Teenage Mental Health Problems
and the Co-development of Parent and Sibling Mental Health

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Abstract

This paper addresses how mental health issues spread within the family network, potentially following not only a downward transmission, from parents to children, but also the so far understudied upward transmission, from children to parents, as well as a horizontal diffusion, from one sibling to another. We draw from unique Norwegian register data covering the full population, and engage in a series of fixed effects models, adopting a difference-in-differences approach. Using these models, we compare the different development in the probability of mental health consultations for parents and siblings in families with a second born teenager with *versus* without a diagnosis of depression. Our study shows that an adolescent's depression can potentially trigger mental health declines in parents and siblings right after the teenager's diagnosis. Mothers and fathers are almost equally affected, although the effect seems to be short-termed, which suggests that seeking help may bring about mental health improvements. Conversely, potential spillover effects on siblings seem to be more long-lasting. Such co-development of mental health conditions within the family needs to be acknowledged because a failure to support family members, such as parents and siblings might allow for a more sustainable improvement in mental health for both the teenager and their family, with potentially better opportunities and prospects for the teenagers' adult life.

Introduction

Mental health problems affect 10-20% of children and adolescents worldwide (Kieling et al. 2011) and global burden of disease studies identified depression as one of the major causes of health loss (GBD 2019 Mental Disorders Collaborators 2022). Whereas depression is relatively rare during childhood, adolescence marks the prime age for depression onset and rates of major depressive episodes among adolescents and young adults have increased substantially since the mid-2000s (Twenge et al. 2019).

This negative development, which has further intensified during the COVID-19 pandemic (Mansfield et al. 2022; Giuntella et al. 2021), will increase the likelihood of adverse experiences in other life domains across individuals' life courses, because mental health problems in adolescence have been shown to affect a variety of adult outcomes, such as socio-economic attainment or family formation (Dobewall et al. 2023; Evensen & Lyngstad 2020). Moreover – and importantly – adolescent mental health occurs within the developmental context of the family system (Chan et al. 2014; Zhou & Sun 2021). There may thus be negative 'spillovers' from the adolescent child to the mental health of parents (Ha et al. 2008; Song et al. 2018) and siblings (Jayasinghe et al. 2022; Ma et al. 2020). Consequently, rising rates of depression in adolescent children might be paralleled by rising rates of depression in previously unaffected family members as well, which may then affect family functioning and wellbeing (e.g., Lee et al. 2023; Wiegand-Grefe et al. 2019).

A plethora of studies investigated the intergenerational, that is, *'downward' transmission* of depression from parents to children (for a recent review see Goodman 2020): Tyrell et al. (2019), for example, showed that parents who experienced higher levels of depressive symptoms were more likely to have children with elevated rates of depressive symptoms from early adolescence to young adulthood. Similarly, Brown et al. (2015) found that maternal depression was significantly associated with adolescent depression two years later. The same study provided no evidence, however, that adolescent depression predicted maternal depression. This reverse pathway, that is, the *'upward' transmission* from children to parents has received considerably less attention so far, and results are inconclusive. For example, next to the lack of support for this hypothesis in Brown et al. (2015), Zhou & Sun (2021) found that

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when adolescents are at risk for depression, at least one parent is likely to be concurrently at risk for depression (but not vice versa; also see Lee et al. 2023). Moreover, Song et al. (2018) report evidence of lifelong effects of parenting children with developmental or mental health problems, indicating that midlife and older parents of children with these conditions have poorer physical and mental health profiles and poorer cognitive functioning than their counterparts whose children do not have such conditions (also see Ha et al. 2008). Finally, largely understudied is also the intragenerational, that is, *'horizontal' transmission*, of mental health issues. Among the existing few studies, Buist et al. (2019) showed that sibling depressive symptoms predicted adolescent depressive symptoms one year later (also see Marquis et al. 2019). Therefore, while the 'downward' transmission of mental health problems, that is from parents to children, seems to be well-established in the scientific literature, we aim at shedding new light on the reversed and unexplored perspective with respect to the conventional wisdom: In this study, we examine how parents' and siblings' mental health outcomes change before, during, and after a child's mental health condition changes. We contribute to the literature by providing a detailed description of potential 'ripple effects' (Wolfe et al. 2014) of adolescents' depression on their parents' and siblings' risk of mental health problems over time. Whereas previous research tended to focus on specific 'downward' dyadic linkages (e.g., from the mother to her child), we acknowledge children's active role in shaping their family environment (e.g., Davidov et al. 2015) and that one family member's mental health problems may 'spill over' to multiple family members along different generational lines at the same time. Beyond this primary focus of our analysis, we further acknowledge that there may be reciprocal influences between adolescent children's depression and corresponding outcomes in their family context of parents and siblings (Speyer et al. 2022; Xerxa et al. 2021), which may also be reflected in *concurrent trajectories of change* in adolescent depressive symptoms and parental mental health (Garber et al. 2011; Perloe et al. 2014). Such findings have important implications on how family-centered care systems should effectively be designed and implemented in order to best care for the child's health. We provide new evidence that the entire family needs to be supported in order to stop the vicious cycle of co-development of mental health issues among family members.

Building on unique register data from Norway, covering the full population, our study is specifically concerned with the particular event of an adolescent child's first diagnosis of depression and it provides evidence of its association with other family members' deviation from their baseline level of mental health in the years before, during, and after that event. The adolescent child's mental health diagnosis can potentially trigger mental health declines in parents and siblings through, for example, concerns about their loved one, an increased need for provision of social support, disruption of daily routine, or increases in conflict (e.g., Lee et al. 2023). It may also be accompanied by other cha(lle)nges in everyday live arising from sharing a household with a child or sibling suffering from depression. Moreover, in the last couple of decades spillover effects from children to parents could have been further amplified by the diffusion and deepening of the intensive parenting norm (Nomaguchi & Milkie 2020). This approach to parenting is based on the assumption of parental determinism, according to which parents' actions, behaviors and consistent involvement determine children's healthy development (Faircloth 2014; Milkie & Warner 2014). Such believes can undermine parents' well-being especially in case of child's depression, making them feel responsible for the child's mental health status. Finally, cross-sibling effects might also be driven by the contagion of unhealthy lifestyles (e.g., lack of physical exercise and sleep, excessive screen time). Our findings also suggest that the diagnosis may, however, also bring about (mental health) improvements for the other family members, especially if it is followed by treatment and subsequent recovery of the affected adolescent child (Wilkinson et al. 2013).

Materials and Methods

Data. The analysis is based on Norwegian register data covering the full population. We make use of the population register, which contains demographic information about each person registered in Norway and allows to link persons to their parents and siblings. Through their personal identification number, we link information about consultations with general practitioners (GPs) that is available from the Norwegian Control and Payment of Health Reimbursements Database (KUHR) since 2006. KUHR contains information about the date of

the patients' visit and the symptom or diagnosis the GP registered in order to receive reimbursement for their service from the state.

Sample. We selected couples consisting of a mother and father that had at least two children together. We focus on families where the second born child is diagnosed or not diagnosed with depression, and the association with mental health consultations of the parents and the first-born sibling. The choice of siblings was made because children are hardly diagnosed with depression or anxiety before teen age, which would limit our ability to identify potential spillover effects from firstborn children to their (possibly relatively young) siblings.

From the initial pool of families, we established our analytical sample with two specific objectives in mind. First, we aimed to observe the initial onset of depression in the firstborn child during their teenage years. Second, we aimed to examine the mental health consultations sought by their parents and siblings, both preceding and following the teenager's first diagnosis, for a minimum period of three years. For this purpose, we observed teenage depression cases between 2009 and 2016, while tracking the mental health of parents and siblings from 2006 to 2019. Specifically, we selected families with second-born children aged between 11 and 13 in 2009. We identified the year of their first depression diagnosis up until 2016, when they were between 18 and 20 years old. It is important to note that only a small percentage (less than 0.5%) of individuals had received a depression diagnosis by the age of 13, in comparison to approximately 8% by the age of 20. Consequently, we are confident that our sample primarily captures initial diagnoses, even if they were not observed before the ages of 11, 12, or 13, respectively. Given that the KUHR database covers the period from 2006 to 2019, this selection of teenage diagnoses enables us to examine consultations sought by family members at least three years before and after the (presumed) first diagnosis of the teenagers. Furthermore, individuals are only included in the sample for the years in which they were alive and registered in the country.

The analytical sample consists of 46,816 families and 470,274 family-years. Of those families, 2,557 experience that their second born child is diagnosed with depression during the relevant period, and 44,259 make up the control group.

Variables. Depression diagnosis of the second born child is coded if KUHR contains the code P74. The codes in KUHR follow the ICPC-2 system (International Classification of Primary Care). *Any mental health diagnosis* among the parents and siblings is coded if at least one code of P70-P99 is observed. *Years since the first depression diagnosis* indicate calendar years since the diagnosis, with the year of diagnosis coded 0. We account for the *number and age of children* using variables indicating the number of children in these age brackets: (1) 0-5 years, (2) 6-11 years, (3) 12-19 years, and (4) 20 or more years.

Method. We describe the annual probability of having a GP-consultation where a mental health diagnosis is given to the mother, father, or sibling, respectively. The observation period covers five years before and five years after the second born child's first observed diagnosis. We further apply a difference-in-differences approach using linear probability models to describe the different development in the probability of mental health consultations for parents and siblings in families with a second born teenager with *versus* without a diagnosis of depression. For families where the second born does not receive a teenage diagnosis – the "control" group – we assign a random year as the year of the "diagnosis" to allow comparison of developments to those with an actual diagnosis. We acknowledge that exogenous variation in teenage mental health is hard to find and mutual influence in the family makes it difficult to establish causal direction. Therefore, we aim to additionally give an impression of the *parental "impact" on the teenager* by also modelling the mental health development of teenagers in the years before and after their mother or father receives a mental health diagnosis for the first time within a five-year period.

Results

Preliminary results show that approximately 8% of boys and girls born between 1994 and 2000 were diagnosed with depression by age 20, which seems to be consistent with the prevalence found in the U.S. for such young population, using claims data (Cuddie & Currie 2020). Our analysis reveals two important patterns: Firstly, mothers, fathers, and siblings of children that eventually get diagnosed with depression exhibit higher probabilities of mental health consultations (i.e., consultations where a mental health diagnosis is given) throughout

the observation period spanning five years before and five years after the first depression diagnosis of the second born child in teen age (Figure 1, bottom row). This is in line with prior research and indicates that mental health issues "run in the family", but can also be equally indicative of the fact that help-seeking behavior (i.e., the inclination to consult a GP for mental health) varies across families. Secondly, mothers, fathers, and siblings have significantly more mental health consultations in the year their teenage family member is diagnosed with depression, compared to five years before. This is above and beyond any age effects, and these findings are robust also when controlling for the number of children the family has, the age of the youngest child, and individual as well as year*age fixed effects (Figure 1, top row). Note that age controls rely on the assumption that individuals from families with a diagnosed teenager would follow the same age-trend as those with a teenager who is not depressed holds. For mothers and fathers, the net increase in the probability of mental health consultations relative to five years before the diagnosis corresponds to 25% and 21%, respectively. The results further suggest that parents experience a gradual increase in the probability of consulting a GP in the years leading up to the teenager's diagnosis, and a decline in the years thereafter. This pattern is in line with the idea that not only the teenager's mental health – but also that of their parent – declines in the years before the teenager's diagnosis, and improves after the teenager – as well as the parent – seek help from the medical system.

A) Mothers   **B) Fathers**   **C) Siblings**
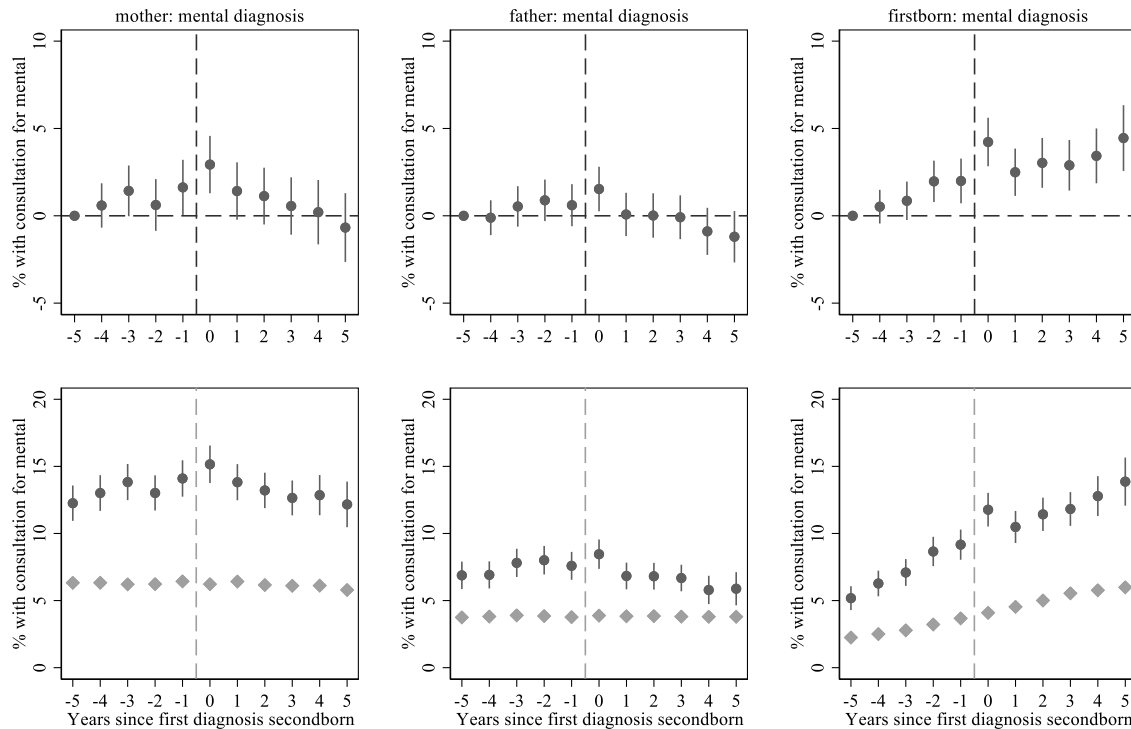
Figure 1: Consultation of mother, father, and firstborn siblings with GP for mental health diagnosis, before and after the second born child's first depression diagnosis. Top row of figures displays the coefficients (percentage point change) of the fixed effects models estimation, with year = 0 representing the year the second born child was diagnosed with depression. year = -5 is the reference group. The models control for number of children and age of the youngest child, and include individual fixed effects as well as year*age fixed effects. The bottom row of figures displays the observed share of individuals consulting GPs, for those with a second born teenage family member diagnosed with depression in year = 0 (dark circles) and those without such a second born teenage family member (light diamonds).

Firstborn siblings of second born teenagers diagnosed with depression are – throughout the observation period – on a more adverse mental health-age-trajectory than their counterparts in families without a diagnosed second born teenager, with an increase in the probability of mental health consultations as they age. In addition, firstborns have a higher consultation probability in the year their sibling is diagnosed, and this seems to be a deviation from their already more adverse mental health-age-trajectory. Specifically, the net increase in the probability of mental health consultations of the firstborn sibling relative to five years before the diagnosis corresponds to 91% . This pattern is observed accounting for age, year*age-fixed effects and individual fixed effects, number of children in the family and the age of the youngest child.

While these findings are in line with the idea that upward and horizontal transmissions of mental health problems are relevant and cannot be neglected, it is also reasonable to assume that family members jointly influence each other, as their lives are typically closely intertwined in terms of shared residence, time spent together, and mutual dependency. Therefore, in such an endogenous context, we cannot rule out that the co-development of mental health problems, also (and possibly simultaneously) acts through the alternative, and already well-established, mechanism where the mental health of parents affects the mental health of their (second born) child. Figure 2 shows the probability for the second born child having at least one consultation with a mental health diagnosis during the period spanning five years before and five years after their mother or father has been diagnosed with depression. Time since depression diagnosis of the mother or father, respectively, was measured for the first diagnosis observed in the interval 2011 to 2016; however, in order to observe a change in the parent's mental health status, diagnosed parents where only considered if they had received a depression diagnosis in the interval spanning 2011 to 2016, but not in the five years preceding this diagnosis. The control group were children whose respective parent (mother or father) did not receive a diagnosis throughout the period 2006 to 2019. The results (Figure 2) indicate that children have a higher probability of receiving a mental health diagnosis when their mother or father is diagnosed with depression. The sustained higher probability of having at least one mental health consultation in the years after the first parental diagnosis suggests a long-term increase in children's probability of being diagnosed with depression also after the parent's diagnosis. One should keep in mind that parental diagnoses not necessarily are singular events, but that mental health problems also among the parents might be enduring after the first diagnosis (see Figure A1 in the Appendix). These might possibly be followed up in specialist care, such that the primary health care data displayed in Figure A1 might provide an underestimation of the phenomenon, especially after the first mental health diagnosis.

A) Before and after mother's depression diagnosis

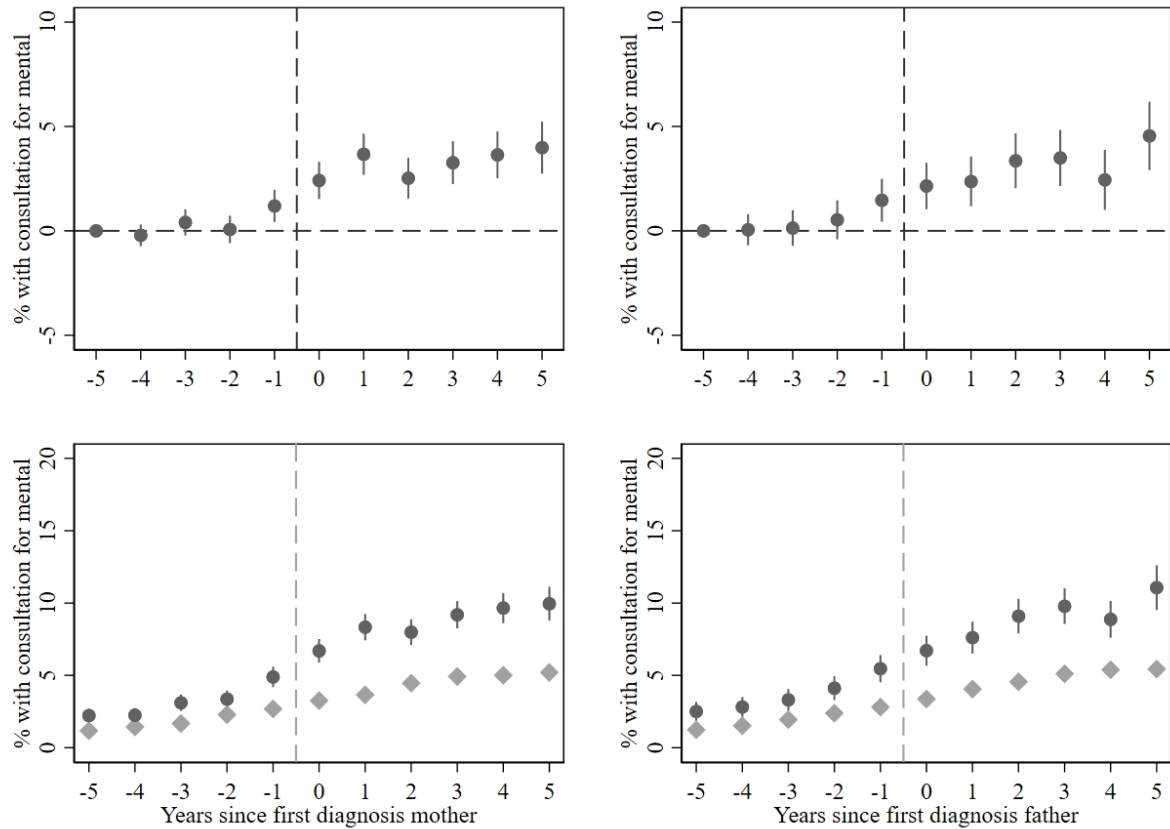**B) Before and after father's depression diagnosis**

Figure 2: Consultation of second born children with GP for mental health diagnosis, before and after parental depression diagnosis. Top row of figures displays the coefficients (percentage point change) of the fixed effects models estimation, with year = 0 representing the year the mother (left) and father (right) was diagnosed with depression after a period of at least five years without such a diagnosis. year = -5 is the reference group. The models control for number of children in the family and age of the youngest child, and include indivivdual fixed effects as well as year-age-fixed effects. The bottom row of figures displays the observed share of individuals consulting GPs, for those with a mother/father diagnosed with depression in year = 0 (dark circles) and those without such a mother/father (light diamonds).

Conclusion

In 2019, it was estimated that one in seven adolescents worldwide experience mental disorders (UNICEF 2021), implying that mental health conditions account for 13% of the global burden of disease among teenagers. If these estimates are the result of an already negative development during the last couple of decades, such trend has further intensified during the COVID-19 pandemic, leading to what has even been called a "youth mental health crisis" by media, which is known to have enduring consequences preventing a healthy and fulfilling adulthood. While there has been a growing recognition of this phenomenon, policy interventions continue to be slow or missing (UNICEF 2021), also because we still need to better understand and address

spillover mechanisms within the family system in which the adolescent is embedded, that might reinforce negative channels of transmission.

The vast majority of the existing studies looking at intra-family transmission of mental health issues focuses on how mental health conditions of parents impact their children's mental health (Goodman 2020). Rather overlooked and much less acknowledged is the reversed pattern, that is whether and how mental health issues of children are transmitted to parents, as well to the other siblings. This study shows that an adolescents' first diagnosis of depression is associated with a higher probability of both parents, mother and father, to be diagnosed with depression right after, and actually in the same year in which the teenager is diagnosed. To be precise, results suggest that parents experience a gradual increase in the probability of going for consultations in the years up until the adolescent's diagnosis, and a decline in the years thereafter. This pattern is in line with the idea that not only the teenager's mental health – but also that of their parent – declines in the years before the child's diagnosis, and improves after the adolescent seeks help and possibly receives treatment from the medical system. An increased probability of receiving a mental health diagnosis is also observed for siblings. However, while for parents such potential ripple effect seem to be short-term, a clearly more adverse long-term mental health trajectory is observed for the sibling. Potential mechanisms that can explain cross-sibling effects are: i) the mediating effects of the worsening mental health conditions of the parents caused by the other sibling's depression; ii) the focus of parental attention and care on the child who initially struggled with mental health, causing negative impact on initially more healthy siblings; iii) contagion effects between siblings of unhealthy behaviors, such as lack of physical exercise, sleep and excessive screen time. In light of the fact that this latter channel can be even stronger when the transmission goes from the firstborn (who can be seen as role-model) to the second born, and because data constraints made us focus on potential spillover effects of the second born child's depression on the firstborn's mental health, we believe that our estimates of cross-sibling effects might be rather conservative.

Our findings are in line with the few existing studies looking at upward transmission of mental health issues from children to parents, showing that: i) the onset of an emotional disorder in children is associated with parental mental health decline (Wilkinson et al., 2021); ii)

depressive symptoms among mothers decline as their children with major depressive disorder experience improvements in mental health as a consequence of treatment (Perloe et al., 2014; Wilkinson et al., 2013). The present work contributes to this existing literature by offering a more comprehensive analysis of how an adolescents' depression can affect the other family members, both parents and siblings. It therefore provides important new evidence of how adolescents' mental health conditions co-develop with mental health across both inter- as well as intra-generational relations within the family. Moreover, this study, by using register data, reports on the entire Norwegian population rather than samples.

We acknowledge that behind such evidence of co-development of mental health issues within the family, a web of endogenous relationships is likely to be hidden. Therefore, we cannot rule out the (co-)presence of the opposite, and already well-established, pattern of transmission of mental health problems from parents to children. However, even in presence of reverse causality, it remains valid and sound that mental health issues spread within the family, both within generations and across generations. To address an adolescent's mental health conditions effectively, it is crucial to consider the transmission of mental health problems within the family. Family members have a mutual influence on each other due to shared residence, time spent together, and interdependency. By recognizing this dynamic, supporting and – in case – treating the entire family when one member faces mental health issues can break the cycle of mental health transmission and promote more sustainable family well-being.

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Appendix

A) Second born child
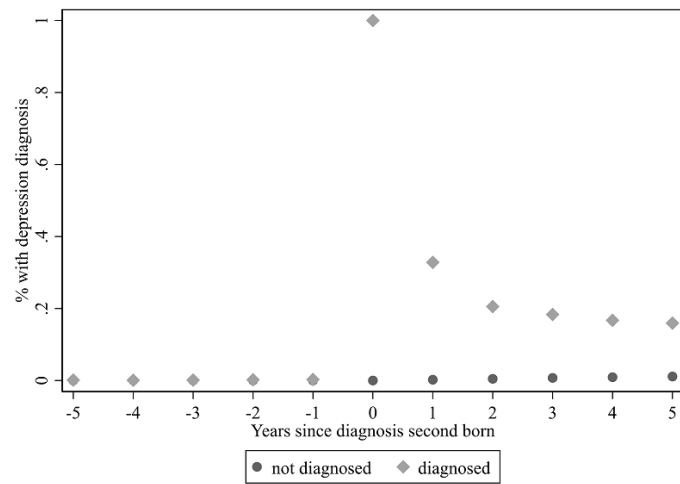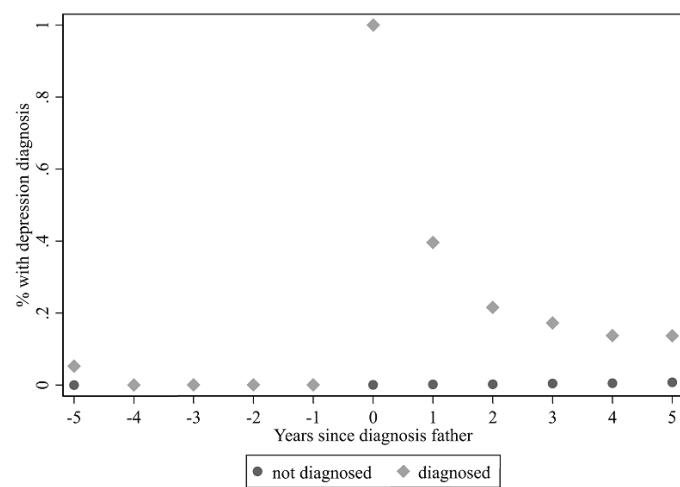

B) Mother
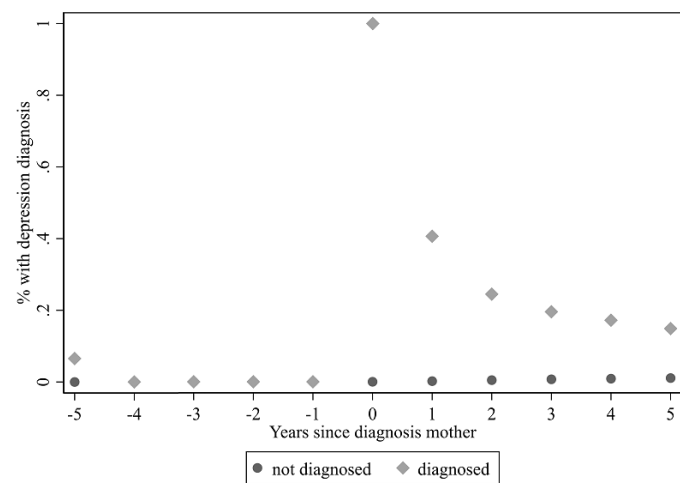
C) Father

Figure A1: Probability of being diagnosed with depression over years since the first depression diagnosis, by family member. See methods section for definitions of non-diagnosed and diagnosed family members.