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**The effects of parent-child relationships on later life mental health status in two national birth cohorts.**

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## **Abstract**

**Purpose:** Abusive and neglectful parenting is an established determinant of adult mental illness, but longitudinal studies of the impact of less severe problems with parenting have yielded inconsistent findings. In the face of growing interest in mental health promotion, it is important to establish the impact of this potentially remediable risk factor.

**Methods:** Participants: 8405 participants in the 1958 UK birth cohort study, and 5058 in the 1970 birth cohort study

Exposures: questionnaires relating to the quality of relationships with parents completed at age 16 yrs.

Outcomes: 12-item General Health Questionnaire and the Malaise Inventory collected at age 42yrs (1958 cohort) and 30 yrs (1970 cohort).

Statistical methodology: Logistic regression analyses adjusting for sex, social class and teenage mental health problems.

**Results:** 1958 cohort: relationships with both mother and father predicted mental health problems in adulthood; increasingly poor relationships were associated with increasing mental health problems at age 42. 1970 cohort: positive items derived from the Parental Bonding Instrument predicted reduced risk of mental health problems; negative aspects predicted increased risk at age 30. Odds of mental health problems were increased between 20 and 80% in fully adjusted models.

**Conclusions:** Results support the hypothesis that problems with parent-child relationships that fall short of abuse and neglect play a part in determining adult mental health and suggest that interventions to support parenting now being implemented in many parts of the western world may reduce the prevalence of mental illness in adulthood.

**Keywords:** Parenting, Parent-child relationship, mental illness in adulthood, longitudinal study.

**Declaration of interest:** None

## **Introduction**

The importance for future mental health and adult behaviour of parent-child relationships has begun to be recognised in policies designed to reduce child poverty and to provide wider access to parenting training (<http://www.familyandparenting.org/parentingPractitioners>). It is important that the longer term effects of parent-child relationships on mental health throughout adulthood are examined critically in order to tailor and refine policy and practice. Such evidence comes from cross sectional, experimental and cohort studies. In general, retrospectively reported levels of parental care, and control in particular are associated with higher risks of depression and anxiety in adults, the increased risk being between 1.5 and 3 fold [1; 2; 3]. High levels of care and low control are associated with lower risks of mental health problems. Child abuse and neglect represent the most disturbed end of the spectrum of parent-child relationship quality and a number of studies show these to be predictive of future mental health problems [4]. Parental separation or divorce, another well-known predictor of future mental health problems, is often associated with poor quality parent-child relationships [1].

Cross sectional research has now shown that retrospectively reported quality of parenting is associated with mental disorder consistently across six different European countries [5; 6]. Notwithstanding the importance of consistent cross national findings such cross sectional studies cannot control for the effects of concurrent mental health on reported parenting or tease out cause effect associations. Controlled evaluations of interventions in children at risk also suggest promising effects on externalising and internalising symptoms in older children and young people, but the longer term effects on internalising mental disorders such as anxiety and depression throughout adulthood are as yet unknown [7].

Longer term mental health outcomes have been collected in national birth cohorts followed up into adulthood covering the major age groups at risk of adult internalising disorders. Longitudinal studies with the longest follow up tend to have the least searching prospective measures of relationship quality and those with the most detailed observational measures usually do not provide prospectively gathered follow up data [1]. One of us has previously reported analyses of three national birth cohorts (1946, age 43 years; 1958, age 33 years; 1970, age 26 years) examining associations between parent-child relationships and physical health outcomes [8]. Rodgers reported analyses from the 1946 birth cohort using the Parental Bonding Interview collected retrospectively at the same time as mental health outcomes were assessed [9] at age 43. Analyses of the 1958 and 1970 birth cohorts examining effects on mental health outcome to age

33 and 26 years respectively using the Malaise Inventory [10] were summarised by Stewart-Brown [11]: in the 1970 birth cohort it was found that three of five positive aspects and all six negative aspects of parental relationships measured at age 16 predicted mental health at age 26 years assessed using the Malaise Inventory. The present paper reports in detail on the 1958 and 1970 cohorts using questions on parent-child relationships collected at age 16, adjusting prospectively for mental health at age 16, and for other potentially important confounders, making use of more recently collected waves of mental health outcomes at age 42 and 30 respectively using data not available previously.

## Methods

Participants: members of UK national birth cohort studies recruited at birth in England, Wales and Scotland (plus N. Ireland in 1970) during a single week, in 1958 and 1970 with full data available on exposures, outcomes and confounders.

### *1958 Cohort National Child Development Study;*

*Exposures:* Self report data relating to the quality of parent-child relationships were collected from participants aged 16yrs. 11,370 subjects, out of the original cohort of 17,418 newborns, completed the following questions: "I get on well with my mother" and "I get on well with my father"; with response categories: 'very true', 'true', 'uncertain', 'untrue' and 'very untrue'. In these analyses the last two categories were combined. Table 1 illustrates the response levels to these questions.

*Outcomes:* 11,271 subjects completed 12-item General Health Questionnaire (GHQ-12) and the Malaise Inventory (MI) and 11,270 at age 42. The GHQ-12 is a well-validated measure of mental health [12] designed to detect those with a diagnosable psychiatric disorder. A score greater than 10, using the Likert (0,1,2,3) scoring method that corresponds closely to a score of 3 or greater using the GHQ-12 (0,0,1,1) scoring method, is regarded as evidence of probable caseness; 45.6 % (5,144) of the cohort respondents age 42 had scores above 10.

The MI is a 24-item self-completion questionnaire to assess psychiatric morbidity in general population surveys [13;14]. Scores were dichotomised, those scoring 5 or less being categorised as "no malaise" (76.6%, 8,632) and those scoring above 5 "malaise present" (23.4%, 2,639). Rodgers [15] demonstrated a sensitivity and specificity of 0.73 and 0.81 for case-level depression using this cut-off point.

### *Confounding factors considered*

*Social class:* Data on social class was gathered in 7 categories at age 16; if data at this age was missing, data collected at age 11 was substituted. The distribution of social class is given in Table 2. The 'unclear' category includes households with no male head of household or with a male head of household in the armed forces, or where information was missing. Analyses were controlled for social class as: 'non-manual' (classes I, II, III-nm); 'manual' (classes III-m, IV, V); and 'unclear'.

Exploratory analyses for men and women separately gave similar findings, so results are presented for men and women combined. However, sex was entered into the models as a possible confounder.

*Mental health age 16:* At age 16, data on behaviour problems were gathered using both Teacher and Parent reported Rutter A 'Health and Behaviour Checklist' [14], but these data were incomplete. The contents of Rutter A focus on externalising (conduct disorder, hyperactivity) rather than internalising

mental health problems (anxiety and depression) characteristic of mental health inventories such as the MI and the GHQ-12. Mental health at age 16 was therefore controlled in these analyses using two items from the scale relating to emotional aspects (often worries about things and appears miserable, unhappy and tearful).

*Relationship with other parent:* analyses were conducted separately for relationship with mother and relationship with father. In the final model, the relationship with one parent was controlled for the relationship with the other. Subjects who had no relationship with one of their parents were excluded from these analyses.

#### *Statistical Analysis.*

Logistic regression modelling of data pertaining to 8128 subjects (71.5% of those interviewed at age 16) for whom exposure, outcome and confounding factor information was available for analysis. The first set of models examined the MI, the second GHQ-12. In both sets, model calculated unadjusted odds; the second the odds adjusted for sex and social class; the third the odds adjusted for sex, social class and teenage mental health (restricted to 7756 subjects with mental health data at 16); and the fourth model calculated the odds adjusted for sex, social class, teenage mental health and relationship with the other parent. Model 4 could be considered to be over-adjusted due to the correlation between the parental items and therefore, model 3 will be considered to be fully adjusted for reporting purposes.

#### ***1970 Cohort (The Child Health and Development Study).***

*Exposures:* Out of the original cohort of 17,198 newborns, supplemented with immigrants added within the first 10 years, 11,628 subjects were contacted and responded to some aspect of data collection at age 16. 6,349 respondents (55%) completed a questionnaire based upon the Parental Bonding Instrument (PBI) [16] about their relationship with their parents, not distinguishing between mother and father. The questions and responses can be seen in Table 3. (Note: the data do not permit distinction to be made between negative responses and non-response).

#### *Outcomes*

At age 30, the Malaise Inventory (MI) was completed by 11106 cohort members and the GHQ-12 was by 11105 cohort members.

MI scores were dichotomised, as in the 1958 analyses, into 'no malaise' (77.3%, 8586) or 'malaise present' (22.7%, 2520). On the GHQ-12, 42.2%, (4682) of this sample scored more than 10.

*Confounding factors considered*

*Social class:* Data on social class was gathered in 7 categories at each sweep; Age 10 social class was used if these data were missing at age 16. Frequencies for social class categories are given in Table 2. The 'unclear' category includes households with no male head of household, with a male head of household a student, in the armed forces or who had never worked, or where information was missing. Analyses were controlled for social class as 'non manual and manual and unclear as for the 1958 cohort.

*Mental health age 16 years:* The GHQ-12 was completed at age 16 by 4,950 (42.6%) subjects, 35.6% of whom scored over 10.

*Statistical Analyses.* Logistic regression modelling of data pertaining to 5,058 (MI analyses) and 5060 (GHQ-12 analyses) subjects (79.7% of those interviewed at age 16) for whom exposure outcome and confounding factor data were available. In models including teenage depression numbers were restricted to 3,771 (MI) and 3,773 (GHQ-12).

Separate models assessed the association of each aspect of parental relationship quality at age 16 with mental health (MI and GHQ-12) at age 30, initially unadjusted (model 1); adjusted for sex and social class (model 2); adjusted for sex, social class and teenage depression (model 3); and adjusted for sex, social class, teenage depression and other aspects of the parental relationship (model 4). Once again, model 4 could be considered to be over-adjusted due to the correlation between the parental items and therefore, model 3 will be considered to be fully adjusted for reporting purposes.



## **Results**

In the 1958 cohort, both relationship with mother and relationship with father were predictive of mental health problems at age 42 as measured by both the MI and the GHQ-12 (Tables 4 and 5 respectively). There was a significant trend for both mother and father, with an increasingly poor parental relationship being associated with increasing likelihood of mental ill health. Adjustment for sex and social class attenuated the association a little for the MI but not at all for the GHQ-12. Similarly, adjustment for teenage mental health, in addition to sex and social class, attenuated the association a little for the MI but not at all for the GHQ-12. Adjusting for the effect of the relationship with the other parent attenuated the association a little for both measures. Relationship with father appeared to be slightly more influential than relationship with mother, but both retained an independent effect in the final model for both measures. Analyses performed adjusting for parent-rated items from the Rutter scale, as a measure of mental health at age 16, yielded very similar results as those reported here for teacher-rated items. Similarly, analyses performed adjusting for the 'full' Rutter scale (mother rated), as a measure of mental health, taken from data obtained at age 11, yielded very similar results as those reported here.

In the 1970 cohort, for both the MI and the GHQ-12, Tables 6 and 7 respectively, all five of the positive aspects of the relationship were predictive of relatively low risk of mental health problems in the first two models. For the MI, four, and for the GHQ-12, three remained predictive after adjusting for mental health measured at age 16. All six of the negative aspects were predictive, increasing the odds of mental health problems between 40% and 100% (MI) or between 40% and 80% (GHQ-12). Adjustment for sex, social class and teenage depression had only a small impact on the results (MI: 20-80%; GHQ-12: 20-60%), other than for 'my parents are strict and bossy' which showed lower significance (MI) or became non-significant (GHQ-12); and for 'my parents are over-protective', which became non-significant (MI) or less significant (GHQ-12). In model 4, for both measures of mental health, the most predictive descriptor proved to be 'don't understand me/my motives', as had been found in this cohort at age 26 [11]. Analyses performed adjusting for the 'full' Rutter scale (mother rated), as a measure of mental health, taken from data obtained at age 10, yielded very similar results as those reported here.

## **Discussion**

Epidemiological studies are important in the identification of new determinants of health, and, short of experimental evaluations, longitudinal studies provide the most powerful tool for investigating potential

impact. Secondary analyses of existing data sets can provide inexpensive and rapid answers to important public health questions, but they rarely contain the particular data, or exhibit the measurement precision ideal for such investigations. Interpretation of results is limited by issues of validity of measures, availability of confounders, and representativeness of samples.

Neither of these cohort studies provided ideal data. In the 1958 cohort, data were collected at the end of childhood with a non-specific measure of relationship quality. Its merits are that it provides 26 years of follow up after 16, and a large sample size. The 1970 cohort's measure of relationship quality has not been validated as a unidimensional scale and did not discriminate between parents. As a result responses to items in this inventory were analysed individually rather than as an overall score. This cohort, as yet, provides only 14 years of follow up and is compromised by incomplete data collection. Data on parent-child relationship quality collected in adolescence may be subject to influence by mood swings and emotional difficulties associated with this age. We attempted to control for this by adjusting for the presence of mental health problems at age 16. In the 1958 cohort we were able to adjust for the more objective teacher reported observations as well as parent report. In the 1970 cohort the corresponding data were child report. As mental health at age 16 is influenced by parenting earlier in childhood and parenting styles and relationship quality are correlated at different child ages, adjustment for mental health age 16 years carries the potential for over adjustment, but the association between relationship quality and later mental health remained even in these models. There is no simple statistical solution to this problem. We have presented analyses with and without adjustment for mental health problems at the time of measurement of parenting and the true extent of the effect is likely to lie somewhere between the two.

The measures of mental health used as outcomes are validated, but not without ambiguity in discriminating mental health problems. The MI records problems only in the previous four weeks and may miss common, important intermittent problems. Similarly, the GHQ-12 records recent changes in mental health and may miss longstanding problems. Analytical dichotomies necessarily ignore realities of gradations of illness and for the GHQ recommended cut points vary. We have chosen a cut point which includes a relatively high proportion of the population, many of whose mental health problems will fall short of clinical diagnosis. Given the inherent problems of measurement and the known inadequacies of the measures used, misclassification will be present in the data minimising the observed strength of any statistical association. All these issues will tend to reduce the capacity to demonstrate significant

relationships. The fact that our hypothesis was supported using both outcomes in two different cohorts strengthens the findings.

It has been suggested that any possible impact of parent-child relationships on health is entirely due to confounding by socio-economic factors such as social class and poverty. As far as possible this has been accommodated in our analyses where necessary using social class data from a previous data-sweep. The research literature available [1,4] generally shows associations independent of these factors, though they are obviously important, and should always be taken into account. Attrition biases were present in both data sets. The analyses we have presented have been carried out only on the subjects from whom all the necessary exposure, outcome and confounding variable data were gathered. Particularly in the case of the 1970 cohort, these subjects represented only a minority of the cohort. Although analysis of the sex, social class and family type of the subjects who were included suggests that the sample was reasonably representative, included subjects were more likely to be from the non-manual classes, in a two-parent family and female. These biases were also evident in the 1958 cohort data set, even though subjects available for analyses represented a higher proportion of cohort subjects. In order to keep attrition to a minimum, we have used the maximum number of subjects available for each analysis and as a result numbers of subjects vary from one analysis to another. Neither of these surveys can therefore be regarded as being entirely representative of the population and some caution needs to be exercised in extrapolating the results to all families. In contrast to most studies of the impact of the parent-child relationship, they are most pertinent to two-parent families, not exposed to social deprivation. In so far as relationships are likely to be worse in single parent and deprived families, and for children in care (most likely to be lost to follow-up) these results may under-estimate the overall effect of parent-child relationships on mental health.

Given the nature of the data, risk estimates are necessarily approximate and subject to the potential inaccuracies mentioned above. Many possible confounding variables could be discovered in the cohort data set; we have chosen to adjust only for the key ones – sex and social class, and teenage depression where available. The 1958 cohort permitted adjustment for relationship with the other parent, and the 1970 cohort permitted adjustment for all the other aspects of relationships in the questionnaire used. A detailed analysis of the parent-child relationship in single and step-parent families awaits further work. Poverty, poor diet, poor housing, poor education, and injury risk are all likely to affect mental health and to

confound the analyses. However, social class adjustment attenuated results very little in all our analyses, suggesting that parent-child relationships have an importance independent of social factors.

In the 1958 cohort we were able to adjust for the relationship with the other spouse; the quality of their relationships tend to be correlated, so attenuation of one or the other is inevitable, but they show some independent association. It is of note that in some analyses, relationship with father was apparently more predictive than relationship with mother. This may be a feature of adolescence and may not be true at other ages in childhood. However, it has been shown that an interaction between mother's and father's affection can be a risk factor for anxiety and depression symptoms, such that mental health was worse in families where the father was reported to show a higher level of affection but the mother a lower level [17].

In spite of these methodological issues, the 26-year longitudinal analyses of the large 1958 cohort after age 16 supports the hypothesis of a general population effect of parent-child relationship quality on mental health in later life, independent of social factors. The increase in risk fell between 40 and 80% (Model 3 – fully adjusted) in the different analyses, representing a small increase at the level of the individual, but given the high prevalence of this level of mental health problems in the cohort, a sizeable population attributable risk. In this cohort, previous analyses have shown poor relationships with parents to predict multiple illnesses, poor health in general [8] and poor mental health at age 33 [11]. The current analyses show a persisting effect on mental health to age 42 using more robust measures of mental health and adjustment for mental health at age 16.

In spite of a smaller sample and shorter follow-up period, the analyses of the 1970 cohort also support the hypothesis that poor parent-child relationship quality increases the risk of later mental health problems and good quality relationships are protective. Surprisingly, adjusting for mental health, that is, depression at age 16, sex and social class had only a small effect. Four of the five positive aspects of relationship quality were predictive at age 30 in the first two models, and three remained predictive after adjusting for mental health age 16 years. All six of the negative aspects were predictive, increasing the odds of mental health problems between 40 and 100%. Similarly, adjusting for mental health, sex and social class had only a small effect (increase in odds between 20 and 80%). The most predictive item proved to be 'don't understand me/my motives', a reasonable indicator of parental care as perceived by the child and reported by 18% of the cohort. Similar results have been presented previously on this cohort for both physical

health and mental health at age 26[11]. The current analyses indicate a persisting effect of similar size to that in the 1958 cohort.

These results add weight to the hypothesis that parent child relationship quality is an, albeit, modest, determinant of mental health in later life. Because poor quality relationships are common, their population impact is likely to be important in terms of prevalence of adult mental health. A wide range of studies have demonstrated that parenting interventions can impact the aspects of parent-child relationships quality studied here and that such interventions have an impact on mental health outcomes in childhood [18]. The results of our analyses suggest that it is reasonable to conclude that such interventions will also impact mental health in the longer term.

### **Conclusion**

Caring, supportive and understanding relationships in childhood protect against poor mental health in adulthood, and over-controlling relationships increase the risk in families from well to do as well as impoverished backgrounds. Poor parent-child relationships, as measured by the indicators used in this study, affect between 5 and 24% of the population and increase the risk of health problems by 20-80%. For methodological reasons these are likely to be minimum estimates of risk.

Interventions to improve parent-child relationships are likely to prove valuable in health promotion programmes to improve adult mental health and according to the results of this study should not be limited to families living with social deprivation.

## Acknowledgements

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Tables

*Table 1: Frequency of response to measure of parent-child relationship: 1958 cohort age 16 yrs*

| Question                             | Response           | Frequency | %    |
|--------------------------------------|--------------------|-----------|------|
| Do you get on well with your mother? | Very true          | 4875      | 41.3 |
|                                      | True               | 5377      | 45.5 |
|                                      | Uncertain          | 952       | 8.1  |
|                                      | Untrue/Very untrue | 606       | 5.1  |
| Total                                |                    | 11810     | 100  |
| Do you get on well with your father? | Very true          | 3930      | 34.6 |
|                                      | True               | 5127      | 45.1 |
|                                      | Uncertain          | 1400      | 12.3 |
|                                      | Untrue/Very untrue | 913       | 8.0  |
| Total                                |                    | 11370     | 100  |

*Table 2: Distribution of social class in the 1958 and 1970 cohort, age 16 yrs.*

| Social Class   | 1958 Cohort |      | 1970 cohort |      |
|----------------|-------------|------|-------------|------|
|                | Frequency   | %    | Frequency   | %    |
| I              | 806         | 4.3  | 651         | 5.6  |
| II             | 2798        | 15.1 | 2575        | 22.2 |
| III non-manual | 1341        | 7.2  | 940         | 8.1  |
| III manual     | 6330        | 34.1 | 4300        | 37.0 |
| IV             | 2254        | 12.1 | 1103        | 9.5  |
| V              | 847         | 4.6  | 345         | 3.0  |
| Student        | -           | -    | 133         | 1.1  |
| Deceased       | -           | -    | 236         | 2.0  |
| Unclear        | 4182        | 22.5 | 1332        | 11.5 |
| Total          | 18558       | 100  | 11615       | 100  |

*Table 3: Frequency of responses to parent-child relationship inventory. 1970 cohort aged 16 years*

*(multiple responses permitted).* (Note: the data do not permit distinction to be made between negative responses and non-response).

| My parents:                                   |   | Number responding<br>Yes | % of total |
|---|---|--------------------------|------------|
| Allow me freedom of action within reason      | + | 5229                     | 82.4       |
| Are over-protective / fussing / worrying      | - | 1373                     | 21.6       |
| Are understanding / I can talk to them        | + | 3470                     | 54.7       |
| Treat me like a child                         | - | 607                      | 9.6        |
| Don't understand me / my motives              | - | 1164                     | 18.3       |
| Are loving / caring / they look after me      | + | 4662                     | 73.4       |
| I feel I can't understand what they want      | - | 957                      | 15.1       |
| Are helpful / good in a crisis                | + | 3832                     | 60.4       |
| Are strict / bossy / they have too many rules | - | 453                      | 7.1        |
| Are generous / buy me clothes / things I need | + | 3574                     | 56.3       |
| Are nagging / moaning / complaining           | - | 1513                     | 23.8       |
| Total   |   | 6349                     |            |

*Table 4: 1958 Cohort: shows the associations of the parent-child relationship with mental health measured by the Malaise Inventory at age 42.*

|   | Model 1<br>(N=8405) | Model 2<br>(N=8405)             | Model 3<br>(N=7756)             | Model 4<br>(N=7756)              |
|---|---------------------|---------------------------------|---------------------------------|----------------------------------|
| <b>Do you get on well with your mother?</b> |                     |                                 |                                 |                                  |
| Very true                                   | 1                   | 1                               | 1                               | 1                                |
| True  | 1.1 (1.0, 1.2)      | 1.1 (1.0, 1.2)                  | 1.1 (1.0,1.2)                   | 1.0 (0.9,1.2)                    |
| Uncertain                                   | 1.6 (1.3, 1.9)***   | 1.6 (1.3, 1.9)***               | 1.5 (1.2,1.9)***                | 1.3 (1.0,1.6)*                   |
| Untrue or very untrue                       | 1.8 (1.4, 2.2)***   | 1.7 (1.4, 2.2)***               | 1.7 (1.3,2.2)***                | 1.4 (1.1,1.9)**                  |
| Statistics for model                        |                     | $\chi^2=179.8$<br>df=6, p<0.001 | $\chi^2=202.8$<br>df=8, p<0.001 | $\chi^2=230.0$<br>df=11, p<0.001 |
| <b>Do you get on well with your father?</b> |                     |                                 |                                 |                                  |
| Very true                                   | 1<br>(N=8128)       | 1<br>(N=8128)                   | 1<br>(N=7756)                   | 1<br>(N=7756)                    |
| True  | 1.1 (1.0, 1.2)      | 1.1 (1.0,1.2)                   | 1.1 (1.0,1.3)                   | 1.1 (0.9,1.2)                    |
| Uncertain                                   | 1.6 (1.4, 1.9)***   | 1.6 (1.3, 1.8)***               | 1.5 (1.3,1.8)***                | 1.4 (1.1,1.6)**                  |
| Untrue or very untrue                       | 2.0 (1.6, 2.4)***   | 1.8 (1.5, 2.2)***               | 1.8 (1.5,2.2)***                | 1.7 (1.3,2.1)***                 |
| Statistics for model                        |                     | $\chi^2=196.1$<br>df=6, p<0.001 | $\chi^2=217.6$<br>df=8, p<0.001 | $\chi^2=230.0$<br>df=11, p<0.001 |
|   |                     | *p< 0.05                        | **p< 0.01                       | ***p< 0.001                      |

Table 4: Logistic regression analyses of the impact of parental relationships at 16 years on malaise score at age 42 years. Values are odds ratios (95% confidence intervals) unless otherwise stated. Model 1 unadjusted, model 2 adjusted for sex and social class, model 3 adjusted for sex, social class and teenage mental health, model 4 adjusted for sex, social class, teenage mental health and relationship with the other parent. 1958 cohort age 42 years.

*Table 5: 1958 Cohort: shows the associations of the parent-child relationship with mental health measured by the GHQ-12 at age 42.*

|   | Model 1<br>(N=8405) | Model 2<br>(N=8405)             | Model 3<br>(N=7755)             | Model 4<br>(N=7755)              |
|---|---------------------|---------------------------------|---------------------------------|----------------------------------|
| <b>Do you get on well with your mother?</b> |                     |                                 |                                 |                                  |
| Very true                                   | 1                   | 1                               | 1                               | 1                                |
| True  | 1.2 (1.1, 1.3)***   | 1.2 (1.1, 1.3)***               | 1.2 (1.1,1.3)**                 | 1.1 (1.0,1.2)                    |
| Uncertain                                   | 1.4 (1.2, 1.7)***   | 1.4 (1.2, 1.7)***               | 1.4 (1.2,1.7)***                | 1.2 (1.0,1.5)*                   |
| Untrue or very untrue                       | 1.6 (1.3, 1.9)***   | 1.5 (1.2, 1.9)***               | 1.6 (1.3,2.0)***                | 1.4 (1.1,1.7)**                  |
| Statistics for model                        |                     | $\chi^2=86.5$<br>df=6, p<0.001  | $\chi^2=103.1$<br>df=8, p<0.001 | $\chi^2=120.7$<br>df=11, p<0.001 |
| <b>Do you get on well with your father?</b> |                     |                                 |                                 |                                  |
| Very true                                   | (N=8128)<br>1       | (N=8128)<br>1                   | (N=7755)<br>1                   | (N=7755)<br>1                    |
| True  | 1.2 (1.1, 1.3)***   | 1.2 (1.1, 1.3)***               | 1.2 (1.1,1.3)***                | 1.1 (1.0,1.3)                    |
| Uncertain                                   | 1.5 (1.3, 1.8)***   | 1.5 (1.3, 1.8)***               | 1.5 (1.3,1.7)***                | 1.3 (1.1,1.6)***                 |
| Untrue or very untrue                       | 1.5 (1.3, 1.8)***   | 1.5 (1.3, 1.8)***               | 1.5 (1.3,1.8)***                | 1.4 (1.1,1.7)**                  |
| Statistics for model                        |                     | $\chi^2=102.8$<br>df=6, p<0.001 | $\chi^2=110.5$<br>df=8, p<0.001 | $\chi^2=120.7$<br>df=11, p<0.001 |
|   |                     | *p< 0.05                        | **p< 0.01                       | ***p< 0.001                      |

Table 5: Logistic regression analyses of the impact of parental relationships at 16 years on GHQ score at age 42 years. Values are odds ratios (95% confidence intervals) unless otherwise stated. Model 1 unadjusted, model 2 adjusted for sex and social class, model 3 adjusted for sex, social class and teenage mental health, model 4 adjusted for sex, social class, teenage mental health and relationship with the other parent. 1958 cohort age 42 years.

*Table 6: 1970 Cohort: shows the associations of the parent-child relationship with mental health as measured by the Malaise Inventory at age 30.*

| Aspects of parental relationship<br>age 16 yrs | Model 1<br>N=5058 | Model 2<br>N=5058 | Model 3<br>N=3771 | Model 4<br>N=3771                |
|--|-------------------|-------------------|-------------------|----------------------------------|
| My parents:                                    |                   |                   |                   |                                  |
| Allow me freedom of action<br>within reason    | 0.6(0.5,0.7)***   | 0.6(0.5,0.7)***   | 0.7(0.6,0.9)***   | 0.8(0.7,1.1)                     |
| Are understanding/can talk to<br>them          | 0.7(0.6,0.8)***   | 0.7(0.6,0.8)***   | 0.7(0.6,0.9)***   | 0.9(0.7,1.1)                     |
| Are loving/caring/look after me                | 0.7(0.6,0.8)***   | 0.7(0.6,0.8)***   | 0.8(0.7,1.0)*     | 1.0(0.8,1.2)                     |
| Are helpful/good in a crisis                   | 0.7(0.6,0.8)***   | 0.7(0.6,0.8)***   | 0.8(0.7,0.9)**    | 1.0(0.8,1.2)                     |
| Are generous/buy me<br>clothes/things I need   | 0.9(0.7,1.0)*     | 0.9(0.8,1.0)*     | 1.0(0.8,1.1)      | 1.1(0.9,1.3)                     |
| Are overprotective / fussing                   | 1.4(1.2,1.6)***   | 1.4(1.2,1.6)***   | 1.2(1.0,1.5)      | 0.9(0.7,1.2)                     |
| Treat me like a child                          | 2.0(1.6,2.4)***   | 2.0(1.6,2.4)***   | 1.8(1.4,2.3)***   | 1.4(1.0,1.8)*                    |
| Don't understand me/my motives                 | 1.9(1.6,2.2)***   | 1.9(1.6,2.2)***   | 1.7(1.4,2.1)***   | 1.3(1.1,1.7)*                    |
| I feel I can't understand what<br>they want    | 1.6(1.4,2.0)***   | 1.6(1.3,1.9)***   | 1.6(1.3,1.9)***   | 1.3(1.0,1.6)*                    |
| Are strict/bossy/have too many<br>rules        | 1.8(1.4,2.3)***   | 1.8(1.4,2.3)***   | 1.4(1.1,1.9)*     | 0.9(0.7,1.3)                     |
| Are nagging/moaning/<br>complaining            | 1.6(1.3,1.8)***   | 1.6(1.3,1.8)***   | 1.4(1.2,1.7)***   | 1.2(0.9,1.4)                     |
| Statistics for model                           |                   |                   |                   | $\chi^2=185.4$ df=15,<br>p<0.001 |
|  | *p< 0.05          | **p< 0.01         | ***p< 0.001       |                                  |

Table 6: Logistic regression analyses of the impact of parental relationship at 16 years on malaise score at age 30 years. Values are odds of experiencing mental health problems compared not experiencing such problems (95% confidence intervals) Model 1 unadjusted, model 2 adjusted for sex and social class only, model 3 adjusted for sex, social class and teenage depression, model 4 adjusted for sex, social class teenage depression and all other aspects of the parental relationship. 1970 cohort age 30 year.

*Table 7: 1970 Cohort: shows the associations of parent-child relationship with mental health measured by the GHQ-12 at age 30.*

| Aspects of parental relationship<br>age 16 yrs | Model 1<br>N=5060 | Model 2<br>N=5060 | Model 3<br>N=3773 | Model 4<br>N=3773                |
|--|-------------------|-------------------|-------------------|----------------------------------|
| My parents:                                    |                   |                   |                   |                                  |
| Allow me freedom of action<br>within reason    | 0.7(0.6,0.8)***   | 0.7(0.6,0.8)***   | 0.8(0.7,1.0)      | 1.0(0.8,1.2)                     |
| Are understanding/can talk to<br>them          | 0.8(0.7,0.9)***   | 0.8(0.7,0.9)***   | 0.8(0.7,0.9)***   | 0.9(0.8,1.1)                     |
| Are loving/caring/look after me                | 0.8(0.7,1.0)**    | 0.8(0.7,0.9)**    | 0.8(0.7,1.0)*     | 0.9(0.8,1.1)                     |
| Are helpful/good in a crisis                   | 0.8(0.7,0.9)***   | 0.8(0.7,0.9)***   | 0.8(0.7,1.0)**    | 1.0(0.8,1.2)                     |
| Are generous/buy me<br>clothes/things I need   | 0.9(0.8,1.0)*     | 0.9(0.8,1.0)*     | 0.9(0.8,1.0)      | 1.0(0.9,1.2)                     |
| Are overprotective / fussing                   | 1.4(1.2,1.6)***   | 1.4(1.2,1.6)***   | 1.3(1.1,1.5)**    | 1.1(0.9,1.3)                     |
| Treat me like a child                          | 1.8(1.5,2.1)***   | 1.8(1.5,2.1)***   | 1.5(1.2,1.9)***   | 1.2(0.9,1.5)                     |
| Don't understand me/my motives                 | 1.7(1.5,2.0)***   | 1.8(1.5,2.0)***   | 1.6(1.3,1.9)***   | 1.3(1.1,1.6)*                    |
| I feel I can't understand what<br>they want    | 1.6(1.4,1.9)***   | 1.6(1.4,1.9)***   | 1.5(1.2,1.8)***   | 1.3(1.0,1.5)*                    |
| Are strict/bossy/have too many<br>rules        | 1.4(1.1,1.8)**    | 1.4(1.1,1.8)**    | 1.2(1.0,1.6)      | 0.9(0.7,1.2)                     |
| Are nagging/moaning/<br>complaining            | 1.6(1.4,1.8)***   | 1.6(1.4,1.8)***   | 1.4(1.2,1.7)***   | 1.2(1.0,1.4)*                    |
| Statistics for model                           |                   |                   |                   | $\chi^2=190.2$ df=15,<br>p<0.001 |
|  | *p< 0.05          | **p< 0.01         | ***p< 0.001       |                                  |

Table 7: Logistic regression analyses of the impact of parental relationship at 16 years on GHQ score at age 30 years. Values are odds of experiencing mental health problems compared not experiencing such problems (95% confidence intervals) Model 1 unadjusted, model 2 adjusted for sex and social class only, model 3 adjusted for sex, social class and teenage depression, model 4 adjusted for sex, social class teenage depression and all other aspects of the parental relationship. 1970 cohort age 30 year.

**Authors and their contributions.**

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Contributed to the analysis design, reviewed the literature, performed statistical analyses, reporting of results and report writing.

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