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## Unintended health consequences of Swedish parental leave policy (ParLeHealth): Protocol for a quasi-experimental study

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# Unintended health consequences of Swedish parental leave policy (ParLeHealth): Protocol for a quasi-experimental study

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## ABSTRACT

**Introduction:** Sweden has long been praised for a generous parental leave policy oriented towards facilitating a gender-equitable approach to work and parenting. Yet certain aspects of Swedish parental leave could also be responsible for the maintenance of (or even the increase in) health inequalities. Using a 'Health in All Policies' lens, this research project aims to assess the unintended health consequences of various components of Sweden's parental leave policy, including eligibility for and uptake of earnings-based benefits.

**Methods and analysis:** We will utilise individual-level data from multiple Swedish registers. Sociodemographic information, including on parental leave use, will be retrieved from the Total Population Register, Longitudinal Integration Database for Health Insurance and Labour Market Studies, and Social Insurance Agency Registers. Health information for parents and children will be retrieved from the Patient, Prescribed Drug, Cause of Death, Medical Birth and Children's Health Registers. We will evaluate parents' mental, mothers' reproductive and children's general health outcomes in relation to several policy reforms aiming to protect parental leave benefits in short birth spacing (the *speed premium*) and to promote father's uptake (the *Father's quota*) and sharing of parental leave days (the *Double days* reform). We will also examine effects of increases in basic parental leave benefit levels. Using quasi-experimental designs, we will compare health outcomes across these reforms and eligibility thresholds with interrupted time series, difference-in-difference, and regression discontinuity approaches to reduce the risk of health selection and assess causality in the link between parental leave use and health.

**Ethics and dissemination:** This project has been granted all necessary ethical permissions from the Stockholm Regional Ethical Review Board (Dnr 2019-04913) for accessing and analysing de-identified data. The final outputs will primarily be disseminated as scientific articles published in open-access, high-impact peer-reviewed international journals, as well as press releases and policy briefs.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- This will be the first project to evaluate multiple aspects of Swedish parental leave policy by adopting a health equity perspective and Health in All Policies (HiAP) approach.
- The study will utilise quasi-experimental methods on total population register data to assess causal links between parental leave uptake and health.
- The study will expand on existing evidence of health effects by considering outcomes not only for mothers and children, but fathers as well.
- Analyses will be restricted to studying health outcomes that are available within administrative datasets, thereby precluding assessment of potentially more sensitive self-reported assessments of health.

## INTRODUCTION

Childbearing is a life event with significant social and health implications for parents, children and society alike. Among women, childbearing has been considered to be responsible for lower labour market participation and gendered wage gaps (i.e., the ‘motherhood penalty’),<sup>1</sup> resulting in lower income protection in old age.<sup>1-3</sup> Childbearing is also a risk factor for various physical and mental health conditions among mothers.<sup>4</sup> By offering secure time off work for childcare and recovery, parental leave has the potential to reduce social and health inequalities in society. However, given that parental leave eligibility and uptake may vary across social strata, it may also have the potential to (re)produce social inequalities in health.

### *1. The Swedish parental leave system*

We report intervention details according to the TIDieR-PHP reporting guidelines.<sup>5</sup>

#### *1.1 Length and flexibility of parental leave*

Sweden has developed into one of the most generous and flexible paid parental leave systems worldwide.<sup>6</sup> Starting in 1974, parents were entitled to six months of leave to be used within 270 days of birth and shared by the parents as they desired. An additional nine months of leave were introduced incrementally from 1975 to 1989,<sup>6,7</sup> with an extension to use a portion of the leave until the child turned eight years old in 1978. In 1995, one month of the existing length of leave was reserved for each parent, which was further extended by one month each in 2002 and 2016.<sup>8,9</sup> Since 2014, couples have been entitled to use 480 parental leave days up until the child turns 12 years old, but with no more than 96 days from the child’s fourth birthday.<sup>7</sup>

We will focus on mothers’ and fathers’ *paid parental leave* (i.e., job-protected leave paid at set benefit levels) rather than *unpaid parental leave* (i.e., job-protected unpaid leave in the first 18 months after birth). Furthermore, we do not examine *maternity leave* (i.e., two weeks of mandatory job-protected leave for the mother prior to or after childbirth, which can be unpaid

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3 or paid as standard parental leave days), *temporary leave*, including at birth/adoption (formerly  
4 *paternity leave*; i.e., up to ten days of separate paid, job-protected leave for partners to attend  
5 the delivery or assist the mother with infant care), or leave for the care of sick children.<sup>6,7</sup>  
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### 10 *1.2 Parental leave eligibility and compensation*

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13 In Sweden, all legally residing parents are eligible to receive parental leave benefits (i.e., job-  
14 protected leave), including biological parents as well as individuals with child custody.<sup>10</sup>  
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16 Individuals must apply for these benefits through the Social Insurance Agency, the  
17 governmental authority that decides on and administers insurance and contributions to families  
18 and children in Sweden.<sup>11</sup> The benefits are split into general flat-rate or earnings-based benefits,  
19 collectively referred to as ‘parental benefits’ and applied to 390 out of the total 480 days, while  
20 the remaining 90 days are paid at a second flat rate, henceforth referred to as ‘guarantee days’.<sup>7</sup>  
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30 To be eligible for earnings-based parental benefits, an individual must have been employed for  
31 at least 240 consecutive days prior to the estimated delivery date with a minimum annual  
32 income (82,100 Swedish kronor (SEK) in 2020). Although the remuneration level has varied  
33 over time, individuals today receive approximately 80% of their salary up to a certain ceiling  
34 (1,006 SEK per day in 2020) from the Social Insurance Agency, with potential top-ups from  
35 the employer.<sup>12</sup> If an individual has an income below a certain level (117,590 SEK in 2020)  
36 during the 240 days before childbirth, they are only entitled to a general flat-rate benefit (250  
37 SEK per day in 2020) for the first 180 days which they claim for the child. After 180 claimed  
38 days, parents can receive benefits based on their current earnings.<sup>7</sup> Finally, if an individual has  
39 no income or an annual income below the stipulated level throughout the leave period they will  
40 receive the general flat-rate benefit for the full 390 days. However, if an individual is sick, a  
41 student, or unemployed but a ‘job seeker’, they can receive parental leave benefits based on  
42 their prior income if they have registered with the Public Employment Service.<sup>10</sup> Regardless of  
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3 employment history, the final 90 days are always paid at a minimum guaranteed level, paid at  
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5 60 SEK starting in 1987, and 180 SEK since 2006.<sup>7</sup>  
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## 8 9 *1.2 Policy reforms*

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11 The Swedish parental leave system has undergone several reforms over the past half-century.  
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13 We define a ‘policy reform’ as any change implemented at a specific time that could impact  
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15 either uptake or sharing of parental leave, as well as eligibility for earnings-based benefits. To  
16  
17 evaluate the unforeseen health consequences of the parental leave policy – i.e., a welfare policy  
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19 that *does not* primarily target health – we will concentrate on reforms that have either been  
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21 shown to accomplish their primary aim (i.e., the *speed premium*, *Father’s quota*, and *Double*  
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23 *days* reforms) or with undoubtedly significant, albeit unintended, impacts (i.e., the doubled  
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25 value of general flat-rate benefits).  
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31 *Doubled flat-rate benefits:* Although not explicitly a reform, the doubling of the general flat-  
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33 rate benefits from 60 SEK per day (from 1987) to 120 SEK per day (in 2002) aimed to secure  
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35 the economic welfare of low-income families.  
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39 *Speed premium:* Since earnings-related parental leave benefits are estimated based on one’s  
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41 salary prior to childbearing (at approximately 80% of the salary), parents having children in  
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43 quick succession may choose to temporarily reduce their working hours or be unable to return  
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45 to work at all, and will thus have lower benefits for their second and subsequent births. In 1980,  
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47 a supplement (commonly referred to as the “speed premium”) was introduced to safeguard  
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49 women’s income between parental leave periods, ensuring that for births with up to 24 months’  
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51 spacing,<sup>13</sup> and then up to 30 months’ spacing (following a 1986 expansion),<sup>14</sup> all earnings-  
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53 based benefits could be based on the parents’ salaries prior to the birth of their previous child,  
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55 if higher than their current income. An evaluation of the 1986 “speed premium” expansion  
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3 revealed that an increased proportion of Swedish-born parents had children in short succession;  
4 therefore it has been called the speed premium, even if this was an unintended consequence.<sup>14</sup>  
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9 *Father's quota*: Fathers have been eligible to use parental leave since 1974, when parents could  
10 choose to divide parental leave days between themselves as they saw fit. However, most  
11 fathers' days were transferred to and claimed by mothers, with an average use of 320 days in  
12 1994, reinforcing mothers' "double burden" of childcare and work. In response, a *Father's*  
13 *quota* reform was implemented in 1995, reserving a month of leave exclusively for the father,  
14 to be forfeited completely if left unused (similarly, a 30-day reserve was allocated to the  
15 mother, i.e., a *Mother's quota*). It succeeded in increasing the proportion of fathers using  
16 parental leave from 43% to 75%.<sup>15</sup> The *quota* was expanded to two and three months in 2002  
17 and 2016, respectively, but with smaller impacts on uptake.<sup>6</sup>  
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31 *Double days*: In 2012, 30 days of existing parental leave were designated as 'shareable', i.e.,  
32 could be used simultaneously by both parents within the child's first year of life. By granting  
33 flexibility to the couple in their leave use, this "Double days" reform aimed to facilitate the  
34 transfer of care from one parent to another. In fact, the reform significantly increased the  
35 proportion and number of father's leave days used in the first half-year after childbirth.<sup>16</sup>  
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43 All reforms were implemented nationally on January 1<sup>st</sup> of the indicated year.  
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## 46 **2. Unintended health consequences of the Swedish parental leave system**

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50 Despite the relative generosity of the Swedish parental leave system and its efforts to promote  
51 gender equity, some aspects could be responsible for the maintenance or increase in social and  
52 health inequities. For example, the strong work-eligibility requirement for earnings-based  
53 parental leave benefits may exclude groups with less stability in the labour market, such as  
54 students and migrants, from benefits equal to those enjoyed by persons with stable incomes.<sup>17</sup>  
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3 Inequities in the work-eligibility requirement can emerge in various ways, either by restricting  
4 the parental leave benefits scheme to the securely employed and coincidentally excluding  
5 parents with ill health (i.e., *health selection*), or by creating health inequities through the  
6 unequal distribution of benefits (i.e., *social causation*). For example, individuals with long-  
7 term illness may be more likely to have a weak labour market attachment, which in turn can  
8 exclude them from earnings-related parental leave benefits, thus further increasing  
9 socioeconomic inequities. Based on this, we expect that the *doubled flat-rate benefits* could  
10 increase the uptake among lower income families or decrease the economic trade-off of using  
11 parental leave among lower income families, thus having potential psychosocial benefits.  
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26 Parental leave policies might impact health differently following certain policy reforms. For  
27 example, the *speed premium* supplement introduced to secure earnings-based parental leave  
28 benefits to parents who have children in quick succession essentially incentivises short birth  
29 spacing.<sup>14</sup> This might lead to increased psychosocial stress and adverse reproductive outcomes  
30 among women who become pregnant whilst simultaneously rearing an infant or toddler. Short  
31 birth intervals (defined as consecutive births within 33 months, assuming nine months of  
32 gestation)<sup>18</sup> have been associated with nutrition depletion, as the mother might not have enough  
33 time between births to recover her nutritional reserves,<sup>14</sup> and higher risks of weight gain and  
34 obesity throughout life.<sup>15</sup> In turn, these issues are risk factors for adverse outcomes in  
35 subsequent children, including low birthweight, preterm birth and perinatal death.<sup>19</sup>  
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51 The *Father's quota* was implemented to promote a gender-equitable work-life balance and  
52 shared parenting. However, the health consequences of the *Father's quota* have been debated,  
53 with a lack of empirical evidence on its differing mechanisms. Studies have shown a positive  
54 association between the father's parental leave use and healthy behaviours, including decreased  
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3 alcohol use and increased physical activity,<sup>20,21</sup> as well as decreased mortality risks.<sup>22</sup>  
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5 Nonetheless, there may be situations in which fathers' leave use is less optimal for or even  
6 unfavourable for the family. The quota may have encouraged mothers to return to work sooner,  
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8 potentially interrupting their physical and psychological recovery from pregnancy and  
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10 childbirth. These potential adverse effects among parents could extend to the child: shorter  
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12 maternity leave in the child's first months could shorten breastfeeding, a risk factor for  
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14 childhood obesity<sup>23</sup> and respiratory track infectious in the first two years of life.<sup>24</sup> However,  
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16 there is a lack of evidence on changes in mothers' labour supply following the reform,<sup>25,26</sup>  
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18 suggesting that mothers may have stayed at home with fathers on an unpaid basis, foregoing  
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20 their income and thus potentially creating psychological strain, especially among low-income  
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22 parents.  
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31 Given that parental leave in Sweden is longer than in most other contexts, it can be argued that  
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33 any health effect of shortened parental leave among mothers with the introduction of the  
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35 *Father's quota* would be negligible. However, adverse effects may become apparent in specific  
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37 sub-populations, including for couples only entitled to flat-rate benefits (that may therefore  
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39 need to return to work early), as well as individuals with job insecurity or who are self-  
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41 employed. Identifying adverse health effects in population sub-groups will not only shed light  
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43 on the differential impacts of parental leave reforms within a population but will have  
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45 implications for policy transferability in international contexts where parental leave is generally  
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47 shorter and discussions on reserved days for the father are ongoing.  
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54 The adverse unintended consequences of the reserved days for the mother could to some extent  
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56 be compensated for by the introduction of the subsequent *Double days* reform, which allowed  
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58 parents to use a month of parental leave days *simultaneously* in the crucial first year after birth.  
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3 In fact, this reform has been shown to have beneficial psychiatric effects for mothers by  
4 allowing fathers to participate in childcare as their partners recover from pregnancy and  
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8 childbirth.<sup>16</sup>  
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### 10 11 12 13 **3. Theoretical framework** 14

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16 This project is rooted in the Health in All Policies (HiAP) framework, which advocates for  
17 considering the health implications of policies across all sectors.<sup>27</sup> The HiAP approach will  
18 help to shed light on the health consequences of a family policy that does not target health, but  
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22 could have considerable health impacts in society. This approach also highlights how  
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25 advantages derived from parental leave uptake can be restricted for individuals with poor  
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28 health, due to the specific work-related requirements for earnings-based benefits. Therefore, in  
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31 this project health is considered in the sociological perspective of ‘unanticipated (or  
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34 unintended) consequences of social actions’,<sup>28</sup> according to which policies and interventions  
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37 can have latent functional or dysfunctional effects that were not planned or anticipated by  
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40 relevant actors.<sup>29</sup> This unexpected dimension reveals the complexity of organised social  
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43 actions, calling for the investigation of well-intentioned interventions to identify non-linear  
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46 mechanisms through which such consequences arise (see **Figure 1**). Within this framework,  
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49 the persistence of (or increase in) health inequalities associated with parental leave policy can  
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52 be seen as an adverse side effect to be identified and addressed through policy reform.<sup>30</sup>  
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### 54 55 56 57 **4. Aim/objectives and research questions** 58

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60 The aim of this project is to evaluate the consequences of parental leave policy in Sweden from  
a health equity perspective. More specifically, the project will cover the following research  
questions (RQ):

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3 RQ#1. Is eligibility for earnings-based parental leave benefits associated with parents' mental  
4 health?  
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8 RQ#2. Is short birth spacing in relation to the *speed premium supplement reform* associated  
9 with health problems in the subsequent pregnancy of the mother (early pregnancy obesity) and  
10 the subsequent child (low birthweight, preterm and small-for-gestational age)?  
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14 RQ#3. Does the introduction and expansion of the *Father's quota* reserve days influence the  
15 mental health of parents after the birth of their child?  
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19 RQ#4. Does the introduction of simultaneous parental leave use through the *Double days*  
20 reform influence parents' mental health?  
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24 RQ#5: Does the introduction of the *Father's quota* and *Double days* reforms influence  
25 children's health (episodes of respiratory tract infections, childhood obesity) or health-related  
26 outcomes (duration of breastfeeding)?  
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## 31 32 **METHODS AND ANALYSIS**

### 33 34 **Study population**

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36 We will include all Swedish- and foreign-born individuals registered in Sweden between 1973  
37 and 2019 and their Swedish-born children, followed through their first five years of life. For  
38 most studies, we will focus on a subsample consisting of all women (and their partners) residing  
39 in Sweden who had their first birth between 1973 and 2019.  
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49 Studies will be primarily focused on primiparous couples, with secondary analyses for  
50 multiparous couples. We will only include biological parents, since we aim to examine joint  
51 biological and psychosocial consequences of parental leave uptake, with singleton children,  
52 given that parents of multiple births are entitled to more days of leave.<sup>6</sup> Separate analyses by  
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3 parents' sociodemographic characteristics, nativity, and cohabitation status will be conducted  
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5 to investigate the heterogeneity of effects in the population.  
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## 8 9 **Data**

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11 This project will use data from available national registers, collected and linked by the Swedish  
12 authorities. Using a unique personal identity number,<sup>31</sup> we will identify and reconstruct  
13 families in the study population through the Total Population Register (TPR; 1968-)<sup>32</sup> and the  
14 Multigenerational Register (MGR; 2001-).<sup>33</sup> Sociodemographic information will be retrieved  
15 from the TPR, the Longitudinal Integration Database for Health Insurance and Labour Market  
16 Studies (LISA; 1990-),<sup>34</sup> the Swedish Social Insurance Agency Database (SIAD; 1955-) and  
17 the 1985 and 1990 Population and Housing Censuses. We will link health information from  
18 the National Patient Register (NPR), on inpatient (IPR; 1964-)<sup>35</sup> and outpatient care (IPR;  
19 2001-); and the Medical Birth (MBR; 1973-),<sup>36</sup> Cause of Death (1952-)<sup>37</sup> and Prescribed Drug  
20 (2005-) Registers.<sup>38</sup> We also plan to include information from the Swedish Children's Health  
21 Centers (CHC; 1993-), with full coverage of longitudinal childhood obesity and breastfeeding  
22 data from the countries of Uppsala and Örebro (see **Figure 2**).  
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## 44 **Outcomes**

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46 Child health outcomes include low birthweight (<2,500 grams, irrespective of gestational age),  
47 preterm birth (<37 gestational weeks), and a small-for-gestational age measure (<10<sup>th</sup>  
48 percentile of birthweight for each gestational age, based on sex-specific Swedish reference  
49 curve for normal foetal growth)<sup>39</sup> from the MBR; hospitalisation episodes of respiratory tract  
50 infections during the first two years of life (International Classification of Diseases-10 [ICD-  
51 10] Codes J20.5, J21.0, J21.9, J20.9, J18.9, J12.9 and J22.9) from the NPR; and duration of  
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3 partial or exclusive breastfeeding (at months 2, 4, 6, 9 and 12) as well as childhood obesity  
4 (body mass index [BMI; weight in kilograms/height in meters<sup>2</sup>] using age- and sex-specific  
5 cut-offs for children's overweight and obesity<sup>40,41</sup> at 18 months and 3, 4 and 5 years old) from  
6 the CHR. Maternal health outcomes include maternal early pregnancy overweight (BMI 25-  
7 29.9 kg/m<sup>2</sup>) and obesity (BMI 30-39.9 kg/m<sup>2</sup>).<sup>42</sup>  
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17 Mental health outcomes will be assessed for both parents using count data on purchases of  
18 prescription anxiolytic and antidepressant medications (Anatomical Therapeutic Classification  
19 or ATC Codes N05B and N06A, respectively) and hospitalisations with a primary diagnosis of  
20 mental and behavioural disorders (until 1997, ICD-9 Codes 290-319; thereafter, ICD-10 Codes  
21 F00-F99), from childbirth to 18 and 36 months after birth.  
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31 Outcomes will be expressed as prevalence or rates, given availability of follow-up time.  
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### 35 **Covariates**

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37 Annual information on parental leave uptake (number of days) for each parent will also be  
38 available from LISA. Specific information on parental leave eligibility and uptake (including  
39 length of paid and unpaid leave) will be retrieved from the SIAD.  
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47 Demographic characteristics will include parents' age at childbirth, country of birth (i.e.,  
48 Swedish vs. other and specific origins), and marital and cohabitation status, from the TPR and  
49 LISA. Sociodemographic characteristics including educational attainment, household  
50 disposable income, individual labour income, employment status and receipt of sick leave  
51 benefits will be drawn from LISA.  
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### 58 **Study design and statistical analysis**

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3 A variety of advanced designs and statistical methods for observational data will be applied.  
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5 First, using descriptive and correlational designs, we will implement standard multivariable  
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7 methods to quantify links between pre-birth health conditions, parental leave eligibility and  
8  
9 uptake, and post-birth health outcomes while accounting for confounding using relevant  
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11 covariates and heterogeneity analyses.  
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15 Second, we will use robust quasi-experimental approaches to assess the causal effects of  
16  
17 parental leave policy on health, reducing the risk of selection effects and unmeasured  
18  
19 confounding by harnessing the natural, “as-if” randomisation around policies.<sup>43,44</sup> With this  
20  
21 approach, we can isolate the absolute policy effects on health even in the absence of detailed  
22  
23 information on changes in parental leave uptake. These approaches include interrupted time  
24  
25 series (ITS), regression discontinuity (RD) and difference-in-difference (DiD) designs. For ITS  
26  
27 designs, segmented regression models will be adjusted for seasonality and trend while  
28  
29 accounting for autocorrelation.<sup>44</sup> For RD designs, continuity around the cut-off will be tested  
30  
31 using the McCrary density test and similarity of eligible and ineligible observations will be  
32  
33 determined through descriptive statistics. Finally, for DiD designs, we will examine the data to  
34  
35 confirm parallel trends and other relevant assumptions.<sup>43</sup>  
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41 RQ#1: We will examine the effects of the 2002 *doubling of flat-rate benefits* on the mental  
42  
43 health of parents. An RD design will be applied to plot psychiatric hospitalisation rates with  
44  
45 labour income as a forcing variable, with separate plots before (with an income cut-off  
46  
47 equivalent to 75 SEK, at 80% reimbursement rate) and after 2002 (with a cut-off equivalent to  
48  
49 150 SEK daily). Cut-offs for both parents’ income will be examined. We will triangulate our  
50  
51 findings with a DiD approach, comparing those eligible for the increased benefits to those  
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53 ineligible before and after reforms.  
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3 RQ#2: A segmented-regression ITS of monthly birth data comparing the rate of low  
4 birthweight and preterm births three years before and after the 1986 *speed premium* reform will  
5 be implemented. We will also compare the prevalence of obesity in mothers early in their  
6 second pregnancy before and after the reform.  
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13 RQ#3: We will conduct an ITS analysis of parents of children born before and after the 1995  
14 *Father's quota* reform using segmented regression to capture changes in psychiatric  
15 hospitalisation rates up to 36 months after childbirth based on fathers' eligibility for the  
16 *Father's quota*.  
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23 RQ#4: An ITS for parents to children born before and after the 2012 *Double days* reform will  
24 be implemented to capture changes in the number of psychotropic prescriptions and psychiatric  
25 hospitalisations within 36 months after childbirth by child's month of birth.  
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30 RQ#5: We will implement separate ITS analyses of children born before and after the 1995  
31 *Father's quota* and 2012 *Double days* reforms, comparing hospitalisation rates for diagnoses  
32 of respiratory tract infections (in children under 2), prevalence of childhood obesity (at 18  
33 months and 3, 4 and 5 years old), and changes in breastfeeding duration.  
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#### 40 *Additional analyses*

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43 Given the potential for effect modification and compositional changes in the study populations,  
44 sub-group analyses by parents' sociodemographic characteristics (i.e., annual labour income,  
45 to determine eligibility for earnings-based benefits, or educational attainment) will be  
46 considered for all research questions. Analyses by parents' nativity will be implemented for  
47 RQ#2-4, given differential responses to the policies by Swedish- and foreign-born parents.<sup>14</sup>  
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49 Other relevant parental characteristics, i.e., age at childbirth and cohabitation status, will also  
50 be considered.  
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3 Sensitivity analyses will be performed to account for systematically missing data, such as  
4 maternal weight (i.e., given that women appearing to be of normal weight are less monitored  
5 for obesity).<sup>45</sup> For studies examining first births, sensitivity analyses restricting mental health  
6 outcomes to the 18 months post-birth will be considered in order to exclude the potential health  
7 effects related to a second pregnancy.  
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12 For all ITS designs, we will specify multiple intervention points to assess the possibility of  
13 lagged policy effects. Robustness analyses of falsification ('pseudo-intervention') dates, and  
14 falsification outcomes (e.g., pre-birth hospitalisations) will also be considered.  
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### 17 18 19 20 21 22 23 **Limitations**

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26 Despite our reliance on a robust quasi-experimental approach, it is difficult to predict the  
27 relative timing of the behavioural response to each parental leave reform (i.e., in uptake) and  
28 its health consequences. Parents have been shown to respond quickly to policy changes,<sup>14,15,25</sup>  
29 but given that some parents may not be aware of their eligibility on the reform dates, delayed  
30 reaction times could lead to lagged health effects for sub-groups such as migrants.<sup>12</sup> Thus, we  
31 will utilise a long follow-up both within the life course (i.e., years since birth) and in the context  
32 of the policy (i.e., years since reform implemented).  
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37 Quasi-experimental designs have the potential to reduce unmeasured confounding, but policies  
38 themselves, as well as ongoing trends, could inadvertently modify the composition of the study  
39 populations, potentially biasing any causal interpretations. For one, the *speed premium* may  
40 have affected the composition of individuals who decided to have children after the reform,  
41 i.e., encouraging more parents eligible for earnings-based benefits to have children after 1986,  
42 given their increased level of benefits for subsequent children. Exogenous impacts other than  
43 the policy under investigation could also contribute to changing population compositions, as in  
44 the case of the 1990s economic crisis, which may have discouraged couples with lower  
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3 socioeconomic position (SEP) from having children after the 1995 *Father's quota*. We will  
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5 thus examine varying sociodemographic characteristics of the study populations before and  
6  
7 after each reform to assess the robustness of the design to approximate causal effects, with  
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9 corresponding sub-group and sensitivity analyses.  
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12 Registers generally have greater coverage than other data sources but may be prone to bias in  
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14 the form of missing data and over-coverage (i.e., unreported outmigration), which we will  
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16 address in appropriate sensitivity analyses. The historical availability of register data may also  
17  
18 influence our analytical choices. For example, to evaluate the impact of the *Father's quota* on  
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20 psychiatric health, we will primarily look at the first reserved month introduced in 1995.<sup>6</sup>  
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22 However, only severe health outcomes (psychiatric hospitalisations) can be assessed with the  
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24 available registers at that time. In order to evaluate less severe outcomes (prescription data) of  
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26 increased fathers' leave use, we will evaluate the more recent *Double days* reform.<sup>16</sup>  
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32 Finally, although our primary aim is to evaluate unintended adverse health effects of these  
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34 parental leave reforms, we will also consider health benefits. For example, short birth intervals  
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36 promoted by the *speed premium* supplement could also have led to women having subsequent  
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38 children at younger age, thereby reducing the risk for adverse reproductive outcomes associated  
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40 with advanced age (e.g., foetal abnormalities, preterm and stillbirths).<sup>46-48</sup>  
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44 By considering both negative and positive health outcomes, in conjunction with a variety of  
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46 parental leave reforms and parental characteristics, this study will openly explore future  
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48 directions for international parental leave research.  
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## **Patient and public involvement**

This project will not involve any patients or the public. However, we will attempt to communicate the findings of the study to the public through the mass media.

## **Ethics and dissemination**

Although we handle personal information, individual consent is not required since the information is anonymised by the agencies responsible for data protection, and none of the records will have personal identifiers attached. Statistics Sweden may also aggregate some information (such as country of birth) to ensure that individuals cannot be identified in relation to other variables (e.g., education or place of residence). Nevertheless, since our dataset contains individual-level information and thus requires special provisions for its use, we applied for all necessary ethical permissions from the Stockholm Regional Ethical Review Board to cover the specific research questions addressed by this project (Dnr 2019-04913).

## **Author's contribution**

SPJ, HH and AD conceived and designed the study with feedback from EM and AZD (regarding the policy), MR and AH (regarding health outcomes and data access) and VK (regarding methodology). SPJ drafted the manuscript with help from HH, ED and AMH and all authors made substantial contributions. All authors approved the final version submitted for publication. SPJ is the guarantor.

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Funders of the study had no involvement in study design and will not be involved in any parts of the study, including data collection, data analysis, data interpretation, or writing of the report.

**Competing Interests Statement:** None

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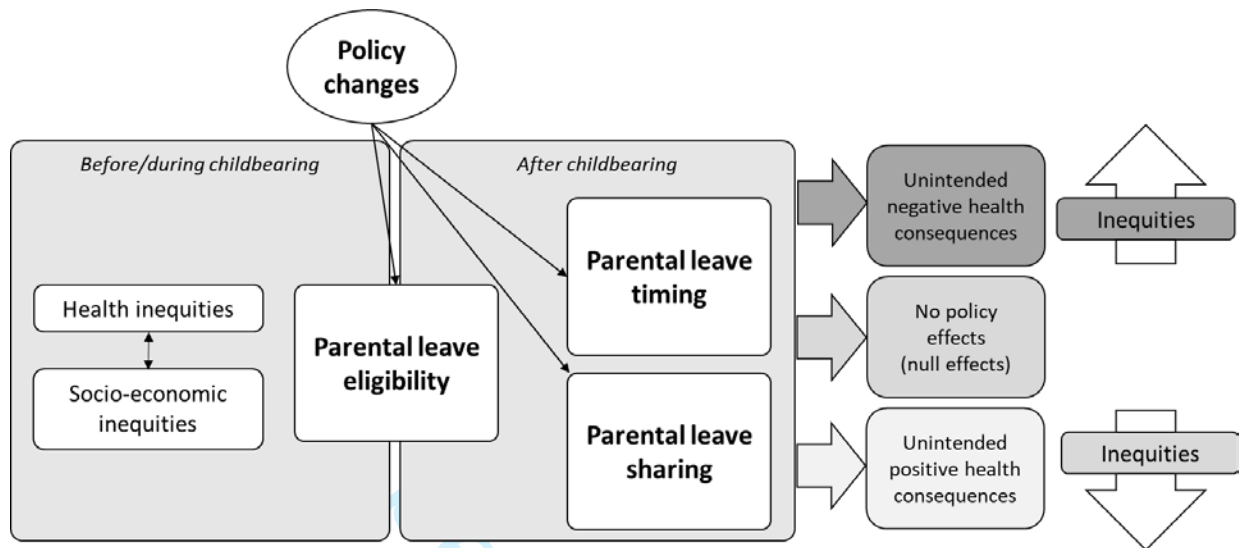
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3 **Figure legends**  
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5 **Figure 1.** Theoretical framework to study the unintended consequences of parental leave policy  
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7 from a health equity perspective  
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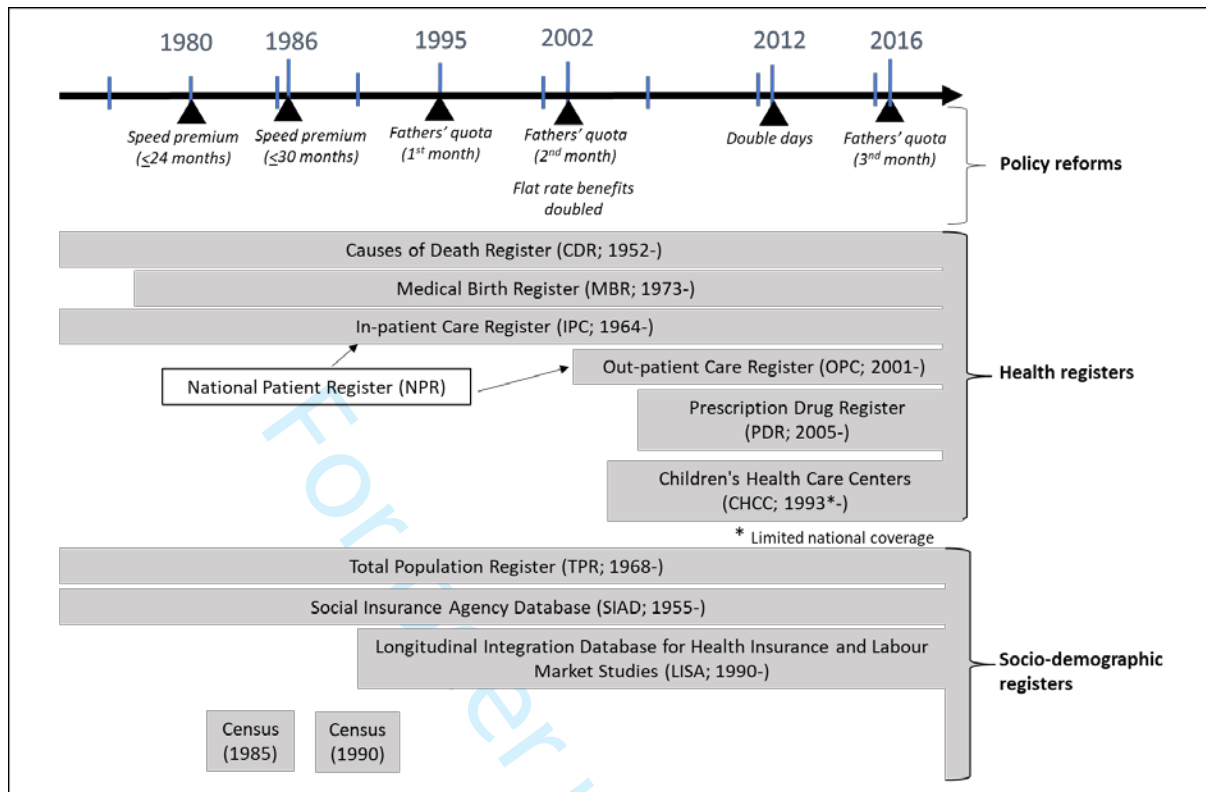
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10 **Figure 2.** National registers and policy reforms included in the study  
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**Figure 1. Theoretical framework to study the unintended consequences of parental leave policy from a health equity perspective**



**Figure 2. National registers and policy reforms included in the study**



## TIDieR-PHP checklist.

Item	Item description	Page in manuscript where item is reported
1 Brief name	Provide the name or a phrase that describes the intervention	5,6
2. Why	Describe the logic, mechanisms, or rationale of the intervention, clearly linking intervention elements to the expected effects on immediate or longer term outcomes (or both)	6-9
3. What materials	Describe any materials used in the intervention (including online appendices or URLs for further details). For example: — informational materials (may include those provided to recipients of the intervention or in training of intervention providers) — nature and value of any benefit provided (eg, cash, voucher, meal) — any physical resources or infrastructure provided as part of the intervention	n/a
4. What and how	Describe how the intervention was planned, established, and intended to be delivered. Depending on the type of intervention, it may be useful to consider: — <u>how sources of funding for the intervention</u> and the service providers were obtained, <u>how users were enrolled and the service delivered</u> — how any payments were made or benefits delivered, how qualifying conditions were implemented — <u>the entity being regulated, the scope of the regulation, permitted level of use</u> ; procedures for monitoring or enforcing compliance, and any sanctions for non-compliance — how people were exposed to the intervention, whether it was provided to individuals or larger populations — <u>any underpinning legislation including name, date passed, and legislative body</u>	4-7
5. Who provided	Describe the provider of the intervention, including legal status and powers, field organisations and staff responsible for planning, implementation, monitoring and enforcement. Where relevant, describe intervention provider expertise and training (general or specific to the intervention)	5
6. Where	Describe the type of location (eg, school, community centre) and the geographical scope of the intervention (eg, national, regional, city-wide). Where relevant, describe the historical, cultural, socioeconomic, or political background to the intervention	4, 7
7. When and how often	Describe when the intervention was implemented, how long it remained in place, and, if applicable, the number, duration, and scheduling of occasions	4-7
8.1 Planned variation	Describe and provide the reason for any variation or tailoring that was planned or allowed for in the design of the intervention.	n/a
8.2 Unplanned variation	Describe and provide the reason for any unplanned variation or modifications in the intervention (eg, between different locations, geographical areas, population subgroups, or over time) that were made after the intervention commenced	n/a
9.1 How well	Describe any strategies used or actions taken to maintain fidelity of the intervention (ie, to ensure that the intervention was delivered as intended)	n/a
9.2 How well— delivery	Describe the fidelity of the intervention (ie, the extent to which the intervention was delivered as intended)	6,7

\*If the information is not provided in the primary paper, give details of where this information is available (eg, protocol, other published papers (provide citation details), or a website (provide the URL))

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## STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	1-9
Objectives	3	State specific objectives, including any prespecified hypotheses	10-11, 7-9
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	1,2, 14-15
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	11-15, fig.2,
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	16
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	12-13
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	12-13
Bias	9	Describe any efforts to address potential sources of bias	15, 16- 17
Study size	10	Explain how the study size was arrived at	n/a
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	n/a
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	14, 16- 17
		(b) Describe any methods used to examine subgroups and interactions	15
		(c) Explain how missing data were addressed	16
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed	16

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*Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy

(e) Describe any sensitivity analyses

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Continued on next page

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<b>Results</b>		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
<b>Discussion</b>		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
<b>Other information</b>		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).



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## Unintended health consequences of Swedish parental leave policy (ParLeHealth): Protocol for a quasi-experimental study

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# Unintended health consequences of Swedish parental leave policy (ParLeHealth): Protocol for a quasi-experimental study

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## ABSTRACT

**Introduction:** Sweden has long been praised for a generous parental leave policy oriented towards facilitating a gender-equitable approach to work and parenting. Yet certain aspects of Swedish parental leave could also be responsible for the maintenance of (or even the increase in) health inequalities. Using a ‘Health in All Policies’ lens, this research project aims to assess the unintended health consequences of various components of Sweden’s parental leave policy, including eligibility for and uptake of earnings-based benefits.

**Methods and analysis:** We will utilise individual-level data from multiple Swedish registers. Sociodemographic information, including on parental leave use, will be retrieved from the Total Population Register, Longitudinal Integration Database for Health Insurance and Labour Market Studies, and Social Insurance Agency Registers. Health information for parents and children will be retrieved from the Patient, Prescribed Drug, Cause of Death, Medical Birth and Children’s Health Registers. We will evaluate parents’ mental, mothers’ reproductive and children’s general health outcomes in relation to several policy reforms aiming to protect parental leave benefits in short birth spacing (the *Speed premium*) and to promote father’s uptake (the *Father’s quota*) and sharing of parental leave days (the *Double days* reform). We will also examine effects of increases in basic parental leave benefit levels. Using quasi-experimental designs, we will compare health outcomes across these reforms and eligibility thresholds with interrupted time series, difference-in-difference, and regression discontinuity approaches to reduce the risk of health selection and assess causality in the link between parental leave use and health.

**Ethics and dissemination:** This project has been granted all necessary ethical permissions from the Stockholm Regional Ethical Review Board (Dnr 2019-04913) for accessing and analysing de-identified data. The final outputs will primarily be disseminated as scientific articles published in open-access, high-impact peer-reviewed international journals, as well as press releases and policy briefs.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- This will be the first project to evaluate multiple aspects of Swedish parental leave policy by adopting a health equity perspective and Health in All Policies (HiAP) approach.
- The study will utilise quasi-experimental methods on total population register data to assess causal links between parental leave uptake and health.
- The study will expand on existing evidence of health effects by considering outcomes not only for mothers and children, but fathers as well.
- Analyses will be restricted to studying health outcomes that are available within administrative datasets, thereby precluding assessment of potentially more sensitive self-reported assessments of health.

## INTRODUCTION

Childbearing is a life event with significant social and health implications for parents, children and society alike. Among women, childbearing has been considered to be responsible for lower labour market participation and gendered wage gaps (i.e., the ‘motherhood penalty’),<sup>1</sup> resulting in lower income protection in old age.<sup>1-3</sup> Childbearing is also a risk factor for various physical and mental health conditions among mothers.<sup>4</sup> By offering secure time off work for childcare and recovery, parental leave has the potential to reduce social and health inequalities in society. However, given that parental leave eligibility and uptake may vary across social strata, it may also have the potential to (re)produce social inequalities in health.

### *1. The Swedish parental leave system*

We report intervention details according to the TIDieR-PHP reporting guidelines.<sup>5</sup>

#### *1.1 Length and flexibility of parental leave*

Sweden has developed into one of the most generous and flexible paid parental leave systems worldwide.<sup>6</sup> Starting in 1974, parents were entitled to six months of leave to be used within 270 days of birth and shared by the parents as they desired. An additional nine months of leave were introduced incrementally from 1975 to 1989,<sup>6,7</sup> with an extension to use a portion of the leave until the child turned eight years old in 1978. In 1995, one month of the leave was reserved for each parent, a quota which was further extended by one month each in 2002 and 2016.<sup>8,9</sup> Since 2014, couples have been entitled to use 480 parental leave days up until the child turns 12 years old, of which no more than 96 days from the child’s fourth birthday.<sup>7</sup>

We will focus on mothers’ and fathers’ *paid parental leave* (i.e., job-protected leave paid at set benefit levels) rather than *unpaid parental leave* (i.e., job-protected unpaid leave in the first 18 months after birth). Furthermore, we do not examine *maternity leave* (i.e., two weeks of mandatory job-protected leave for the mother prior to or after childbirth, which can be unpaid

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3 or paid as standard parental leave days), *temporary leave*, including at birth/adoption (formerly  
4 *paternity leave*; i.e., up to ten days of separate paid, job-protected leave for partners to attend  
5 the delivery or assist the mother with infant care), or leave for the care of sick children.<sup>6,7</sup>  
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### 10 *1.2 Parental leave eligibility and compensation*

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13 In Sweden, all legally residing parents are eligible to receive parental leave benefits (i.e., job-  
14 protected leave), including biological parents as well as individuals with child custody.<sup>10</sup>  
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16 Individuals must apply for these benefits through the Social Insurance Agency, the  
17 governmental authority that decides on and administers insurance and contributions to families  
18 and children in Sweden.<sup>11</sup> The benefits are split into general flat-rate or earnings-based benefits,  
19 collectively referred to as ‘parental benefits’ and applied to 390 out of the total 480 days, while  
20 the remaining 90 days are paid at a second flat rate, henceforth referred to as ‘guarantee days’.<sup>7</sup>  
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30 To be eligible for earnings-based parental benefits, an individual must have been employed for  
31 at least 240 consecutive days prior to the estimated delivery date with a minimum annual  
32 income (82,100 Swedish kronor (SEK) in 2020). Although the remuneration level has varied  
33 over time, individuals today receive approximately 80% of their salary up to a certain ceiling  
34 (1,006 SEK per day in 2020) from the Social Insurance Agency, with potential top-ups from  
35 the employer.<sup>12</sup> If an individual has an income below a certain level (117,590 SEK in 2020)  
36 during the 240 days before childbirth, they are only entitled to a general flat-rate benefit (250  
37 SEK per day in 2020) for the first 180 days which they claim for the child. After 180 claimed  
38 days, parents can receive benefits based on their current earnings.<sup>7</sup> Finally, if an individual has  
39 no income or an annual income below the stipulated level throughout the leave period they will  
40 receive the general flat-rate benefit for the full 390 days. However, if an individual is sick, a  
41 student, or unemployed but a ‘job seeker’, they can receive parental leave benefits based on  
42 their prior income if they have registered with the Public Employment Service.<sup>10</sup> Regardless of  
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3 employment history, the final 90 days are always paid at a minimum guaranteed level of 60  
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5 SEK starting in 1987, and 180 SEK since 2006.<sup>7</sup>  
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## 8 9 *1.2 Policy reforms*

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11 The Swedish parental leave system has undergone several reforms over the past half-century.  
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13 We define a ‘policy reform’ as any change implemented at a specific time that could impact  
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15 either uptake or sharing of parental leave, as well as eligibility for earnings-based benefits. To  
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17 evaluate the unforeseen health consequences of the parental leave policy – i.e., a welfare policy  
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19 that *does not* primarily target health – we will concentrate on reforms that have either been  
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21 shown to accomplish their primary aim (i.e., the *Speed premium*, *Father’s quota*, and *Double*  
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23 *days* reforms) or with undoubtedly significant, albeit unintended, impacts (i.e., the doubled  
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25 value of general flat-rate benefits).  
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31 *Doubled flat-rate benefits:* Although not explicitly a reform, the doubling of the general flat-  
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33 rate benefits from 60 SEK per day (from 1987) to 120 SEK per day (in 2002) aimed to secure  
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35 the economic welfare of low-income families.  
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39 *Speed premium:* Since earnings-related parental leave benefits are estimated based on one’s  
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41 salary prior to childbearing (at approximately 80% of the salary), parents having children in  
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43 quick succession may choose to temporarily reduce their working hours or be unable to return  
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45 to work at all, and will thus have lower benefits for their second and subsequent births. In 1980,  
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47 a supplement (commonly referred to as the “speed premium”) was introduced to safeguard  
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49 women’s income between parental leave periods, ensuring that for births with up to 24 months’  
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51 spacing,<sup>13</sup> and then up to 30 months’ spacing (following a 1986 expansion),<sup>14</sup> all earnings-  
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53 based benefits could be based on the parents’ salaries prior to the birth of their previous child,  
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55 if higher than their current income. An evaluation of the 1986 expansion revealed that an  
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3 increased proportion of Swedish-born parents had children in short succession; even if this was  
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5 an unintended consequence, the reform has henceforth been called the “speed premium”.<sup>14</sup>  
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9 *Father’s quota:* Fathers have been eligible to use parental leave since 1974, when parents could  
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11 choose to divide parental leave days between themselves as they saw fit. However, most days  
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13 were transferred to and claimed by mothers, with an average use of 320 days in 1994,  
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15 reinforcing mothers’ “double burden” of childcare and work. In response, a *Father’s quota*  
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17 reform was implemented in 1995, reserving a month of leave exclusively for the father, to be  
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19 forfeited completely if left unused (similarly, a 30-day reserve was allocated to the mother, i.e.,  
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21 a *Mother’s quota*). It succeeded in increasing the proportion of fathers using parental leave  
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23 from 43% to 75%.<sup>15</sup> The *quota* was expanded to two and three months in 2002 and 2016,  
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25 respectively, but with smaller impacts on uptake.<sup>6</sup>  
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31 *Double days:* In 2012, 30 days of existing parental leave were designated as ‘shareable’, i.e.,  
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33 could be used simultaneously by both parents within the child’s first year of life. By granting  
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35 flexibility to the couple in their leave use, this “Double days” reform aimed to facilitate the  
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37 transfer of care from one parent to another. In fact, the reform significantly increased the  
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39 proportion and number of father’s leave days used in the first half-year after childbirth.<sup>16</sup>  
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44 All reforms were implemented nationally on January 1<sup>st</sup> of the indicated year.  
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## 47 **2. Unintended health consequences of the Swedish parental leave system**

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50 Despite the relative generosity of the Swedish parental leave system and its efforts to promote  
51  
52 gender equity, some aspects could be responsible for the maintenance or increase in social and  
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54 health inequities. For example, the strong work-eligibility requirement for earnings-based  
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56 parental leave benefits may exclude groups with less stability in the labour market, such as  
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58 students and migrants, from benefits equal to those enjoyed by persons with stable incomes.<sup>17</sup>  
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3 Inequities in the work-eligibility requirement can emerge in various ways, either by restricting  
4 the parental leave benefits scheme to the securely employed and coincidentally excluding  
5 parents with ill health (i.e., *health selection*), or by creating health inequities through the  
6 unequal distribution of benefits (i.e., *social causation*). For example, individuals with long-  
7 term illness may be more likely to have a weak labour market attachment, which in turn can  
8 exclude them from earnings-related parental leave benefits, thus further increasing  
9 socioeconomic inequities. Based on this, we expect that the *doubled flat-rate benefits* could  
10 increase leave uptake among lower income families or decrease the economic trade-off of using  
11 parental leave among lower income families, thus having potential psychosocial benefits.  
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26 Parental leave policies might impact health differently following certain policy reforms. For  
27 example, the *Speed premium* supplement introduced to secure earnings-based parental leave  
28 benefits to parents who have children in quick succession essentially incentivises short birth  
29 spacing.<sup>14</sup> This might lead to increased psychosocial stress and adverse reproductive outcomes  
30 among women who become pregnant whilst simultaneously rearing an infant or toddler. The  
31 WHO recommends a minimum of 24 months, assuming nine months of gestation, before a new  
32 conception to avoid adverse reproductive outcomes.<sup>18</sup> Short birth intervals have been  
33 associated with nutrition depletion,<sup>19</sup> as the mother might not have enough time between births  
34 to recover her nutritional reserves, and higher risks of weight gain and obesity throughout life.<sup>20</sup>  
35 In turn, these issues are risk factors for adverse outcomes in subsequent children, including low  
36 birthweight, preterm birth and perinatal death.<sup>18,21</sup>  
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54 The *Father's quota* was implemented to promote a gender-equitable work-life balance and  
55 shared parenting. However, the health consequences of the *Father's quota* have been debated,  
56 with a lack of empirical evidence on its differing mechanisms. Studies have shown a positive  
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3 association between the father's parental leave use and healthy behaviours, including decreased  
4 alcohol use and increased physical activity,<sup>22,23</sup> as well as decreased mortality risks.<sup>24</sup>  
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6 Nonetheless, there may be situations in which fathers' leave use is less optimal for or even  
7 unfavourable for the family. The quota may have encouraged mothers to return to work sooner,  
8 potentially interrupting their physical and psychological recovery from pregnancy and  
9 childbirth. These potential adverse effects among parents could extend to the child: shorter  
10 maternity leave in the child's first months could shorten breastfeeding, a risk factor for  
11 childhood obesity<sup>25</sup> and respiratory track infectious in the first two years of life.<sup>26</sup> However,  
12 there is a lack of evidence on changes in mothers' labour supply following the reform,<sup>27,28</sup>  
13 suggesting that mothers may have stayed at home with fathers on an unpaid basis, foregoing  
14 their income and thus potentially creating psychological strain, especially among low-income  
15 parents.  
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33 Given that parental leave in Sweden is longer than in most other contexts, it can be argued that  
34 any health effect of shortened parental leave among mothers with the introduction of the  
35 *Father's quota* would be negligible. However, adverse effects may become apparent in specific  
36 sub-populations, including for couples only entitled to flat-rate benefits (that may therefore  
37 need to return to work early), as well as individuals with job insecurity or who are self-  
38 employed. Identifying adverse health effects in population sub-groups will not only shed light  
39 on the differential impacts of parental leave reforms within a population but will have  
40 implications for policy transferability in international contexts where parental leave is generally  
41 shorter and discussions on reserved days for the father are ongoing.  
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56 The adverse unintended consequences of the reserved days for the mother could to some extent  
57 be compensated for by the introduction of the subsequent *Double days* reform, which allowed  
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3 parents to use a month of parental leave days *simultaneously* in the crucial first year after birth.  
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5 In fact, this reform has been shown to have beneficial psychiatric effects for mothers by  
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7 allowing fathers to participate in childcare as their partners recover from pregnancy and  
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9 childbirth.<sup>16</sup>  
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### 15 **3. Theoretical framework**

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18 This project is rooted in the Health in All Policies (HiAP) framework, which advocates for  
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20 considering the health implications of policies across all sectors.<sup>29</sup> The HiAP approach will  
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22 help to shed light on the health consequences of a family policy that does not target health, but  
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24 could have considerable health impacts in society. This approach also highlights how  
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26 advantages derived from parental leave uptake can be restricted for individuals with poor  
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28 health, due to the specific work-related requirements for earnings-based benefits. Therefore, in  
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30 this project health is considered in the sociological perspective of ‘unanticipated (or  
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32 unintended) consequences of social actions’,<sup>30</sup> according to which policies and interventions  
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34 can have latent functional or dysfunctional effects that were not planned or anticipated by  
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36 relevant actors.<sup>31</sup> This unexpected dimension reveals the complexity of organised social  
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38 actions, calling for the investigation of well-intentioned interventions to identify non-linear  
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40 mechanisms through which such consequences arise (see **Figure 1**). Within this framework,  
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42 the persistence of (or increase in) health inequalities associated with parental leave policy can  
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44 be seen as an adverse side effect to be identified and addressed through policy reform.<sup>32</sup>  
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### 54 **4. Aim/objectives and research questions**

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3 The aim of this project is to evaluate the consequences of parental leave policy in Sweden from  
4 a health equity perspective. More specifically, the project will cover the following research  
5 questions (RQ):  
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12 RQ#1. Is eligibility for earnings-based parental leave benefits associated with parents' mental  
13 health?  
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16  
17 RQ#2. Is short birth spacing in relation to the *Speed premium* supplement reform associated  
18 with health problems in the subsequent pregnancy of the mother (early pregnancy obesity) and  
19 the subsequent child (low birthweight, preterm and small-for-gestational age)?  
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24 RQ#3. Does the introduction and expansion of the *Father's quota* reserve days influence the  
25 mental health of parents after the birth of their child?  
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29 RQ#4. Does the introduction of simultaneous parental leave use through the *Double days*  
30 reform influence parents' mental health?  
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34 RQ#5: Does the introduction of the *Father's quota* and *Double days* reforms influence  
35 children's health (episodes of respiratory tract infections, childhood obesity) or health-related  
36 outcomes (duration of breastfeeding)?  
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## 41 **METHODS AND ANALYSIS**

### 42 **Study population**

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44  
45 We will include all Swedish- and foreign-born individuals registered in Sweden between 1973  
46 and 2019 and their Swedish-born children, followed through their first five years of life. For  
47 most studies, we will focus on a subsample consisting of all women (and their partners) residing  
48 in Sweden who had their first birth in the country between 1973 and 2019.  
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3 Studies will be primarily focused on primiparous couples, with secondary analyses for  
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Studies will be primarily focused on primiparous couples, with secondary analyses for  
multiparous couples. We will only include biological parents, since we aim to examine joint  
biological and psychosocial consequences of parental leave uptake, with singleton children,  
given that parents of multiple births are entitled to more days of leave.<sup>6</sup> Separate analyses by  
parents' sociodemographic characteristics, nativity, and cohabitation status will be conducted  
to investigate the heterogeneity of effects in the population.

## Data

This project will use data from available national registers, collected and linked by the Swedish  
authorities. Using a unique personal identity number,<sup>33</sup> we will identify and reconstruct  
families in the study population through the Total Population Register (TPR; 1968-)<sup>34</sup> and the  
Multigenerational Register (MGR; 2001-).<sup>35</sup> Sociodemographic information will be retrieved  
from the TPR, the Longitudinal Integration Database for Health Insurance and Labour Market  
Studies (LISA; 1990-),<sup>36</sup> the Swedish Social Insurance Agency Database (SIAD; 1955-) and  
the 1985 and 1990 Population and Housing Censuses. We will link health information from  
the National Patient Register (NPR), on inpatient (IPR; 1964-)<sup>37</sup> and outpatient care (IPR;  
2001-); and the Medical Birth (MBR; 1973-),<sup>38</sup> Cause of Death (1952-)<sup>39</sup> and Prescribed Drug  
(2005-) Registers.<sup>40</sup> We also plan to include information from the Swedish Children's Health  
Centres (CHC; 1993-), with full coverage of longitudinal childhood obesity and breastfeeding  
data from the counties of Uppsala and Örebro (see **Figure 2**).

## Outcomes

Child health outcomes include low birthweight (<2,500 grams, irrespective of gestational age),  
preterm birth (<37 gestational weeks), and a small-for-gestational age measure (<10<sup>th</sup>  
percentile of birthweight for each gestational age, based on sex-specific Swedish reference

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3 curve for normal foetal growth)<sup>41</sup> from the MBR; hospitalisation episodes of respiratory tract  
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5 infections during the first two years of life (International Classification of Diseases-10 [ICD-  
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7 10] Codes J20.5, J21.0, J21.9, J20.9, J18.9, J12.9 and J22.9) from the NPR; and duration of  
8  
9 partial or exclusive breastfeeding (at months 2, 4, 6, 9 and 12) as well as childhood obesity  
10  
11 (body mass index [BMI; weight in kilograms/height in meters<sup>2</sup>] using age- and sex-specific  
12  
13 cut-offs for children's overweight and obesity<sup>42,43</sup> at 18 months and 3, 4 and 5 years old) from  
14  
15 the CHR. Maternal health outcomes include maternal early pregnancy overweight (BMI 25-  
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17 29.9 kg/m<sup>2</sup>) and obesity (BMI 30-39.9 kg/m<sup>2</sup>).<sup>44</sup>  
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24 Mental health outcomes will be assessed for both parents using count data on purchases of  
25  
26 prescription anxiolytic and antidepressant medications (Anatomical Therapeutic Classification  
27  
28 or ATC Codes N05B and N06A, respectively) as well as outpatient visits and hospitalisations  
29  
30 with a primary diagnosis of mental and behavioural disorders (until 1997, ICD-9 Codes 290-  
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32 319; thereafter, ICD-10 Codes F00-F99), from childbirth to 18 and 36 months after birth.  
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38 Outcomes will be expressed as prevalence or rates, given availability of follow-up time.  
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## 42 **Covariates**

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44 Annual information on parental leave uptake (number of days) for each parent will also be  
45  
46 available from LISA. Specific information on parental leave eligibility and uptake (including  
47  
48 length of paid and unpaid leave) will be retrieved from the SIAD.  
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54 Demographic characteristics will include parents' age at childbirth, country of birth (i.e.,  
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56 Swedish vs. other and specific origins), and marital and cohabitation status, from the TPR and  
57  
58 LISA. Sociodemographic characteristics including educational attainment, household  
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3 disposable income, individual labour income, employment status and receipt of sick leave  
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5 benefits will be drawn from LISA.  
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## 10 **Study design and statistical analyses**

11  
12 A variety of advanced designs and statistical methods for observational data will be applied.  
13  
14 First, using descriptive and correlational designs, we will implement standard multivariable  
15  
16 methods to quantify links between pre-birth health conditions, parental leave eligibility and  
17  
18 uptake, and post-birth health outcomes while accounting for confounding using relevant  
19  
20 covariates and heterogeneity analyses.  
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25 Second, we will use robust quasi-experimental approaches to assess the causal effects of  
26  
27 parental leave policy on health, reducing the risk of selection effects and unmeasured  
28  
29 confounding by harnessing the natural, “as-if” randomisation around policies.<sup>45,46</sup> With this  
30  
31 approach, we can isolate the absolute policy effects on health even in the absence of detailed  
32  
33 information on changes in parental leave uptake. These approaches include interrupted time  
34  
35 series (ITS), regression discontinuity (RD) and difference-in-difference (DiD) designs. For ITS  
36  
37 designs, segmented regression models will be adjusted for seasonality and trend while  
38  
39 accounting for autocorrelation.<sup>46</sup> For RD designs, continuity around the cut-off will be tested  
40  
41 using the McCrary density test and similarity of eligible and ineligible observations will be  
42  
43 determined through descriptive statistics. Finally, for DiD designs, we will examine the data to  
44  
45 confirm parallel trends and other relevant assumptions.<sup>45</sup>  
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51 RQ#1: We will examine the effects of the 2002 *doubling of flat-rate benefits* on the mental  
52  
53 health of parents. An RD design will be applied to plot psychiatric hospitalisation rates with  
54  
55 labour income as a forcing variable, with separate plots before (with an income cut-off  
56  
57 equivalent to 75 SEK, at 80% reimbursement rate) and after 2002 (with a cut-off equivalent to  
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3 150 SEK daily). Cut-offs for both parents' income will be examined. We will triangulate our  
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5 findings with a DiD approach, comparing those eligible for the increased benefits to those  
6  
7 ineligible before and after reforms.  
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11 RQ#2: A segmented-regression ITS of monthly birth data comparing the rate of low  
12  
13 birthweight and preterm births three years before and after the 1980 and 1986 *Speed premium*  
14  
15 reforms will be implemented. We will also compare the prevalence of obesity in mothers early  
16  
17 in their second pregnancy before and after the reform.  
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20  
21 RQ#3: We will conduct an ITS analysis of parents of children born before and after the 1995  
22  
23 *Father's quota* reform using segmented regression to capture changes in psychiatric  
24  
25 hospitalisation rates up to 36 months after childbirth, based on fathers' eligibility for the  
26  
27 *Father's quota*.  
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30  
31 RQ#4: An ITS for parents to children born before and after the 2012 *Double days* reform will  
32  
33 be implemented to capture changes in the number of outpatient visits for mental health and  
34  
35 psychotropic prescriptions within 36 months after childbirth, by child's month of birth.  
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38  
39 RQ#5: We will implement separate ITS analyses of children born before and after the 1995  
40  
41 *Father's quota* and 2012 *Double days* reforms, comparing hospitalisation rates for diagnoses  
42  
43 of respiratory tract infections (in children under 2), prevalence of childhood obesity (at 18  
44  
45 months and 3, 4 and 5 years old), and changes in breastfeeding duration.  
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#### 48 *Additional analyses*

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51 Given the potential for effect modification and compositional changes in the study populations,  
52  
53 sub-group analyses by parents' sociodemographic characteristics (i.e., annual labour income,  
54  
55 to determine eligibility for earnings-based benefits, or educational attainment) will be  
56  
57 considered for all research questions. Analyses by parents' nativity will be implemented for  
58  
59 RQ#2-4, given differential responses to the policies by Swedish- and foreign-born parents.<sup>14</sup>  
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3 Other relevant parental characteristics, i.e., age at childbirth and cohabitation status, will also  
4  
5 be considered.  
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8 Sensitivity analyses will be performed to account for systematically missing data, such as  
9  
10 maternal weight (i.e., given that women appearing to be of normal weight are less monitored  
11  
12 for obesity).<sup>47</sup> For studies examining first births, sensitivity analyses restricting mental health  
13  
14 outcomes to the 18 months post-birth will be considered in order to exclude the potential health  
15  
16 effects related to a second pregnancy.  
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19  
20 For all ITS designs, we will specify multiple intervention points to assess the possibility of  
21  
22 lagged policy effects. Robustness analyses of falsification (‘pseudo-intervention’) dates, and  
23  
24 falsification outcomes (e.g., pre-birth hospitalisations) will also be considered.  
25  
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### 28 **Limitations**

29  
30 Despite our reliance on a robust quasi-experimental approach, it is difficult to predict the  
31  
32 relative timing of the behavioural response to each parental leave reform (i.e., in uptake) and  
33  
34 its health consequences. Parents have been shown to respond quickly to policy changes,<sup>14,15,27</sup>  
35  
36 but given that some parents may not be aware of their eligibility on the reform dates, delayed  
37  
38 reaction times could lead to lagged health effects for sub-groups such as migrants.<sup>12</sup> Thus, we  
39  
40 will utilise a long follow-up both within the life course (i.e., years since birth) and in the context  
41  
42 of the policy (i.e., years since reform implemented).  
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48 Quasi-experimental designs have the potential to reduce unmeasured confounding, but policies  
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50 themselves, as well as ongoing trends, could inadvertently modify the composition of the study  
51  
52 populations, potentially biasing any causal interpretations. For one, the *Speed premium* may  
53  
54 have affected the composition of individuals who decided to have children after the reform,  
55  
56 i.e., encouraging more parents eligible for earnings-based benefits to have children after 1986,  
57  
58 given their increased level of benefits for subsequent children. Exogenous impacts other than  
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3 the policy under investigation could also contribute to changing population compositions, as in  
4 the case of the 1990s economic crisis, which may have discouraged couples with lower  
5 socioeconomic position (SEP) from having children after the 1995 *Father's quota*. We will  
6 thus examine varying sociodemographic characteristics of the study populations before and  
7 after each reform to assess the robustness of the design to approximate causal effects, with  
8 corresponding sub-group and sensitivity analyses.  
9

10 Registers generally have greater coverage than other data sources but may be prone to bias in  
11 the form of missing data and over-coverage (i.e., unreported outmigration), which we will  
12 address in appropriate sensitivity analyses. The historical availability of register data may also  
13 influence our analytical choices. For example, to evaluate the impact of the *Father's quota* on  
14 psychiatric health, we will primarily look at the first reserved month introduced in 1995.<sup>6</sup>  
15 However, only severe health outcomes (psychiatric hospitalisations) can be assessed with the  
16 available registers at that time. In order to evaluate less severe outcomes (outpatient visit and  
17 prescription data) of increased fathers' leave use, we will evaluate the more recent *Double days*  
18 reform.<sup>16</sup>  
19

20 Finally, although our primary aim is to evaluate unintended adverse health effects of these  
21 parental leave reforms, we will also consider health benefits. For example, short birth intervals  
22 promoted by the *Speed premium* supplement could also have led to women having subsequent  
23 children at younger age, thereby reducing the risk for adverse reproductive outcomes associated  
24 with advanced age (e.g., foetal abnormalities, preterm and stillbirths).<sup>48-50</sup>  
25

26 By considering both negative and positive health outcomes, in conjunction with a variety of  
27 parental leave reforms and parental characteristics, this study will openly explore future  
28 directions for international parental leave research.  
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## **Patient and public involvement**

This project will not involve any patients or the public. However, we will attempt to communicate the findings of the study to the public through the mass media.

## **Ethics and dissemination**

Although we handle personal information, individual consent is not required since the information is anonymised by the agencies responsible for data protection, and none of the records will have personal identifiers attached. Statistics Sweden may also aggregate some information (such as country of birth) to ensure that individuals cannot be identified in relation to other variables (e.g., education or place of residence). Nevertheless, since our dataset contains individual-level information and thus requires special provisions for its use, we applied for all necessary ethical permissions from the Stockholm Regional Ethical Review Board to cover the specific research questions addressed by this project (Dnr 2019-04913).

## **Author's contribution**

SPJ, HH and AD conceived and designed the study with feedback from EM and AZD (regarding the policy), MR and AH (regarding health outcomes and data access) and HH and SVK (regarding methodology). SPJ drafted the manuscript with help from HH, ED and AMH and all authors made substantial contributions. All authors approved the final version submitted for publication. SPJ is the guarantor.

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Funders of the study had no involvement in study design and will not be involved in any parts of the study, including data collection, data analysis, data interpretation, or writing of the report.

**Competing Interests Statement:** None

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3 **Figure legends**  
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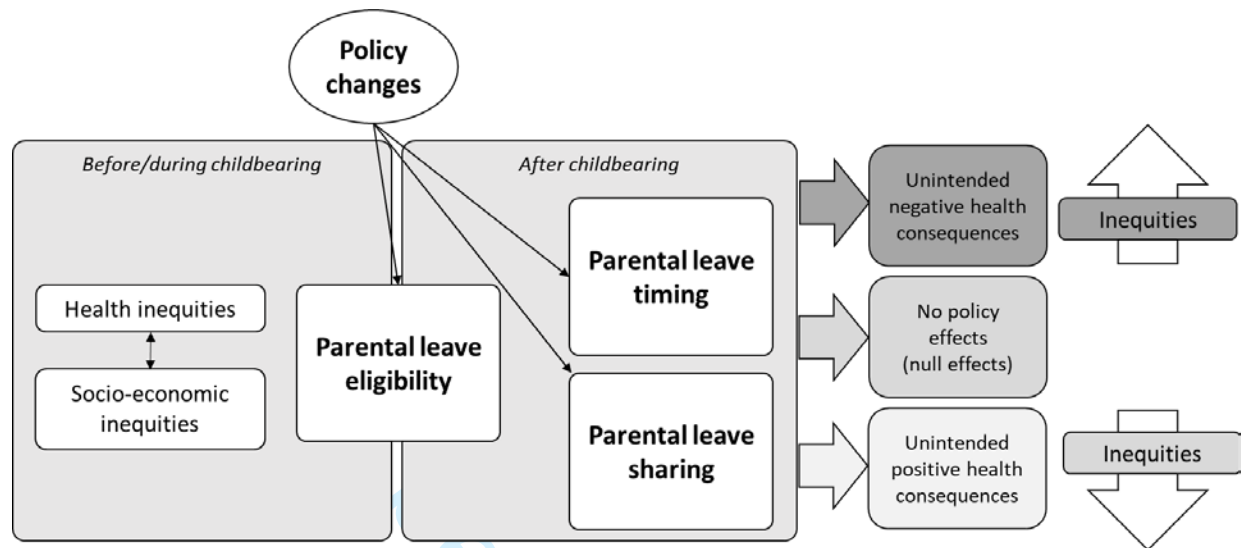
5 **Figure 1.** Theoretical framework to study the unintended consequences of parental leave policy  
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7 from a health equity perspective  
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10 **Figure 2.** National registers and policy reforms included in the study  
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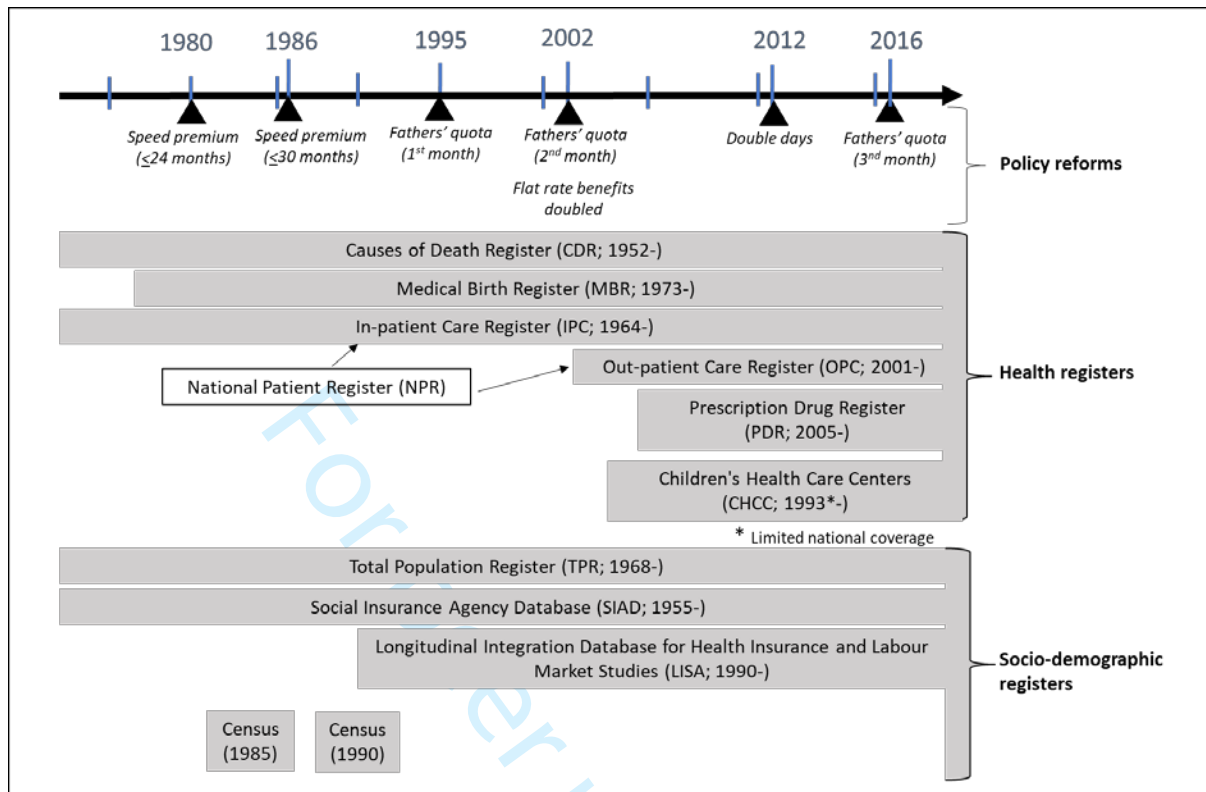
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**Figure 1. Theoretical framework to study the unintended consequences of parental leave policy from a health equity perspective**



**Figure 2. National registers and policy reforms included in the study**



## TIDieR-PHP checklist.

Item	Item description	Page in manuscript where item is reported
1 Brief name	Provide the name or a phrase that describes the intervention	5,6
2. Why	Describe the logic, mechanisms, or rationale of the intervention, clearly linking intervention elements to the expected effects on immediate or longer term outcomes (or both)	6-9
3. What materials	Describe any materials used in the intervention (including online appendices or URLs for further details). For example: — informational materials (may include those provided to recipients of the intervention or in training of intervention providers) — nature and value of any benefit provided (eg, cash, voucher, meal) — any physical resources or infrastructure provided as part of the intervention	n/a
4. What and how	Describe how the intervention was planned, established, and intended to be delivered. Depending on the type of intervention, it may be useful to consider: — <u>how sources of funding for the intervention</u> and the service providers were obtained, <u>how users were enrolled and the service delivered</u> — how any payments were made or benefits delivered, how qualifying conditions were implemented — <u>the entity being regulated, the scope of the regulation, permitted level of use</u> ; procedures for monitoring or enforcing compliance, and any sanctions for non-compliance — how people were exposed to the intervention, whether it was provided to individuals or larger populations — <u>any underpinning legislation including name, date passed, and legislative body</u>	4-7
5. Who provided	Describe the provider of the intervention, including legal status and powers, field organisations and staff responsible for planning, implementation, monitoring and enforcement. Where relevant, describe intervention provider expertise and training (general or specific to the intervention)	5
6. Where	Describe the type of location (eg, school, community centre) and the geographical scope of the intervention (eg, national, regional, city-wide). Where relevant, describe the historical, cultural, socioeconomic, or political background to the intervention	4, 7
7. When and how often	Describe when the intervention was implemented, how long it remained in place, and, if applicable, the number, duration, and scheduling of occasions	4-7
8.1 Planned variation	Describe and provide the reason for any variation or tailoring that was planned or allowed for in the design of the intervention.	n/a
8.2 Unplanned variation	Describe and provide the reason for any unplanned variation or modifications in the intervention (eg, between different locations, geographical areas, population subgroups, or over time) that were made after the intervention commenced	n/a
9.1 How well	Describe any strategies used or actions taken to maintain fidelity of the intervention (ie, to ensure that the intervention was delivered as intended)	n/a
9.2 How well—delivery	Describe the fidelity of the intervention (ie, the extent to which the intervention was delivered as intended)	6,7

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\*If the information is not provided in the primary paper, give details of where this information is available (eg, protocol, other published papers (provide citation details), or a website (provide the URL))

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## STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	1-9
Objectives	3	State specific objectives, including any prespecified hypotheses	10-11, 7-9
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	1,2, 14-15
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	11-15, fig.2,
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	16
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	12-13
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	12-13
Bias	9	Describe any efforts to address potential sources of bias	15, 16- 17
Study size	10	Explain how the study size was arrived at	n/a
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	n/a
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	14, 16- 17
		(b) Describe any methods used to examine subgroups and interactions	15
		(c) Explain how missing data were addressed	16
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed	16

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*Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy

(e) Describe any sensitivity analyses

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<b>Results</b>		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
<b>Discussion</b>		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
<b>Other information</b>		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

\*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).