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Building Health across Generations: Childbirth, Childcare and Maternal Health

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Building Health across Generations: Childbirth, Childcare and Maternal Health

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Abstract

Family dynamics and institutions play significant roles in shaping individuals' health. We evaluate the short- and long-term effects of (1) motherhood and (2) public early childcare on maternal health. Our results align with an intra-household disease spread from children to mothers in the first years after childbirth, which is further amplified by childcare availability. Additionally, mothers exhibit deteriorated mental health from the medium run, particularly concerning depression diagnoses, due to the psychological demands of motherhood. In contrast, our findings reveal long-term improvements for most health conditions after childbirth, which is supported by childcare provision. Specifically, childcare availability leads to persistent reductions in non-communicable diseases such as obesity, back pain, and hypertension, and, for multiparous and older mothers, in mental health.

Keywords: maternal health, motherhood, early childcare, administrative health data
JEL classification: I10, I12, J13

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1 Introduction

Health influences individuals in various life aspects, including their well-being, education, and labour market outcomes (Currie & Madrian, 1999; Dolan et al., 2008; García-Gómez et al., 2013). Moreover, its impact ripples across generations, shaping the trajectories of families through spillover effects on younger and older generations, as well as on partners and siblings (e.g., Bencsik et al., 2023; Black et al., 2021; Breivik & Costa-Ramón, 2023; Jeon & Pohl, 2017). This interconnectedness becomes crucial in the context of women, of whom 80–90% eventually become mothers (OECD, 2024). Given that women often bear the main responsibility for home-production activities, including child-rearing (OECD, 2020), family dynamics may benefit from healthy mothers while being disrupted from adverse shocks to maternal health.

Given their central role within the household, women often experience more pronounced and persistent costs from parenthood than men. Mothers not only bear the physical burden of childbirth but also face more job discrimination and spend more time on child-related activities than fathers (Andresen & Nix, 2022). This imbalance contributes to the persistence of gender inequality by imposing greater penalties on mothers' career trajectories (e.g., Cortés & Pan, 2023; Kleven et al., 2019a,b, 2021, 2023). Evidence from the medical literature shows that motherhood is also associated with short-term adverse effects on maternal physical and mental health during pregnancy, childbirth, and the postpartum period, extending beyond postnatal care when attention shifts towards the child's well-being (Vogel et al., 2023). However, beyond these short-term (biological) effects, motherhood may also have long-term effects on maternal health, which may stem from a shift in activities (e.g., from self-care or paid work to time-investments in childcare) or the joy of building a family (Saxbe et al., 2018). In an ageing society with low fertility rates, understanding these long-term effects is crucial for designing policies that improve maternal outcomes and reduce the costs of motherhood, thereby encouraging women who desire children to have them. The literature on the short- and long-term causal effects of childbirth on maternal health is scarce with mixed findings depending on the institutional setting and health condition (Ahammer et al., 2023; Dehos et al., 2024; Hart et al., 2024). Therefore, the first part of this paper focuses on bridging this research gap by estimating the impact of motherhood on maternal health.

Institutions influence fertility decisions and the experience of motherhood. For example, family policies, such as parental leave and public childcare, have the potential to enhance fertility and improve maternal outcomes. Public childcare provision enables mothers to shift from family-care duties to labour market participation (e.g., Havnes & Mogstad, 2011a; Müller & Wrohlich, 2020; Nollenberger & Rodríguez-Planas, 2015) and is seen as a means to reduce gender inequality and alleviate the burden of motherhood (Karademir et al., 2024; Lim & Duletzki, 2023). Beyond its effects on maternal employment, child development, and fertility (e.g., Baker et al., 2019; Bauernschuster et al., 2016; Havnes & Mogstad, 2011b), public childcare may also affect maternal health through several channels, including an intra-household disease spread and a shift in time-use. Despite its relevance within the family unit, the impact of public childcare provision on maternal health has received little attention (Baker et al., 2008; Haeck et al., 2022). The second part of this study aims to address this research gap by estimating how public early childcare influences maternal health.

Our analyses use panel data based on comprehensive administrative health records covering 90% of the West German population and including all outpatient care contacts from 2010 to 2019. We focus on a sample of around three million publicly health-insured women who gave birth between 2010 and 2018. We track these mothers from three years pre-birth of their first child to eight years post-birth, and estimate dynamic health effects by the child's age. To comprehensively assess maternal health, we explore a wide range of health conditions given that distinct mechanisms may be in place. We examine four groups of outcomes, namely (i) communicable diseases (infections, respiratory and ear diseases), (ii) non-communicable diseases (obesity, hypertension, back pain, and nutritional deficiencies), (iii) mental health disorders, and (iv) healthcare consumption.

We start by analysing whether motherhood influences women's health in the short and medium run, through biological changes of giving birth but also physical and psychological effects of investing time in child-rearing. We examine a society with strong traditional gender roles and a well-established child penalty in labour market outcomes, namely West Germany (Campa & Serafinelli, 2019; Feldhoff, 2021). We employ a *stacked* difference-in-differences (DiD) model, which accounts for the fact that age at first childbirth is a critical determinant of women's life trajectory and uses a comparable control group comprised only by slightly older mothers (Cengiz et al., 2019; Melentyeva & Riedel, 2023). This design circumvents the methodological challenges of Kleven et al. (2019b)'s standard approach associated with two-way fixed effects (TWFE) models with staggered roll-out and heterogeneous treatment effects related to the use of already-treated and older not-yet-treated women as controls (de Chaisemartin & D'Haultfoeuille, 2023).

Our results reveal worse health around the time of birth for most conditions. This could be due to various factors such as physiological, hormonal, and psychological changes in women's bodies, as well as increased outpatient contacts during pregnancy. Additionally, our findings suggest that there is a decrease in diagnoses for most health outcomes immediately after childbirth, which may be attributed to improved health, changes in mothers' behaviours, such as increased engagement with maternity or children healthcare services but less with others, or the adoption of protective measures (e.g., spending more time at home to avoid infections or less necessity for diagnosing given that certain drugs pose risks during breastfeeding). Four years after giving birth, the level of outpatient care diagnoses compared to pre-conception levels varies depending on the condition: mothers (1) experience increased levels of infections and respiratory and ear diseases, which are likely transmitted within the household from children to mothers, (2) have increases in the prevalence of mood-related disorders, including depression, related to the psychological demands of motherhood, and (3) undergo reductions in non-communicable diseases, stress-related disorders, and healthcare consumption. Understanding the health dynamics of motherhood allows policymakers to develop strategies to address maternal health issues, such as reducing transmission of infectious diseases or accompanying mothers to balance their time-investments in child-rearing with other non-parenting activities. The improvements (and null results) in other health dimensions can serve as compelling arguments for establishing a political framework that alleviates the burden of motherhood, thereby encouraging women who desire to have children to do so.

To study how motherhood is affected by family policies, we exploit a large-scale public childcare expansion for children under three in West Germany and estimate the effect of childcare availability on maternal health. West Germany has historically experienced low female labour market participation and limited access to public early childcare before the mid-2000s. From 2005, several reforms expanded the childcare slots for children under three and childcare coverage rates reached almost 30% by 2019. This public childcare expansion induced exogenous temporal and spatial variation in childcare coverage rates, which we leverage in a TWFE framework. While the effects of the West German childcare expansion have been widely analysed on child and labour market outcomes, its impact on other life dimensions such as maternal health remains understudied.[1]

We show that the availability of public childcare is an effective instrument to improve maternal health in many dimensions. Specifically, mothers benefit from childcare availability with a 4.4–10.9% reduction in obesity, a 5-10% decline in hypertension, and a 3.3–5.6% decrease in back pain from early childcare ages. We show that the mechanisms behind these benefits are associated with improvements in mothers' employment and healthy behaviours. Although overall mental health effects are null, heterogeneity analysis uncovers a lower prevalence of mood- and stress-related disorders for multiparous and older mothers. In contrast, our findings provide evidence that childcare exacerbates the intra-household transmission of communicable diseases present during the first years of motherhood: childcare availability results in mothers being diagnosed with 3.9–8% more infections and 1.5–3.9% more respiratory diseases when their child is aged 1–2. While for West German children there is a substitution of infectious illness spells from elementary school to the first years of childcare (Barschkett, 2022), effects for mothers fade out as the child grows up. In terms of healthcare consumption, we observe an increase of 1–1.7% in treatment cases and 1.6–2.6% in healthcare costs likely related to the rise in infectious diseases at early childcare ages. Although the rise in infectious diseases could pose potential challenges to maternal productivity, the positive effects on other health dimensions may have important implications for mothers' labour supply and well-being, and benefit other family members due to their pivotal role within the household.

Our study contributes to several strands of the literature. First, we contribute to the literature on parenthood and child penalties. Childbirth has stronger and more persistent effects on mothers' labour market outcomes than fathers' (e.g., Cortés & Pan, 2023; Kleven et al., 2019a,b, 2021, 2023). Beyond its influence on labour market outcomes, parenthood may also affect other life dimensions, including health. While men and women exhibit different health profiles and healthcare consumption behaviours (e.g., Crimmins et al.,

[1] The introduction of highly subsidised formal childcare encouraged West German mothers to join the labour force (Huber & Rolvering, 2023; Müller & Wrohlich, 2020), while boosting fertility (Bauernschuster et al., 2016), improving child outcomes (Barschkett, 2022; Felfe & Lalive, 2018; Sandner et al., 2024), shrinking the child penalty in earnings (Lim & Duletzki, 2023), and promoting less-traditional gender norms (Zoch & Schober, 2018).

2011; Osika Friberg et al., 2015; Schünemann et al., 2017; Van de Velde et al., 2010), little is known about the effects of parenthood on parental health.[2] Notably, studies in Denmark, Austria and Germany demonstrate that childbirth worsens maternal mental health (Ahammer et al., 2023; Dehos et al., 2024). In contrast, Hart et al. (2024) in Norway find unclear evidence on maternal mental health after childbirth. Other health outcomes have received little attention, with the recent work by Dehos et al. (2024) being an exception.[3] We add to this the literature by quantifying the effects of motherhood across various physical and mental health outcomes derived from outpatient care use, while employing new techniques that circumvent the problems associated with TWFE specifications used by previous studies (Cengiz et al., 2019; Melentyeva & Riedel, 2023).

Second, our contribution extends to the literature on the impact of family policies, more precisely of childcare policies, on health. There is a large field of literature assessing the effects of various family policies, including parental leave (e.g., Danzer et al., 2022; Danzer & Lavy, 2018), informal care (e.g., Barschkett et al., 2021; del Boca et al., 2018), and public formal childcare (e.g., Baker et al., 2008; Barschkett, 2022; Bosque-Mercader, 2022; Cattan et al., 2021; van den Berg & Siflinger, 2022) on various child outcomes, including health. Much less is known about the effects of such reforms on parents, beyond labour supply (e.g., Ginja et al., 2020; Huber & Rolvering, 2023; Müller & Wrohlich, 2020), fertility (e.g., Bauernschuster et al., 2016; Lalive & Zweimüller, 2009), and child penalties (Ahammer et al., 2023; Karademir et al., 2024; Kleven et al., 2024; Lim & Duletzki, 2023; Rabaté & Rellstab, 2022). The few studies assessing parental health are based on survey data, which include broad and subjective health measures mainly targeting mental health (Baker et al., 2008; Haeck et al., 2022).[4] Our study is the first to use administrative health records to estimate the effect of the provision of public childcare on maternal health, enabling a comprehensive analysis of various health dimensions. Previous studies focus on the Canadian context, which exhibits large differences in the social welfare system

[2]There is an extensive medical literature studying the association between motherhood and health (see literature reviews in Gmelig Meyling et al., 2023; Shorey et al., 2018; Vogel et al., 2023). Despite the lack of causal interpretation, their main conclusion is that motherhood is negatively correlated with both maternal physical and mental health in the short run.

[3]Few studies analyse related outcomes. Angelov et al. (2020) and Fontenay & Tojerow (2020) show that childbirth increases mothers' sick leave more than fathers'. Myrskylä & Margolis (2014) and Baetschmann et al. (2016) find contrasting results on maternal happiness and satisfaction after childbirth.

[4]Baker et al. (2008) find detrimental effects of a low-quality public childcare expansion in Canada on fathers' general health status and mothers' depression scores. However, Haeck et al. (2022) point out that the effects fade out when children reach school age.

and labour market compared to European countries such as Germany. Hence, our paper is the first to show evidence for Europe. In addition, the German reform targeted children below three, while the childcare reform in Canada affected all children below school age. Therefore, our paper isolates the effects of childcare availability for very young children on maternal health. Lastly, we are able to estimate dynamic effects by age, i.e., considering both short- and long-term horizons. Most previous studies instead provide evidence of immediate health effects.

Third, we contribute to the literature on intergenerational health effects. While the literature has mostly focused on downward intergenerational effects, e.g., parental income or education affecting child health (e.g., Arendt et al., 2021; Kuehnle, 2014), evidence on upward intergenerational effects is scarce (De Neve & Kawachi, 2017). Examples of upward spillover effects are papers that demonstrate the detrimental effects of children's severe health conditions on parental labour market outcomes, resulting from the increased caregiving time and the worsening of maternal mental health (e.g., Breivik & Costa-Ramón, 2023; Eriksen et al., 2021). Furthermore, the most extreme health shock —the loss of a child— is shown to negatively impact various parental outcomes, including labour income, employment status, marital status, and hospitalisations (van den Berg et al., 2017). As the childcare expansion in West Germany shifted children immunity development from elementary school to early childcare ages (Barschkett, 2022), our findings also contribute to the related literature on intra-household disease spread (e.g., Daysal et al., 2024; Schlinkmann et al., 2018).

This paper is structured as follows. We first outline the institutional setting in Section 2 and describe our data in Section 3. Next, we explain the empirical strategy and show our findings for the effects of motherhood on maternal health in Section 4. For the effect of public early childcare on maternal health, we detail the empirical methodology and identification strategy, and discuss our results in Section 5. We conclude in Section 6.

2 Institutional Setting

Germany is characterised by a low fertility rate, which has been increasing over the past two decades from 1.4 in 2000 to 1.5 in 2019 (German Statistical Office, 2023a). Compared to other OECD countries, the share of childless women (20%) is relatively high (OECD, 2024). Among the 80% of women with children, the majority (46%) has two children, 32% have one child and 22% have more than two children (German Statistical Office, 2023c). The average age at first childbirth has increased over time, from 28.9 in 2010 to 30.1 years in 2019 (German Statistical Office, 2023b).

Germany is known for differences between its Eastern and Western parts due to historical exposure to distinct institutions and policies. While East Germany implemented family-friendly policies that encouraged mothers to join the labour market, West Germany adhered to a more traditional male-breadwinner family model with low maternal labour force participation, especially for mothers with children under three (Boelmann et al., 2021; Campa & Serafinelli, 2019; Jirjahn & Chadi, 2020; Müller & Wrohlich, 2020). Over the recent decades, Germany has adopted several family policies to support a family-work balance, including generous parental leave and access to public childcare services. Employed mothers benefit from six weeks of maternal leave before and eight weeks after childbirth at full pay. Since 2007, parents are entitled to 14 months of paid parental leave (12 months if only one partner takes leave) at 67% of pre-birth net earnings, capped at €1,800 per month (Frodermann et al., 2023; Welteke & Wrohlich, 2019).

Limited fertility and maternal labour force participation rates are often attributed to the low supply of public formal childcare for ages 1–2 (*Kinderkrippe*) and for ages 3–6 (*Kindergarten*), particularly in West Germany. In contrast, East Germany invested in public childcare facilities during the German division and experienced higher childcare coverage rates for children aged one to six also after the reunification (Bauernschuster & Schlotter, 2015). West Germany eventually reached childcare coverage rates above 90% for ages 3–6 in the 2000s thanks to the implementation of the Child and Adolescent Support Law (*Kinder- und Jugendhilfegesetz*). Implemented in 1996, this law legally entitled a childcare slot to all children aged three and older (Müller & Wrohlich, 2020). However, access to public childcare for children aged 1–2 in West Germany remained limited, with childcare coverage rates below 5% until the mid-2000s (Barschkett, 2022).

Childcare centres for children aged 1–2 focus on child development of both cognitive and non-cognitive skills (Felfe & Lalive, 2018). To achieve this goal, they are required to maintain high-quality standards, including opening for a minimum of four hours on weekdays and limiting groups up to ten children under the supervision of a state-recognised educator, often assisted by one or two aides (Felfe & Lalive, 2018). In 2021, groups ranged from 8 to 15 children and the average child-staff ratio was 4:1 (Eurydice, 2023).

The admission process to early childcare varies by local regulations with some centres prioritising disadvantaged households and families with previously enrolled siblings. Childcare at ages 1–2 has been characterised by an excess demand. In 2005, 36% of parents with children in this age group sought childcare slots, while childcare centres only accommodated around 7% of slots (Bien et al., 2006). While parents are the primary caregivers for children under three, around 30% receive care from other relatives, particularly grandparents for an average of eight hours per week (Barschkett et al., 2021). For children aged 2–3 in West Germany, born between 2002 and 2008, the average time spent in childcare centres was 6.4 hours per working week, while they spent most of their time with their mother (42.8 hours) followed by extended family members (19.2 hours with father, grandparents, siblings or other relatives), and to a lesser extent, in informal childcare (1.5 hours with a childminder or a nanny) (Felfe & Lalive, 2012).

In the mid-2000s, several policy reforms were introduced to expand the supply of childcare slots for children below three. In 2005, the Childcare Expansion Law (*Tagesbetreuungsausbaugesetz*) was enacted aiming at adding 230,000 slots by 2010 in West Germany. In 2007, the federal government, states, and counties agreed on a summit (the *Krippengipfel*) to set the target of achieving a 35% childcare coverage rate for children under the age of three by 2013. By the end of 2008, the Support for Children Law (*Kinderförderungsgesetz*) was implemented and legally entitled all children aged one and older to a subsidised childcare slot, either in childcare centres or with childminders, by August 2013.

These reforms resulted in an expansion of childcare slots for children under the age of three, leading to an increase in childcare coverage rates since the mid-2000s. Figure 1 plots the trend of childcare coverage rates for children under three in West Germany from 1994 to 2019. Before the expansion, childcare coverage rates were below 5%. After the reforms, childcare coverage rates started to increase from 7.4% in 2006 to 26.9% in 2014, with a slower growth continuing until it reached 29.3% by 2019. Childcare slots were taken up more frequently by families with high education and no migration background (Jessen et al., 2020).[5] The childcare expansion led to higher fertility and mothers' labour

[5]Given that high socioeconomic families enrolled in early childcare in Germany (Jessen et al., 2020) and high-quality early childcare is in general more beneficial for disadvantaged families (Cascio, 2015),

market participation (Bauernschuster et al., 2016; Müller & Wrohlich, 2020), but it failed in achieving the 35% childcare coverage target. Although the gap between demand for and supply of early childcare shrank over time, excess demand remained wide amounting to 16% in 2009–2011 and 13% in 2021 (Kayed et al., 2022; Müller & Wrohlich, 2016).

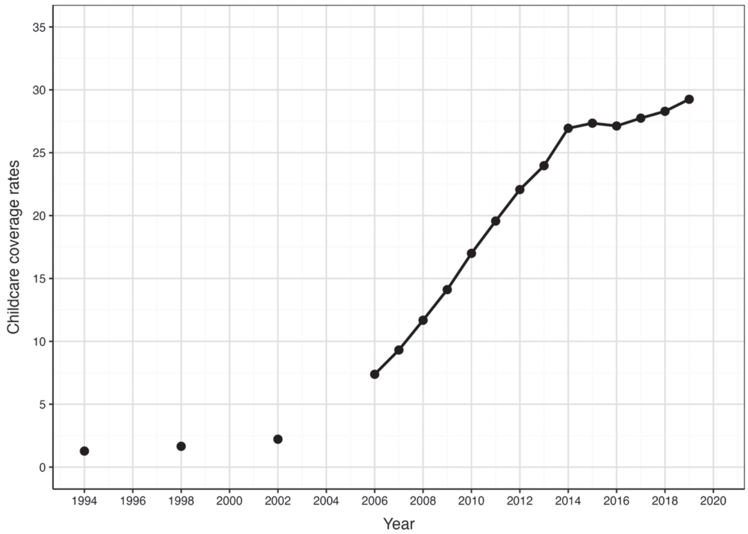
Childcare is highly subsidised by the federal government, states, and municipalities, although states and municipalities are responsible for funding and municipalities ensure its provision, resulting in significant regional disparities (Huebener et al., 2020). In 2006, childcare costs for children under three amounted to €14.1 billion, with 79% covered by public subsidies, 14% by parents, and the remainder by private non-profit organisations (Bauernschuster et al., 2016). Parents' contributions are income-dependent and vary from one state to another, with some incurring minimal or no childcare costs and others paying over €300 for a full-day slot (Eurydice, 2023).[6] The childcare expansion was also subject to complex decisions regarding the creation of new slots taken at different authority levels. Although objectives and strategies were set at the federal level, municipalities were responsible for operational planning, objective implementation, and predicting childcare demand, and states oversaw the approval of proposals for new childcare centres by private non-profit organisations, a process that varies across counties (Barschkett, 2022; Bauernschuster et al., 2016). All in all, the reforms led to an expansion of highly subsidised childcare whose intensity varied considerably across regions.

Figure A.1 in Appendix A shows the geographical distribution of childcare coverage rates for children under three by county for 2002, 2011, 2014, and 2019. In 2002, rates were consistently less than 5% for most counties. The geographical variation of childcare coverage rates changed over time and ranged from 9.2% to 37.6% in 2011, and from 13.9% to 46.9% in 2014. The increase in childcare coverage rates also varied over time and across counties from 6.6 percentage points (pp) in counties with slow expansion intensity to 34.7pp in counties with fast expansion intensity between 2002 and 2011, slowing down from 1.5pp to 17.6pp between 2011 and 2014. In 2019, most counties exceeded 25% coverage.

our estimates are likely to be a lower bound of the effect of early childcare on maternal health.

[6] For couples with two children aged two and three, earning 67% of the average wage and using full-time centre-based childcare, net childcare costs as a percentage of household income were 13% in Germany in 2008, similar to the OECD average but considerably lower than other countries such as the US (31%) and the UK (22%) (OECD, 2023). By 2019, Germany's percentage dropped to 1%, which was significantly below the OECD average of 11%, the US's 29%, and the UK's 22%.

Figure 1: Childcare coverage rates for children under three (1994–2019)



Note: Trend of childcare coverage rates for children under three years old in West Germany between 1994 and 2019. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019), own calculations.

3 Data

Our data comprise administrative health records containing all outpatient care contacts with physicians, specialists, and therapists between 2010 and 2022 from all public health insurers in Germany. For our analysis, we only include outpatient care contacts between 2010 and 2019, excluding records from 2020 due to the Covid-19 pandemic.

Health insurance is mandatory for all citizens and permanent residents in Germany, resulting in universal health coverage through a combination of public and private health insurance schemes (Blümel et al., 2020). Almost 90% of the German population is covered by public health insurers, primarily funded by mandatory contributions from both employers and employees combined with tax revenues. Individuals with incomes exceeding a threshold (€62,550 in 2020) and certain professional groups (e.g., civil servants and self-employed) have the option to voluntarily enrol in a private health insurance company.

Physicians assign a standardised diagnosis to each outpatient contact for reimbursement by the patient's health insurance company. The 17 Associations of Statutory Health Insurance Physicians collect and forward these claims from all publicly health-insured individuals in Germany to the National Association of Statutory Health Insurance Physicians (*Kassenärztliche Bundesvereinigung*, henceforth KBV). The administrative data used in this study are derived from the claims received by the KBV.

3.1 Sample

Our main sample consists of publicly health-insured women who gave birth in West Germany between 2010 and 2018. While we have data on all births per mother during our sample period, we consider the mother's first observed child as our "focal" child and the main subject of our analyses.[7,8] We follow mothers using a unique patient ID based on their name and surname, date of birth, and postal code. Through this ID, we observe all outpatient diagnoses received by mothers in West Germany from 2010 until 2019.

To construct our panel of mothers, we follow Barschkett et al. (2022) in two steps. Firstly, for intensive margin outcomes, we count the occurrences of a diagnosis in a year. For extensive margin outcomes, we create a binary indicator to identify patients with at least one relevant diagnosis per year. Secondly, we aggregate the data annually so that each mother appears only once per year. As the panel is unbalanced, with mothers only appearing when they receive outpatient care, we address this by imputing zeros for years when mothers did not receive relevant diagnoses.[9]

In the analysis examining the impact of motherhood on maternal health, we adopt the approach of Melentyeva & Riedel (2023) and limit the sample to mothers who were aged between 23 and 32 at focal child's birth.[10] To be as closely as possible to a balanced panel and have three periods before and four after childbirth, we include mothers who gave birth to their focal child between 2013 and 2015. This yields a sample of mothers born between 1981 and 1992 amounting to 490,488 mothers.

When estimating the effects of public early childcare on maternal health, we are more lenient and include all mothers aged 15 to 49 at the time of the focal child's birth and

[7]Unless explicitly stated, we refer to the "focal" child when using the term "child".

[8]In line with the methodology by Melchior et al. (2017), we examine physician billing practices for pregnant women using the *GOP 01770* flat fee-per-case code. Physicians bill this code four times: once per quarter during pregnancy and up to eight weeks post-delivery. To identify women who gave birth between 2010 and 2018, we focus on women with four consecutive times billing of this code. Specifically, we include women whose first flat fee was billed between 1 April, 2009, and 31 March, 2018, and whose fourth flat fee was billed three quarters after, that is, between 1 January, 2010, and 31 December, 2018.

[9]Publicly health-insured mothers who gave birth in 2010–2018 but did not receive any outpatient care between 2010 and 2019 are not captured in the sample. However, 90% of women in Germany receive outpatient care at least once per year (RKI, 2014). Moreover, our dataset covers 79.8% of births in 2010–2018 in Germany and 87.8% of mothers in our sample have consistently received outpatient care each year since their first child was born. Therefore, the proportion of mothers not receiving any outpatient care should be minimal.

[10]Details on the empirical strategy and the importance of maternal age at childbirth in Section 4.1.

born between 1961 and 2003.[11] Our focus is on mothers' diagnoses starting when their child reached age one (i.e., when the family started being exposed to formal childcare), which occurred between 2011 and 2019. The sample then includes mothers' diagnoses when the focal child was aged 1–8 in 2011–2018 for children born in 2010, and aged 1–8 in 2012–2019 for those born in 2011, aged 1–7 in 2013–2019 for those born in 2012, and so on.[12] Our final panel includes around 340,000 mothers per focal child's birth cohort and a total of 3.1 million mothers.[13]

3.2 Health Outcomes

The KBV data include ICD-10 codes, which allow us to group maternal health by diagnosis. We group diagnoses based on the three-character ICD-10 code and assess three aspects of health: *physical health*, *mental health*, and *healthcare consumption*. While we are aware that our outcomes capture both health and healthcare use, we show that the diagnoses are a good proxy for health in Section 5.2.2.

Physical health is measured by communicable and non-communicable diseases. Communicable diseases comprise conditions that children catch frequently, for example in childcare centres according to previous evidence (Barschkett, 2022), and potentially transmit to their mothers: infections (ICD-10 codes A00–B99), respiratory diseases (ICD-10 codes J00–J99), and ear diseases (ICD-10 codes H60–H95).[14] Non-communicable diseases might be related to changes in labour market outcomes due to mothers leaving and rejoining the labour force, and in maternal healthy behaviours derived from different time constraints and activities as a mother. Additionally, childcare attendance can affect healthy behaviours through, for example, information transfer about health-promoting routines and a shift of time from parenting to non-parenting activities. As non-communicable diseases, we consider: obesity (ICD-10 codes E65–E68)[15], hypertension (ICD-10 codes

[11]To maximise the number of observations, we use a larger sample to estimate the effects of early childcare on maternal health. In a robustness check, we show that our results are similar when using the smaller sample as for the motherhood effects on maternal health in Section 5.2.2.

[12]We do not include mothers' diagnoses when their focal child was aged nine in 2019 for children born in 2010 because they cannot be compared with any other birth cohort in our model.

[13]Descriptive statistics of the two samples are reported in Appendix A.

[14]Physicians assign a unique ICD-10 diagnosis to each outpatient contact for coding any of these three conditions. However, communicable diseases are closely related and may have a causal relationship. For instance, certain respiratory or ear diseases might result from infections. Depending on physicians' coding practices, the three conditions could fall under all three sets of diagnoses. Therefore, it is crucial to investigate all three categories to disentangle the impact on communicable diseases.

[15]The observed obesity prevalence (10% of mothers, see Table A.2) slightly underscores the actual

I10–I15), back pain (ICD-10 codes M40–M54), and nutritional deficiencies (ICD-10 codes D50–D53, E00–E07, and E40–E64).

Becoming a mother as well as childcare attendance can also impact maternal well-being and trigger or ameliorate certain mental health disorders. We categorise *mental health* into two groups: mood-related disorders, such as depression (ICD-10 codes F30–F39), and stress-related disorders, including anxiety (ICD-10 codes F40–F48).

To measure communicable diseases, we count the number of diagnoses per mother and year as intensive margin measures. For non-communicable diseases and mental health disorders, we create binary indicators equal to one for women with at least one diagnosis per year and zero otherwise as extensive margin measures. These definitions are analogous to Barschkett (2022), ensuring comparability with her study.

We assess *healthcare consumption* by calculating treatment cases and healthcare costs. A treatment case is defined as the treatment of an insured patient billed by a doctor to a public health insurance fund within a quarter.[16] Quarterly treatment cases are aggregated at the annual level. Finally, healthcare costs billed by physicians in a quarter are also aggregated at the annual level and adjusted to 2009 fees.

3.3 Childcare Coverage Rates and Control Variables

The KBV data do not contain information on childcare enrolment or attendance. For the analysis of the effect of the childcare expansion, we therefore assign each mother the average childcare coverage rate for children under three in the county where she resided when her focal child was aged one. The childcare coverage rate is defined as the number of children enrolled in childcare centres or with childminders divided by the total number of children residing in a county in a given year. The German Youth Institute reported childcare coverage rates for children aged 1–2 in 1994, 1998, and 2002, and the German Statistical Office has published annual data since 2006. Our analysis focuses on the 324 counties in West Germany, excluding Berlin.

Lastly, the KBV data include a few individual-level characteristics to be used as controls

incidence in the population, as physicians not necessarily record an obesity diagnoses when weight is not relevant. In a comparable sample of mothers surveyed in the Pairfam survey (for details, see Section 5.2.1) 12.7% of mothers report a body mass index above 30, which is equivalent to being obese.

[16] A mother has one treatment case in a quarter if she visits the same doctor in that specific quarter regardless of the number of visits, but two treatment cases if she visits two different doctors.

such as mother's age and birth cohort, number of children per mother between 2010 and 2019, focal child's age and birth quarter and cohort, county of residence, and year of outpatient care attendance.[17]

4 The Effects of Motherhood on Maternal Health

In this section, we analyse the effects of motherhood on maternal health. We outline the empirical strategy in Section 4.1 and report the results along with sensitivity analyses in Section 4.2.

4.1 Empirical Strategy

To estimate the effects of motherhood —mostly on labour market outcomes—, event study approaches as proposed by Kleven et al. (2019b) are well-established (e.g., Andresen & Nix, 2022; Kleven et al., 2023). The rationale behind this approach is that although fertility choices are not exogenous, childbirth should generate changes in the outcome that are arguably orthogonal to the unobserved determinants of the outcome. However, even under this assumption, the approach can produce biased estimates as outlined by the emerging literature on TWFE models with staggered roll-out and heterogeneous treatment effects (see the summary by de Chaisemartin & D'Haultfoeuille, 2023). New estimators circumvent the issues related to using "forbidden comparisons" in these settings, i.e., using already-treated units as controls, by constructing more suitable control groups. For example, Cengiz et al. (2019) propose a *stacked* DiD estimator where not-yet treated units, i.e., women who give birth at a later point, serve as the control group. This approach though only yields valid estimates under the assumption that younger and older first-time mothers are comparable and follow similar trajectories in the absence of childbirth. Melentyeva & Riedel (2023) demonstrate that this assumption is implausible given that age is a critical determinant of fertility and labour market outcomes as well as of health. Women who give birth in their 30s are likely on different career and health trajectories as women who give birth in their early 20s. Hence, older first-time mothers are not necessarily a good control group for younger first-time mothers. Instead, the authors propose an adaptation of Cengiz et al. (2019)'s stacked DiD approach where the control

[17] Despite being potentially a *bad control*, we include the number of additional children per mother in our models to account for the differences across family sizes. Nonetheless, our main results are robust when excluding this control and are available upon request.

group consists only of women that give birth at similar ages to the treatment group.

To ensure comparability of treated and control units, we follow Melentyeva & Riedel (2023) and implement a stacked DiD approach where the control group consists only of slightly older mothers. Specifically, we build for each maternal-age-at-birth cohort s a sub-panel that consists of all mothers who gave birth to her focal child at a given age plus women who gave birth to their focal child up to five years later, i.e., each sub-panel includes mothers aged $[a, a+5]$ where a is maternal age. We include maternal-age-at-birth cohorts 23 to 32 and three pre- and four post-childbirth years.[18] We do not consider younger and older maternal-age-at-birth cohorts, as mothers who give birth at earlier and later ages differ to mothers giving birth close to the average maternal age at first childbirth and are therefore not comparable.

We then estimate the following DiD model in the form of a TWFE regression for each sub-panel:

$$y_{iast} = \sum_{\substack{l=-3 \\ l \neq -2}}^{4} \beta_l^s \times \mathbf{I}[a - s = l] \times \mathbf{I}[a_i^0 = s] + \sum_{\substack{l=-3 \\ l \neq -2}}^{4} \alpha_l^s \times \mathbf{I}[a - s = l] + \delta kids_{ia} + \gamma_a + \lambda_i + \theta_t + \varepsilon_{iast} \quad (1)$$

where y_{iast} represents the health of mother i at age a who belongs to maternal-age-at-birth cohort $s \in [23, 32]$ and gave birth to her focal child in year t. $\mathbf{I}[a-s = l]$ is an indicator for the years relative to the maternal-age-at-birth cohort. $\mathbf{I}[a_i^0 = s]$ identifies all women that are treated in the respective sub-panel, i.e., that actually gave birth to their focal child at age a_i^0 coinciding with the maternal-age-at-birth cohort s. This approach allows the treatment to vary across sub-panels, i.e., mothers can be in the control group in some sub-panels and in the treatment group in the sub-panel of her respective maternal-age-at-birth cohort. β_l^s are the coefficients of interest and they identify the effect of motherhood on maternal health l years away from first childbirth, where $l = -2$ is the reference category to allow for an anticipation effect on health during pregnancy. Additionally, we control for the number of additional children per mother, $kids_{ia}$, and age, γ_a, individual, λ_i, and

[18]Given that our data cover the years from 2010 to 2019, it is not possible that each sub-panel is fully balanced. To get as closely as possible to a fully balanced panel, we include as treated units only mothers who gave birth to their focal child between 2013 and 2015, while control units are also mothers who gave birth to their focal child after 2015. Due to this span of data, we can only use three years before and four years after childbirth.

year, θ_t, fixed effects. Standard errors are clustered at the individual level.

We stack these TWFE regressions for all sub-panels across maternal-age-at-birth cohorts and employ the corrective sample weights developed by Wing et al. (2024) in order to correct for the bias derived from weighting treatment and control trends differently across sub-panels in conventional stacked DiD regressions.[19] Lastly, we divide the stacked coefficients identifying the motherhood effects by the average health of treated mothers before pregnancy to present the results as percentages.

The main identifying assumption behind the stacked DiD approach is that health outcomes of treated and control mothers would have evolved in parallel in absence of childbirth. We provide evidence for the plausibility of this assumption by showing that the estimates of the effect of motherhood on maternal health are close to zero before pregnancy ($l = -3$) in Section 4.2. Furthermore, to verify that our estimates do not just reflect age or time trends, we assign placebo births to a sample of men and non-mothers who are comparable in terms of age and birth cohorts to our sample of mothers in Section 4.2.[20,21] If our estimates were truly capturing the motherhood effect on maternal health, the coefficients of placebo tests should be close to zero for all l.

4.2 Results

In this section, we present and discuss our results for the effects of motherhood on maternal health and test their robustness through a set of sensitivity analyses.

4.2.1 Main Results and Discussion

In Figure 2, we plot the weighted average across maternal-age-at-birth cohorts depicting the impact of motherhood on maternal health compared to the average health outcome before pregnancy (two years prior to childbirth).

Communicable diseases

Mothers experience an increase in infections during pregnancy, with a rise of approxi-

[19] Our results are robust to stacking the TWFE regressions for sub-panels across maternal-age-at-birth cohorts without employing corrective sample weights and are available upon request.

[20] Following Ahammer et al. (2023), we assign placebo childbirth events to men and non-mothers by approximating the factual distribution of age at first childbirth by a log-normal distribution within cells of mothers' birth cohorts.

[21] In our data, we cannot distinguish men with and without children and non-mothers are any woman who did not give birth within our observation period.

mately 10% compared to the number of infections two years prior to childbirth. However, in the year of and following childbirth, mothers experience a decrease in infections which could be attributed to the adoption of protective measures, such as spending more time at home to avoid infections. The patterns for respiratory and ear diseases resemble those of infections, except for an immediate decrease in the number of diagnoses prior to childbirth. From two years after giving birth, mothers experience more infections and respiratory and ear diseases compared to pre-pregnancy levels. This increase may be linked to mothers starting to re-interact with others outside the household and children contracting infectious diseases, potentially in childcare centres as evidenced in Section 5.2, and transmitting them to their mothers.

Non-communicable diseases

Figure 2 suggests that there is an initial spike in the prevalence of obesity, hypertension, back pain, and nutritional deficiencies around the time of birth. However, these conditions quickly return to at least pre-birth levels. The spikes in these conditions during pregnancy and childbirth may be linked to physiological, hormonal, and psychological changes in women's bodies, as well as more contacts with the outpatient care system. Instead, mothers experience improvements once the child reaches age one for all non-communicable diseases. The post-birth improvements may be attributed to either better overall health related to, for example, healthier behaviours learnt after having children, or changes in mothers' health-seeking behaviours, such as increased engagement with maternity or children healthcare services but less with other services due to a shift towards prioritising the child's well-being.

Mental health disorders

During pregnancy, there is a slight increase in the incidence of mood-related disorders (including depression). Throughout childbirth and the first year postpartum, there is a significant decrease in the prevalence of mood-related disorders. This reduction may be attributed to the positive emotional impact of having a child or to a reduced necessity for diagnosing depression, given that certain antidepressants pose risks during pregnancy and breastfeeding (Ahammer et al., 2023). After the child reaches the age of one, there is an observed positive trend, resulting in an increase in the incidence of mood-related disorders of approximately 5 and 15% at child ages three and four, respectively. This rise might be related to the psychological demands of motherhood in the long run, reflecting the considerable emotional and physical investments mothers make in childcare. These findings align with Ahammer et al. (2023)'s research on antidepressant usage but contrast with Dehos et al. (2024)'s results, who did not find a rise in depression diagnoses among all mothers. This discrepancy might stem from event studies underestimating the impact of motherhood (Melentyeva & Riedel, 2023).

The prevalence of stress-related disorders (including anxiety) bursts during pregnancy and childbirth. This increase may be explained by the numerous responsibilities associated with this period, coupled with concerns about the health of both the mother and the unborn child. After childbirth, the prevalence of these disorders decreases but follows a positive trend, similar to mood-related disorders, which eventually returns to pre-pregnancy levels by the time the child reaches the age of four.

Healthcare consumption

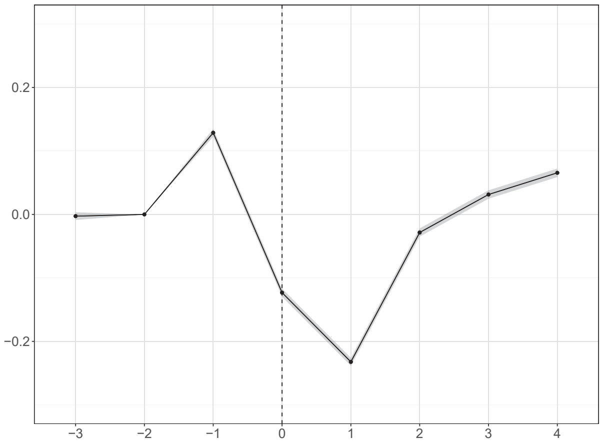
Similar to the trends observed in non-communicable diseases, mothers experience an increase in treatment cases and healthcare costs around the time of childbirth. However, two years postpartum, healthcare consumption declines to slightly lower levels compared to the pre-birth period. This consistent decrease in healthcare utilisation may be attributed to either an improvement in overall health or shifts in healthcare-seeking behaviour, such as prioritising the child's well-being over the mother's. If the latter is the predominant factor and mothers are refraining from seeking medical attention, this could result in adverse long-term outcomes, including more severe diagnoses.

4.2.2 Sensitivity Checks and Heterogeneity Analyses

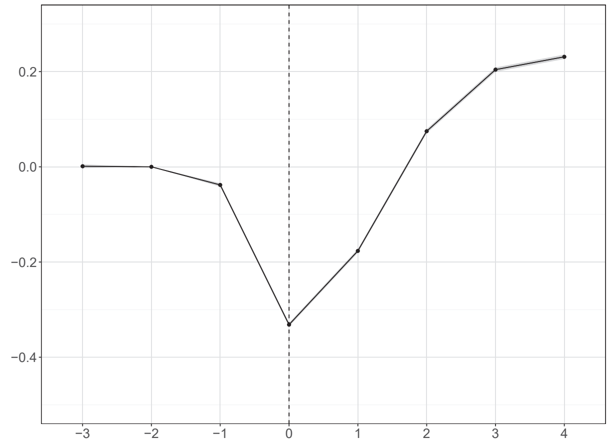
As outlined in Section 4.1, the parallel trend assumption needs to hold to ensure that the approach in equation (1) generates valid estimates. By examining the pre-trends in Figure 2, it can be observed that the coefficients at period $l = -3$ for all outcomes are (close to) zero. This provides evidence supporting the plausibility that health outcomes for treated and control mothers would have evolved in parallel in absence of giving birth. Additionally, to verify that our estimates do not solely reflect some age or time trend, we run placebo models for non-mothers and men. The estimation results of equation (1) for mothers, non-mothers, and men are presented in Figure B.1. A comparison between these results for mothers and the placebo tests for non-mothers and men reveals a consistent

Figure 2: The effects of motherhood on maternal health

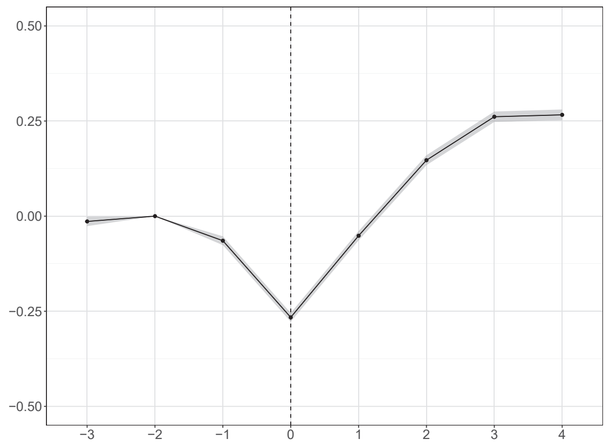
(a) Infections



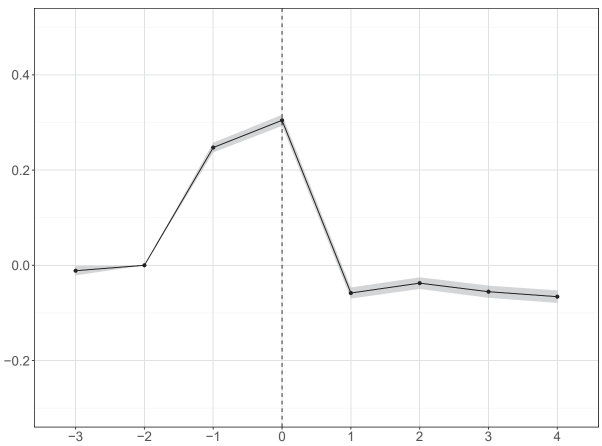
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

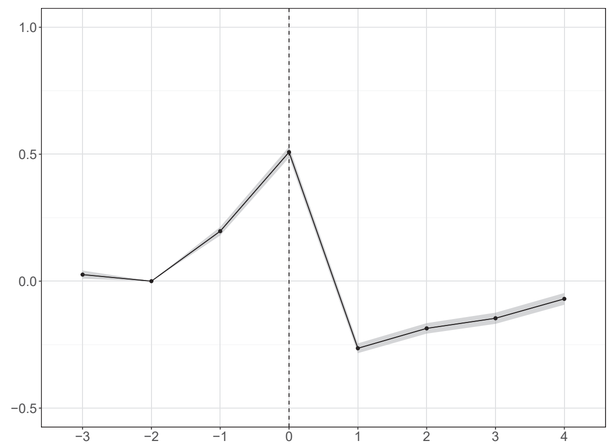
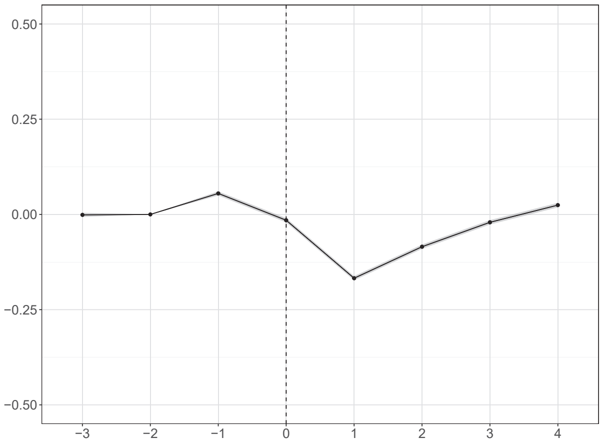
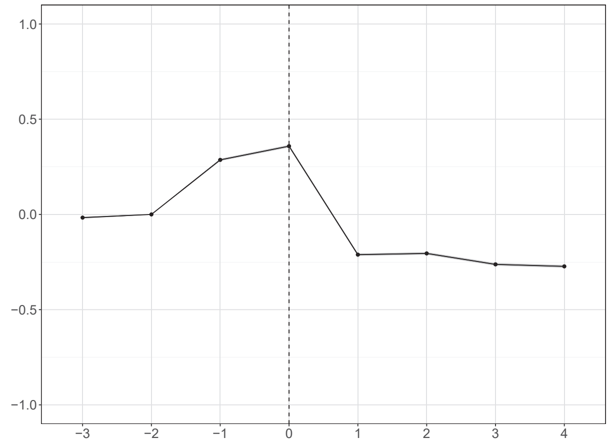


Figure 2: The effects of motherhood on maternal health (*continued*)

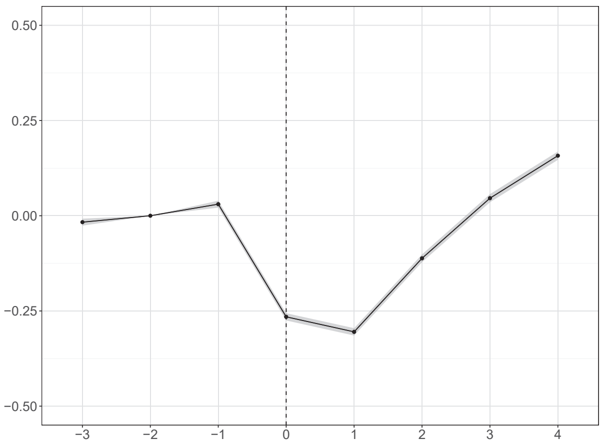
(f) Back pain



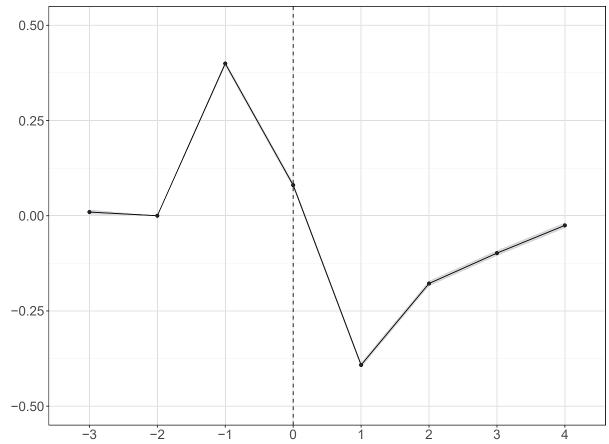
(g) Nutritional deficiencies



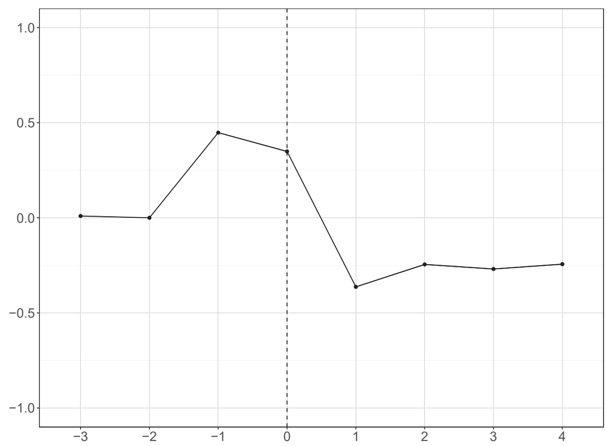
(h) Mood-related disorders



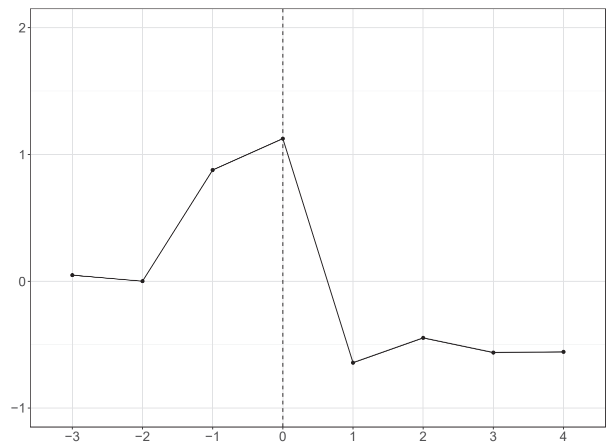
(i) Stress-related disorders



(j) Treatment cases



(k) Healthcare costs



Note: Pre- and post-birth estimates of the effects of motherhood on maternal health outcomes for mothers based on equation (1). The graphs plot the weighted average of the maternal-age-at-birth cohort-specific estimates relative to the pre-birth average of the health outcomes in year $l = -2$. *Source*: KBV (2010–2019), own calculations.

flat trend for non-mothers and men, while there are noticeable changes around childbirth for mothers. These patterns suggest that our findings are not simply reflecting time or age trends, but rather the effects of motherhood on maternal health.

In our main specification, we use as controls not-yet-treated women who give birth being up to five years older. In Figure B.2, we show that our results are robust to shrinking and widening this five-years age-window to four- and six-years, respectively. Moreover, we also use a four-years age-window for maternal-age-at-birth cohorts 23 to 30 given that first-time pregnant women who give birth from age 35 are considered of high risk and are included in the control groups of maternal-age-at-birth cohorts 31 and 32. Figure B.2 shows that the results of this alternative sample are similar to our main findings.

In Figure B.3, we present our main results compared to the conventional approach relying on event studies to estimate the effects of motherhood proposed by Kleven et al. (2019b). The results show that —similar to the findings on labour market outcomes by Melentyeva & Riedel (2023)— the conventional approach largely estimates biased effects of motherhood.[22] In Figure B.4, we also estimate the results for first-time mothers with an only child in our observation period given that some of our findings might be amplified by the fact of having more than one child. The results in Figure B.4 closely resemble those in Figure 2 with the effect of motherhood on maternal health for only-child families being slightly larger.

As pointed out by Melentyeva & Riedel (2023), younger and older first-time mothers are on different career trajectories before giving birth. Since this might be also the case for health, our main estimation strategy follows Melentyeva & Riedel (2023) and only includes women who give birth at slightly older ages in the control group. In Figure B.5, we present the results separately for each maternal-age-at-birth cohort. The graphs show that there is heterogeneity (without a systematic pattern) across cohorts and health outcomes, highlighting the importance of accounting for the differences in the estimation.

5 The Effect of Early Childcare on Maternal Health

In this section, we turn to the effect of public early childcare on maternal health. We describe our empirical approach and identification strategy in Section 5.1, and present

[22]Estimates for the conventional approach in Figure B.3 closely resemble those in Dehos et al. (2024).

the main results along with robustness checks and heterogeneity analyses in Section 5.2.

5.1 Empirical Strategy

Our aim is to estimate the effect of early childcare availability on maternal health. We exploit the temporal and spatial variation of the expansion of highly subsidised formal childcare for children under age three in West Germany. The childcare expansion led to a gradual rise in childcare coverage rates from the mid-2000s until 2014 with a subsequent notable deceleration as illustrated in Figure 1. However, Figure A.1 shows substantial variation in the pace of expansion across counties. Mothers were exposed to the childcare expansion with varying degrees of intensity depending on when their children were aged 1–2 and where they lived at that time. Similar to previous studies analysing the impact of the childcare expansion in West Germany (e.g., Bauernschuster et al., 2016; Müller & Wrohlich, 2020; Sandner et al., 2024), we leverage this variation in treatment intensity across counties and time, and regress maternal health on childcare coverage rates controlling for county and birth cohort fixed effects in a TWFE model. We estimate the following main specification:

$$y_{mcdty} = \beta CC_{ct} + \mathbf{X}'_{my}\boldsymbol{\delta} + \boldsymbol{\mu}_d + \boldsymbol{\theta}_t + \boldsymbol{\lambda}_y + \varepsilon_{mcdty} \qquad (2)$$

where y_{mcdty} is the health outcome of mother m who gave birth to her focal child in t (2010–2018), lived in county c when her focal child was aged one, and resided in county d when she attended outpatient care in year y (2011–2019).[23] CC_{ct} is the average childcare coverage rate for children under three when her focal child was aged 1–2.[24,25] $\mathbf{X}_{my}$ is a vector of control variables including mother's age, number of additional children per mother between 2010 and 2019, and binary variables for the focal child's birth quarter. $\boldsymbol{\mu}_d$ are county fixed effects where the mother resided when she attended outpatient care to control for systematic time-invariant differences in county characteristics, $\boldsymbol{\theta}_t$ are cohort

[23] Given the skewness of healthcare costs, we use healthcare costs in logs in equation (2) (Jones et al., 2015).

[24] Due to data restrictions, equation (2) exploits the spatial and temporal variation in childcare coverage rates induced by the childcare expansion between 2011–2019. Despite not covering the first years of the childcare expansion, the variation across counties and over time in this period was substantial as depicted in Figures 1 and A.1 and Table A.2.

[25] Our sample comprises mothers who gave birth in 2010–2018. We assume that mothers were initially exposed to formal childcare when their focal child was aged 1–2 in 2011–2019. In our main specification, we therefore assume that the first observed births in our sample period (birth of the focal child) are the first actual births of the mothers under study. However, some mothers may have given birth before 2010 and been exposed to formal childcare before 2011. We address this in a robustness test in Section 5.2.2.

of birth fixed effects of the focal child to account for common factors of all mothers whose focal child was born in the same year, and $\boldsymbol{\lambda}_y$ are year fixed effects to capture any secular trend in outpatient care. ε_{mcdty} is the error term. Standard errors are clustered at the county level to allow for serial correlation in maternal health outcomes.

Given the continuous nature of our treatment leading mothers to face varying levels (or doses) of exposure to the childcare expansion, the parameter β is interpreted as the slope of the dose-response function of the relation between early childcare availability and health outcomes of all mothers, irrespective of whether their children attended early childcare. β measures how increasing the childcare coverage rate for children under three by 1pp affects maternal health on average. In the results, we show the estimates of parameters in equation (2) for a 10pp increase in childcare coverage rates both by focal child's age and aggregating ages 1–8.[26]

Our identification strategy relies on four key assumptions: (1) full take-up of childcare slots, (2) the *strong* parallel trends assumption, (3) the childcare expansion being exogeneous, and (4) no selective migration. First, the expansion of childcare slots should have led to an increase in the enrolment of children under three in public childcare. Germany has been characterised by an excess demand for childcare at ages 1–2 even after the childcare expansion (Kayed et al., 2022; Müller & Wrohlich, 2016). Given this excess demand and that data on childcare slots for children under three is unavailable, we assume that the childcare reforms expanded the supply of childcare slots and induced a full take-up of new slots. To verify that our measure of childcare expansion (i.e., childcare coverage rates) is related to supply-driven indicators, we regress childcare centres and slots for ages 1–6 on childcare coverage rates for children under three controlling for county and year fixed effects in Table C.1. The estimates reveal that the increase in childcare coverage rates led to a rise in childcare centres and slots, reflecting the construction of new facilities and the expansion of existing ones to accommodate the additional supply of childcare slots.

Second, the average slope of a heterogeneous dose-response function is identified under a stronger version of the parallel trends assumption. The *strong* parallel trends assumption claims that the average change in health for mothers with different doses of exposure to the childcare expansion would have had the same evolution, on average, had they

[26]In our regression for all ages, we weight observations by the inverse proportion of mothers in each age group relative to the total sample size to account for decreasing subsample sizes as child's age increases.

received the same dose (Callaway et al., 2024). While alternative estimators for continuous treatment definitions and formal methods to test the strong parallel trends assumption are under development, we conduct a series of tests to demonstrate that our setting is consistent with this assumption. To begin with, we follow Lindo et al. (2020) and compare the evolution of maternal health outcomes before they were exposed to the childcare expansion (i.e., before her focal child turns one) in counties with varying treatment doses. Counties are divided into four groups according to their treatment doses and based on quartiles of the distribution of increases in childcare coverage rates between 2011 and 2014. Figure C.1 shows that the evolution of maternal health up to nine years before the first birthday of their focal child exhibits similar trends across counties with low, middle, high, and very high treatment doses. Figure C.2 also provides graphical evidence of pre-reform parallel trends for childcare coverage rates for children under three. All in all, this evidence supports our identifying assumption that county-specific trends of maternal health outcomes and childcare coverage rates in West Germany would have evolved in parallel in the absence of differential changes in early childcare availability. Moreover, we follow Schmidheiny & Siegloch (2023)'s approach and employ an event study with leads and lags as discussed in Section 5.2.2.

Under the strong parallel trends assumption, β recovers a weighted average of slopes when employing TWFE models. According to Callaway et al. (2024), these weights are positive and sum to one, with TWFE regressions placing the most weight to observations around the mean dose. When the dose distribution is symmetric and closer to normal, the authors argue that the TWFE weights allow β to well-approximate the average causal response parameter. Following Andersen et al. (2023) and Parker & Vogl (2023), we examine whether the histogram of childcare coverage rates assigned to mothers in our sample approximates a normal distribution. Figure C.3 plots these histograms alongside a normal distribution with mean and standard deviation derived from our distribution of childcare coverage rates by focal child's age and aggregating ages 1–8. The figure illustrates that our dose distribution approaches normality, thereby supporting the idea that our results provide a reliable estimate of the average causal response parameter.[27]

[27] Studies by de Chaisemartin et al. (2024a,b) are also developing new estimators for continuous treatment definitions. The authors assume that the treatment of certain units changes over time (the switchers) while the treatment of other units remains constant (the stayers) or experiences infinitesimally small changes (the quasi-stayers). However, this assumption appears implausible in our setting where treatment changes across time and counties are significant and far from negligible.

Third, our identification strategy does not entail the childcare expansion to be exogenous to time-invariant county characteristics given that we control for county fixed effects ($\boldsymbol{\mu}_d$) in equation (2). It, however, requires that the childcare expansion be orthogonal to time-variant determinants of maternal health. A threat to our identification is contemporaneous policies that were correlated with the childcare expansion. Most of these policies were implemented at the federal or state level (Sandner et al., 2024). Federal-level policies are common to all mothers regardless of county of residence and thus taken into account by cohort of birth ($\boldsymbol{\theta}_t$) and year ($\boldsymbol{\lambda}_y$) fixed effects. To account for state-level policies, we add to our main specification state-year fixed effects as a robustness check. However, county-specific time-variant determinants might still be correlated with the childcare expansion and maternal health. We prove that the childcare expansion was exogenous to these determinants and that they did not evolve differently across counties by showing that the pre-policy trends of county characteristics were similar in counties with varying treatment doses in Figure C.4.[28] We further check that time-variant county characteristics do not lead to omitted variable bias by adding them as controls in Section 5.2.2.

Fourth, the last assumption is the absence of selective migration across West German counties. Families (or mothers) may have moved across counties in search of available childcare slots. If such migration was correlated with maternal health (e.g., wealthier families being healthier and more informed about where available slots are), our results would be biased. We rule out this possibility by excluding mothers who moved across counties when their focal child was younger than three in a robustness check.

5.2 Results

In this section, we report and discuss our results for the effect of public early childcare on maternal health. We then provide a wide range of robustness checks to test the sensitivity of our results and a set of heterogeneity analyses.

5.2.1 Main Results and Discussion

In Figure 3, we plot the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. We break down the results by the age of the focal child and also aggregate them for children aged 1–8.

[28] County characteristics are economic and political indicators, demographic factors, and childcare measures.

Communicable diseases

Mothers with higher exposure to the childcare expansion experience an increase in infections and respiratory diseases when their focal child is aged 1–2. A 10pp rise in childcare coverage rate amounts to 0.02–0.03 more infections (or 3.9–8% more compared to sample means) and 0.03–0.04 more respiratory diseases (or 1.5–3.9% more). These findings align with the increase in infections and respiratory diseases for 1–2-year-olds in Barschkett (2022) and align with previous evidence showing that children may catch certain communicable diseases at childcare centres which are transmitted to other family members (Schlinkmann et al., 2018). This supports the increase in communicable diseases during the first years after childbirth, as discussed in Section 4.2. Once children begin interacting with others outside the household, they catch and transmit certain infectious diseases to their mothers, a phenomenon exacerbated by attendance at childcare facilities. Another transmission channel might happen at the workplace since West German mothers joined the labour force (Müller & Wrohlich, 2020).

This increase vanishes from age three, although mothers are diagnosed with 0.02 fewer respiratory diseases (or 1.1–1.3% less) when their child is aged 4–5. Unlike the substitution effect from elementary school to early childcare ages found by Barschkett (2022), the effects on maternal infections and respiratory diseases at early ages are smaller in magnitude and the impact fades out at older ages. This may be attributed to mothers having higher immunity levels than their children, who experience a shift in immunity development from elementary school age to early childcare age. When aggregating ages 1–8, we find a rise only in infections (around 0.01 or 1.5% more infections). No consistent effect on ear diseases is observed across ages, except for a small reduction of 0.01 (or 2–2.5% less) at ages 3–4.

Non-communicable diseases

Figure 3 suggests that the childcare expansion generally reduces the prevalence of obesity, hypertension, and back pain in mothers, thus amplifying the effect of motherhood on non-communicable diseases. There is a positive (negative) impact on obesity and hypertension when the focal child is one (two), but this effect is smaller compared to older ages. After age two, the probability of being diagnosed with obesity decreases by approximately 0.01pp (or 7–10.9% less compared to sample means) and with hypertension reduces by

0.01pp (or 8.3–10% less). Similarly, mothers have 0.01–0.02pp lower probability of being diagnosed with back pain (or 3.3–5.6% less) when their focal child is aged 2–8. The aggregated effects for ages 1–8 on obesity, hypertension, and back pain exhibit similar magnitudes to the significant age-specific effects. Although pointing to a drop across all ages, the estimates on nutritional deficiencies are indistinguishable from zero.

These beneficial health effects may be attributed to improved labour market outcomes and healthy behaviours. To investigate these two mechanisms, we use the Panel Analysis of Intimate Relationships and Family Dynamics (Pairfam). Pairfam is an annual representative survey which includes self-reported information on family characteristics including employment status, health outcomes, type of childcare, and socioeconomic background.[29] We focus on mothers residing in West Germany whose first child was born in 2007–2018 and aged 1–8 in 2009–2019. We then estimate the association between early childcare attendance below the age of three of the first child and maternal labour market outcomes and healthy behaviours by employing linear regressions and weights calculated through entropy balancing. To mimic equation (2), we control for age of the mother, number of children per mother, and fixed effects for wave, cohort and month of birth of the first-born, and state of residence.[30] While these estimates do not imply causation, they may provide insights into potential pathways to explain our results. The associations are reported in Tables C.2 and C.3 for all ages as well as age groups 1–2 and 3–8.

Regarding labour market outcomes, Table C.2 illustrates a positive association between early childcare attendance and maternal employment at all ages. This finding aligns with previous evidence indicating that maternal labour force participation increased following the childcare expansion in West Germany both in the short and long run (Huber & Rolvering, 2023; Müller & Wrohlich, 2020). Furthermore, the estimates suggest that early childcare attendance is negatively associated with blue-collar jobs, which are often more physically demanding, hazardous to the health and lower paid. As shown in the last two columns of Table C.2, early childcare attendance is also positively associated with household income. The rise in maternal employment and earnings might have raised maternal-to-paternal wages and mothers' bargaining power within the household (Sandner

[29]We rule out changes in health-seeking behaviour for non-communicable diseases as a mechanism since the results when using self-reported health are close to our main results (see Section 5.2.2).

[30]Some family characteristics are reported biennially or triennially. To maximise the number of observations, we impute the previous available value to these missing characteristics.

et al., 2024), who devote a higher share of the household budget to calorie- and protein-rich diets and human capital goods such as health (Thomas, 1993). Moreover, the persistent health benefits for non-communicable diseases might stem from stimulating both short- and long-term maternal employment resulting in higher family income, which has been associated with healthier behaviours (Cawley & Ruhm, 2011).

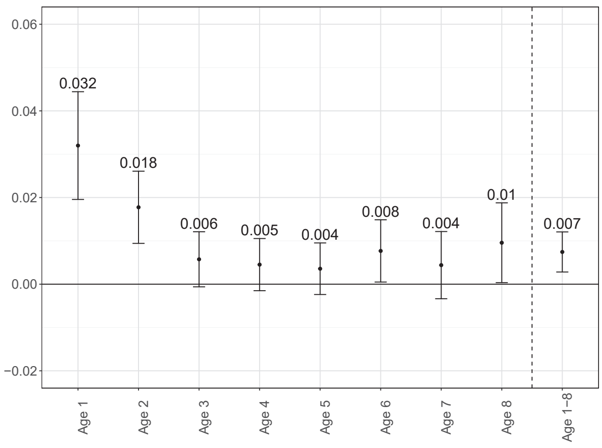
Table C.3 reports a boost in healthy behaviours, including less sedentary activities, smoking, and alcohol consumption and an increase in exercising, as children grow older. Besides the relation between household income and healthy behaviours, there are additional explanations for these improvements. Early skill learning shapes the evolution of health capital (Cunha & Heckman, 2007) and children may convey health-promoting habits learnt in formal childcare to their families. Likewise, information exchange occurs through parent-staff communication and social interactions with other parents in childcare settings (Endsley & Minish, 1991; Small, 2009) or in the workplace. If this exchange involves information on healthy habits, it may indeed influence mothers' behaviours toward a healthier lifestyle. Non-working mothers might instead have more leisure time to focus on their physical well-being, such as exercising, while their children attend childcare.

Mental health disorders

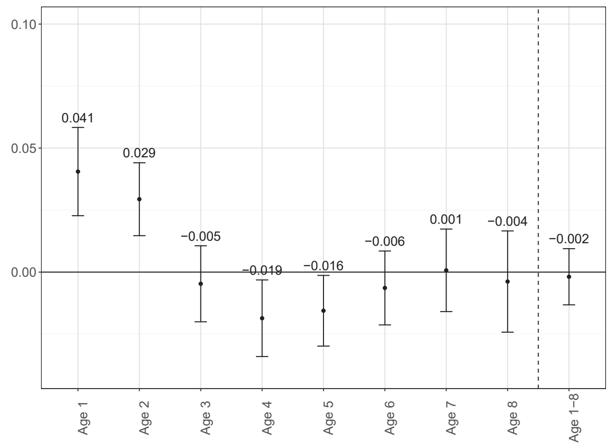
We observe no effects on the probability of being diagnosed with mood- or stress-related disorders. This absence of effect might stem from a genuine lack of impact on maternal mental health, similar to findings in children's mental health (Barschkett, 2022). Alternatively, positive and negative mechanisms might cancel each other out. Childcare attendance could trigger mother's mental health disorders, for example, through maternal separation anxiety, feelings of guilt related to allocating less time to children, especially in a society with traditional gender norms like West Germany (Campa & Serafinelli, 2019), or work-family conflicts, which are associated with poorer health (Bianchi & Milkie, 2010; Nilsen et al., 2017). Conversely, it may improve them, for instance, via enhancing child development (Felfe & Lalive, 2018) if parents have altruistic utility functions (Becker & Barro, 1988; Doepke et al., 2019), shifting time to more enjoyable activities, or, if joining the labour force, by fulfilling career aspirations (Carr, 1997), widening the family network by interacting with colleagues (Holt-Lunstad, 2022), and raising mothers' earnings and influence within the household (Sandner et al., 2024). Compared to our null effects, stud-

Figure 3: Effect of the childcare expansion on maternal health outcomes

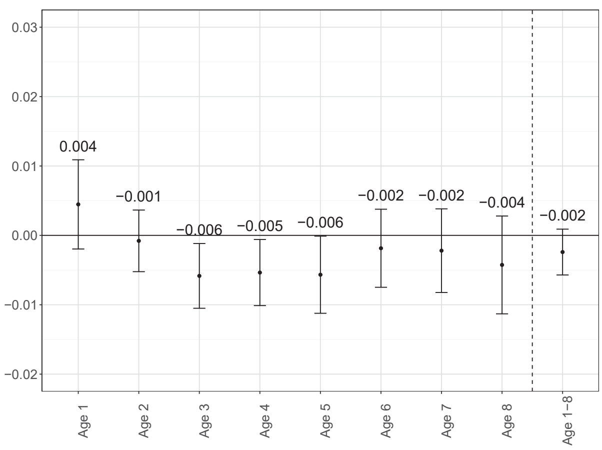
(a) Infections



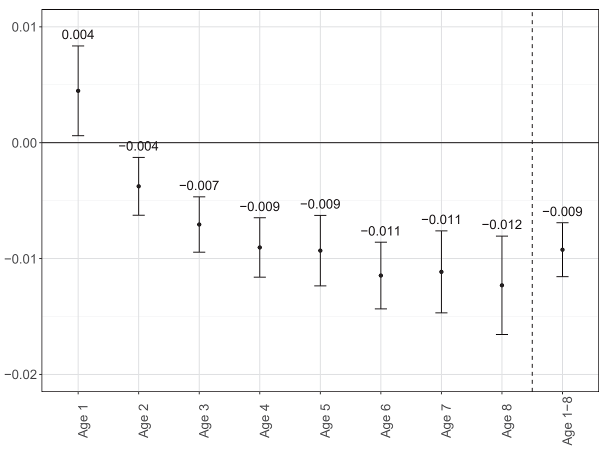
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

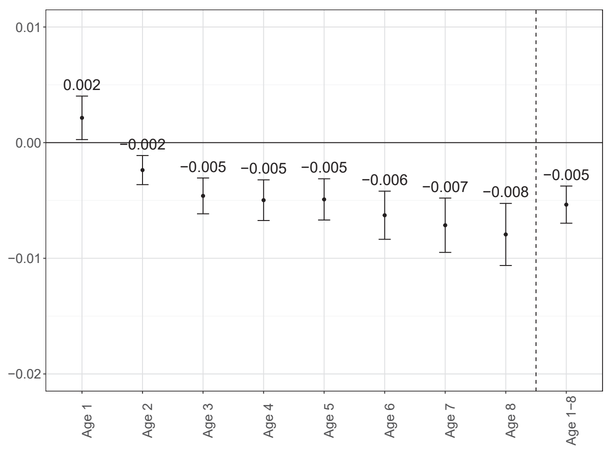
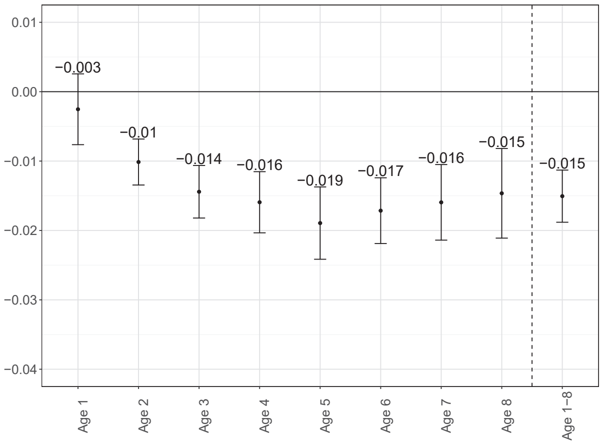
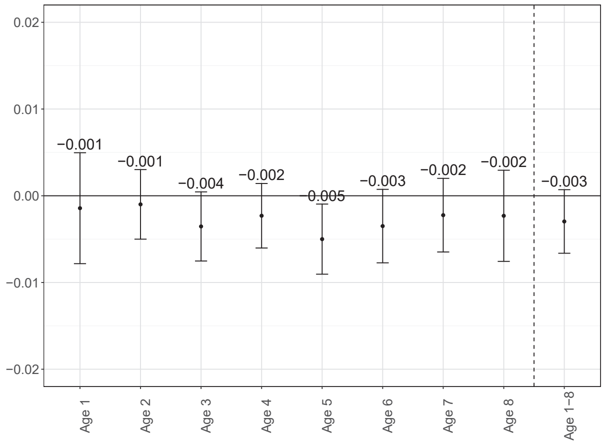


Figure 3: Effect of the childcare expansion on maternal health outcomes (*continued*)

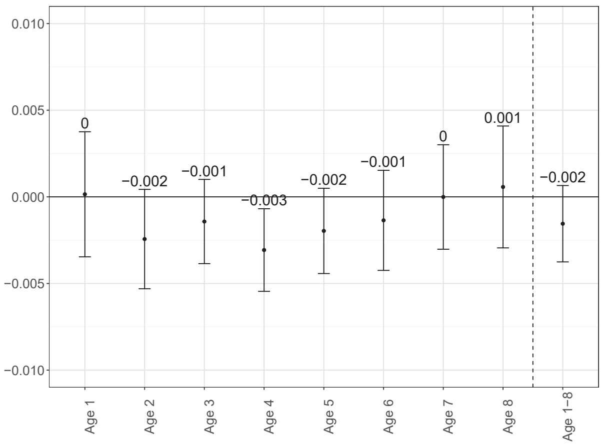
(f) Back pain



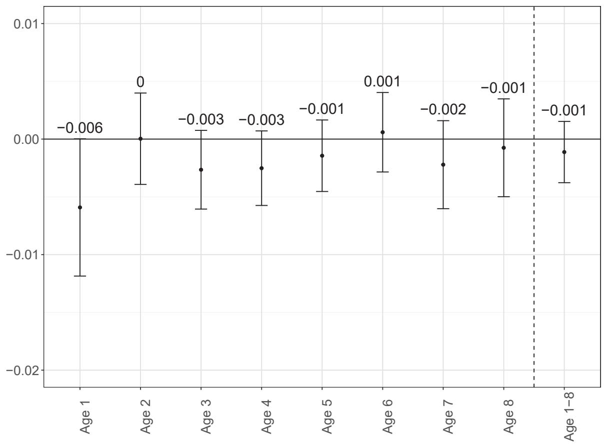
(g) Nutritional deficiencies



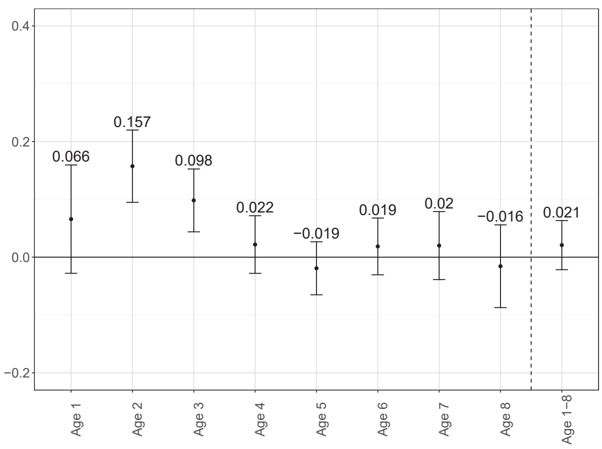
(h) Mood-related disorders



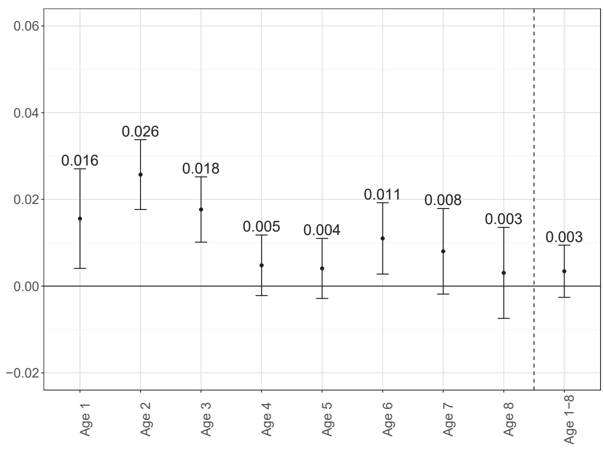
(i) Stress-related disorders



(j) Treatment cases



(k) Healthcare costs



Note: Age-specific and aggregated estimates of the effects of the childcare expansion on health outcomes for mothers with a 1–8-year-old focal child based on equation (2). The graphs plot the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. The estimates are plotted together with their 95% confidence intervals from robust standard errors clustered at the county level. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

ies in the US and Canada indicated short-term detrimental effects on maternal mental health, although these effects vanished when children reached age five (Baker et al., 2008; Haeck et al., 2022). However, these studies are not directly comparable to ours due to differences in childcare policies, data sources, and identification strategies.

Healthcare consumption

Lastly, the childcare expansion increases treatment cases for mothers when their focal child is younger, in particular at ages two and three. A 10pp rise in childcare coverage rate leads to 0.16 and 0.10 more treatment cases (or 1.7% and 1% more compared to sample means) at ages two and three, respectively. The significance of the results diminishes for older ages and aggregated ages 1–8. The estimates for healthcare costs reveal a similar trend: positive for 1–3-year-olds (1.6–2.6% more) but generally insignificant for older ages and aggregated ages 1–8. More treatment cases and healthcare costs at early ages could be interpreted as a decline in maternal health potentially due to the increase in communicable diseases, which require more intensive use of primary care resources than non-communicable diseases (Finley et al., 2018; ZI, 2015). This interpretation contrasts with the null effects from Baker et al. (2008) and Haeck et al. (2022) in Canada. Moreover, Barschkett (2022) shows an increase in treatment cases for children at early childcare ages, followed by a decrease at older ages. Given that German women experience the primary responsibility for family obligations such as childcare (EIGE, 2021), Barschkett (2022)'s and our findings suggest an intensification of family workload along with own sickness, particularly during the early years of motherhood. Our results could also imply a different time constraint when employed, revealing that mothers may seek more healthcare services even for less severe illnesses to obtain a doctor's note to be absent from the workplace and care for their sick child. These interpretations might explain the work-family conflicts that working mothers face, which are in turn associated with worse health (Bianchi & Milkie, 2010; Nilsen et al., 2017). Alternatively, more treatment cases and healthcare costs could indicate a higher usage of preventive care, reflecting a change in maternal healthy and health-seeking behaviours.

5.2.2 Robustness Checks

We perform several checks to validate the plausibility of the identifying assumptions and the robustness of our findings against potential biases arising from choices made in model specification and sample selection. Overall, the estimates across the different sensitivity analyses align closely with our baseline results.

Identifying assumptions

To further validate the assumptions underlying our identification strategy, we conduct additional tests on the plausibility of the parallel trend assumption, the exogeneity of the childcare expansion and the threat of selective migration.

Event studies. Following Schmidheiny & Siegloch (2023), we employ an event study model with binned endpoints to further evaluate pre-reform parallel trends in maternal health. Contemporaneous and lagged variations in childcare coverage rates might causally affect current maternal health, but leads of future variations in childcare coverage rates should not be correlated with it. We therefore expand equation (2) to include leads and lags of the childcare expansion (Sandner et al., 2024), where the *pre-treatment* effects are denoted by the leads ($\ell < 0$) and are expected to be statistically indistinguishable from zero, and the *post-treatment* effects are denoted by the lags ($\ell \geq 0$) and should point to similar conclusions as our main results in Figure 3.[31] The details of this approach are outlined in Appendix C.3. Figure C.5 plots the event studies and illustrates that the coefficients on the leads are statistically insignificant in general, supporting the underlying assumption of pre-reform parallel trends. Instead, the coefficients on the lags point to similar directions as our main results, being positive and statistically significant for infections, respiratory diseases, obesity, and hypertension, and statistically insignificant for the rest of maternal health outcomes.

State-level policies. Figure C.6 illustrates that our main findings for ear diseases, back pain, nutritional deficiencies, mental health disorders, and treatment cases are broadly robust to adding state-year fixed effects, which control for state-level policies. Given that state-year fixed effects capture a significant portion of the variation in county-level childcare coverage rates, the statistical significance of the results diminishes for infections when the focal child is aged 1–2, respiratory diseases at age five, and obesity, hypertension and healthcare costs at age one. The remaining age-specific and aggregated estimates for these conditions, however, align with our main results.

[31]For the sake of brevity, we estimate this model at the start of being exposed to early childcare, i.e., when the focal child is aged one.

County characteristics and childcare quality. Certain time-variant county characteristics may have influenced the pace of the childcare expansion and affected the overall population health, including maternal health. Although having parallel pre-reform trends (see Figure C.4), we now examine various county characteristics such as economic and political indicators, demographic factors, and childcare measures, and regress them against childcare coverage rates, controlling for county and year fixed effects. The estimates in Table C.4 indicate that the childcare coverage rate predicts some county characteristics, while there is no statistically significant association between childcare coverage rates and childcare quality, as measured by the ratio of childcare slots to teaching staff. This minimises potential biases in our estimates arising from changes in childcare quality due to the childcare expansion. Given the mixed findings in Table C.4, we add county characteristics as control variables in our analysis and show that the baseline results are similar to the estimates of this alternative specification in Figure C.7.

Selective migration. To address the potential selective migration, we exclude all mothers who moved across counties when the focal child was born and may have attended childcare (i.e., aged 0–2) in Figure C.8. The results after excluding movers remain similar to the baseline results, despite some being slightly less precisely estimated.

First-time mothers

Our sample consists of mothers aged 15–49 and born in 1961–2003 who gave birth to their focal child in 2010–2018. The underlying assumption in our model is that the first observed births in our sample period represent the first actual births of the mothers under study. That is, we assume these mothers were first exposed to formal childcare when the focal child was aged 1–2 in 2011–2019. However, some of these mothers might indeed have given birth before 2010 and been exposed to formal childcare prior to 2011.

We rerun our main specification for a subsample of "real" first-time mothers who gave birth in 2010–2018 and exclude mothers who might have given birth before 2010.[32] We show that the results are robust to excluding mothers who potentially have given birth before 2010 in Figure C.9. In Figure C.10, we substitute the number of children per mother between 2010 and 2019 with the control variable encompassing the number of children born before 2010 and up to 2022, and show that the estimates are consistent

[32] See Appendix C.3 for identification of first-time mothers.

with the main results.

Additional checks

Motherhood effect sample. To optimise the samples of our two research questions, we use different definitions. To rule out the possibility that the results are driven by sample selection, we impose the restrictions applied for the sample for the motherhood effects to the sample for the childcare effects. Specifically, we include only mothers who are aged 23–32 at first childbirth and show that the estimates closely resemble our main findings in Figure C.11.[33]

Multiple hypotheses testing. Given the large number of health outcomes in this study, we adjust p-values (*q-values*) for multiple hypotheses testing following Benjamini & Hochberg (1995) and Anderson (2008) to control for the false discovery rate (i.e., the expected proportion of null hypotheses rejected that are type I errors).[34] The results are presented in Table C.5, which displays the coefficients of the main findings alongside the corresponding q-values. Notably, the statistical significance of our main estimates remained fairly unchanged after the adjustment of p-values for multiple hypotheses testing.

Health and healthcare consumption. While we implicitly assume that our outcomes are a proxy of health status, they may also capture variations in the diagnosis rate or record based on physician's decisions or changes in healthcare consumption. Although health and healthcare consumption are difficult to disentangle when using administrative data, physician's decisions on how to code diagnoses are unlikely to be altered by the childcare expansion. To rule out potential alterations to the coding process, we switch definitions and investigate the extensive margin for communicable diseases and the intensive margin for non-communicable diseases and mental health disorders in Figure C.12. The direction and statistical significance of the effects are very similar to the main results.

To further probe whether our findings are indicative of health status, we show that similar conclusions are drawn when using self-reported health data from surveys. Table C.6 presents the association between early childcare attendance and overweight and obesity using Pairfam. The estimates closely resemble our main results, confirming that our

[33]We do not restrict the sample to mothers giving birth between 2013 and 2015, as our empirical approach requires temporal variation in childcare coverage rates.

[34]Q-values are calculated within age groups and two families of outcomes: 1) *physical and mental health*, and 2) *healthcare consumption.*

administrative health records are linked to health status.

5.2.3 Heterogeneity Analysis

To explore the impact of the childcare expansion on mothers with diverse characteristics, we conduct heterogeneity analyses. At the individual level, our data allow the differentiation of mothers based on the number of children they have and the age at which they had their focal child.[35] This analysis enables us to unravel variations in the effects of childcare availability, providing insights into how maternal experiences differ by family size and the timing of childbirth.

Number of children. We stratify our sample based on the number of children per mother. Specifically, we distinguish between mothers with a single child (i.e., the focal child) and those with more than one child, using the variable encompassing children born before 2010 and up to 2022 (see Section 5.2.2). Focusing solely on children born after 2010 introduces variation in the number of siblings only from the age of two as it comprises only children born subsequent to the presumed firstborn (i.e., the focal child).[36]

Figure C.13 illustrates that, across nearly all outcomes, the effects are more pronounced for mothers with multiple children. Although the estimates for infections are similar for both groups, multiparous mothers experience reductions in respiratory and ear diseases when their focal child is aged three to five. Mothers with two or more children, whose focal child born during the observation period is 3–5 years, likely had the siblings of the focal child before 2010. Hence, this divergence may be attributed to the fact that these mothers have no young child (1–2 years old) attending childcare. Consequently, mothers in this group encounter fewer respiratory and ear diseases than the comparison group where the focal child starts childcare at age three. Notably, effects on obesity, hypertension, and back pain are slightly larger and more persistent for multiparous mothers. Despite overall null effects, mothers with two or more children exhibit a lower prevalence of mood-related disorders when their focal child born after 2010 is aged 2–6 and stress-related disorders at ages 3–5 and seven. These positive effects for multiparous mothers may be attributed to the growing challenge of reconciling family-care duties, work, and leisure time with an

[35] We extend our heterogeneity analysis to the county level, examining dimensions that characterise socioeconomic status (SES). However, the outcomes do not indicate heterogeneity across mothers from lower and higher SES areas. Results are available upon request.

[36] When employing the variable exclusively considering the number of children born after 2010, findings from age two are very similar.

increasing number of young children. Childcare availability may facilitate this balance, alleviating stress. Regarding healthcare consumption, results are comparable across the two groups, with more persistent effects for mothers with a single child, although effect sizes are larger for multiparous mothers.

Maternal age at first birth. Subsequently, we investigate whether the impact of childcare availability varies based on maternal age at the time of first (focal) childbirth. To conduct this analysis, we focus on mothers without prior children before the focal child. The inclusion of all mothers in the analysis would hinder the isolation of the effect of maternal age since the age at first birth and the presence of earlier births are inherently correlated. The sample is divided at the median age (29 years) at birth of the focal child, generating distinct subsets of "young" mothers (below the median age) and "old" mothers (equal to or above the median age).[37]

As depicted in Figure C.14, outcomes predominantly exhibit higher statistical significance and more substantial effects for older mothers. As mentioned in Section 4, this result highlights the importance of distinguishing between younger and older mothers in settings similar to ours given that their career and health trajectories differ. While positive effects on infections extend up to age four for younger mothers, older mothers manifest a reduction in respiratory diseases when their focal child is aged three and four, indicating that older mothers derive greater benefits from childcare availability. Similarly, the impact on obesity, hypertension, and back pain is more pronounced for older mothers. Furthermore, older mothers experience an improvement in mental health disorders. In particular, the prevalence of mood-related disorders (stress-related disorders) decreases when their focal child is aged 3–5 (one and 3–4). The advantageous effects, particularly for older mothers, may be attributed to the increasing challenges of child-rearing with advancing age, resulting in greater relief facilitated by childcare. As noted by Melentyeva & Riedel (2023), maternal age at childbirth matters given that women who opt for child-rearing at older ages are on average more educated and may be more oriented toward their careers, implying a disproportionate benefit from childcare in reconciling career aspirations and family obligations. Furthermore, Jessen et al. (2020) showed that children below three are more likely to attend childcare when their parents are highly educated,

[37] The median maternal age at first birth in our restricted sample (29) is similar to the national statistics in Germany: 28.9 in 2010, 29.5 in 2014, and 30.1 in 2019 (German Statistical Office, 2023b).

implying that the beneficial effects for older, and potentially more educated, mothers might stem from a higher take-up rate. Notably, older mothers exhibit higher healthcare consumption, evidenced by more treatment cases and healthcare costs compared to their younger counterparts.

6 Conclusion

This paper provides novel insights into the causal effects of motherhood and public early childcare on maternal health. Using a stacked DiD approach, employing only slightly older mothers as control units, our findings reveal that maternal health worsens around pregnancy and childbirth but improves for many conditions shortly thereafter. Four years post-birth, the number of diagnoses vary depending on the health outcome, with increases in communicable diseases and mental health disorders but decreases for most remaining conditions. In additional analyses, we show that conventional event study approaches estimate biased motherhood effects on maternal health, emphasising the importance of using a suitable control group.

To causally identify whether childcare availability amplifies or reduces the motherhood effects, we exploit temporal and spatial variation in the childcare expansion speed across West German counties in a TWFE approach. The availability of public early childcare improves maternal health by persistently reducing obesity, hypertension, and back pain, mainly through better employment and healthier behaviours. Furthermore, heterogeneity analyses indicate that mothers with more than one child and those above the median age at the birth of their first child benefit from the childcare expansion in terms of mental health, encountering a reduction in mood- and stress-related disorders. However, our results also show that motherhood effects are amplified for mothers with higher exposure to the childcare expansion, as they exhibit an increased susceptibility to infections and respiratory diseases when their child is aged 1–2. While children who commence childcare before the age of three witness a decline in communicable diseases during their elementary school years compared to their non-childcare counterparts (Barschkett, 2022), these effects wane for mothers. Similar patterns are visible for healthcare consumption.

Recognising the pivotal role of maternal health in shaping the family environment, our findings present valuable implications for crafting policy initiatives for boosting fertility and enhancing maternal health and, consequently, the overall well-being of families, especially those with young children in childcare. On the one hand, beyond the biological effects of pregnancy and childbirth, the immediate increase in infectious illnesses, exacerbated during the first two years of childcare attendance, and the medium-term rise in mood-related diagnoses, including depression, present a notable challenge to maternal productivity and could pose difficulties for mothers as well as for the entire family in the first years after childbirth and subsequent childcare attendance. To address the observed challenges in reconciling work, childcare, and illness burdens, policymakers may consider implementing generous sick leave policies tailored to families with young children in childcare, offering flexibility, including working remotely. Launching targeted campaigns promoting hygiene practices both at home and in childcare facilities and designing childcare as a healthier environment, such as by reducing group sizes, also emerge as proactive strategies to combat and prevent the transmission of communicable diseases, ultimately benefiting child and maternal health.

On the other hand, our results also exhibit long-term positive motherhood effects on maternal health, specifically reductions in non-communicable diseases. These shifts should encourage policymakers to pass reforms to create an environment that makes motherhood less costly and support women who wish to have children. The unintended, yet, advantageous improvements of early childcare availability in these health dimensions, coupled with the broader societal benefits of the expansion —such as higher labour market participation (Huber & Rolvering, 2023; Müller & Wrohlich, 2020) and fertility rates (Bauernschuster et al., 2016), and less child maltreatment (Sandner et al., 2024)—, underscore its significance and societal impact, encouraging policymakers to invest in childcare to improve quality and meet the demand for childcare slots. Our results also provide evidence that mothers with multiple children as well as older first-time mothers, with a potentially higher educational level and policy take-up rate, benefit more from childcare. Given that demand for childcare still exceeds the supply (Müller & Wrohlich, 2016) and that childcare policies tend to be more effective for disadvantaged households (Cascio, 2015), a potential policy consideration could be prioritising larger and low socioeconomic families in slot allocation. However, the primary focus of policymakers should remain on expanding childcare slots to a level where such prioritisation measures become unnecessary.

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Appendices

A Institutional Setting and Data

Table A.1: Summary statistics for the sample of the motherhood effects on maternal health

Outcomes	Mean (SD)
Infections (no. per year)	0.56 (0.99)
Respiratory diseases (no. per year)	1.47 (2.05)
Ear diseases (no. per year)	0.20 (0.68)
Obesity (prevalence)	0.07 (0.25)
Hypertension (prevalence)	0.03 (0.16)
Back pain (prevalence)	0.29 (0.46)
Nutritional deficiencies (prevalence)	0.18 (0.38)
Mood-related disorders (prevalence)	0.11 (0.31)
Stress-related disorders (prevalence)	0.23 (0.42)
Treatment cases (no. per year)	9.29 (6.41)
Healthcare costs (EUR per year)	382.82 (472.25)
Age (mother)	26.35 (2.65)

Note: Mean (standard deviation) of maternal health outcomes and mother's age before pregnancy ($l = -2$). *Source*: KBV (2010–2019), own calculations.

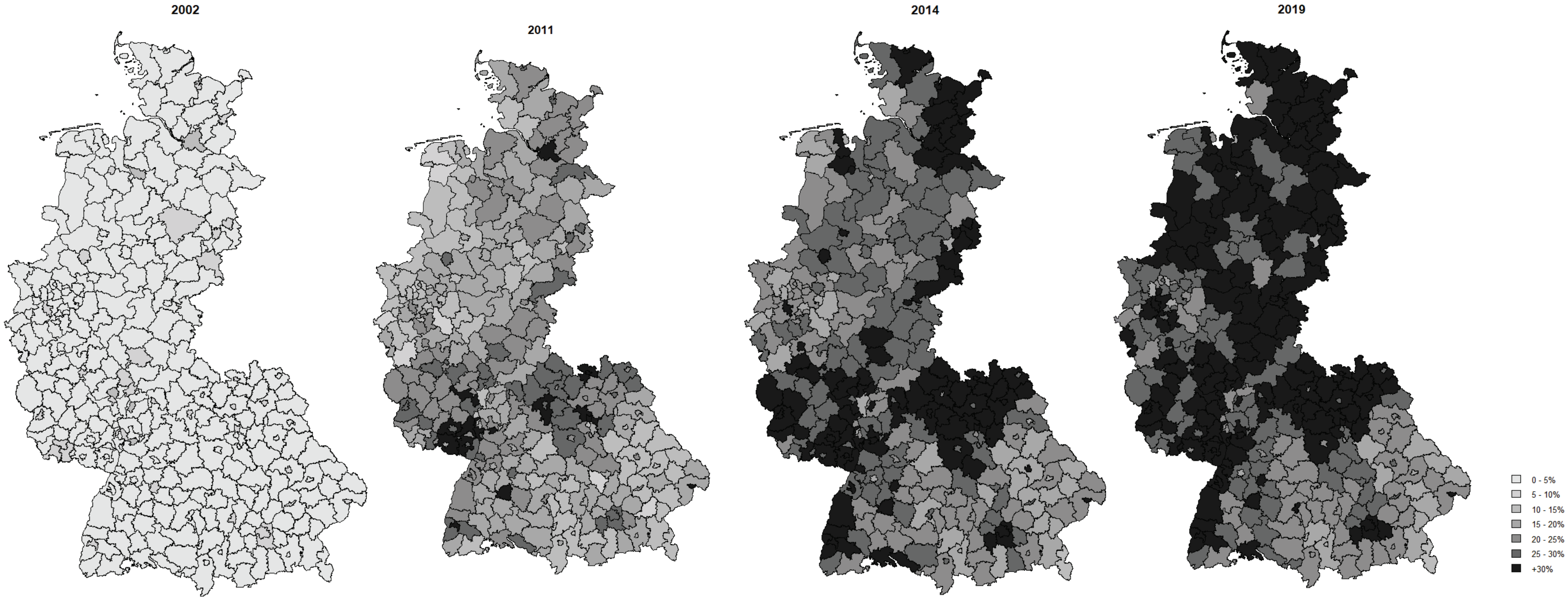
Table A.2: Summary statistics for the sample of the effect of early childcare on maternal health by child's age

Outcomes: Mean (SD)	Age 1	Age 2	Age 3	Age 4	Age 5
Infections (no. per year)	0.40 (0.85)	0.47 (0.92)	0.48 (0.94)	0.49 (0.95)	0.48 (0.95)
Respiratory diseases (no. per year)	1.04 (1.78)	1.31 (2.01)	1.46 (2.13)	1.50 (2.18)	1.47 (2.19)
Ear diseases (no. per year)	0.18 (0.65)	0.21 (0.71)	0.24 (0.76)	0.25 (0.79)	0.25 (0.79)
Obesity (prevalence)	0.08 (0.28)	0.09 (0.29)	0.10 (0.30)	0.10 (0.30)	0.10 (0.31)
Hypertension (prevalence)	0.04 (0.19)	0.04 (0.20)	0.05 (0.22)	0.05 (0.23)	0.06 (0.24)
Back pain (prevalence)	0.28 (0.45)	0.30 (0.46)	0.32 (0.47)	0.33 (0.47)	0.34 (0.47)
Nutritional deficiencies (prevalence)	0.24 (0.43)	0.26 (0.44)	0.27 (0.44)	0.27 (0.45)	0.28 (0.45)
Mood-related disorders (prevalence)	0.09 (0.29)	0.10 (0.31)	0.12 (0.32)	0.13 (0.33)	0.13 (0.34)
Stress-related disorders (prevalence)	0.20 (0.40)	0.24 (0.43)	0.26 (0.44)	0.26 (0.44)	0.27 (0.44)
Treatment cases (no. per year)	8.94 (6.54)	10.06 (7.07)	10.19 (7.20)	10.00 (7.19)	9.80 (7.15)
Healthcare costs (EUR per year)	398.1 (504.8)	485.7 (572.7)	488.7 (592.3)	465.6 (591.0)	449.3 (596.5)
CC when child is 1–2	26.63 (6.80)	26.23 (6.71)	25.77 (6.63)	25.31 (6.57)	24.80 (6.51)
Age (mother)	31.60 (5.40)	32.61 (5.40)	33.62 (5.40)	34.62 (5.41)	35.62 (5.41)
No. additinal children per mother	0.02 (0.15)	0.15 (0.36)	0.28 (0.45)	0.36 (0.51)	0.42 (0.56)
Observations	3,060,816	2,760,319	2,454,931	2,153,331	1,849,002

Outcomes: Mean (SD)	Age 6	Age 7	Age 8	Ages 1–8
Infections (no. per year)	0.47 (0.94)	0.45 (0.94)	0.45 (0.94)	0.46 (0.92)
Respiratory diseases (no. per year)	1.42 (2.18)	1.37 (2.17)	1.35 (2.18)	1.34 (2.08)
Ear diseases (no. per year)	0.24 (0.79)	0.24 (0.80)	0.24 (0.81)	0.22 (0.75)
Obesity (prevalence)	0.11 (0.31)	0.11 (0.31)	0.11 (0.32)	0.10 (0.30)
Hypertension (prevalence)	0.07 (0.25)	0.07 (0.26)	0.08 (0.27)	0.05 (0.22)
Back pain (prevalence)	0.34 (0.48)	0.35 (0.48)	0.36 (0.48)	0.32 (0.47)
Nutritional deficiencies (prevalence)	0.28 (0.45)	0.29 (0.45)	0.29 (0.45)	0.27 (0.44)
Mood-related disorders (prevalence)	0.14 (0.35)	0.15 (0.35)	0.15 (0.36)	0.12 (0.32)
Stress-related disorders (prevalence)	0.27 (0.44)	0.27 (0.44)	0.27 (0.45)	0.25 (0.43)
Treatment cases (no. per year)	9.58 (7.08)	9.44 (7.05)	9.40 (7.04)	9.70 (7.03)
Healthcare costs (EUR per year)	434.1 (599.6)	423.0 (594.3)	421.4 (599.8)	449.3 (575.3)
CC when child is 1–2	24.11 (6.40)	23.11 (6.16)	21.97 (5.92)	25.29 (6.69)
Age (mother)	36.61 (5.42)	37.60 (5.41)	38.57 (5.41)	34.25 (5.81)
No. additional children per mother	0.46 (0.60)	0.49 (0.63)	0.51 (0.67)	0.28 (0.50)
Observations	1,532,114	1,203,942	837,729	15,852,184

Note: Mean (standard deviation) of maternal health outcomes, childcare coverage rates, and controls by child's age and aggregated for ages 1–8. CC = Childcare coverage rate. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

Figure A.1: Childcare coverage rates for children under three by county



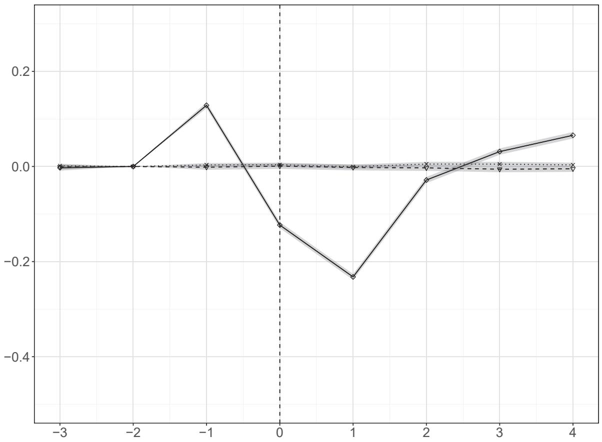
Note: Childcare coverage rates for children under three years old by West German counties in 2002, 2011, 2014, and 2019. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019), own calculations.

B The Effects of Motherhood on Maternal Health

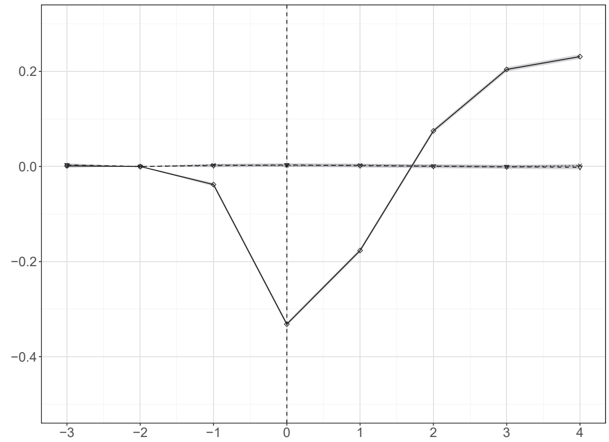
Figure B.1: Placebo test of mothers compared to non-impacted groups

Mothers — Non-mothers — Men

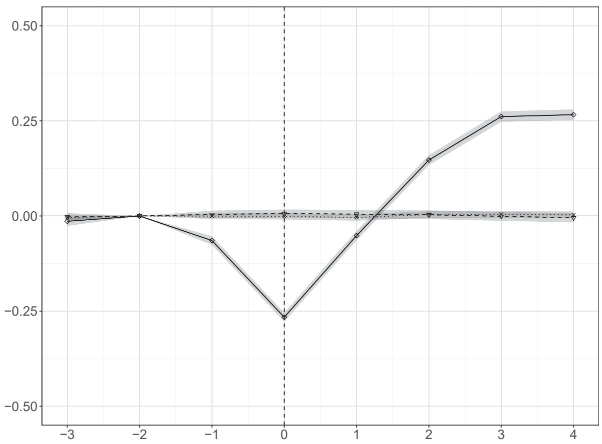
(a) Infections



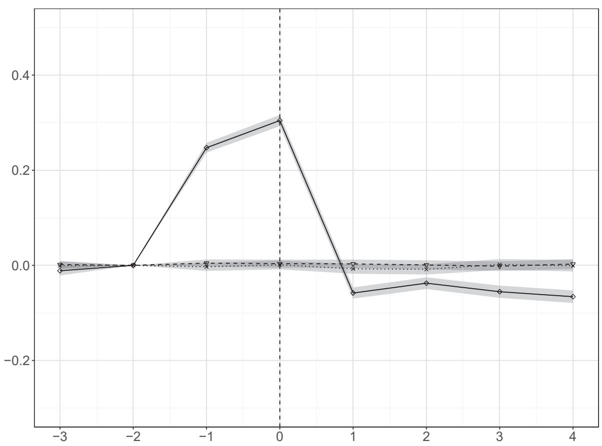
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

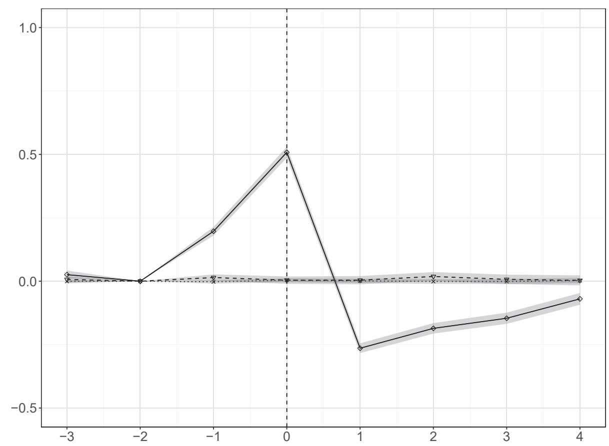
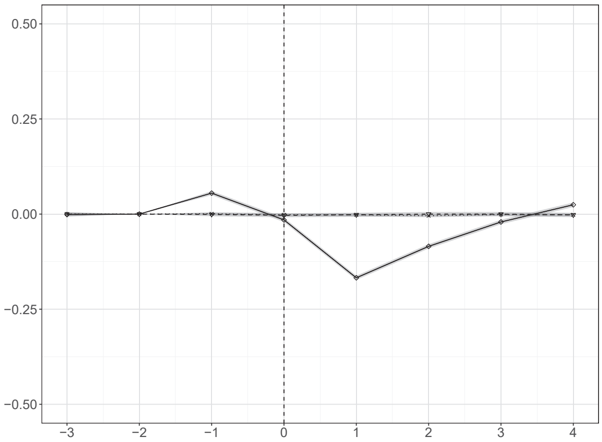


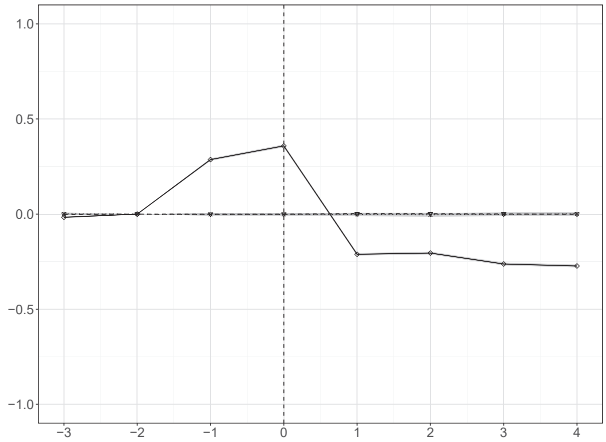
Figure B.1: Placebo test of mothers compared to non-impacted groups (*continued*)

Mothers - - - - - Non-mothers ·········· Men

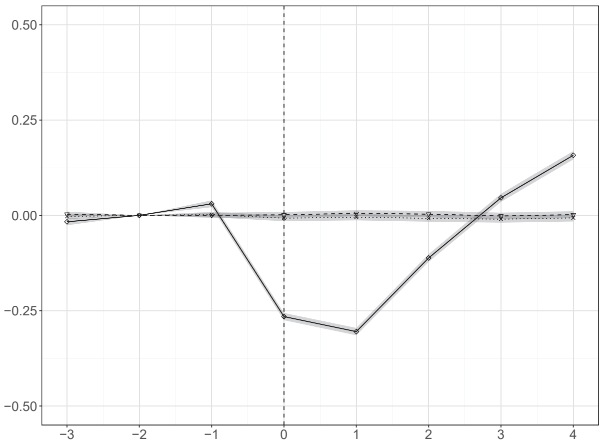
(f) Back pain



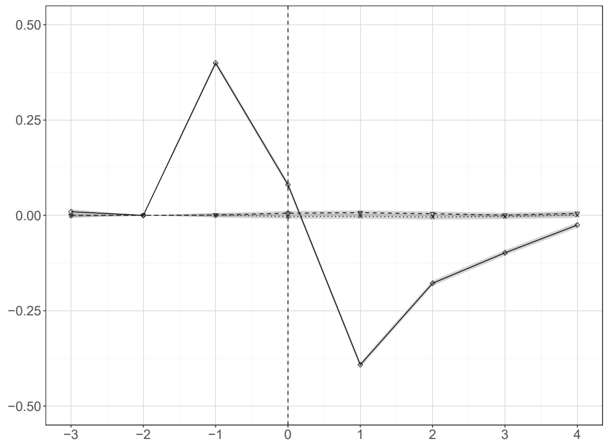
(g) Nutritional deficiencies



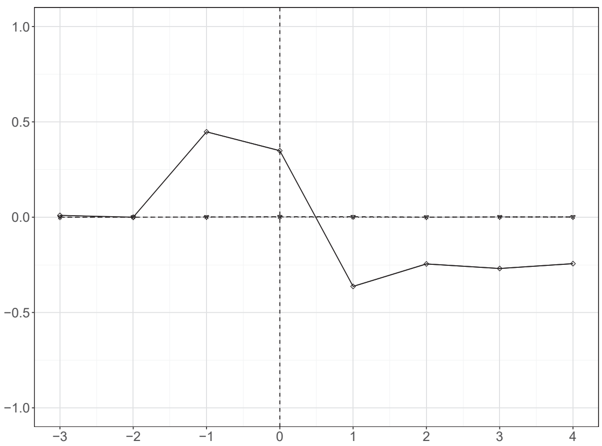
(h) Mood-related disorders



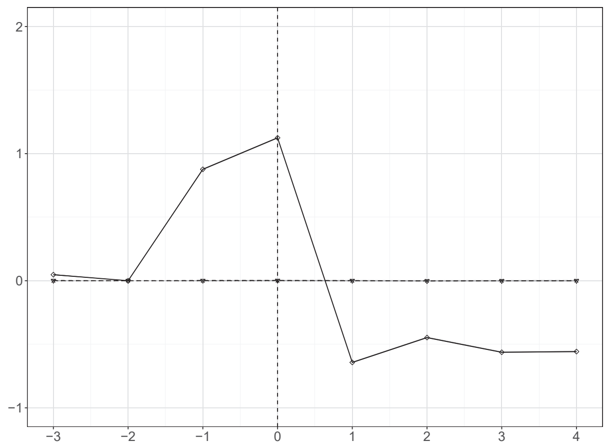
(i) Stress-related disorders



(j) Treatment cases



(k) Healthcare costs

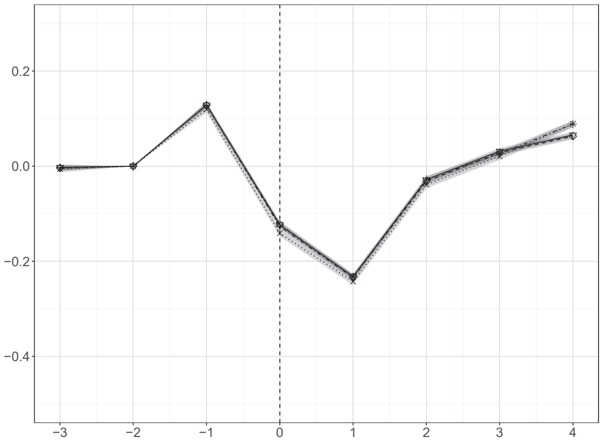


Note: Pre- and post-birth estimates of the effects of parenthood on health outcomes for mothers (solid line), non-mothers (dashed line) and men (dotted line) based on equation (1). The graphs plot the weighted average of the maternal-age-at-birth cohort-specific estimates relative to the pre-birth average of the health outcomes in year $l = -2$. *Source*: KBV (2010–2019), own calculations.

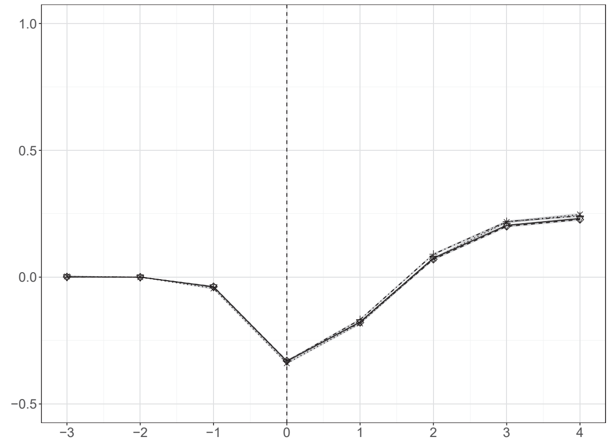
Figure B.2: Motherhood effects shrinking and widening the five-years age-window and excluding high-risk pregnancies

—— 5-year window   -·-·- 4-year window   - - - - 6-year window   ········ No high-risk preg

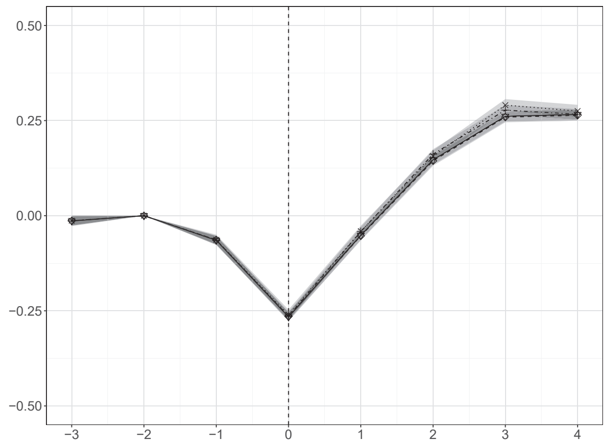
(a) Infections



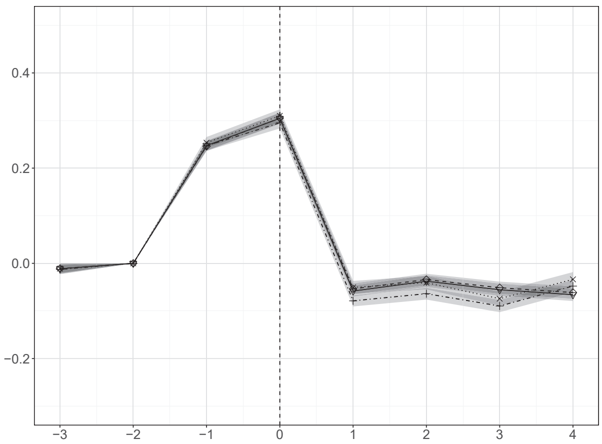
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

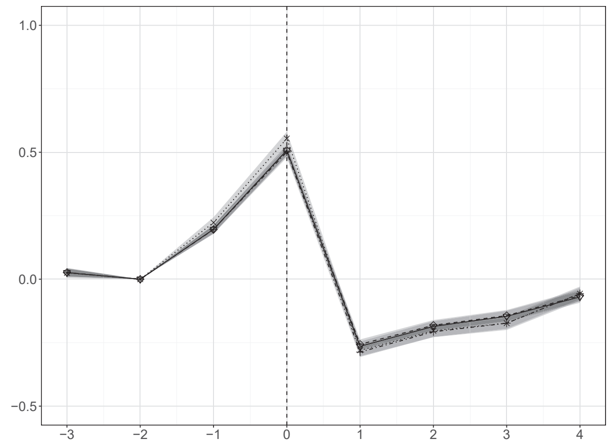
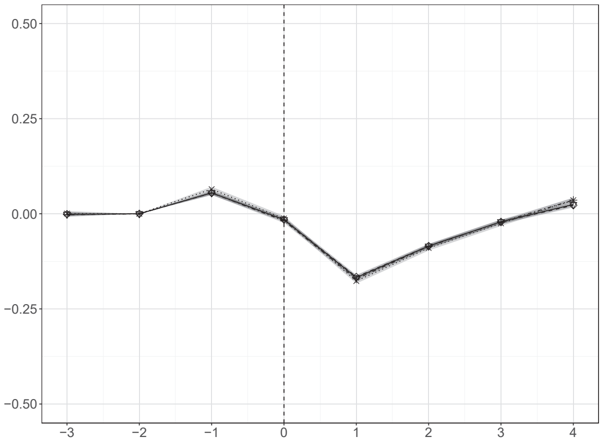


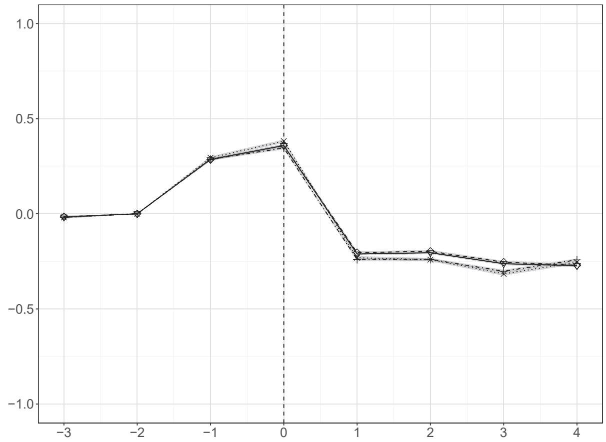
Figure B.2: Motherhood effects shrinking and widening the five-years age-window and excluding high-risk pregnancies (*continued*)

—— 5-year window -·-·- 4-year window - - - - 6-year window ········ No high-risk preg

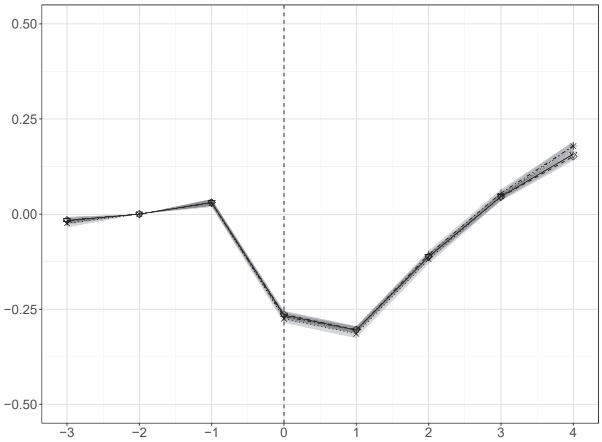
(f) Back pain



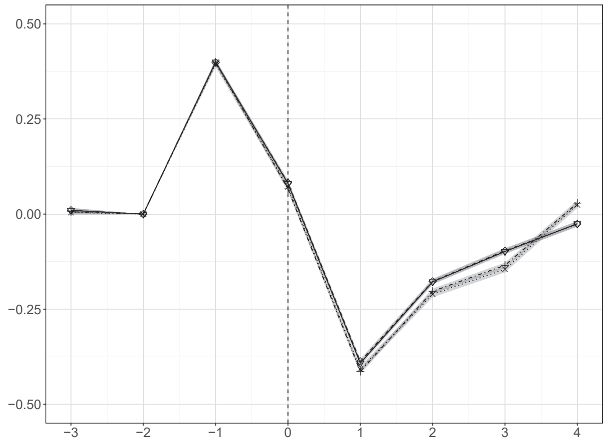
(g) Nutritional deficiencies



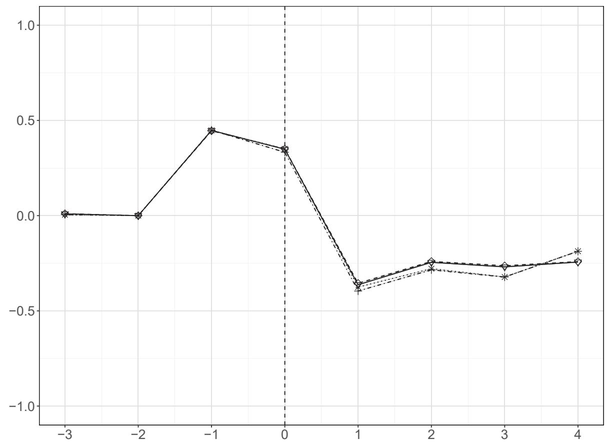
(h) Mood-related disorders



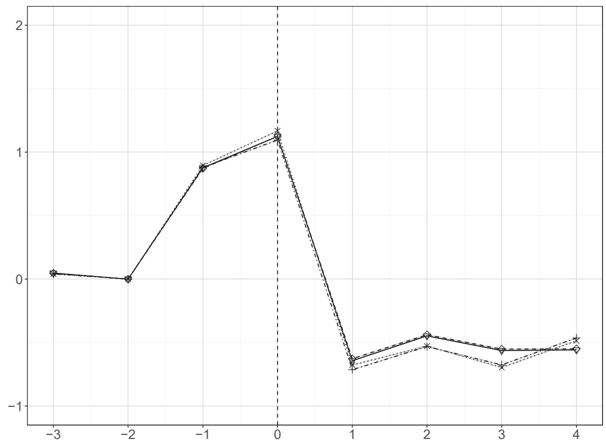
(i) Stress-related disorders



(j) Treatment cases



(k) Healthcare costs

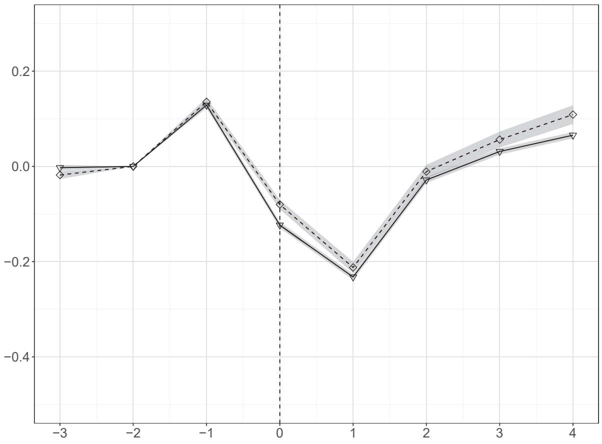


Note: Pre- and post-birth estimates of the effects of motherhood on maternal health outcomes based on equation (1) using five-year age-window (solid line), four-year age-window (dotdashed line), six-year age-window (dashed line), and four-year age-window excluding high-risk pregnancies of first-time mothers aged older than 35 at childbirth (dotted line). The graphs plot the weighted average of the maternal-age-at-birth cohort-specific estimates relative to the pre-birth average of the health outcomes in year $l = -2$. *Source*: KBV (2010–2019), own calculations.

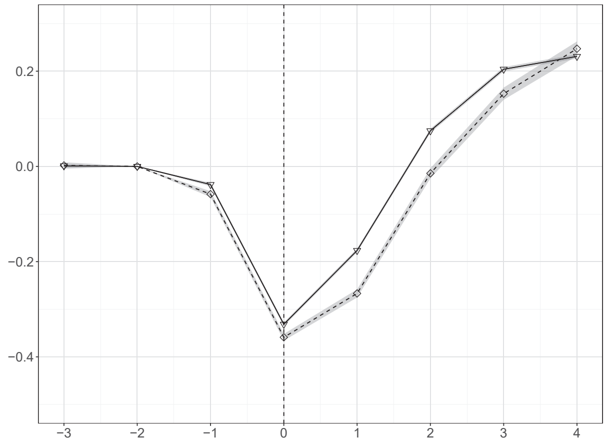
Figure B.3: Comparison of conventional and stacked DiD approaches

——— Stacked DiD approach - - - - - Conventional approach

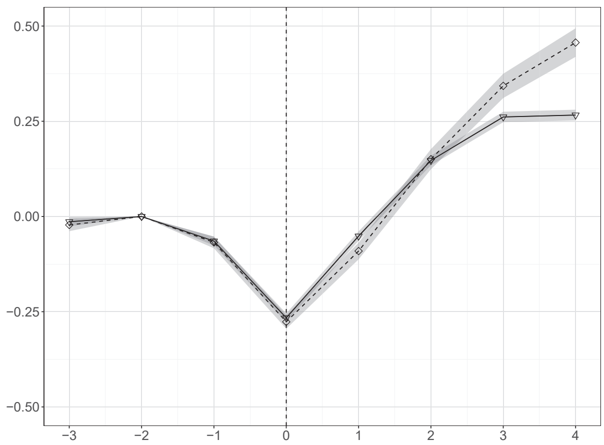
(a) Infections



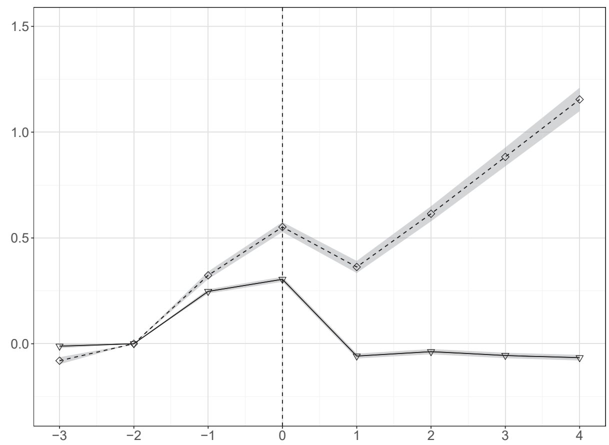
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

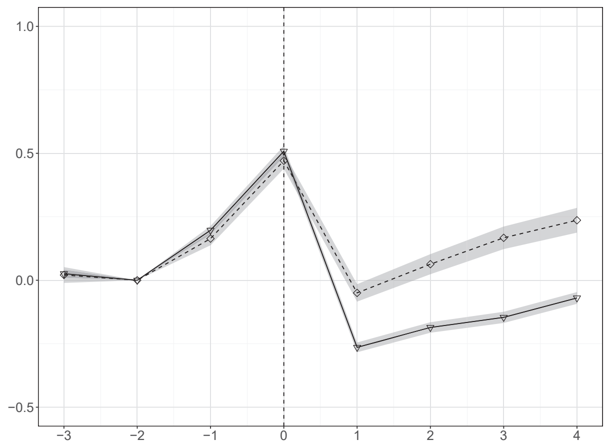
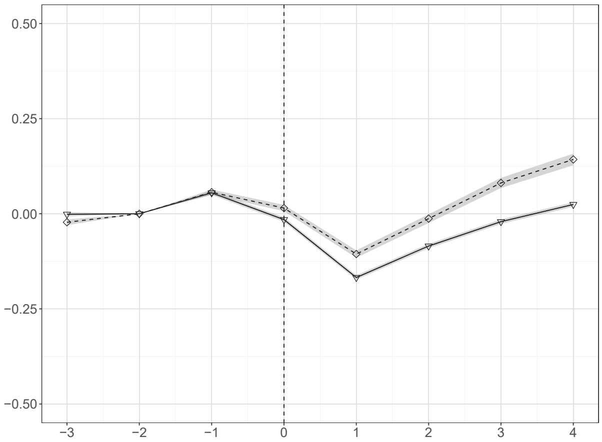


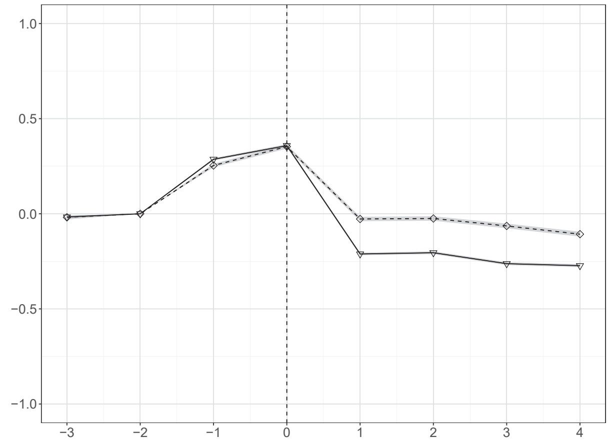
Figure B.3: Comparison of conventional and stacked DiD approaches (*continued*)

——— Stacked DiD approach   - - - - - Conventional approach

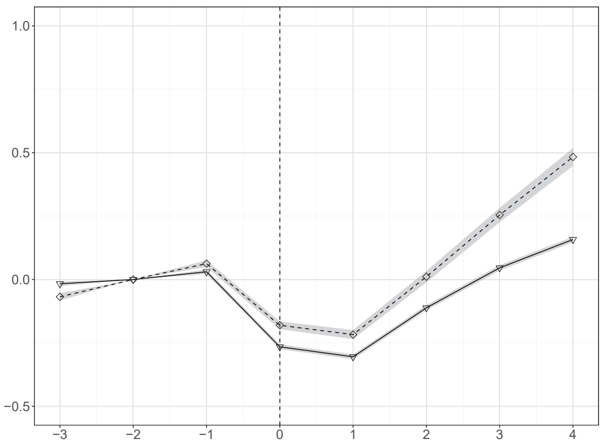
(f) Back pain



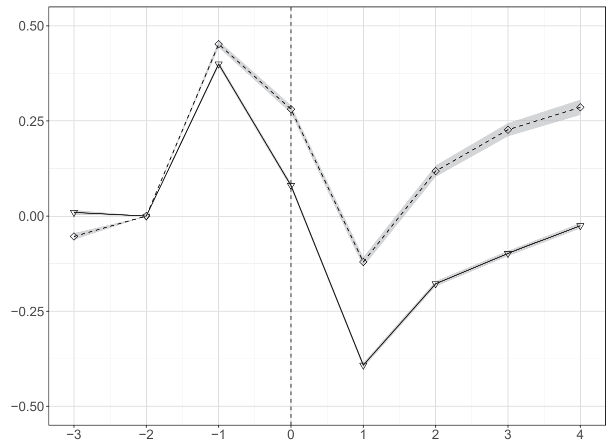
(g) Nutritional deficiencies



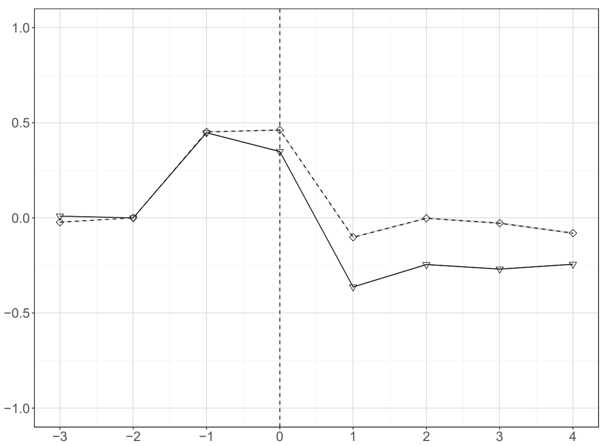
(h) Mood-related disorders



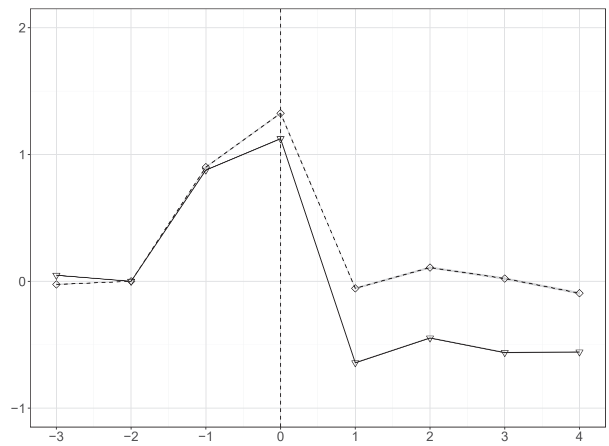
(i) Stress-related disorders



(j) Treatment cases



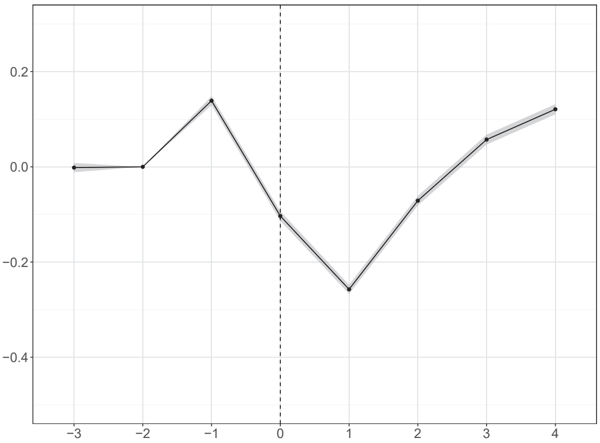
(k) Healthcare costs



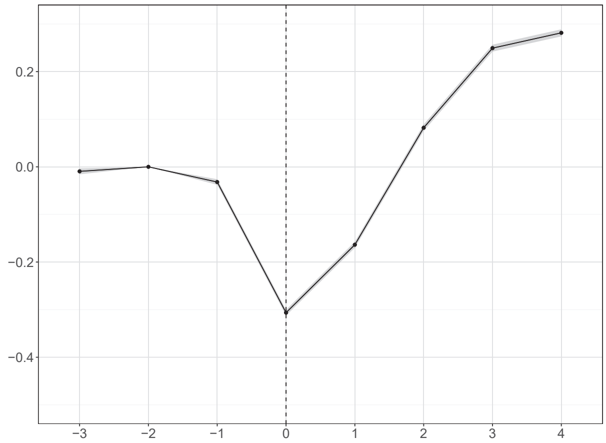
Note: Pre- and post-birth estimates of the effects of motherhood on maternal health outcomes for mothers based on the conventional event-study approach (dashed line) and based on equation (1) (solid line). The graphs plot the estimates relative to the pre-birth average of the health outcomes in year $l = -2$. *Source*: KBV (2010–2019), own calculations.

Figure B.4: The effects of motherhood on maternal health for first-time mothers with a only child

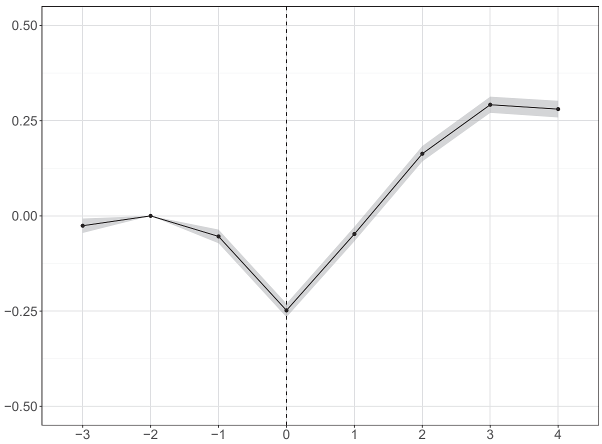
(a) Infections



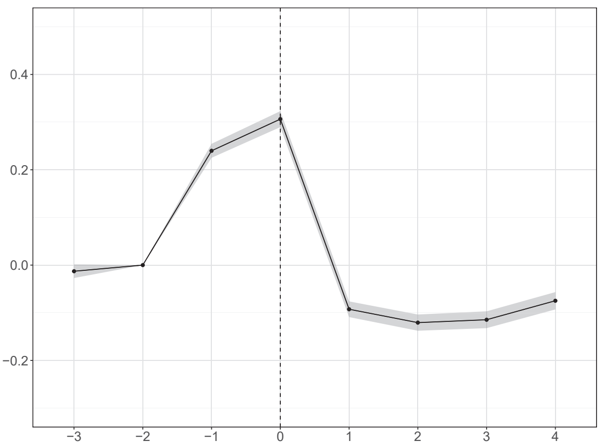
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

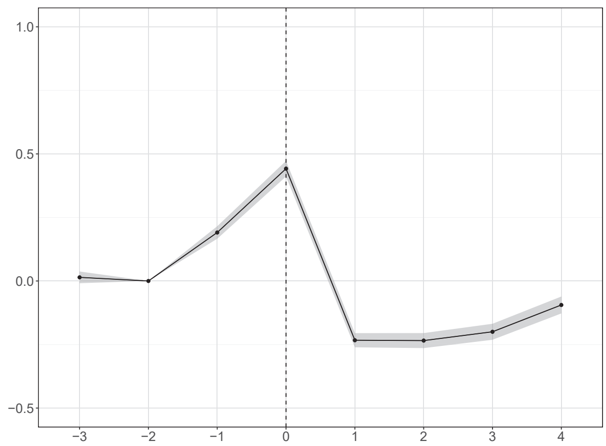
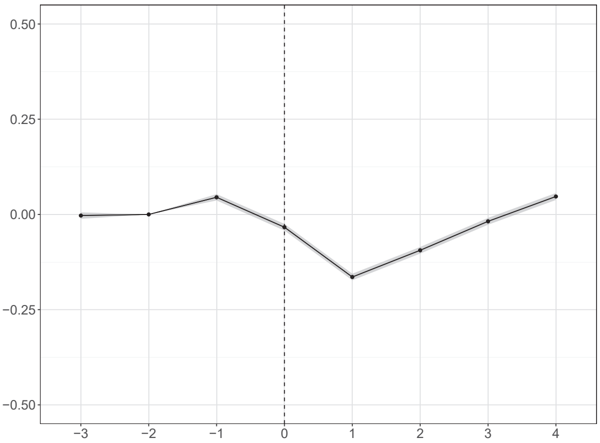
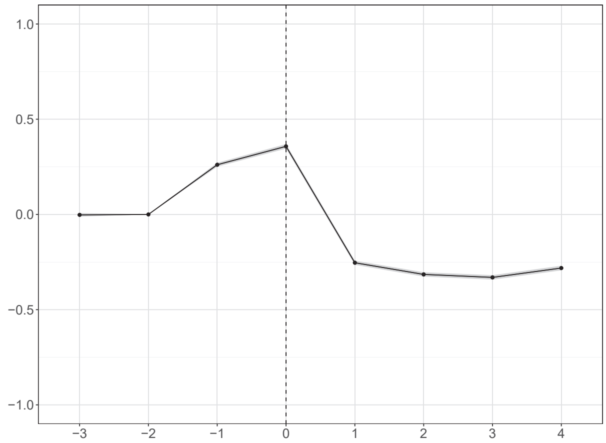


Figure B.4: The effects of motherhood on maternal health for first-time mothers with an only child (*continued*)

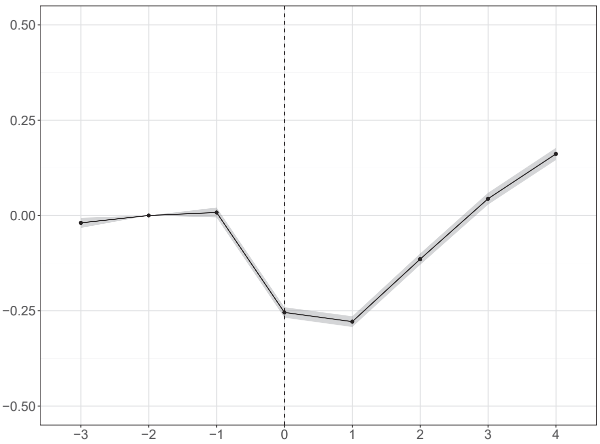
(f) Back pain



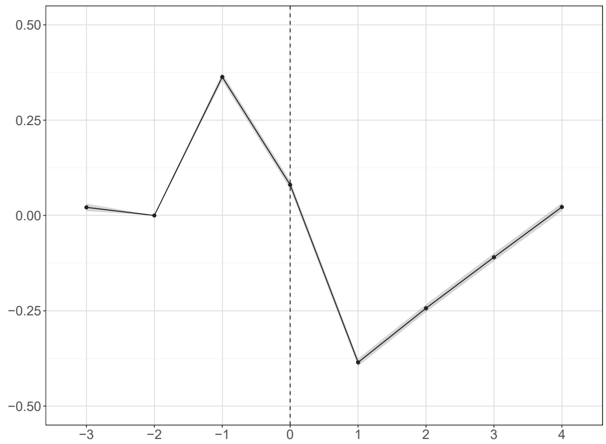
(g) Nutritional deficiencies



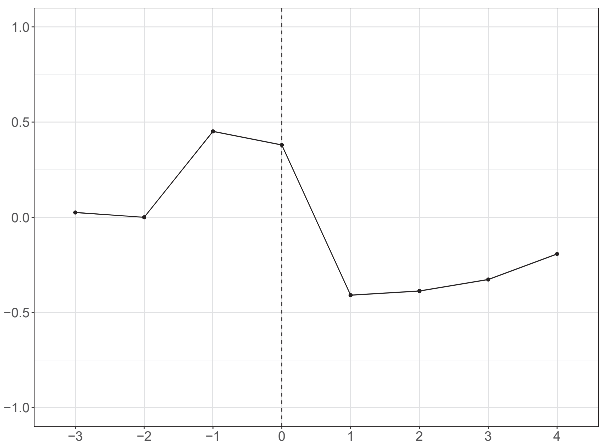
(h) Mood-related disorders



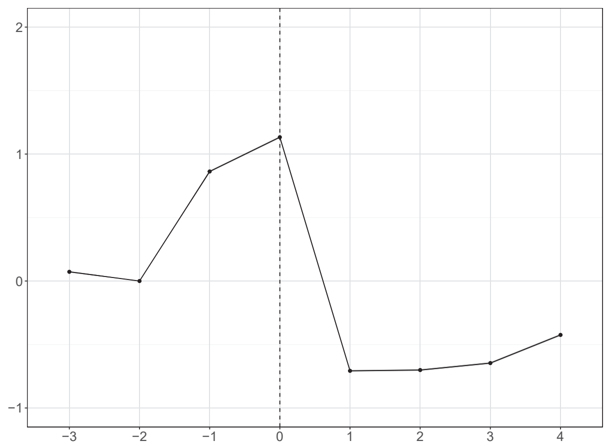
(i) Stress-related disorders



(j) Treatment cases



(k) Healthcare costs

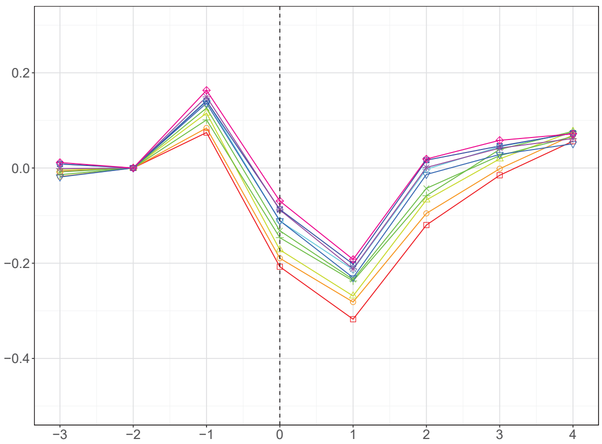


Note: Pre- and post-birth estimates of the effects of motherhood on maternal health outcomes for mothers with an only child in our observation period based on equation (1). The graphs plot the weighted average of the maternal-age-at-birth cohort-specific estimates relative to the pre-birth average of the health outcomes in year $l = -2$. *Source*: KBV (2010–2019), own calculations.

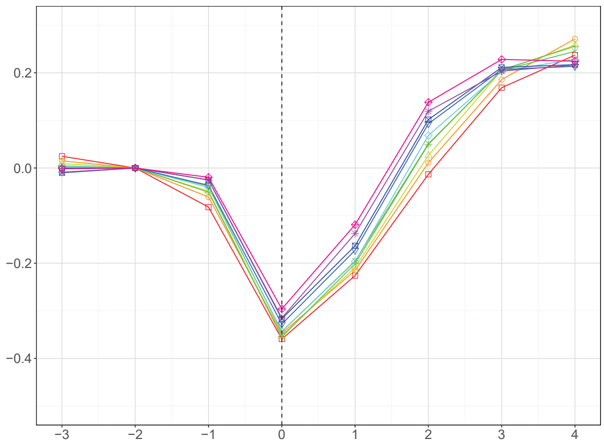
Figure B.5: Motherhood effects by maternal-age-at-birth cohort

Cohort 23 | Cohort 24 | Cohort 25 | Cohort 26 | Cohort 27
Cohort 28 | Cohort 29 | Cohort 30 | Cohort 31 | Cohort 32

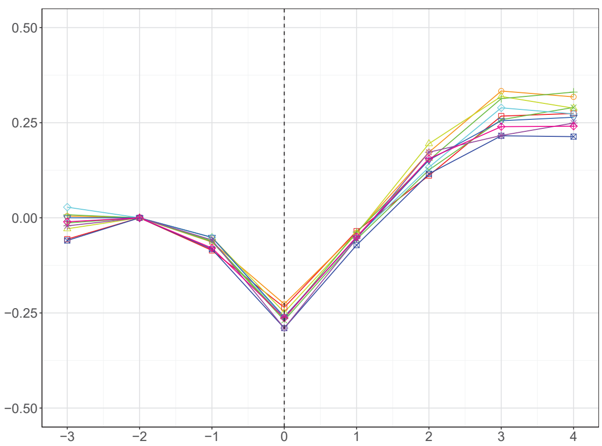
(a) Infections



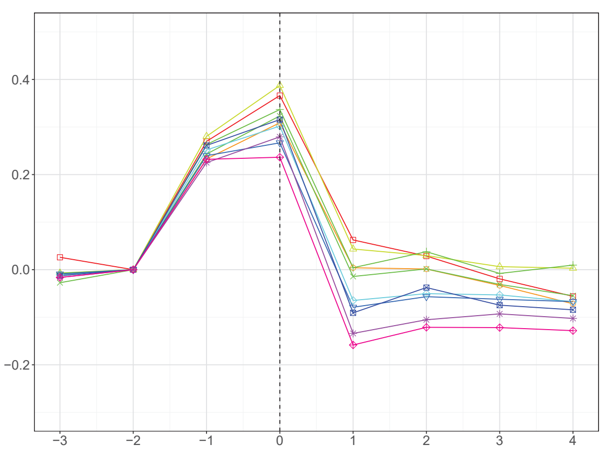
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

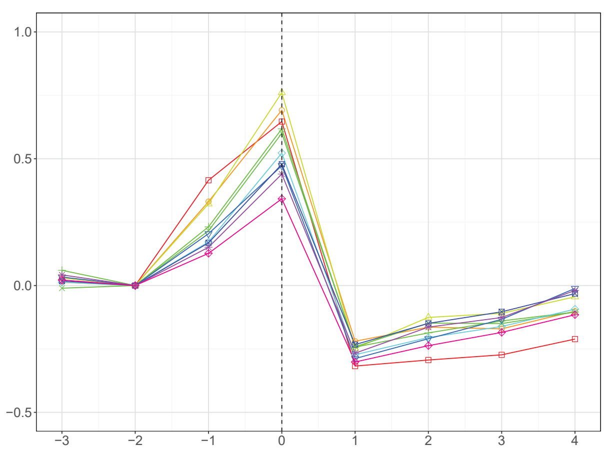
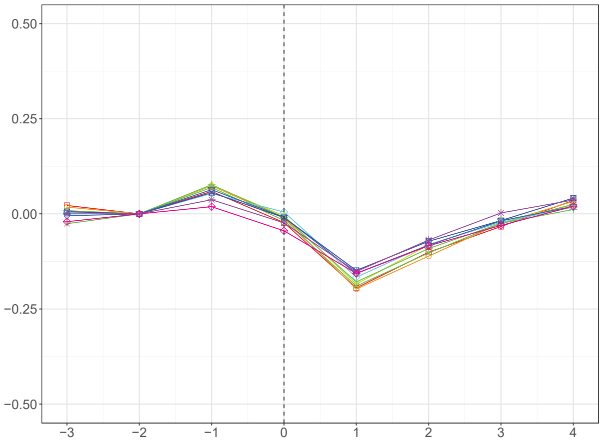


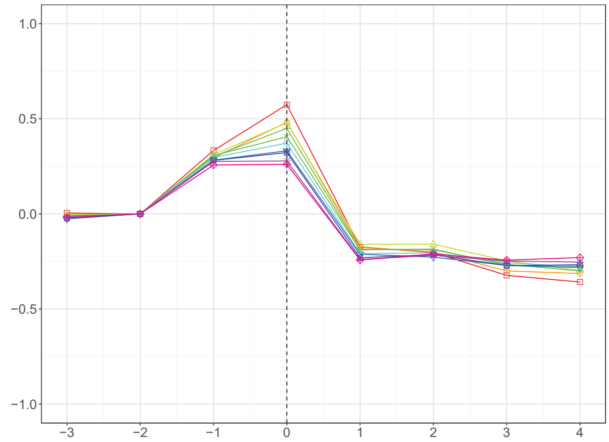
Figure B.5: Motherhood effects by maternal-age-at-birth cohort (*continued*)

Cohort 23 | Cohort 24 | Cohort 25 | Cohort 26 | Cohort 27
Cohort 28 | Cohort 29 | Cohort 30 | Cohort 31 | Cohort 32

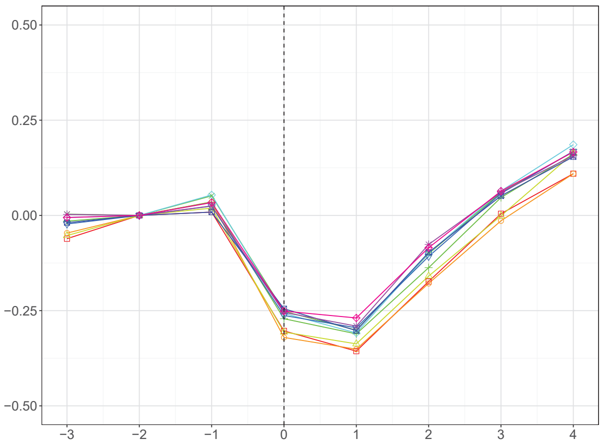
(f) Back pain



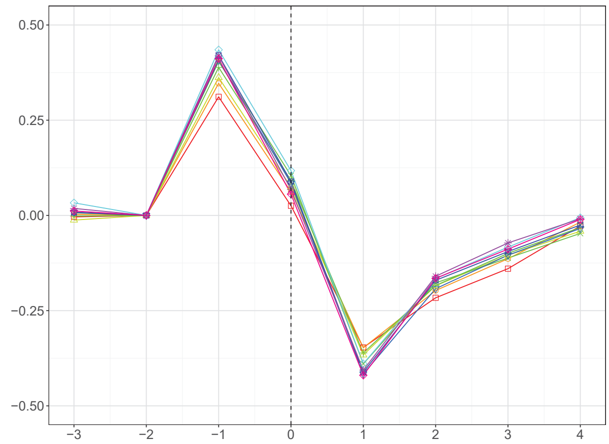
(g) Nutritional deficiencies



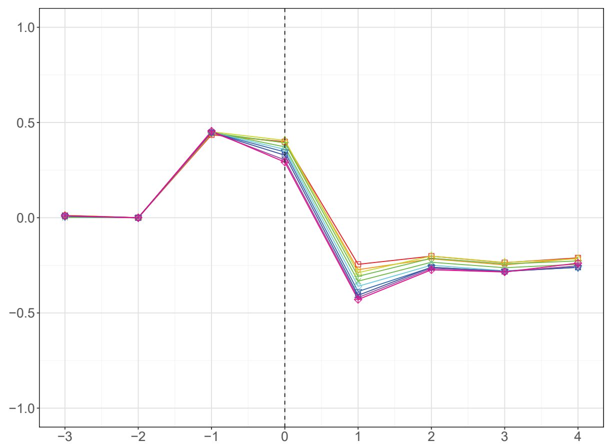
(h) Mood-related disorders



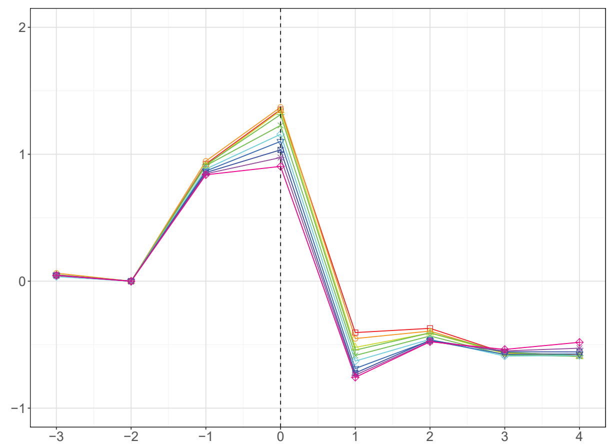
(i) Stress-related disorders



(j) Treatment cases



(k) Healthcare costs



Note: Pre- and post-birth estimates of the effects of motherhood on maternal health outcomes for mothers based on equation (1). The graphs plot the maternal-age-at-birth cohort-specific estimates relative to the pre-birth average of the cohort-specific health outcomes in year $l-2$. *Source*: KBV (2010–2019), own calculations.

C The Effect of Early Childcare on Maternal Health

C.1 Empirical Strategy

Table C.1: Effect of the expansion on childcare centres and slots

	Dependent variable:	
	Childcare centres	Childcare slots
	(1)	(2)
CC	0.745***	47.660**
	(0.205)	(16.847)
County FE	Yes	Yes
Year FE	Yes	Yes
Observations	4,212	4,212

Note: $^{+}$p<0.1; *p<0.05; **p<0.01; ***p<0.001. OLS regressions of childcare centres and slots for ages 1–6 against childcare coverage rates (CC) for children under three controlling for county and year fixed effects. Robust standard errors clustered at county-level in parentheses. *Source*: German Statistical Office (2007-2019), own calculations.

Figure C.1: Trends of maternal health outcomes by treatment doses

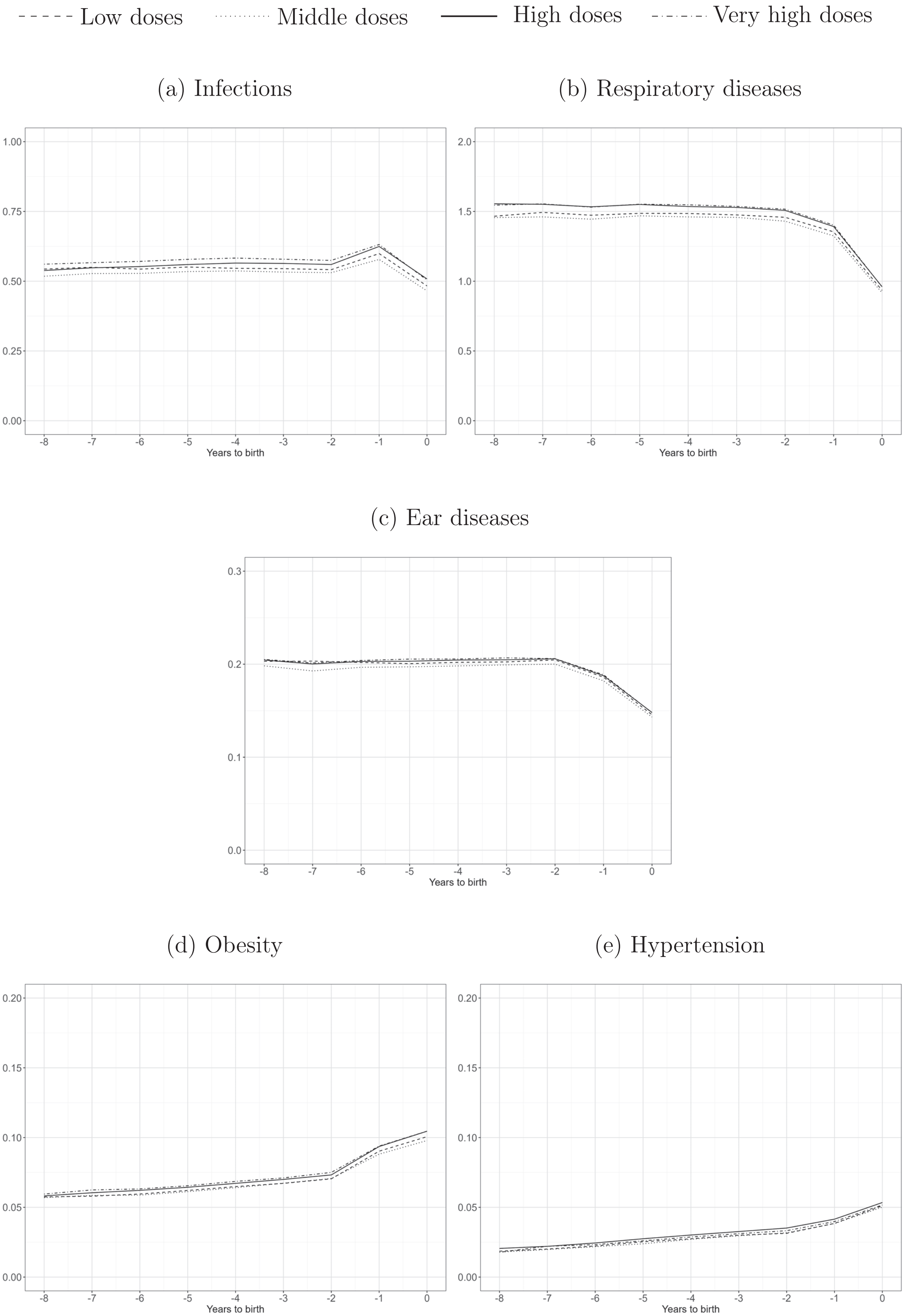
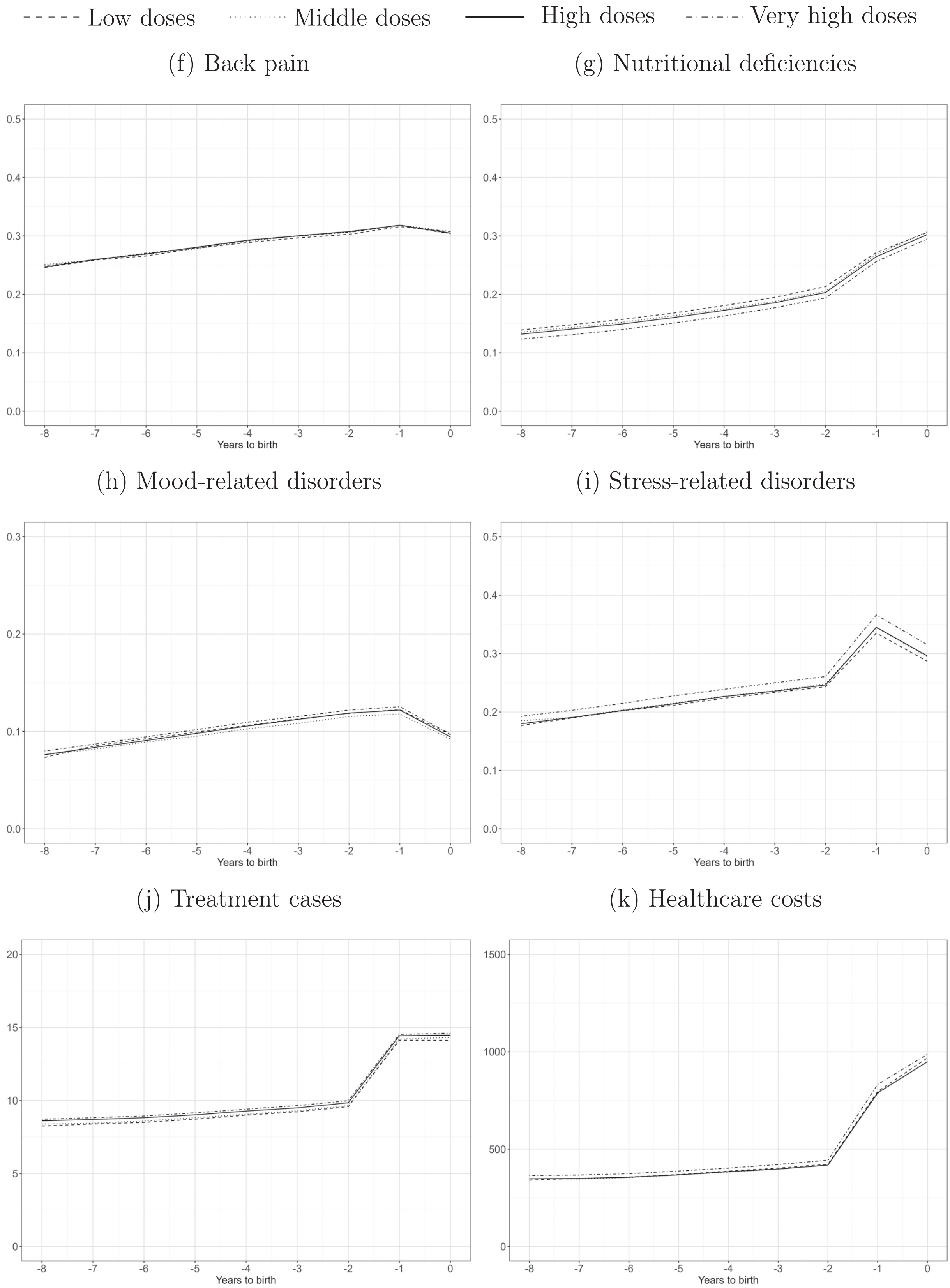
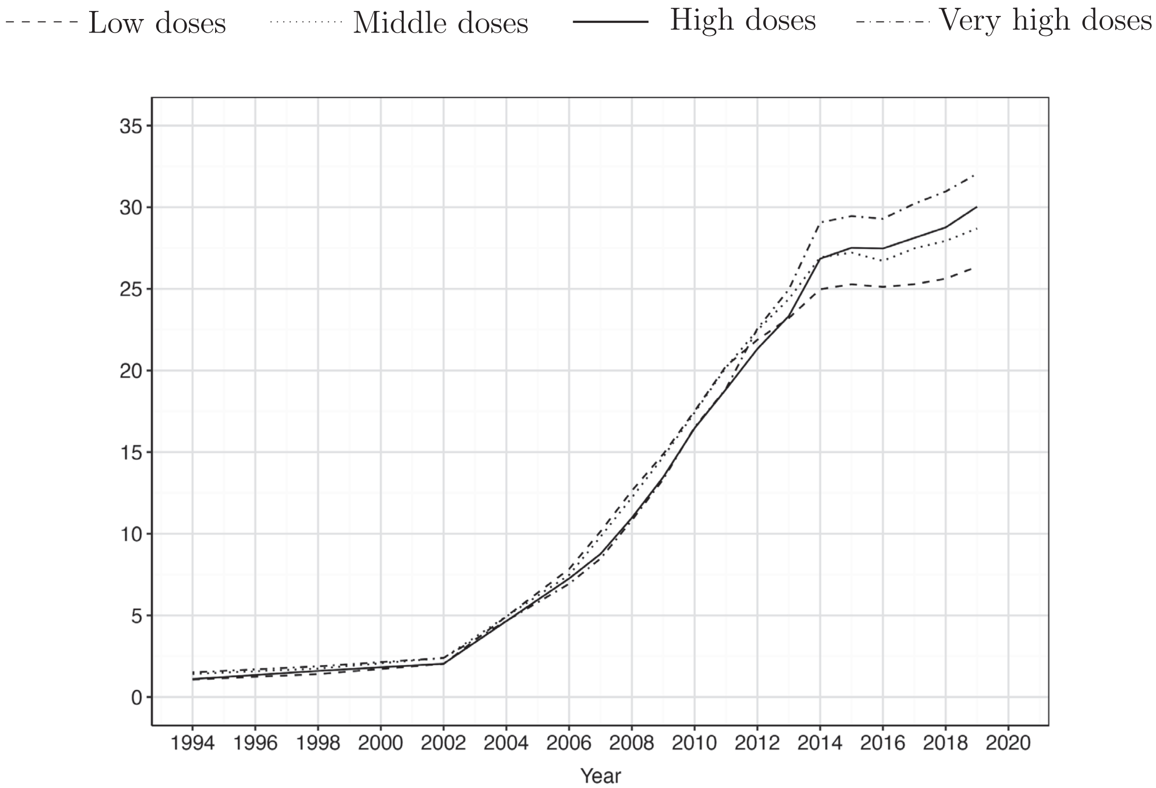


Figure C.1: Trends of maternal health outcomes by treatment doses (*continued*)



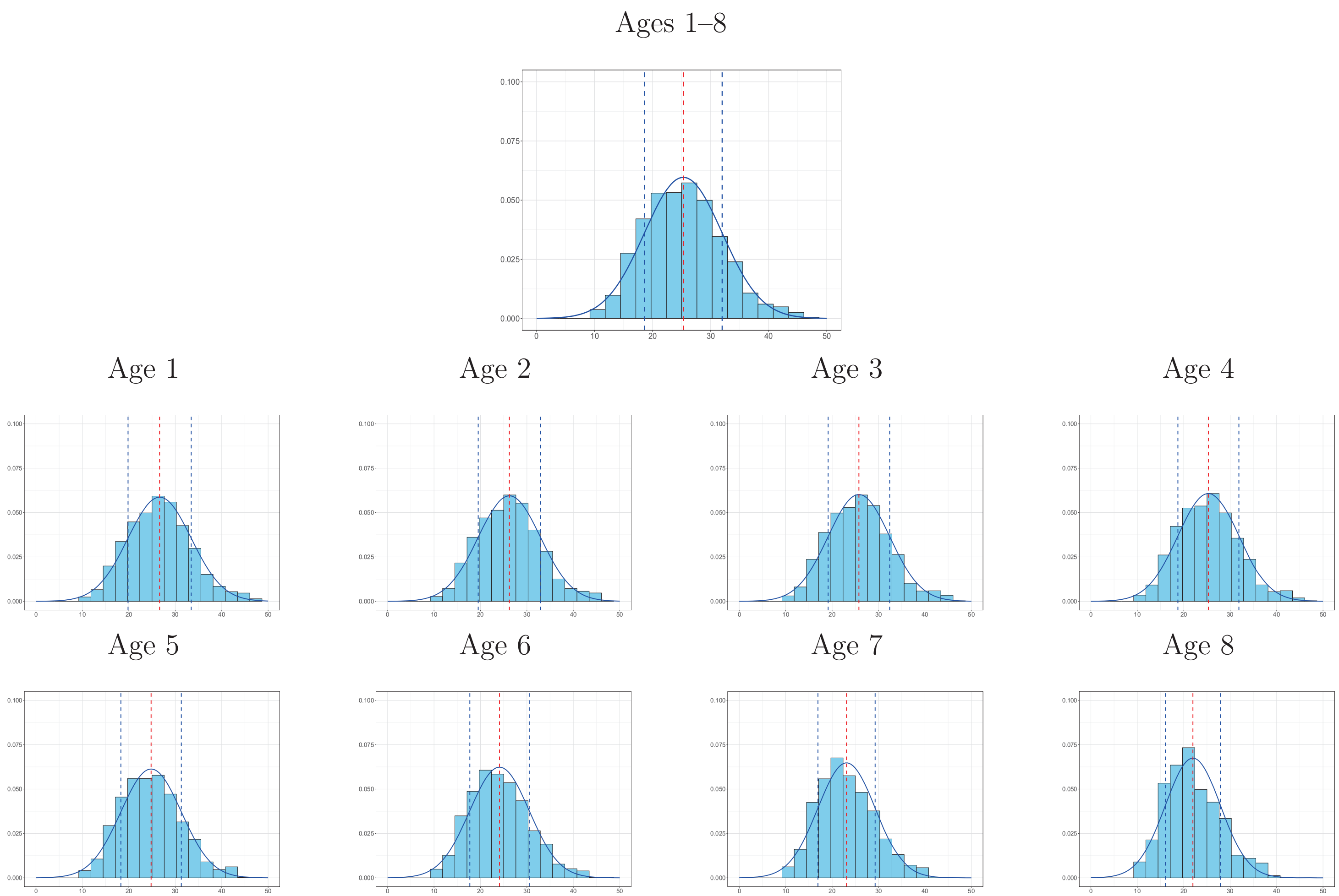
Note: Trends of maternal health outcomes before giving birth to their focal child in counties with different treatment doses: i) counties with low treatment doses (dashed line) have an increase below the first quartile of the distribution of increases in childcare coverage rates between 2011 and 2014; ii) counties with middle treatment doses (dotted line) have an increase between the first and second quartiles; iii) counties with high treatment doses (solid line) have an increase between the second and third quartiles; and iv) counties with very high treatment doses (dotdashed line) have an increase above the third quartile. The x-axis refers to the years to birth of the focal child. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes, own calculations.

Figure C.2: Trends of childcare coverage rates in counties by treatment doses



Note: Trends of childcare coverage rates between 1994 and 2019 in counties with different treatment doses: i) counties with low treatment doses (dashed line) have an increase below the first quartile of the distribution of increases in childcare coverage rates between 2011 and 2014; ii) counties with middle treatment doses (dotted line) have an increase between the first and second quartiles; iii) counties with high treatment doses (solid line) have an increase between the second and third quartiles; and iv) counties with very high treatment doses (dotdashed line) have an increase above the third quartile. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019), own calculations.

Figure C.3: Histograms of childcare coverage rates

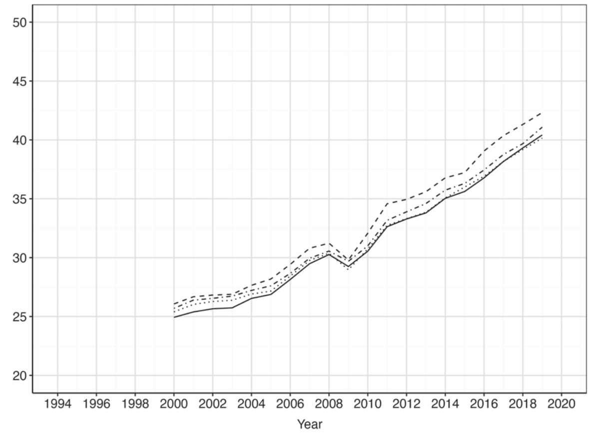


Note: Histograms of childcare coverage rates assigned to mothers in our sample alongside a normal distribution with mean (dashed red line) and standard deviation (dashed blue lines) of the distribution of childcare coverage rates by focal child's age and aggregating ages 1–8 *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes, own calculations.

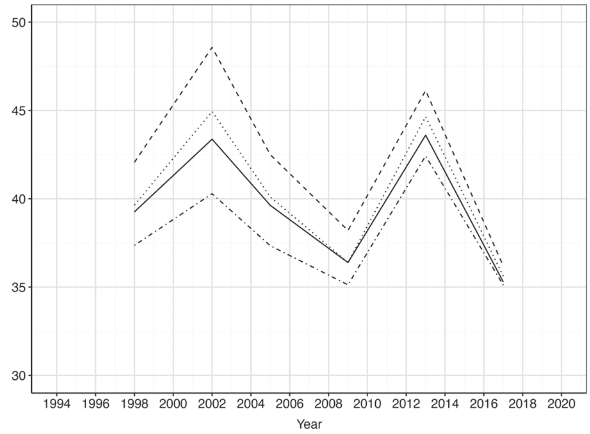
Figure C.4: Trends of county characteristics by treatment doses

Low doses — Middle doses — High doses — Very high doses

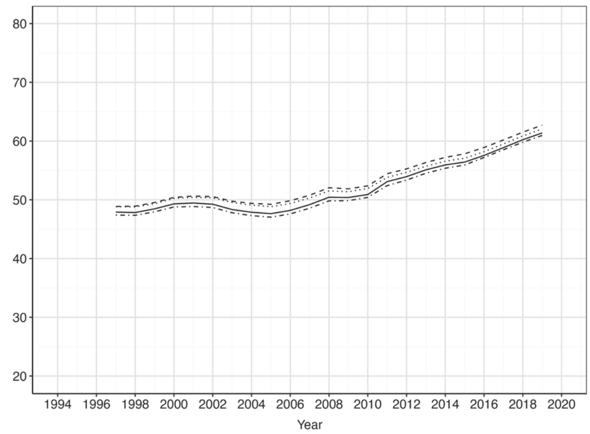
(a) GDP per capita



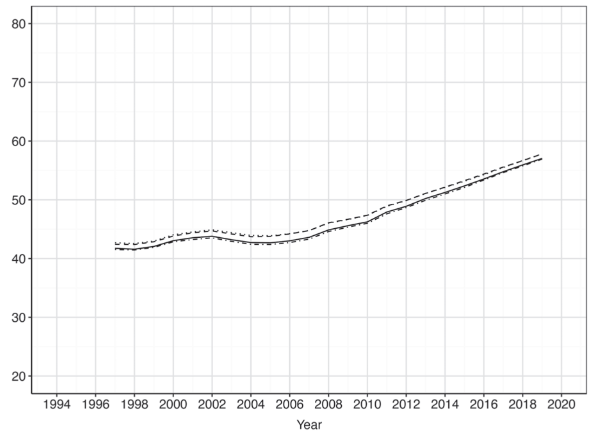
(b) Share of conservative votes



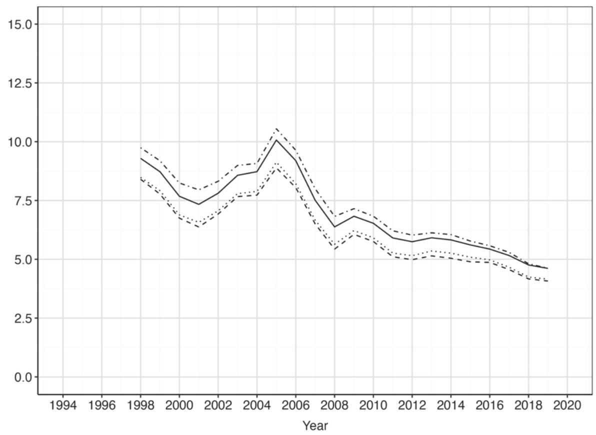
(c) Total employment rate



(d) Women employment rate



(e) Total unemployment rate



(f) Women unemployment rate

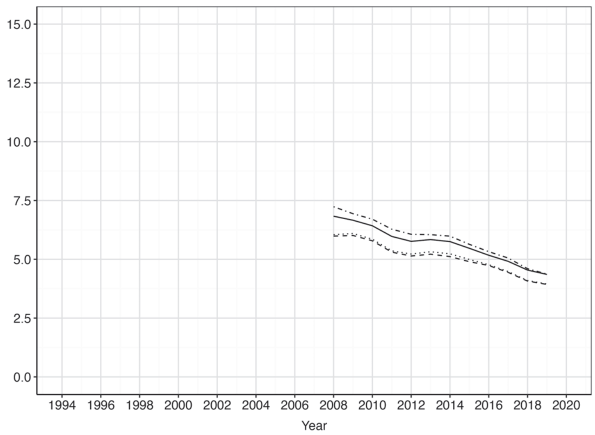
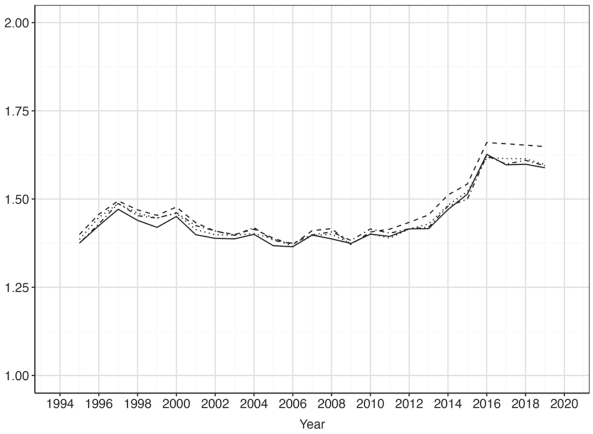


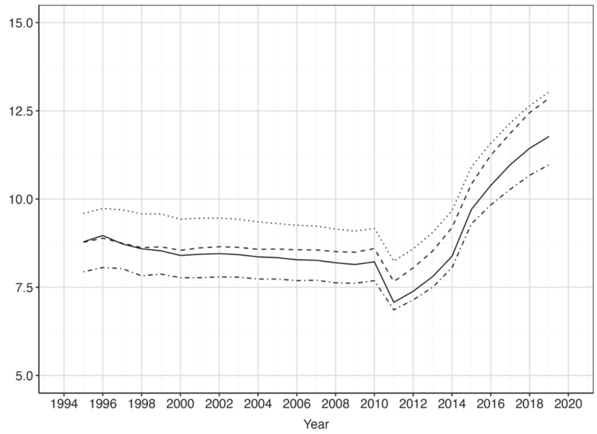
Figure C.4: Trends of county characteristics by treatment doses (*continued*)

- - - - Low doses ·········· Middle doses —— High doses -·-·- Very high doses

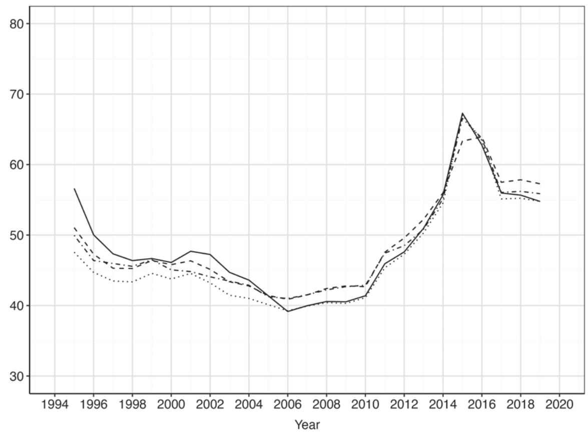
(g) Fertility rate



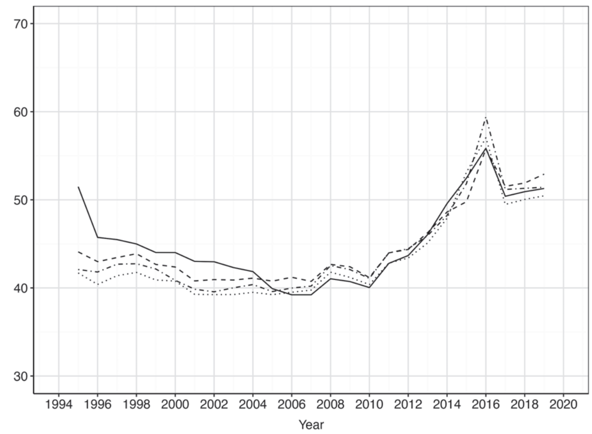
(h) Share of migrants



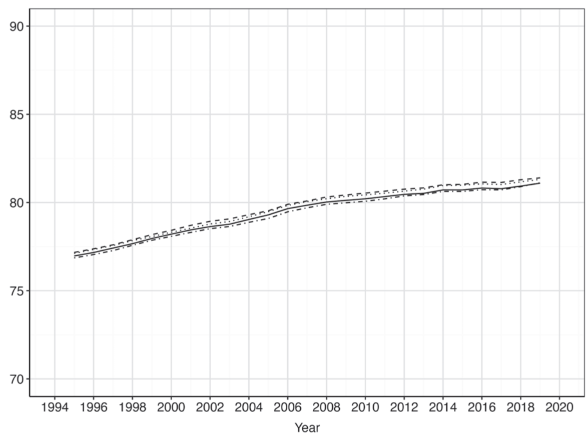
(i) Inflow of population into counties



(j) Outflow of population into counties



(k) Life expectancy



(l) Population density

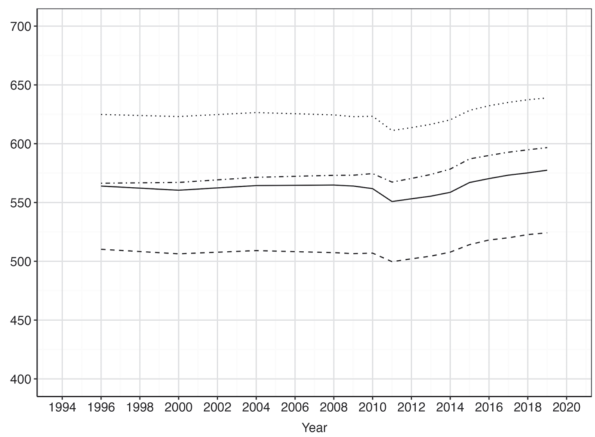
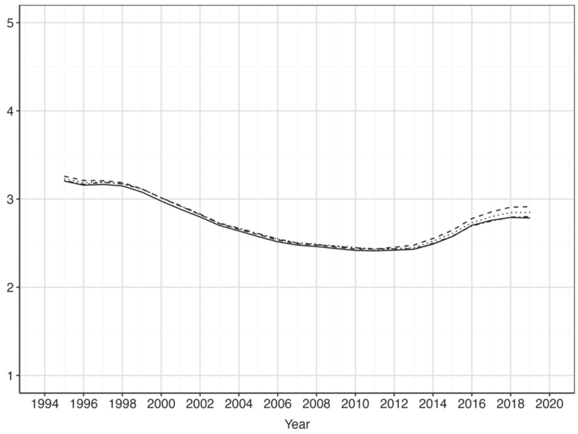


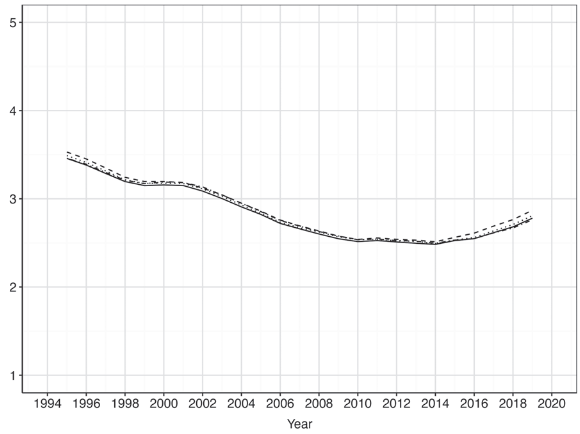
Figure C.4: Trends of county characteristics by treatment doses (*continued*)

- - - - Low doses ·········· Middle doses —— High doses -·-·- Very high doses

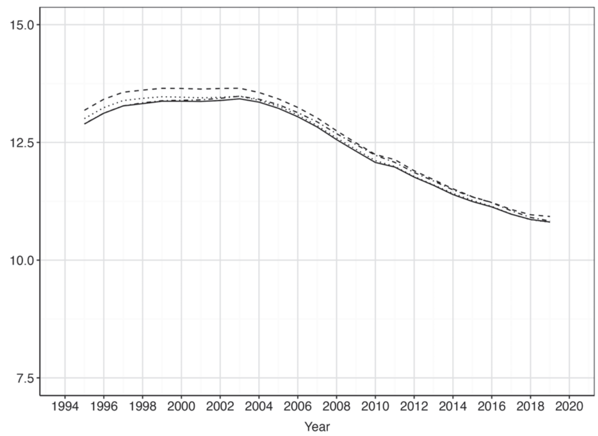
(m) % Population under age 3



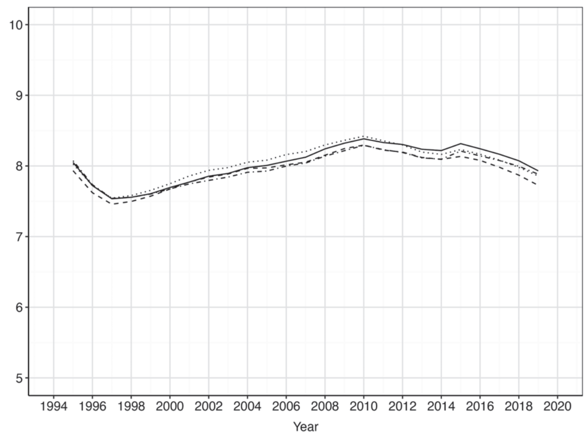
(n) % Population aged between 3 and 6



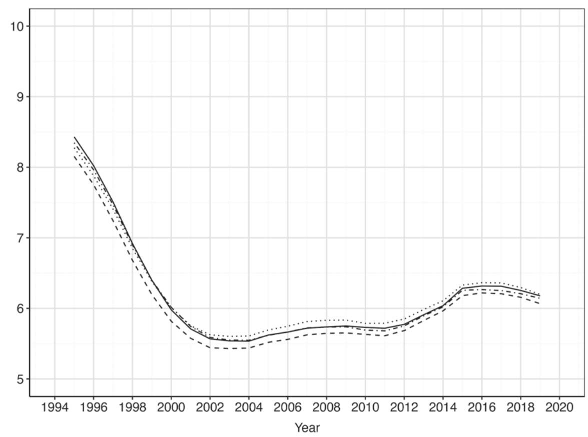
(o) % Population aged between 6 and 18



(p) % Population aged between 18 and 25



(q) % Population aged between 25 and 30



(r) % Population aged between 30 and 50

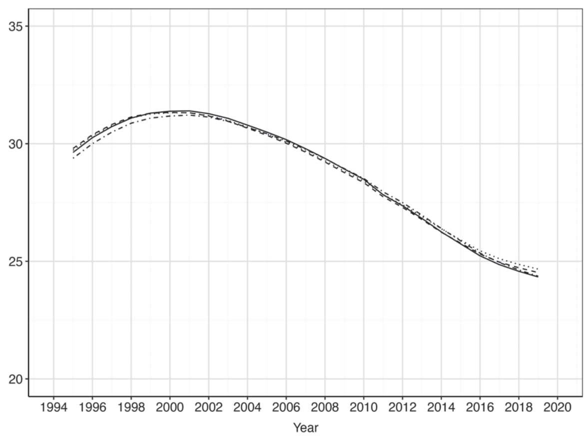
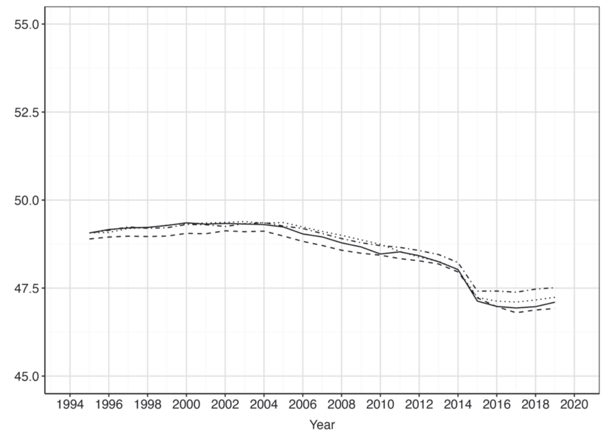


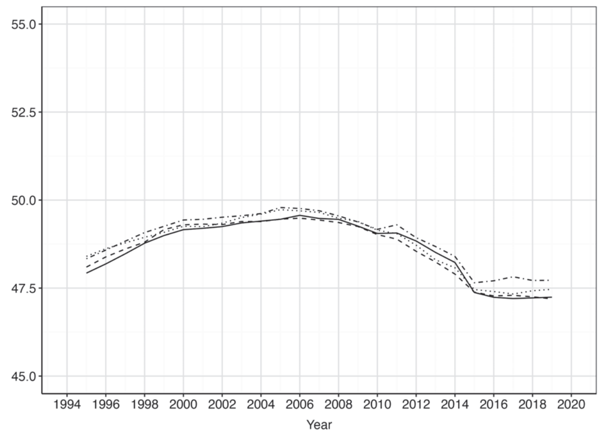
Figure C.4: Trends of county characteristics by treatment doses (*continued*)

- - - - - Low doses ········· Middle doses ——— High doses -·-·-· Very high doses

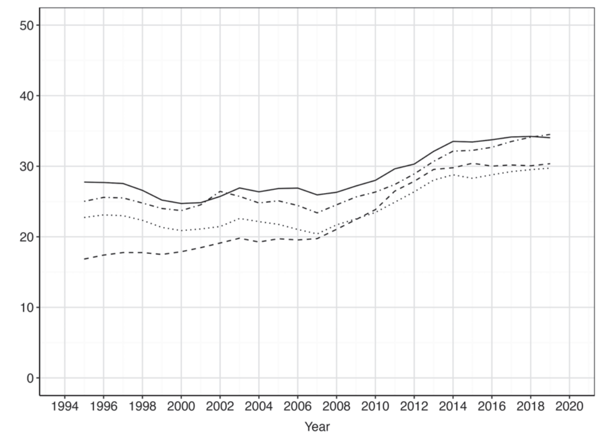
(s) % Women aged between 18 and 25



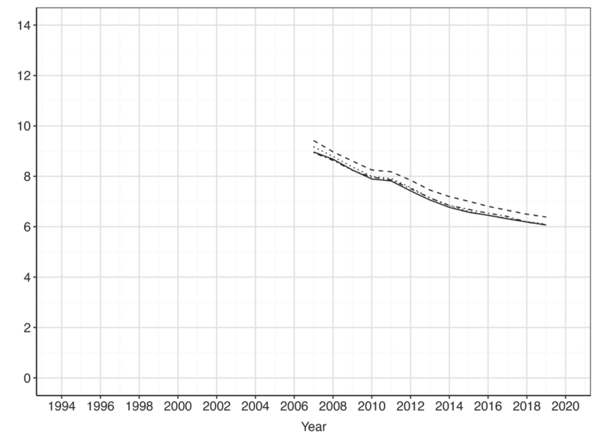
(t) % Women aged between 25 and 30



(u) Students aged between 18 and 25



(v) Childcare slots to teaching staff



Note: Trends of county characteristics between 1994 and 2019 in counties with different treatment doses: i) counties with low treatment doses (dashed line) have an increase below the first quartile of the distribution of increases in childcare coverage rates between 2011 and 2014; ii) counties with middle treatment doses (dotted line) have an increase between the first and second quartiles; iii) counties with high treatment doses (solid line) have an increase between the second and third quartiles; and iv) counties with very high treatment doses (dotdashed line) have an increase above the third quartile. *Source*: INKAR (1995–2019) and German Statistical Office (2007–2019) for county characteristics, and German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, own calculations.

C.2 Mechanisms

Table C.2: Early childcare attendance and labour market outcomes

	Employed		Blue-Collar Occupation		Household Income	
	OLS	Balancing	OLS	Balancing	OLS	Balancing
First-Born Ages: 1–8						
Early Childcare Attendance	0.126***	0.119***	-0.036*	-0.046***	0.089***	0.106***
	(0.016)	(0.016)	(0.015)	(0.013)	(0.017)	(0.016)
Observations	4135	4135	3526	3526	3877	3877
First-Born Ages: 1–2						
Early Childcare Attendance	0.279***	0.250***	-0.031	-0.042+	0.137***	0.131***
	(0.030)	(0.030)	(0.024)	(0.024)	(0.031)	(0.032)
Observations	1431	1431	1169	1169	1336	1336
First-Born Ages: 3–8						
Early Childcare Attendance	0.052**	0.062**	-0.037+	-0.044**	0.074***	0.088***
	(0.019)	(0.020)	(0.019)	(0.016)	(0.020)	(0.020)
Observations	2704	2704	2357	2357	2541	2541

Note: $^{+}$ p < 0.1; * p < 0.05; ** p < 0.01; *** p < 0.001. Columns (1) and (3) estimate OLS regressions of self-reported labour market outcomes against early childcare attendance of first-born child controlling for age of the mother, number of children per mother, year of wave fixed effects, cohort and month of birth of first-born child fixed effects, and state of residence fixed effects. We weight observations using weights for representative population. Columns (2) and (4) estimate OLS regressions of self-reported labour market outcomes against early childcare attendance of first-born child and controls after entropy balancing mothers with children attending childcare with mothers with children not attending childcare. Sample includes mothers residing in West Germany whose first-born child was born in 2007–2018 and aged 1–8 in 2009–2019. Control coefficients are not reported. Standard errors clustered at individual level are in parentheses. *Source*: Pairfam Survey (2009-2019), own calculations.

Table C.3: Early childcare attendance and healthy behaviours

	Hours of Sleep		Importance of Children Eating Healthy and Exercising		Exercises Daily		Weekly Hours Watching TV		Smokes		Daily Number of Cigarettes		Monthly Times Heavily Drinking	
	OLS	Balancing	OLS	Balancing	OLS	Balancing	OLS	Balancing	OLS	Balancing	OLS	Balancing	OLS	Balancing
First-Born Ages: 1–8														
Early Childcare Attendance	-0.078+	-0.065+	-0.070	0.028	0.011	0.006	-0.731*	-0.615*	-0.002	-0.026	-0.701**	-0.815***	-0.172*	-0.130+
	(0.042)	(0.040)	(0.047)	(0.046)	(0.007)	(0.006)	(0.327)	(0.300)	(0.019)	(0.017)	(0.271)	(0.229)	(0.071)	(0.072)
Observations	4047	4047	3127	3127	4107	4107	3919	3919	2979	2979	2979	2979	3048	3048
First-Born Ages: 1–2														
Early Childcare Attendance	-0.050	-0.011	-0.112	0.003	-0.002	0.004	-0.473	0.042	0.023	-0.020	-0.484	-0.973*	-0.221*	-0.209+
	(0.079)	(0.068)	(0.083)	(0.079)	(0.012)	(0.011)	(0.641)	(0.562)	(0.033)	(0.030)	(0.457)	(0.429)	(0.112)	(0.126)
Observations	1381	1381	1087	1087	1414	1414	1342	1342	977	977	977	977	1004	1004
First-Born Ages: 3–8														
Early Childcare Attendance	-0.082	-0.091+	-0.073	0.055	0.018*	0.012+	-0.796*	-0.863+	-0.023	-0.055*	-0.994**	-1.158***	-0.188*	-0.172*
	(0.052)	(0.053)	(0.059)	(0.059)	(0.008)	(0.007)	(0.399)	(0.459)	(0.024)	(0.022)	(0.379)	(0.304)	(0.093)	(0.086)
Observations	2666	2666	2040	2040	2693	2693	2577	2577	2002	2002	2002	2002	2044	2044

Note: + $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Columns (1) and (3) estimate OLS regressions of self-reported healthy behaviours against early childcare attendance of first-born child controlling for age of the mother, number of children per mother, year of wave fixed effects, cohort and month of birth of first-born child fixed effects, and state of residence fixed effects. We weight observations using weights for representative population. Columns (2) and (4) estimate OLS regressions of self-reported healthy behaviours against early childcare attendance of first-born child and controls after entropy balancing mothers with children attending childcare with mothers with children not attending childcare. Sample includes mothers residing in West Germany whose first-born child was born in 2007–2018 and aged 1–8 in 2009–2019. Control coefficients are not reported. Standard errors clustered at individual level are in parentheses. *Source*: Pairfam Survey (2009-2019), own calculations.

C.3 Robustness Checks

Event study approach

We estimate the following equation following Schmidheiny & Siegloch (2023):

$$y_{mcdty} = \sum_{\substack{\ell=-3 \\ \ell\neq-1}}^{3} \gamma_\ell \Delta CC_{c\ell} + \mathbf{X}'_{my}\boldsymbol{\delta} + \boldsymbol{\mu}_d + \boldsymbol{\theta}_t + \boldsymbol{\lambda}_y + \varepsilon_{mcdty} \tag{C.1}$$

where

$$\Delta CC_{c\ell} = \begin{cases} CC_{c,2022} - CC_{c,t-\ell-1} & \text{if } \ell = -3, \\ CC_{c,t-\ell} - CC_{c,t-\ell-1} & \text{if } -2 \leq \ell \leq 2, \\ CC_{c,t-\ell} - CC_{c,2007} & \text{if } \ell = 3. \end{cases}$$

The leads and lags γ_ℓ capture the dynamic treatment effects of childcare coverage rates on maternal health, where the first lead is taken as the baseline category.

First-time mothers

In Section 5.2.2, we rerun our main specification for a subsample of “real" first-time mothers who gave birth in 2010–2018 and exclude mothers who might have given birth before 2010. This selection process involves three steps. We first calculate the total number of children per mother using our data on all births from 2010 to 2022. We then compute the percentage of mothers within our sample with one, two, and three or more children per mother’s birth cohort (i.e., 1961–2003). Second, we consider the national statistics of the number of women with zero, one, two, and three or more children per women’s birth cohort published by the German Statistical Office (2023c) and calculate the percentage of mothers in Germany with one, two, and three or more children in 2022 per mother’s birth cohort. To identify potential cases where mothers might have given birth before 2010, we mimic the national percentage distribution within our sample. This involves random assignments of mothers to either have more children born before 2010 or maintain their existing number of children. For example, the national percentage of mothers born in 1982 with one, two, and three or more children is 27.8%, 48.8%, and 23.4%, respectively. In our sample, the corresponding percentages are 56.7%, 36.8%, and 6.5%, respectively. To align our data with the national statistics, we randomly assign mothers with one child in our sample to have two children (one born before 2010) until we reach 27.8%. We then repeat this procedure for the percentage of mothers with two and three or more children. That is, among mothers who have two or more children, the national percentage of mothers born in 1982 with two and three or more children is 67.7% and 32.4%, respectively, and the percentage in our sample is 84.9% and 15.1%, respectively. To match with the national percentages, we randomly assign mothers with two children in our sample to have three or more children until our sample mirrored the national proportions of 67.7% among mothers with two or more children, or 48.8% among all mothers. We repeat this process for all mother's birth cohorts.[38]

Table C.4: Effect of childcare coverage rates on county characteristics

	GDP per capita	Share of conservatives votes	Total employment rate	Women employment rate	Total unemployment rate	Women unemployment rate	Fertility rate	Share of migrants
CC	−0.048	0.089*	0.029+	0.041*	−0.038***	−0.030***	0.001*	−0.034***
	(0.037)	(0.044)	(0.017)	(0.018)	(0.009)	(0.007)	(0.001)	(0.010)
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,480	1,944	7,452	7,452	7,128	3,888	8,100	8,100

	Inflow of population into counties	Outflow of population into counties	Life expectancy	Population density	% Population under 3	% Population aged between 3 and 6	% Population aged between 6 and 18	% Population aged between 18 and 25
CC	−0.286**	−0.217*	0.015***	1.312**	−0.003	−0.002	−0.010	0.007
	(0.095)	(0.090)	(0.003)	(0.450)	(0.002)	(0.002)	(0.007)	(0.006)
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,100	8,100	8,100	4,860	8,100	8,100	8,100	8,100

	% Population aged between 25 and 30	% Population aged between 30 and 50	% Women population aged between 18 and 25	% Women population aged between 25 and 30	Students per 100 individuals aged between 18 and 25	Childcare slots to teaching staff
CC	−0.006	−0.066***	0.004	0.005	−0.302+	0.009
	(0.005)	(0.008)	(0.011)	(0.010)	(0.177)	(0.006)
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,100	8,100	8,100	8,100	8,100	4,212

Note: +p<0.1; *p<0.05; **p<0.01; ***p<0.001. OLS regressions of county characteristics against childcare coverage rates (CC) controlling for county and year fixed effects. Robust standard errors clustered at county-level in parentheses. Data of childcare coverage rates are available for 1994, 1998, 2002 and 2006-2019. Linear interpolations between 1994 and 1998, 1998 and 2002, and 2002 and 2006 have been calculated. *Source*: INKAR (1995-2019) and German Statistical Office (2007-2019) for county characteristics, and German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006-2019) for childcare coverage rates, own calculations.

[38] The national statistics provide information on the number of women with zero, one, two, and three or more children for those born from 1947 to 1992. Given that our mothers were born between 1961 and 2003, we apply a linear extrapolation for cohorts born in 1993–1995. For cohorts born in 1996 and later, we instead assume that the percentage of mothers in our sample with one, two, and three or more children closely resembles the national percentages since these mothers were younger than 15 in 2010 being unlikely that they had given birth to more children before 2010.

Table C.5: Effect of the childcare expansion on maternal health outcomes adjusting p-values for multiple hypotheses testing

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Ages 1-8
Infections	0.032***	0.018***	0.006	0.005	0.004	0.008+	0.004	0.010+	0.007**
	(0.000)	(0.000)	(0.122)	(0.160)	(0.273)	(0.081)	(0.459)	(0.093)	(0.004)
Respiratory diseases	0.041***	0.029***	-0.005	-0.019*	-0.016+	-0.006	0.001	-0.004	-0.002
	(0.000)	(0.000)	(0.557)	(0.033)	(0.057)	(0.524)	(0.997)	(0.763)	(0.757)
Ear diseases	0.004	-0.001	-0.006*	-0.005*	-0.006+	-0.002	-0.002	-0.004	-0.002
	(0.261)	(0.832)	(0.032)	(0.041)	(0.068)	(0.594)	(0.622)	(0.430)	(0.217)
Obesity	0.004+	-0.004**	-0.007***	-0.009***	-0.009***	-0.011***	-0.011***	-0.012***	-0.009***
	(0.057)	(0.006)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hypertension	0.002+	-0.002***	-0.005***	-0.005***	-0.005***	-0.006***	-0.007***	-0.008***	-0.005***
	(0.057)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Back pain	-0.003	-0.010***	-0.014***	-0.016***	-0.019***	-0.017***	-0.016***	-0.015***	-0.015***
	(0.432)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Nutritional deficiencies	-0.001	-0.001	-0.004	-0.002	-0.005*	-0.003	-0.002	-0.002	-0.003
	(0.758)	(0.823)	(0.122)	(0.227)	(0.034)	(0.190)	(0.459)	(0.593)	(0.203)
Mood-related disorders	0.000	-0.002	-0.001	-0.003*	-0.002	-0.001	0.000	0.001	-0.002
	(0.941)	(0.143)	(0.285)	(0.026)	(0.151)	(0.524)	(0.997)	(0.763)	(0.217)
Stress-related disorders	-0.006+	0.000	-0.003	-0.003	-0.001	0.001	-0.002	-0.001	-0.001
	(0.091)	(0.987)	(0.163)	(0.160)	(0.368)	(0.748)	(0.459)	(0.763)	(0.466)
Treatment cases	0.066	0.157***	0.098***	0.022	-0.017	0.019	0.020	-0.016	0.021
	(0.169)	(0.000)	(0.000)	(0.396)	(0.421)	(0.465)	(0.513)	(0.682)	(0.340)
Healthcare costs	0.016*	0.026***	0.018***	0.005	0.004	0.011*	0.008	0.003	0.003
	(0.016)	(0.000)	(0.000)	(0.358)	(0.421)	(0.017)	(0.222)	(0.682)	(0.340)

Note: $^{+}$p<0.1; *p<0.05; **p<0.01; ***p<0.001. Age-specific and aggregated estimates of the effects of the childcare expansion on health outcomes for mothers with a 1–8-year-old focal child based on equation (2) adjusting p-values from clustered standard errors at county level for multiple hypotheses testing (q-values in parentheses). The table reports the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

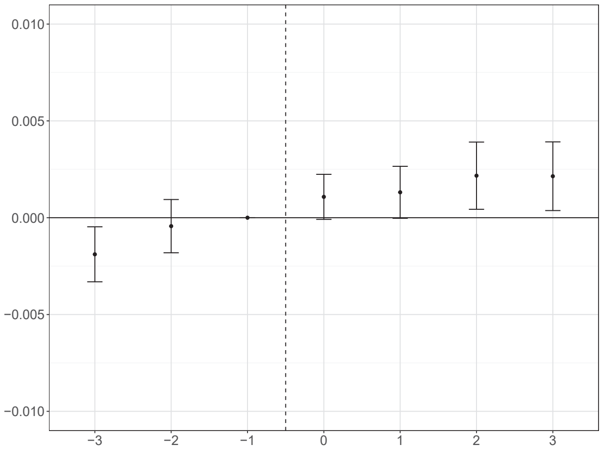
Table C.6: Early childcare attendance and self-reported health outcomes

	Overweight		Obesity	
	OLS	Balancing	OLS	Balancing
First-Born Ages: 1–8				
Early Childcare Attendance	-0.050**	-0.041*	-0.061***	-0.035**
	(0.018)	(0.018)	(0.013)	(0.012)
Observations	3768	3768	3768	3768
First-Born Ages: 1–2				
Early Childcare Attendance	-0.049	-0.047	-0.031	-0.017
	(0.033)	(0.033)	(0.022)	(0.020)
Observations	1310	1310	1310	1310
First-Born Ages: 3–8				
Early Childcare Attendance	-0.060**	-0.049*	-0.080***	-0.045**
	(0.023)	(0.022)	(0.016)	(0.015)
Observations	2458	2458	2458	2458

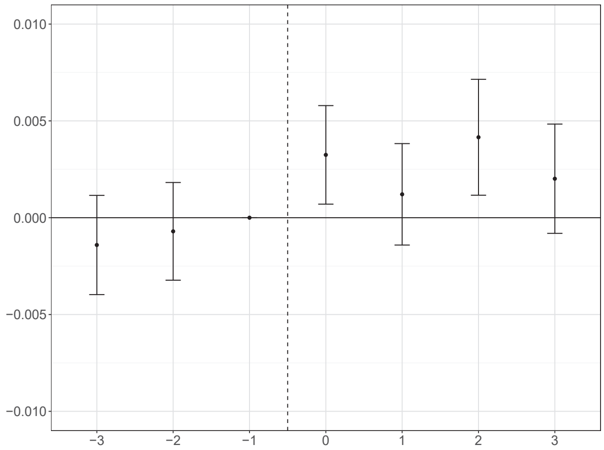
Note: $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Columns (1) and (3) estimate OLS regressions of self-reported health outcomes against early childcare attendance of first-born child controlling for age of the mother, number of children per mother, year of wave fixed effects, cohort and month of birth of first-born child fixed effects, and state of residence fixed effects. We weight observations using weights for representative population. Columns (2) and (4) estimate OLS regressions of self-reported health outcomes against early childcare attendance of first-born child and controls after entropy balancing mothers with children attending childcare with mothers with children not attending childcare. Sample includes mothers residing in West Germany whose first-born child was born in 2007–2018 and aged 1–8 in 2009–2019. Control coefficients are not reported. Standard errors clustered at individual level are in parentheses. *Source*: Pairfam Survey (2009-2019), own calculations.

Figure C.5: Effect of the childcare expansion on maternal health outcomes with leads and lags

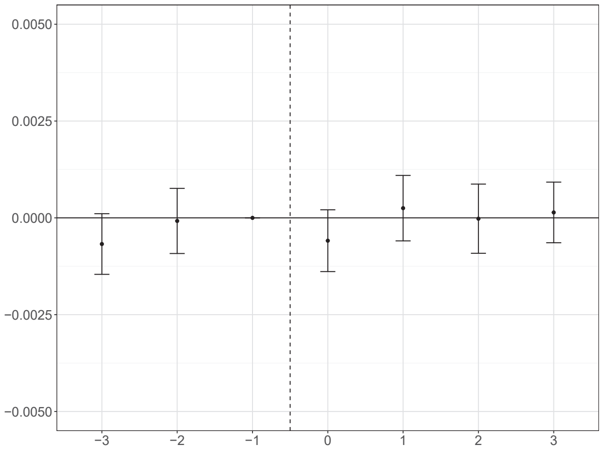
(a) Infections



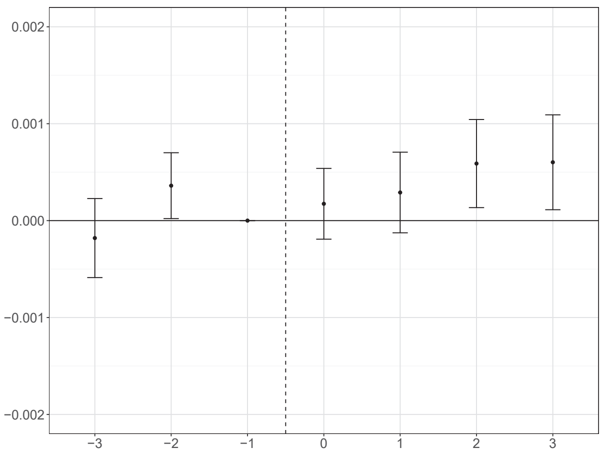
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

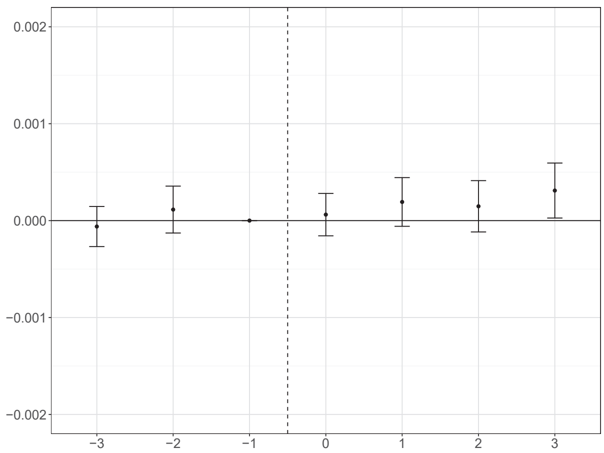
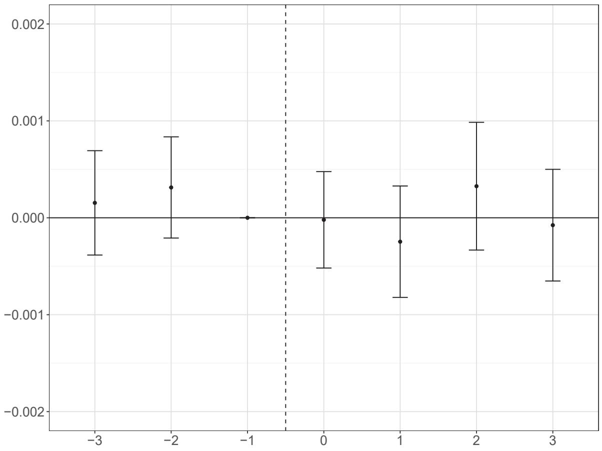
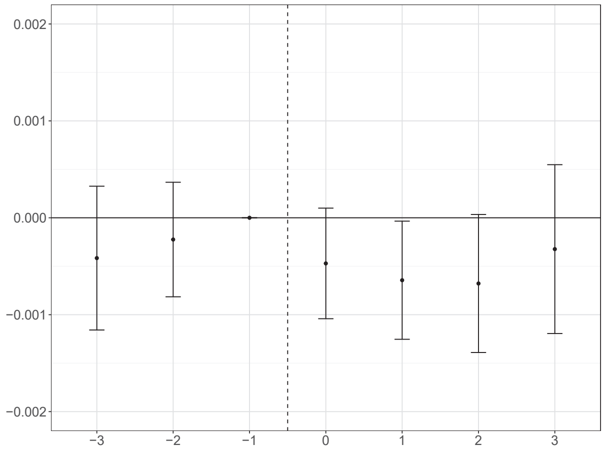


Figure C.5: Effect of the childcare expansion on maternal health outcomes with leads and lags (*continued*)

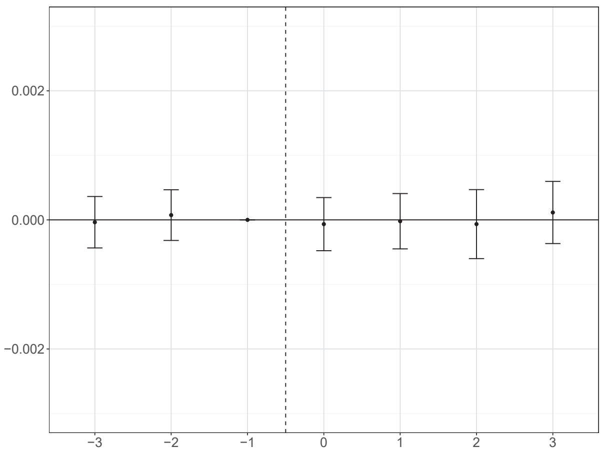
(f) Back pain



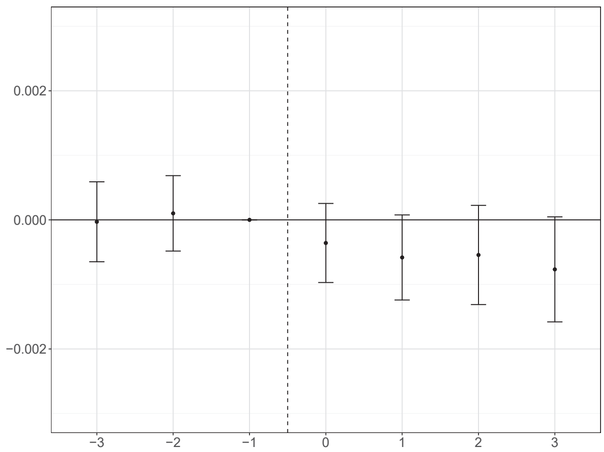
(g) Nutritional deficiencies



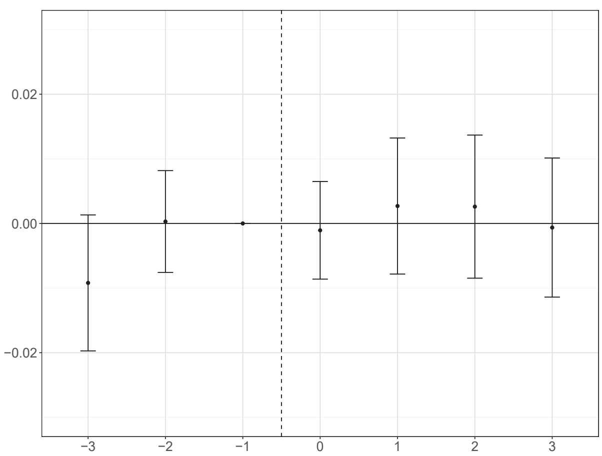
(h) Mood-related disorders



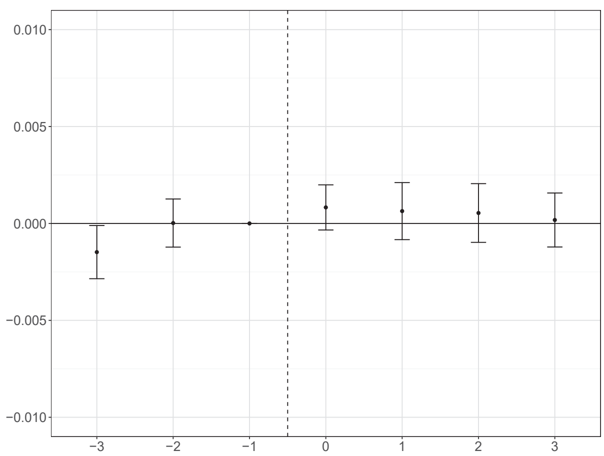
(i) Stress-related disorders



(j) Treatment cases



(k) Healthcare costs



Note: Estimates of the effects of the childcare expansion on health outcomes with leads and lags for mothers with a 1-year-old focal child based on equation (C.1) and following Schmidheiny & Siegloch (2023). The estimates are plotted together with their 95% confidence intervals from robust standard errors clustered at the county level. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2022) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

Figure C.6: Effect of the childcare expansion on maternal health outcomes with state-year fixed effects

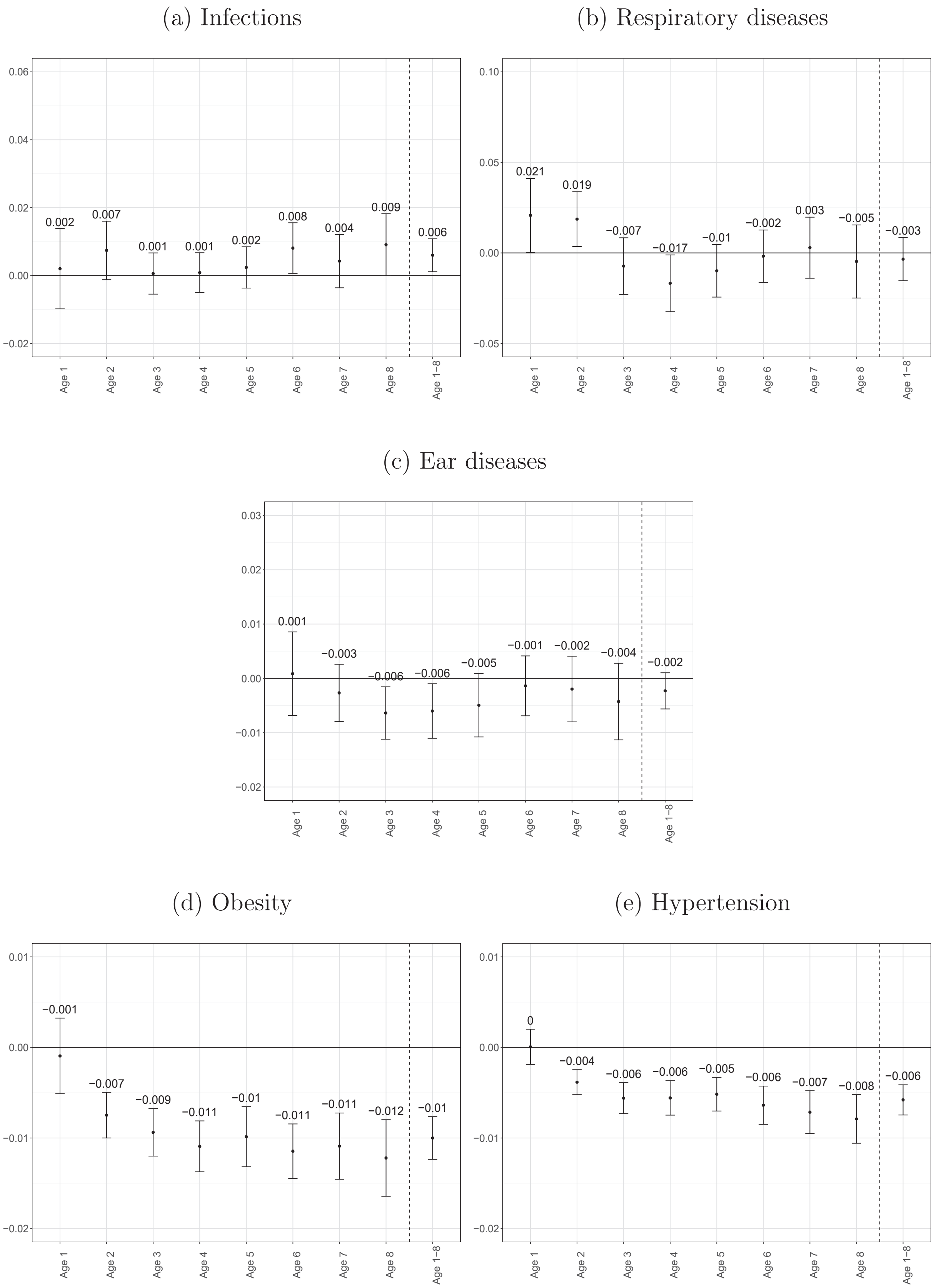
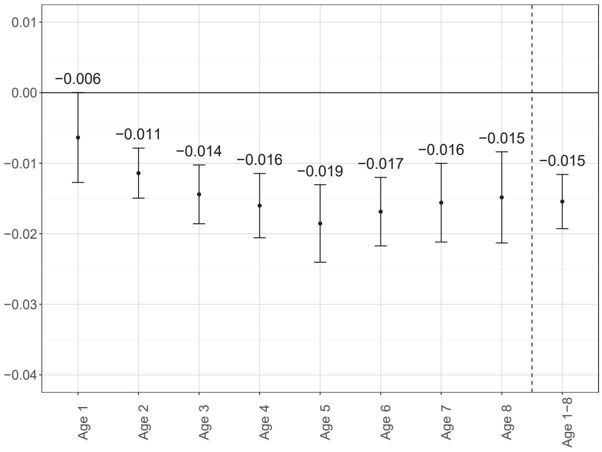
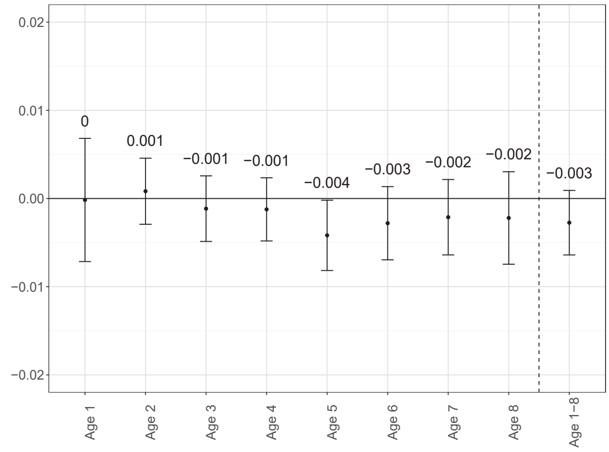


Figure C.6: Effect of the childcare expansion on maternal health outcomes with state-year fixed effects (*continued*)

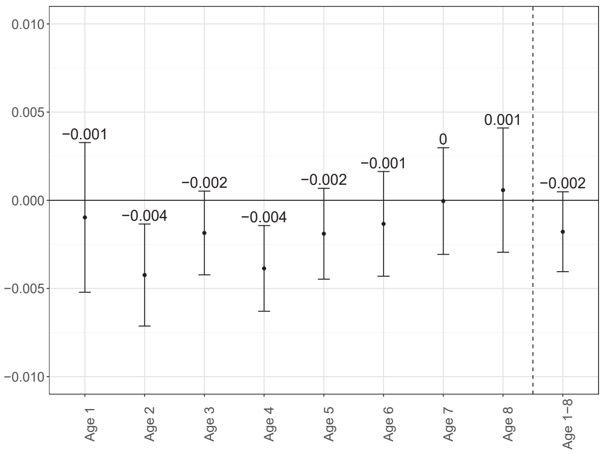
(f) Back pain



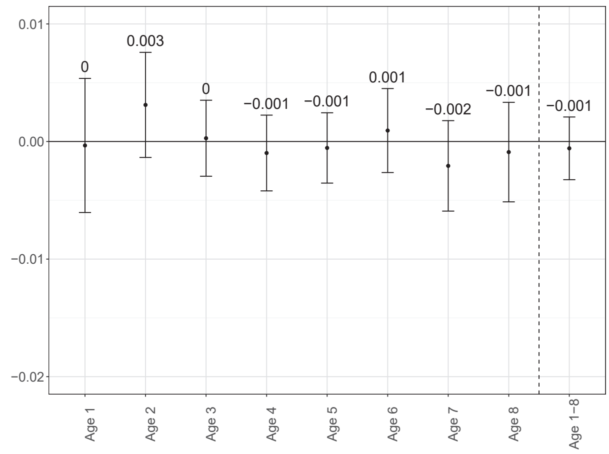
(g) Nutritional deficiencies



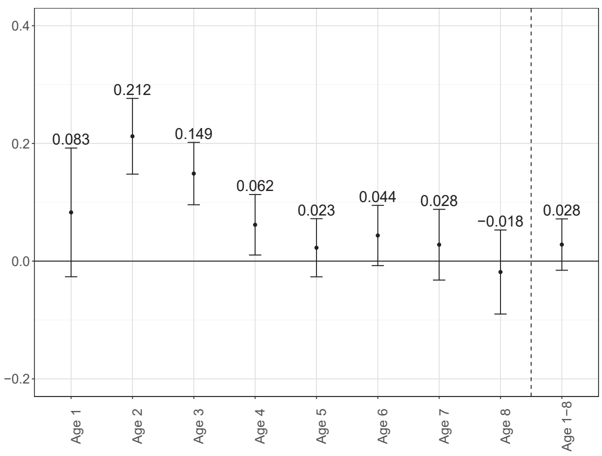
(h) Mood-related disorders



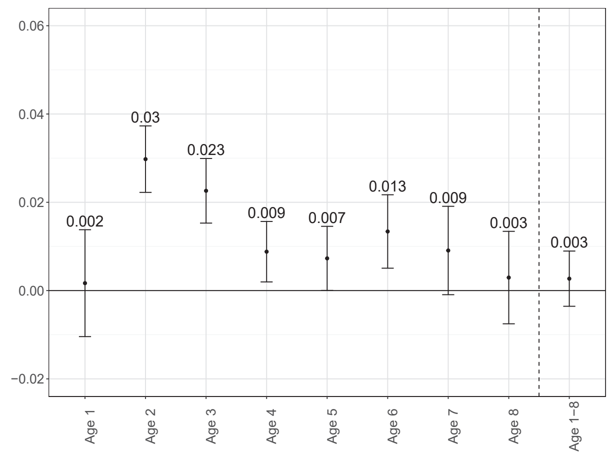
(i) Stress-related disorders



(j) Treatment cases



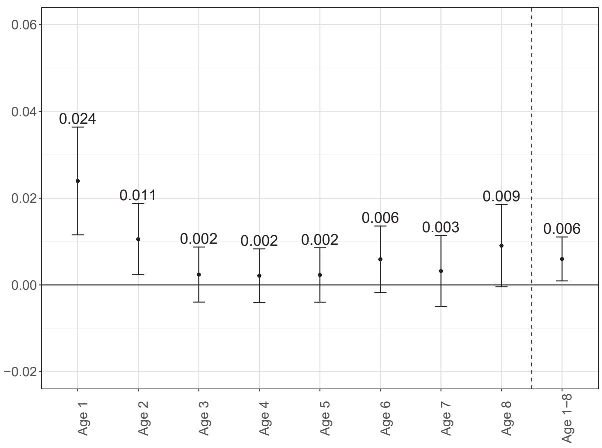
(k) Healthcare costs



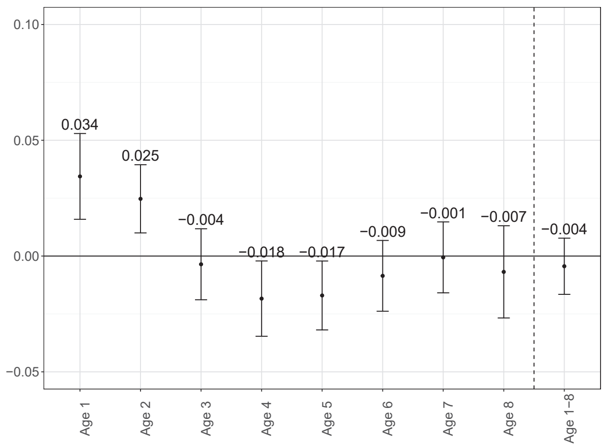
Note: Age-specific and aggregated estimates of the effects of the childcare expansion on health outcomes for mothers with a 1–8-year-old focal child based on equation (2) controlling for state-year fixed effects. The graphs plot the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. The estimates are plotted together with their 95% confidence intervals from robust standard errors clustered at the county level. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

Figure C.7: Effect of the childcare expansion on maternal health outcomes with county characteristics

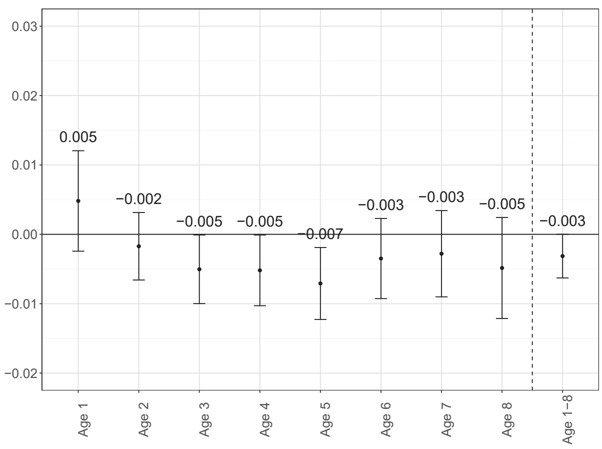
(a) Infections



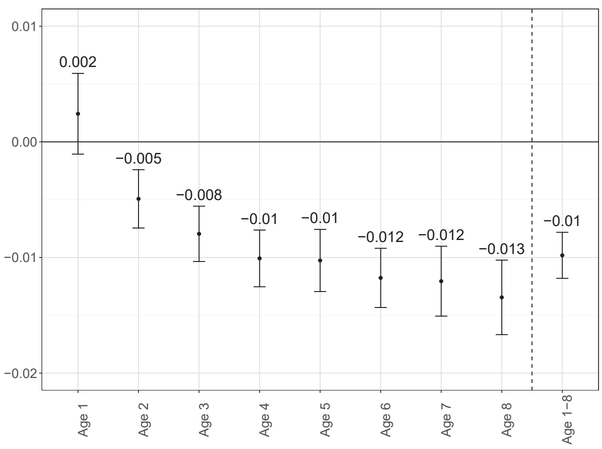
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

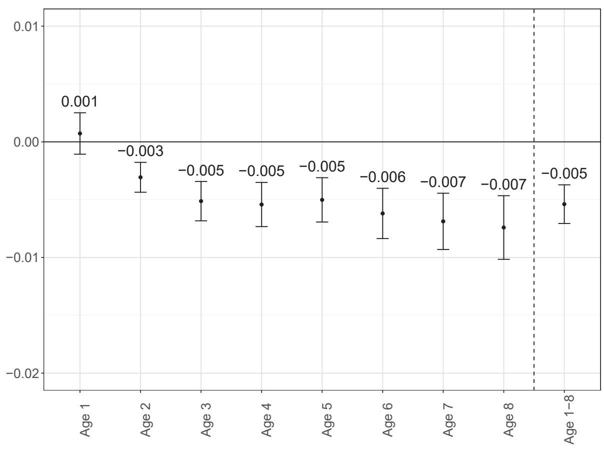
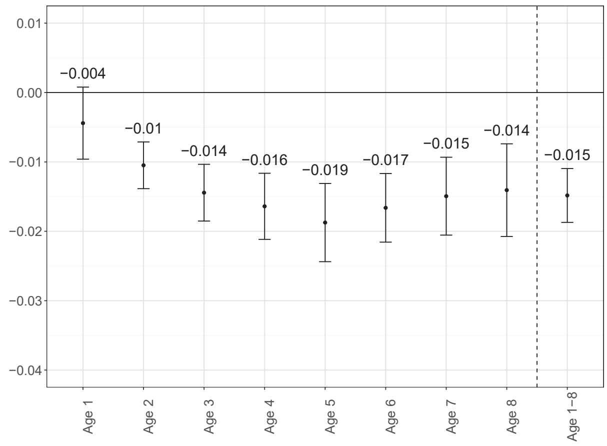
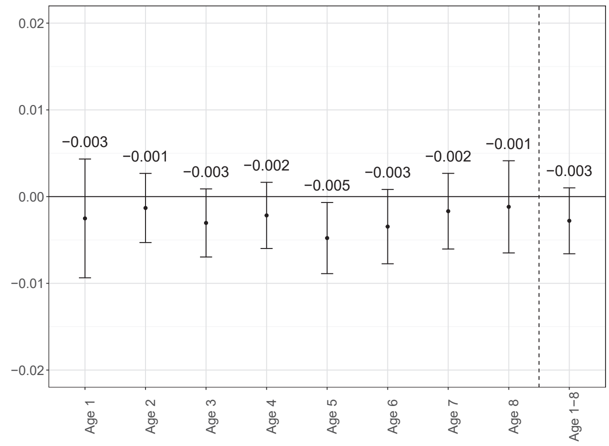


Figure C.7: Effect of the childcare expansion on maternal health outcomes with county characteristics (*continued*)

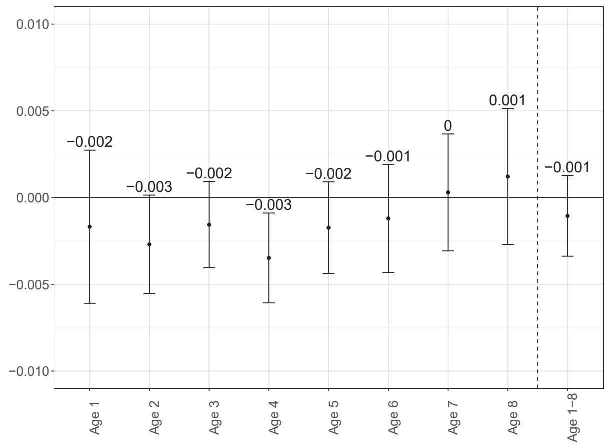
(f) Back pain



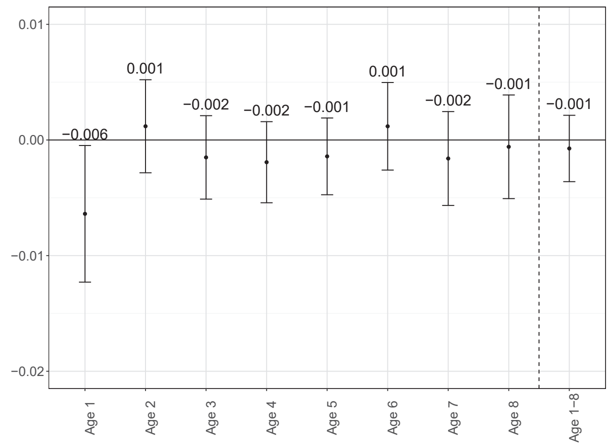
(g) Nutritional deficiencies



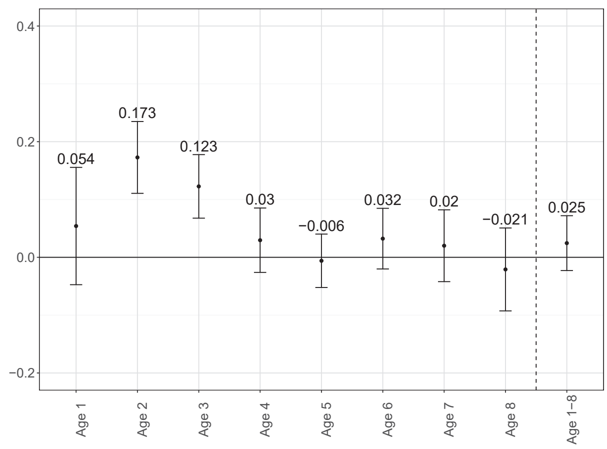
(h) Mood-related disorders



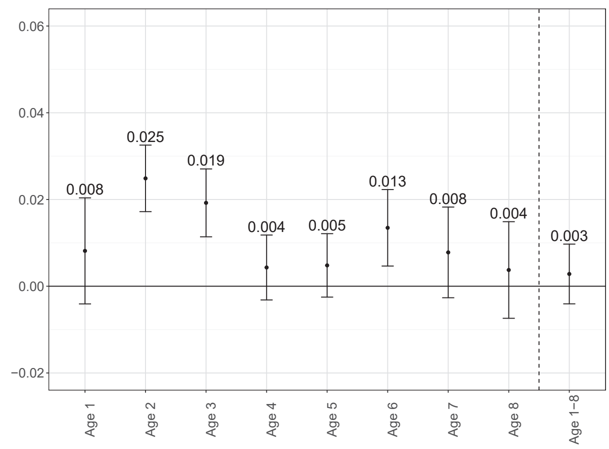
(i) Stress-related disorders



(j) Treatment cases



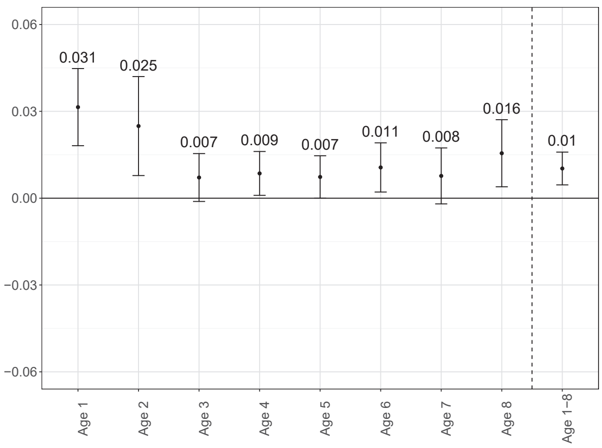
(k) Healthcare costs



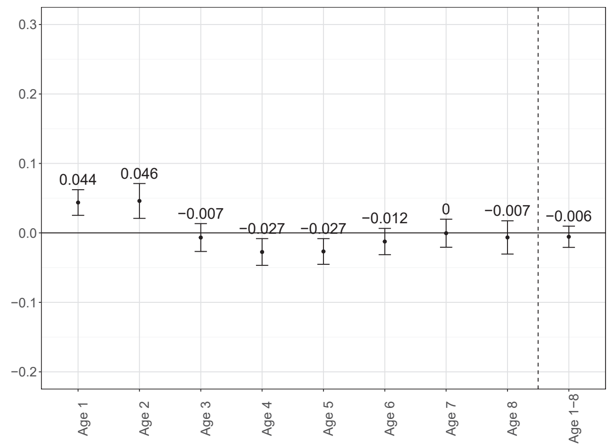
Note: Age-specific and aggregated estimates of the effects of the childcare expansion on health outcomes for mothers with a 1–8-year-old focal child based on equation (2) controlling for county characteristics (GDP per capita, women employment rate, unemployment rate, fertility rate, share of migrants, population density, % of population under three, 3–6, 6–18, 18–25, 25–30, and 30–50, and childcare slots to teaching staff). The graphs plot the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. The estimates are plotted together with their 95% confidence intervals from robust standard errors clustered at the county level. *Source*: INKAR (1995–2019) and German Statistical Office (2007–2019) for county characteristics, German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

Figure C.8: Effect of the childcare expansion on maternal health outcomes excluding movers

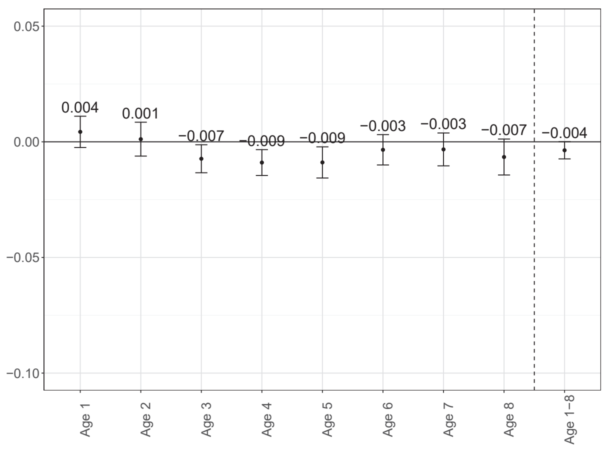
(a) Infections



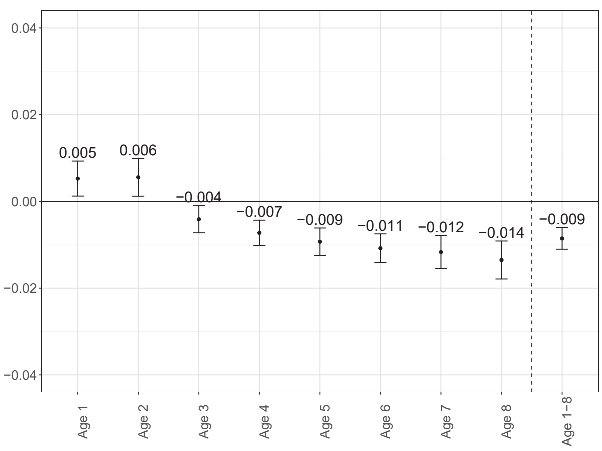
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

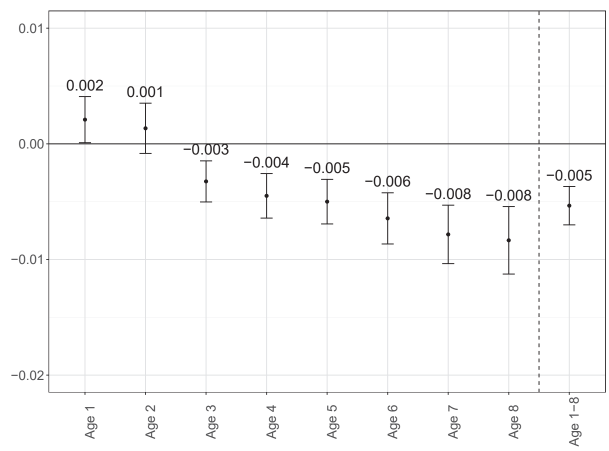
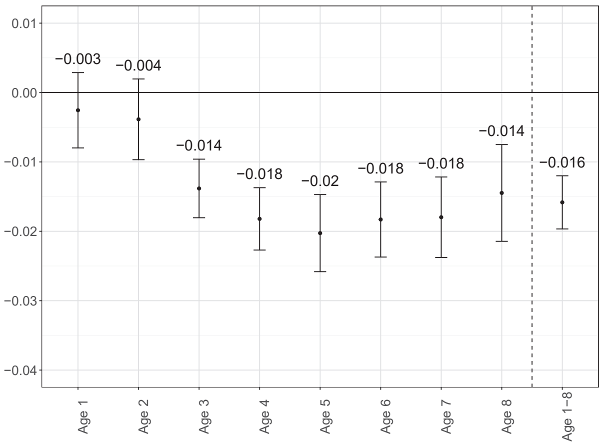
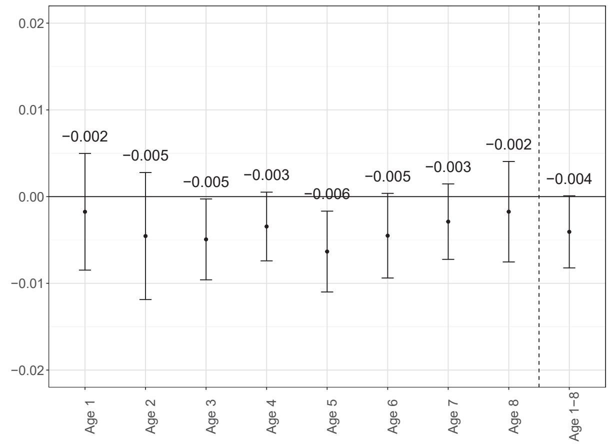


Figure C.8: Effect of the childcare expansion on maternal health outcomes excluding movers (*continued*)

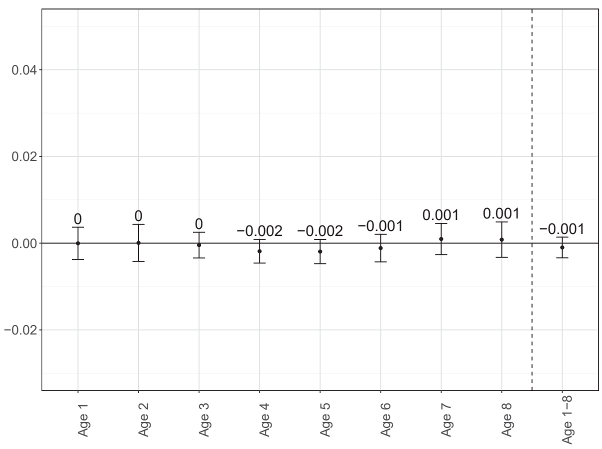
(f) Back pain



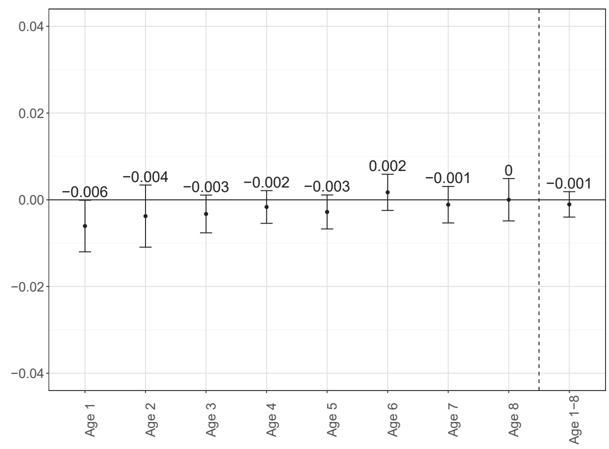
(g) Nutritional deficiencies



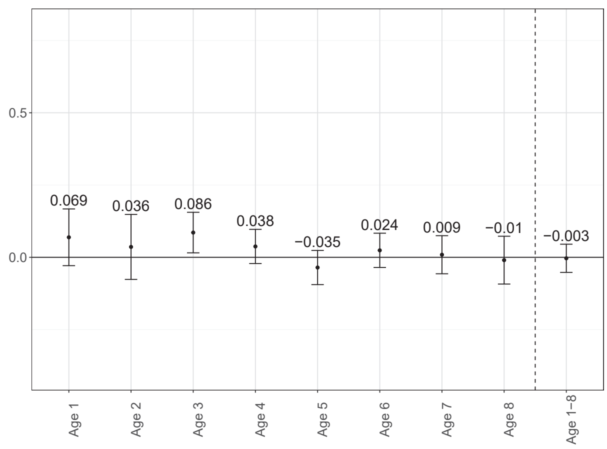
(h) Mood-related disorders



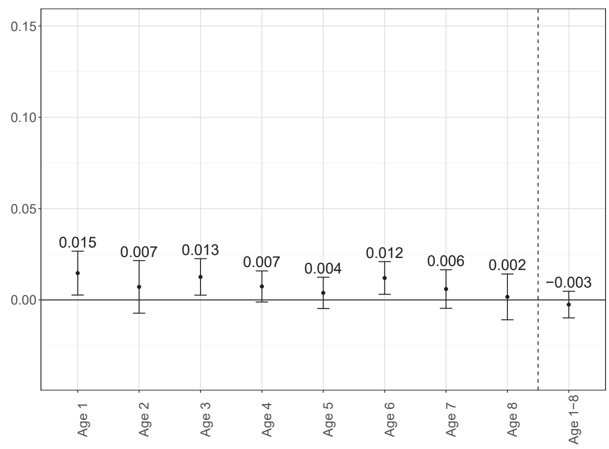
(i) Stress-related disorders



(j) Treatment cases



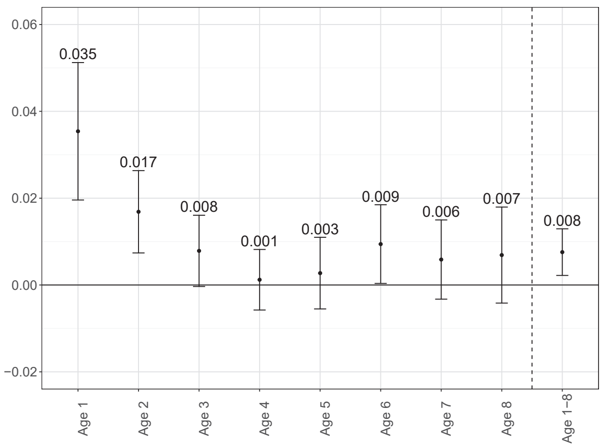
(k) Healthcare costs



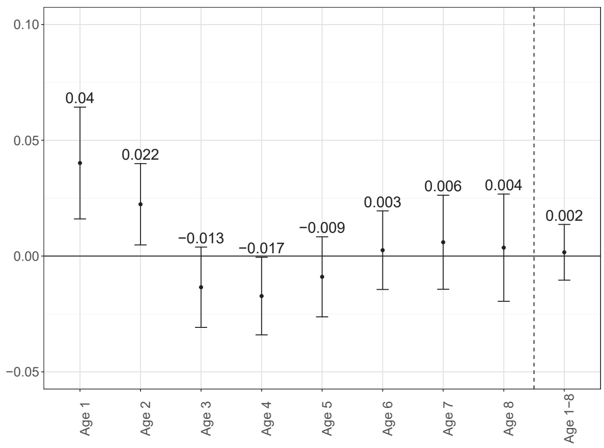
Note: Age-specific and aggregated estimates of the effects of the childcare expansion on health outcomes for mothers with a 1–8-year-old focal child based on equation (2) excluding mothers who moved across counties when their focal child was aged 0–2. The graphs plot the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. The estimates are plotted together with their 95% confidence intervals from robust standard errors clustered at the county level. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

Figure C.9: Effect of the childcare expansion on maternal health outcomes excluding mothers who potentially gave birth before 2010

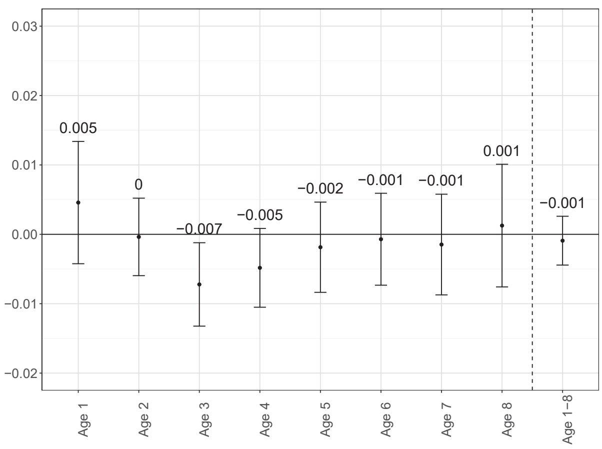
(a) Infections



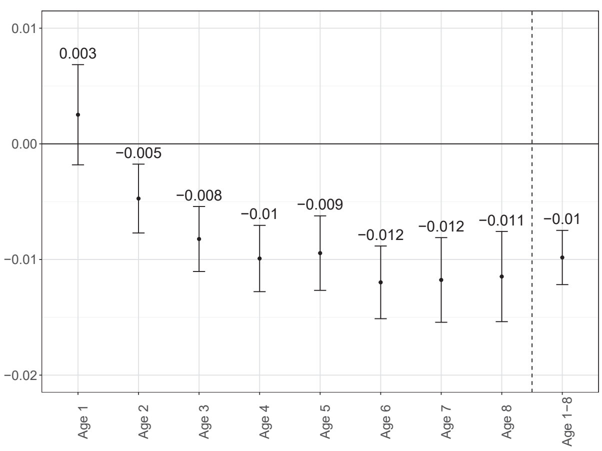
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

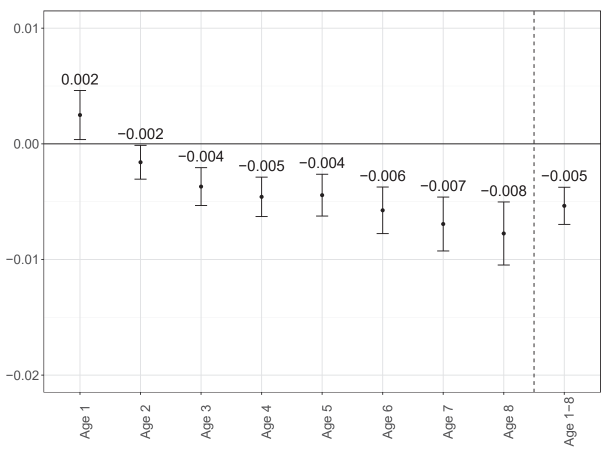
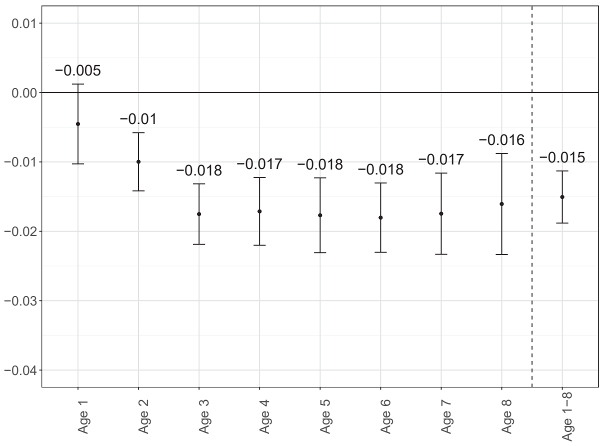
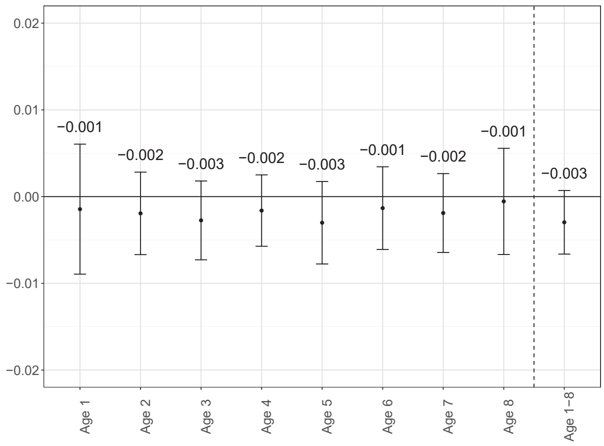


Figure C.9: Effect of the childcare expansion on maternal health outcomes excluding mothers who potentially gave birth before 2010 (*continued*)

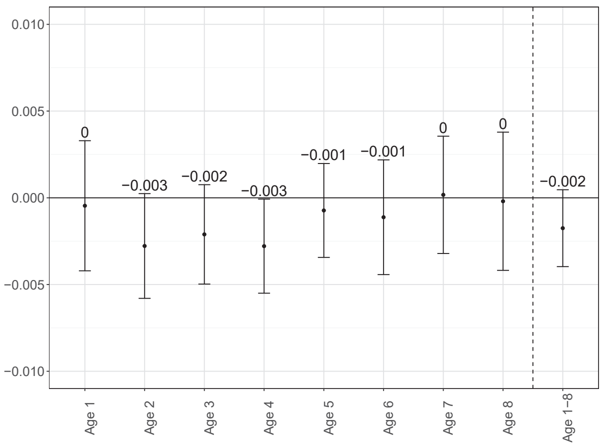
(f) Back pain



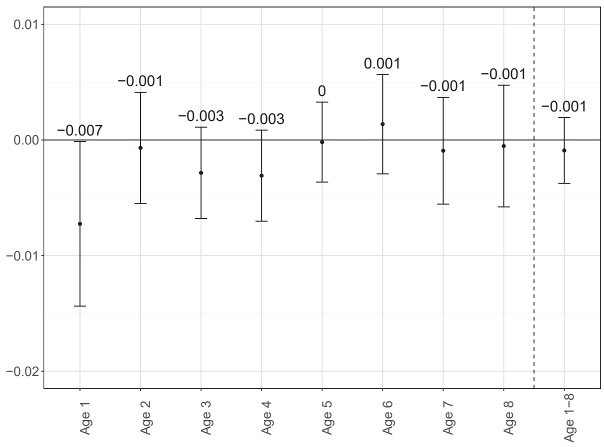
(g) Nutritional deficiencies



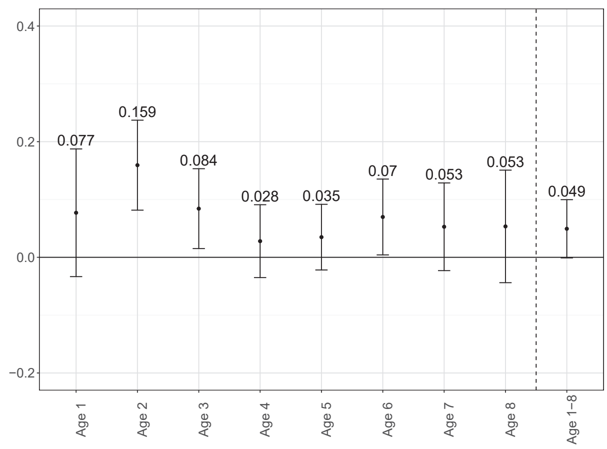
(h) Mood-related disorders



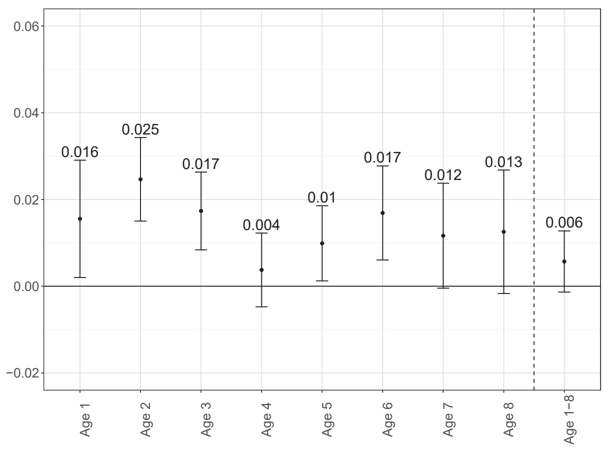
(i) Stress-related disorders



(j) Treatment cases



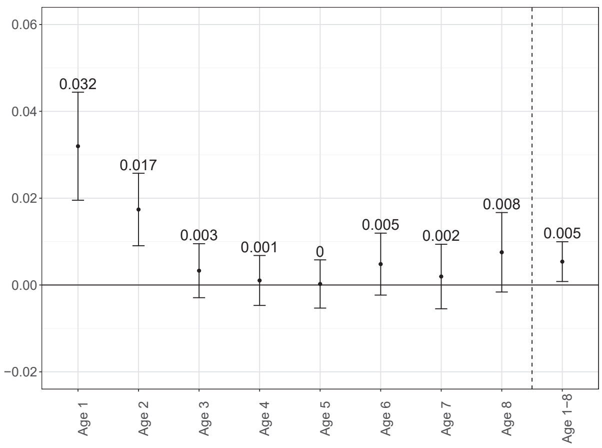
(k) Healthcare costs



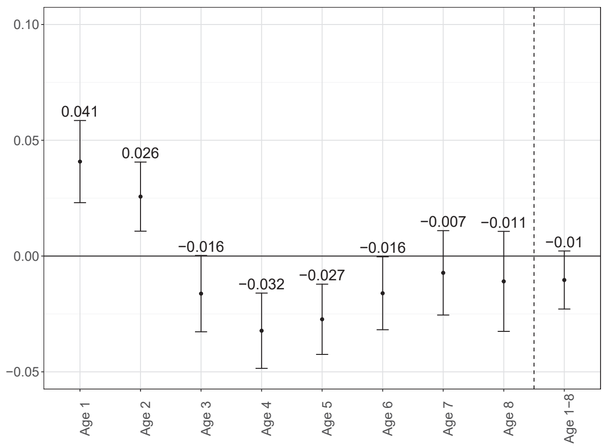
Note: Age-specific and aggregated estimates of the effects of the childcare expansion on health outcomes for mothers with a 1–8-year-old focal child based on equation (2) excluding mothers who potentially had given birth before 2010 (see Section C.3). The graphs plot the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. The estimates are plotted together with their 95% confidence intervals from robust standard errors clustered at the county level. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

Figure C.10: Effect of the childcare expansion on maternal health outcomes controlling for number of children per mother before 2010 and up to 2022

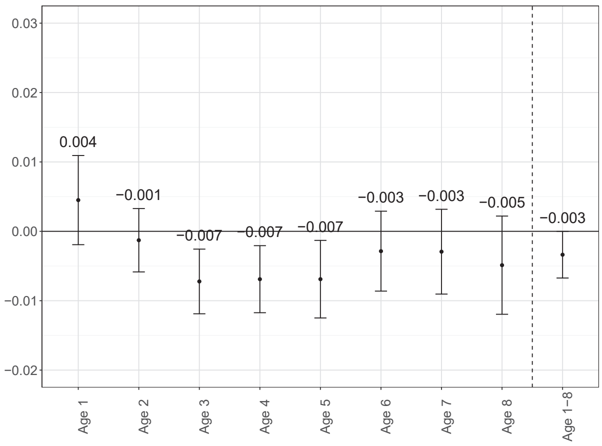
(a) Infections



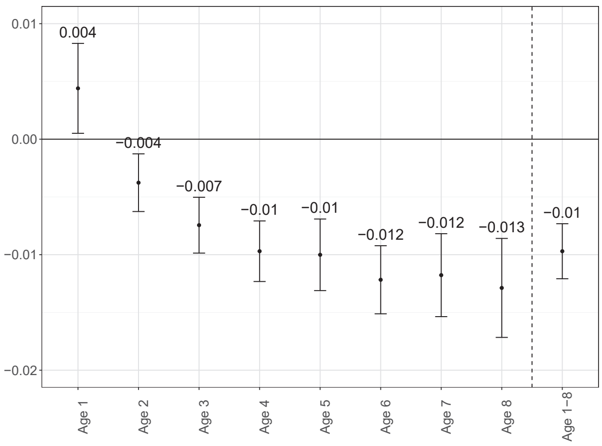
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

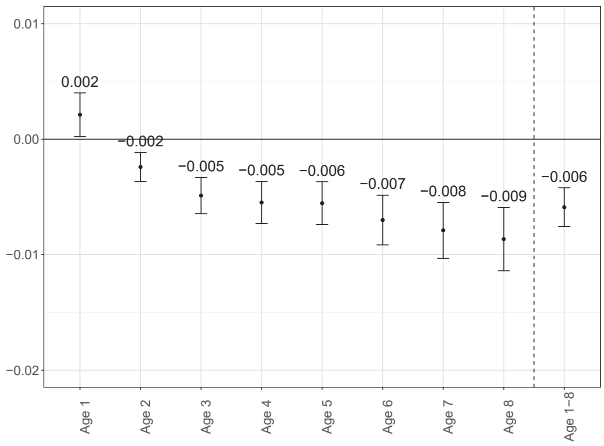
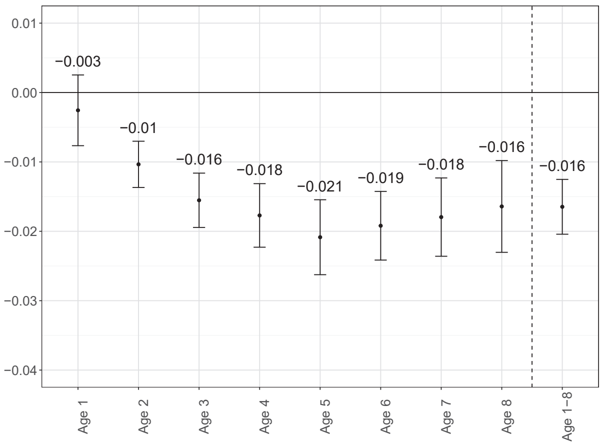
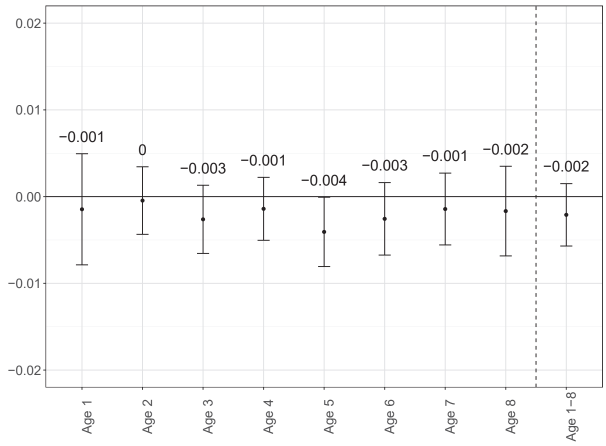


Figure C.10: Effect of the childcare expansion on maternal health outcomes controlling for number of children per mother before 2010 and up to 2022 (*continued*)

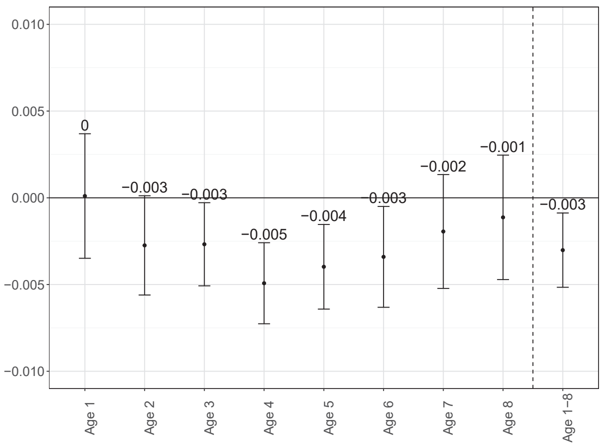
(f) Back pain



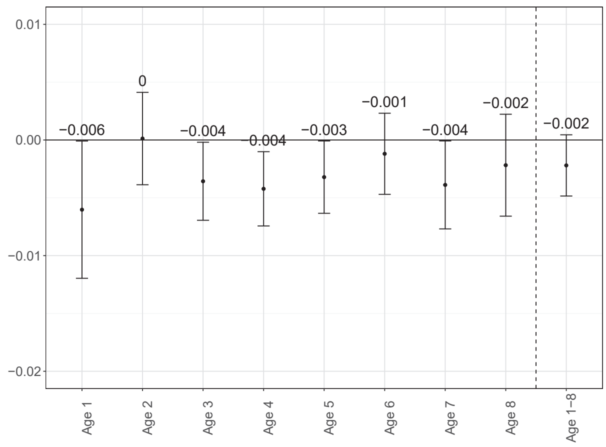
(g) Nutritional deficiencies



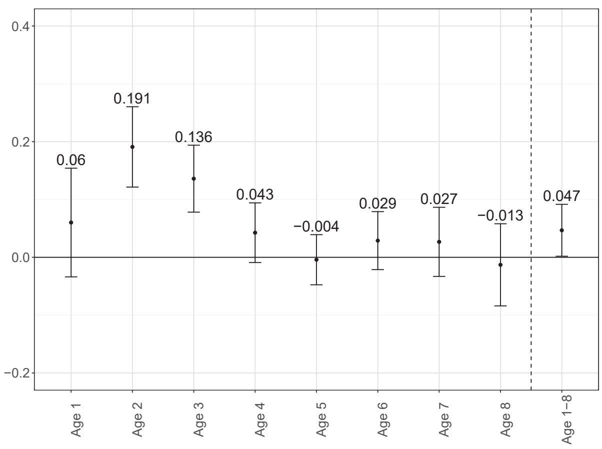
(h) Mood-related disorders



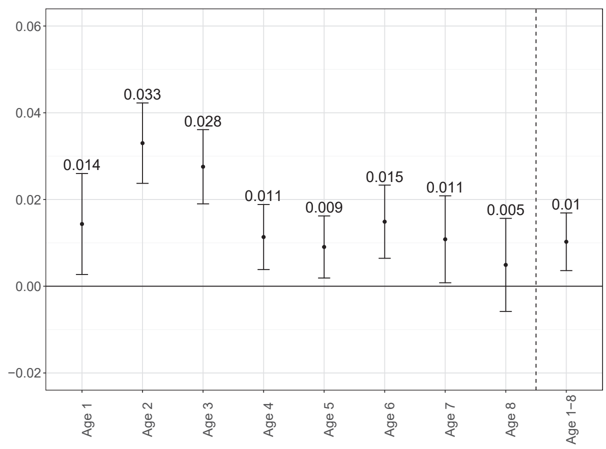
(i) Stress-related disorders



(j) Treatment cases



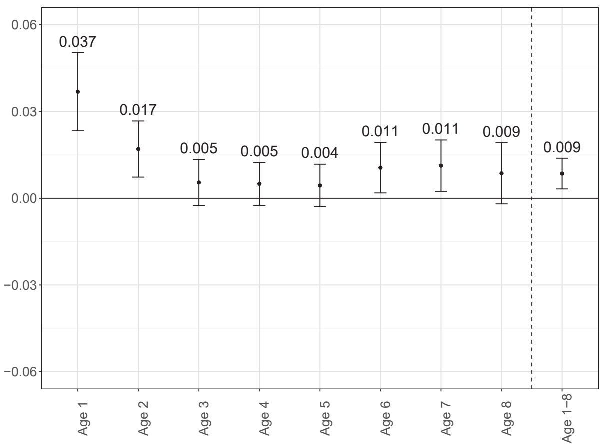
(k) Healthcare costs



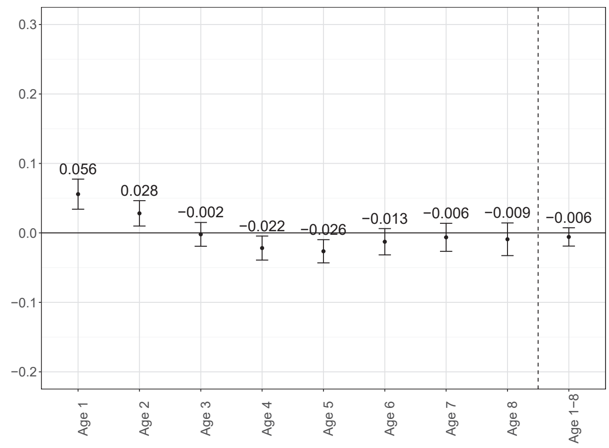
Note: Age-specific and aggregated estimates of the effects of the childcare expansion on health outcomes for mothers with a 1–8-year-old focal child based on equation (2) controlling for the number of children per mother before 2010 and up to 2022. The graphs plot the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. The estimates are plotted together with their 95% confidence intervals from robust standard errors clustered at the county level. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

Figure C.11: Effect of the childcare expansion on maternal health outcomes using the motherhood effect sample

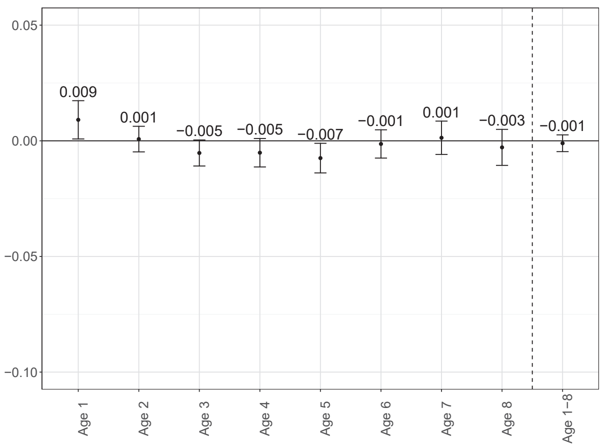
(a) Infections



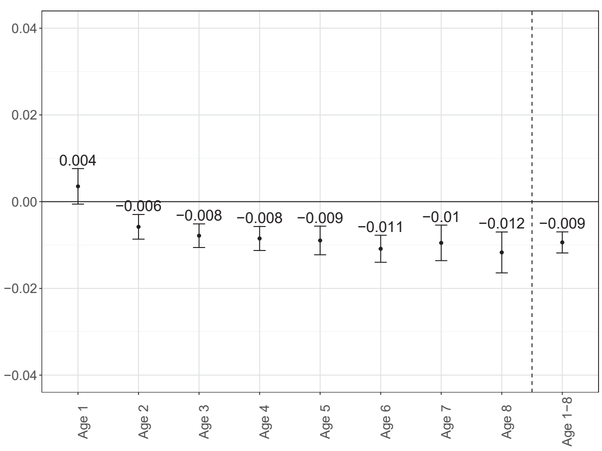
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

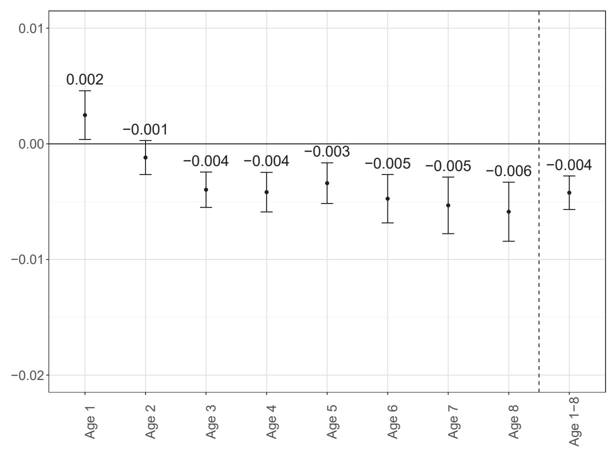
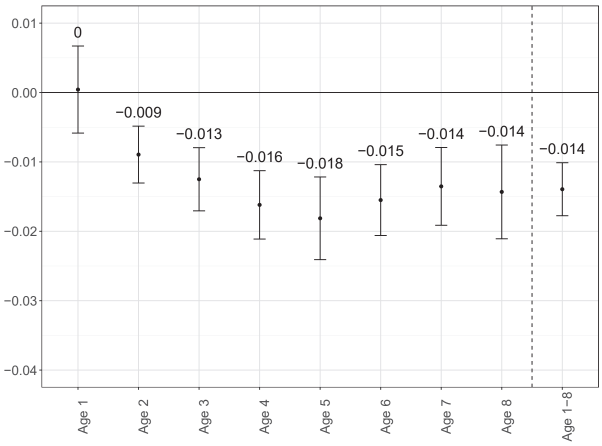
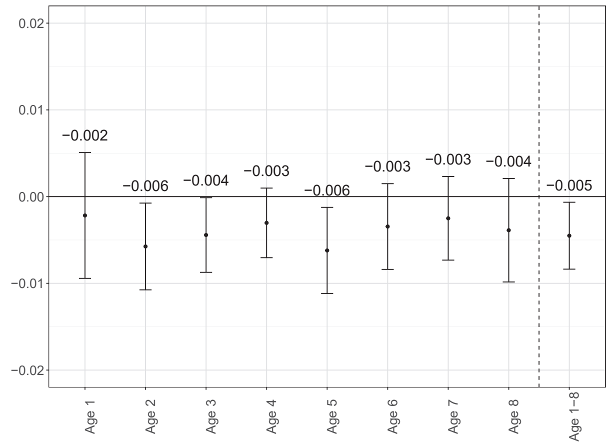


Figure C.11: Effect of the childcare expansion on maternal health outcomes using the motherhood effect sample (*continued*)

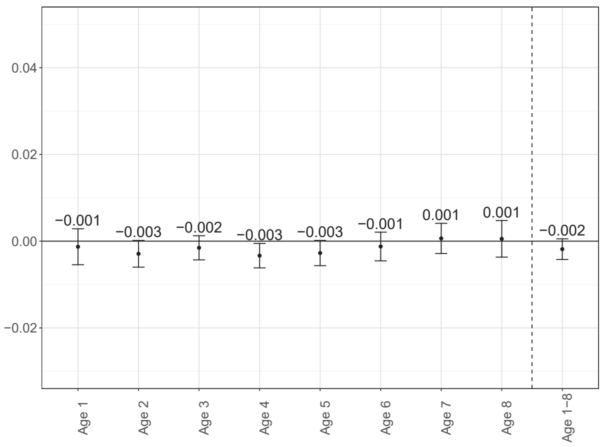
(f) Back pain



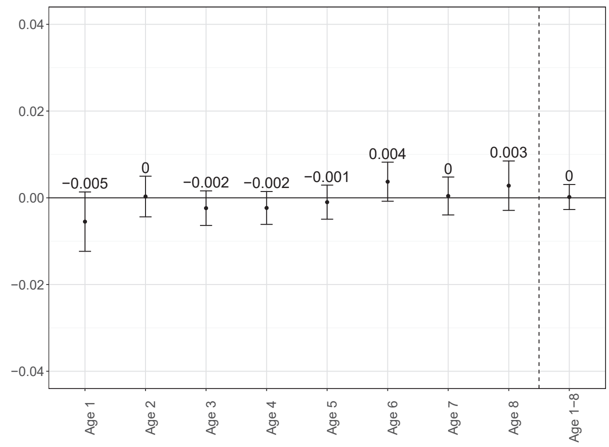
(g) Nutritional deficiencies



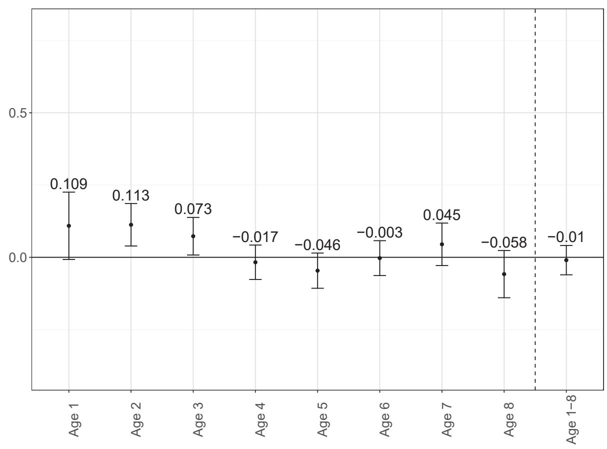
(h) Mood-related disorders



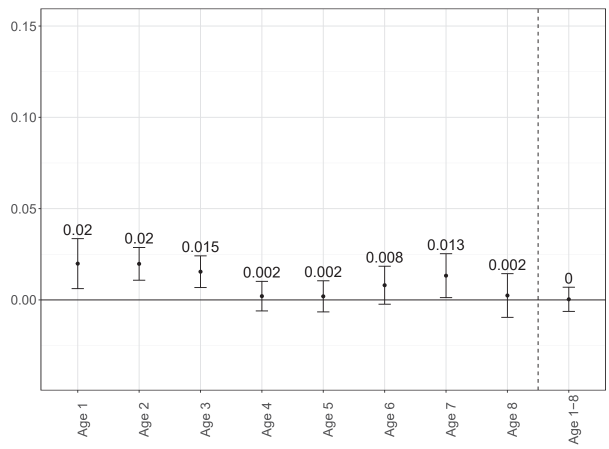
(i) Stress-related disorders



(j) Treatment cases



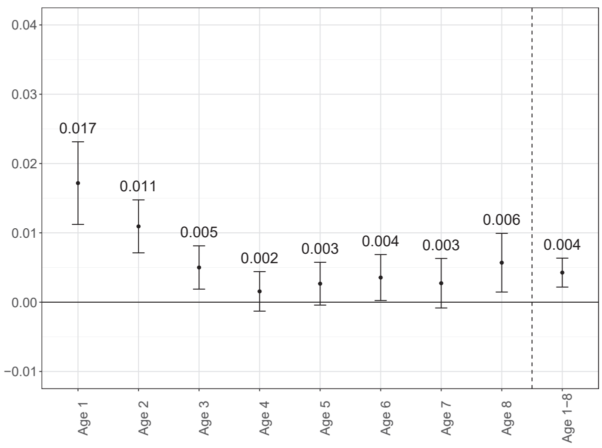
(k) Healthcare costs



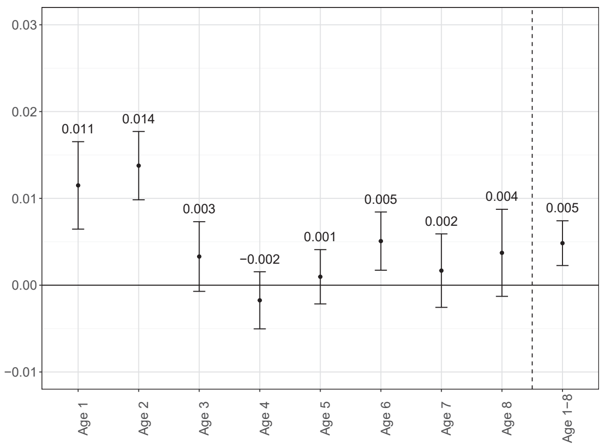
Note: Age-specific and aggregated estimates of the effects of the childcare expansion on health outcomes for mothers with a 1–8-year-old focal child and aged 23–32 based on equation (2). The graphs plot the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. The estimates are plotted together with their 95% confidence intervals from robust standard errors clustered at the county level. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

Figure C.12: Effect of the childcare expansion on maternal health outcomes with extensive and intensive margin measures

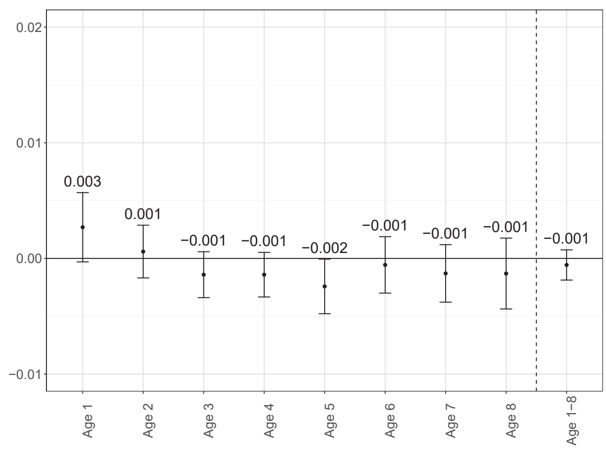
(a) Infections



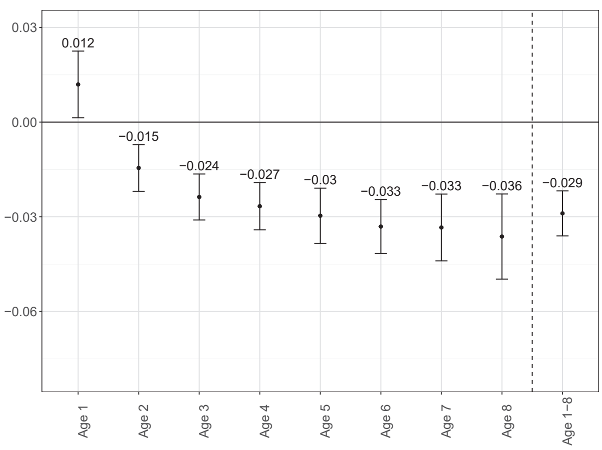
(b) Respiratory diseases



(c) Ear diseases



(d) Obesity



(e) Hypertension

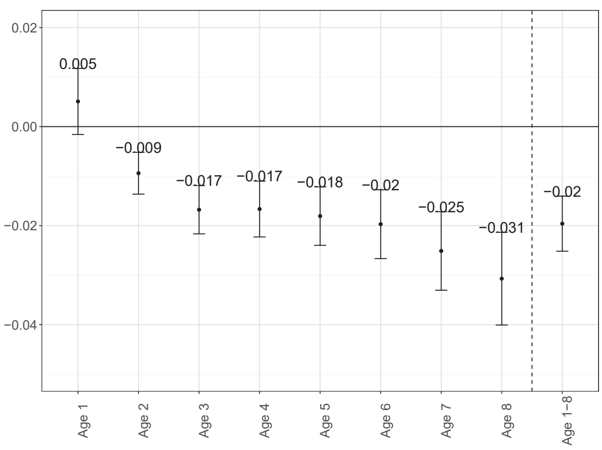
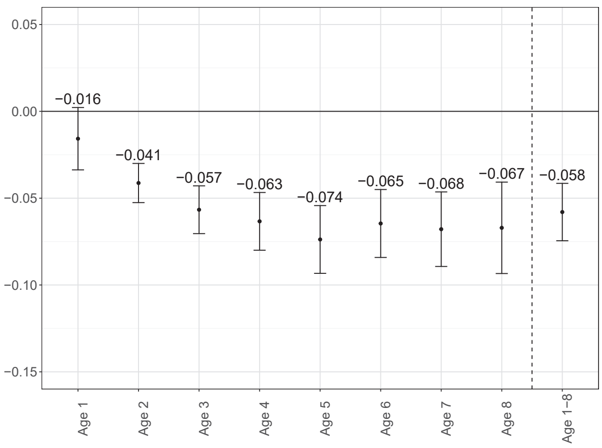
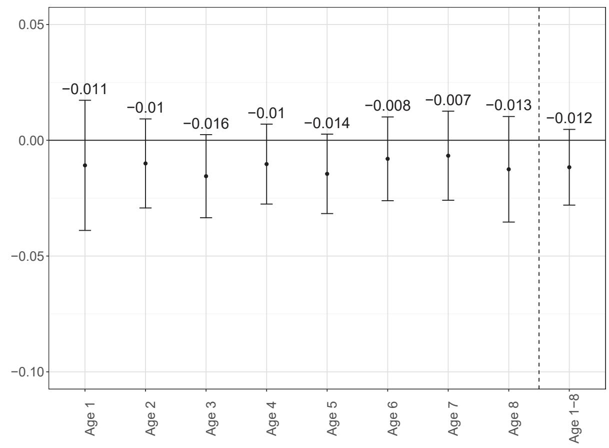


Figure C.12: Effect of the childcare expansion on maternal health outcomes with extensive and intensive margin measures (*continued*)

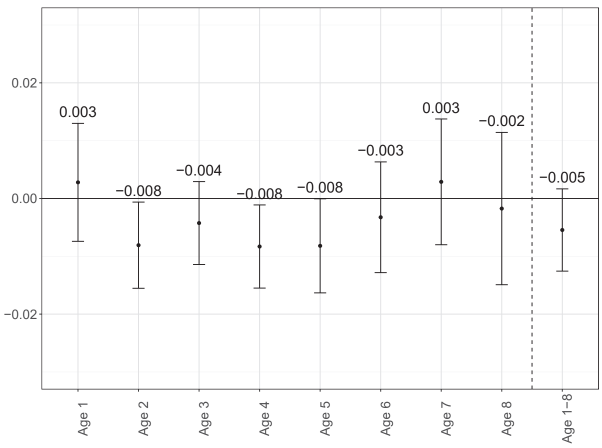
(f) Back pain



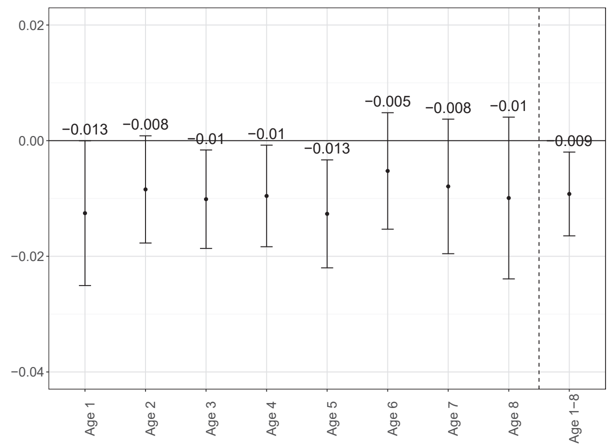
(g) Nutritional deficiencies



(h) Mood-related disorders



(i) Stress-related disorders

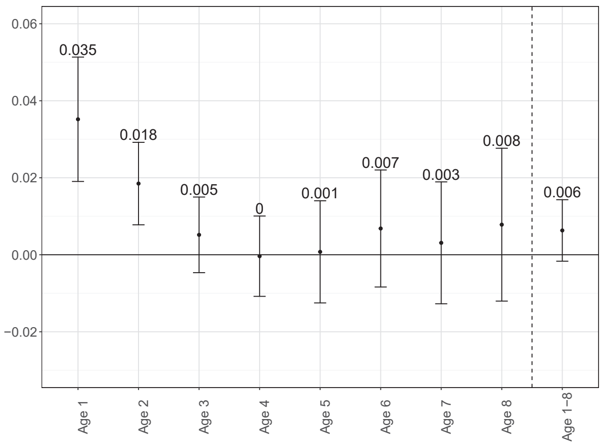


Note: Age-specific and aggregated estimates of the effects of the childcare expansion on health outcomes for mothers with a 1–8-year-old focal child based on equation (2). Infections, respiratory and ear diseases are extensive margin measures. Obesity, hypertension, back pain, nutritional deficiencies, and mental health disorders are intensive margin measures. The graphs plot the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. The estimates are plotted together with their 95% confidence intervals from robust standard errors clustered at the county level. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

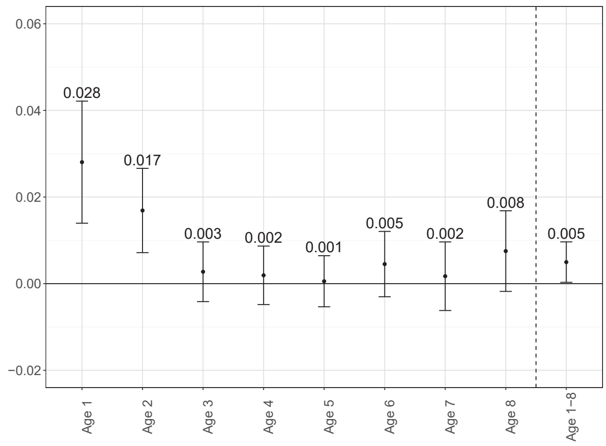
C.4 Heterogeneity Analysis

Figure C.13: Heterogeneity results: Effect of the childcare expansion on maternal health outcomes by number of children

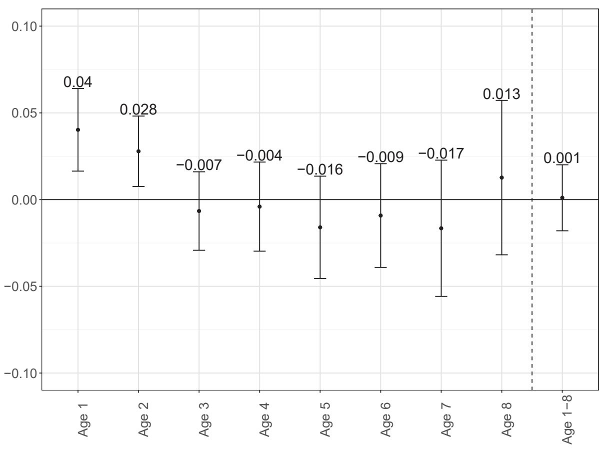
(a) Infections (1 child)



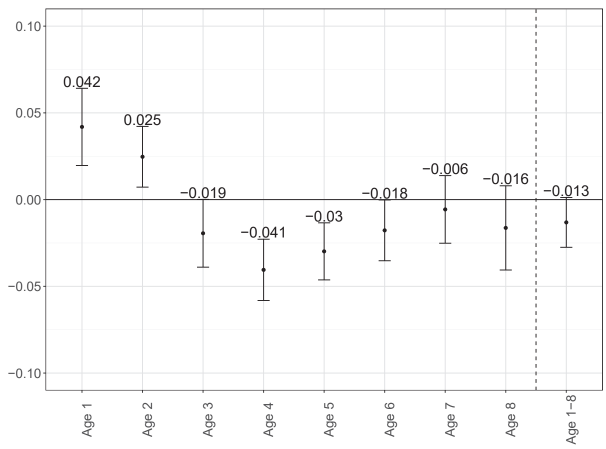
(b) Infections (2+ children)



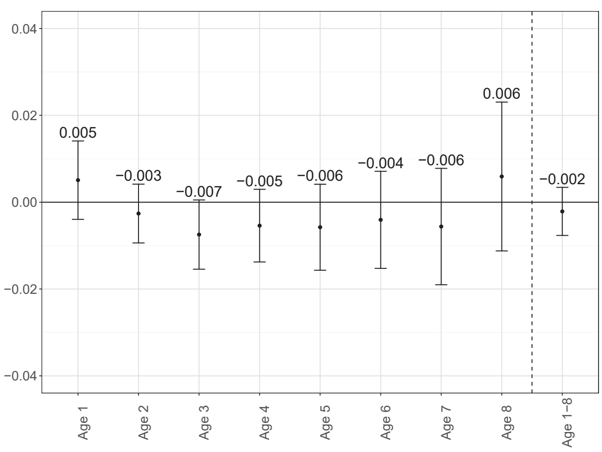
(c) Respiratory diseases (1 child)



(d) Respiratory diseases (2+ children)



(e) Ear diseases (1 child)



(f) Ear diseases (2+ children)

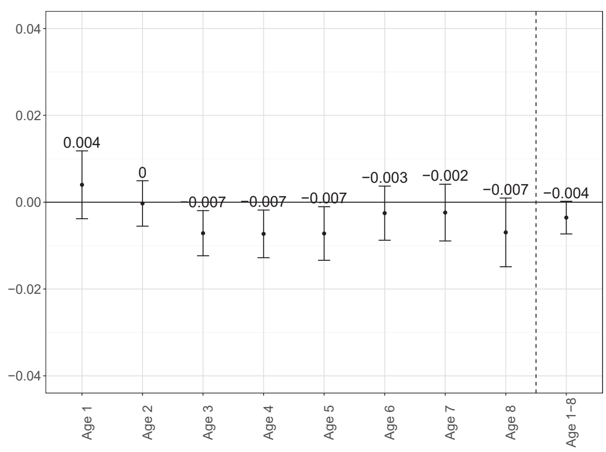
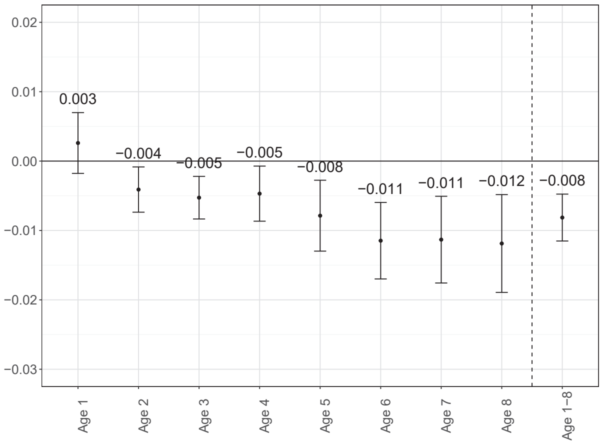
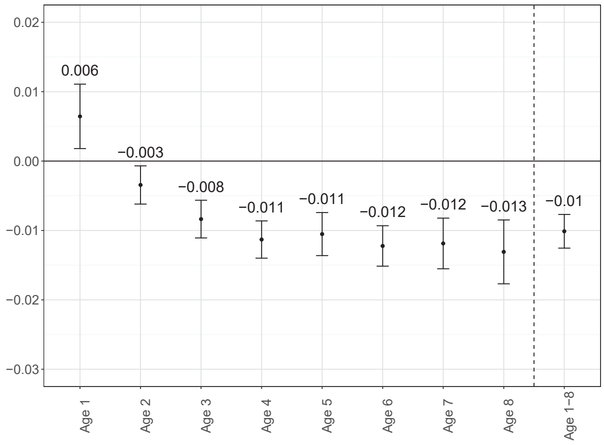


Figure C.13: Heterogeneity results: Effect of the childcare expansion on maternal health outcomes by number of children (*continued*)

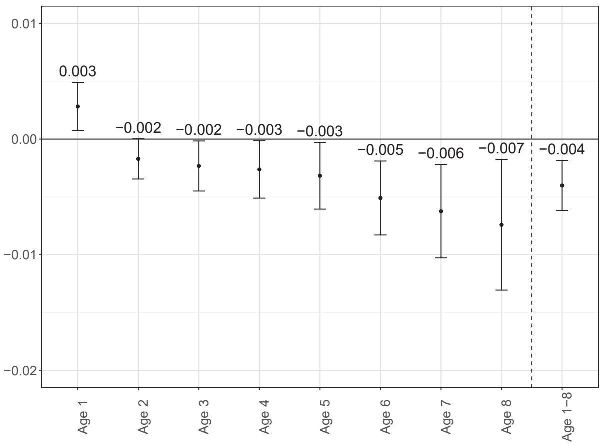
(g) Obesity (1 child)



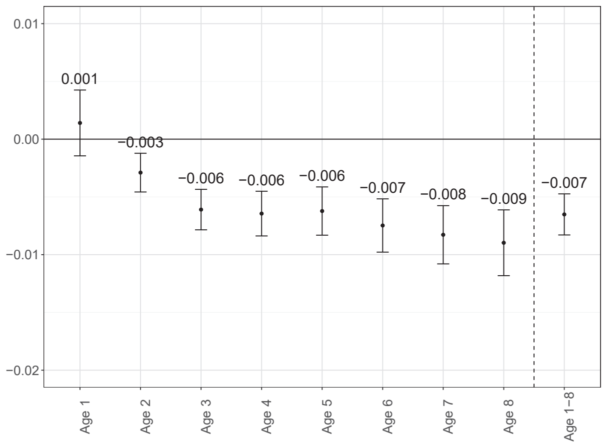
(h) Obesity (2+ children)



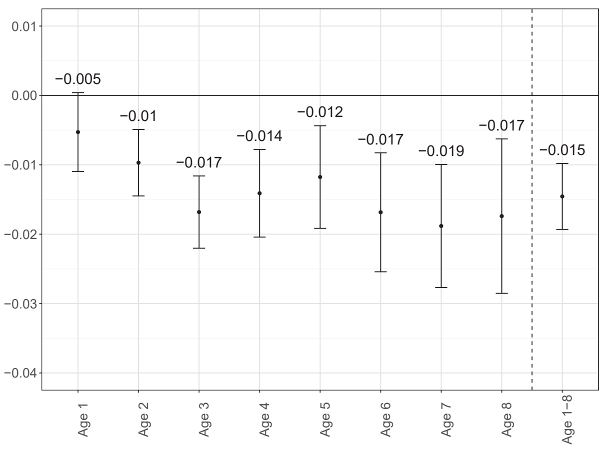
(i) Hypertension (1 child)



(j) Hypertension (2+ children)



(k) Back pain (1 child)



(l) Back pain (2+ children)

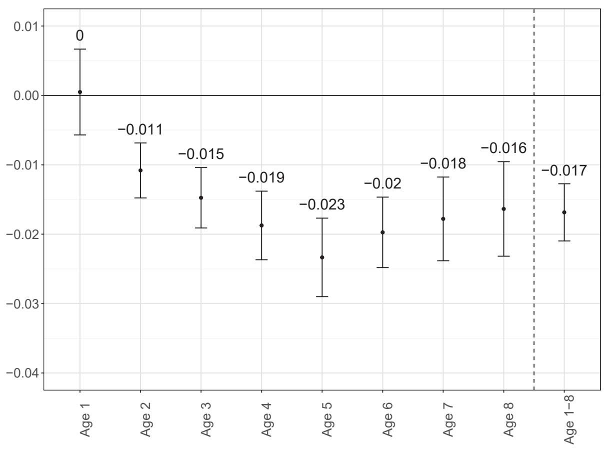
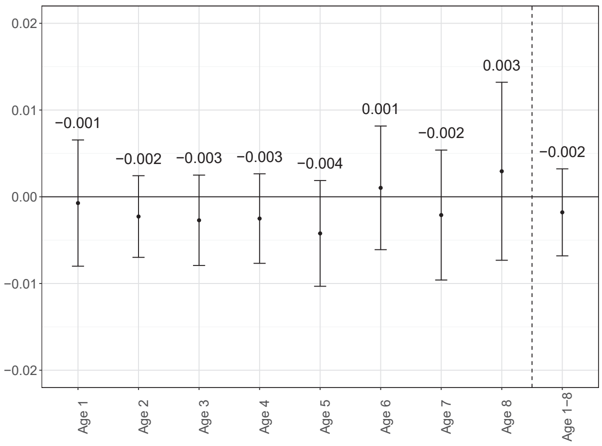
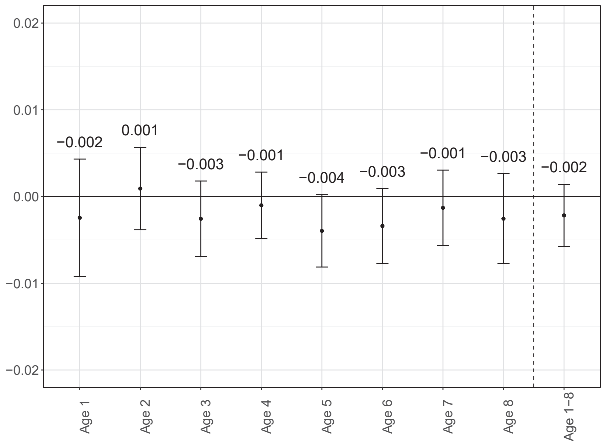


Figure C.13: Heterogeneity results: Effect of the childcare expansion on maternal health outcomes by number of children (*continued*)

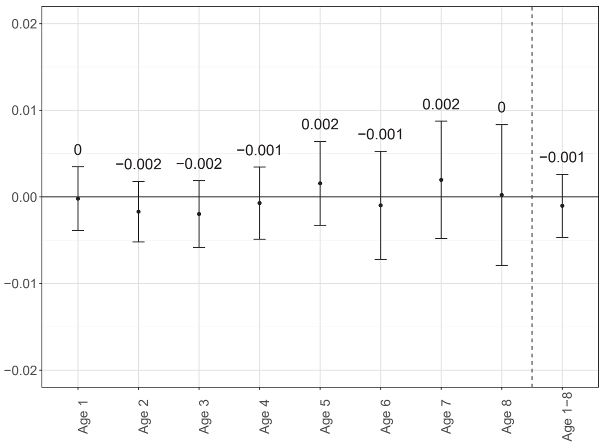
(m) Nutritional deficiencies (1 child)



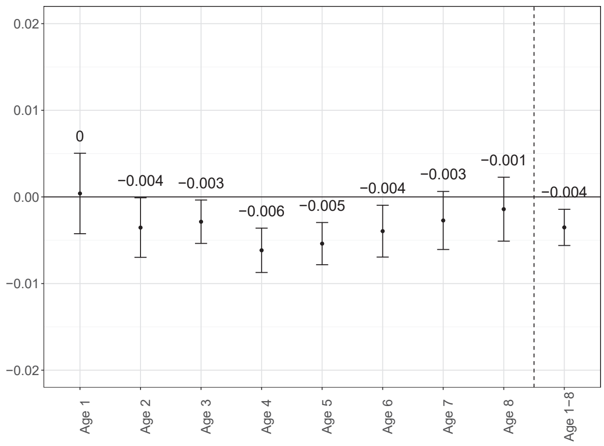
(n) Nutritional deficiencies (2+ children)



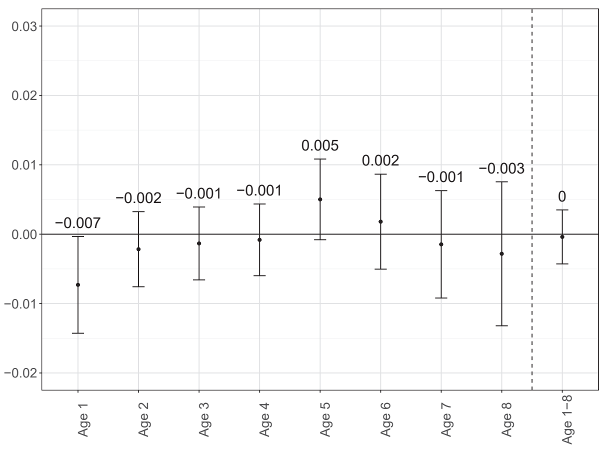
(o) Mood-related disorders (1 child)



(p) Mood-related disorders (2+ children)



(q) Stress-related disorders (1 child)



(r) Stress-related disorders (2+ children)

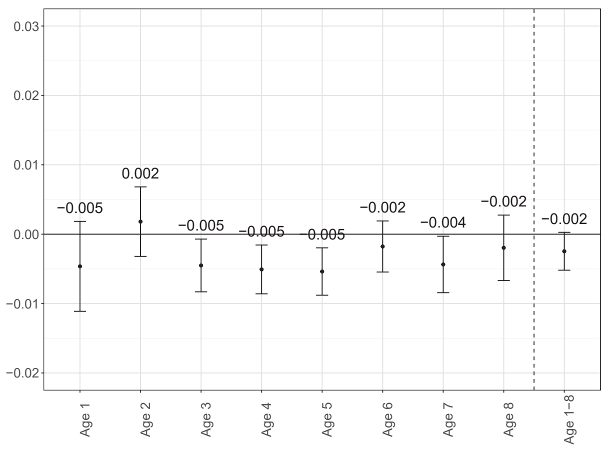
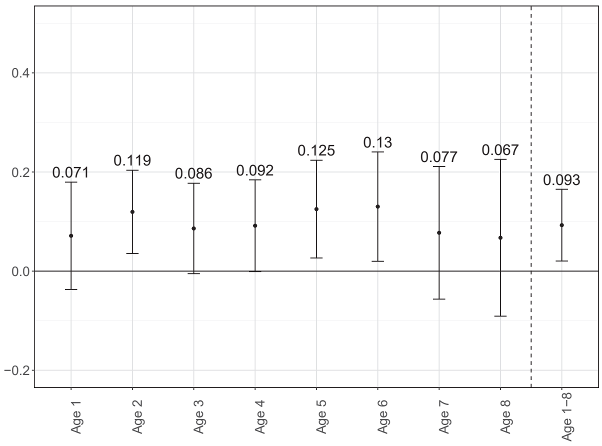
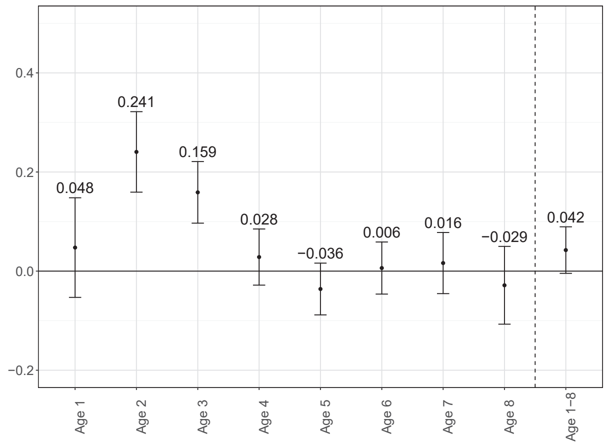


Figure C.13: Heterogeneity results: Effect of the childcare expansion on maternal health outcomes by number of children (*continued*)

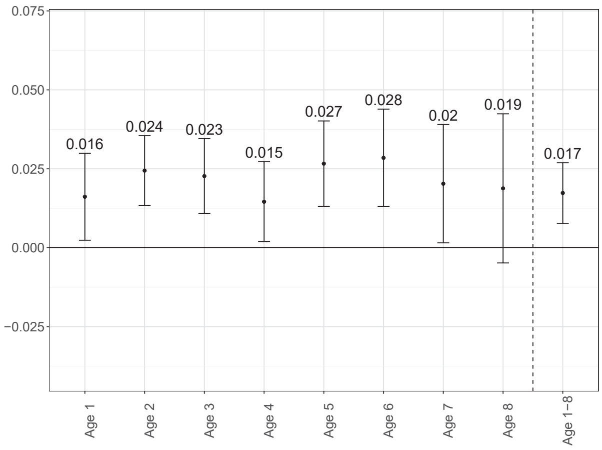
(s) Treatment cases (1 child)



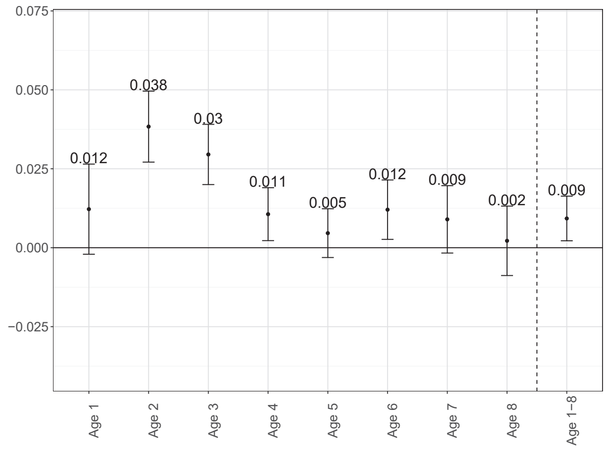
(t) Treatment cases (2+ children)



(u) Healthcare costs (1 child)



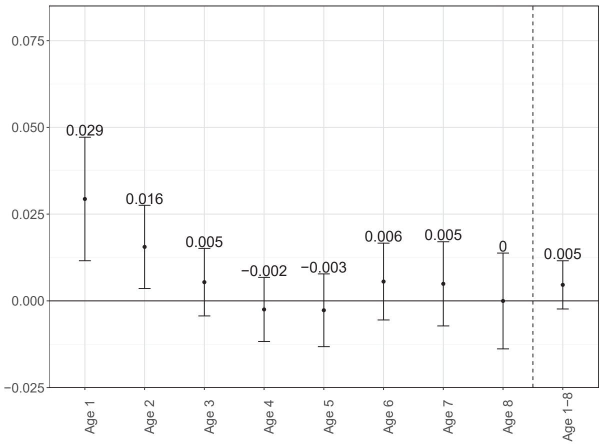
(v) Healthcare costs (2+ children)



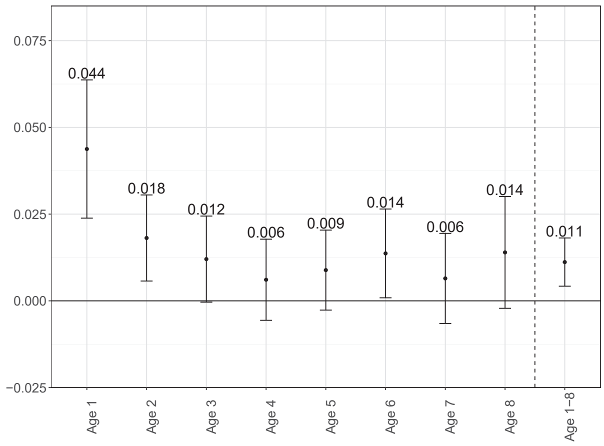
Note: Age-specific and aggregated estimates of the effects of the childcare expansion on health outcomes for mothers with a 1–8-year-old focal child based on equation (2) by number of children. To measure the number of children per mother, the variable adjusted for the number of births before 2010 and up to 2022 is used. The graphs plot the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. The estimates are plotted together with their 95% confidence intervals from robust standard errors clustered at the county level. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.

Figure C.14: Heterogeneity results: Effect of the childcare expansion on maternal health outcomes by maternal age at first birth

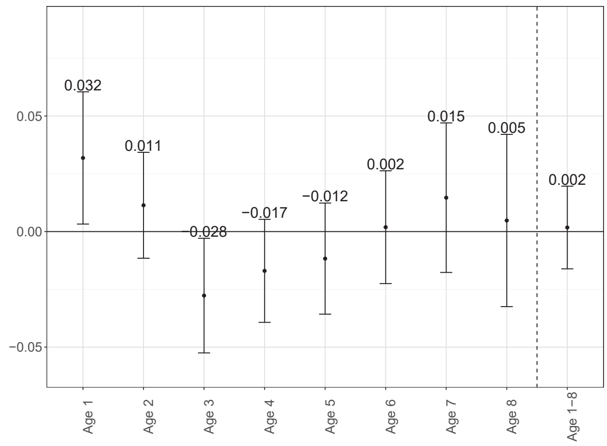
(a) Infections (age ≥ median age)



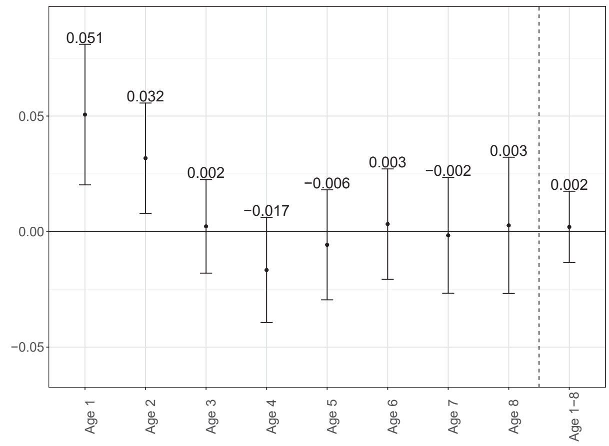
(b) Infections (age < median age)



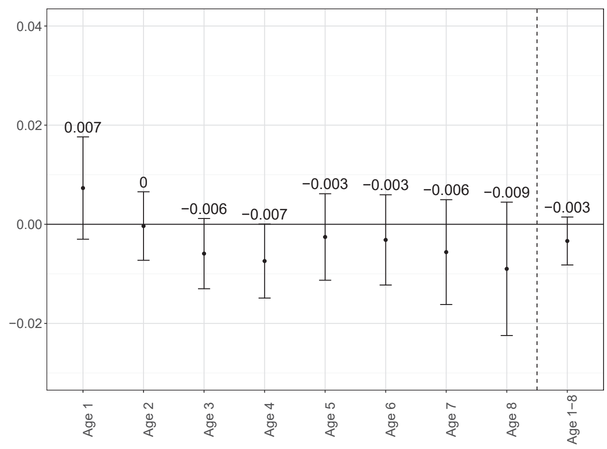
(c) Respiratory diseases (age ≥ median age)



(d) Respiratory diseases (age < median age)



(e) Ear diseases (age ≥ median age)



(f) Ear diseases (age < median age)

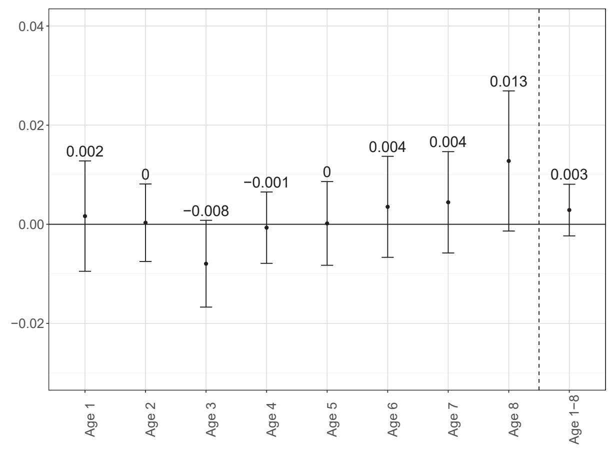
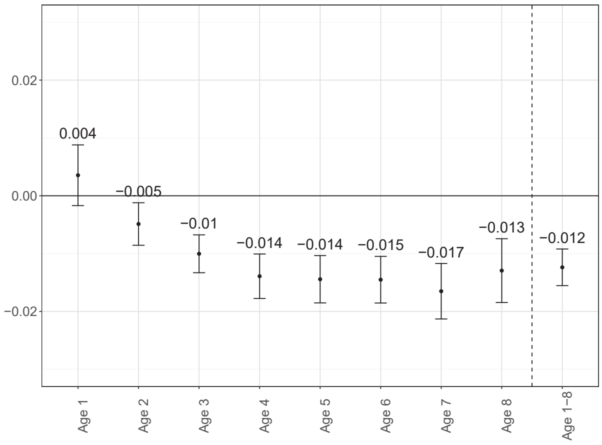
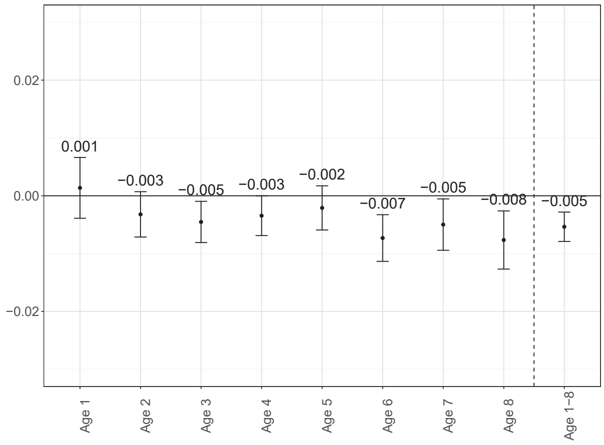


Figure C.14: Heterogeneity results: Effect of the childcare expansion on maternal health outcomes by maternal age at first birth (*continued*)

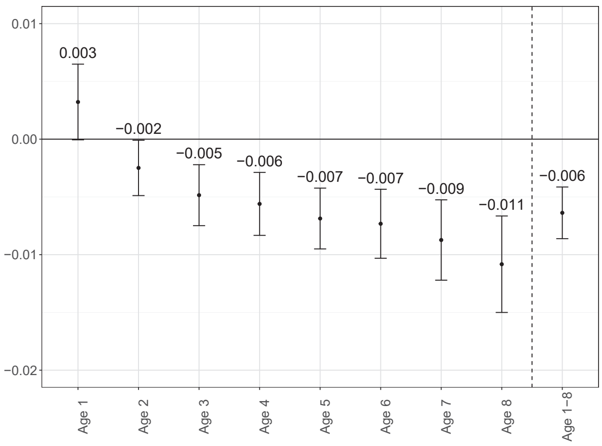
(g) Obesity (age ≥ median age)



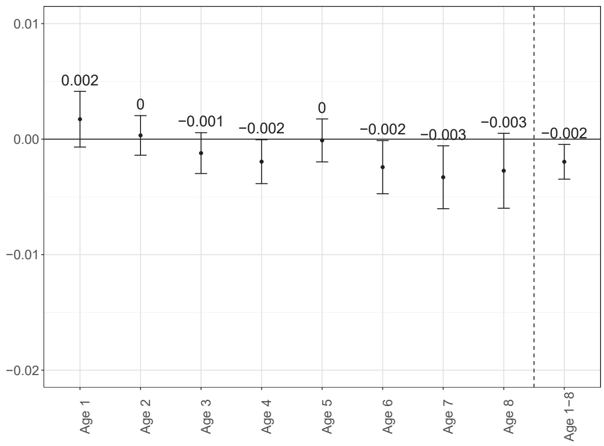
(h) Obesity (age < median age)



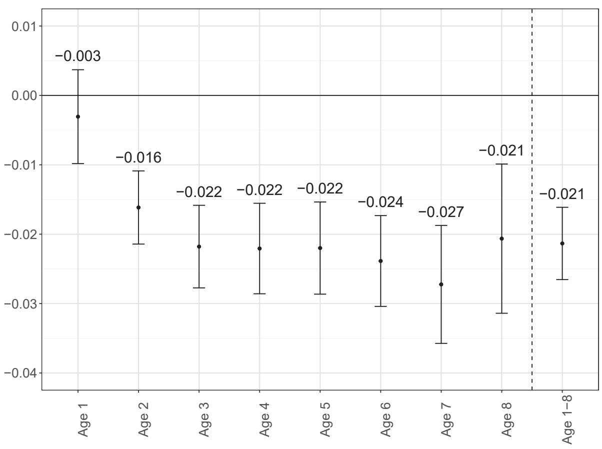
(i) Hypertension (age ≥ median age)



(j) Hypertension (age < median age)



(k) Back pain (age ≥ median age)



(l) Back pain (age < median age)

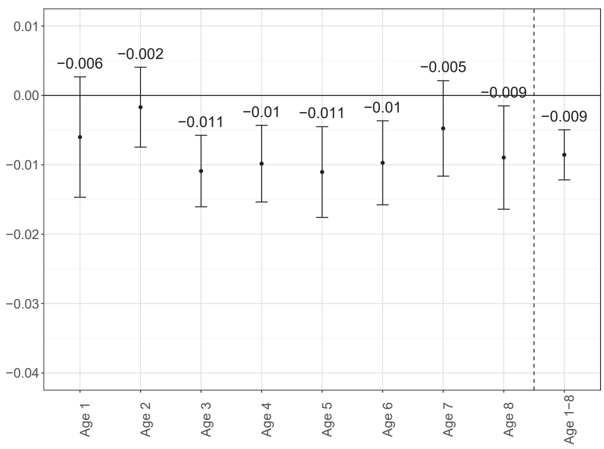
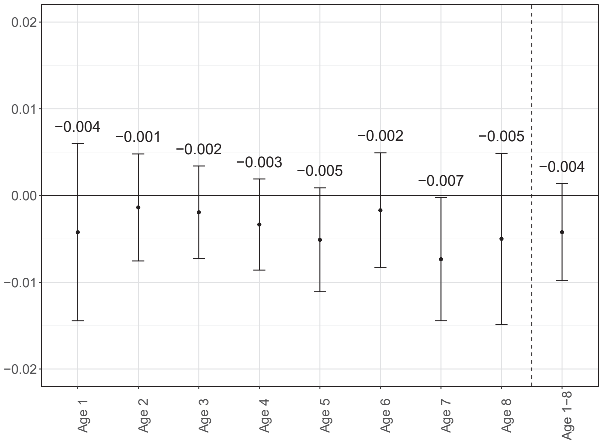
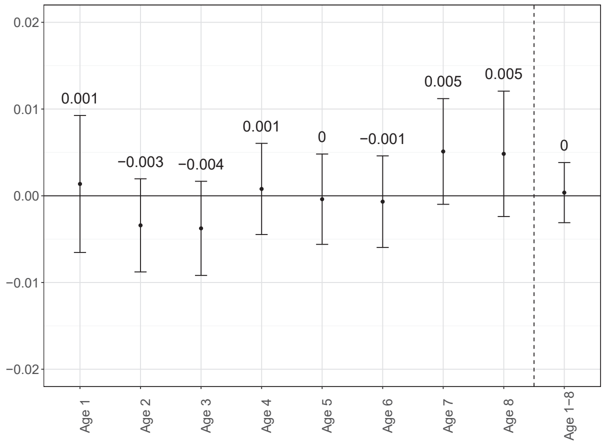


Figure C.14: Heterogeneity results: Effect of the childcare expansion on maternal health outcomes by maternal age at first birth (*continued*)

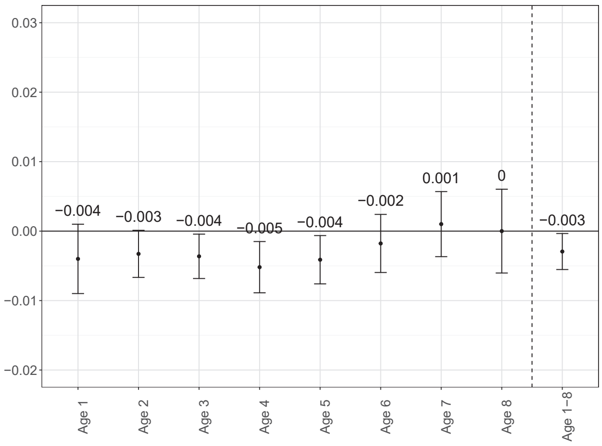
(k) Nutritional deficiencies (age ≥ median age)



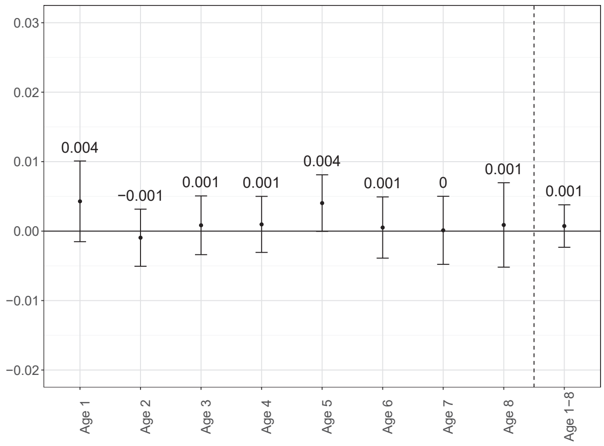
(l) Nutritional deficiencies (age < median age)



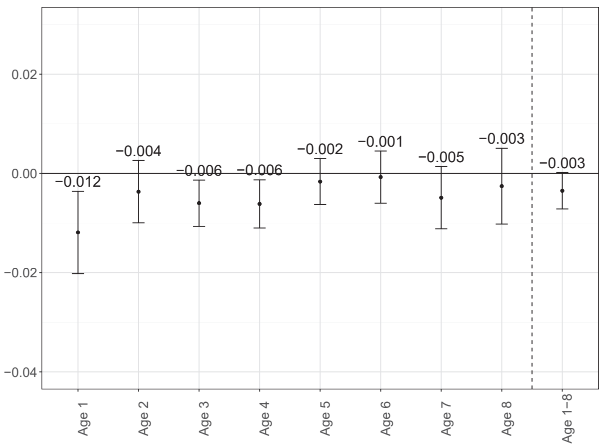
(k) Mood-related disorders (age ≥ median age)



(l) Mood-related disorders (age < median age)



(m) Stress-related disorders (age ≥ med. age)



(n) Stress-related disorders (age < median age)

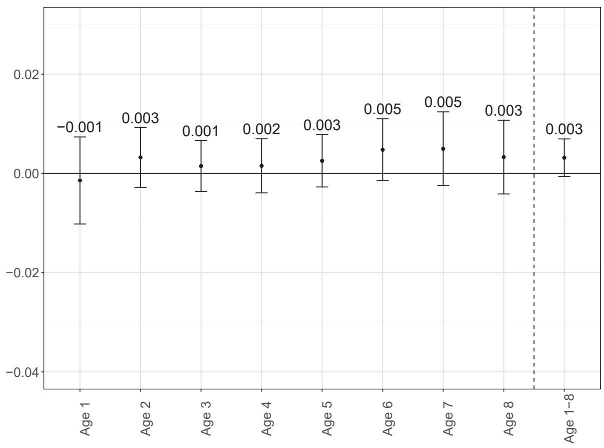
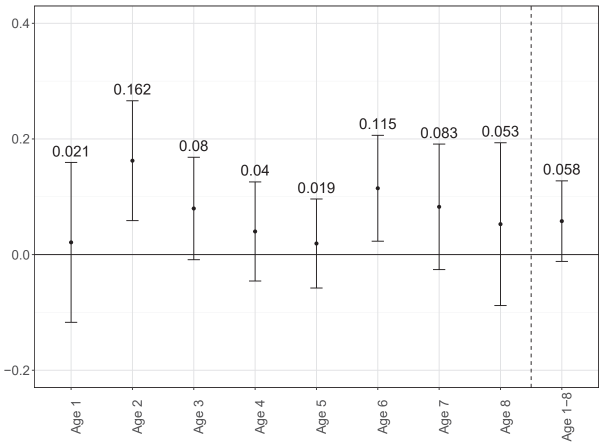
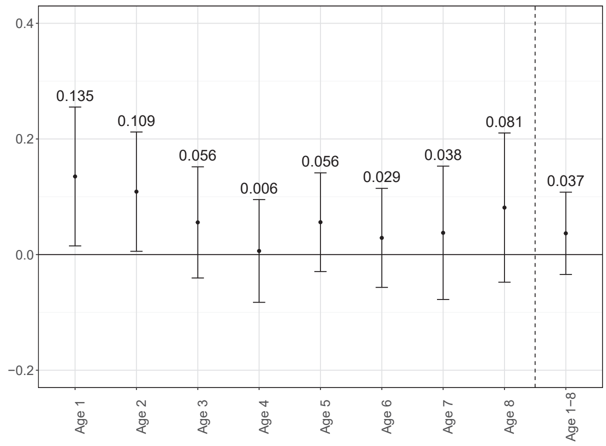


Figure C.14: Heterogeneity results: Effect of the childcare expansion on maternal health outcomes by maternal age at first birth (*continued*)

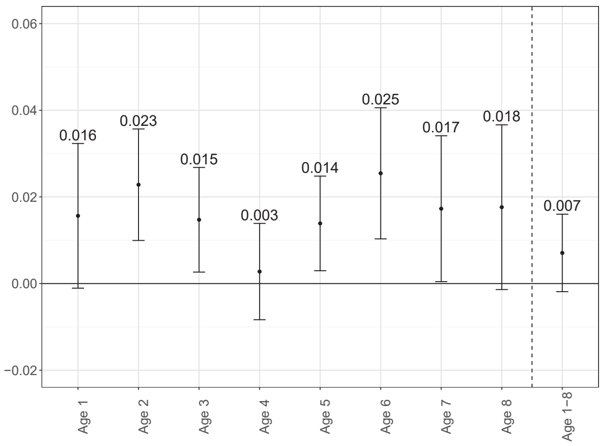
(o) Treatment cases (age ≥ median age)



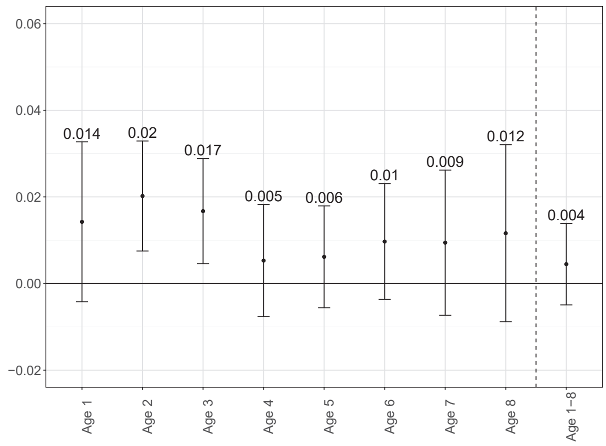
(p) Treatment cases (age < median age)



(q) Healthcare costs (age ≥ median age)



(r) Healthcare costs (age < median age)



Note: Age-specific and aggregated estimates of the effects of the childcare expansion on health outcomes for mothers with a 1–8-year-old focal child based on equation (2) by maternal age at first birth. Median age is equal to 29. The graphs plot the effect of a 10pp increase in childcare coverage rates for children under three on maternal health. The estimates are plotted together with their 95% confidence intervals from robust standard errors clustered at the county level. The sample includes only mothers who did not have children before 2010. *Source*: German Youth Institute (1994, 1998, 2002) and German Statistical Office (2006–2019) for childcare coverage rates, and KBV (2010–2019) for maternal health outcomes and control variables, own calculations.