# Maternal Mental Health and Child Development: The Role of Nurse Quality

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February 6, 2026

**[Preliminary & under revision, do not circulate]**

**Abstract**

We study the role of maternity care nurses in improving maternal mental health and its further implications for maternal and child outcomes. We estimate nurse value-added to maternal mental health, measured by their effectiveness in preventing mental health diagnoses during the year of birth. We combine linked nurse-mother-child health and demographic data, with within-clinic quasi-random assignment of mothers to nurses to estimate variation in nurse quality. We find substantial variation in nurses' value-added on maternal mental health. High value-added nurses generate persistent improvement in maternal labour market outcomes, and reduction in subsequent sickness benefit claims. These effects also extend to children: exposure to a higher mental health value-added nurse reduces diagnoses of developmental disorders and mental health-related healthcare visits in early childhood. Our findings highlight the critical role of frontline healthcare workers in delivering effective mental health support at scale, particularly in settings where formal mental health services are under-utilised.

# 1 Introduction

Maternal mental health is a key determinant of maternal and child outcomes, with consequences that extend beyond health to labour market trajectories and child development. The pregnancy and postpartum period is characterised by an elevated risk of mental health conditions, and depressive symptoms during this period often persist well beyond childbirth. Despite its importance, maternal depression remains highly prevalent worldwide, affecting an estimated 17.2 percent of mothers (Wang et al., 2021), while the utilisation of mental health services varies widely across settings. A large share of mothers experiencing mental health difficulties do not self-initiate contact with mental health services and therefore remain untreated. As a result, most existing evidence on maternal mental health interventions is based on selected samples of mothers who have already engaged with mental health care, leaving the population-level effects of interventions for the full population at risk largely unexplored.

In this study we go beyond these limitations and provide evidence on effects of universal frontline healthcare on maternal mental health and subsequent outcomes. Specifically, we leverage the set-up of the Finnish maternity clinic system (Neuvola), where visits are free, universal, and not initiated by patients for mental health purposes. Maternal nurses nevertheless carry out mental health screening, coaching, and therapy for mothers. These scheduled visits are highly intensive: visits last 40–60 minutes and occur around ten times during pregnancy. These universally attended visits mitigate the selection issues faced by previous studies of mental health interventions.

However, examining the quality and impact of maternal nurses remains challenging. First, there is often sorting between the quality of maternity care services and the socioeconomic status of families. Second, visits are often carried out by multiple health professionals, with limited high-quality primary care data available to document these interactions. We take advantage of within-clinic exogenous assignment between nurses and mothers, whereby mothers are assigned a single nurse before their first visit and the same nurse follows mothers throughout pregnancy and the

early months postpartum. Since nurses and first-time mothers have no information about each other prior to assignment, we assume that nurse quality is independent of mothers' socioeconomic status and health and mental health history. We use this exogenous variation to first identify variation in nurse quality in terms of preventing maternal depression, and second to examine whether nurses who are more effective at improving mental health also generate improvements in maternal labour market outcomes and child development-related outcomes.

To conduct our analysis, we use extensive linked nurse-mother-child administrative data from the public healthcare system, combined with mother's prescription history, labour market outcomes, benefits claimant history and demographic information. We use data from all first births in Finland during the years 2015-2019. We follow the literature to adopt a Value-Added approach in estimating nurse effectiveness on improving maternal mental health. Our main measure of nurse quality is the mother's probability of not having a mental health diagnosis in the year of birth. These diagnoses are not made by maternity clinic nurses, as nurses do not perform diagnostic duties, and therefore constitute an external measure of maternal mental health status. We use this outcome to study whether there is variation in the quality of the screening, coaching and therapy that nurses provide to all mothers, as reflected in differences in the prevention of mental health diagnoses at the year of birth.

To validate the assumption of quasi-random assignment of first-time mothers within maternity care clinics, we test for systematic correlations between maternal characteristics and the nurse quality. The identifying thought experiment underlying our estimation compares mothers who attend the same clinic and give birth in the same period, but who are assigned to different nurses as a result of routine scheduling practices and capacity constraints that are unrelated to maternal characteristics. We find no evidence of differential sorting on observable demographic, socioeconomic, or pre-pregnancy health and mental health characteristics, supporting the validity of our research design.

After estimating nurse quality in the Finnish maternity care system, we examine

its effects on maternal and child economic and health outcomes and explore potential mechanisms underlying the observed results.We find that nurses vary in their effectiveness in preventing mental health diagnoses. One standard deviation increase in nurse VA reduces a mother's probability of being diagnosed with mental health issues at the year of birth by four percentage points. We find that mothers with a prior history of antidepressant use benefit particularly from exposure to a high value-added nurse. Because these mothers have already had contact with mental health services, the observed reduction in diagnoses around childbirth is unlikely to reflect a decrease in screening or referral and instead points to the role of nurses' coaching and therapeutic support during clinic visits. This is further supported by the fact that mothers who benefit from exposure to a higher value-added nurse also experience sustained improvements in labor market outcomes, including higher employment and lower reliance on sickness benefits in the years following childbirth. Turning to children, we find that maternal exposure to a higher value-added nurse is associated with improved early life outcomes, with children being less likely to receive a developmental disorder diagnoses and making fewer mental health related healthcare visits by age four.

In terms of mechanisms, we find no evidence that the effects of nurse mental health value-added operate through delivery related or immediate physical health channels. Nurse quality has no significant impact on mother's probability of experiencing re-hospitalization, caesarean-section or pre-term birth. Similarly, the improvements in child developmental outcomes do not appear to be driven by physical health at birth, as we find no effects of high VA nurses reducing perinatal diagnoses within the first six months nor on low birthweight. Taken together, these findings suggest that the improvements in maternal labor market outcomes and child developmental outcomes associated with exposure to a higher mental health value-added nurse operate primarily through sustained improvements in maternal mental health.

As a robustness check, we replicate our analysis using an alternative measure of nurse quality based on preventing pregnancy related physical complications, such as pre-eclampsia, gestational diabetes, and hypertension. This physical complication

value-added is not associated with maternal mental health, child mental health or developmental diagnoses, maternal employment, or subsequent sickness benefit claims, indicating that our main results are specific to nurses' mental health value-added rather than reflecting general nurse quality.

Our paper contributes to three related literatures. First, it adds to the literature on maternal mental health, its intergenerational transmission, and the evaluation of interventions aimed at improving it. Existing work has documented the consequences of maternal depression and studied the effects of targeted treatments such as antidepressants and psychotherapy (Baranov et al., 2020; Currie and Zwiers, 2025). We add to this evidence by examining a universal, non patient initiated intervention embedded in routine maternity care services. Specifically, we study variation in the quality of nurse that perform these interactions that all first time mothers receive, rather than interventions that depend on selection into specialized mental health consultations.

Second, our analysis advances the growing literature on healthcare professional quality and its role in shaping patient outcomes. Recent studies estimate value-added for physicians and surgeons using exogenous variation in patient-doctor matches (Currie and Zhang, 2025; Ginja et al., 2025; Stoye, 2025). We extend this approach to maternity clinic nurses, a setting that differs in important ways from those studied for primary care physicians or surgeons. Maternity care is characterized by frequent and sustained contact with patients, a focus on preventive rather than acute care, and a distinct skill and training profile. This setting allows us to quantify the distribution of nurse quality and to assess its consequences beyond immediate clinical outcomes, including mothers' longer run labor market outcomes and children's early life development.

Third, we contribute to the literature on early childhood interventions by focusing on the quality of medical care provided during pregnancy and postpartum as a determinant of child outcomes. A large body of work shows that early life events, environments, and treatments can have sizable effects on later outcomes (Black et al., 2007; Almond et al., 2018), with particularly relevant evidence on conditions dur-

ing pregnancy (Persson and Rossin-Slater, 2018) and early life medical treatments (Almond et al., 2010; Chyn et al., 2021). Related work also has examined the effects of maternity care services primarily through historical expansions of maternity or child health clinics (Bütikofer et al., 2019; Baker et al., 2023; Olkkola, 2025a). We advance this literature by studying the quality of maternity services within a universal maternity care system. We show that, even with near universal take-up, differences in the quality of frontline care during pregnancy can generate meaningful and persistent improvements in health and economic outcomes for mothers and their children.

# 2 Institutions

Finland's healthcare system is based on universal coverage and is primarily publicly financed through taxation, with small co-payments. Healthcare provision is organised largely at the municipal and regional levels. Primary care is delivered through publicly run health centres, while specialised services are provided by regional hospitals overseen by local authorities. A smaller private sector and a system of occupational healthcare complement public provision, but access to essential healthcare services does not depend on private insurance or employment status.

Maternity care in Finland is mainly delivered through the publicly funded maternity and child health clinic system (Neuvola), which provides free and comprehensive prenatal and postnatal services to all expectant mothers. Women are encouraged to contact the maternity clinic immediately after a positive pregnancy test, with the first appointment is typically scheduled between 8 and 10 weeks of gestation. This initial visit is usually conducted by a public health nurse and involves a detailed discussion of the mother's physical and mental health history, pregnancy-related risk factors, and family circumstances. Based on this information, a pregnancy monitoring plan is established. The nurse assigned at the first visit remains the primary provider and follows the mother throughout pregnancy and into the early postnatal period, typically up to four months after childbirth.

During pregnancy, mothers attend a series of regularly scheduled visits, amount-

ing to around twelve appointments in total. Most visits are conducted by the same public health nurse, complemented by two to three shorter consultations with a physician. Nurse visits are long and intensive, usually lasting 40–60 minutes. They include repeated monitoring of physical health indicators such as blood pressure and weight, as well as assessment of foetal growth, movement, and heartbeat. Beyond physical monitoring, nurses devote a substantial portion of each visit to psychosocial support, including guidance on health behaviours, discussions of emotional well-being, management of anxiety and mood changes, psychotherapy, and screening for mental health concerns. When appropriate, nurses refer mothers for laboratory tests, consultations with on-site psychiatrists, or further medical evaluation. All maternity clinic services are provided free of charge.

Importantly for our empirical setting, visits to maternity clinics follow a fixed timetable and are not initiated by mothers for mental health purposes. Mothers are assigned a single nurse before or at the first visit, and neither the nurse nor the mother has prior information about each other at the time of assignment. Mothers are generally not offered the option to switch nurses unless a special request is made for a valid reason.[1] Receipt of the maternity grant is tied to attending maternity clinic check-ups, and although attendance is not formally mandatory, almost all mothers (99 percent) have attended their first visit by week 10 of pregnancy. The median number of maternity clinic visits is around 14.

Almost all births in Finland take place in public hospitals with specialised maternity wards, ensuring standardised and high-quality obstetric care at delivery. Following birth, mothers continue to receive follow-up care through the maternity and child health clinic system, including family coaching aimed at supporting early parenting and child development. The combination of universal access, continuity of care, and detailed administrative records makes the Finnish maternity care system particularly well suited for studying the role of nurse quality in shaping maternal mental health and downstream maternal and child outcomes.

[1]We define switching as cases in which the nurse seen most frequently before birth differs from the nurse assigned at the first visit, conditional on the mother having had more than three pre-birth visits. Approximately 5.5 per cent of mothers meet this definition. The probability of switching is not correlated with maternal age, marital status, pre-pregnancy healthcare costs, mental health visits, mental health diagnoses, or other pre-pregnancy characteristics.

# 3 Data

We use a combination of administrative registers in our analysis. The individuals can be linked across datasets by unique identifiers, allowing also linkage of parents to children.

## 3.1 Healthcare data

The main source of healthcare data for us is the register of Primary Health Care, Avohilmo (THL, 2023). Avohilmo was introduced in 2011 and designed to include all visits to public healthcare, from primary healthcare, including maternity clinics. Due to compatibility issues with IT systems and similar irregularities, the early data includes a lot of missing information for some of the variables. We focus on the period starting in 2015 with better data quality. Today, the register is used for official statistics and other purposes, and the data quality is considered good.

From Avohilmo we observe, among other things, the department visited, the clinic and healthcare provider, the professional that did conducted the visit, actions done during the visit, and possible diagnoses (ICD10) or other codes associated with the encounter (ICPC2).

As a secondary source, we use Hilmo (THL, 2024), the register for inpatient and some forms of specialized care. The data are available for all years, and the quality is in general very good. We use these data to observe some of the outcomes related to birth and complications.

Thirdly, we also use the registry of Reimbursed Drugs from the National Health Insurance Scheme (Aineistokatalogi, 2025). This data includes all drugs reimbursed (which are most of the prescribed and bought drugs). We observe the quality (ATC5-codes) and quantity of the drug, data, and patient identifier. As a register of payments from a single authority, the quality of this data is also good.

Finally, to measure psychotherapy use as an outcome, we add together observed psychotherapy from the public healthcare and psychotherapy reimbursed through the public health insurance, but produced by the private sector. A share of psychotherapy paid entirely by the individuals themselves is not included in these mea-

sures.

## 3.2 Labor market and demographics

The main source of labor market and demographic data for us is the FOLK Basic -module (Tilastokeskus, 2025c). This dataset contains the place of residence, number of children, different categories of earnings, gender, age, marriage status, maternal language, and other background information for the whole population with yearly frequency. We link children and parents using FOLK Child -module (Tilastokeskus, 2025b). In addition, to observe sick leave take-up and some other benefits from FOLK Income (Tilastokeskus, 2025d).

## 3.3 Nurse quality

We measure the value-added of a nurse on mother's mental health using visits and diagnoses (ICD10) information based on the Register of Primary Health Care, Avohilmo. In our analysis, the mental health measure includes all relevant ICD-10 mental health diagnoses recorded in the Avohilmo , covering depressive and mood disorders (F32–F34) as well as anxiety disorders (F40–F41), and ranging from mild to severe conditions. We focus on diagnoses made in the year of childbirth, when interactions with maternity clinic nurses are most intensive and mothers are particularly vulnerable to the onset of mental health conditions. Importantly, these diagnoses are not made by maternity clinic nurses themselves, but by other healthcare providers, and therefore constitute an external measure of maternal mental health that is not mechanically related to nurses' recording or diagnostic practices.

Later in our robustness checks, we use prevention of physical complications as alternative measure for nurse quality, to test if improvement on maternal and child outcomes are driven by nurse general quality rather than nurse quality in mental health prevention. We measure physical complications during pregnancy, using diagnosis codes for pre-eclampsia, gestational diabetes, and hypertension. In our sample, 8.7 per cent of mothers receive a relevant mental health diagnoses around the time of childbirth; round one fifth of mothers experience at least one pregnancy

related physical complication.

### 3.4 Sample

We focus on the sample of mothers giving birth for the first time, since these mother's have little knowledge of the system and nurses, making the assignment of nurses as close to random as possible. We restrict our analysis on visits with non-missing professional ID, clinics withmore than 3 nurses and 100 visits in total. We also exclude nurses with less than 15 visits, and mothers interacted with nurses less than 4 times.

Table A.1 reports summary statistics for mothers in our sample. The average mother is 29.6 years old; 26 percent are married, 78 percent employed, and 50 percent have higher education. Healthcare utilisation prior to childbirth includes 5.3 primary care and 1.9 secondary care visits on average, with relatively few mental health–related visits, although 23 percent have a history of antidepressant use. During pregnancy, mothers attend about 18 maternal clinic visits, roughly 10 of which are with maternal nurses. Table A.2 provides summary statistics on the healthcare supply side. On average, a clinic has around 10 professionals and around 100 mothers each month.

## 4 Methods

### 4.1 Measuring Nurse Quality

To estimate the effect of maternal nurse quality on maternal mental health, we exploit rich sets of linked nurse-mother-child register data and the Finnish maternity care system. Namely, a maternal nurse is assigned to a mother upon her first visit, and this assigned nurse follows this mother throughout her pregnancy and first few months after birth. Given that first-time mothers and nurses have no information on each other, we assume that this allocation is independent of mothers' socioeconomic status and her physical and mental health status prior birth. We will test this assumption in the next section. This as-if random allocation of nurses to mothers is

the key for estimating the effect of nurse quality and maternal and child outcomes. Following the previous literature on teacher- and doctor Value Added, we calculate nurse Value-added using the following formula:

$$y_{ij} = \mu_j + \gamma_{\text{cymf}} + M_m + \epsilon_{ij} \tag{1}$$

Where $y_{ij}$ is an indicator equal to one if mother $i$, assigned to nurse $j$, received a diagnosis for mental health issues at the year of birth. In addition, $\gamma_{\text{cymf}}$ are the clinic-by-year-by-month-by-Finnish fixed effects. This is the essential controls needed for as-if random assignment of nurses. Further, $M_m$ are additional controls for maternal pre-pregnancy characteristics, such as physical and mental health history, age, and education. $\mu_j$ is nurse fixed effects capture nurse quality and form the basis of our value-added estimates. Our estimation captures the setting that two mothers walk into the same clinic upon the same time of first contact. The quality of the nurse her she gets assigned to ,$\mu_j$, should be independent of mother's characteristics.

We then follow the teacher and doctor Value-Added literature, to adjust $\mu_j$ using an empirical Bayes shrinkage factor, $\lambda_j = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_\epsilon^2/n_j}$. Where $\sigma_u^2$ and $\sigma_\epsilon^2$ represent the between- and within-nurse variances respectively in the outcome. $n_j$ is the number of mothers assigned to nurse $j$. This procedure yields shrinkage factor adjusted nurse-level value-added measures that account for sampling error due to differences in the number of mothers assigned to each nurse for which we can calculate our VA for.

## 4.2 Identifying Assumptions

To interpret the effect of nurse quality on maternal and child outcomes in a causal framework, the key identifying assumption under our estimation is conditional random assignment. In particular, conditional on clinic, time of first contact and language, there is no systematic sorting of mothers to nurses by their social economic status and (mental) health history. To test this assumption empirically, we examine the correlation between our nurse VA and a rich set of pre-pregnancy characteristics

that may predict maternal and child outcomes. If there is no systematic sorting between mothers and high-quality maternal nurses measured by their effectiveness in reducing mental health diagnoses, then we should see small and insignificant results in our tests for their correlation. Table 1 shows the estimates for this test. Nurse mental health VA are uncorrelated with any characteristics: all coefficients are close to zero and statistically insignificant. This supports our assumption for the conditional random assignment of maternal nurses to mothers.

## 4.3 Impact on Maternal and Child Outcomes

Finally, we examine the impact of nurse quality on outcomes of mothers and children. We estimate the following regression:

$$w_{ijt} = \beta\Omega_j + \gamma_{\text{cymf}} + M_m + \epsilon_{ijt} \tag{2}$$

Where $w_{ijt}$ is maternal and child outcomes of mother $i$ assigned to nurse $j$ measured at time $t$. $\Omega_j$ is based on a leave-one-out measure in which we exclude individual $i$ from estimation of shrinkage-adjusted nurse VA ($\lambda_j\mu_j$). we apply this step to avoid mechanical correlation when examining the impact of nurse VA on individual $i$'s outcomes. In addition, we standardised and take negative for interpretation such that high VA nurses are more effective at reducing mental health conditions for mothers. Similarly, $\gamma_{\text{cymf}}$ captures the clinic-by-year-by-month-by-Finnish fixed effects, and $M_m$ are additional controls for maternal pre-pregnancy characteristics. Our coefficient of interest $\beta$ captures the effect of a one standard deviation increase in nurse VA on maternal and child outcomes.

Table 1: Correlation between nurses' VA and baseline maternal characteristics

| | (1)<br>VA (mental health) |
|---|---|
| **Panel A. Socio-demographics** | |
| Age | 0.00030 |
| | (0.00344) |
| Income (empl) | 0.00000 |
| | (0.00000) |
| Higher education | -0.00246 |
| | (0.00447) |
| Employed | 0.00525 |
| | (0.00803) |
| Student | 0.01513 |
| | (0.01026) |
| Married | 0.00605 |
| | (0.00435) |
| **Panel B. Pre-pregnancy health** | |
| Inpatient visits | -0.00039 |
| | (0.00058) |
| Total cost | -0.00000 |
| | (0.00000) |
| Outpatient visits | -0.00051 |
| | (0.00033) |
| Outpatient M.H. visits | 0.00306 |
| | (0.00332) |
| Anxiety | -0.00075 |
| | (0.00117) |
| Depression | 0.00142 |
| | (0.00109) |
| Mental health visits (ICPC) | -0.00178 |
| | (0.00251) |
| Mental health diag. (ICD) | -0.00179 |
| | (0.00537) |
| History of antidepressant | 0.00079 |
| | (0.00467) |
| History of therapy | -0.01732 |
| | (0.01695) |
| Observations | 45,834 |
| F | 1.10098 |
| $p$-value | 0.33953 |

*Note.*— Dependent variables are mothers' characteristics relevant to our analysis. Unless otherwise specified, demographic characteristics are measured in the year of birth, and healthcare usage characteristics are measured in the year prior to pregnancy. VA measures are standardised and multiplied by $-1$ such that higher values indicate higher nurse quality: fewer assigned mothers are diagnosed with maternal depression at the year of birth. Controls included in the model but omitted from the table are clinic-by-year-by-month-by-Finnish fixed effects. Standard errors in parentheses are clustered at the clinic level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

# 5 Results

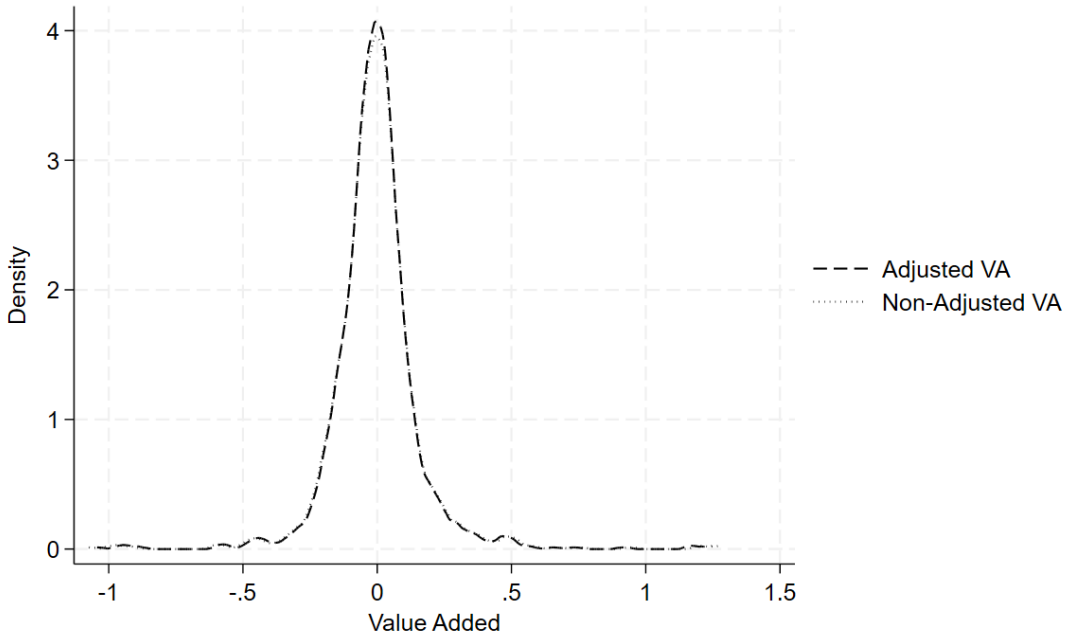
## 5.1 Nurse Quality

Figure 1 shows the distribution of nurse effectiveness on preventing mental health diagnoses, based on our estimation of equation (1). Figure 1 illustrates that there is considerable variation in the distribution of maternal nurse quality within the clinic. In addition, the distributions of Bayesian-adjusted and unadjusted nurse VA are similar to each other.

Using the value-added estimates underlying Figure 1, we find that the standard deviation of nurse VA for maternal mental health is 0.16, with distribution centered at zero by construction. A one standard deviation increase in nurse quality, measured by effectiveness in reducing mental health diagnoses, is associated with a 9.1 percentage point reduction in maternal depression diagnoses around childbirth.

There is sizable and meaningful variation in maternal nurse quality, with clear implications for maternal mental health. Percentile differences highlight this heterogeneity: moving from a median-quality nurse to one in the top quartile of the depression VA distribution reduces depression risk by 9.1 percentage points. These patterns highlight the importance of nurse-specific practice styles and the potential gains from reducing variation in maternal nurse quality.

Figure 1: Distribution of nurse VA




*Note.*— Figure reports the distribution of empirical Bayes–shrinkage adjusted and unadjusted nurse value-added estimated from Equation 1. VA measures are standardised and multiplied by $-1$ such that higher values indicate higher nurse quality: fewer assigned mothers are diagnosed with maternal depression at the year of birth.

## 5.2 Impact on mothers and children

In this section we further investigate the impact of nurse quality on health and economic outcomes of mothers and children, up to 4 years after birth.

### 5.2.1 Mothers

**Maternal mental health around delivery.** Table 2 explores the impact of nurse VA on mental health conditions diagnosed at the year of delivery. Coefficients in tables show the effects of a one standard deviation increase in nurse VA on the outcome of each column.

Table 2 focuses on the effect of nurse VA on preventing maternal mental health conditions. Column (1) indicates that a one standard deviation increase in nurse quality ,measured by effectiveness in preventing depression, decrease such diagnoses by around 4.0 percentatage point (45.7 % relative to baseline mean) during the year of delivery. This effect is in particular strong for those with antidepressant history before their pregnancy. Given that such individuals have already previously interacted with mental health services before pregnancy, a stronger effect among these mothers is indicative of good nurses are good at improving true mental health status rather than solely lack of detecting and referring role for mother's mental health.

**Median-term mental health.** Next, we investigate whether mental health effective maternal nurses are able to have lasting positive effect on mental health of mothers beyond the year of delivery. Figure 2 shows the effect of nurse VA on mothers' mental health diagnoses, psychotherapy and antidepressant use up to 4 years after birth.

Figures (a) indicates nurses who are good are reducing diagnoses during the year of birth for mothers, have persistent significant positive effect up to 2 years after birth. One standard deviation increase in nurse VA reduces diagnoses by 5.0 percentage point (year 1) and 2.6 percentage point (year 2) respectively relative to a baseline mean 10.1. Given mothers's last scheduled visit ends with maternal clinic at around 4 months after birth, we interpret the reduction of mental health diag-

noses at year 1 and 2 after birth manifesting an improvement in maternal mental health. This is also supported by the reduction in psychotherapy use for mothers. Specifically, one SD increase in nurse VA reduces cumulative number of therapy use by 0.63 times (17.1%) by year 4, relative to a baseline mean 3.7 sessions.

**Labour market and welfare.** Finally, we explore whether the improvement on mental health outcomes for mothers translate into further improvement on labour market outcomes and reduction in benefits claims. Figure 3 highlights that mothers assigned to nurses that are effective in reducing maternal depression (measured at the year of delivery) see a reduction in sickness benefit claims. This effects persist for 4 years: from year of delivery to 3 years after birth. A one standard deviation increase in nurse VA reduces probability of claiming sickness benefits by 0.8 percentage point at 3 years after birth. That is around 18.7% reduction relative to a baseline mean of 9.7%.

Similarly, for employment we observe a small positive effect for nurses that are effective at preventing maternal depression. One standard deviation increase in nurse VA increases the probability of employment by 1.2 ppt (1.6%) at 4 years after birth.

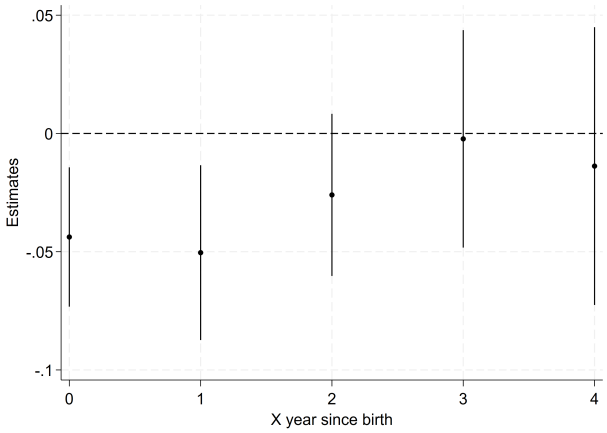
Table 2: Effects of Nurse VA on Mental Health Outcomes

| | (1) Depression | (2) Depression | (3) Depression |
|---|---|---|---|
| VA(depression) | -0.040*** | -0.038*** | -0.048*** |
| | (0.006) | (0.006) | (0.007) |
| VA * Higher Edu. | | 0.004 | |
| | | (0.004) | |
| VA * No Antidepressant History | | | 0.011** |
| | | | (0.006) |
| FE + Controls | Yes | Yes | Yes |
| Mean dep. var. | 0.087 | 0.087 | 0.087 |
| Pct. effect | -45.667 | -43.550 | -55.291 |
| N | 45,834 | 45,834 | 45,834 |

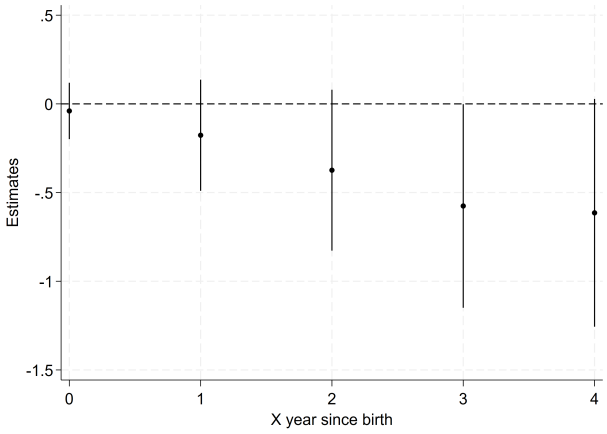
*Note.*— Estimates based on equation 2. VA measures are standardised and multiplied by $-1$ such that higher values indicate higher nurse quality: fewer assigned mothers are diagnosed with maternal depression at the year of birth. Controls included in the model but omitted from the table are clinic-by-year-by-month-by-Finnish fixed effects and additional mother-level controls such as age, education and mental health history. Standard errors in parentheses are clustered at the clinic level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 2: Effects of Nurse Value-Added on Maternal Mental Health Outcomes

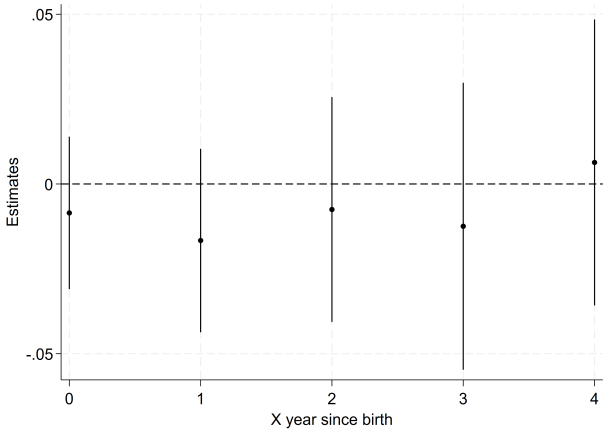
*A. ICD Diagnoses*




*B. Treatment – Psychotherapy*



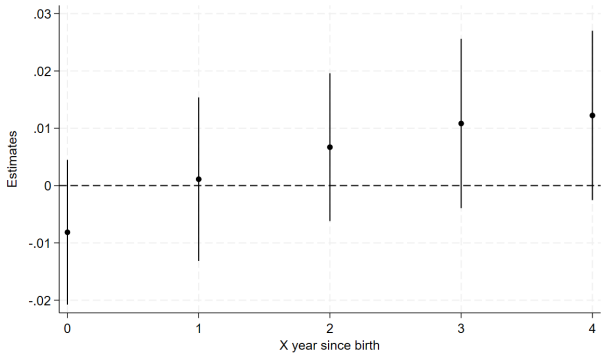

*C. Treatment – Antidepressants*



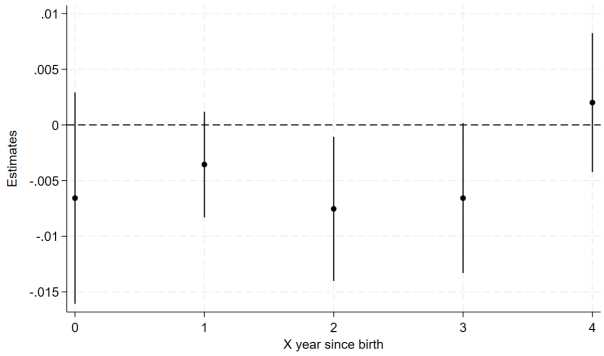

*Note.* Estimates based on equation 2. Each figure shows the effect of nurse value-added on three maternal mental-health outcomes (ICD diagnoses, cumulative use of therapy and antidepressant. VA measures are standardised and multiplied by −1 such that higher values indicate higher nurse quality: fewer assigned mothers are diagnosed with maternal depression at the year of birth. Controls included in the model but omitted from the table are clinic-by-year-by-month-by-Finnish fixed effects and additional mother-level controls such as age, education and mental health history. Standard errors in parentheses are clustered at the clinic level. The vertical lines indicate 95 percent confidence intervals.

Figure 3: Effects of Nurse Value-Added on Labour Market and Benefits Claims

(a) Sick leave benefits claims




(b) Employment




*Note.* Estimates based on equation 2. Figure shows the effect of nurse value-added on probability of employment and sickness benefit claims of mothers.VA measures are standardised and multiplied by $-1$ such that higher values indicate higher nurse quality: fewer assigned mothers are diagnosed with maternal depression at the year of birth. Controls included in the model but omitted from the table are clinic-by-year-by-month-by-Finnish fixed effects and additional mother-level controls such as age, education and mental health history. Standard errors in parentheses are clustered at the clinic level. The vertical lines indicate 95 percent confidence intervals.

### 5.2.2 Children

In previous sections, we have learned that nurses vary in their effectiveness in preventing maternal mental health conditions, and this quality variation can further affect maternal outcomes. In particular, mental health effective nurses can have further positive impact on maternal mental health and labour market outcomes up to 4 years after birth. Given the inter-generational transmission of mental health bewteen mothers and children, in this section we explore the impact of nurse VA on children's developmental and mental health.

Children in our sample are followed from birth to age four, and we examine early-life developmental and mental health–related diagnoses recorded in ICD-10. Developmental diagnoses include conditions such as disorders of speech and language (F80), developmental coordination disorder (F82), and childhood autism (F84), which capture early delays in communication, motor skills, and social functioning. We also track mental health–related diagnoses that tend to emerge in early childhood, including emotional and anxiety disorders (F93) and behavioural disorders (F90–F92). These diagnoses reflect clinically observed difficulties during early development and provide an early indicator of children's socio-emotional and cognitive wellbeing.

Table 3 column (1) and (2) show estimates on the effects of nurse VA on child development and mental health outcomes. For the nurses that are effective in reducing maternal depression, we observe a positive impact on children's development and mental health outcomes. In particluar, we see one standard deviation higher VA nurse reduces probability of being diagnosed with developmental-related conditions by age of 4, by 0.6 percentage point. This effect is significant and represents a 25.6% reduction from baseline mean of 2.5%. Similarly, we observe nurses who are good at improving maternal mental health, significantly decreases proabability of children visiting mental health department by age 4, by 0.5 percentage point (16.9%).

Next, we answer the question of whether the impact on child development from high mental health VA nurse come through the channel of better physical health outcomes for children at birth. Table 3 column (3) and (4) reports the effects of

nurse value-added on child health outcomes at birth. We find no evidence that either dimension of nurse VA affects children's early physical health. Specifically, neither perinatal-period diagnoses within the first six months nor pre-term birth rates respond significantly to assignment to a higher-quality nurse. The point estimates are small and statistically indistinguishable from zero. These results indicate that the downstream improvements we observe in children's later development and mental health are unlikely to operate through channels related to physical health at birth. Instead, they suggest that maternal mental health support during pregnancy influences child outcomes through other pathways, rather than through improvements in neonatal health.

Table 3: Effects of Nurse Value-Added on Child Outcomes

| | Child development and mental health | | Child health at birth | |
|---|---|---|---|---|
| | Child dev. diagnosis | Mental health dept. visits | Perinatal diagnoses ($\leq$ 6 months) | Pre-term birth |
| | (1) | (2) | (3) | (4) |
| | -0.006*** | -0.005** | -0.054 | -0.005 |
| | (0.002) | (0.003) | (0.121) | (0.004) |
| FE + Controls | Yes | Yes | Yes | Yes |
| Mean of dep. var. | 0.025 | 0.031 | 1.254 | 0.047 |
| Percentage effect | -25.695 | -16.989 | -4.291 | -10.256 |
| N | 45,834 | 45,834 | 45,834 | 45,834 |

*Note.*— Estimates are based on Equation 2.VA measures are standardised and multiplied by $-1$ such that higher values indicate higher nurse quality: fewer assigned mothers are diagnosed with maternal depression at the year of birth. Controls included in the model but omitted from the table are clinic-by-year-by-month-by-Finnish fixed effects and additional mother-level controls such as age, education and mental health history. Standard errors in parentheses are clustered at the clinic level. The vertical lines indicate 95 percent confidence intervals.

# 6 Discussion

**Maternal outcomes are not driven by improved delivery outcomes.** We have shown that nurses who are more effective at preventing maternal mental health diagnoses in the year of birth generate persistent improvements in maternal mental health and labour market outcomes. A natural question is whether these gains operate through improved delivery outcomes, such as mode of delivery, maternal re-hospitalisation, pre-term birth.

Table A.3 reports the effects of nurse value-added on delivery outcomes. Column (1) shows no statistically significant effect on maternal re-hospitalisation, while column (2) indicates no effect on the likelihood of Caesarean delivery. Columns (3) and (4) show that nurse value-added is not associated with pre-term birth or low birthweight. Overall, the estimates suggest that the positive effects of high mental-health value-added nurses on maternal mental health and subsequent labour market outcomes are not driven by improvements in delivery or immediate birth outcomes.

**Effects driven by mental health-specific value-added.** Next, we examine whether the improvements in maternal mental health generated by high mental health value-added nurses reflect mental health-specific quality or broader nurse quality. As a robustness check, we replicate our analysis using an alternative measure of nurse quality based on effectiveness in preventing pregnancy-related physical complications. We focus on common complications, including pre-eclampsia, gestational diabetes, and hypertension. While we observe similar within-clinic variation in nurse quality along this dimension, physical health value-added has no significant effects on maternal mental health, child mental health or developmental diagnoses, maternal employment, or subsequent sickness benefit claims. These findings indicate that our main results are specific to nurses' mental health value-added rather than reflecting general nurse quality. The corresponding results are reported in Figures A.1 and A.2. These findings suggest that improvements in maternal and child outcomes are driven by nurses' mental health–specific quality rather than general nurse quality.

# 7 Conclusion

We study the role of maternity clinic nurses in improving maternal mental health and its longer run consequences for mothers and children. Leveraging the institutional features of Finland's universal maternity care system, with quasi-random assignment of first-time mothers to nurses within clinics, we estimate nurse mental health value-added based on the prevention of maternal mental health diagnoses around childbirth.

We document substantial variation in nurses' effectiveness at preventing maternal mental health diagnoses. Exposure to a higher mental health value-added nurse significantly reduces the probability that a mother receives a mental health diagnosis in the year of birth. These effects are particularly large for mothers with a prior history of antidepressant use, a group that has already had contact with mental health services. For these mothers, the reduction in diagnoses is unlikely to reflect differences in screening or referral and instead points to the role of sustained coaching and therapeutic interactions during routine maternity visits.

Improvements in maternal mental health persist beyond the year of childbirth and translate into economic outcomes. Mothers exposed to higher value-added nurses experience higher employment and reduced reliance on sickness benefits for several years after birth. These maternal mental health improvements also extend to children. Children whose mothers were assigned to higher mental health value-added nurses are less likely to be diagnosed with developmental disorders and have fewer mental health-related healthcare visits by age four.

We find no evidence that these effects operate through delivery-related or immediate maternal physical health channels. Nurse mental health value-added has no impact on re-hospitalisation, cesarean section, preterm birth, low birthweight. A robustness analysis using an alternative nurse value-added measure based on preventing physical pregnancy complications yields no effects on mental health, the labour market, or child outcomes. Taken together, these results indicate that the benefits of high-quality nurses operate primarily through sustained improvements in maternal mental health rather than through physical health at birth or general

nurse quality.

Our findings have clear policy implications. Even within a universal maternity care system with near-universal take-up, differences in the quality of maternal nurse interactions matter. Strengthening mental health training for maternity nurses or reallocating more effective nurses toward mothers at higher risk could generate lasting improvements in maternal well-being, labor market attachment, and child health and development. More broadly, our results highlight the importance of frontline healthcare workers in delivering effective mental health support at scale, particularly in settings where formal mental health services are under-utilised.

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# A Appendix

Table A.1: Summary statistics: mother

| | Mean | S.D. |
|---|---|---|
| Age | 29.60 | 5.25 |
| Married | 0.26 | 0.44 |
| Household size | 2.17 | 0.74 |
| Employed | 0.78 | 0.42 |
| Higher education | 0.50 | 0.50 |
| Finnish language | 0.86 | 0.35 |
| N. secondary care visits (year) | 1.87 | 5.60 |
| N. primary care visits (year) | 5.28 | 7.85 |
| N. walk-in primary care visits (year) | 0.61 | 1.60 |
| N. primary care mental health department visits (year) | 0.13 | 1.66 |
| Taken antidepressant before childbirth | 0.23 | 0.42 |
| N. maternal clinic visits | 18.21 | 5.39 |
| N. maternal clinic visits to maternal nurses | 10.11 | 4.38 |
| Obs | 45,834 | 45,834 |

*Note.*— This table presents summary statistics of mothers' characteristics relevant to our analysis. Unless otherwise specified, demographic characteristics are measured in the year of birth, and healthcare usage characteristics are measured in the year prior to pregnancy.

Table A.2: Summary Statistics: Clinic and nurse-level

| | (1) Clinic | (2) Nurse |
|---|---|---|
| Number of professionals in a clinic (month) | 9.98 | |
| | (15.57) | |
| Number of mothers a clinic sees (month) | 100.37 | |
| | (97.39) | |
| Number of mothers a clinic sees (day) | 6.70 | |
| | (4.856) | |
| Number of mothers a professional sees (month) | | 22.54 |
| | | (11.17) |
| Number of mothers a professional sees (day) | | 2.59 |
| | | (0.896) |
| Observations | 236 | 1405 |

*Note.*— This table presents summary statistics of maternal clinic and nurse characteristics relevant to our analysis. Descriptive statistics are based on data from 2015–2019.

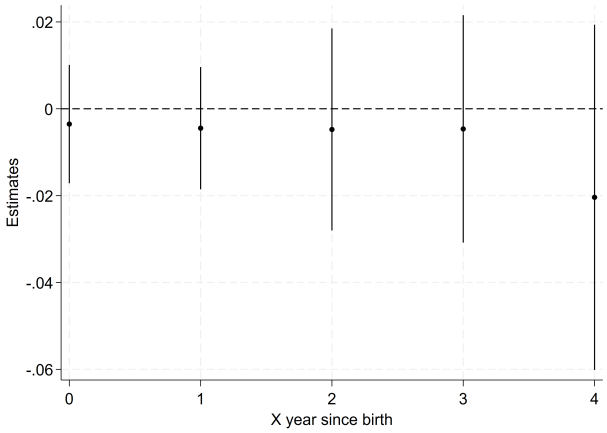
Table A.3: Effects of Nurse VA on Delivery Outcomes

| | Re-hospitalisation (1) | C-section (2) | Pre-term (3) | Low birthweight (4) |
|---|---|---|---|---|
| | -0.006 | 0.005 | -0.005 | -0.001 |
| | (0.007) | (0.005) | (0.004) | (0.003) |
| FE + Controls | Yes | Yes | Yes | Yes |
| Mean of dep. var. | 0.275 | 0.135 | 0.047 | 0.031 |
| Percentage effect | -2.175 | 4.078 | -10.256 | -3.439 |
| N | 45,834 | 45,834 | 45,834 | 45,834 |

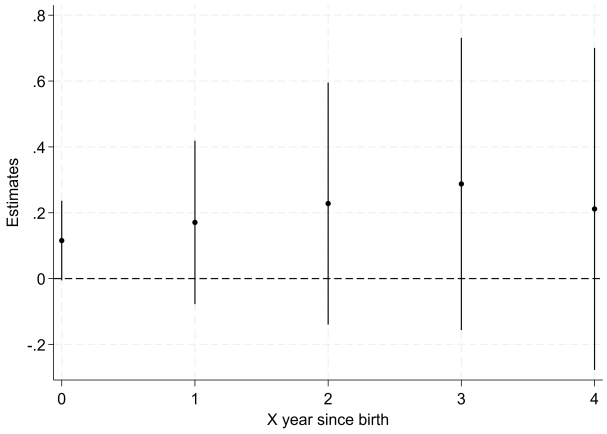
*Note.*— Estimates are based on Equation 2. VA measures are standardised and multiplied by $-1$ such that higher values indicate higher nurse quality: fewer assigned mothers are diagnosed with maternal depression at the year of birth. Controls included in the model but omitted from the table are clinic-by-year-by-month-by-Finnish fixed effects and additional mother-level controls such as age, education and mental health history. Standard errors in parentheses are clustered at the clinic level.
$^{*}$ $p < 0.1$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

Figure A.1: Effects of Nurse Value-Added (Physical) on Maternal Mental Health Outcomes

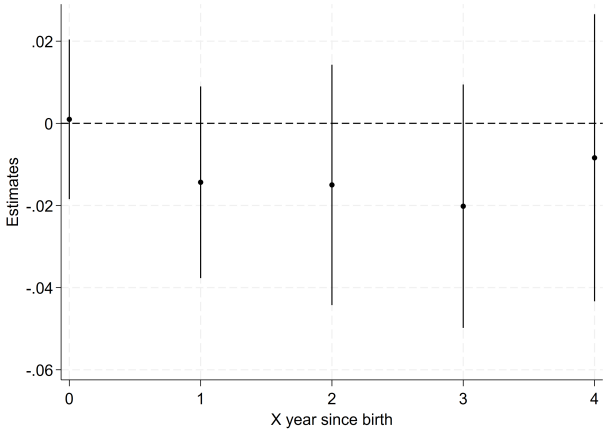
*A. ICD Diagnoses*




*B. Treatment – Psychotherapy*



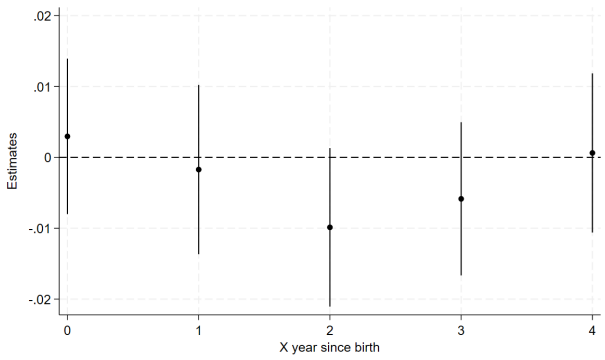

*C. Treatment – Antidepressants*



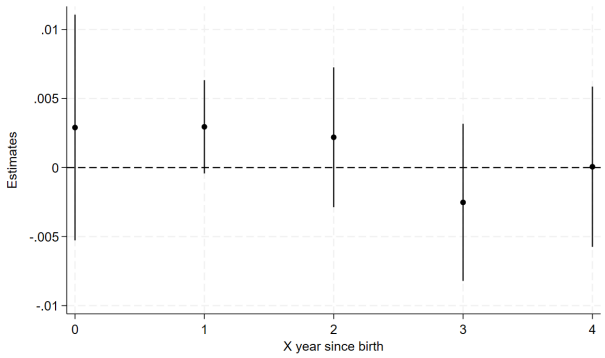

*Note.* Estimates based on equation 2. Each figure shows the effect of nurse value-added on three maternal mental-health outcomes (ICD diagnoses, cumulative use of therapy and antidepressant. VA measures are standardised and multiplied by −1 such that higher values indicate higher nurse quality: fewer assigned mothers are diagnosed with maternal depression at the year of birth. Controls included in the model but omitted from the table are clinic-by-year-by-month-by-Finnish fixed effects and additional mother-level controls such as age, education and mental health history. Standard errors in parentheses are clustered at the clinic level. The vertical lines indicate 95 percent confidence intervals.

Figure A.2: Effects of Nurse Value-Added (Physical) on Labour Market and Benefits Claims

(a) Sick leave benefits claims




(b) Employment




*Note.* Estimates based on equation 2. Figure shows the effect of nurse value-added on probability of employment and sickness benefit claims of mothers. VA measures are standardised and multiplied by $-1$ such that higher values indicate higher nurse quality: fewer assigned mothers are diagnosed with maternal depression at the year of birth. Controls included in the model but omitted from the table are clinic-by-year-by-month-by-Finnish fixed effects and additional mother-level controls such as age, education and mental health history. Standard errors in parentheses are clustered at the clinic level. The vertical lines indicate 95 percent confidence intervals.