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Validation of the new Swedish vaccination register – Accuracy and completeness of register data

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ABSTRACT

Objective: The aims of this study are to validate infant vaccination data in the Swedish Vaccination Register (SVR) to the Swedish administrative coverage reports, and to assess differences in register-based vaccination coverage estimates between providers using different data reporting methods.
Methods: The study population included all infants born in Sweden with a Swedish Personal Identity Number during 2014 and 2015 (n = 230,220). Data on all National Immunisation Programme vaccinations administered before 24 months of age were collected from the SVR and from administrative coverage reports. Information regarding data registration methods in the SVR were collected from national and regional authorities. Coverage from health care providers using single registration methods, where vaccination data were transferred automatically from the electronic health care record to the SVR, was compared to that from providers using double registration methods where data had to be added into the SVR in a separate process.
Results: For 98,4% of the study population at least one vaccination was recorded in the SVR. The coverage of 3-dose DTP-containing (87,1%) and 1 dose MMR (91,1%) in the register did not reach administrative data coverage (97,4% for 3-dose DTP-containing and 97,0% for MMR). Single registration procedures yielded significantly higher coverage than double registration procedures (92,24% vs 87,10%, p < 0,0001). A regional switch from double to single registration increased coverage from 80,0 to 95,2%.
Conclusions: The SVR is a valuable data source for vaccination coverage monitoring. For research purposes, the SVR provides valuable data, since every health care provider is obliged to register all vaccine doses given within the national immunisation program. The SVR shows a high completeness validated by comparison to a very well-functioning administrative data system. Single-registration procedures give more complete data and should be supported by health systems while creating health care registers.

1. Introduction

The development and provision of National Immunisation Programmes (NIP:s) for children has had the most profound positive impact on human health by saving children from death and severe sequalae due to vaccine-preventable infectious diseases [1]. Close surveillance of immunisation programme performance is of crucial importance for effective disease control [2]. For further development of immunisation programmes, continuous research regarding their impact and safety is vital.

Immunisation programme performance is monitored by several means including vaccine-preventable disease surveillance, safety follow-up, seroprevalence studies and estimations of vaccination coverage. Vaccination coverage is the proportion of individuals in a target population that are vaccinated. This has usually been evaluated by administrative data reporting, where health care providers report their number of administered doses annually, or by repeated surveys to samples of the target population.

During the last decades, vaccination registers have gained importance not only for monitoring coverage, but also for evaluation of impact and safety of immunisation programmes [3]. In the United States, vaccination registers and immunisation information systems have been developed in several states since the 1970:s [4]. Since the first national vaccination registers were founded in

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the 1990:s in Norway [5] and Australia [6] more countries have followed and in 2016, sixteen European countries had national or subnational immunisation registers [7]. In recent years, several, low- and middle-income countries have also started introducing electronic immunisation registers [8,9].

By linking to other health and socioeconomic data registers, research questions such as vaccination timeliness for certain groups, equality in vaccination program delivery, subpopulation effectiveness studies, safety and long-term effects of vaccinations can be addressed using vaccination register data. Some useful examples of important safety studies using immunisation registers are the Danish studies showing no association between MMR (measles, mumps and rubella) and DTaP-IPV-Hib (diphtheria, tetanus, acellular pertussis, inactivated polio and Haemophilus influenzae type B) vaccination and autism [10] and the Finnish studies showing a link between AS03-adjuvanted AH1N1 influenza vaccination (Pandemrix) and childhood narcolepsy [11]. As Sweden has a comprehensive system of personal identification numbers and a very large number of population-based health and socioeconomic data registers, the launch of the Swedish Vaccination Register in 2013 has opened up possibilities for a broad variety of vaccination epidemiology research to be conducted.

Register-based research quality depends on the data quality in used registers. Data sources and registration methods vary among vaccination registers from different countries and settings. Transfer from billing systems has been used in several cases, often with major problems as the billing systems are not set up to provide data for vaccination registers. Another approach is that health care workers are responsible, not only for giving a vaccination, but also for a separate registration into a vaccination register. A third way is to automatically transfer information about a given vaccination from an electronic health record into a vaccination register.

Sweden has since 1982 relied on vaccination coverage by a version of administrative data reporting, where nurses in well-baby clinics (WBC) report to the Public Health Agency of Sweden annually the number of children enrolled in their clinics and the number of children vaccinated [12]. The Swedish immunisation coverage data is considered to be of very high quality with some inherent limitations, such as the delay in reporting and the aggregated form of data. The Swedish Vaccination Register (SVR) was founded in 2013 and is managed by the Public Health Agency of Sweden. Health care providers are obliged by law to report vaccinations included in the NIP into the register.

Data may not be accessed by data providers, which makes the SVR a pure register, not a complete Immunisation Information System [7].

The aims of this study are to validate the data on infant vaccinations in the Swedish Vaccination Register to the best available external data, the Swedish administrative coverage data, and to assess differences in vaccination coverage between providers using different data reporting methods.

2. Methods

2.1. Study population

The study is a population-based retrospective cohort study with prospectively collected national register data. The study population included all infants born alive in Sweden with a Swedish Personal Identity Number (PIN) during 2014 and 2015 (n = 230,220). The study population was defined from the Register of the Total Population by Statistics Sweden.

Infants born to parents with a Swedish PIN receive their own PIN within days after birth. Asylum seekers and people living without permission in Sweden do not have a PIN but will receive one if granted asylum or a residence permit. Children to asylum seekers who receive a PIN in their first two years of life were included in the study population. Women who are seeking asylum have the right to deliver at Swedish hospitals without cost. Women giving birth at a hospital are reported to the Medical Birth Register regardless of having a PIN or not. In this register, 231,486 live births were registered in 2014 and 2015, which is 1,266 children more than our study population. These children were assumed being born in Sweden without a PIN. They are not included in the SVR, but are eligible for vaccinations at WBC:s and may therefore be included in the administrative data. Children immigrating to Sweden during their two first years of life are also included in the administrative data and in the SVR, but not in the SVR data used in this study.

2.2. Organisation of NIP services in Sweden

There are 21 regions in Sweden. The regions are self-governing authorities with independent responsibility for organisation and provision of health care. All regions collect regional tax used to finance their health care systems and are obliged by law to offer all children residing in their region vaccinations included in the NIP free of charge.

The Swedish NIP for children below 6 years of age is administered via WBC:s. These clinics are either run by private or public organisations and regardless of ownership free of cost for families and publicly financed. We use the term health care provider (HCP) for all providers owning WBC:s that administer NIP vaccinations. These providers vary vastly in size, ranging from private companies running only one small WBC to the largest, Region Stockholm that runs 59 WBC:s.

2.3. Registration methods in the SVR

Information regarding registration methods into the register was provided on aggregated levels for each provider from the Public Health Agency of Sweden. Further information regarding registration methods was collected by personal interviews with paediatric consultants responsible for WBC services in each region of Sweden.

Four different methods were in use for data registration into the SVR (Fig. 1). Two of the methods only required the vaccinating nurse to sign the electronic health record for the data to be transferred to the SVR. We refer to these two methods as "single registration" methods. The other two methods required nurses to fill in a web form with vaccination information for the register in addition to signing the administration in the electronic or paper health record. These procedures are referred to as "double registration" methods.

SVEVAC is a Swedish vaccination information system that has been in use since 2002 for registering NIP and other vaccinations by health care providers. Some regions use SVEVAC as their electronic health care record for vaccinations. During the study period, 12 of 21 Swedish regions used SVEVAC for NIP vaccines. The two single registration methods differs in the use of SVEVAC as the electronic health care record or not. The two double registration methods differ in whether they use the SVEVAC web form for vaccine registration or if they use the SVR web form.

2.4. Data collection and handling

Data regarding vaccination date, vaccination product name and HCP who administered the vaccination were collected from the SVR for all NIP vaccinations administered to infants before 24 months of age (see supplementary table S1 for a complete list of SVR variables). Vaccine product names occurring in the SVR

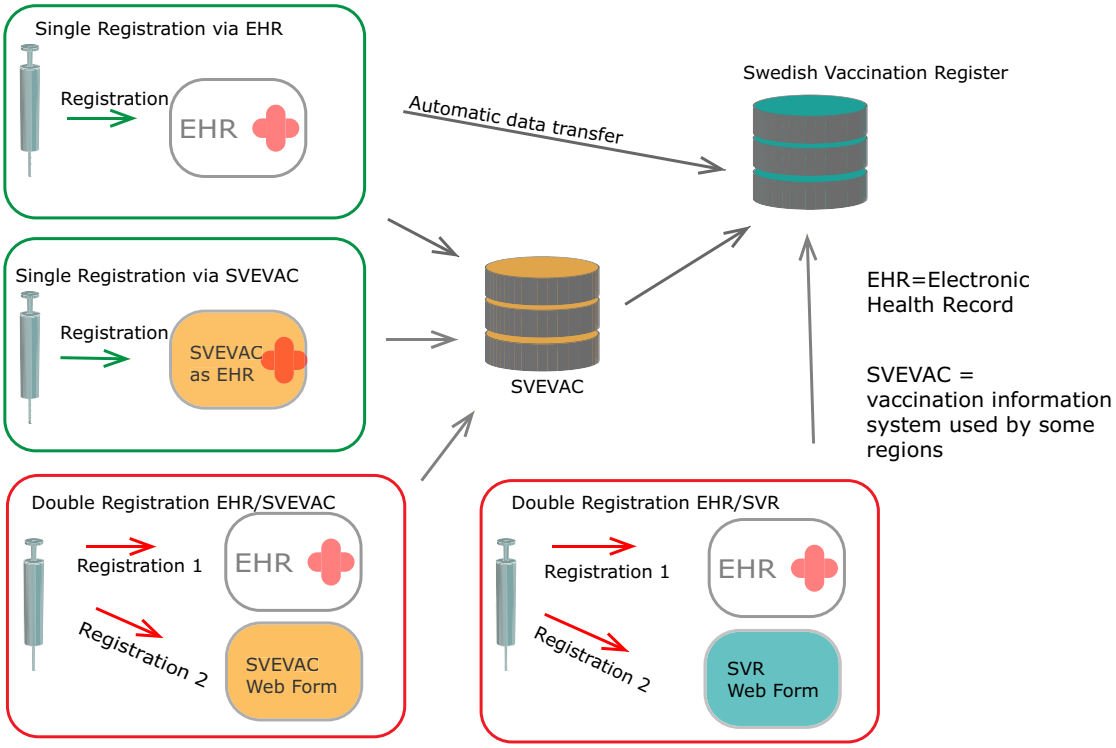

Fig. 1. Registration methods in the Swedish Vaccination Register (SVR) 2014–2017.

were coded into vaccine categories DTP-containing (Diphteria, Tetanus, Pertussis-containing), PCV (Pneumococcal Conjugate Vaccine) and MMR (Measles, Mumps, Rubella) (see supplementary data table S2). All DTP-containing vaccines also included IPV (Inactivated Polio Vaccine). Hib (Haemophilus influenzae type B) vaccine was included in the NIP in pentavalent or hexavalent vaccines and was given to a large majority of children receiving DTP-containing vaccine.

Providers who had vaccinated<10 infants during the study period were not included in the analysis. Vaccination coverage for 3 doses of DTP-containing and one dose MMR vaccine was calculated for each provider, by analysing the proportion of infants assigned to each provider that had three DTP-containing or one MMR dose reported at 24 months of age respectively.

In order to do analyses on provider level, we had to assign infants to a specific HCP. We chose to assign an infant to the provider that administered their first vaccination recorded in the SVR, and an infant kept this association even when registering later doses at other providers. To test this assumption, we compared if it was more common to switch provider among children who had three or more doses of DTP-containing vaccine registered compared to those who had only two registered doses of DTP-containing vaccine in the SVR.

Administrative vaccination coverage data for children born 2014–2015 was received from the Public Health Agency of Sweden that compiles reports from regional authorities responsible for WBC care. These reports are based on forms sent to all nurses performing WBC care yearly. All nurses report the number of two-year-olds they have enrolled in their services and how many of them that has received three doses of DTP, PCV and one dose of MMR vaccine at 24 months of age. A child can change WBC provider during their childhood, but can only be enrolled at one WBC at any point of time, and should therefore be reported only once in the administrative data. The denominator in Swedish administrative coverage data is the number of children enrolled in WBC services.

2.5. Statistical analyses

We calculated the vaccination coverage for the single and double registration methods and estimated their respective 95% Wilson confidence intervals. A Chi-square test was used to compare the proportions. Finally, univariate logistic regression was performed to estimate the odds ratio of being registered to have received three or more DTP vaccinations with the single registration method compared to the double registration method. All analyses were performed with the statistical software R (http://www.r-project-org/).

2.6. Ethics

Ethical approval 2015/1961–31/4 was obtained from the Regional Ethical Review Board in Stockholm. Applications for delivery of microdata for research purposes were made to Statistics Sweden and the Public Health Agency of Sweden. After secrecy examination and approval Statistics Sweden defined the population from the Register of the Total Population. PIN:s were removed and replaced with serial numbers according to a key made by Statistics Sweden. Linkages of the data were made by the research group using serial numbers.

Data was stored in secured servers inside the Public Health Agency of Sweden. Only defined members of the research group had access to data, the researchers did not at any time have access to PINs.

3. Results

3.1. Vaccination coverage in the SVR

More than 98% of infants born in Sweden 2014–2015 had at least one vaccination recorded in the SVR at two years of age. The coverage for 3-dose DTP-containing, pneumococcal conjugate vaccine and 1 dose MMR in the register did not reach previously

Table 1
Vaccination coverage data at two years of age as reported in the Swedish Vaccination Register (SVR) for children born 2014 and 2015 compared to national administrative coverage data from Well Baby Clinics (WBC).

	Administrative data of children born 2014	SVR born 2014	Administrative data of children born 2015	SVR born 2015
Total population at two years of age	120 165		120 381	
Population, born in Sweden	114 907	114 857	115 160	114 893
Population, born abroad	5425		5221	
Enrolled in WBC[1]	119 205		115 559	
≥3 doses DTP-containing	116 042	98 629[4]	112 497	100 307[4]
DTP-containing coverage in population[2]	96,5%	85,8%	93,4%	87,1%
DTP-containing coverage enrolled in WBC[3]	97,5%		97,4%	
≥3 doses PCV	115 058	98 122	111 845	99 727
PCV coverage in population[2]	95,7%	85,4%	92,9%	86,6%
PCV coverage enrolled in WBC[3]	96,5%		96,8%	
≥1 dose MMR (n)	115 247	103 898[5]	112 142	104 895[5]
MMR coverage in population[2]	95,9%	90,4%	93,1%	91,1%
MMR coverage enrolled in WBC[3]	96,7%		97,0%	

[1] This only includes WBC:s that have reported administrative vaccination data.
[2] Percentage of total population at two years of age for administrative data and population born in Sweden for SVR.
[3] Percentage of infants enrolled in WBC services (as presented in administrative data).
[4] 186 subjects have missing birth year and are not included in the analysis.
[5] 1151 subjects have missing birth year and are not included in the analysis.

Table 2
Vaccination status in Vaccination Register at 24 months of age per Health care provider (HCP) and registration method.

HCP	n started vaccination programmes	≥3 doses DTP + IPV[2]	≥3 doses HepB[2]	≥3 doses PCV[2]	≥1 dose MMR[2]	Registration method
Publicly owned HCP:S	**158,626**	**89,49%**	**73,68%**	**88,98%**	**93,13%**	
Stockholms läns landsting	29 065	90,76%	90,57%	89,84%	92,53%	Mixed
Västra Götalandsregionen	26 749	89,82%	54,94%	88,47%	91,10%	Double SVEVAC
Region Skåne	20 111	89,02%	66,51%	88,75%	94,26%	Single SVEVAC
Region Östergötland	8365	83,86%	53,26%	83,60%	93,32%	Double SVEVAC
Region Uppsala	5652	89,40%	47,05%	88,15%	91,49%	Double OWN
Region Jönköpings län	8190	95,76%	94,37%	95,63%	98,19%	Single SVEVAC
Region Halland	4180	90,48%	32,68%	89,95%	92,27%	Double SVEVAC
Region Örebro län	6675	90,64%	89,93%	89,35%	96,28%	Double OWN
Landstinget Sörmland	5241	81,57%	81,28%	81,66%	87,92%	Double SVEVAC
Landstinget Dalarna	5350	80,75%	73,25%	80,50%	89,57%	Double VR
Region Västmanland	2756	77,76%	38,57%	77,10%	92,09%	Double VR
Region Gävleborg	4200	93,88%	81,55%	94,21%	96,33%	Single SVEVAC
Västerbottens läns landsting	4689	89,25%	88,29%	90,53%	94,22%	Single SVEVAC
Landstinget i Värmland	5025	97,09%	95,34%	96,94%	98,11%	Single SVEVAC
Region Norrbotten	4295	92,46%	92,04%	92,32%	91,71%	Double SVEVAC
Landstinget Västernorrland	3454	94,50%	94,24%	94,18%	93,66%	Single SVEVAC
Landstinget i Kalmar län	4867	96,90%	95,11%	96,79%	97,60%	Single SVEVAC
Region Kronoberg	3823	89,17%	88,70%	91,92%	91,73%	Single EHR
Landstinget Blekinge	2518	83,48%	60,17%	83,32%	92,69%	Double VR
Region Jämtland Härjedalen	2415	77,27%	69,32%	76,73%	88,41%	Double VR
Region Gotland	1006	82,50%	25,94%	80,52%	96,42%	Mixed
Very large private HCP:s	**28 458**	**87,14%**	**70,67%**	**86,75%**	**93,47%**	**Mixed**
Capio[1]	14 370	91,43%	72,44%	86,39%	92,95%	Mixed
Praktikertjänst AB	14 088	87,49%	68,86%	87,12%	93,99%	Mixed
Private HCP:s with 10–2532 started programmes (147 HCP:s)	**38 854**	**82,86%**	**72,23%**	**82,50%**	**91,23%**	**Mostly double VR**

[1] Includes HCP:s Capio Närsjukvård AB, Capio Primärvård AB, Capio Läkarhus AB and Capio Sjukvård AB.
[2] Percentage of started DTP-programmes.

reported administrative data coverage where 97,4% of the infants born 2015 were reported as vaccinated with 3-dose DTP-containing and 97,0% with one dose MMR. SVR coverage was 87,1% for 3 doses of DTP-containing and 91,1% for one dose MMR in 2015 (Table 1).

There were 170 HCP:s reporting vaccinations to the SVR during the study period. Of those, the 21 regions and two large private providers vaccinated 82,8% of all infants in the study population. 3-dose DTP-containing vaccine coverage among those providers ranged from 77,3% to 97,0% (Table 2). For the remaining 147 providers, no individual data is presented but their coverage data were mostly in the same range as for larger providers.

In our main analysis we did not account for the possibility that children changed provider between doses. To test this assumption, we compared the risk of changing provider between doses among those fully vaccinated to the risk among those with only two doses of DTP-containing vaccine. Among fully vaccinated children, 5,8% had changed provider between their first and subsequent doses while 5,6% of the children with only two recorded doses had changed provider between doses.

3.2. Methods used for data registration

Among the 21 regions and two very large private providers, seven used single-registration procedures during the whole study

Table 3
Coverage estimates for recieving ≥ 3 doses of DTP-containing vaccine for single vs double registration methods.

Registration method	n	DTP3 coverage estimate (%) [95% CI]	p	Odds Ratio [95% CI]
Single	54 433	92,24 [92,01 –92,46]	<0,0001	1,76 [1,69–1,83]
Double	74 195	87,10 [86,85–87,33]		

period, five used double registration with SVEVAC as an intermediate and six used double registration via SVR. The remaining five used mixed methods.

Providers with single registration procedures reported higher coverage than those with double registration procedures. Estimated coverage for 3-doses of DTP-containing vaccine using a single-registration method was 92,2% (95% CI 92,0% to 92,5%), significantly higher than the 87,1% (95% CI 86,9% to 87,3%) estimated with double-registration procedures (Table 3). The odds ratio for having three or more doses of DTP-containing vaccine registered was 1,76 (95% CI 1,69 to 1,83) with a single registration method compared to a double.

In 2014, Region Stockholm made a switch from double registration to single registration. When comparing 2,239 infants born in Stockholm before and 2,268 infants born after the change of the registering method, from double to single, the 3-dose DTP-containing coverage increased from 80,0% to 95,2%.

4. Discussion

More than 98% of the Swedish infant population born 2014–2015 had at least one dose of vaccine registered in the SVR, indicating a rapid implementation of the register into routine health care practice. Despite this high participation, vaccination coverage at two years of age for 3 dose DTP-containing vaccine and one dose MMR vaccine in the SVR did not reach administrative data coverage levels on a national level. SVR coverage was 87,1% for 3 dose DTP-containing and 91,1% for one dose MMR while reported coverage in the administrative data was 97,4% for 3-dose DTP-containing and 97,0% for MMR. Coverage differed between health care providers, as did reporting methods into the register. Single-registration procedures were significantly associated with higher reported coverage than double registration procedures and among HCP:s using single registration procedures, SVR coverage was 92,2% for 3 doses of DTP-containing vaccine.

Even if the Swedish administrative vaccine coverage data is considered to be of very high quality, it is not likely to be free from the known biases of administrative data, namely denominator and numerator biases [14]. In Sweden, the denominator of administrative vaccine coverage data is the number of children enrolled in the WBC system. This has been chosen over total population data to lessen the sensitivity to reporting problems from certain regions. Using WBC data as denominator is supported by the exceptionally high coverage of WBC attendance among the population. However, when the number of children living in Sweden is used as denominator in administrative data coverage calculations, the difference between administrative and register data is less pronounced.

Incompleteness of register data is not a unique feature for the SVR. On the contrary, data completeness is a recurrent problem in evaluations of vaccination register data quality. In Denmark, among children that were unvaccinated with MMR vaccine according to the vaccination register, a majority were found to be vaccinated in a review of their medical health records [15]. Among Danish children recorded as missing their DTaP-booster, a majority were likewise found to be vaccinated in a parental questionnaire-based study [16]. The Danish vaccination register at that time used billing data as its main data source [17]. Also in Ontario (Canada), vaccination billing data was shown to be an incomplete measurement method of vaccination coverage [18]. Incomplete registration has also been shown in the Australian Childhood Immunisation Register (ACIR) [19] as well as in the Flemish Vaccinnet [20]. In the ACIR completeness study from 2001, encounter forms were to be sent to the ACIR from HCP:s. Of 162 children overdue in the ACIR in 2001, 69 were actually vaccinated but the forms were not sent in to the ACIR. The Flemish register was based on data from a vaccine-ordering system where administration date needed to be registered when a vaccination was administered. In the Chinese province Zheijang, coverage in an immunisation information system was 6–7% lower than could be confirmed with a survey using vaccination cards [21].

The difference in coverage between single and double registration procedures indicates that the discrepancy between coverage in the SVR and in administrative data is in part due to lack of completeness in the parts of SVR based on double-registration procedures. We also noticed that the difference between administrative and register data is larger for 3-dose DTP than for 1-dose MMR. This difference may reflect an effect of incomplete registration, where each dose carries a likelihood of not being registered. We also see a marked increase in coverage in the Stockholm region following a switch from double to single registration. No other relevant changes were made in Stockholm WBC system during this time period besides changing the electronic health record to one that enabled automatic transfer of data into the SVR.

Our data showing that single-registration procedures leads to more complete reporting than double-registration procedures is in line with what has been shown by Davidson et al. in their validation study of a vaccination register in Denver, USA [22]. The Denver study shows that by declaring their register the official record of vaccine administrations, completeness went up from 71,4% to 97,7% in five years after the register started. In a study from Wisconsin (USA), data completeness was found to be higher with automatic transfer to a vaccination register than with manual input by health care workers [23]. An intervention study from Boston (USA) changing from a billing system requiring someone else to register compared to a system where vaccination data registration was done by nurses while preparing vaccinations, the number of missing doses in the register decreased from 37,9% to none [24].

4.1. Time to use the SVR for vaccination coverage reports

For some regions with single-registration methods, the SVR may provide a vaccination coverage estimate that is as least as close to the true coverage as the administrative data. It should therefore be considered to complete the national coverage reports with data from the SVR. For other regions, data completeness needs to be enhanced before the register is mature enough to stop administrative coverage data reporting.

Today, there are no regulations regarding method choice for data registration into the SVR. Considering the results of this study, where single-registration procedures provide more accurate results, this practice should be enhanced and supported by health systems. In addition to being more reliable, single-registration procedures also reduce the administrative workload for child health care nurses, and free up time they could use for supporting families and children.

In addition, the SVR will be useful in identifying undervaccinated groups of Swedish infants, giving valuable knowledge for tailoring vaccination interventions. With current regulations it is not possible to address parents of infants missing a vaccination to inform them about this. A possible future use of the SVR for reminders and targeted interventions could be of importance for further increasing vaccination coverage in Sweden and should be discussed taking ethical and information security issues into account. Such reminders have been proven effective in Denmark [25].

4.2. The SVR is a valuable research tool with high potential

With a very well-defined population, a large number of national registers for both socioeconomic and health care data, and not least use of a national PIN making data linkage between registers easily feasible, there are opportunities for high-quality studies on vaccine timeliness/coverage, effectiveness and safety using SVR data. Regional differences in data completeness described in this article need to be taken into consideration in future study design and analysis.

5. Limitations

This study was limited to children born 2014 and 2015, one and two years after the SVR was launched. It is known from other countries that completeness tends to improve during the first years a vaccination register is running. Thus, it is likely that data completeness will improve in the SVR over time. It would have been valuable if we had included infants from additional birth cohorts. Unfortunately, it was not possible to include children who were not born in Sweden and started their vaccination programs abroad in our study as vaccinations given outside Sweden is not included in the SVR according to current regulations. However, all children with a Swedish PIN are included in the SVR, regardless of country of birth. Further studies may include them but need to take this limitation of register data into consideration. Another limitation in the SVR data is the absence of information about dose number in a vaccine schedule. Adding this to the register would increase its value for research.

In this study, only registration of vaccines given until two years of age in the registry is studied. The five-year booster of DTP + IPV vaccine is given by the WBC:s as are the vaccines in the present study. Vaccines given from 6 years of age (MMR dose 2 at 6–8 years of age, DTP booster at 14–15 years and HPV vaccine to 10–11 year old girls) are on the contrary given by school health care providers and need to be validated in a separate study.

6. Conclusions

For vaccination coverage monitoring, the Swedish Vaccination Register (SVR) is a valuable additional data source to current administrative data reports. However, in some regions, data completeness is not yet high enough to stop administrative data reporting.

For research purposes, the SVR provides a valuable data source, since all health care providers are obliged to register all vaccine doses given within the national immunisation program and the SVR shows on a national level a reasonably high completeness validated by comparison to a very well-functioning administrative data system. In regions using single-registration methods completeness is very high. The possibility for data-linking to other Swedish population-based registers creates a unique opportunity for quality research to be accomplished. So far, data completeness is excellent in some regions but lower in others which needs to be taken into consideration in study design using the SVR as a data source. On a national level, comparison of unvaccinated versus vaccinated individuals should be done with caution.

CRediT authorship contribution statement

Cecilia Chrapkowska: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data curation, Writing - original draft. **Ilias Galanis:** Methodology, Formal analysis, Data curation. **Malin Kark:** Methodology, Writing - review & editing. **Tiia Lepp:** Validation, Investigation, Writing - review & editing. **Ann Lindstrand:** Conceptualization, Resources, Writing - review & editing. **Adam Roth:** Conceptualization, Resources, Writing - review & editing. **Anna Nilsson:** Conceptualization, Writing - review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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