: the journal of the American Medical Association, 303*(19), 1961.
- Paulson, J. F., Dauber, S., & Leiferman, J. A. (2006). Individual and combined effects of postpartum depression in mothers and fathers on parenting behavior. *Pediatrics, 118*(2), 659.
- Ramchandani, P. G., O'Connor, T. G., Evans, J., Heron, J., Murray, L., & Stein, A. (2008). The effects of pre and postnatal depression in fathers: a natural experiment comparing the effects of exposure to depression on offspring. *Journal of Child Psychology and Psychiatry, 49*(10), 1069-1078.
- Richters, J. E. (1992). Depressed Mothers as Informants About Their Children: A Critical Review of the Evidence for Distortion. *Psychological Bulletin, 112* (3), 485-499.
- Schumacher, M., Zubaran, C., & White, G. (2008). Bringing birth-related paternal depression to the fore. *Women and Birth: Journal of the Australian College of Midwives, 21*, 65-70.
- Strand, B. H., Dalgard, O. S., Tambs, K., & Rognerud, M. (2003). Measuring the mental health status of the Norwegian population: a comparison of the instruments SCL-25, SCL-10, SCL-5 and MHI-5 (SF-36). *Nordic Journal of Psychiatry, 57*(2), 113-118.
- Tambs, K., & Moum, T. (1993). How well can a few questionnaire items indicate anxiety and depression? *Acta Psychiatrica Scandinavica, 87*, 364-367.
- Tambs, K., Rønning, T., Prescott, C. A., Kendler, K., Reichborn-Kjennerud, T., Torgersen, S., & Harris, J. R. (2009). Norwegian Institute of Public Health Twin Study of Mental Health: Examining Recruitment and Attrition Bias. *Twin Res Hum Genet, 12*(2), 158-168.
- Wee, K. Y., Skouteris, H., Pier, C., Richardson, B., & Milgrom, J. (2011). Correlates of ante- and postnatal depression in fathers: A systematic review. *Journal of Affective Disorders, 130*(3), 358-377.
- Østberg, M., & Hagekull, B. (2013). Parenting stress and external stressors as predictor of maternal ratings of child adjustment. *Scandinavian Journal of Psychology, 54*, 213-221.

Table 1. Socio-demographics and characteristics of fathers and mothers (N=28,695).

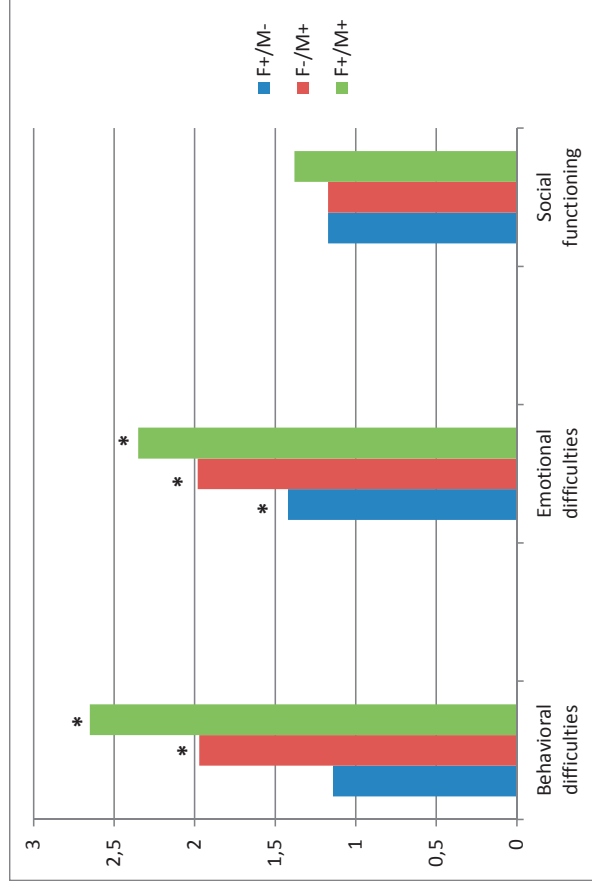
Frequencies and percentages

Variable	Category	Mothers N (%)	Fathers N (%)
Age	≤19	190 (1 %)	57 (0.2 %)
	20-24	2,797 (10 %)	1,201 (4 %)
	25-29	10,495 (37 %)	7,231 (25 %)
	30-34	11,100 (39 %)	11,701 (41 %)
	35-39	3,709 (13 %)	6,121 (21 %)
	≥40	404 (1 %)	1,771 (6 %)
	45-49		458 (2 %)
	⇒50		154 (1 %)
	Missing		0 (0 %)
Marital status	Married		14,887 (52%)
	co-habiting		13,181(46%)
	single		204 (1%)
	divorced/separated		80 (0.3%)
	widower		1 (0%)
	other		342 (1%)
	missing		0 (0%)
Education at baseline	secondary education	398 (1 %)	996 (4 %)
	3 years further education	7,957 (28 %)	12,142 (42 %)
	university/college ≤4 years	12,368 (43 %)	7,837 (27 %)
	university/college ≥4 years	6,620 (23 %)	6,603 (23 %)
	missing	1,352 (5 %)	1,050 (4 %)
Cigarette smoking	yes	2,325 (8%)	3,941(14%)
	no	26,370 (92%)	24,754 (86%)
Use of alcohol	never/seldom	24,565 (86%)	7,311 (26%)
	once -3 times/month	768 (3%)	16,845 (59%)
	2-7 times/ week	27 (0.1%)	3,526 (12%)
	missing	3,335 (12%)	1,013 (4%)
Somatic health problems	no	23,269 (81%)	23,284 (81%)
	yes	5,426 (19%)	5,411 (19%)
*for mothers before pregnancy			
Pregnancy planned	no	4,271 (15%)	
	yes	24,136 (84%)	

Table 2. Logistic regression model; parents' categories as predictor variable and summary scales of Children's development as outcome variables (N=28,695).

Model	Behavioral difficulties			Emotional difficulties			Social functioning		
	F+/M-	F-/M+	F+/M+	F+/M-	F-/M+	F+/M+	F+/M-	F-/M+	F+/M+
	OR 95%CI	OR 95%CI	OR 95%CI	OR 95%CI	OR 95%CI	OR 95%CI	OR 95%CI	OR 95%CI	OR 95%CI
Crude	1.18 0.93,1.50	2.07 1.80,2.38	3.03 1.83,5.02	1.54 1.24,1.91	2.17 1.89,2.49	2.86 1.71,4.79	1.31 1.04,1.64	1.21 1.02,1.42	1.55 0.84,2.86
Adjusted	1.14 0.88,1.46	1.97 1.70,2.30	2.65 1.56,4.48	1.42 1.12,1.79	1.98 1.70,2.31	2.35 1.36,4.07	1.17 0.92,1.50	1.17 0.98,1.40	1.38 0.72,2.63

Figure 1. Adjusted odds ratio (OR) for behavioral-, emotional-, or social difficulties in children by parent's categories.



*Significant level set to ≤ 0.001