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Health care utilisation and measles, mumps, rubella vaccination rates among children with an extended postnatal home visiting programme in a disadvantaged area in Stockholm, Sweden – a three-year follow-up

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Key notes

- The study assessed the impact at 36 months of an extended postnatal home visiting programme in a disadvantaged area.
- Vaccination rates for measles, mumps and rubella vaccination increased, overall health care utilisation was similar in intervention and control groups, but children receiving six home visits had lower use of inpatient care and emergency care than those receiving fewer home visits.
- Further studies are needed with larger samples and longer follow-up.

List of abbreviations used

CHC	Child Health Care
ISRCTN	International Standard Randomised Controlled Trial Number
MMR	Measles, mumps, rubella (vaccine)
SPSS	Statistical Package for the Social Sciences
WHO	World Health Organization

Abstract

Aim: To follow-up health care utilisation and measles, mumps and rubella (MMR) vaccination rates among children 0-36 months, receiving an extended postnatal home visiting programme in a disadvantaged area with poorer child health, and in control groups, in Stockholm, Sweden.

Methods: We analysed electronic child health records regarding outpatient visits, inpatient episodes and MMR vaccination for children 0-36 months receiving the home visiting programme (Intervention Group) and in control groups (Control Group and Rinkeby Comparison Group).

Results: Children in the Intervention Group had significantly higher MMR vaccination rate than children in the Rinkeby Comparison Group. Health care utilisation was similar in the Intervention Group and the control groups. In stratified analyses by number of home visits received, children receiving the recommended six home visits had significantly fewer inpatient episodes and somewhat fewer emergency visits than those receiving fewer home visits.

Conclusion: The extended home visiting programme had a positive impact on the MMR vaccination rate. Children receiving the recommended six home visits had lower use of inpatient care. In addition to being positively perceived by parents in an area with greater health care needs, the programme may have a positive impact on their children's health care utilisation.

BACKGROUND

In spite of the well-developed welfare system in Sweden, health inequalities prevail and in some aspects increase (1). In the residential area Rinkeby in Stockholm municipality, a large proportion of the residents are recent immigrants and about 95% of the children have foreign background (2). Compared to other areas in Stockholm county, the mean age is lower, a lower proportion of the adult population are gainfully employed and the proportion of households with children receiving social assistance is three times higher than the average. Residents of Rinkeby report lower health-related quality of life and a higher proportion report limiting longstanding illness, compared to the average (2). Child health in Stockholm county partly mirrors the inequalities observed for adults. Children growing up in disadvantaged areas face more difficult circumstances and have poorer health than other children. More than half (61%) of the children in Rinkeby live in households with low purchasing power, the proportion of mothers with low education is three times higher than the county average (3). Children's exposure to tobacco smoke is higher, the rate of overweight and obesity at 4 years of age and the prevalence of dental caries at 3 years of age is higher than the county average (3). Vaccination rates for measles, mumps and rubella (MMR) among children born 2013 were lower in Rinkeby than the average (82% compared to 96%) (3). In addition, among children born 2010-2015, the rate of child health services reporting children to social services, was 6.0 per 1000 in Rinkeby compared to 2.6 per 1000 in Stockholm County Council as a whole (3).

Hence, extra efforts and resources would be needed in order to meet the greater health needs in the population in disadvantaged areas. However, in terms of resource allocation this has not been recognised by Stockholm County Council. The reimbursement system in child health provides the same amount for each child, regardless of area of residence.

Postnatal home visiting programmes

There is considerable scientific support in the literature for positive effects of targeted postnatal home visiting, with regards to mental health, reduced social assistance dependency and increased mastery among mothers, and improved interaction between mothers and children (4,5). This type of intervention has also been noted to have positive effects among children, e.g. reducing emotional vulnerability at age 6 months, less language delays at 21 months and increased mental development at 24 months (5). Furthermore, in a population with high poverty rates, this type of intervention was shown to lower utilisation of emergency care and to improve family outcomes at

child's age 6 months (6). In a review of studies, home visiting programmes were found to be potentially beneficial to high-risk families with children (7).

A recent Lancet Review series on early childhood development (8-10) has found evidence of positive impact on children's health, of interventions directed to the whole family, integration of health and social care, especially for young children, providing what is referred to as nurturing care. Nurturing care implies a holistic approach, focusing not just on the child but on the whole family, from pre-conception to delivery and early childhood, and should include necessary elements (health, including vaccinations, responsive care giving, nutrition, safety and intellectual stimulation) and should integrate different actors (8-10).

The Rinkeby extended home visiting programme

In view of the greater needs of support for parents in disadvantaged areas, an application for a project of an extended postnatal home visiting programme to first-time parents was done jointly by Stockholm County Council Child Health Services, the local social services in Rinkeby-Kista, Stockholm municipality, and the Department of Public Health Sciences at Karolinska Institutet. The application was in response to a call from the Public Health Agency of Sweden, on improving conditions for children growing up in risk environments.

The project started in September 2013, the recruitment of participants ended in February 2015 and participating families received home visits until the child was about 15 months old. The objective was to support the parents in their new role, thereby improving their parental efficacy and health, which would also positively affect children's health and growth. The extended postnatal home visiting programme became permanent in 2017.

The study design, programme logic and evaluation plans have previously been described in a study protocol (11). The study has been registered in the ISRCTN registry (ISRCTN11832097 DOI 10.1186/ISRCTN11832097). Ethical permission for the study for the project duration was granted by the Regional Ethics Committee, Stockholm (Dnr 2013/877-31/1), and for an extended time for follow-up of medical records until the child reaches the age of six years (Dnr 2014/1773-32). Informed consent has been obtained from parents for participation in the study.

The extended postnatal home visiting programme was based on the Swedish National Child Health Programme (12). The objective of the national programme is to monitor the health of each child up to age 6 years and consists of a series of scheduled visits to Child Health Care (CHC) nurses and doctors. At the time of the study, all parents in Sweden with a newborn child were offered one home visit by a CHC nurse when the child is about two weeks old. In the project, parents participating in the extended home visiting programme were offered an additional five home visits by a CHC nurse together with a parental advisor from social services, when the child was aged from 2 to 15 months of age. Hence, the total number of planned home visits in the project was six visits. An interview with the parents was held at the beginning and at the end of the home visits, when their child was 2 months and 15 months, respectively.

In terms of design, the extended home visiting programme was considered as an area-based intervention, and participation was not randomized, but offered to all first-time parents with newborn children attending Rinkeby CHC (12). Families with first-born children attending neighboring CHCs served as controls. They received the standard programme with one home visit by the CHC nurse and were also interviewed when their child was 2 months and 15 months, respectively.

The content of the home visits in the project has been described (11), and analysed (13) elsewhere. The content follows the National Child Health Programme, and the visits have age-relevant themes (e.g. attachment, nutrition, sleep, safety) but the focus of each visit is largely driven by questions from the parents. The emphasis is on health promoting aspects, the CHC nurse and the parental advisor complement each other's skills and expertise. Parents are also informed about self-management of illness and when and how to seek health care, and about opportunities for child day care.

In previous reports evaluating the extended home visiting programme, both parents and participating staff have been very satisfied (12,14). The participation rate among mothers and fathers has been high, and the programme has been appreciated among both mothers and fathers (15). The content of the home visits corresponds to the concept of nurturing care (13), as recommended by the WHO Commission on Social Determinants of Health (17), and can be seen as an example of practicing proportionate universalism (11,16), that is, providing a universal service but with an intensity proportionate to need.

Hypothesised effects of extended postnatal home visiting programmes on health care utilisation

Extended postnatal home visiting programmes have been shown to reduce utilisation of emergency care. In a study by Dodge et al, a 4 to 7 session programme to newborns reduced the number of total emergency medical episodes up to age 6 months by 59 per cent (6).

Postnatal home visiting may be hypothesised to have different effects on health care utilization.

a) It may increase the utilisation of health care overall, as parents become more aware of and sensitized to the health problems and symptoms of their children
b) It may increase the utilisation of health care at the local level, as parents learn where to turn with less serious health problems
c) It may reduce the utilisation of emergency specialist in-patient and outpatient care, as parents' knowledge of symptoms and treatment increases, and as their trust in local health services increases
d) It may reduce the number of visits to outpatient services, because of an increased knowledge and ability among parents to care for their children themselves

The aim of the present study was to follow-up health care utilisation and measles, mumps and rubella (MMR) vaccination rates among children 0-36 months, receiving an extended postnatal home visiting programme in a disadvantaged area with poorer child health, and in control groups, in Stockholm, Sweden.

PATIENTS AND METHODS

The study was a longitudinal follow-up of health care utilization up to 36 months of age, among first-born children receiving the extended postnatal home visiting programme at Rinkeby CHC (Intervention Group), compared with first-born children attending neighboring CHCs and receiving care according to the standard child health programme during the same time period (Control Group). During the course of the study, families in the Intervention Group were found to differ in their socioeconomic composition from families in the Control Group. In both groups, mothers were mainly immigrants from more than 30 countries, but in the Intervention Group about one third came from Somalia, compared to six per cent in the Control Group. The level of education was lower in the Intervention Group, with 38 per cent having less than nine years of education, compared to six per cent in the Control Group (12). Therefore, in addition to the Control Group, first-born children attending Rinkeby CHC in 2012/2013 before the extended home visiting programme was started, also served as a comparison group (Rinkeby Comparison Group). The health care records of the Rinkeby Comparison Group were analysed for the same outcomes as the Intervention Group and the Control Group, following ethical approval (Dnr 2018/550-32). The intervention started in September 2013 and went on until December 2014.

In the Intervention Group, out of a total of 119 families who were offered to participate in the extended home visiting programme, eleven families moved out before the first interview, and seven families declined participation. A total of 101 families (94%) in the Intervention Group accepted to participate, compared to 92 of 122 families (75%) in the Control Group. The population in both Rinkeby and control areas is quite mobile, with high rates of moving out. In both the Intervention and Control Group, 80% of the children (81 of 101 and 74 of 92 children, respectively) could be followed up until 36 months of age. In the Rinkeby Comparison Group, 91% (106 of 117 children) could be followed up until age 36 months. The reasons for loss to follow-up were mainly that the family had moved out of the area and/or could not be followed in electronic health care records.

Children in the three groups were followed up in electronic health care records, with respect to the mean number of visits made to the emergency ward, to primary care, primary care out of hours, pediatric specialists, and for inpatient episodes (excluding neonatal care), up to 36 months of age. MMR vaccination rates were obtained from CHC records.

Children in the Intervention Group were compared to children in the Control Group and to children in the Rinkeby Comparison Group. Additional analyses were made within the Intervention Group, by the number of actually received home visits.

Analyses of categorical data (vaccination) were done using Chi Square test. Numerical data were not normally distributed and were analysed with non-parametric tests. The Mann Whitney U-test was used to investigate differences in the distribution of health care utilization between the groups. SPSS was used for the statistical analyses, statistical significance was at the 5% level.

RESULTS

There were no statistically significant differences when analysing the whole age group 0-36 months, except for children in the Intervention Group having a higher rate of visits to primary care out of hours (p=0.009), and that children in the Intervention Group had higher MMR vaccination rate than children in the Rinkeby Comparison Group (p=0.019). The mean number of total outpatient visits was similar in all three groups (Table 1).

Among children aged 0-18 months, the only statistically significant difference in the rate of health care visits was that children in the Intervention Group had significantly more visits to primary care out of hours (p=0.016) than children in the Control Group (Table 2).

Among children aged 18–36 months (Table 3), children in the Intervention Group had significantly fewer visits to pediatric specialists (p=0.041) than children in the Control Group. Children in the Intervention Group had significantly higher MMR vaccination rate compared to children in the Rinkeby Comparison Group (p=0.019). The MMR vaccination rate in the Intervention Group was very similar to that in the Control Group.

Stratified analyses were also done within the Intervention Group, by the number of home visits actually received (Table 4). Among the 81 families, 23 had five or less visits; 44 had six visits; and 14 families had seven or more visits. Children who had received the recommended six home visits had fewer inpatient episodes (p=0.011) and fewer emergency care visits (not statistically significant) than children who had fewer home visits.

Compared to children in the Control Group, children with six home visits had a lower rate of emergency visits (borderline statistical significance, p=0.062). There were no statistically significant differences compared to children in the Rinkeby Comparison Group.

DISCUSSION

We found some, but little, empirical support for the hypothesised effects of the extended home visiting programme on health care utilization. In the analysis for the whole follow-up time (0-36 months) there were few statistically significant differences between children in the Intervention Group and children in the Control Group, and between children in the Intervention Group and children in the Rinkeby Comparison Group, in the overall analysis. Although the Control Group was selected from among areas geographically neighboring to Rinkeby, the Control Group in some aspects (e.g. level of education, gainful employment among parents) was less disadvantaged than the Intervention Group. As this may make comparison more difficult, it was one reason to include also the Rinkeby Comparison Group.

One main finding of the study was a higher MMR vaccination rate in the Intervention Group, statistically significantly higher than in the Rinkeby Comparison Group, and at a similar level as in the Control Group. MMR vaccine coverage has previously for many years been lower among children in Rinkeby than in other areas (3), and it is promising to observe a higher vaccination rate among children in the Intervention Group, as this was also discussed in the home visits. Postnatal home visiting may increase the knowledge of parents regarding the benefits (and possible drawbacks) of vaccination. Parents' trust in local health workers, established through a longer relationship during the extended home visiting programme, is likely to reduce parental hesitancy toward vaccines. There were also two information meetings, to raise vaccination rates overall in Rinkeby, but gathering few participants.

In the analysis 0–36 months, children in the three groups studied had very similar total numbers of visits and inpatient episodes. Children 0-36 months in the Intervention Group had significantly more visits to primary care than children in the Control Group. In the first 18 months, children in the Intervention Group had a higher (not statistically significant) mean total number of visits than children in the Control Group and children in the Rinkeby Comparison Group. At age 18–36 months, children in the Intervention Group on the other hand had a lower (not statistically significant) mean total number of visits than children in the Control Group and children in the Rinkeby Comparison Group, and significantly lower rate of visits to pediatric specialist care than children in the Control Group. The rate of inpatient admission (18–36 months) was higher among

children in the Control Group and in the Rinkeby Comparison Group, than among children in the Intervention Group, but these differences were not statistically significant. The major reasons for seeking care (respiratory infections and fever, gastrointestinal problems and skin disorders) were similar among children in the Intervention Group and in in the Control Group).

Inpatient episodes and emergency care visits by number of home visits

When stratifying children within the Intervention Group by the number of home visits received, children (0–36 months) in families who had received six home visits had a significantly lower rate of inpatient episodes compared to children having fewer home visits, 0.11 and 0.39, respectively ($p=0.011$). Children in the Intervention Group who received six home visits also had a somewhat lower rate of emergency care visits compared to children in the Control Group, 1.23 compared to 1.81 ($p=0.062$).

These findings may be related to our hypotheses regarding the impact of the extended home visiting programme. We expected children receiving home visits to have less emergency specialist care and inpatient care. However, this was observed only among those children receiving six home visits. Previous studies (6,18) have found larger effects of nurse home visiting programmes focusing on the first six months and up to 12 months of age. These studies observed up to a 50–59% lower rate of infant emergency ward care (a composite measure combining emergency outpatient and inpatient care), mainly driven by fewer inpatient nights (6,18). However, it should be remembered that in our study, the control groups received the standard Swedish National Child Health Programme of scheduled clinic visits, including one home visit, while this was not the case in the American studies (6,18). Therefore, a smaller difference might be expected in our study between the intervention and control groups.

The total number of outpatient visits was similar in all three groups compared. This may be due to the high burden of disease and ill health among disadvantaged populations, and home visiting and discussions with health care staff may increase the parents' awareness of health problems and the rate of seeking care. As extra home visits, over and above six visits, were provided according to need, the group receiving more than six home visits may have been in greater need of care, and therefore made more outpatient visits. The group receiving less than six home visits may have moved out from the area before completing the home visiting programme. It may also suggest that fewer than six home visits is less effective than the full programme.

The observed differences in health care visits among children in the Intervention Group and in the Control Group may be partly due to the impact of the extended home visiting programme. During the home visits, there is ample time to discuss advice on self-management as well as when, where and for what condition to seek health care. Nevertheless, the results reported here should be interpreted with caution. The sample size was very small in all the three groups studied which limits the statistical power, and the few differences observed are quite small. There may also be other factors to explain the differences found between children participating in the programme and children in control areas, such as changes in the access to local health care facilities, which may have affected the pattern of utilisation of health care services.

In summary, results of the follow-up study suggest a positive impact on MMR vaccination rates among children in the Intervention Group compared to the Rinkeby Comparison Group, and some positive impact on emergency care visits and inpatient episodes among children who received six home visits. Previous studies with longer follow-up (4, 5) have noted positive effects of extended postnatal home visiting, also in the longer term. It may be that the effects of extended home visiting also appear later in the child's life. Further studies are warranted, with larger sample sizes and longer term follow-up, also with other outcomes, such as language and developmental delays.

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Conflict of interests

The authors report no conflicts of interests.

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TABLE 1-4

Table 1. Health care utilisation by group, 0-36 months

0-36 months	**Intervention Group (n=81) Mean number of visits**	**Control Group (n=74) Mean number of visits**	**Rinkeby Comparison Group (n=106) Mean number of visits**
Emergency care	1.63	1.81	1.25
Primary care	4.72	4.15	5.75
Primary care (out of hours)	**2.63**	**1.53** p=0.009	2.48
Pediatric specialist care	0.62	1.84	0.40
Total outpatient visits	9.60	9.33	9.88
Inpatient care (excluding neonatal)	0.20	0.19	0.21
Received MMR vaccine (%)	**95.1**	94.6 p=0.019	**84.0**

Bold indicates significant difference (5% level)

Table 2. Health care utilisation by group, 0-18 months

0-18 months	**Intervention Group (n=81) Mean number of visits**	**Control Group (n=74) Mean number of visits**	**Rinkeby Comparison Group (n=106) Mean number of visits**
Emergency care	1.16	1.12	0.81
Primary care	2.40	1.89	2.29
Primary care (out of hours)	**1.22**	**0.64** p=0.016	1.08
Pediatric specialist care	0.46	0.36	0.30
Total outpatient visits	5.24	4.01	4.48
Inpatient care (excluding neonatal)	0.17	0.14	0.15
Received MMR vaccine (%)	87.6	85.1 p=0.07	77.4

Bold indicates significant difference (5% level)

Table 3. Health care utilisation by group, 18-36 months

18-36 months	Intervention Group (n=81) Mean number of visits		Control Group (n=74) Mean number of visits		Rinkeby Comparison Group (n=106) Mean number of visits	
Emergency care	0.48		0.69		0.44	
Primary care	2.35		2.26		3.45	
Primary care (out of hours)	1.43		0.89		1.40	
Pediatric specialist care	**0.16**	p=0.041	**1.47**		0.09	
Total outpatient visits	4.42		5.31		5.38	
Inpatient care (excluding neonatal)	0.02		0.05		0.06	
Received MMR vaccine (%)		**95.1**		94.6	p=0.019	**84.0**

Bold indicates significant difference (5% level)

Table 4. Health care utilisation in the Intervention Group (0-36 months), by number of home visits received

0-36 months	**<6 visits (n=23) Mean number of visits**	**6 visits (n=44) Mean number of visits**	**>6 visits (n=14) Mean number of visits**
Emergency care	2.17	1.23	1.25
Primary care	3.74	4.93	5.75
Primary care (out of hours)	2.48	2.82	2.48
Pediatric specialist care	0.48	0.77	0.40
Total outpatient visits	8.87	9.75	10.29
Inpatient care (excluding neonatal)	**0.39**	**0.11** p=0.011	0.21

Bold indicates significant difference (5% level)