

Vaccine registers – experiences from Europe and elsewhere

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In this special issue, published in two parts, *Eurosurveillance* has presented a series of articles from countries in Europe, Australia and Canada, describing their various experiences with the introduction of vaccine registers [2-11]. Vaccine registers are population-based systems that contain core individual-level information on the population, together with information on immunisation status – usually for the childhood vaccination programmes. These systems are linked to a variety of programme management, surveillance and research tasks [1].

The lessons outlined in this special issue of *Eurosurveillance* illustrate the many potential opportunities of such systems and some of the challenges and the alternatives that may be available (Table).

There are a series of core attributes for any successful national vaccine register. Firstly, accurate and up-to-date ascertainment of individual-level demographic data of the population of interest is needed, as these constitute the denominator for calculation of coverage data. A small number of countries illustrate how this has been achieved through access to their national administrative population or universal healthcare registers based on personal identifiers/health numbers (2-4,7). Some of the systems presented are able to electronically transfer this population data in real-time and can automatically take into account new births, families moving address, children dying etc. Such innovations can help to minimise some of the traditional denominator problems of ghosting and unregistered populations. Secondly, information on vaccine status (numerator data) on this population needs to be both accurate and complete. Examples are provided of vaccine programmes using barcodes on vaccine vials, which can be used to record information on vaccine dose, batch number and name, thus reducing data entry time and errors [6,11]. Thirdly, register systems need to be flexible as national vaccine programmes are continuously evolving, with the introduction of new vaccines and changes in current childhood immunisation programmes. The registers are able to adapt to

such changes. Finally, as personal identifiable data are required, which is highly sensitive, the importance of developing robust data security and confidentiality mechanisms to protect these systems are highlighted by L Trogstad et al. [2].

The articles illustrate how vaccine registers can be used both as a management tool and for surveillance purposes. As a management tool, countries show how they have used registers to deliver their immunisation programmes. Examples are provided how they can be used to purchase vaccines and monitor supply [3,8]; how they can function as patient call-recall systems – producing invitation and reminder letters [3,5-8]; how they can provide certificates of vaccination for patients [2] and also how they can be linked to incentive schemes for health practitioners [7].

Vaccine registers can also be used as important surveillance tools to monitor national immunisation programmes. Data from such systems can be used to monitor vaccine uptake from national through to local level. This can identify unvaccinated sub-populations (whether by age, geography or particular risk group) and to ensure vaccine uptake is optimal in these pockets. The availability of unique personal identifiers provides the opportunity to link vaccine registers to disease registers and thus identify specific health outcomes. This provides the ability to evaluate the vaccine effectiveness and to investigate vaccine safety signals of existing and new vaccine programmes. Finally, there are examples of these systems being used to answer specific research questions, seeking informed consent from individuals on the national register to take part in vaccine trials or questionnaire surveys [3].

The challenges of developing such national systems are outlined. Firstly, the development of such systems is a significant undertaking, not least from the IT perspective, requiring substantial investment and careful planning. Secondly a number of countries have decentralised health structures, which create difficulties in establishing such a national register. Some

TABLE

Characteristics of immunisation registers in six European countries, Australia and Canada

Country	Register name	Start date	Level of information available	Description of register	Use
Denmark [4]	Danish vaccination register	2000 ^a	National	Covers programme vaccinations in children (planned for all vaccinations in children and adults) Based on unique civil registration number and national population register	<ul style="list-style-type: none"> • Call-recall (planned) • Vaccine coverage • Vaccine effectiveness • Vaccine safety • Patient access to vaccine record (planned) • Patient research
England [5]	Child Health Information Systems (CHISs) ^b	Mid -1980s	Local	Covers population up to 18 years ^c of age based on birth health registration Computerised clinical record systems for child health prevention programmes	<ul style="list-style-type: none"> • Call-recall system • Vaccine coverage • Vaccine safety • Vaccine effectiveness • Outbreak investigation and response • Child health screening
Italy [8]	Computerised immunisation register	Not available	Local	Regional-level computerised systems (15/21 regions)	<ul style="list-style-type: none"> • Call-recall system • Vaccine supply • Vaccine coverage • Management of the high-risk group target
the Netherlands [3]	Præventis	2005	National and subnational	Covers all children and adolescents Linked to population register Continuously updated (birth, death, change of address)	<ul style="list-style-type: none"> • Call-recall system • Vaccine supply • Vaccine coverage and vaccine status at individual child level • Additional research (on vaccine safety, vaccine effectiveness, acceptance of the national immunisation programme, etc.) • Other mother-child prevention programmes
Norway [2]	SYSVAK	1995	National	Covers all children Covers adult vaccinations since 2011 Based on unique personal identification number Vaccination is entered once in the Electronic Patient Record system and transferred automatically to SYSVAK	<ul style="list-style-type: none"> • Vaccine coverage • Vaccine safety • Vaccine effectiveness • Research • Link to other data systems • Healthcare personnel access to vaccine records • Vaccinee access to vaccine record
Spain – Murcia [6]	Computerised vaccinations register	1991	Regional	All children and adults Uses population register and is updated (deaths, change of address) real-time Developed vaccine barcode use	<ul style="list-style-type: none"> • Call-recall system • Vaccine coverage • Linked to other public health programmes
Spain – Navarre [10]	Computerised medical record	2000–2004	Regional	Covers all the residents and all vaccines for children and adults Represents a subsection of the computerised medical record	<ul style="list-style-type: none"> • Call-recall system • Vaccine coverage • Vaccine effectiveness
Australia ^d [7]	Australian Childhood Immunisation Register	1996	National	Covers information on all children up to seven years of age based on the health insurance scheme Data updated daily	<ul style="list-style-type: none"> • Call-recall system • Vaccine coverage (including risk groups) • Vaccine safety • Payments to parents and vaccination providers
	National Human Papillomavirus Vaccination Register	2008	National	Covers details on HPV vaccinations given to eligible females	<ul style="list-style-type: none"> • Call-recall system • Vaccine coverage • Potential to link with a disease register of cervical cancer screening
Canada [11]	Various depending on province/territory	Various depending on province/territory	Various (regional/ local to provincial/territorial) depending on specific system	Provincial level computerised systems (covers 6/13 provinces) Creating and adopting national standards Promoting interoperability between registries Developing vaccine barcode use	<ul style="list-style-type: none"> • Vaccine coverage (as part of an integrated public health surveillance system in some provinces/territories)

^a Covers data on childhood vaccinations from 1996; system under reorganisation, changes planned to be implemented in 2012-14.

^b Multiple CHISs exist in England, provided by different suppliers.

^c Sometimes up to 16 years only.

^d In addition to the two national immunisation registers, a variety of jurisdiction-based registers and primary care practice software systems exist in Australia, which interact with the national registers; there is also a Q fever vaccination register (industry-based register).

countries have overcome this problem, at least to a certain extent, by regions/provinces creating register networks. Such networks require common national standards and issues can remain around ensuring an accurate denominator. Thirdly, some countries have strict information governance regulations which do not allow personal identifiable data to be kept at national level [9]. Finally, the role of the private sector in vaccine delivery in some settings (as opposed to the central purchase of vaccine by the public sector) can provide a challenge to properly estimating the numerator.

The special issue highlights some of the future directions of travel. Countries which already have national vaccine registers are now extending these to whole life and teenage and adult vaccine programmes. The potential for synergy (and efficiencies) with other public health programmes such as maternal screening/neonatal screening is being explored. There is an increasing automation of operational processes from patient reminders through to scanning barcoded vaccine products. These need to be more standardised and at least for the latter, buy-in from the vaccine manufacturers is required. The full surveillance and research potential of such systems (under appropriate governance) is only just being realised, particularly through linkage to other electronic health records and through direct contact with patients. For some countries, there are important operational, financial and governance challenges to their establishment, for example decentralised health systems or concerns about data confidentiality. Alternative solutions need to be found, and some countries have tried to collect vaccine uptake data in other ways – such as by the use of telephone surveys [9]. Despite these challenges, national vaccine registers can play a key role in the delivery of national immunisation programmes in many countries and make important contributions to achieving national and international control and elimination targets.

Acknowledgments

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