





Child health professionals' experiences of the introduction and successful implementation of rotavirus vaccination in Sweden

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Funding information

The study was funded by Futurum – Academy of Health and Care and Stiftelsen Samariten

Abstract

Aim: To explore child health professionals' experiences of the early implementation of the rotavirus vaccination in the two regions that first introduced this vaccination in Sweden.

Methods: A descriptive and repeated cross-sectional study based on a digital study-specific questionnaire with a baseline in 2014 and with a 2-year follow-up in 2016. The study population consisted of nurses and doctors working in child health centres in the health care regions of Stockholm and Jönköping.

Results: In Stockholm, a larger proportion of the respondents ($n = 355$) had concerns in 2014, in comparison with the respondents in Jönköping ($n = 101$), mostly about the vaccination being a new and time-consuming task (60% versus 23%). In 2016, the overall attitude to vaccination was more positive in both regions and the levels of concern about increased workload were reduced (Stockholm, $n = 519$, 39%, versus Jönköping, $n = 96$, 10%). Challenges before and after the introduction in both regions were particularly related to how to give information about the vaccine's potential increased risk of intussusception.

Conclusion: The gap between respondents' knowledge, attitudes and concerns pre- and post-vaccination introduction was larger in Stockholm compared to Jönköping. In both regions, overall, the implementation of the rotavirus vaccination was perceived as being easier than expected.

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KEYWORDS

child health services, experience, health care professionals, rotavirus, vaccination

1 | INTRODUCTION

Experiences of the introduction of a new vaccination in the national immunisation programme may facilitate the process of vaccination implementation and other vaccinations. In Sweden, the rotavirus vaccination was included in the national immunisation programme in 2019, but it had already been introduced to both the Stockholm and Jönköping regions in 2014. In these two regions, which were the first to offer the vaccination to all newborn infants, a rapid increase in rota-vaccination coverage occurred, reaching above 80% in 2016 in Stockholm and in 2017 in Jönköping.^{1,2} This high coverage rate was considered a contributing factor behind decreased hospital admissions for acute gastroenteritis in young children in both regions.^{2,3}

The knowledge and attitudes regarding a new vaccination amongst child health professionals have been shown to affect parental decisions about vaccinating their child.^{2,4-6} In Sweden, the child health nurse has a key role in health promotion for pre-school children, 0–6 years of age, including providing information and support to parents. These child health nurses are authorised to prescribe and administer vaccines to all children in accordance with the national immunisation programme.⁷ Previous studies have shown that trust in the child health nurse is crucial in the parents' decision-making process on vaccinating their child.^{2,4,8} It is also crucial that child health professionals are able to meet different parental needs for vaccination information.^{8,9} Furthermore, when a new vaccination is introduced, parental trust and high vaccination coverage often relate to child health professionals' attitudes and knowledge.^{2,4,10,11}

The World Health Organization (WHO) and the Public Health Agency of Sweden have highlighted the importance of studying parents' and professionals' experiences to facilitate the implementation of the rotavirus vaccination.^{12,13} In line with these recommendations, Swedish studies with this aim have been performed in Stockholm and Jönköping, showing an overall parental willingness to vaccinate against the rotavirus infection, and showing the importance of a trustful relationship between the families and the child health professionals in the child health centres.^{2,4,10} The aim of this study was to explore the child health professionals' experiences, in relation with their knowledge, attitudes and concerns, of the early implementation of the rotavirus vaccination in Stockholm and Jönköping.

2 | MATERIAL AND METHODS

2.1 | Study design

This study had a descriptive, repeated cross-sectional design conducted at two time-points, based on a digital questionnaire with a baseline in 2014 and a 2-year follow-up in 2016.

Keynotes

- This repeated cross-sectional study explored child health professionals' experiences of the early introduction and implementation 2014–2016 of the rotavirus vaccination in the Stockholm and Jönköping regions of Sweden.
- In both regions, the potential increased risk of intussusception related to the vaccine was highlighted, whilst concerns about the vaccination being a new time-consuming task were most prominent in Stockholm.
- The overall implementation process was perceived as being successful and easier than expected.

2.2 | Study population

The two included regions, Stockholm and Jönköping, are differently sized geographical areas and used different brands of rotavirus vaccine due to regional procurement. Stockholm is an urban region with about 2,150,000 inhabitants and was the first to introduce the three-dose scheduled pentavalent vaccine RotaTeq (Merck & Co Inc.), in April 2014. Jönköping is a middle-sized region with approximately 345,000 inhabitants and was the next region to introduce the vaccine in July 2014, with the two-dose scheduled monovalent vaccine Rotarix (GlaxoSmithKline plc).

The child health services were organised similarly in both regions. In Stockholm, the child health organisation involved 122 child health centres with 483 nurses employed. On average, a full-time employed child health nurse had the responsibility to care for 69 newborn infants and a total of 423 pre-school children per year. In Jönköping, the equivalent numbers were 25 centres with approximately 100 nurses employed. They were responsible for on average 55 newborn infants and in total 338 children per full-time employee. The total number of consulting doctors was difficult to define in Stockholm, due to flexibility in ways of employment. A distribution list with email addresses was used to estimate the number of presumptive participants. The list included 236 doctors who had occasionally or regularly worked within the organisation. In Jönköping, 50 to 60 doctors were involved in the child health organisation. In total, there were 719 presumptive participants in Stockholm and 150–160 presumptive participants in Jönköping.

In both regions, educational seminars and training initiatives to educate about the rotavirus infection and the new vaccination were performed. These activities were carried out in January to June in 2014 in Stockholm and Jönköping, before the introduction of the rotavirus vaccination. The educational programme was headed by the

Child Health Units and the Departments for Communicable Disease Control in both regions. In Stockholm, an information sheet about the rotavirus vaccine was produced and administered to parents of newborn infants at the first home visit from the child health nurse. Stockholm subsequently shared their material with Jönköping. The Child Health Units in Stockholm and Jönköping collaborated closely. Stockholm's information sheet was adjusted for the Jönköping setting with a different vaccine, two-dose regimen and slightly different possible side effects.

2.3 | The questionnaire

The questionnaire was developed by the research team in Stockholm. As a first step in creating the questionnaire, a focus group interview was conducted in December 2013. This was regarded to be a suitable method to gain knowledge about the respondents' experiences concerning the topic.^{14,15} Child health nurses ($n = 5$) from five different parts of the region were specially selected to participate according to their knowledge within the field and their willingness to share their opinions with others.¹⁵ A thematic analysis¹⁶ was performed resulting in two main themes: the important factors of knowledge and attitudes as facilitators, and the importance of a good balance in work with concerns about a new task that might take time from all other necessary tasks. With these results as a base, the questionnaire was developed by two of the researchers in the research team and a child health co-ordinator in Stockholm. The validation process included a pre-test of the questionnaire amongst five child health professionals in Stockholm and a specialist in infectious diseases involved in the research team. This resulted in a final version used in both regions. Questions were defined as knowledge-based or attitude-related, and some issues were related to professional perceptions of adverse events. Depending on the type of question, the possible responses were yes, no or do not know or correct, not true or do not know. Several statements or questions were based on Likert scales of 1–5 or 1–10. Examples of knowledge-based statements were that children under the age of two were most affected by rotavirus infections and that rotavirus vaccine was administered orally. Also, more personal and attitude-related questions were posed, such as how the respondents assessed their own knowledge about the rotavirus infection and the rotavirus vaccine. Furthermore, questions were asked whether the respondents would have vaccinated their own child or grandchild, and if they thought that the rotavirus vaccination should be included in the national programme. In addition, demographic data of the study population were collected (Appendix S1).

In the 2-year follow-up questionnaire, additional questions were added regarding challenges in the implementation process, such as vaccine storage and parental questions. Also, questions were asked concerning what adverse events had been reported by the parents, for example, fever, allergic reaction or intussusception. In addition, the respondents rated their overall perception of the implementation process and their opinion regarding a new time-consuming task (Appendix S1).

2.4 | Data collection

The questionnaire was delivered to all child health centres, nurses and doctors, in each region by email close to the vaccination introduction date in 2014 and 2 years later, in 2016. All centres were asked to internally distribute the questionnaire to as many employees as possible. The data collection was facilitated by the two Child Health Units in Stockholm and Jönköping. Reminders were sent out twice for each questionnaire.

2.5 | Statistical analysis

Results from the data analysis are presented as numbers, frequencies, medians and 25th and 75th percentiles when suitable. To analyse differences between groups on categorical data, Fisher's exact test was utilised. For variables that are measured on Likert scales, non-parametric statistical methods were used to test differences between year and regions. A p -value ≤ 0.05 was considered to be statistically significant. The data analysis for this paper was generated using SPSS Statistics version 25.0 (IBM Corp.) and SAS/STAT version 13.1 (SAS Institute Inc.).

2.6 | Ethical approval

The studies were performed according to the 2003 Swedish law, which states that ethical approval is not needed for research studies with healthcare professionals about work-related issues. The Stockholm part of the study was approved by the Stockholm Regional Ethics Board (2013/2041-31, 2014/912-32) as part of a larger research project.

3 | RESULTS

3.1 | Study population

The majority of the respondents in both regions were nurses with more than 5 years of working experience. There were no data regarding the exact number of distributed questionnaires at each time point, and it was not possible to link responses to the pre-vaccine questionnaire with responses to the 2 year follow-up. The aim was to include all presumptive participants that was approximately 720 nurses and doctors in Stockholm and approximately 160 nurses and doctors in Jönköping. Based on these data, the estimated over all response rate in Stockholm was 49% in 2014 and 72% in 2016. The corresponding estimated response rate in Jönköping was 63% and 60%, respectively. Due to fragile data regarding the total number of consulting doctors in Region Stockholm, no further professional sub-group analyses could be performed. In Jönköping, more than 50% of the total number of doctors participated both before and after the rotavirus vaccination introduction. Table 1 describes the study population in more detail.

3.2 | Self-estimated knowledge of the rotavirus infection and vaccine

The respondents' self-estimated knowledge of the rotavirus infection and vaccine is presented in Table 2. As seen from Table 2, the median and percentiles of the self-estimated knowledge of rotavirus infection were similar and stable in both regions, both before and 2 years after the rotavirus vaccine introduction. However, there was an increase in the respondents' self-estimated rating of their knowledge of the rotavirus vaccine in both regions 2 years after the introduction that was statistically significant ($p = 0.039$).

3.3 | Self-estimated personal and attitude-related issues

Data on the child health professionals' willingness to include the rotavirus vaccine in the national immunisation programme and on whether they would give the vaccine to their own child or grandchild are presented in Figures 1 and 2, together with the questions posed. All respondents (80%) in both regions, except the participating doctors in Jönköping, were more positive towards including the rotavirus vaccine in the national immunisation programme when asked 2 years after the introduction, compared to their responses in the pre-vaccination survey in 2014. A similar pattern was seen

regarding responses concerning willingness to vaccinate their own child or grandchild.

3.4 | Concerns before the introduction and experiences of implementation

In total, about 20% of the respondents had concerns about adverse events related to the rotavirus vaccine before the vaccination introduction in both regions (Stockholm, 17% and Jönköping, 21%), presented in Table 4. After the 2 years of implementation, respondents in both regions also agreed that intussusception was perceived as the most serious adverse event related to the vaccine (Stockholm, 92% and Jönköping, 97%). Furthermore, respondents in both regions described this condition as the most difficult vaccine-related issue to inform about, both before (Stockholm, 72% and Jönköping, 73%) and 2 years after (Stockholm, 73% and Jönköping, 64%) the vaccination introduction.

In comparison, the professional experience of parental reports of adverse events related to the vaccine differed in the two regions during the two first years of vaccination with the rotavirus vaccine, as presented in Table 3. In Stockholm, the most common parentally reported adverse events were fever, diarrhoea, abdominal pain and vomiting, and in Jönköping diarrhoea and abdominal pain. In the Stockholm survey, the respondents stated a high level (5%) of parent-reported intussusception, in 2016.

TABLE 1 Characteristics of the study population

	Stockholm		Jönköping	
	Pre ^a (n = 355) % (n missing = 1)	2-year post (n = 519) % (n missing = 3)	Pre ^b (n = 101) % (n missing = 0)	2-year post (n = 96) % (n missing = 0)
Professions				
Nurse	75	76	57	66
Doctor	19	20	43	34
Other ^c	6	4	0	0
Work experiences	Stockholm		Jönköping	
	Pre ^a (n = 355) % Nurse (n missing = 3) Doctor (n missing = 2)	2-year post (n = 519) % Nurse (n missing = 3) Doctor (n missing = 3)	Pre ^b (n = 101) % Nurse (n missing = 0) Doctor (n missing = 0)	2-year post (n = 96) % Nurse (n missing = 1) Doctor (n missing = 0)
<1 year	8	5	5	15
1–<5 years	23	32	26	30
5–<10 years	21	22	30	33
>10 years	48	41	38	23

Note: All percentages are from the total number of respondents for each questionnaire and column.

^aRotavirus vaccination was introduced for all eligible children in the Stockholm region April 14, 2014.

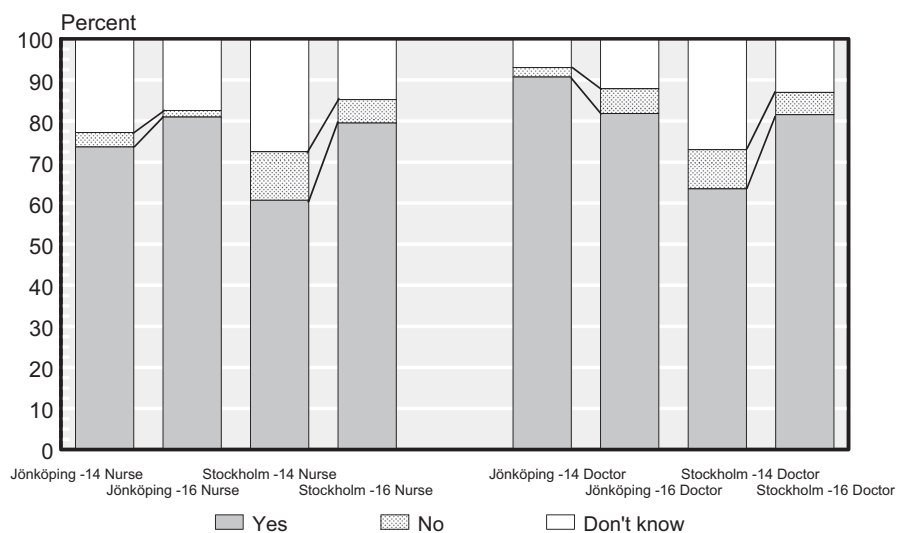
^bRotavirus vaccination was introduced for all eligible children in the Jönköping region July 1, 2014.

^cMidwife, assistant nurse.

TABLE 2 Self-estimated knowledge, scale 1 (very limited) – 10 (very good), regarding rotavirus infection and rotavirus vaccine in 2014 and 2016

Region and year of questionnaire:	Self-estimated knowledge of rotavirus infection, scale 1–10	Self-estimated knowledge of rotavirus vaccine, scale 1–10
	25th percentile/75th percentile (median)	25th percentile/75th percentile (median)
Stockholm 2014 (Pre-vaccination introduction)	6/8 (7) n = 339 (n = 16)	5/8 (7) n = 344 (n = 11)
Stockholm 2016 (2 years post-vaccination introduction)	6/8 (7) n = 488 (n = 31)	7/9 (8) n = 477 (n = 42)
Jönköping 2014 (Pre-vaccination introduction)	6/8 (7) n = 98 (n = 3)	5/8 (7) n = 94 (n = 7)
Jönköping 2016 (2 years post-vaccination introduction)	6/8 (7) n = 96 (n = 0)	6/9 (8) n = 96 (n = 0)

FIGURE 1 Do you think that rotavirus vaccination should be included in the national childhood vaccination programme in Sweden?



3.5 | Concerns about the vaccination introduction and assessment of implementation

Overall, there was a larger proportion of concerns about the rotavirus vaccination introduction in Stockholm than in Jönköping before the vaccination start in 2014. However, 2 years after the introduction, respondents from both regions were more positive over all to the rotavirus vaccination compared with before the start. Table 4 shows that 60% of the Stockholm respondents in the pre-vaccination survey had worries about needing to perform a new task that would take time from other necessary work, in comparison with only 23% in Jönköping. In the 2-year follow-up study, 66% of the respondents in Jönköping experienced the implementation as unproblematic compared to 26% in Stockholm (Table 5).

Also, the respondents were asked to rate and summarise their overall perception of the 2 years of implementation of the rotavirus vaccination (response alternatives one [more difficult than expected] to 10 [easier than expected]). The results, presented as interquartile range (Stockholm, median = 9 and Jönköping, median = 8), reveal

that the introduction was perceived to have been easier than expected in both regions.

4 | DISCUSSION

This questionnaire-based repeated cross-sectional study showed that the overall implementation of the rotavirus vaccination was perceived as successful, positive and easier than expected amongst child health professionals, representing the two regions that first introduced the vaccination in Sweden. In all dimensions, the gap between responses before the introduction and after the implementation was larger in Stockholm in comparison with Jönköping. In Stockholm, the participants had more concerns before the introduction than participants from Jönköping, mostly about the vaccination being a new and time-consuming task. Challenges in both regions before and after the introduction were particularly related to the potential adverse event of intussusception related to the vaccine and also about informing parents about this slightly increased risk.

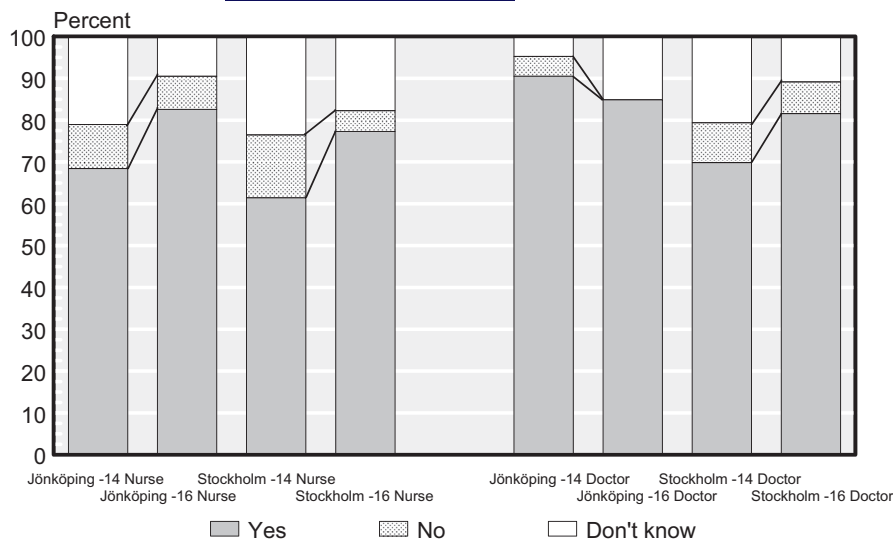


FIGURE 2 Would you recommend rotavirus vaccination to your own child or grandchild?

TABLE 3 Child health professionals' experiences of parental reports of adverse events related to the rotavirus vaccination during the two first years in Stockholm and Jönköping

	Stockholm (n = 519)			Jönköping (n = 96)			p-Value (Fisher's exact test)
	Yes	No	Don't know	Yes	No	Don't know	
	%	%	%	%	%	%	
Fever	55	38	7	19	60	21	$p < 0.0001$
Allergic reaction	4	85	11	0	80	20	$p = 0.018$
Diarrhoea	89	6	5	77	10	13	$p = 0.0042$
Upper respiratory tract infection	2	85	13	0	80	20	$p = 0.10$
Intussusception	5	85	10	0	79	21	$p = 0.0008$
Rash	10	80	10	3	77	20	$p = 0.010$
Abdominal pain	87	7	6	78	9	13	$p = 0.025$
Vomiting	72	20	8	56	26	18	$p = 0.004$

Note: All percentages are from the total number of respondents for each region and column. Multiple answers were possible.

Two years of practical experience of the new rotavirus vaccination may have contributed to the more positive and robust attitude amongst the respondents in 2016. There were significant differences between the regions regarding the parent-reported adverse events. In Stockholm, the parents commonly reported that their child had fever after the vaccination, which is an expected and very frequent adverse event of the RotaTeq vaccine. The Rotarix vaccine, which was administered in Jönköping, does not state fever as a known adverse effect. Also, one out of twenty parental reports to the child health professionals in Stockholm stated intussusception, in contrast to no such reports in Jönköping. We cannot explain the high level of reported intussusception, nor the discrepancy between the regions. According to the Public Health Agency of Sweden, experiences from Stockholm and Jönköping showed that there was an increased number of children who sought emergency care due to gastrointestinal symptoms in connection with vaccination but also due to concerns about intussusception.¹⁷ Parents in Stockholm may have interpreted and thus

reported their child's abdominal pain and vomiting as suspected intussusception.

The respondents in both regions rated their own knowledge of the rotavirus infection as stable before and after the implementation, probably due to their long working experience within child health services. Their increase in knowledge regarding the rotavirus vaccine after 2 years may indicate improved professional competence. Still, there was a more prominent before/after gap in Stockholm. A similar gap was shown regarding the overall attitude to the rotavirus vaccination in both regions. Overall, 2 years' experience of rotavirus vaccine has probably deepened the clinical understanding and confidence in handling new situations for both nurses and doctors. This is in line with the knowledge of how work-based interprofessional learning takes place¹⁸ and knowledge of the role of professional relationships to support improvement work.¹⁹

The knowledge about a vaccine and attitudes towards a vaccination amongst child health professionals have been shown to be important for the parental decision about vaccinating their child.^{2,4} In

TABLE 4 Child health professionals' concerns of rotavirus vaccination before the introduction in the regions of Stockholm and Jönköping

	Stockholm Before introduction Yes (n = 355) %	Jönköping Before introduction Yes (n = 101) %	Fisher's exact test p-value Stockholm/Jönköping
Concerns in 2014			
Administering the vaccine in the mouth	9	4	0.9
A new task that takes time	60	23	<0.0001
The vaccination has a negative impact on my other tasks	18	5	0.0007
Vaccine side effects	17	21	0.09
The parents don't want their child to be vaccinated	17	24	0.9
Media attention of the vaccine	4	4	0.2
Parental questions	21	22	<0.0001
Giving the vaccine as early as 6 weeks of age	11	12	0.003
No worries/ nothing will be problematic	19	42	0.009

Note: All percentages are from the total number of respondents for each region and column (n missing = 0).

TABLE 5 Child health professionals' experiences of the rotavirus vaccination 2 years after the introduction in the regions of Stockholm and Jönköping

	Stockholm 2 years after introduction Yes (n = 519) %	Jönköping 2 years after introduction Yes (n = 96) %	Fisher's exact test p-value Stockholm/ Jönköping
Has anything of the following being problematic during the 2 years of implementation?			
Administering the vaccine in the mouth	9	2	0.7
A new task that takes time	39	10	0.02
The vaccination has a negative impact on my other tasks	5	1	0.2
The vaccine's side effects	13	6	0.003
That the parents did not wanted their child to be vaccinated	16	12	0.04
Media attention of the vaccine	2	2	0.7
Parental questions	9	7	0.005
Giving the vaccine as early as 6 weeks of age	5	4	0.07
No worries/ nothing has been problematic	26	66	<0.0001

Note: All percentages are from the total number of respondents for each region and column (n missing = 0).

previous literature, the professional intrinsic motivational factor of being knowledge-based in challenging situations is well-known and is expected to increase with growing experience.²⁰ Together with expert knowledge regarding vaccines, it is also crucial that health care professionals are aware of their role as influencers and that they convey attitudes of confidence in the implementation of new preventive healthcare actions, such as a new vaccination.²¹ Furthermore, effective parental-professional communication can shape the parental attitudes to vaccination and facilitate the child health professionals' aim of understanding the situation and needs of individual families.⁹ In the present study, at the 2-year follow-up, all respondents except participating doctors in Jönköping were more positive about including the rotavirus vaccine in the national programme, as well as vaccinating

their own child or grandchild. We do not know the reasons for hesitancy amongst the doctors in Jönköping and we cannot draw any conclusions from the present study results. Previous research has indicated that the health care professionals own vaccination is related to their willingness to recommend others to be vaccinated, but also that the self-vaccination attitude and behaviour need to be personal decisions for the individual nurse and doctor, as it is the choice of their patients.²¹ Studies have also shown that vaccination recommendations are more common when the health care professionals feel comfortable about explaining risks and benefits.²¹ According to previous publications from Sweden, there are no significant differences between the regions when it comes to vaccination coverage, indicating a homogenous national approach to the rotavirus vaccine.^{2,3}

The study results revealed differences regarding the two regions when it came to concerns and challenges related to introducing a new vaccination. In Stockholm, there were more doubts and worries regarding limited resources and increased workload. The difference remained after 2 years, but to a markedly lower degree. Several different causes are likely to play a role in these dissimilarities. Stockholm was the first region to introduce the vaccination in Sweden in April 2014. At that point, there was no professional or parental national experience. In Stockholm, each nurse was responsible for a larger number of newborn infants and pre-school children in comparison with nurses in Jönköping. Furthermore, in Stockholm the vaccine had a three-dose regimen compared to two-dose regimen in Jönköping. The concern about increased workload may partly be explained by these contextual factors. The parental reported experiences of intussusception, in Stockholm, have most likely increased parental and professional distress and might have increased the psychological burden of work. Taking into account organisational factors, with a more stable staffing of doctors in Jönköping, everyday work can be facilitated when healthcare professionals know each other, are supported and are familiar with the work-related expectations for each professional group.¹⁹ In addition, previous studies have pointed out that healthcare professionals can be distressed regarding the risk of time-consuming activities, in particular when it comes to their role of trying to motivate patients who are hesitant to vaccination.²¹ All these circumstances might have contributed to the regional differences when introducing a new vaccination.

Limitations of this study are the cross-sectional design at each time point and the fact that we did not register the exact number of distributed questionnaires, which resulted in ambiguity regarding the response rate. Also, that we did not have the opportunity to study each pre- and post-vaccination response at an individual, longitudinal level. The question regarding whether a respondent would be inclined to vaccinate their own child or grandchild assumes that they have a child/grandchild. These circumstances should have been mapped, as they possibly could affect the respondent's attitude when answering the question. However, the overall design can be considered as a strength because of the 2-year follow-up, that is, the results presented showed a switch to a more positive attitude to the new vaccination following the clinical experience. Also, the study design with introduction of the vaccination to newborn children in two different regions can be considered as a strength.

5 | CONCLUSION

Since September 2019, the rotavirus vaccination has been introduced in the National Immunisation Programme, with a reported vaccination coverage in April 2020 of 88.6% for one dose and 80.8% for two doses, respectively.²² The child health professionals' perception regarding the implementation process as being easier than expected is encouraging, in spite of the challenges. The knowledge gained from this study may be of importance when

introducing other new vaccinations in the national Swedish immunisation programme. This study is an example of the valuable knowledge management and structured collaboration between the Child Health Units in Sweden. Also, the knowledge from the implementation process of the rotavirus vaccination in a Swedish context, may contribute to vaccination strategies regarding the ongoing COVID-19 pandemic.

ACKNOWLEDGEMENT

We would like to acknowledge all child health professionals' who participated in this study in the Stockholm and Jönköping regions.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

How to cite this article: Stenmarker M, Oldin C, Golsäter M, et al. Child health professionals' experiences of the introduction and successful implementation of rotavirus vaccination in Sweden. *Acta Paediatr*. 2021;110:2833-2841. <https://doi.org/10.1111/apa.16038>