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Masterarbeit zum Thema:

Examining the Relationship between Fertility Patterns and Midlife Health in Germany

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1 Introduction / Abstract

Can a certain pattern of having children or remaining childless have direct impacts on physical and mental health of women and men in midlife? Is there something like an ideal 'fertility behaviour' that is generally advisable for women and men when it comes to health outcomes in Germany?

Raising children comes with joy and hope but also with major changes and challenges for parents' lives. Most women and men in Germany, even if they have no children themselves, think of children as an enrichment of life: they represent an expression of love, a symbol of a "real home" and provide a meaning of life. On the other side they restrict personal freedom and are experienced as 'handicaps' on the job market. It is reasonable to assume children to have an impact on physical and mental health in the short and long run, just as other major adult roles like employment do. Studies in sociological and epidemiological life course research, especially from the USA, UK, and Scandinavia have shown specific associations between fertility and later life health for western societies and present a variety of explanation attempts that range from evolutionary biological to social mechanisms. Findings indicate that childless adults, those with four or more children, as well as those who entered parenthood very early in life generally suffer from worse health and show higher mortality than parents of two or three children born later in life. However, the data shows rather small effects, the correlations and causal mechanisms are not fully understood yet, and there is a broad range of social and biological influences to be considered efficacious.

As there is little evidence for Germany so far, this paper aims to test whether similar correlations between childlessness, fertility timing, fertility quantum and mid-life health can be detected on the basis of a German sample and investigate the underlying causal effects by controlling for a set of mediators.

Data is drawn from the Pairfam panel wave 7, using the oldest cohorts born 1971-73, aged 41-43 in 2014/15.

This paper is structured as follows. In section 2 I provide an introduction into life course research, prior research findings and some theoretical background. In section 3 I define the research questions and describe the dataset, as well as the variables. In section 4 the regression analysis and descriptive results are documented. In section 5 I summarise and discuss the findings of this project.

2 Context, Theory and Evidence

2.1 Life Course Research

The interdisciplinary life course perspective looks at pathways across life domains, life roles, relationships, and generations – always with the assumption that childhood (if not in utero) but also adulthood history is strongly impacting later life outcomes.

Health across the life course**,** the fastest growing area in life course studies, focuses on pathways to psychological and physical health outcomes and mortality (Mayer, 2009, p. 421) and has blossomed in the last two decades as a response to the limited medical models of disease (Kuh et al., 2003, p. 781). It's all about understanding risk factors at different life stages, patterns of health distribution in society and eventually translating knowledge into policy recommendations to benefit public long-term health.
Health has been operationalised in many ways: chronic disease, disability, mortality, well-being and so forth. The majority of adult health resp. disease is explained as consequences of the complex accumulation and interaction of biological, behavioural, and social influences over the life course of individuals and cohorts. Natural factors (such as genetics, foetal growth, birth weight, childhood illness, body height, hypertension), physical circumstances (pollution and other environmental stressors), political environments (access to health services, social disruptions), socioeconomic positions throughout life (education, occupation, income), and lifestyle factors (smoking, diet, exercise, social networks, stress) have been intensely investigated and interrelated as health formative variables by natural and social scientists (Blane et al., 2007, p. 32; Lynch & Smith, 2005, p. 2ff.). In social sciences especially the effects of socioeconomic factors on health have been focused on and found to be highly relevant (ibid.).
Fertility as a health determinant is a less explored field but nevertheless boasts a huge body of evidence by now and the most common diseases have been investigated in coherence to fertility in Western societies.

Considering the multi-disciplinary perspective in life course research, it also attempts a synthesis of theoretical models to explain the relationship between exposures during life and later health and disease. Literature names a variety of concepts (see: Kuh et al., 2003;

Lynch & Smith, 2005; Blane et al., 2007) and some authors criticise the lack "of a coherent body of theory" (Mayer, 2009, p.423).

A selection of models that can support the purpose of this paper, as well as relevant facts and research findings will be further described below. To keep it within reasonable bounds and since health outcomes are highly cohort and culture specific, I will concentrate on recent findings, i.e., from 2000 and later, in Western societies.

2.2 Parenthood, Childlessness, and Health

2.2.1 Childlessness in Germany – Facts and Figures

About 25% of women and 33% of men at age 41 in Germany are childless (Kreyenfeld & Konietzka, 2017, p. 106). At this age the state of parenthood is predominantly permanent as births later in life are rare (Destatis, 2012, p. 28). Childlessness here is used in its demographic sense describing people who don't have any own biological children but might have step-, foster or adopted children.

The number of men and women who remain childless has continuously increased over the past decades, which is a major reason for the low fertility rate in Germany (Destatis, 2012, p.27f). Their share is particularly high in the three German city states and among academics, of which around every third woman remains nulliparous and particularly low in former East Germany (Bujard, 2016; Destatis, 2012, p. 32).

While the educational gradient in Germany is recently described as diminishing, i.e., the childlessness for highly educated women has stopped to increase, it keeps increasing for low and medium educated, as well as migrant women, so a further overall increase of childlessness in Germany can be expected (Bujard, 2016).

It has been estimated that internationally about 9% of women (20-44) in a partnership remain childless due to biological reasons (Boivin et al., 2007). Recent data shows how women's sterility rises after age 35 (12% unable to have a child) and especially between age 41 (50%) and 45 (90%) (Eijkemans et al., 2014). Men's fertility is biologically stable up until old age but bound to the age of their female partner.

Others may remain childless for social reasons. Being in a stable relationship is by far the most important determinant of whether people form and realise positive fertility

intentions in Germany, followed by financial stability (Kuhnt & Trappe, 2013, p. 22f.). This is consistent with the idea that most people – especially the highly educated - are continuously postponing childbearing until it is 'too late' rather than rejecting it altogether (Berrington, 2017; Carmichael & Whittaker, 2007)

2.2.2 Childlessness, Parenthood and Health – Central Research Findings

Being a parent is often hypothesised to have an overall health promoting effect for both women and men, while childlessness is generally associated with worse health conditions (Grundy & Kravdal, 2007; Jaffe et al., 2009; Modig et al., 2017).

Having at least one child correlated with lower death risks and an increased life expectancy of averagely 1.5 years for women and 2 years for men at age 60 in Sweden. The same study found an increasing association with parents' age (Modig et al., 2017).

In Norway cancer patients (female and male aged 20-63) with children were found with a significantly lower mortality than that of the childless (up to 25%, depending on the type of cancer). However, the advantage didn't show up in cases of breast and ovarian cancer or in cases where the children were already adults (Kravdal, 2003).

An U.S. study investigated middle-aged women (40-59) and found a post-reproductive mortality advantage for white mothers of 2-3 children compared to childless women – not so for the black study participants (Spence & Eberstein, 2009). UK studies found a negative effect of childlessness only when compared to parents of one or two children (Doblhammer, 2000) or could not find any association between childlessness and physical illness at all (Grundy & Read, 2015).

Regarding mental health in mid-life and old age, a study from Norway found higher usage of antidepressants for childless men and women compared to parents (Kravdal et al., 2015). American studies however detected no general psychological health differences for middle-aged parents (Koropeckyj-Cox et al., 2007) and elderly parents (70+) (Zhang & Hayward, 2001) compared to childless individuals. Only early mothers – mothers who had their child before age 19 - showed a significant mental health disadvantage, related to singlehood, marriage disruptions and poorer socioeconomic status (Koropeckyj-Cox et al., 2007). Two years later, the same researcher even found a health advantage and less depression among the childless (across all marital status groups) in mid- and late life.

Highest levels of depression were observed among never-married mothers and formerly married mothers who had lost their children (Bures et al., 2009).

A systematic review on international studies up to 2003 on women found overall highest mortality for childless women compared to mothers but concluded that research results were not consistent, and effects were generally small (Hurt et al., 2006). Another review evaluating international studies of the years 1999-2009 on psychological well-being stressed how the influence of parenthood and childlessness varies over the life course and how effects vary along many confounding and mediating factors (Umberson, Pudrovska, et al., 2010).

Obviously, it is tricky to compare study results from different countries, age-groups, cohorts, using different operationalizations of health and controlling for various sets of mediators in the analysis but a few key findings and explanatory concepts will be summarised in the following to structure research findings and explain some causal links.

2.2.3 Parenthood, Childlessness and Health – Causal Links

A. Biological Factors: Physical Condition and Hormones

For women, there certainly are biological pathways from pregnancy and childbearing respectively remaining nulliparous to health, whereas they don't necessarily run in the same direction.

While maternal depletion and the risk of dying during pregnancy and postpartum are still significant factors in developing countries (Hurt et al., 2006, p. 55), maternal mortality in Germany is below four deceased mothers per 100,000 live births (0,004%) and practically not relevant (Bevölkerungsforschung, n.d.)

Still, there is a variety of diseases for which acute risks are heightened by pregnancy. The U.S. Department of Health and Human Services lists them on their site: gestational hypertension, gestational diabetes, and degenerative changes in arterial walls, preeclampsia, iron deficiency anaemia and others (Services, 2017).

The risk of cervical cancer was found to be positively associated with childbearing and increases with the number of births (Parazzini et al., 1998) Another biological risk factor that currently is investigated, is Microchimerism: foetal cells invade the maternal immune

system during pregnancy, lifting maternal tolerance for the foetus, and remaining in the mother's blood and tissues for decades. This potentially leads to greater cancer vulnerabilities and increased autoimmune disease susceptibility in the mother's body (Boddy et al., 2015).

On the other hand, female reproductive organs (except the cervix) seem to be health-promotingly stimulated by hormones during pregnancy and lactation. Mothers, especially if they breastfed their offspring, were found to have lower risks when it comes to breast cancer.

However, Grundy and Kravdal found quite different results for different parity groups in Norway. It was only mothers of three and more children that showed statistically significant health benefits when it came to breast cancer (Grundy & Kravdal, 2010, p. 1850). Multiparous women were also found to have a lower risk of suffering from endometrial uterus cancer (Rieck & Fiander, 2006, p. 237) and a 30 to 70% lower risk of suffering from ovarian cancer as compared with nulliparous women (Salehi et al., 2008, p. 309).

This suggests that one child might not be enough to benefit from the direct physical health advantages of pregnancy and childbearing as a woman.

When it comes to men, studies have found that pregnancy and childbearing also affect their hormonal balance, reducing their testosterone levels, potentially reducing aggressions, and increasing empathy (Edelstein et al., 2015), but it remains unclear whether this is linked to behavioural changes and later health outcomes. As many studies have found the parenthood-health-correlation to affect both women and men, psychosocial factors seem to play an elevated role for the association.

B. Babies and Young Children: The Stressful Transition to Parenthood

Pregnancy and the transition to parenthood can take a toll on some new parents' mental health and go along with depressive symptoms. During the first-year post-partum, 4.4% of mothers and 4.0% of fathers were newly suffering from postnatal depression in Spain (Escriba-Aguir & Artazcoz, 2011). In the U.S. new parents residing with young children showed higher levels of distress and depression than empty-nest parents and childless people in the U.S. (Evenson, 2005, p.349). These outcomes are partly ascribed to hormonal changes that happen during pregnancy and "co-pregnancy" and can remain over years, but more so to psychosocial and personal factors such as marital problems (Edward et al., 2014; Escriba-Aguir & Artazcoz, 2011).

A meta-analysis of 97 research publications approved that parents generally, but especially mothers of infants, report lower marital satisfaction due to "role conflicts and restriction of freedom" compared with non-parents (Twenge et al., 2003, p. 574).

Parenthood often represents a caesura in the life course, a relapse into traditional role allocations even for previously egalitarian couples with similar education and career goals for women and men (Institut & Destatis, 2015, p. 103). Minor children increase housework hours and partnership strains significantly more from women's perspective (Nomaguchi & Milkie, 2003, p. 370). Even though fathers' involvement in childcare has been increasing over the last decades, women mostly fill the role of children's caretaker, even if they also work outside the home (Bianchi, 2000, p. 404). In societies where women have professional lives just as men, but are still bearing the majority of housework, their fertility drops dramatically until men finally step in to share the burden – generally with a delay of around 30 years (Sacerdote & Feyrer, 2008, p. 1).

Researchers have shown that marital quality is directly linked to physical and psychological well-being (Proulx et al., 2007) and work-family conflicts and parental stress can go along with serious health issues (such as earlier hypertension) for women (Wickrama et al., 2001). The latter association did not exist for men.

Other researchers could not confirm the association between new parenthood and depression for the U.S.; they found lower levels of self-efficacy but at the same time better social integration into a community among their new parents' group (Nomaguchi & Milkie, 2003, p. 363). Social relationships are generally health relevant in any life stage by shaping health behaviour: "Without social ties, distress emerges, and health fails" (Umberson, Crosnoe, et al., 2010, p. 152).

A study based on the German Socio-Economic Panel even found an overall increased life satisfaction for parents in the year prior and of their first birth in comparison to their life satisfaction three to five years before (Margolis & Myrskylä, 2015, p. 1154ff.).

C. Partnership Status: The Support and Social Control of a Spouse

Many papers stress the finding that partnership status moderates a good part of the association between parenthood and health. Especially the stabilising conditions of marriage – which highly correlates with parenthood – could potentially act as an effective physical and mental health protector.

Never married and divorced cancer patients, for example, show 7-15% higher mortality than the married in Norway (Kravdal, 2001, p. 357).

Some studies suggest that men's health is generally more affected by their partnership status than women's or as a 2003 cancer survival study from Norway concludes: "a man appears to benefit from having a wife as well as having children […]." For women they couldn't find such obvious beneficial effects of marriage, but obvious detrimental effects of divorce (Kravdal, 2003).

Similar effects were found in Australia and the Netherlands where never married and divorced elderly men showed worse general health, worse health behaviour (daily fruit consumption, smoking, physical exercise) and increased depression compared to their currently married counterparts. Among women, again no marital status group emerged as having consistently poor or good health (Kendig et al., 2007, p. 1480f.).

Children come with costs and rewards and certain types of parents seem to really benefit from having children, while others rather suffer from it. Unmarried couples were found to be more affected by the costs while the married benefit more from the rewards (Nomaguchi & Milkie, 2003, p. 370f.). Single parents reported significantly more symptoms of depression than the married or cohabiting parents (Evenson, 2016, p. 341).

The combination of relationship status and parent's gender seems to be especially potent for the association between having kids and well-being: an U.S. study found that married new mothers enjoyed especially good mental health, while never-married new fathers showed especially bad mental health compared to all the other groups (Nomaguchi & Milkie, 2003, p. 370f.).

And when it comes to remaining childless, it is the divorced, widowed and never married men who suffer most; their mental health in old age is significantly worse than women's in comparable circumstances (Kendig et al., 2007; Zhang & Hayward, 2001). Men – at least in late life – are described as being more dependent on their spouse and children as resources of care and social control. If both resources aren't available, this can have especially detrimental effects for their health condition (Wenger, 2001).

When controlling for marital status, effects of general parenthood on health are reduced, but effects often remain (Kravdal, 2003, p. 264).

D. Lifestyle Factors: Becoming and Remaining Health Conscious as a Parent

As mentioned above, having a spouse can positively affect lifestyle choices – and so can having children. Grundy and Kravdal examined cause-specific mortality in Norway and after controlling for education, marital status and geographical factors, they found positive associations between low parity (having 0-1 children) and alcohol related deaths,

accidents and violence (Grundy & Kravdal, 2010, p. 1851). Finnish parents were generally found to smoke less, eat healthier and exercise more than their childless peers in old age – independent of their marital status (Kendig et al., 2007, p. 1480).

Having offspring probably motivates a more health-conscious and safe lifestyle. The willingness and social pressures to change one's behaviour start during pregnancy and can remain over the life course.

On the other side, it seems as if people – especially men – with very active lifestyles have problems adapting to the demands and constraints of parenthood. Fathers who very frequently participated in leisure activities before the birth of their child, were found to report reduced mental well-being after the birth in Switzerland. For women this association wasn't true, they generally showed higher rates of well-being after becoming a mother (Roeters et al., 2016).

E. Social Support: Adult children as Resources

As children grow and parents progress in their lives the costs and benefits of parenting change: On the upside there is more emotional support and better social integration (Nomaguchi & Milkie, 2003, p. 371) than with young kids or no kids. Adolescent children can enhance the family's social capital by generating sources of support outside the family (Antonucci et al., 2003; Offer & Schneider, 2007) and being a source of support themselves.

Research from the UK points out that elderly parents had better chances of regular face-to-face contact than their nulliparous reference group and that the contact with a child can predict the receipt of help two years later (Grundy & Read, 2012). Accordingly, elderly childless individuals might suffer from support deficits (Dykstra & Hagestad, 2007). It also found that especially having a daughter made the difference, more so than the number of children (Grundy & Read, 2012). This makes sense since female relatives mostly bear the brunt of the care work (Bott et al., 2017; Nowossadeck et al., 2016, p. 3). However, Swedish research could not find any association between gender of the child, parenthood, and mortality (Modig et al., 2017).

On the downside, the support that children provide for their parents is relatively uncertain: The offspring may be unavailable and unwilling to assist or even remain dependent on their parents and therefore rather present a source of distress and disappointment for their parents (Bures et al., 2009, p. 72). How difficult parent-child relationships are linked to

diminished psychological well-being of parents (50-84 years) was shown for an U.S. sample (Koropeckyj-Cox, 2002).

F. Involuntary Childlessness: Distress and Regret

While parenthood and childlessness have mostly become a matter of choice, some remain childless involuntarily, may it be due to infertility or career pressures, and consequently suffer from decreased mental health (Hewlett, 2002).

The line between involuntary childlessness and childlessness by choice is blurry and changing over the life course but estimates show that only few individuals actually wish to remain childless. Around 13% of the childless citizens between age 20 and 50 in Germany state the conscious choice to remain "childfree" The grand majority sees themselves having a child now or later and regard their current situation as a temporary transition phase. Around 25% were found to be involuntarily childless, of which more than 90% over age 40 were trying to fulfil their wish for a child for more than five years. Many are lacking a stable partnership (26% of women, 42% men), have too stressful jobs (19% / 16%) or are diagnosed with infertility (8% on average and 27% at age 40-50 / 4% and 8%). The numbers also show that women more often remain inadvertently childless despite being in a stable partnership, while men on the other side cannot fulfil their wish for a child because they haven't found a partner (Kreyenfeld & Konietzka, 2017, p. 97ff.).

To inadvertently remain childless can become a stress factor, and studies suggest that the attitude towards childlessness might be more relevant for health outcomes than childlessness itself: Koropeckyi-Cox found that childless women (50-84) with "incongruent attitudes" towards childlessness are lonelier and more depressed than women who are at peace with their nulliparity in the U.S. For men she didn't find a similar link (Koropeckyj-Cox, 2002, p. 964). In Canada involuntarily childless women (45+) reported worse overall well-being, less autonomy, and more regret than voluntarily childless women (Jeffries & Konnert, 2016).

Women in partnerships experience a greater pressure compared to men when it comes to having children: Being a complete woman is still closely related to motherhood, with advancing age women increasingly feel as the sole cause for the couple's physical fertility problems, and nulliparous women more than men fear being dismissed by others as egoistic, irresponsible and hedonistic or otherwise as pitiful and deficient (Anonymous, 2015, p.161).

The opposing phenomenon ‘regretting motherhood’ is lately discussed in the public but thus far lacks investigations to estimate its prevalence (Donath, 2017, p. 30).

G. The Will to Fight: Surviving Illness as a Mother or Father

As Norwegian Researcher Kravdal found significantly better survival rates amongst parents compared to childless cancer patients, he hypothesised: “those who have children, of any age, are particularly eager to put up a fight when faced with a potentially fatal disease” (Kravdal, 2003). This intuitively makes sense but needs to be further explored in scientific research.

H. Selection Effect: Prior Health Conditions

Subfecundity, sterility and other health conditions can be a cause or a reason to remain childless (Kravdal, 2003, p. 264). As early health conditions are directly related to later life health (Blane et al., 2007, p. 32), this might be the underlying link for the correlation between childlessness and later health. Vice versa it is probably the physically robust and mentally stable who decide on having children, especially more than one. For this reason, it makes sense to control for prior health conditions.

2.2.4 Summary

To sum it up, we must deal with mixed evidence and small effects in a very complex relationship. It is difficult to imagine parenthood not having an impact on mental and physical health, as other social institutions like marriage and employment do (Evenson, 2005, p. 341). The experience of parenthood and childlessness seems to be highly dependent on the context and can have very different effects on individuals - as described above. If anything, childlessness seems to negatively affect men more than women (Dykstra & Hagestad, 2007).

2.3 First Birth Timing and Health

2.3.1 Age at First Birth in Germany – Facts and Figures

The mean age at first birth in Germany has constantly been rising since 1970: from 24 to 29.8 years by 2019 (Destatis, 2019; Eurostat, 2015) and a further rise is expected.

In the years before the reunification 1960-1989 East German women were much younger than their West German counterparts (22-23 years) at their first birth (Bujard & Diabaté, 2016), which could be relevant for the sample of this paper (born in 1971-73, teenage years 1981-1991). The numbers converged very quickly in the 1990s, but East Germans today are still slightly younger at first birth than West Germans and more likely to have children outside of marriage and as single parents (Kreyenfeld & Konietzka, 2017, p. 98).

For official statistics in Germany women between 15 and 49 are generally assumed to be prolific, i.e., capable of bearing children. An early first birth generally is considered a teenage birth before age 20 for women, for men it is often defined as a birth before age 23. The term "late birth" is used more inconsistently, it mainly refers to childbearing at ages after 35.

The number of live births to teenage mothers (before the age of 20) in Germany is very low by international comparison and ever declining: it's share in the total fertility rate was at 1.7% in 2014 (Destatis, 2016). Since the 1950s the level of teenage fertility has been strikingly higher in the East German Counties with maximum rates of almost 21% in the 1970s (the rate in the West was around 9% at that time). During the eighties, up until the early nineties the rates still differed quite a lot. Today, the difference still exists on a rather low level (1,9% in the West, 4% in the East in 2012) (Bevölkerungsforschung, 2014).

On the contrary, the share of first births after age 35 has increased by 40% in ten years 2006-2016 (Bujard & Diabaté, 2016). The number of births after 45 is still very low but has tripled since 2000 from 0.1% (706 babies) to 0.3% (2.268) of all live births in Germany in 2015 (Destatis, 2017). A big part of late births happens in the academic milieu (Bujard & Diabaté, 2016).

Men's fertility in Germany was not covered up until 2016 since official statistics lack information about the father's age at birth. In 2016 researchers estimated missing paternal ages based on birth data between 1991 and 2013, using imputation methods and sensitivity analysis. They suggest that, compared to female fertility, male fertility is realised later and spread across a broader age range (Dudel & Klüsener, 2016, p. 1556). Their estimation for the year 2010 says that the mean age of German fathers at childbirth was 33.1 and keeps rising parallel to the mothers age (female partners are on average, three to four years younger than her male partner). While as much as 6% get their children

after the age of 45, most men have completed their fertility history by that age. Unfortunately, there are no details on age at first birth or teenage fatherhood.

2.3.2 Age at First Birth as Health Factor – Central Research Findings

Studies revealed significant associations between young maternal age at first birth and high blood pressure, diabetes, and chronic lung disease (Pirkle et al., 2014, p. 6) and heart problems in midlife and old age (Lee & Ryff, 2016).

Grundy and Kravdal examined mortality patterns of all Norwegian citizens and showed an overall positive association between early first birth and mortality for men and women likewise (Grundy & Kravdal, 2007). For the U.S. population Mirowsky stated generally improving health outcomes with increasing age at first birth. The association was found to be "linear for men and parabolic for women, with maximum health predicted for mothers who had a first birth around age 30.5" (95% CI 26.9-34.1) (Mirowsky, 2002, pp. 315 & 329).

On the contrary, having children late in life was in some studies associated with health advantages (Grundy & Kravdal, 2007; Grundy & Tomassini, 2005), in others with higher mortality risks (Spence & Eberstein, 2009).

2.3.3 Age at First Birth as Health Factor – Causal Links and Theory

I. Theory: Teenage Years as Sensitive Period

Natural sciences use the concept of critical periods, which says that an exposure during a specific time frame in life has long-lasting effects on the body's structure and function that may eventually result in disease later in life. The causal effect does not exist when exposed at a different life period. Critical periods are mostly times of foetal development, childhood, and adolescence (Kuh et al., 2003, p. 780; Lynch & Smith, 2005, p. 5).

In social sciences the similar concept of sensitive periods can help understand the importance of exposure timing. During sensitive periods, exposures have greater effects on the individual's future condition than the same exposure during other time periods in an individual's life (Kuh et al., 2003, p. 781; Lynch & Smith, 2005, p. 6). Outside sensitive periods the correlation between treatment and outcome does not completely

vanish, but it is distinctly smaller. To illustrate the concept of sensitive periods, consider the following example:

A study on women who experienced the Nigerian civil war (1967-1970) found the teenage years to be the most sensitive time frame for physical development. Adult health, measured in body height, didn't differ much for individuals exposed to conflict and famine between the foetal year and age twelve. An average reduction in adult height of 0.75 centimetres relative to unexposed women of the same cohort was found for them. But those exposed at age 12 to 16 showed a striking 4.53 cm deficit in body height (Akresh et al., 2012, p. 274f.).

Sensitive Periods might be highly complex and culture-specific, but it is reasonable to assume that the impact of having children on later health is stronger during adolescence than later in life. To explain this link, biological-evolutionary and socioeconomic, and mental processes are hypothesised and explained below.

J. Biology and Evolution: Pregnancy as a Physical Risk for Young Women

Pregnancy, parturition, and lactation are challenging for the female body and can change women's physiology permanently, supposedly even more for younger women (Pirkle et al., 2014, p. 2).

The "Evolution of senescence" of Kirkwood and Rose is consistently mentioned as one evolutionary approach for understanding the effect of early motherhood on women's physiology. It assumes that in metabolic trade-offs scarce resources are directed either towards physical maintenance or towards fertility from the same supply within an organism. Reproductive activity reduces survival also through non-metabolic trade-offs by increased risk exposure and wear-and-tear. The authors conclude that "simply rescheduling fecundity to later ages will increase survivorship" (Kirkwood & Rose, 1991, p. 20) and there are current studies that support this idea:

Adolescence is known as a critical period for accumulating bone mass and childbearing might interfere with it. A Korean study found lower bone mineral density and increased risk of osteoporosis for postmenopausal women with histories of adolescent pregnancy – after adjusting for a variety of factors including SEP, exercise, smoking and parity (Cho et al., 2012).

A study based on a Norwegian Sample found that the inclusion of sociodemographic variables generally weakened correlations between age at first birth and cause-specific mortality, but had no noticeable effect on breast, ovary, and uterus cancer. The risks for

breast cancer increased, while the risks for ovary and uterus cancer decreased with age at first birth (Grundy & Kravdal, 2010, p. 1853f.).

K. Socio-Economic Position: Early Parenthood as Symptom and Cause of Instability

In western societies, early childbearing can be a symptom of a disadvantaged background and a pointer to a weak start into adulthood: As humans mature biologically about ten years before they mature socially and professionally (Mirowsky, 2002, p. 316), having a teenage-birth is often correlated with less completed years of college education (Hofferth et al., 2001), increased probability for divorce, worse status on the marriage market i.e. higher risk of partnering with poorly educated and unemployed (Ermisch & Pevalin, 2005), and an overall tendency to having bigger families and less economic well-being in the long run (Grundy & Foverskov, 2016, p. 259). All these factors are closely related to socio-economic position SEP and health themselves. Therefore, the associations between timing of childbirth and later health may well be moderated by socioeconomic factors.

It is well established that socio-economic position SEP – including professional status, income, and education – is a strong determinant of health and mortality (Hayward & Gorman, 2004; Smith, 2004) as well as mental well-being (Miech & Shanahan, 2000). In most chronic diseases distinct differences can be observed with a consequent plus of 13 to 14 years of good health that people on highest socio economic positions are enjoying, compared to people on the lowest positions in Germany (Institut & Destatis, 2015, p. 22). This goes along with the distribution of the most important health risks, that low status people are more prone to: malnutrition, overweight, hypertension and smoking (ibid., p. 26), as well as physical inactivity, dyslipidemia, negative emotions and stress (Gallo & Matthews, 2003; Kravdal et al., 2015, p. 128; Lampert et al., 2013, p. 514).
The association between status and health is already apparent at birth when babies from less wealthy and less educated families have lower birth weights than babies from more advantaged households (Case & Paxson, 2010). Childhood disadvantage is a strong predictor for poor socioeconomic outcomes later in life - mostly moderated through educational attainment - (Mckenzie et al., 2011) as well as mortality (Galobardes et al., 2004, 2008) and was found to be a strong risk factor for early parenthood (Allen et al., 2007). So, early life conditions are likely to be a central causal root of the relation between first birth timing and midlife health.

These coherences are part of cultural and political structures and might not be true for societies other than the west. As studies have shown, the association between giving birth early and poorer later health was significantly smaller in south-eastern countries such as Georgia and Romania (Grundy & Foverskov, 2016) or Columbia and Brazil (Pirkle et al., 2014), where early parenthood is much more usual – in 2016 14% of first births Romania were teenage births (Eurostat, 2018). An U.S. study found that early childbearing was associated with higher mortality among white mothers, but late childbearing (in this study 25 or older) was associated with higher mortality among black mothers (Spence & Eberstein, 2009). Possibly it is especially the "not-normative" life transitions resp. ways of starting a family, in relation to the social norm of a society or specific subcultures, that bring negative social effects for the parent's health. Traditional family formation on the other side seems to prevent disease, depression, and risky behaviour (Barban, 2013, p. 373).

In this logic later births are less risky in western societies: they are more compatible with individual freedom and well-being and are backed much more by social and economic resources.

L. Children as Stress Factors: Vulnerability to Mental Overload

Another pathway from first birth timing to later health is leading through the stressful life with children. In the face of the emotional and economic burdens that come with childbearing, very young parents might have fewer stress-buffering resources compared to individuals with more life experience. They simply had less time to accumulate human capital, find a stable partner and develop healthy physical and mental habits to avoid disease and depression (Barban, 2013, p. 382). A 2015 UK study has found a direct association between early parenthood (f<20, m<23) and worse stress-related physiological dysfunction (allostatic load) and long-term-illness – however partly mediated through wealth, smoking, and physical activity (Grundy & Read, 2015). And since early first birth is also associated with bigger family size, it is possible that these parents do not have the opportunity to develop healthy self-care and stress-relieving strategies over a long period of time in their lives.

M. Selection Effect: Late Children and Robust Parents

Having a 'late' child, on the other hand, could be selected for above average health and slower ageing. As perceived health status likely affects decisions about late parenthood (Grundy & Kravdal, 2007) people in great health might more often select themselves for a child later in life. As described above, fertility is dropping with age and bearing children after 35 could point to genetic robustness of women (Jacobsen et al., 2003) but also mental and physical well-being of men.

2.3.4 Summary

The pathway from age at first birth to later health is probably to a large extent an indirect route over their common correlation with many socio-economic factors. When controlling for the SEP factors described above, the effect of age at childbirth in Germany will probably be noticeably reduced but a small direct influence might remain and reflect its direct effects on health.

2.4 Parity and Health

2.4.1 Parity in Germany – Facts and Figures

For almost five decades the total fertility rate in Germany has been especially low, compared to the rest of Europe, and constantly beneath replacement level (i.e., 2.1 live births per woman). Male fertility is generally even lower (1.35 vs. 1.42 for women in 2013) because due to immigration and longer male reproductivity periods, births are distributed across relatively more men than women (Dudel & Klüsener, 2016, p. 1554ff.).

Within the German micro-census every four years since 2008 women (15-75) are asked how many biological children they have. Around 75% of women in Germany are mothers, of which 30% are parents to one child, almost 50% have two children and another 20% have three or more children in their lifetime (Destatis, 2012, p. 26).
A strong correlation between parity (number of children) and mother's educational level can be found in the microcensus data, at least for West Germany: the higher the education, the lower the average number of children (Dorbritz, 2014, p. 256). The biggest group of women born between 1964 and 1968 who attained a high school degree (31%) remain

childless while the majority of women without any degree (46%) have three or more children (ibid., p. 257). This is also linked to the parity differences between immigrants and native Germans. Individuals with a Turkish background for example, generally show a higher parity compared to women without a migration history, but with increasing education parity levels become comparable (Naderi, 2015).

2.4.2 Parity as a Health Factor – Central Research Findings

There is a large body of research on the question, whether and how the number of children affects parents' health over the life course. Although the findings are not consistent, a systematic 2006 review on studies up to 2003 was able to detect trends for women's mortality (Hurt et al., 2006): In historical cohorts, parity and mortality had a somewhat linear relationship: female mortality declined with the numbers of births. In contemporary cohorts the relationship appears to be more of an inverted U-shaped curve:
Medium parity (having two or three children) seems to be optimum in many western societies regarding later health outcomes. Having a single child and likewise high parity, (having four or more children), is associated with overall worse health for many countries like Norway (Grundy & Kravdal, 2007, 2010), Great Britain (Grundy & Tomassini, 2005), or Israel (Jaffe et al., 2009).
Another meta study on 752 publications found that at a parity level of seven to eight, the relative mortality risk equals that of nulliparous individuals with ever increasing risk per additional child (Högnäs et al., 2016). Short birth intervals and multiple births might also contribute to increased mortality (Grundy & Tomassini, 2005).

A general health disadvantage for high parity parents was found to be true for middle aged, as well as elderly men and women in Israel (Jaffe et al., 2009). An Austrian study however found that the correlation changes significantly over age groups: mortality of high parity women was lowest compared to all other women around age 50, grew stronger with increasing age and peaked around age 75 (Doblhammer, 2000, p. 172). This points either to a life course effect (risk accumulation over time and showing effects with delay) or a cohort effect (older cohorts might have suffered more disadvantages from having many children than women in more recent years). What contradicts the ladder theory is that older cohorts actually show opposing effects: for "respondents who would have been

age 120 as of 2016 […] the relative mortality risk is […] essentially falling as parity increases, even to 7, 8, 9, or 10 children." (Högnäs et al., 2016, p. 19).
Differences between the sexes only emerge at about 7 or more children, suggesting that the health risks of very large family sizes are higher for women (ibid.).

In some cases, effects that were initially found disappeared after controlling for background factors like socioeconomic status, smoking, physical activity, and social stress. In other cases, the addition of social factors reduced the associations but "trends remained substantial and significant" (Jaffe et al., 2009, p. 15).
Albeit other studies could not approve any correlation: No mortality effects were found for high parity parents in Norway (Grundy & Kravdal, 2007) and mothers in Finland (Hinkula et al., 2006). Higher risks for some diseases were found to be offset by lower mortality from others.

2.4.3 Parity and Health: Causal Links and Theory

N. Biological Risks and Benefits: Mixed Effects of High Parity

Apparently, the risk for female cancers of breast, uterine and ovaries (Hurt et al., 2006, p. 55) decreases with every further live birth (Antoniou et al., 2006) and duration of breastfeeding. According to a meta-analysis from 47 epidemiological studies in 30 countries, every 12 months of breastfeeding decreases the relative risk of breast cancer by 4.3% in addition to 7% for each birth (Cancer, 2002, p. 187). The risk of ovarian cancer is also significantly reduced for multiparous women, i.e., having 3 or more children (Chiaffarino et al., 2001).
On the other hand, some authors suggest that having many pregnancies, especially when closely spaced or multiple, can wear out the female body by using up physical resources that therefore cannot be used for repair processes. Still, this effect called "maternal depletion or a trade-off between reproduction and mortality" (Hurt, 2006, p. 55) has not been proven for human bodies yet.
Mortality from cervix cancer, however, was found to be raised for high parity (4+) mothers, with best survival chances for mothers of two children (Grundy & Kravdal, 2010, p. 1859ff.).
High parity appears to increase the risk factor for diabetes in older women, but not in men in Britain (Lawlor et al., 2003). Also, the risk for obesity among older women increases

by 7-11% per additional live birth, “demonstrating a dose – response relationship […] independent of socioeconomic status and other confounding factors” in the USA (Bastian et al., 2005, p. 99; Umberson et al., 2011). Obesity again leads to increased risks of coronary heart disease: For parents of at least two children, every additional child increased the age-adjusted odds by 30% for women and 12% for men in Great Britain (Lawlor et al., 2003).

The causality between parity and obesity is not fully understood, researchers assume physiological mechanisms through insulin resistance and altered glucose metabolism during pregnancies, but also behavioural mechanisms (Bastian et al., 2005, p. 102).

Since the number of children was found to be positively associated with waist-hip-ratio, body mass index, and heart disease for both sexes (Lawlor et al., 2003), lifestyle factors probably make up the majority of the association and biological responses of pregnancy could add some adverse effects for women.

O. Finances: The Economic Burden of Having Children and the Role of Family Policy

Raising children can go along with financial stress, more working hours, and less wealth accumulation. The German Federal Office of Statistics estimated that couples with one child spend 21% of their consumer spending on their child. For single parents the percentage rises to 35%. As the kids grow older, their needs for food, leisure and entertainment grow too; On average a single child up to 6 years costs 679 Euros, a single teenager costs 953 Euros per month in Germany 2018. With increasing number of children, the cost per child decreases but the total costs keep going up: for two kids, parents would spend 1276 Euros, for three kids 1770 Euros per month (DeStatis & Bundesamt, 2021), which can be a heavy burden for especially young, single, and multiparous parents.

A 2018 study (Kageyama & Matsuura, 2018) estimated that every additional child is associated with a loss of 1.47 to 1.96 income class in low and very low total fertility rate countries like Germany, using the equivalence scale, and therefore has significant negative effects on financial satisfaction (Rojas, 2007). The financial burden, especially of older children, “is a major binding constraint for having children” in low and very low TFR countries (Kageyama & Matsuura, 2018). Interestingly, in high fertility countries the correlation points in the exact opposite direction: additional children are equivalent to higher income classes there.

In a comparative study on European data the researchers conclude: “economic well-being […] is almost always compromised as a result of a childbearing event” (Aassve et al., 2006) However, the association depends quite a bit on national family policies. In Mediterranean states and the U.K. childbearing is most often associated with increased levels of poverty with a positive gradient in financial deprivation by the number of children. These countries offer limited welfare support and rely much more on strong inter-generational family ties than northern Countries.

The social democratic politics in Scandinavia, buffer parents’ financial burden with generous family support quite successfully. There the parity-poverty gradient is much flattened, still it steepens significantly from the third child for some countries (Aassve et al., 2006). When studies did not find mortality effects for high parity parents in Norway (Grundy & Kravdal, 2007) and mothers in Finland (Hinkula et al., 2006), Grundy hypothesised the overall health benefits of having many children outweighed the costs in ‘‘family friendly’’ Scandinavian countries (Grundy & Kravdal, 2007, p. 274), indicating the importance of the socio-political environment.

German family policy is classified somewhere in the middle as conservativism (Aassve et al., 2006) or continental European subsidiarity (Bahle & Bildung, 2017), recently leaning towards Nordic universalism. This means, direct financial benefits to equalise the financial burden between childless and parents are more and more accompanied by childcare services to increase the compatibility of family and career. Since 2013, parents have the right to claim child day-care for their children from the age of one. The Sample of this paper, however, could only marginally benefit from the Scandinavian influences into German policy, since their fertile phase was mostly completed in 2013.

P. Selection Effects: High Parity and Robust Parents

Like having a ‘late’ child, having many children could be selected for physical and mental capability. In the USA protective effects of very high parity (6+ children) on middle-aged men and women’s (45-59) health appeared after controlling for first birth timing, as well as social, economic, and health characteristics, especially for black women (Spence & Eberstein, 2009, p. 1630).

Also, parental well-being with the first child can predict further parity behaviour in Germany: “A drop in well-being surrounding first birth predicts a decreased likelihood of having another child” (Margolis & Myrskylä, 2015, p. 1147).

These findings could point to biological and mental selection effects: robustness allows parents to raise a well above average number of children and weaker conditions may prevent them from having more than one child (Doblhammer & Oeppen, 2003, p. 1541; Grundy & Tomassini, 2005, p. 255; Spence & Eberstein, 2009, p. 1630).

Q. Theory: Parenthood as an Accumulation of Risks and Benefits

To explain how life events, like having kids, as well as their level and timing may relate to later health disparities, healing, ageing and morbidity many papers build on the concept of cumulative advantage (Willson et al., 2007) and disadvantage (Douhit & Dannefer, 2007; Ferraro & Kelley-Moore, 2003) based on the works of Merton (Merton & Storer, 1973), Blau (Blau & Duncan, 1967), and Dannefer (Dannefer & Sell, 1988a, 1988b).

The basic idea is that risks and chances are being collected over the life course and add up to patterns of health inequality between groups and individuals with ever widening inequalities as people get older.

Both approaches clearly do not cover the whole experience of parenting or remaining childless. One cannot say that parents in general are either benefitting from cumulative advantage, like being educated or employed {Walsemann:2008kf, Mirowsky:2005dk} or suffering from cumulative disadvantage like obesity or race {Ferraro:2003gm} {Shuey:2008ha}), both is the case under certain circumstances. As studies show, effects can point in different directions and interact or neutralise each other. Moreover, factors of chance and personal agency can compensate for disadvantage or else derail advantaged trajectories (McLeod & Almazan, 2003; ORand, 2009) (McLeod & Almazan, 2003; ORand, 2009) (McLeod & Almazan, 2003; ORand, 2009)

2.4.4 Summary

Children come with stress factors like physical and mental challenges, narrowed opportunities, role overload, economic costs, disruption of careers and so on (Grundy & Read, 2015, p. 111). On the other hand, they provide a sense of stability, meaning, social integration and some hormonal benefits. And one could argue that more children equal to more stress but also more benefits. However, the extent of these effects depends on circumstances like household income, partnership status and parenting history.

Therefore, the analysis can be very sensitive to the set of control variables, which will be described in the next section.

3 Aims and Data

3.1 Research Questions and Hypotheses

Regarding midlife health in Germany and based on the previous literature, the dataset will be approached with the following questions and hypotheses:

Q1: Are parents generally healthier than the childless?

H1: I expect parents, and especially fathers, to generally show slightly better physical and mental health outcomes than their childless counterparts.

Q2: Do early first birth parents generally suffer from worse health?

H2: Early first birth parents (here up to 22 years) should generally have worse physical and mental health outcomes compared to other parents, mostly moderated through socio economic factors. The optimum age for first birth should lay around age 30 for women and a few years later for men.

Q3: What is the optimal number of children?

H3: Among parents, having a single child or more than three children is associated with worse physical and mental health outcomes than having two to three kids. Having no children should be associated with worst health.

3.2 Data and Sample Description

The German Panel Analysis of Intimate Relationships and Family Dynamics Pairfam provides data on the formation and development of intimate relationships and families in Germany. The panel started in 2008/09 with a random sample of all German-speaking persons living in private households from the population register. Three age cohorts have been selected for the survey (cohort 1: 1991-93 aged 15-17, cohort 2: 1981-83 aged 25-27, cohort 3: 1971-73 aged 35-37 in 2008). Every year one hour CAPI-interviews are conducted with minor changes in the survey design. The study is funded by the German Research Foundation (DFG) until 2022 (Brüderl et al., 2016).

To assure external validity Pairfam data is being collated with other high quality studies in Germany like the German Family Survey, Mikrozensus and SOEP (Brüderl et al., n.d., p. 25ff.).

This paper is using Pairfam wave seven material, collected in 2014/2015 and will focus on the oldest cohort, born 1971-73, i.e., aged 40 to 44 (M=42.11, SD=.86) at the time of the questionnaire. At this age it can be assumed that the large majority of people has terminated their fertility history as a birth after 40 years of age is relatively seldom, especially for women {Destatis:2012uh p.28}. Looking into the data, 5% think that having additional children is a realistic scenario (1.96%of women and 9.39% of men).

3.3 Measuring Health

In a general perception "health can be defined negatively, as the absence of illness, functionally, as the ability to cope with everyday activities, or positively, as fitness and well-being" (Blaxter, 2005, p. 14). The World Health Organization WHO defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (Organization & Worl, 1946).
To measure general health, this Paper will work with the self-reported, non-cause-specific Short-Form-12 Health Survey Version 2 (SF12v2) - an internationally applied, but Germany-specified health questionnaire to assess mental and physical health on standardised scales.

Mental health and physical health have a bidirectional and complex relationship: poor mental health is a risk factor for chronic physical illness. Vice versa chronic physical conditions are a risk factor for poor mental health.
To give just a few examples: The rates of depression among U.S. citizens with diabetes are two times greater than in the general population and both diseases seem to act as a cause for the other: "Just as type 2 diabetes increases the risk for on-set of major depression, a major depressive disorder signals increased risk for onset of type 2 diabetes" (Ducat et al., 2014, p. 691). Negative emotions, and especially anxiety, also promote the development of coronary heart disease (Kubzansky & Kawachi, 2000), and there is a 30% higher mortality from cancer among psychiatric patients than in the general population, even though their incidence is the same or even lower (Kisely et al., 2013).
Hence, the two health scales cannot exist independent from each other but will always correlate to some extent (in this sample: r=0.5, p=.000).

3.3.1 The Short Form SF12v2 Health Survey

The Short Form SF-12 was designed by RAND Corporation to be brief and therefore of practical use in large-scale surveys; it fits on one single page and is administered in two to three minutes (Ware & Corporation, 1996). Being a timesaving and still reliable version of the longer original version SF-36, it is an effective and an internationally applied measure of overall health (Andersen et al., 2007, p. 171).
The German Socio–Economic Panel SOEP has developed and adapted the SF-12v2 questions specifically for the German population (Nübling et al., 2006, p. 2). This survey version is included in the Pairfam panel every other year from wave 7 on.

The survey consists of twelve items that cover eight health dimensions, of which four are each summarised into two sum scores: physical health composite score and mental health composite score (see figure 1).
The twelve question-items cover topics like pain, fitness, energy, and social functioning. For each question three to five answering possibilities are given. Please look at the variables list in section 7 for the exact wording of the questions.

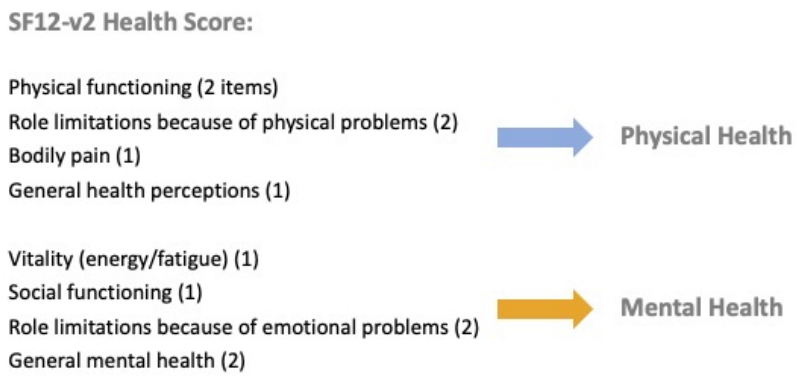

Figure 1: SF12-v2 Health Score – Eight Dimensions

3.3.2 Calculating the Health Scores

To generate two indices from the twelve items and eight dimensions, I followed the recommendation of the German Socio Economic Panel SOEP (Andersen, 2007, Nübling, 2006). The first step of this analysis was to employ the algorithm on the Pairfam sample

(wave 7, cohort 3, *n*=2116) and check whether the two health dimensions can be clearly obtained from this dataset.
Only cases that provided valid answers for all 12 items were included in the computation. After excluding cases with missing values in the variables of interest and implausible data we end up with 2,116 observations (56% female, 44% male). The missing values per variable amounted from 0 to 0.8%; Almost 99% of cases did not show any missings, so that 1.35% (29 of 2146) cases have been excluded. The overall impact of missing values on the sample is negligible.

The scales of seven items were inverted so that increasing values stand for increasing health perceptions and in four cases, where one dimension contained two items, a sum scale has been calculated. The resulting eight health dimension have then been standardised to a range from 0 to 100.

With exploratory factor analysis it was investigated whether the eight subscales clearly depict two latent factors for mental and physical health and therefore can be reasonably summarised.
Unrotated principal component factor analysis showed two factors with Eigenvalues over one, meaning that they together explain more than one single variable, clarifying about 62% variance. All variables load high on the first factor, which confirms their common features. Some also load high on the second factor. Hence, content wise the two suggested factors cannot be reasonably interpreted as physical or mental health related.
To allow a content related interpretation of the two factors the coordinate system needs to be rotated in a way that every variable loads highly on one specific factor, but not on the other. With oblique oblimin rotation I found a clear pattern of four highly loading (0.6 – 0.8) variables per factor in two categories, which can be interpreted as mental (vitality, social functioning, role limitations due to emotional problems and general mental health) and physical health (physical pain, role limitations due to physical problems, physical functioning, general health) – just like suggested by the SF-12v2 instructions.
The final aggregate scores hpcs and hmcs were calculated using these factors score coefficients.

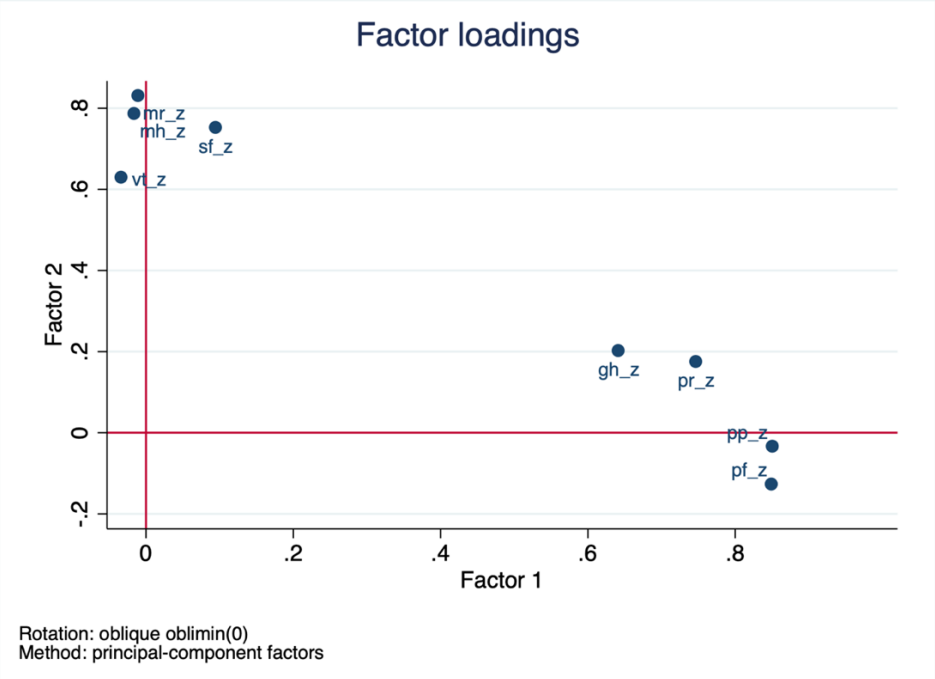

Figure 2: Principal Component Factor Analysis – Identifying the two Health Scores

Kaiser-Meyer-Olkin Kriterium KMO showed high values of 0.79-0.89 (overall 0,85) for the variables, which confirms their eligibility for principal component factor analysis (wolf, Dziuban & Shirkey (1974).

After another scale transformation to a mean of 50 and standard deviation of 10, the norm-based-scoring process is complete. An empirical value of 50 on the health scales now equals the mean health of all interviewees (Pairfam, wave 7 cohort 3). A value of 40 would be one standard deviation below the mean value.

	Obs.	min	max	mean	sd
Physical Health Score	2116	7.74	62.11	50.01	9.99
Mental Health Score	2116	-1.37	64.99	50.00	10.00

Figure 3: Distribution Table – Health Scores

With regards to physical health, the smallest measured value was 7.74 and the maximum score lay at 62.10. For mental health the minimum was -1.37 and the maximum was 64.99, showing a wider range. The health outcomes for men and women were relatively similar, with a slightly better mean score for men on both scales (see figure 4).

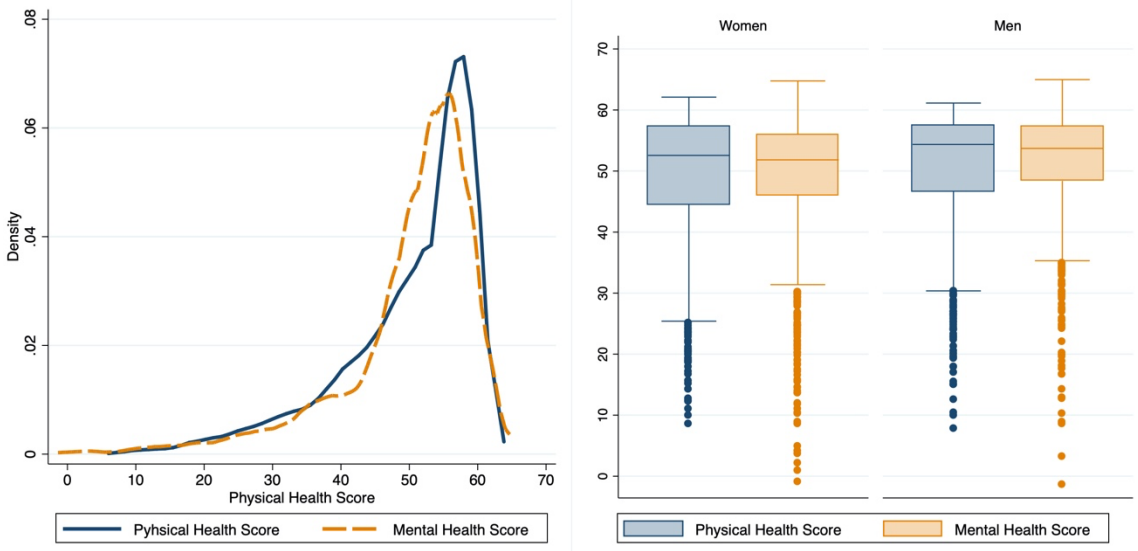

Figure 4: Distribution Graphs – Health Scores

3.4 Measuring Fertility

Parenthood

Every respondent who indicated to have at least one living child, no matter whether biological, step, foster, or adopted is classified as a parent. The sample contains 1,745 (82.5%) parents and 371 (17.5%) childless. Compared to the general population of Germany, women and parents are distinctly overrepresented in this dataset.

All together 3,661 children are part of the analysis, of which 189 are non-biological children to the respondent. Deceased children are excluded from the analysis.

To narrow down 'active' from 'passive' parents, I created variables to compare parents who currently share a household with at least one child to the childless.

Parents' Age at Birth of their first Child

To compare age at first birth, dichotomous dummy variables for five age groups were created. For reasonable group size, early first birth is defined as having had the first child up until age 22 for women and men. Late first birth would be a first birth at age 35 or later. The sample average age at first birth lies at 28.55 (*SD*=5.51, *min*=13, *max*=43), more specifically at 27.55 for women and 29.96 for men.

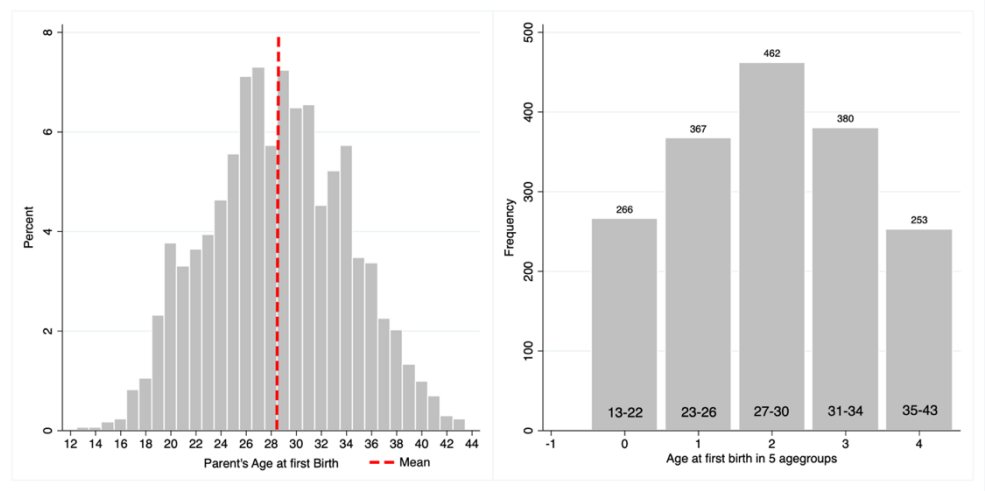

Figure 5: Histograms – Parents' Age at First Birth

Parity

On average every anchor has 1.73 (*SD*=1.2, *min*=0, *max*=10) kids. Looking at parents only, the mean number of kids is 2.*1* (*SD*=.99). From four kids on, the number of cases becomes vanishingly small. For this reason, all the parents of four or more children were pooled into one group.

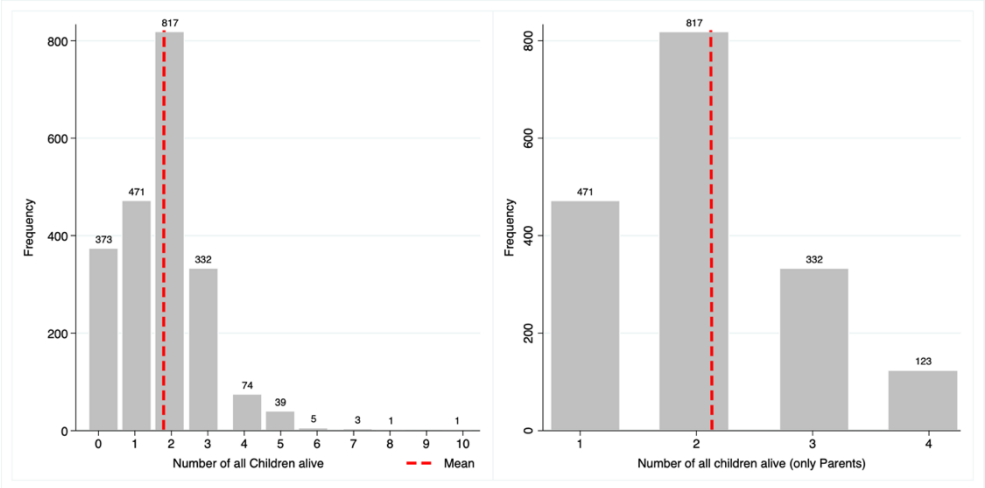

Figure 6: Histograms – Parity per Respondent / Parity per Parent

For an alternate measure of parity or 'parenting intensity', I calculated the sum of cohabiting years per parent, that is adding together all the years that the responded cohabited with all their children. A person who has kids, but never lived with any of them, would end up with 0 cohabiting years; childless individuals are not included in the scale. The idea behind this is, that all the costs and benefits of having children only come into play when the parent is exposed to their child(ren) on an everyday basis.

3.5 Covariables

Based on the current state of research and the available items in the Pairfam questionnaire, a set of covariables was operationalised to control for moderating factors.

Parent Stress

The Pairfam questionnaire asked parents about their problems and worries with rearing children. I used ten items to summarise a parent-stress score, including topics like feeling pressured, insufficient, overburdened, or anxious as a parent. Subsequently a dummy was created to differentiate those parents with above average stress levels (about 44% of fathers and 48% of mothers) from the others.

Support for Parents

The parent respondents were asked to what extent they feel supported in their parent role by their partner and by other family members and friends. Two dummies were created with '1' for above average support scores.

Another variable measures the overall satisfaction with the childcare situation. Since it was originally operationalised using a 10 item Likert scale, I calculated the average satisfaction over all parents' children and treat it as a quasi-interval scale.

Breastfeeding

As described above, breastfeeding is supposed to be health protective for women. A dummy was created to control for people who had breastfed at least one of their children. Only parents who had an infant or toddler at the time of the interview in 2014/15 were asked this question, so only 144 cases of people who had breastfed could be identified. Interestingly, a good deal more men than women answered the question, leaving us with 91 men and 53 women, who had at least one child breastfed themselves or by their partner.

Age of children

To isolate the effect that very young children or adult children might have on health, five dichotomous variables were created to indicate whether a parent has at least one child in a certain age group.

For reasonable group sizes I chose the segmentation as follows: 0-5 years (babies, toddlers, pre-school kids), 6-10 (elementary school), 11-14 (young teenagers), 15-18 (adoles-cents), 19-30 (adults).

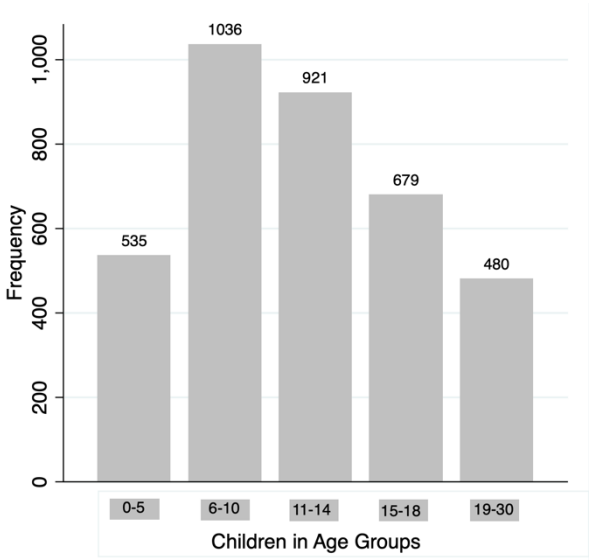

Figure 7: Bar Chart – Number of Children per Age Group

Relationship Status

Relationship status was dichotomised into married and/or cohabiting respondents vs. single, divorced, or living-apart-together respondents (66% vs. 34%). As an alternative measure of relationship stability, the duration of the current relationship in years was summed up (*mean*=15.2, *SD*=7.5 *min*=0, *max*=29).

Education

To represent the level of education I use the sum of education years (*mean*=13.6, *SD*=3.0 *min*=8, *max*=20) and a dummy variable to identify those with tertiary qualification (30%).

Occupation

A dummy distinguishes employed individuals (full time, half time, self-employed) from other (marginally employed, unemployed, retired, stay at home). 81% of the sample participates in professional life on a substantial and regular basis.

Finances

The respondents' financial position was measured by their monthly household net income (excluding nine outliers of very high incomes above 12,000 Euro monthly) and by a dichotomous variable that indicates whether someone has experienced serious financial hardship in their life. The mean household income is widely spread with a mean at 3,300 Euro (*SD*=1,612 *min*=0, *max*=12,000). About 22% had experienced big financial problems like dept and insolvency before.

East / West Germany

Another dummy is to indicate citizens of the former Eastern States of Germany. With 34% they are heavily overrepresented in the Sample, presenting only 15% of Germany's total population. Since this paper is not predicting future health outcomes, but rather analysing possible causal effects for past events, I keep the Sample as is.

Smoking

A dummy variable indicates whether somebody currently is an active smoker (about 30% of the interviewed). A continuous variable shows the intensity of smoking, i.e., the number of cigarettes, pipes, or cigars smoked per day. For active smokers a daily average of 14.5 was found (*SD*=9, *min*=0, *max*=60).

Alcohol

In a similar way drinking alcohol was dichotomised to differentiate regular drinkers (3 times per week or more: 17% of respondents) from occasional drinkers (1 to 2 times per week or less: 83%). A continuous variable tells how often an active drinker had more than five alcoholic drinks on one occasion in the preceding month, and therefore displays the intensity of their drinking (*mean=1.5, SD*=1.9, *min*=0, *max*=6).

Sport

A dummy indicates whether a person exercises at least once per week on a regular basis. 973 of 2,116 respondents (46%) do.

Social Contacts

Seeing friends was dichotomised to check whether a person is having social contacts at least once per week (816 people, 39% do).

Sleeping

Another dummy variable helps to identify people who get a good amount of sleep of 6 to 8 hours on a working day night (about 85% do). Sleeping shorter or longer hours was both associated with worse health outcomes, especially for physical health.

Overweight

Since data on height was missing, the respondents' body mass index could not be calculated. As a workaround I split the panel up into four same size groups along the weight variable and used the upper quartile to check for overweight and obesity with a dummy. This concludes women weighing 80 to 140kg (289 observations) and men weighing 95 to 165kg (255 obs.)

Prior Health

The categorical scale for the respondent's childhood health was dichotomised to distinguish people who had good or very good health during their own childhood from those who had mediocre or bad health (83% vs 17%).

3.6 Variables and Correlations Overview

For a first overview of the data, the health score means of all categorial variables as described above, are depicted in figure 8.

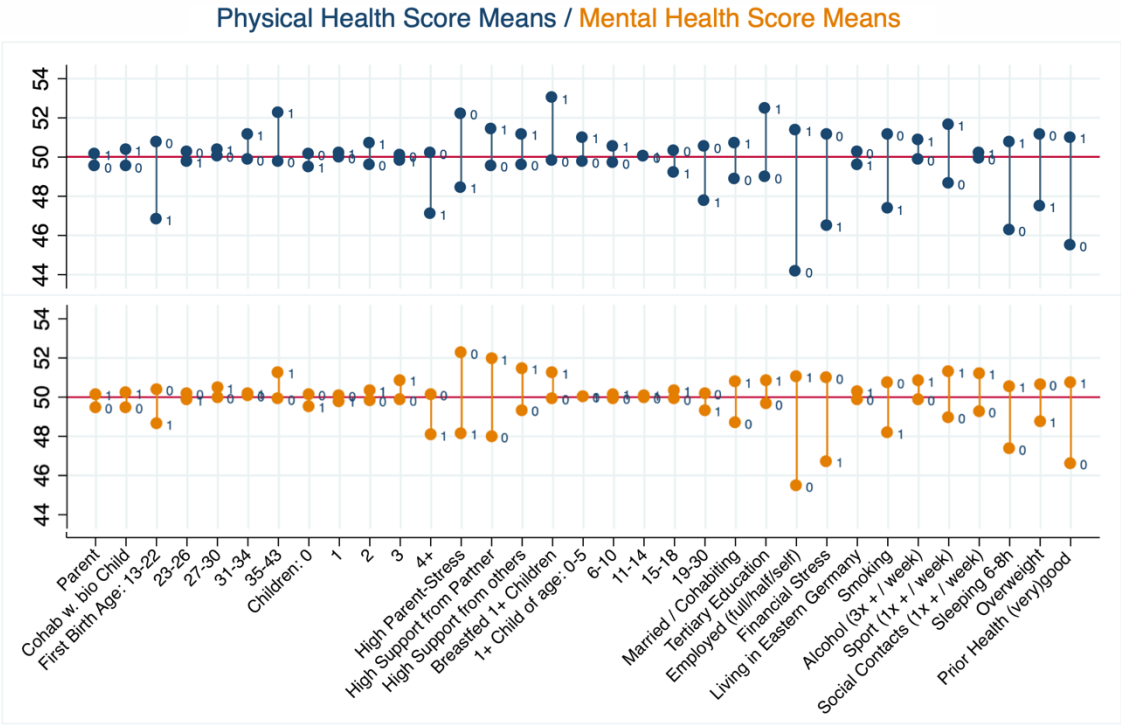

Figure 8: Health Score Means (physical on top, mental below) – All Independent Categorical Variables

Overall, the effects seem to be stronger on physical health, than on mental health but all associations point in the same direction for both scales. At first glance, parenthood as such seems to be a minor health factor, but early and late first birth, as well as having more than three children could indeed make a difference.

Furthermore, I investigated the correlation coefficients and significance levels between all operationalised dependent and independent variables to weed out unsignificant

correlations, choose between variables if there were two measuring the same concept, and to avoid multicollinearity. Figure 9 shows the pairwise correlation coefficients of the health scores and selected covariables.

Having child(ren) of the oldest age group is stronger associated with health than having children in any other age group. But as children's age groups are strongly correlated with age at first birth and statistically insignificant for mental health, they are mostly redundant.

Breastfeeding was only associated with physical health, however, and this is though-provoking, shows similar health associations for men and women.

The dummy for 'married and/or cohabiting' appears to be a stronger health predictor than 'current relationship duration', that's why I chose to drop the latter.

For education, the continuous variable 'years of education' proved to be stronger than the dichotomised variable that differentiated between university graduates and others.

The number of smoked cigarettes and cigars per day (scale containing 0 for non-smokers) was stronger correlated with health outcomes than the dummy of 'smokers vs. non-smokers'.

Maintaining social contacts proofed to be relevant for mental health, not so for physical health.

Consuming alcohol and living in Eastern or Western Germany were not found to be relevant for further analysis.

The correlations are generally not very strong with the strongest coefficient being 0.37 for household income and years of education.

Having said that, occupational status, finances, parent-stress, and prior health conditions seem to be relatively important health predictors. For physical health lifestyle factors play a bigger role, for mental health it is rather the support from a partner and childcare services that make a difference.

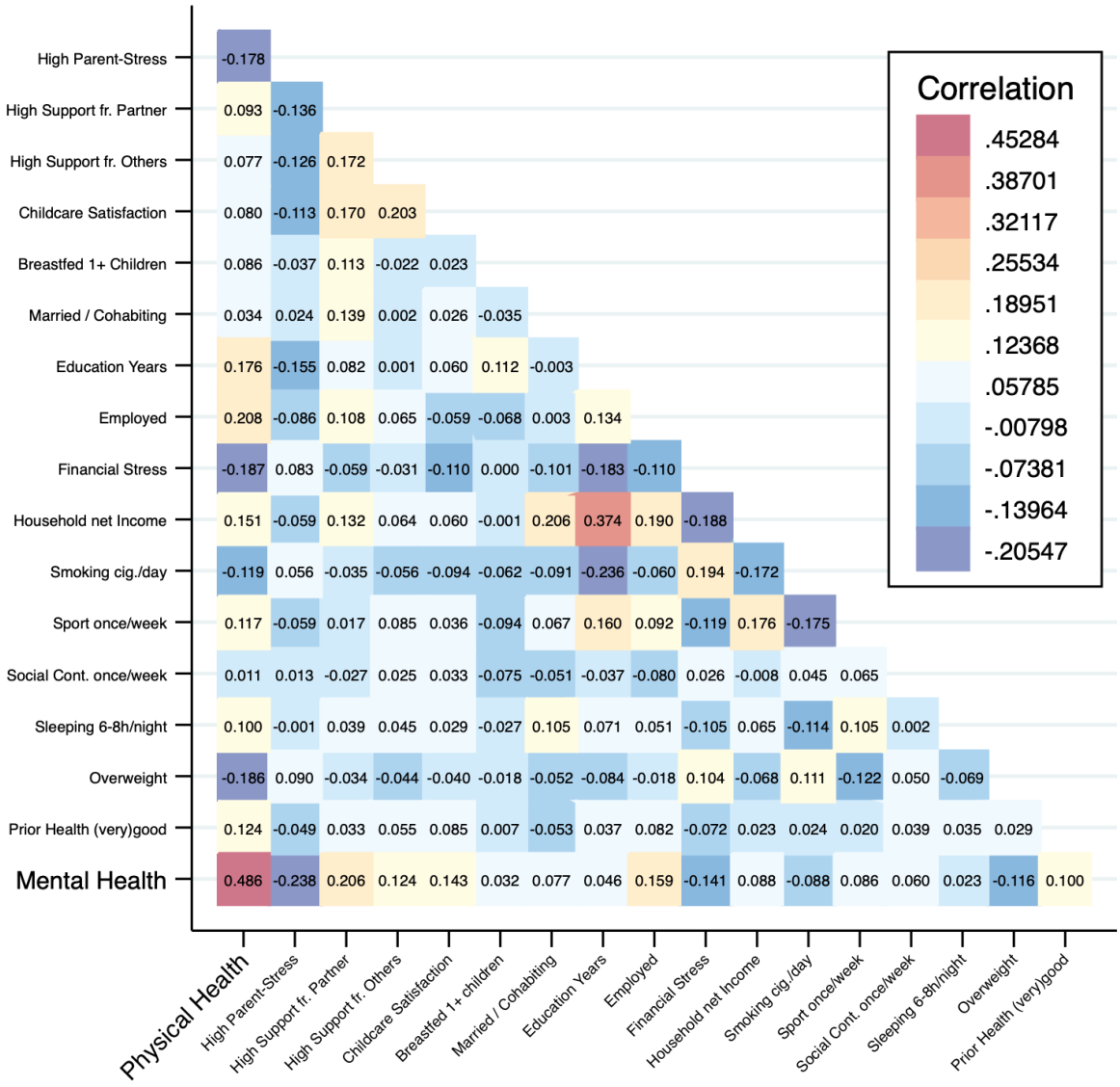

Figure 9: Correlation Heatmap - Health Scores and Covariables

In figure 10 the correlation differences for men and women are broken down: Women's mental health seems to be more negatively affected by parenting stress, but also more positively affected by the support of their partner.

Being married, being employed, and exercising has a distinctly stronger positive effect on men's than on women's physical and mental health.

Overweight and prior health conditions are more relevant for women's than for men's health outcomes.

	Physical Health		Mental health	
	Women	Men	Women	Men
Fertility Predictors				
Being a Parent	0.03	0.04	0.02	0.06
Age at first Birth				
13 - 22	-0.17***	-0.07	-0.04	-0.08*
23 - 26	0.04	-0.10**	0.00	-0.03
27 - 30	0.02	0.00	0.03	0.02
31 - 34	0.06*	0.03	-0.02	0.02
35 - 43	0.05	0.11**	0.03	0.04
Number of Children				
0	-0.03	-0.04	-0.01	-0.05
1	0.01	0.01	-0.02	0.01
2	0.03	0.08**	-0.00	0.08*
3	-0.00	-0.01	0.04	0.04
4+	-0.04	-0.11***	0.00	-0.12***
Cohabiting Years	-0.09**	-0.04	0.03	-0.01
Parenting Factors				
High Parent-Stress	-0.20***	-0.18***	-0.23***	-0.18***
High Support from Partner	0.07	0.10*	0.22***	0.12**
High Support from others	0.05	0.11**	0.11***	0.12**
Childcare Satisfaction	0.10**	0.14***	0.16***	0.16***
Breastfed 1+ Children	0.07*	0.08*	0.03	0.03
Lifestyle Factors				
Married and/or Cohabiting	0.06*	0.12***	0.08**	0.13***
Education Years	0.18***	0.21***	0.08**	0.05
Employed (full / half / self)	0.23***	0.37***	0.18***	0.27***
Financial Stress	-0.19***	-0.20***	-0.14***	-0.23***
Household net Income	0.20***	0.25***	0.11***	0.18***
Smoking: cigarettes per day	-0.17***	-0.24***	-0.17***	-0.13***
Sport: at least once per week	0.12***	0.20***	0.09**	0.17***
Social contacts: once / week	0.03	-0.01	0.11***	0.08*
Sleeping: 6-8h per night	0.15***	0.19***	0.09**	0.16***
Health Factors				
Overweight	-0.22***	-0.10**	-0.11***	-0.06
Prior Health: (very) good	0.27***	0.12***	0.17***	0.12***
Observations	1187	929	1187	929

Figure 10: Correlation Coefficients – All Variables
Data: Pairfam wave 7, own calculations

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4 Analysis

4.1 Are parents generally healthier than the childless?

To start the analysis, we assume that childlessness is generally associated with slightly worse health compared to having one or more children, especially for men.

A comparison of the mean health outcomes indeed indicates that parents have a slightly better physical (.62 units higher) and mental health (.67 higher) than non-parents. The differences however are not statistically significant for physical health ($t(2114)=-1.09$, $p=.28$) and for mental health ($t(499.63)=-1.07$, $p=.28$) as a t-test has shown.

Another attempt to detect health differences, was to define the parent group more precisely and look at women and men separately. Simply having a child might not equal being a 'real' parent. If parentship means being exposed to the effects that children can have, some sort of cohabitation with a child should be given. Based on these thoughts parents who have lived with at least one child in their main residence were compared to childless people – excluding 120 parents who never cohabitated with a child.
In a next attempt, parents who have lived with at least one biological child were compared to the childless people – excluding another 115 parents. This test was based on the idea that biological children might have stronger impact on their parent's health than step, foster or adopted children. Especially step and foster children tend to occur in their parent's life only some years after birth and therefore the physical and mental impacts on average might be less strong. On an overall level this test also didn't show any significant differences, and the mean values of all groups were very much the same. Figure 11 shows how slightly significant effects appear when separating mothers and fathers.

Father's mental health seems to benefit from the presence of a child, whether biological or not, in their household. However, the correlation is rather weak ($r=.081$, $p=.018$), equivalent to an average 1.7 unit increase on the mental health scale as a simple linear regression has shown ($F(1, 846)=5.6$, $p=.018$).

Parents vs. Childless	Physical Health		Mental Health	
	Women	Men	Women	Men
Parent	0.03	0.04	0.02	0.06
Parent lived w. 1+ child in main res.	0.03	0.05	0.02	0.08*
Parent lived w 1+ bio child in main r.	0.03	0.06	0.02	0.08*
Parent of 1+ child of 0-5 years	0.05	0.10*	0.01	0.04
Parent of infant up to 1 year	0.13	0.13*	0.08	0.07
Observations	1187	929	1187	929

Figure 11: Correlation Coefficients – Parents vs. Childless
Data: *Pairfam wave 7, own calculations* $^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001$

As a next step, I had a look at those with a young child of up to 5 years, and to narrow it down even more, a new-born or infant, since some literature suggested those parents were suffering from negative short time health effects. Here again, women didn't show any significant association, but men showed a significant improvement (r=.13, p=.004) on the physical health scale. All other children's age groups didn't affect health outcomes in any significant way.

Hypothesis 1 therefore had to be partly rejected. Being a parent is not enough to show any significant differences in health outcomes compared to childless individuals. Being a father cohabiting with a child appears to be associated with slightly better mental health (β=1.67, $F(1, 846)$=5.6, p=.018, R^2 = 0.007), being a father to a very young child is linked to slightly better physical health (β=2.72, $F(1, 275)$=4.38, p=.037, R^2 = 0.016), as simple linear regression models have confirmed.

To understand the causal effects behind these findings I calculated multiple regression models, including several covariables. Employment status and financial stress were the strongest predictors for mental health in the set (according to their standardised beta coefficients). Just including employment status into the model, turned the association between cohabiting with a child and fathers' mental health insignificant.
For the association between having a very young child and physical health, again including employment was the main underlying causal root, but also breastfeeding and the intensity of smoking.
All these findings point to the idea that fathers cohabiting with children lead a more stable, mental health promoting life, symbolised by low levels of unemployment; and fathers of

young children lead a more health-conscious lifestyle with their families for which breastfeeding, and less smoking are two indicators. Relationship status, however, was among the weaker predictors for fathers' health outcomes.

The physical health benefits of young children for fathers could also have to do with a rather late first birth, which will be investigated in the next section.

4.2 Do early parents generally suffer from worse health?

Comparing parents' health outcomes, I assume that having a child early in life is associated with worse scores than having the first child after the age of 22. The optimum age for the first birth should lay around age 30 for women with a non-linear relationship and a few years later for men with a linear relationship (since the maximum age in the sample is only 44).

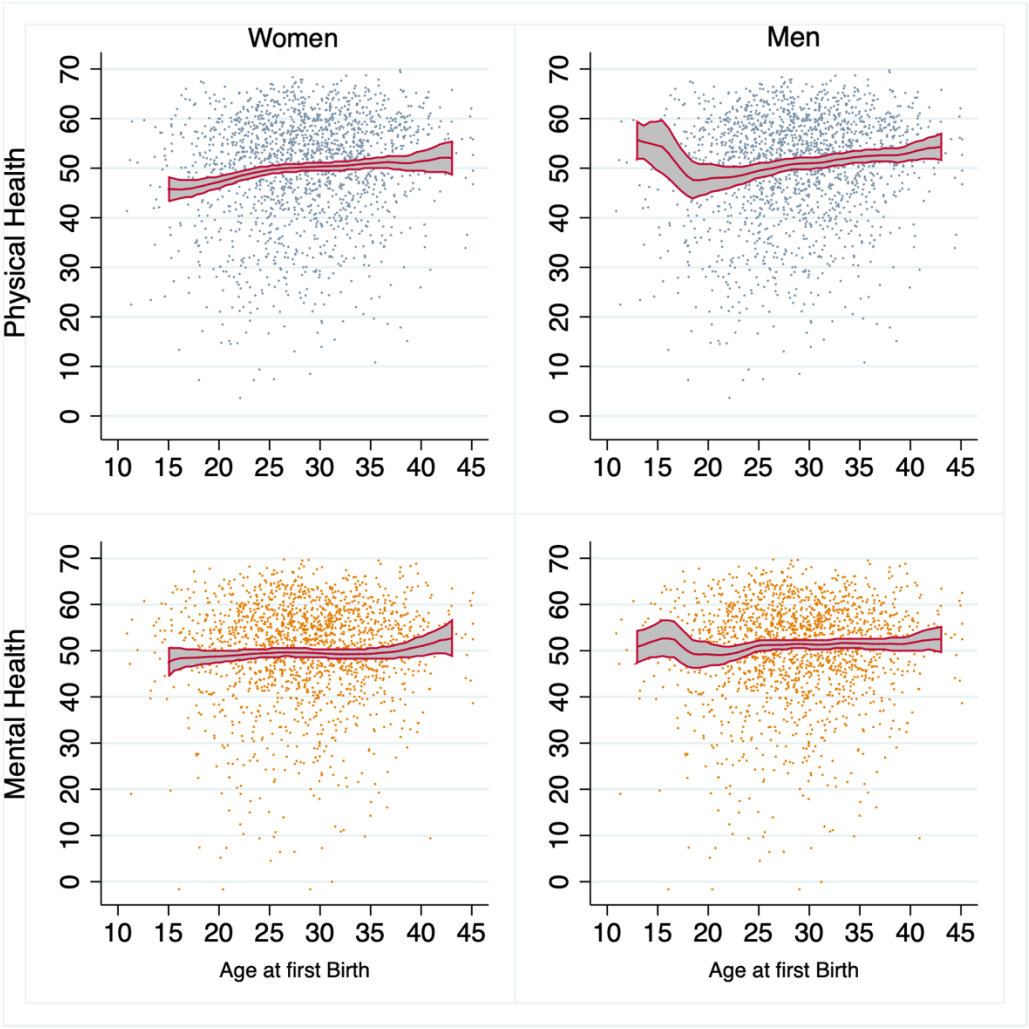

Figure 12: Scatterplots and Polyn. Line Fit (95% Confidence Interval) – Health and Age at First Birth

In figure 12 the associations between the health and age at first birth as a continuous variable are visualised for mothers and fathers separately. For mental health the fitted polynomial lines appear to be quite horizontal and indeed no significant correlation could be found in any regression model and will not be further examined.
For physical health both lines appear nearly linear, showing a slight upward trend with increasing age and wide opening confidence intervals at the ends. The case count of fathers below the age of 20 is very low (17 cases), so estimations are very uncertain here.

A simple linear regression between physical health and age at first birth as continuous variable returned an R^2 of around 2% for both women and men, so the age at first birth accounts for 2% of their health variance. Mothers' physical health score increases by .28 units with every additional year of age ($F(1, 1013)=22.29$, $p=.000$), for fathers the benefit is 0.25 units per year ($F(1, 1013)=22.29$, $p=.000$).

Regression Models with Age Groups at first Birth

To understand the relationship deeper and possibly find greater effects for early and late first birth, linear regressions using dummies for five age groups were calculated (reference group was age group 27-30, since this groups' health mean of 50.37 was closest to the overall mean of 50 on the physical health score).
In the brut model, first birth in the age group of 13-22 turned out to be significantly negatively associated with women's physical health. For the other age groups, no significant differences could be found. Therefore, I narrowed down the dummy for female early first birth to compare age group 13-22 (201 cases, mean age 20) with all other age groups at once. Early mothers showed on average of -4.2 units on the physical health scale compared to all other mothers ($R^2=.028$, $F(1, 1013)=28.92$, $p=.000$).
For fathers I comprised the first two age groups due to a lack of cases in the first group. The dummy for male early first birth now contains all fathers who had their first child up until age 26 (195 cases, mean age 23.3). These early fathers showed on average of -2.96 units on the physical health scale compared to all other fathers ($R^2=.018$, $F(1, 711)=13.24$, $p=.000$).

In hierarchical multiple regression I introduced covariables to assess the ability of early first birth to predict physical health in midlife after controlling for moderating factors. Checking the standardised beta regression coefficients of all available covariables, I

ended up with a set of variables that distinctly reduced the association of age at first birth on physical health for both genders, ultimately revealing it as insignificant. The results are summarised in Table 13.

Occupational status, financial sorrow, overweight and prior health conditions were the main factors to explain health outcomes. Striking is how men's mean physical health in Model 5 and 6 increases by more than a standard deviation on the health scale (β=10,75, p=.000) when switching from unemployed to employed. For women the health effect of employment is much weaker.

For men regular physical exercise proved to be another strong mediator, for women breastfeeding played a major role. Breastfeeding was also significant for men's physical health, so this could be a case of pseudo causality itself, moderated by yet unknown social factors.

Including all Covariables mentioned above, improved the R^{2adj} of the model from 3% to 15% for mothers, resp. from 2% to 16% for fathers but exposed the age at first birth as insignificant.

Physical Health	**Women**			**Men**		
	(1)	(2)	(3)	(4)	(5)	(6)
Early first Birth	-4,195***	-2,709***	-1,505	-2,960***	-2,078**	-1,454
Employed		3,592***	3,940***		10,75***	10,17***
Financial Stress		-3,658***	-2,071**		-3,294***	-2,818***
Sport once/week			0,541			2,611***
Overweight			-4,067***			-2,030**
Prior Health (very) good			5,455***			2,180*
Breastfed 1+ children			4,300**			2,015*
Constant	50,40***	48,44***	43,77***	51,74***	42,34***	39,90***
$R^{2\ adj}$	0,03	0,08	0,15	0,02	0,13	0,16
n	1015	995	923	713	703	689

Figure 13: Unstandardised Regression Coefficients – Physical Health and Early First Birth
Data: Pairfam wave 7, own calculations * p<0.05, ** p<0.01, *** p<0.001

As expected, having kids early in life (-22 for women, -26 for men) has mainly indirect negative effects on health, by being linked to financial bottlenecks, unemployment, obesity, and an unhealthy lifestyle. This is true for both men and women, albeit for slightly different reasons.

Searching for the optimal time frame for having a first child, I compared the physical health outcomes of the age groups who had their first child after the age of 22 resp. 26 with the 'early' parents as reference in multiple regression models (see figure 14, Models 7 and 10).

The relationship appeared to be an almost linear positive function for both genders, at least for this sample with the oldest respondents being 44 years. Late first birth parents (35 years or older) show the highest health benefits compared to the reference group of early parents. On average late mothers show a plus of 4.9 units on the health scale, late fathers around 4.2 units, which is a statistically and practically significant difference.

Physical Health	**Women**			**Men**		
	(7)	(8)	(9)	(10)	(11)	(12)
Age at first Birth: 23-26	4,042***	4,126***	2,142*			
27-30	3,752***	3,857***	1,480	2,223*	2,145*	1,127
31-34	4,622***	4,792***	1,256	2,668**	2,459*	0,769
35-43	4,944***	5,156***	1,842	4,181***	3,680***	2,134
Parity 1-4+		0,227	0,334		-0,653	-0,533
Employed			4,090***			10,09***
Financial Stress			-2,131**			-2,774**
Sport once/week			0,554			2,647***
Overweight			-4,043***			-2,057**
Prior Health (very)good			5,443***			2,102*
Breastfed 1+ children			4,209**			1,724
Constant	46,20***	45,63***	41,36***	48,78***	50,32***	39,83***
$R^{2\ adj}$	0,03	0,02	0,15	0,02	0,02	0,14
n	1015	1015	923	713	713	689

Figure 14: Unstandardised Regression Coefficients – Age Groups at First Birth
Data: Pairfam wave 7, own calculations ** p<0.05, ** p<0.01, *** p<0.001*

Since late age at first birth is correlated with smaller family size (r= -.19, p=.000 for women / r= -.29, p=.000 for men) I controlled for the number of kids as a continuous variable (models 8 and 11). This slightly increased the positive effect of late motherhood but decreased the positive effect of late fatherhood. However, parity measured in this

form is not a significant factor in the model. In the next chapter I will dive deeper into understanding the association of parity and health.

Adding the same control variables to the model as in Table 13, improved the model with an $R^{2\,adj}$ up to 15% but turned most associations between age at first birth and physical health insignificant (models 9 and 12). Financial factors moderate a good part of the relationship, especially for men. For women age group 23-26 still had a significant health advantage compared to younger first-time mothers (β=2.14, p=.022).

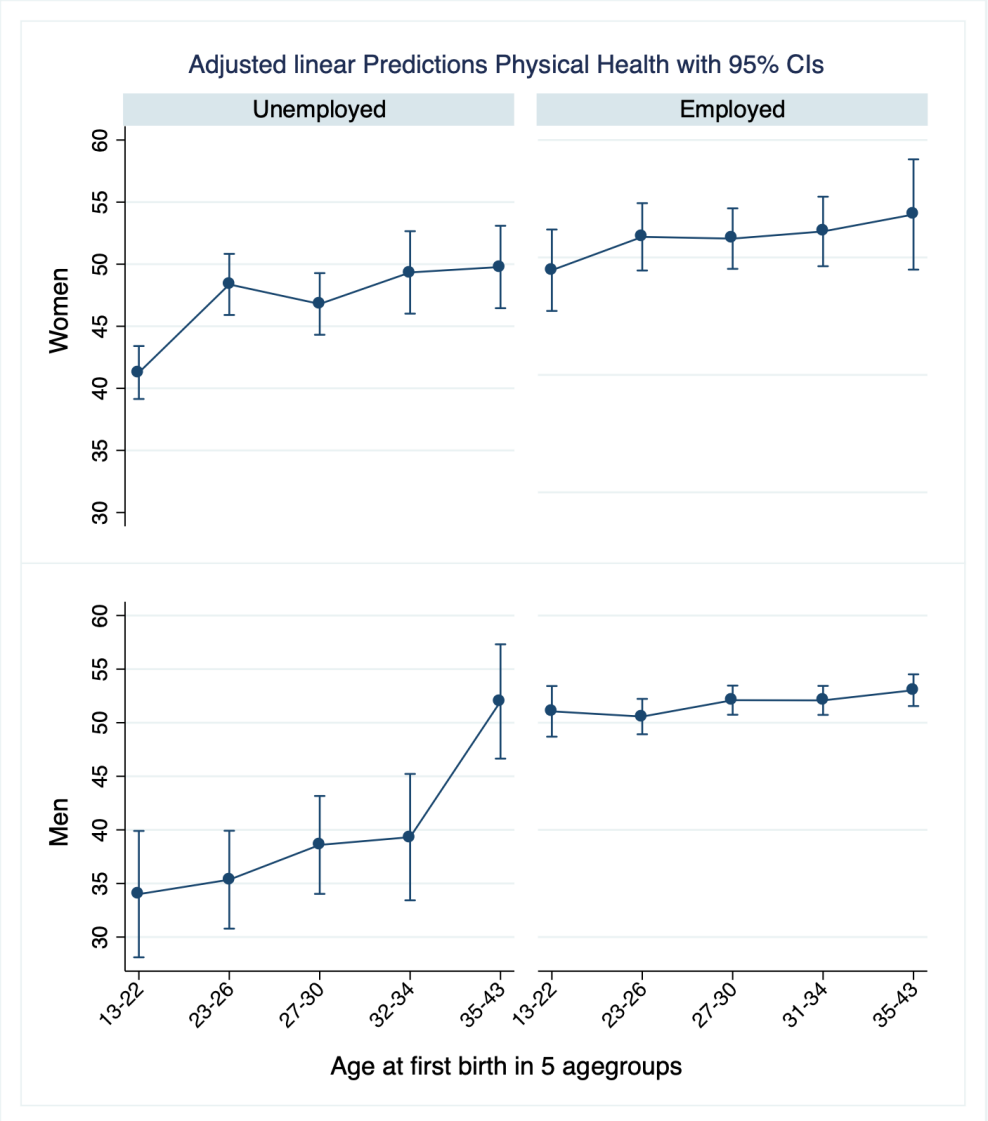

Figure 15: Conditional-Effects-Plots – Physical Health over Age at First Birth, Employment and Sex

Figure 15 visualises the interaction effect of age at first birth and employment status on mothers' and fathers' physical health. For both women and men, the worst health

outcomes were found for those who had an early first birth and stated to be unemployed at the time of the interview. For women delaying the first birth is associated with ever slightly improving health for unemployed and employed mothers in a similar way.
For men occupational status makes a significant difference on how age at first birth is related to health: delaying first birth has quite a positive health effect when being unemployed but does not play a role when having a stable job.
Hypothesis 2 can be confirmed, early first birth is associated with worse physical health for mothers and fathers, mostly moderated through economic and lifestyle. After all, there could be an optimal age for having the first child; I was not able to determine it though, since it seems to depend on a lot of other factors.

4.3 What is the optimal number of children?

We suppose that, among parents, having 1 or 4+ children is associated with worse physical and mental health outcomes compared to having 2 or 3 children (inverted U-shape). Having no children should be associated with worst health.

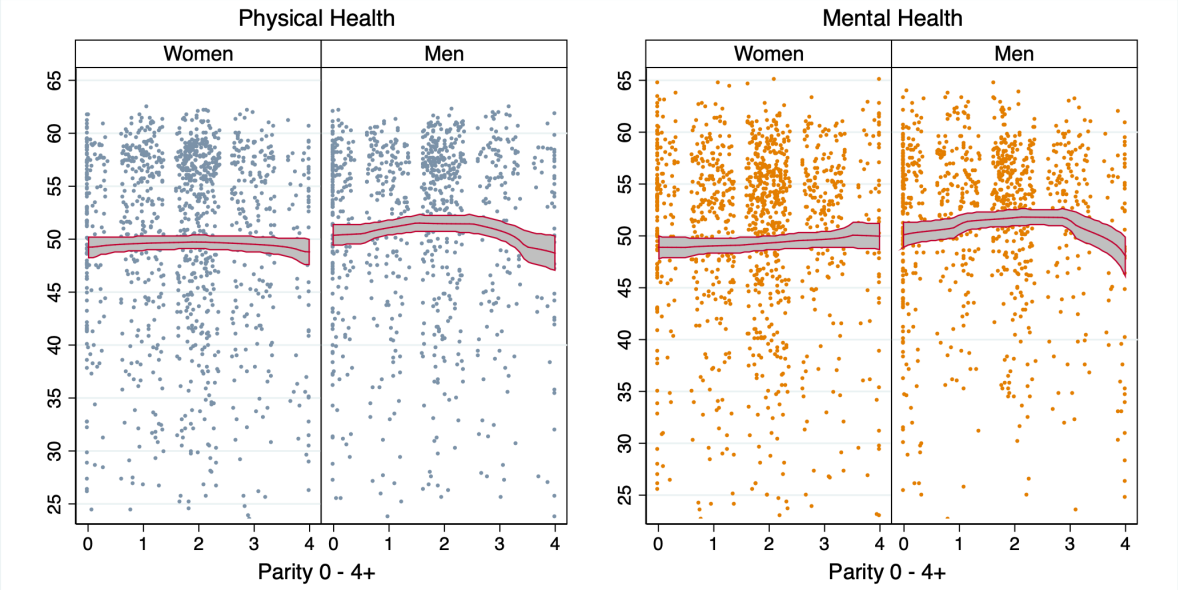

Figure 16: Scatterplots and Polynomial Line Fit (95% Confidence Interval) – Health and Parity

Looking at the scatterplots in figure 16, hypothesis 3 could be right for men. For women the association is much flattened, basically horizontal in the case of physical health and slightly positively linear in the case of mental health.

Since most relationships between parity and heath are supposedly non-linear and the predictor 'number of kids' is not an interval scale, as long as it includes zero for 'childless', I am working with dummy variables for the parity groups, using the group of 'having two children' as reference. Figure 17 shows the regression coefficients of four regression models to check whether parity is somewhat linked to the SF12v2 health score.

The result show no significant relation with women's health, neither physical nor mental (models 13 and 15), which is somewhat surprising, because significant health disadvantages were found for childless men and high parity fathers (models 14 and 16) when compared to fathers of two. Men's physical health is about the same for fathers of 1, 2, or 3 children, but drops by 1.7 (p=.041) units on the health scale for childless men and by 5.3 (p=.000) units for fathers of 4+, which is quite a significant difference. For men's mental health the results are similar.

Having 1-3 children seems to be optimum parity – at least for men. However, parity can only account for 1 to 2 % of the health variance of men and for women it has no explanatory power whatsoever.

	Physical Health		**Mental Health**	
	Women	**Men**	**Women**	**Men**
Parity	(13)	(14)	(15)	(16)
0 Children	-1,107	-1,745*	-0,319	-1,874*
1 Child	-0,213	-0,847	-0,38	-0,755
3 Children	-0,514	-1,374	1,022	-0,124
4+ Children	-2,296	-5,260***	0,204	-5,308***
Constant	49,87***	51,82***	49,25***	51,83***
$R^{2\ adj}$	0	0,01	0	0,02
n	1187	929	1187	929

Figure 17: Unstandardised Regression Coefficients – Parity Groups
Data: Pairfam wave 7, own calculations * $p<0.05$, ** $p<0.01$, *** $p<0.001$

The causalities behind these numbers for men were explored by gradually adding sets of covariables into a hierarchical regression model (figure 18).

After controlling for employment status and financial stress, the associations between parity and physical health (14b), as well as between childlessness and mental health (17)

disappeared. Whereas the association high parity - mental health proofed to be robust. After adding financial factors (17), lifestyle factors (18), and prior health (19) it still showed a significant disadvantage of -2.83 (p=.027) health scale units compared to fathers of two. Only after holding relationship status and education years constant, the association became insignificant, even though both control variables did not show significant relationships with men's mental health themselves.

Men only	**Physical Health**		**Mental Health**				
Parity	(14)	(14b)	(16)	(17)	(18)	(19)	(20)
0 Children	-1,745*	-0,416	-1,874*	-0,791	-0,686	-0,473	-0,442
1 Child	-0,847	-0,0203	-0,755	-0,0316	0,191	0,145	-0,126
3 Children	-1,374	-0,724	-0,124	0,519	0,626	0,576	0,441
4+ Children	-5,260***	-2,293	-5,308***	-3,172*	-2,959*	-2,829*	-2,358
Employed		10,86***		7,038***	6,449***	6,266***	5,666***
Fin. Stress		-3,376***		-4,135***	-3,666***	-3,624***	-3,843***
Sport 1/week					1,844**	1,905**	2,011***
Sleep 6-8h					2,669**	2,535**	2,238**
Prior Health						2,023*	2,253**
Married/Coh.							0,467
Educ. Years							-0,156
Constant	51,82***	42,00***	51,83***	45,70***	42,95***	41,44***	43,98***
$R^{2\ adj}$	0,01	0,15	0,02	0,11	0,13	0,13	0,13
n	929	916	929	916	912	906	891

Figure 18: Unstandardised Regression Coefficients – Age Groups at First Birth and Covariables
Data: Pairfam wave 7, own calculations ** p<0.05, ** p<0.01, *** p<0.001*

Looking at the strongest mental health predictor 'employment status' and its interaction with parity (figure 19), it becomes clear how it can shape the relationship between parity and well-being for men: For unemployed men, mean mental health is generally below average and tends to drop further with high parity. This could have to do with increased financial pressures. For individuals who have a stable job the differences that family size makes are much less pronounced.

Hypothesis 3 can be confirmed insofar as nulliparity, and much more so high parity is associated with worse physical and mental health results for men, especially under adverse socio economic circumstances.

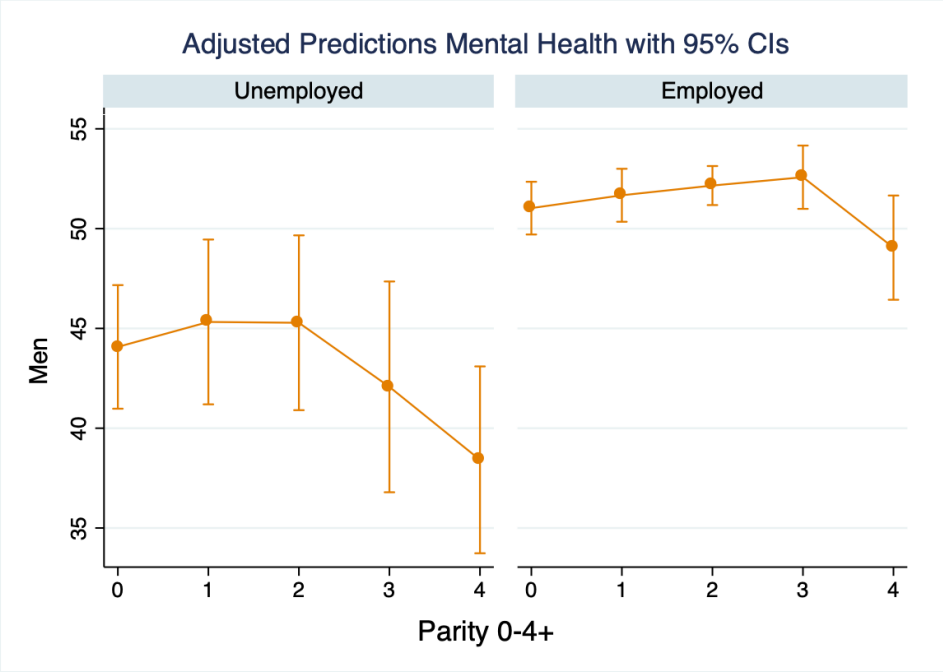

Figure 19 Conditional-Effects-Plots – Mental Health over Parity and Employment for Men

Cohabiting Years as a measure of Parity?

In a last attempt to identify fertility effects for women's health, an alternate predictor was tested: 'Cohabiting Years' summarises all the years that a parent has spent with every single one of their children in the same household. It was tested against the 'Number of Children' continuous variable (without the childless), assuming that both predictors had somewhat of a negative linear correlation with health outcomes.

	Physical Health				Mental Health			
Parity	Women		Men		Women		Men	
	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
Children 1-4	-0,44		-1,056*		0,451		-0,825*	
Cohab-Years		-0,053**		-0,0253		0,0185		-0,0083
Constant	50,5***	51,1***	53,1***	51,5***	48,4***	48,8***	52,9***	51,4***
R^2	0	0,01	0,01	0	0	0	0,01	0
n	1022	1022	721	721	1022	1022	721	721

Figure 20: Unstandardised Regression Coefficients – Parity vs. Cohabiting Years
Data: Pairfam wave 7, own calculations ** p<0.05, ** p<0.01, *** p<0.001*

The scale ‘number of children’, again, was only significant for fathers’ health. ‘Sum of Cohabiting Years’ was able to detect significant differences solely in mothers’ health when regressed over physical health (22). It would be interesting to understand how cohabiting years and the simple number of children affect the genders differently. The effect size of cohabiting-years was practically insignificant though (β= -.05, F(1, 1020)=7.8, p=.005), and therefore not further explored.

5 Summary and Discussion

This paper aimed to reproduce international findings on fertility patterns and midlife health outcomes for Germany. I haven’t found a general health benefit for parents. But for fathers cohabiting with a child, I detected some mental health advantage, for fathers of young children some physical health advantages. These associations disappeared after adding employment status and lifestyle factors to the model, suggesting that men mainly benefit from a stable healthy lifestyle.

Also, both sexes seemed to physically benefit from delaying first birth. When adding socio economic and healthy lifestyle factors to the model it turns out later first birth is probably not directly affecting health but is rather part of a more organised and conscious lifestyle which in general is health promoting.

High parity didn’t bring health differences for women, but quite significant negative differences for men, notably for unemployed men’s mental health.

Looking at these findings it becomes clear how contradictory the association of fertility and health is. On the one hand children are a symbol for a ‘good’ life, on the other hand they are a symptom of a life out of control – depending on timing and economic circumstances. And men’s health reaction to fertility is possibly more sensitive to economic factors, like having an employment or having financial sorrow, than women’s.

These results are just a snapshot in the life of middle-aged men and women. Effects probably vary across the life course, and it would be worthwhile looking at the panel again a few years later. In further analysis it would be also interesting to investigate more interaction effects with variables that I was not able to further explore within this project (relationship-status, parent-stress, social support etc.).

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7 Attachment

SF-12v2 variables list, as asked in wave 7

General Health (question 381 | variable hlt1)
How would you describe your health status in the past 4 weeks?

- 1 Bad
- 2 Not so good
- 3 Satisfactory
- 4 Good
- 5 Very good
- -1 Don't know
- -2 No answer

Vitality (question 132 | variable per4i4)
Have you been feeling full of energy, for the most part, during the past four weeks?

- 1 Not at all
- 2
- 3
- 4 Absolutely
- -1 Don't know
- -2 No answer

Social Functioning (question 384 | variable hlt17i7)
During the last four weeks, how often did you feel that due to physical or mental health problems you were limited socially, that is, in contact with friends, acquaintances, or relatives?

- 1 Almost never 1=4
- 2 Sometimes 2=3
- 3 Often 3=2
- 4 Almost always 4=1
- -1 Don't know
- -2 No answer

Physical Pain (question 384 | variable hlt17i2) → inverted
During the last four weeks, how often did you have severe physical pain?
When answering, please refer to the past four weeks. During this time, how often did you have severe physical pain?

- 1 Almost never 1=4
- 2 Sometimes 2=3
- 3 Often 3=2
- 4 Almost always 4=1
- -1 Don't know
- -2 No answer

Physical Functioning 1 (question 382 | variable hlt15)
When you have to climb several flights of stairs on foot, does your health limit you greatly, somewhat, or not at all?

- 1 Greatly
- 2 Somewhat
- 3 Not at all
- -1 Don't know
- -2 No answer

Physical Functioning 2 (question 383 | variable hlt16)
And what about other demanding everyday activities, such as when you have to lift something heavy or do something requiring physical mobility: Does your health limit you greatly, somewhat, or not at all?

- 1 Greatly
- 2 Somewhat
- 3 Not at all

- -1 Don't know
- -2 No answer

Role Problems, Physical 1 (question 384 | variable hlt17i3) → inverted
During the last four weeks, how often did you feel that due to physical health problems you achieved less than you wanted to at work or in everyday activities?

- 1 Almost never 1=4
- 2 Sometimes 2=3
- 3 Often 3=2
- 4 Almost always 4=1
- -1 Don't know
- -2 No answer

Role Problems, Physical 2 (question 384 | variable hlt17i4) inverted
During the last four weeks, how often did you feel that due to physical health problems you were limited in some way at work or in everyday activities?

- 1 Almost never 1=4
- 2 Sometimes 2=3
- 3 Often 3=2
- 4 Almost always 4=1
- -1 Don't know
- -2 No answer

Mental Health 1 (question 384 | variable hlt17i1) → inverted
During the last four weeks, how often did you feel down and gloomy?

- 1 Almost never 1=4
- 2 Sometimes 2=3
- 3 Often 3=2
- 4 Almost always 4=1
- -1 Don't know
- -2 No answer

Mental Health 2 (question 133 | variable per2i9) → mh2
In the following list you see a number of statements that people can use to describe themselves. Please read each statement and indicate from among the four answers the one that corresponds to the way you feel in general: "I am calm and composed"

- 1 Almost never
- 2 Sometimes
- 3 Often
- 4 Almost always
- -1 Don't know
- -2 No answer

Role Problems, Mental 1 (question 384 | variable hlt17i5) → inverted
During the last four weeks, how often did you feel that due to mental health or emotional problems you achieved less than you wanted to at work or in everyday activities?

- 1 Almost never 1=4
- 2 Sometimes 2=3
- 3 Often 3=2
- 4 Almost always 4=1
- -1 Don't know
- -2 No answer

Role Problems, Mental 2 (question 384 | variable hlt17i6) → inverted
During the last four weeks, how often did you feel that due to mental health or emotional problems you carried out your work or everyday tasks less thoroughly than usual?

- 1 Almost never 1=4
- 2 Sometimes 2=3
- 3 Often 3=2
- 4 Almost always 4=1
- -1 Don't know
- -2 No answer

Eidesstattliche Erklärung*
der Studierenden

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Hiermit versichere ich, dass ich die vorliegende Arbeit mit dem Titel

"Examining the Relationship between
Fertility Patterns and Midlife Health in Germany"

selbstständig verfasst habe, dass ich keine anderen Quellen und Hilfsmittel als die angegebenen benutzt habe und dass ich die Stellen der Arbeit, die ich anderen Werken – auch elektronischen Medien – dem Wortlaut oder Sinn nach entnommen habe, in jedem Fall unter Angabe der Quelle als Entlehnung kenntlich gemacht habe.

Berlin, 31.03.2022 Lisa-M. Keck

(Ort, Datum, Unterschrift)

* Diese Erklärung ist der eigenständig erstellten Arbeit als Anhang beizufügen. Arbeiten ohne diese Erklärung werden nicht angenommen. Auf die strafrechtliche Relevanz einer falschen eidesstattlichen Erklärung wird hiermit hingewiesen.