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**Mental Health of Parents and Life Satisfaction of Children: A Within-Family Analysis
of Intergenerational Transmission of Well-Being**

By

**Nattavudh Powdthavee, University of London and University of York and
Anna Vignoles, University of London**

**Department of Economics and Related Studies
University of York
Heslington
York, YO10 5DD**

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Nattavudh Powdthavee
University of London and University of York

Anna Vignoles
University of London

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Abstract

This paper addresses the extent to which there is an intergenerational transmission of mental health and subjective well-being within families. Specifically it asks whether parents' own mental distress influences their child's life satisfaction, and vice versa. Whilst the evidence on daily contagion of stress and strain between members of the same family is substantial, the evidence on the transmission between parental distress and children's well-being over a longer period of time is sparse. We tested this idea by examining the within-family transmission of mental distress from parent to child's life satisfaction, and vice versa, using rich longitudinal data on 1,175 British youths. Results show that parental distress at year t-1 is an important determinant of child's life satisfaction in the current year. This is true for boys and girls, although boys do not appear to be affected by maternal distress levels. The results also indicated that the child's own life satisfaction is related with their father's distress levels in the following year, regardless of the gender of the child. Finally, we examined whether the underlying transmission correlation is due to shared social environment, empathic reactions, or transmission via parent-child interaction.

JEL: D64, I1, I31, J13

Key words: life satisfaction; mental health; intergenerational transmission; within-family; longitudinal; GHQ

1. Introduction

Policy-makers and even economists, who have historically been more concerned with the material success of citizens, are becoming increasingly aware of the importance of subjective well-being as both a desirable outcome for individuals and also a legitimate area of concern for social policy (Layard, 2005). This is particularly true in the context of child development, where there is also a growing policy awareness of the importance of subjective well-being and the development of non-cognitive skills, not least because of their impact on subsequent material success and wealth (Blanden et al., 2006; Heckman & Rubinstein, 2001; Murnane et al., 1995), as well as future earnings (Graham et al., 2004), health and other social and economic behaviors (Clark, 2001; Palmore, 1969; Sales & House, 1971). Of course recognizing the importance of well-being does not necessarily indicate how policy-makers might be able to influence this outcome, if at all. This paper focuses on one potential determinant of children's subjective well-being, namely the influence of parents' own mental health, as measured by General Health Questionnaire (GHQ) measure of mental distress, on their child's self-assessed life satisfaction (LS).

The sizeable literature on the daily contagion of negative emotions and mental distress between members of the same family (Larson & Almeida, 1999) provides support for the view that short-term stress and strain (at work and in the family domain) can be transmitted between spouses and indeed that in the short run at least, the distress of parents can influence their children's own subjective well-being. The evidence on the longer-term impacts of the mental distress of parents on children's subjective well-being is, however, sparse. This paper examines the transmission correlations between mental health problems of parent and child's LS using rich longitudinal data on 1,175 youths over the course of 10 years from The British Household Panel Survey Youth Study. These data enable us to determine whether mental distress of parents in the previous year is associated negatively and statistically significantly with the change in child's LS measured one year later. We also consider the reverse, i.e. whether a child's LS in the previous year is significantly related to the change in parental distress levels one year later. The paper also considers whether the transmission relationships vary by the gender of the child, given the existing evidence that adolescent males normally possess higher levels of psychological resources than females (e.g., Rutter, 1985). Finally, we explore whether the underlying mechanism of the transmission relationships between child and parents is due to the direct contagion between mental distress and subjective well-being, transmission via parent-child interaction, or other distress-related contagion processes.

2. Literature

There are three bodies of work that are relevant to the research questions posed in this paper. The first and most pertinent is the literature that has considered, using both qualitative and quantitative methodologies, the extent of emotional and psychological transmissions within family and particularly between spouses. The second body of work relates to the role of gender in mental well-being in adolescence. The third is the literature that has considered different underlying mechanisms that can be used to explain the observed distress-LS transmission correlations between parents and child.

2.1 Emotional and Psychological Transmissions within Family

The literature on emotional and psychological transmissions has been characterized by a focus on the contagion of negative emotions and mental distress from one family member to the other (for a review, see Larson & Almeida, 1999). One of the main research topics in the area concerns stress contagion between married couples. Using a semistructured interview method, early studies on work-family relations suggested that there may be stress transmissions within couples, whereby a stress experienced by an individual's spouse leads to stress being experienced by the individual at home (Piotrowski, 1979; Repetti, 1987), as well as spillovers from home to the workplace (Crouter, 1984).

Quantitative studies on the direct transmission of different domain measures of mental distress such as stress and strain have provided convincing evidence that such contagion between spouses exists (e.g., Bolger et al., 1987; Repetti, 1989; Jones & Fletcher, 1993; Rook et al., 1991). For example, in a diary sample of 166 married couples recorded over a period of six weeks, Bolger et al. (1987) found that a bad day at work for a husband significantly increased the probability of arguments between spouses the following day. The home-to-work stress contagion found by Bolger et al. (1987) was robust to controls for the effects of factors that are relatively stable over time but vary across individuals, such as personality and living conditions. In a time-series study on transmission of negative emotions ($N = 33$ husbands, 27 wives), Repetti (1989) found that wives' stress and feelings of work overload often led to an increase in husbands' reports of negative marital and family relations the following day. Roberts and Krokoff (1990) found some significant gender difference in the

transmission relationships; husbands' stress appeared to predict wives' stress better than wives' stress predicted husbands'.

Research into transmission of negative emotions and mental distress within the family between parent and child is more limited but also suggests that parent's heightened level of mental distress may have a direct impact on child's well-being (Almeida et al., 1999; Christensen & Margolin; Downey et al., 1999). For example, in a sample of mothers taken from a diary dataset, Christensen and Margolin (1988) found some evidence of conflict transmission within parent-child dyads. In an observational study of mothers and their children, Repetti and Wood (1997) showed that mothers experiencing stress from work were more likely to withdraw than to display irritation with their children. Using hierarchical generalized linear modelling on daily reports of 117 couples, Almeida et al. (1999) showed that both mothers and fathers were more likely to have tense interactions with their children on days when there were marital tension the previous day. However, they also found that the transmission of conflict varied significantly between fathers and mothers; the tension transmitted from parents to children was nearly twice as strong from fathers as from mothers. According to the authors, one potential explanation is that fathers may have more trouble compartmentalizing problems that occurred in one subsystem, and thus they may react more negatively in another subsystem. Mothers, on the other hand, may be more skilled at handling emotions in the family, thereby maintaining psychological and behavioral boundaries in the family. However, in a study of single mother families, Larson and Gillman (1999) showed that mothers' signs of distress can also have a significant impact on child's well-being; they found mothers' immediate anxiety and anger to be associated positively and statistically significantly with subsequent levels of anxiety and anger experienced by their children, but the adolescents' emotions were not transmitted to their mothers. Similar results are also obtained in a study of well and chronically ill mothers by Downey et al. (1999). Using diary reports of mothers from 82 families, they found significant evidence of direct transmission from mothers' anger to child's anger at the daily level.

Almost all of the empirical studies on transmissions of mental distress within-families described above were looking at a specific measure of mental health problem (i.e. stress, strain, anxiety, and anger), and were carried out using diary studies with time-lags of one day. Although the diary design is useful for capturing the immediate transmission of mental distress within the family, they do not provide information about the long-term impact of such transmission. As a result, longitudinal data have been used to examine transmission relationships over the macroscopic span of months or usually years. This research is

valuable in showing the long-term effect of, for example, economic loss and parental depression on family members (e.g., Grych & Fincham, 1990; Karney & Bradbury, 1995; McLoyd, 1989). Conger and colleagues' study of Iowa farm families showed that a family's economic hardship can be used to predict subsequent adolescent mental distress (Conger et al., 1994; Ge et al., 1995). Using a cross-lagged effect analysis, they found that parent and adolescent distress were reciprocally related across time, even after earlier emotional status was controlled for. However, to the best of our knowledge, there has been no single study to date that used longitudinal data to study the longitudinal relationships between mental distress of parents and well-being of a child.

2.2 Gender Differences in Mental Well-Being and Psychological Resources among Adolescents

Another issue that we consider in this paper is whether transmissions in negative emotions and stress from parent to child vary in their influence by the gender of the child. This research question arises from the literature that suggests that the psychological resources of adolescent girls and boys may differ. While some studies of gender differences in mental health among adolescents have found insignificant variations in mental distress between boys and girls (Baron & Joly, 1988; Friedrich et al., 1988; Mitchell et al., 1988), many more have found that girls consistently report higher levels of depressive symptoms than do boys. For example, in a sample of 935 adolescents in New Zealand, Nada-Raja et al. (1992) found that girls were more likely to report higher anxiety and depression scores compared to boys of the same age. Similar results were also obtained in the studies of adolescents in the United States (Allgood-Merton et al., 1990; Avison & McAlpine, 1992; Webb & VanDevere, 1985), in Canada (D'Arcy & Siddique, 1984), and in the United Kingdom (Rutter, 1985; Wade et al., 2002). Using a 10-year longitudinal data of adolescents' clinical depression symptoms, Hankin et al. (1998) showed that gender differences in depression (females greater than males) first began to emerge between the ages of 13 and 15, and continued to increase until the adolescents reached adulthood at the age of 18. The results are consistent with the earlier findings by Nolan-Hoeksema (1994) on gender differences in depression in adolescence. Cyranowski et al. (2000) found that while prepubescent boys are more likely than girls to be depressed, the trend in depression rates is reversed for the child between the ages of 11 and 13 years old.

Thus, the weight of evidence seems to suggest that adolescent females are more prone to depression than their male counterpart. For a comprehensive review on evidence, see Nolan-Hoeksema (2001).

One common explanation in the literature for the sources of gender differences in depression among adolescents is that boys possess more psychological resources, such as mastery and self-esteem, which provide protective influences on mental well-being (Allgood-Merton et al., 1990; Brack et al., 1988; Burke & Weir, 1978; D'Arcy & Siddique, 1984). This protective explanation is reflected in a number of studies that have found adolescent females to be experiencing more depression recurrence from a single episode of depression than males (Amenson & Lewinsohn, 1981; Lewinsohn et al., 1989). Another potential explanation for the gender differences in depression in adolescence concerns the differences in affiliative needs between males and females during adolescent years, which can interact with adolescent transition difficulties to create a depressogenic diathesis as females reach puberty. This gender-linked vulnerability explains why adolescent females are more likely than males to become depressed when faced with negative life events and, particularly, life events with interpersonal consequences (Cyranowski et al., 2000). Thus, these findings suggest that adolescent males may be better at coping with, as well as adapting to shocks and depression than females. It is therefore plausible to hypothesize that boys will be more skilled at dealing with negative emotional transmissions from the parents than girls of the same age, and thus are less affected by it in terms of their perception of life as a whole.

2.3 Underlying Mechanisms of Emotional Transmissions within Families

According to Westman and Vinokur (1998), most of the crossover studies to date have at least three different interpretations that could produce their results. It is thought that the observed correlation between levels of stress of partners or members of the same family could have been the outcome of (a) common experiences affecting the stress of both partners, (b) direct transfer of stress or strain from one partner to the other through the process of empathic reactions, and (c) indirect transmission of stress through the behavioral interaction of the partners.

The basis for the first proposed explanation by Westman and Vinokur is that the observed transmission of emotions between partners is a spurious transmission effect; what appears to be a crossover effect is no more than the result of people sharing personality traits

or the same social environment such as stressful life events, for example (see, e.g., Westman & Etzion; 1995).

The second explanation is that a direct transmission of emotions occurs from one member of the family to another. The basis for this explanation is the fact that transmission occurs between closely related members of the family who identify with and care for one another and share a great part of their lives together. Westman and Vinokur called this process ‘empathic reactions’, whereby a stress in the parents produces in a child a concerned reaction that reduces the level of happiness in the latter.

The third and final explanation relates the crossover effect to an indirect transmission process, which is mediated by the social interactions between members of the same family. According to this explanation, an increase in parents’ mental distress may trigger or exacerbate negative parenting behaviors that in return damage the LS of the child (see, e.g., Berkowitz, 1989; Jones & Fletcher, 1993; Schaefer et al, 1981).

It is not clear, given that measures of negative and positive emotional disposition tend to be strongly correlated, whether the transmission of parental *distress* on child *well-being* is a distinct process from negative contagions already documented in the literature. For example, a distressed parent may heighten the level of distress experienced by the child, which then lowers his or her levels of LS.

One question of interest is therefore whether there is a fundamental distinction between measures of mental distress and subjective well-being. Although several studies have found a moderate correlation between mental distress and well-being (Chamberlain, 1988; Michalos, 1991), others have shown that these components appear to behave differently over time and to have differing relationships with other variables (Liang, 1985; Stock et al., 1986). Research into the validity of the two constructs has also shown that there is a clear distinction between the two measures. For example, Headey et al (1985) found using factor analysis on Australian panel data that well-being depends more on the personality traits of extraversion and optimism, while ill-being depends more on socio-economic status and poor health. Social networks, on the other hand, contribute more to enhance the feelings of well-being than to relief of ill-being. Similar findings have also been discussed in Bradburn (1969), Diener (1984), Diener et al (1999), and Heady et al (1993). One possible reason for this finding is that people may ignore or deny negative emotional reactions while still recognizing undesirable factors in their lives. Another reason is that a person’s conscious evaluation of life circumstances may reflect unconscious goals and values. In contrast, affective responses may reflect unconscious motives and the influences

of the bodily states to a greater extent than do cognitive evaluations of life ratings (Pavot & Diener, 1993). Because measures of subjective well-being such as LS frequently form a separate factor and correlate with predictor variables in a unique way, it seems worthwhile to separately assess this construct in the research.

3. Hypotheses

The central hypothesis of this study is that there is an intergenerational transmission of parents' distress on their child's LS and *vice versa*. The longitudinal nature of the BHPS allows us to test whether prior experiences of mental distress of both the mother and the father in the previous year is negatively and statistically significantly associated with the child's own perception of his or her quality of life today. We also tested whether the child's LS in year $t-1$ is correlated with both parents' mental distress in year t , i.e. whether transmission can be from child to parent. If one or both parents' mental distress influences the child's own LS, then an increase in one or both of the parents' mental distress in year $t-1$ should be negatively correlated with child's LS in the current year. In a similar fashion, if each child's LS is an important determinant of their parents' mental distress, then either or both parents should experience a decrease in mental distress from an increase in child's LS in year $t-1$.

In the current study, we also considered the possibility that because the literature appears to suggest that adolescent males possess higher levels of psychological resources than females, males may experience significantly lower crossover effects of distress from their parents. There are, however, no prior assumptions made on the strength of happiness-to-distress transmission from child to parents. We also considered the possibility that the extent to which parental distress is transmitted to their child may vary according to the acuteness of the distress symptoms experienced by each parent.

Finally, we explored whether the underlying mechanism of the transmission process is due to a shared social environment, empathic reactions, or crossover via parent-child interactions. We tested whether the transmission of parental distress on child LS reflects the same processes as that of the within-family contagion of stress and strain that are already well-documented in the literature. The hypothesis is that if the transmission of parental distress to child LS is primarily driven by the effects of parental distress on child unhappiness or indirect crossover via parent-child interactions, then the inclusion of these additional control variables that measure child unhappiness and parent-child interactions should lead to

a significant reduction in the size of the estimated parental distress-child LS transmission coefficients for both parents and child. If, however, the transmission between mental distress and well-being is a distinct process from the contagion of stress and strain documented in the literature, then we would expect to observe small or insignificant changes in the transmission coefficients.

To answer these questions we use quantitative methods based on data from the British Household Panel Study Youth Survey, which is particularly suitable for this purpose containing rich controls (e.g. personal characteristics of the parents) and measures of parental distress and child's happiness over time.

4. Method

4.1 Data

This article uses data taken from the British Household Panel Survey. This is a nationally-representative household panel covering a total sample of approximately 19,000 randomly selected individuals from 10,000 British households. The study contains information about each individual's levels of LS and mental distress, as well as other individual characteristics and some household characteristics. There is both entry into and exit from the panel, leading to an unbalanced panel data set with an increasing number of individuals interviewed over time. This is due to the inclusion of children from the original households who turn 16 and enter the survey, and to the addition of the new members of the households formed by original panel members.

The BHPS also interviewed from wave 4 onwards all 11-15 year olds living in each household in the sample. Most of the youth questionnaires such as attitudes towards schools and subjective well-being were answered by the youth themselves, with 773 children being interviewed in the first wave (wave 4). The number expanded to 1,219 children in the latest wave of this study (wave 13). The baseline sample of the Youth Survey used in the current article contains 10,199 observations. This is equivalent to 3,459 unique youths, 759 of whom were present over all nine waves. There is a 0.5% missing rate in the youth LS variable, which leaves 10,149 useable observations in total. However, we are interested in this article in the two-parent families with no missing values on the current child's LS and both parents' mental distress variables; there are 6% and 30% missing values for mother's and father's GHQ scores respectively due to either "not reported" or "mother or father absent from the family". This leaves us with 6,671 (or 2,402 unique youths) in the sample. For the purpose

of our transmission analysis, the sample is further restricted to consist of only 4,173 observations (65% of all two-parent families with no missing values on the current child's LS and both parents' GHQ scores), or 1,175 unique individuals, all of whom include information on own lagged LS level, as well as father's and mother's mental distress measured at year $t-1$. In other words, our sample will not include the children in their first year in the youth sample, the vast majority of whom would be 11 years old. However, because of the decision to drop a large proportion of the observations due to missing information on both child's LS and parents' mental distress in the previous year, we check whether the remaining observations are systematically different in terms of their current LS and GHQ scores with the observations that were dropped from the analysis. Appendix A presents the means for the current LS and GHQ levels by whether or not the observation was included in the analysis. There seems to be no statistical differences between the included and excluded observations, in terms of their LS and their parents' GHQ. We conclude that the decision not to include the children in their first year in the youth sample should not significantly bias our analysis.

The average age of the youths in the final sample is 13.56 years, with an approximate 50-50 split between boys and girls in gender composition. The average ages of fathers and mothers are 42.83 and 40.32 years, respectively. Real household income is approximately £26,253 per annum, on average. Around 40% of fathers and 32% of mothers have at least an undergraduate degree from a university.

4.2 Measures

Our central measure of a child's well-being is the degree of their satisfaction with life. According to Shin and Johnson (1978), *LS* is a global cognitive judgment process, in which each youth evaluates the quality of his or her life on the basis of past, present, and expected experiences in the future. Each adolescent was asked from wave 4 in the BHPS to indicate on a 7-point-scale from 1 (*very dissatisfied with life*) to 7 (*very satisfied with life*). The mean, median, and mode for the youth's LS distribution are 5.8, 6, and 6 respectively. There is a long right hand tail in the distribution of youth LS in BHPS, with 70% reporting high satisfaction levels of 6 and 7.

One issue in the psychology literature has been whether such measure of subjective well-being such as LS is, in their terminology, reliable and valid. A first argument in defense of using data on child's LS comes from evidence that LS scales have often been shown to correlate substantially with other subjective data. These include, for instance, how self-rated

happiness can be shown to be correlated well with assessments of the person's happiness by friends and family (Diener, 1984; Pavot & Diener, 1993; Sandvitz et al., 1993), reports by spouses (Costa & McCrae, 1988), reports from clinical experts (Goldings, 1954), and with memory measures, in which people must remember good versus bad events from their lives (Balatsky & Diener, 1993). A second argument is based on findings within psychology literature, of a well-defined correlation between happiness data and various physical measures. For example, reported subjective well-being has been shown to be positively associated with the duration of genuine or the so-called “Duchenne” smile (Eckman et al., 1990), and measures of responses to stress such as heart rate and blood pressure (Shedler et al., 1993). Subjective well-being measures have also been used to predict the length of the person's life (Palmore, 1969) as well as the risk of getting a coronary heart disease (Sales & House, 1971).

Parents’ overall level of *mental distress* is assessed using the 12 adjective items from the negative affective scales of the General Health Questionnaire (Goldberg, 1978). Mental distress is distinguished from measures of LS in that it is more emotionally than cognitively driven, and can therefore be used as a reasonably good proxy for the transient component of negative affectivity (Watson & Clark, 1984). Individuals indicate on a 4-point scale from 1 (*no more than usual*) to 4 (*much more than usual*) how often over the past few weeks they had lost sleep over worry, felt constantly under strain, felt they could not overcome difficulties, been feeling unhappy and depressed, been losing confidence, and been feeling like a worthless person. Individuals were also asked to indicate on a 4-point scale from 1 (*better than usual*) to 4 (*much less than usual*) on how often over the past few weeks that had felt that they were playing a useful part in things, felt capable of making decisions, been able to enjoy day-to-day activities, been able to concentrate, been able to face up to problems, and been feeling reasonably happy. The number of times the person places himself or herself in the fairly stressed or highly stressed category were then added together to produce the so-called “Caseness score”, in which high numbers correspond to higher levels of mental distress. The predictive validity and content validity of the GHQ are good in comparison with other well-known scaling of mental illness (Bowling, 1991). The GHQ also performs well in reliability tests (Bowling, 1991). The internal consistency of GHQ in our sample is also good, with a Cronbach’s alpha of 0.89. Finally, the GHQ measure of mental distress is also considered as an important outcome in its own right and fits with much recent literature such as Theodossiou (1998), Wildman (2003), Gardner and Oswald (2007), and Oswald and Powdthavee (2007).

4.3 Control Variables

We include a set of youth attributes, as well as both parents' characteristics and some household characteristics ((taken from the main BHPS dataset) as control variables in the child's LS regressions. Youth attributes include child's age and the number of close friends the child has. Age and the number of close friends are measured as continuous variables, and are time-varying across the observation waves.

Parental characteristics include education, employment status, and health status of both parents if present in the household. Education is captured by two dummy variables, which represent (i) whether the parent achieved A levels or not and (ii) whether they achieved a degree. More disaggregated measures of parental education are not feasible with these data. Parental employment status is measured as a categorical variable identifying self-employment and full-time employment. Health status is also measured as a categorical variable, ranging from "1.very poor health" to "5.excellent health". Household characteristics include household income in natural log form and the number of children in the household. Household income is calculated by taking the summation of all household members' annual incomes and is converted into real income in 1995 prices by dividing it by the annual consumer prices index (CPI). The number of children is a continuous variable and time varying across the panel. We include these variables because they are known to be correlated with measures of LS, and they may also be correlated with the mental distress of the parents (for a review, see Oswald, 1997).

Following prior studies on how to model psychological well-being (Clark, 2003; Gardner & Oswald, 2007), a similar set of controls were included in each parent's mental distress equations, with the addition of each parent's age. The spouse's observed characteristics are not included in the parent's own mental distress equation as the model already allows for the correlations between the residuals. We also include the gender of the child in later analyses of moderating gender effects. Details of mean scores and standard deviations in the final sample for each of the dependent and control variables are given in Appendix B. In order to avoid non-response bias, we create dummy variables representing missing values for all control variables in the final sample.

4.4 Mediating Factors

In order to control for the mediating factors in the transmission of parental distress on child LS, two different measures of child unhappiness are included in the estimation process. The first is the number of nights in the week prior to the interview that the child has lost sleep due to worrying about something. This is self-completed by the child, with an answer ranging from 1 (*none*) to 4 (*6-7 nights*). The second is the number of days prior to the interview that the child spent being unhappy, with an answer ranging from 1 (*none*) to 4 (*11 days or more*).

A measure of parent-child interaction was based on the responses to four different questions that assessed daily interactions between parents and child at time t . Each child was asked how often he or she (a) argued with father, (b) argued with mother, (c) talked about things that matter with father, and (d) talked about things that matter with mother. They were asked to indicate on a 4-point scale, with answers ranging from 1 (*on most days*) to 4 (*hardly*).

4.5 Analytic Strategy

Analyzing data from families requires a statistical technique that takes into account the shared variance of outcomes within households (Bray et al., 1995; Maguire, 1999). In the current study, we deal with the interdependence of observations within the family by employing a multilevel multivariate response (MMR) approach that retains the family membership of each child and parent (Kenny et al., 1998; Maguire, 1999; Gareis et al., 2003). One advantage of the MMR model is that it permits simultaneous analysis of within-family and between-family variation (Raudenbush & Bryk, 2002; Rowe & Hill, 1998). For example, we can examine the transmission of emotion from one parent to the adolescent over time and test whether various between-couple factors moderate the transmission effect of stress-to-happiness within the family. In contrast, conventional linear models either aggregate within-couple data, resulting in information loss, or conflate within-family and between-family variation, resulting in incorrect tests of significance (Kenny et al., 1998).

The multivariate structure of the MMR model also allows for both child's LS and parents' mental distress to be estimated simultaneously in a single equation, thus allowing for a non-zero correlation between the residuals of the equations for each dependent variable (Gareis et al., 2003). Failure to allow for the interdependence of observations within the family could be benign or it could confound the correlation of residuals with the effects of independent variables (Stolzenberg, 2001). For example, the correlation of residuals may

have been caused by some omitted variables, such as environmental factors, which are common causes of both child's and parents' psychological status.

There are four levels of data structure in analyses of transmission relationships within family (i.e., multivariate responses within occasion within person within household). The MMR model was used to estimate the following prospective change equations (Larson & Almeida, 1999) simultaneously:

$$LS_{hit} = \alpha_0 + \alpha_1 LS_{hi(t-1)} + \alpha_2 FD_{hi(t-1)} + \alpha_3 MD_{hi(t-1)} + Controls + v_{0h} + u_{0hi} + \varepsilon_{0hit}, \quad (1)$$

$$FD_{hit} = \beta_0 + \beta_1 FD_{hi(t-1)} + \beta_2 MD_{hi(t-1)} + \beta_3 LS_{hi(t-1)} + Controls + v_{1h} + u_{1hi} + \varepsilon_{1hit}, \quad (2)$$

$$MD_{hit} = \gamma_0 + \gamma_1 MD_{hi(t-1)} + \gamma_2 FD_{hi(t-1)} + \gamma_3 LS_{hi(t-1)} + Controls + v_{2h} + u_{2hi} + \varepsilon_{2hit}. \quad (3)$$

where the random components, v_h , u_{hi} , and ε_{hit} , are assumed to be normally distributed, as well as allowed to be correlated across all three regression equations. With respect to the outcome variables, LS represents the self-reported LS of child i living in household h in year t , FD is the mental distress of child i 's father living in household h in year t , and MD is the mental distress of child i 's mother living in household h in year t . The lagged variables, $LS_{hi(t-1)}$, $FD_{hi(t-1)}$, and $MD_{hi(t-1)}$, represent child's LS, father's, and mother's mental distress in year $t-1$, respectively. The coefficients, α_1 , β_1 , and γ_1 , represent the spillover effects from the previous year's own level of LS, in the case of the child equation, or own mental distress in the case of the parent equations. The coefficients, α_2 and α_3 , are the transmission effects of father's and mother's mental distress in year $t-1$ on the child's LS in the current year. The transmission coefficients of the child's LS on the father's and mother's mental distress are captured by the coefficients, β_3 and γ_3 , respectively. The coefficients, β_2 and γ_2 , are the year-to-year transmissions of mental distress within couples. The model was estimated using MLwiN version 2.01.

5. Results

Table 1 reports the pairwise correlation matrix between child's LS, child's lagged LS, parents' GHQ, and parents' lagged GHQ scores. As can be seen from the table, the

correlations between child's current LS and both parents' GHQ score (current and lagged) are negative and statistically significant at the 5% level. The correlation coefficients between father's and mother's GHQ scores are, on the other hand, positive and statistically well-determined. The correlation coefficients between the current level and their lagged values for both LS and GHQ are positive though can be considered not large enough for us to worry about a case of multicollinearity between the dependent variable (i.e. LS at t) and the independent variables (i.e. LS at $t-1$).

Table 2 moves on the multivariate analysis by reporting the MMR results from the child's LS equation. This table therefore shows the statistical relationships between various explanatory variables, including mother's and father's distress levels in the previous year, and the child's subjective well being at time t . Table 2 also assumes homogeneity in the transmission relationship across adolescent males and females by leaving out gender of the child and its interactions with parental distress at time $t-1$. As described in the methods section, these coefficients are derived from a multilevel multivariate response model, which simultaneously models the determinants of child's LS, and parental distress levels. The hypothesis that we test in Table 2 is whether parental distress in the previous time period has a statistically significant relationship with child's LS, measured one year later. The results suggest that only father's distress level in the previous year has a negative and statistically significant correlation with the child's own assessment of LS (i.e., $\alpha_2 = -0.027$, $t = 3.86$, $p < 1\%$). Without separating the transmission relationship by gender of the child, we find mother's distress level in the previous year to be negatively albeit statistically insignificantly related with the change in the child's LS from the previous year to the current year.

A major concern with this kind of analysis is the need to control for unobservable characteristics of the child and parents that commonly influence the variables of interest in each model and the outcome measures. We address this in two ways. Firstly, we estimate a simultaneous equation system that allows for correlations of the residuals across the different equations of interest to be estimated freely. Furthermore, in each case we control for the child or parent's lagged measure of LS or distress. Therefore in Table 2, the results indicate that even conditional on how happy the child was in the previous year, we still observe father's distress level having a significant and negative relationship with child's well being one year later.

Since the focus of the paper is on the transmission relationship between mental distress and subjective well-being, we do not discuss the other variables in the model in

detail. We simply note that most of the parental characteristic variables in Table 2 are insignificant. The fact that many parental characteristic variables are insignificant, for example income and health of the parent, whilst the parental stress measures are statistically important, is of course an important finding. The exception is mother's education which is negative and significant, conditional on household income level and employment status. We have no explanation for this and this is an issue that merits further exploration in a data set that has superior measures of parental education. Mother's employment is also significant, whereby children whose mothers are employed full time have higher levels of LS, again conditional on household income.

Table 3 shows the results of the equations for father's current distress level and mother's current distress level. Again the focus of this paper is on within-family transmissions of mental distress and subjective well-being. This table models the relationship between the child's LS in the previous year and the father's or mother's current level of mental distress, to test the hypothesis that there can be child to parent, as well as parent to child transmission. The model is again stringently specified and controls for both the parent's own mental distress in the previous period and also their spouse's distress in the previous year. The results from Table 3 suggest that the child's LS in the previous year is negatively and statistically significantly correlated with the father's distress levels at the 1% level (i.e., $\beta_3 = -0.115$, $t = 3.48$, $p < 1\%$). The transmission coefficient between child's LS and the mother's distress levels is significantly smaller and only statistically well-determined at the 10% level (i.e., $\gamma_3 = 0.061$, $t = 1.65$, $p < 10\%$). The results are therefore partially supportive of the hypothesis that there can be transmission of LS to distress levels within the family from child to parent.

The model in Table 3 controls for the parent's own previous levels of distress. Unsurprisingly, prior measures of the parent's distress are positive and highly significant predictors of future distress, as has been widely found in the literature. Furthermore, the model is supportive of previous evidence that has found significant transmissions between spouses. In this case the wife's distress in the previous year has no significant relationship with the husband's current level of distress. However, the husband's previous distress level does have a significant negative correlation with the mother's current level of distress, consistent with the existing literature on the impact of husband's work stress on wife's stress level.

In Table 3 many of the other control variables, particularly those measuring employment status and health, are highly significant predictors of parental levels of distress. Men in particular have lower distress levels if they are self-employed or in full time employment. Better health is also associated with lower levels of distress.

We also report in Appendix C the estimates of the correlation between the household and individual levels' residuals across all equations in the simultaneous equation model. The household-level correlations between the residuals for child's LS and parents' distress are positive, with the strongest (and statistically significant at the 10% level) correlation from the father-child dyad. A positive correlation at the household level implies that unobserved family factors that influence a child's LS positively are correlated with the unobserved family factors that determine higher parental distress levels. This may be consistent with some kind of trade off between parental stress levels and unobserved family features that are beneficial to the child. All in all, this result suggests that parents and child share personality traits and common experiences that influence both of their emotions simultaneously.

In addition to this, the household-level correlation between residuals for spousal distress is also positive albeit statistically insignificant. There are zero-correlations between residuals at the individual-level in the LS equation, suggesting that there is virtually no difference in the mean LS of children and the mean distress level of parents between siblings or children in the same household. The within-occasion correlations between the residuals of child's LS and both parents' mental distress are, on the other hand, negative and statistically significant at the conventional levels. This suggests that there are negative and statistically important relationships between the unobserved determinants of child's LS and both parents' mental distress levels within-family over time, which justifies the decision for each LS and mental distress equation to be estimated simultaneously.

Another hypothesis that we wanted to test was the extent to which the distress-LS transmissions (from parent to child and vice versa) differ by gender of the child. Table 4 shows the results of a model of the relationship between parental distress and child's LS in the previous period and various outcome measures in the current period, namely child well being (column 1), father's distress (column 2) and mother's distress (column 3). In this instance the role of gender is included as the main effect (simply the effect of either being a boy or having a boy child) as well as a moderating effect or interaction. The results from Table 4 column 1 suggest that boys report on average higher levels of LS than girls, which seems to be consistent with the previous findings on gender differences in the level of depression between boys and girls. As we saw in Table 2, higher levels of father's and

mother's distress are significantly associated with lower levels of LS in the child. However, the moderating or interaction gender coefficients suggest that for boys, there is no additional association from father's distress but there is a positive relationship between self-rated LS and the mother's distress. This positive interaction offsets the main mother's distress effect; we cannot reject the null hypothesis that the sum of the main effect of mother's distress and its interaction with a dummy representing adolescent male ($-0.029 + 0.032$) is zero. In essence this means that for boys, it is only father's distress in the previous period that is negatively and statistically significantly associated with the child's well being. Mother's distress levels do not appear to have a substantial correlation with boys' own LS.

Table 4 column 2 focuses on father's distress as the outcome of interest. The results suggest that the child's own LS in the previous period continues to be correlated negatively and statistically significantly with father's distress levels (albeit significant only at the 10% level) but that there is no difference in this effect by the gender of the child. In column 3, the results for mother's distress levels are shown. For mothers, the child's own LS in the previous period does not have a significant relationship with her current levels of distress and this does not vary by gender of the child.

In summary, Table 4 suggests that there is variation by gender in the estimated transmission coefficient from parental distress to child's LS. Specifically, mothers' distress levels do not appear to be an important determinant of boys' LS. This provides only weak support for the view that boys have greater psychological resources in adolescence and are therefore less likely to be affected by parental distress. Clearly the father's distress levels continue to play an important role in determining the child's LS, even for boys.

Transmission correlations are quantitatively important as well as statistically significant. For example, the mean of $FD_{hi(t-1)}$ and $MD_{hi(t-1)}$ are 1.759 and 2.186, and their standard deviations are 2.914 and 3.208, respectively. An increase of one standard deviation from the means of $FD_{hi(t-1)}$ and $MD_{hi(t-1)}$ imply a change in the mental distress level to 4.674 for fathers and 5.394 for mothers. Taking conservative estimates of $FD_{hi(t-1)}$ and $MD_{hi(t-1)}$ for girls to be $-.029$ and $-.022$, the implied changes in the girl's LS are approximately $-.051$ and $-.048$. Given that the mean of LS for girls is 5.738 and its standard deviation is 1.348, a *ceteris paribus* increase of one standard deviation in either parent's mental distress level explains around a 25% drop in the standard deviation in the girl's LS. This seems large; it is roughly the same as the influences of or an increase in age by one year or having 5 close friends on child's overall LS.

The GHQ-12 scale can also be unpacked, with separate regressions run on each of its components. Tables 4 and 5 respectively show the results from the models of child's LS and parental distress using unpacked measures of GHQ-12. With child's LS as the dependent variable in the equation, we can see from Table 5 that the distress-to-LS transmissions are negative and significant at the 5% level for 3 out of 12 GHQ components in both father-daughter and father-son dyads. The estimated transmission impacts from mother's distress to child's LS are negative and statistically well-defined at the 5% level for 3 out of 12 components in the mother-daughter dyad, and for 2 out of 12 components in the mother-son dyads.

Factors that appear to be important in the transmission of distress from father to child's well-being include the father's loss of sleep, his problems in overcoming difficulties and any loss of confidence. In the transmission from mother to child, what matters is the mother's loss of sleep and feeling constantly under strain (with lack of self worth also being important in the transmission from mother to daughter). All of the above components of the GHQ-12 seem to tap into a more severe side of mental distress than the rest of the components listed, which include concentration, playing a useful role, ability to make decisions, enjoyment of day-to-day activities, ability to face problems, unhappiness, and general happiness.

Finally, Table 7 moves on to test whether the underlying mechanism of the observed transmission of emotions between parents and child is due to the contagion of stress and strain or transmission via parent-child interaction. Note that the first explanation of shared personality traits and social environment is already taken care off by the MMR structure, which allowed non-zero correlations in the residuals (see earlier discussion on Appendix C's results for more details).

As can be seen from Table 7, the transmission coefficient from mother's distress to child's LS continued to be negative and statistically significant only for girls ($t = -2.56$, $p < .001$) when measures of child unhappiness and parent-child interactions have been taken into account. The inclusion of these additional controls did not change the transmission coefficient in mother-daughter dyad significantly; the difference in the transmission coefficient obtained in Table 4 and Table 7 is highly insignificant, i.e. the t -statistic

$\frac{\beta_1 - \beta_2}{\sqrt{\sigma_1^2 + \sigma_2^2}}$ equals to -0.08. This suggests that in the mother-daughter dyad there is a direct

transmission correlation between parental distress at year $t-1$ and child LS at year t , which is

found to be a distinct process from the distress-to-distress contagion normally found in the stress literature.

The result also yields the conclusion that the transmission of parental distress to child LS for father-son and father-daughter dyads is due primarily to either the distress-to-distress contagion or transmission via negative parent-child interactions (e.g., more arguments and less “heart-to-heart” talk between father and child). This is reflected by the significant child unhappiness and parent-child interaction coefficients in the child LS equation. In addition to this, the transmission from child LS to father’s distress is now statistically insignificant once we controlled for both child unhappiness and parent-child interactions variables. Only the extreme child unhappiness dummies enter both father’s and mother’s distress equations in a significant manner. This implies that the transmission of child LS to father’s distress may have been driven primarily by a negative-to-negative transmission rather than a positive-to-negative transmission. That is, rather than having a direct impact on father’s distress, an increase in child LS at year $t-1$ may lower the level of child negative emotions at year t , which in turns may lead to less disruptive behaviors by the children and lowers his or her father’s distress levels in the process. Again, it should be emphasized here that these results are obtained with controls for shared personality traits and social environment experienced by members of the same family.

6. Conclusions

The results discussed above support the view that there is a significant transmission correlation in measures of mental distress and subjective well-being between parent and child. This is true for boys and girls, although boys’ LS do not appear to be significantly determined by maternal distress levels. In all the models, it was the father’s distress levels that were quantitatively more important in determining child’s LS than mother’s distress levels and most of the other socio-economic factors of the child and the parents. The fact that we observe statistically significant transmission coefficient of parental distress on child’s LS suggests that a child may indeed have a negative short run reaction to the mental health problems being experienced by the parent, but the child will subsequently not completely revert back to his or her original level of LS. Rather, even one year later the child will still be experiencing the consequences of that negative shock and will have a significantly lower level of LS as a result. From a policy-perspective, this indicates that parental mental health problems are of concern, not only to the parent experiencing them, but also because of the

longer-term impact on their children. As we know from other literature, a child's life satisfaction has longer term associations with a number of outcomes of concern to policy-makers, such as health, income and social behavior. Clearly any improvement in our understanding of the potential indicators of, or indeed causes of, child life satisfaction represents an important contribution to this literature.

The results also indicate that there can be transmission of well-being to distress from child to parent. Specifically the child's own LS is associated with lower levels of their father's distress a year later, regardless of the gender of the child. If a child is happier in year 1, this has a positive influence on the father's mental health (i.e. it reduces his overall distress level) in the subsequent year. Mothers on the other hand do not appear to be as affected by their child's own LS in the previous year, although their spouse's previous mental distress does impact on their own subsequent distress as suggested by the spousal transmission literature to date. We also found that the association between parental stress and child LS is due primarily to either distress-to-distress contagion or transmission via parent-child interaction or both. Only in the mother-daughter dyad did we find a *direct* transmission (via empathic reactions) correlation between mother's distress and child's LS.

As in any study, there are limitations and potential weaknesses to these results. Firstly, we are unable to consider transmission from parent to child in the context of single parent households, clearly an area of great policy interest and an important subject for future research. Secondly, as has been said, the education measures in the BHPS are not particularly high quality and therefore we have not been able to explore, as much as we would have liked, the potential mediating effect of parental education on parent-child transmissions. Furthermore, although our ability to control for the nonzero correlation between residuals within family in the prospective change model brings us closer to demonstrating a causal relationship between sender and receiver, it does not fully rule out the possible role of unmeasured third variables. The transmission relationships between distress and LS cannot therefore be interpreted as completely causal. Future research should concentrate on finding appropriate instrumental variables that affect one parent's distress in the previous year but not the child's LS in the current year in order to identify the causal impact of parental distress on child's subjective well-being within family.

The results above also provide some hints as to where one might focus policy, in terms of reducing parental stress and thereby avoiding a negative intergenerational cycle whereby parental distress is transmitted to the child who has lower levels of LS as a result, which then in turn feeds back on the father's distress levels. For example, parental

employment and health are very significantly associated with parental distress. Whilst our modeling approach does not necessarily attribute causality to these relationships, the existing literature has highlighted the potentially causal impact of, for example, unemployment on parental distress (Clark and Oswald, 1994). Our evidence therefore confirms the importance of these factors as either influences on mental health of the parents or as potential indicators to screen parents (and by implication their children) at risk of mental distress and low perception of quality of life as a whole.

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Table 1: Correlation Matrix between Mental Distress of Parents and Life Satisfaction of Children: BHPS Waves 4-13

| | (1) | (2) | (3) | (4) | (5) | (6) |
|-------------------------------------|----------|----------|---------|---------|---------|-----|
| (1) Child's LS at t | 1 | | | | | |
| (2) Child's LS at t-1 | 0.3454* | 1 | | | | |
| (3) Father's mental distress at t | -0.0599* | -0.0653* | 1 | | | |
| (4) Father's mental distress at t-1 | -0.0668* | -0.0600* | 0.4433* | 1 | | |
| (5) Mother's mental distress at t | -0.0784* | -0.0597* | 0.2377* | 0.1231* | 1 | |
| (6) Mother's mental distress at t-1 | -0.0523* | -0.0811* | 0.1030* | 0.2098* | 0.4119* | 1 |

Note: N = 1,175 adolescents. * < 5%.

Table 2: MMR Assessing Transmission in Child's Life Satisfaction

| Dependent variable: Life Satisfaction | Child |
|--|-------------------|
| Father's distress at t-1 | -.027 [.007]** |
| Mother's distress at t-1 | -.006 [.006] |
| Child's LS at t-1 | .290 [.015]** |
| Youth's age | -.062 [.016]** |
| Number of close friends | .013 [.003]** |
| Father's characteristics | |
| Education: A-level | .000 [.055] |
| Education: Completed university | .079 [.056] |
| Self-employed | .080 [.078] |
| Employed full-time | .014 [.067] |
| Health: poor | -.027 [.136] |
| Health: fair | -.131 [.130] |
| Health: good | -.083 [.130] |
| Health: excellent | -.088 [.133] |
| Mother's characteristics | |
| Education: A-level | -.046 [.055] |
| Education: Completed university | -.140 [.060]** |
| Self-employed | .024 [.090] |
| Employed full-time | .097 [.049]* |
| Health: poor | -.056 [.133] |
| Health: fair | -.041 [.124] |
| Health: good | -.102 [.123] |
| Health: excellent | -.101 [.127] |
| Household variables | |

| | |
|--|-----------------|
| Log of real household income | .048 [.039] |
| Number of adolescents in the household | -.015 [.018] |
| Log likelihood | 53083.18 |

Note: N = 1,175 adolescents. Standard errors are in parentheses. The reference groups are no formal education, not employed (i.e., non-labor market status and unemployed), and health: very poor.

+ p < 10%, * p < 5%, ** p < 1%.

Table 3: MMR Assessing Transmission in Parents' Mental Distress

| Dependent variable: Mental distress | Father | Mother |
|--|--------------------|--------------------|
| Own mental distress at t-1 | .250 [.015]** | .189 [.015]** |
| Spouse's mental distress at t-1 | -.002 [.013] | .064 [.017]** |
| Child's LS at t-1 | -.115 [.033]** | -.061 [.037]+ |
| Age | -.007 [.007] | -.011 [.010] |
| Education: A-level | .057 [.124] | .105 [.146] |
| Education: Completed university | .437 [.126]** | .286 [.157]+ |
| Self-employed | -.597 [.173]** | .023 [.233] |
| Employed full-time | -.596 [.149]** | -.117 [.123] |
| Health: poor | -2.830 [.296]** | -2.109 [.327]** |
| Health: fair | -3.997 [.283]** | -3.646 [.309]** |
| Health: good | -4.682 [.284]** | -4.572 [.305]** |
| Health: excellent | -4.893 [.291]** | -5.092 [.316]** |
| Household variables | | |
| Log of real household income | .054 [.086] | -.131 [.097] |
| Number of adolescents in the household | -.065 [.041] | -.018 [.049] |
| Log likelihood | 53083.18 | |

Note: N = 1,175 adolescents. Standard errors are in parentheses.

+ p < 10%, * p < 5%, ** p < 1%.

Table 4: MMR of Child's Gender of Child's Life Satisfaction and Parents' Mental Distress

| | LS Child | Father | Mother |
|--------------------------------|-------------------|------------------|------------------|
| Main Effects | | | |
| Boy | .207 [.038]** | -.086 [.089] | -.025 [.105] |
| Father's distress at t-1 | -.029 [.009]** | .251 [.015]** | .064 [.017]** |
| Mother's distress at t-1 | -.022 [.009]** | -.002 [.013] | .189 [.015]** |
| Child's LS at t-1 | .284 [.015]** | -.081 [.043]+ | -.046 [.049] |
| Moderating Effects | | | |
| Boy × Father's distress at t-1 | .003 [.013] | - | - |
| Boy × Mother's distress at t-1 | .032 [.012]** | - | - |
| Boy × Child's LS at t-1 | - | -.076 [.065] | -.023 [.073] |
| Log likelihood | | 53043.87 | |

Note: N = 1,175 adolescents. Standard errors are in parentheses. Same control variables as in Tables 2 and 3.
+ p < 10%, * p < 5%, ** p < 1%.

Table 5: MMR Assessing Transmission in Child's LS with Disaggregated GHQ-12

| Dependent variable: Life Satisfaction | Child | |
|---|-------|-----------|
| | B | SE |
| Model 1 | | |
| Father's concentration at t-1 | -.087 | [.051]+ |
| Mother's concentration at t-1 | -.064 | [.049] |
| Boy × Father's concentration at t-1 | -.023 | [.072] |
| Boy × Mother's concentration at t-1 | .122 | [.067]+ |
| Model 2 | | |
| Father's loss of sleep at t-1 | -.116 | [.036]** |
| Mother's loss of sleep at t-1 | -.073 | [.035]* |
| Boy × Father's loss of sleep at t-1 | .001 | [.051] |
| Boy × Mother's loss of sleep at t-1 | .079 | [.049] |
| Model 3 | | |
| Father's playing a useful role at t-1 | -.069 | [.048] |
| Mother's playing a useful role at t-1 | -.084 | [.049]+ |
| Boy × Father's playing a useful role at t-1 | .019 | [.067] |
| Boy × Mother's playing a useful role at t-1 | .074 | [.067] |
| Model 4 | | |
| Father's ability to make decision at t-1 | -.045 | [.055] |
| Mother's ability to make decision at t-1 | .111 | [.055]* |
| Boy × Father's ability to make decision at t-1 | .006 | [.077] |
| Boy × Mother's ability to make decision at t-1 | .015 | [.071] |
| Model 5 | | |
| Father's constantly under strain at t-1 | -.074 | [.038]+ |
| Mother's constantly under strain at t-1 | -.092 | [.0037]** |
| Boy × Father's constantly under strain at t-1 | -.002 | [.051] |
| Boy × Mother's constantly under strain at t-1 | .100 | [.052]* |
| Model 6 | | |
| Father's problem overcoming difficulties at t-1 | -.121 | [.040]** |
| Mother's problem overcoming difficulties at t-1 | -.023 | [.039] |
| Boy × Father's problem overcoming difficulties at t-1 | .024 | [.054] |
| Boy × Mother's problem overcoming difficulties at t-1 | .053 | [.053] |
| Model 7 | | |
| Father's enjoy day-to-day activities at t-1 | -.062 | [.046] |
| Mother's enjoy day-to-day activities at t-1 | -.023 | [.045] |
| Boy × Father's enjoy day-to-day activities at t-1 | -.048 | [.065] |
| Boy × Mother's enjoy day-to-day activities at t-1 | .069 | [.063] |
| Model 8 | | |
| Father's ability to face problems at t-1 | .075 | [.059] |
| Mother's ability to face problems at t-1 | .004 | [.050] |
| Boy × Father's ability to face problems at t-1 | -.082 | [.081] |
| Boy × Mother's ability to face problems at t-1 | .073 | [.071] |
| Model 9 | | |
| Father's unhappy or depressed at t-1 | -.032 | [.035] |
| Mother's unhappy or depressed at t-1 | -.046 | [.034] |

| | | |
|---|-------|----------|
| Boy × Father's unhappy or depressed at t-1 | -.041 | [.048] |
| Boy × Mother's unhappy or depressed at t-1 | .085 | [.046]+ |
| Model 10 | | |
| Father's losing confidence at t-1 | -.107 | [.037]** |
| Mother's losing confidence at t-1 | -.042 | [.035] |
| Boy × Father's losing confidence at t-1 | .062 | [.051] |
| Boy × Mother's losing confidence at t-1 | .057 | [.048] |
| Model 11 | | |
| Father's believe in self-worth at t-1 | -.063 | [.042] |
| Mother's believe in self-worth at t-1 | -.122 | [.037]** |
| Boy × Father's believe in self-worth at t-1 | .013 | [.057] |
| Boy × Mother's believe in self-worth at t-1 | .155 | [.051]** |
| Model 12 | | |
| Father's general happiness at t-1 | -.035 | [.047] |
| Mother's general happiness at t-1 | .032 | [.044] |
| Boy × Father's general happiness at t-1 | .053 | [.067] |
| Boy × Mother's general happiness at t-1 | .026 | [.062] |

Note: N = 1,175 adolescents. Standard errors are in parentheses. Same control as in Tables 2 and 3.

+ p < 10%, * p < 5%, ** p < 1%.

Table 6: MMR of Child's Gender of Parents' Mental Distress with Disaggregated GHQ-**12**

| Dependent variable: Disaggregated distress | Father | | Mother | |
|---|--------|-----------|--------|-----------|
| | B | SE | B | SE |
| Model 1: Concentration | | | | |
| Child's LS at t-1 | -.022 | [.008]** | .002 | [.007] |
| Own concentration at t-1 | .150 | [.015]** | .072 | [.0115]** |
| Spouse's concentration at t-1 | .000 | [.014] | .033 | [.016]* |
| Model 2: Loss of sleep | | | | |
| Child's LS at t-1 | -.014 | [.008]+ | -.005 | [.009] |
| Own loss of sleep at t-1 | .279 | [.015]** | .202 | [.015]** |
| Spouse's loss of sleep at t-1 | .029 | [.014]* | .067 | [.015]** |
| Model 3: Playing a useful role | | | | |
| Child's LS at t-1 | -.010 | [.006]+ | -.001 | [.007] |
| Own playing a useful role at t-1 | .097 | [.015]** | .067 | [.015]** |
| Spouse's playing a useful role at t-1 | -.027 | [.015]+ | .023 | [.015] |
| Model 4: Ability to make decision | | | | |
| Child's LS at t-1 | -.005 | [.006] | .012 | [.006]* |
| Own ability to make decision at t-1 | .064 | [.015]** | .038 | [.015]** |
| Spouse's ability to make decision at t-1 | .050 | [.014]** | .080 | [.016]** |
| Model 5: Constantly under strain | | | | |
| Child's LS at t-1 | -.018 | [.008]* | -.015 | [.008]* |
| Own constantly under strain at t-1 | .259 | [.015]** | .222 | [.015]** |
| Spouse's constantly under strain at t-1 | .048 | [.015]** | .073 | [.015]** |
| Model 6: Problem overcoming difficulties | | | | |
| Child's LS at t-1 | -.027 | [.008]** | .001 | [.008] |
| Own problem overcoming difficulties at t-1 | .163 | [.015]** | .171 | [.015]** |
| Spouse's problem overcoming difficulties at t-1 | -.003 | [.014] | .014 | [.015] |
| Model 7: Enjoy day-to-day activities | | | | |
| Child's LS at t-1 | -.014 | [.007]* | -.007 | [.007] |
| Own enjoy day-to-day activities at t-1 | .105 | [.015]** | .061 | [.015]** |
| Spouse's enjoy day-to-day activities at t-1 | .007 | [.014] | .016 | [.015] |
| Model 8: Ability to face problems | | | | |
| Child's LS at t-1 | -.004 | [.005] | .013 | [.027] |
| Own ability to face problems at t-1 | .147 | [.015]** | .130 | [.068]* |
| Spouse's ability to face problems at t-1 | -.012 | [.013] | .071 | [.077] |
| Model 9: Unhappy or depressed | | | | |
| Child's LS at t-1 | -.026 | [.009]** | -.008 | [.009] |
| Own unhappy or depressed at t-1 | .295 | [.015]** | .169 | [.015]** |
| Spouse's unhappy or depressed at t-1 | .032 | [.014]** | .080 | [.015]** |
| Model 10: Losing confidence | | | | |
| Child's LS at t-1 | -.022 | [.008]** | -.010 | [.009] |
| Own losing confidence at t-1 | .287 | [.0115]** | .165 | [.015]** |
| Spouse's losing confidence at t-1 | .018 | [.013] | .061 | [.016]** |
| Model 11: Believe in self-worth | | | | |
| Child's LS at t-1 | -.013 | [.007]+ | -.022 | [.008]** |
| Own believe in self-worth at t-1 | .351 | [.015]** | .250 | [.015]** |
| Spouse's believe in self-worth at t-1 | .037 | [.013]** | .059 | [.016]** |

Model 12: General happiness

| | | | | |
|-----------------------------------|-------|----------|------|----------|
| Child's LS at t-1 | -.004 | [.007] | .000 | [.007] |
| Own general happiness at t-1 | .147 | [.015]** | .104 | [.016]** |
| Spouse's general happiness at t-1 | -.031 | [.014]* | .032 | [.017]+ |

Note: N = 1,175 adolescents. Standard errors are in parentheses. Same control as in Tables 2 and 3.

+ p < 10%, * p < 5%, ** p < 1%.

**Table 7: MMR Assessing Mediator Effects in the
Transmission of Child's Life Satisfaction**

| | LS | | |
|--|--------------------|-------------------|------------------|
| | Child | Father | Mother |
| Main Effects | | | |
| Boy | .030 [.042] | - | - |
| Father's distress at t-1 | -.001 [.010] | .302 [.018]** | .069 [.020]** |
| Mother's distress at t-1 | -.023 [.009]** | -.021 [.016] | .198 [.018]** |
| Child's LS at t-1 | .297 [.016]** | -.056 [.041] | -.028 [.046] |
| Moderating Effects | | | |
| Boy × Father's distress at t-1 | -.008 [.013] | - | - |
| Boy × Mother's distress at t-1 | .038 [.012]** | - | - |
| Mediator Effects | | | |
| a) Child's nights spent lost sleep worrying | | | |
| 1-2 nights | -.187 [.046]** | .170 [.122] | .063 [.135] |
| 3-5 nights | -.535 [.101]** | .111 [.267] | .366 [.296] |
| 6-7 nights | -1.089 [.177]** | -1.118 [.466]* | .177 [.517] |
| b) Child's days felt unhappy | | | |
| 1-3 days | -.270 [.043]** | .038 [.114] | .162 [.126] |
| 4-10 days | -.614 [.064]** | .162 [.166] | .260 [.185] |
| 11 days or more | -1.551 [.095]** | .485 [.251]+ | .643 [.279]* |
| c) Child's frequency of argument with mother | | | |
| More than once a week | .185 [.077]** | -.117 [.204] | .156 [.228] |
| Less than once a week | .202 [.078]** | -.332 [.205] | .013 [.231] |
| Hardly ever | .342 [.077]** | -.147 [.204] | .187 [.230] |
| d) Child's frequency of argument with father | | | |
| More than once a week | .140 [.091] | .255 [.240] | -.105 [.265] |
| Less than once a week | .228 [.088]** | .274 [.233] | -.183 [.259] |
| Hardly ever | .223 | .062 | -.193 |

| | | | |
|--|-------------------|-----------------|-----------------|
| | [.086]** | [.228] | [.256] |
| e) Child's frequency of talking to mother about things that matter | | | |
| More than once a week | -.021 [.054] | .009 [.142] | .331 [.158]* |
| Less than once a week | -.164 [.060]** | -.033 [.154] | .114 [.173] |
| Hardly ever | -.235 [.062]** | .052 [.157] | .011 [.177] |
| f) Child's frequency of talking to father about things that matter | | | |
| More than once a week | -.084 [.077] | .171 [.201] | .235 [.223] |
| Less than once a week | -.169 [.075]* | .259 [.196] | .200 [.218] |
| Hardly ever | -.248 [.074]** | .128 [.191] | .219 [.214] |

Note: N = 1,175 adolescents. Standard errors are in parentheses. Same control as in Tables 2 and 3.

+ p < 10%, * p < 5%, ** p < 1%.

Appendix A: Comparing Life Satisfaction and Mental Distress between Included and Excluded Samples

| | Included in the analysis | Dropped | Equality test | |
|-------------------------------|-----------------------------|------------------|---------------|-----------|
| | | | T-statistics | [p-value] |
| Life satisfaction at t | 5.847 (1.259) | 5.860 (1.306) | -0.305 | [0.760] |
| Father's mental distress at t | 1.814 (0.068) | 1.752 (0.083) | 0.583 | [0.560] |
| Mother's mental distress at t | 2.276 (0.074) | 2.223 (0.090) | 0.458 | [0.647] |
| Number of observations | 4,174 | 2,497 | | |

Note: Standard errors are in parentheses, unless stated otherwise.

Appendix B: Summary of Means, Standard Deviations, and Ranges for Dependent and

Control Variables

| | M | STD | Range |
|--|----------|------------|--------------|
| Child's characteristics | | | |
| LS at t | 5.851 | 1.275 | 1-7 |
| LS at t-1 | 5.887 | 1.263 | 1-7 |
| LS at t (Boys) | 5.962 | 1.189 | 1-7 |
| LS at t (Girls) | 5.738 | 1.348 | 1-7 |
| Youth's age | 13.015 | 1.442 | 11-16 |
| Number of close friends | 6.754 | 6.064 | 0-83 |
| Father's characteristics | | | |
| Father's mental distress at t | 1.791 | 2.971 | 0-12 |
| Father's mental distress at t-1 | 1.759 | 2.914 | 0-12 |
| Education: A-level | .391 | .488 | 0-1 |
| Education: Completed university | .405 | .491 | 0-1 |
| Self-employed | .157 | .364 | 0-1 |
| Employed full-time | .705 | .456 | 0-1 |
| Health: poor | .069 | .254 | 0-1 |
| Health: fair | .199 | .399 | 0-1 |
| Health: good | .446 | .497 | 0-1 |
| Health: excellent | .262 | .440 | 0-1 |
| Mother's characteristics | | | |
| Mother's distress at t | 2.258 | 3.280 | 0-12 |
| Mother's distress at t-1 | 2.186 | 3.208 | 0-12 |
| Education: A-level | .489 | .500 | 0-1 |
| Education: Completed university | .317 | .465 | 0-1 |
| Self-employed | .057 | .231 | 0-1 |
| Employed full-time | .670 | .470 | 0-1 |
| Health: poor | .075 | .263 | 0-1 |
| Health: fair | .204 | .403 | 0-1 |
| Health: good | .475 | .499 | 0-1 |
| Health: excellent | .221 | .415 | 0-1 |
| Household variables | | | |
| Log of real household income | 1.148 | .587 | 4.87-12.56 |
| Number of adolescents in the household | 2.446 | .970 | 1-9 |

Note: N = 1,175 adolescents.

**Appendix C: Covariances (and Correlations) between Household and Individual Level
Random Effects Across Simultaneous Equations for Child's Life Satisfaction and
Parental Mental Distress**

| | | Child's LS |
|-------------------|-------------------|--------------------|
| | | Cov (SE) |
| | | Corr |
| Within household | Father's distress | .071 (.037) |
| | | .276 |
| | Mother's distress | .004 (.043) |
| | | .011 |
| Within individual | Father's distress | .000 (.000) |
| | | .000 |
| | Mother's distress | .000 (.000) |
| | | .000 |
| Within occasion | Father's distress | -.081 (.052) |
| | | -.030 |
| | Mother's distress | -.152 (.056) |
| | | -.052 |
| | | Husband's distress |
| | | Cov (SE) |
| | | Corr |
| Within household | Wife's distress | .120 (.102) |
| | | .098 |
| Within individual | Wife's distress | .000 (.000) |
| | | .000 |
| Within occasion | Wife's distress | 1.322 (.122) |
| | | .212 |

Note: Estimates are from fitting three separate simultaneous equation models for child's LS, father's distress, and mother's distress taken from Table 3. Standard errors are in parentheses.