Use of Electronic Immunisation Registers to strengthen immunisation programs

A/Prof Meru Sheel
Sydney School of Public Health
University of Sydney
e: meru.sheel@sydney.edu.au
@merusheel
Outline

1. Electronic immunisation registries (EIRs) and immunisation information systems
   • Health Information Management Systems

2. Usefulness of EIRs in strengthening immunisation programs
   • Individual level
   • Population level

3. Considerations for implementation
Electronic immunization registries (EIRs)

• Tools that facilitate the monitoring of individual immunization schedules and the storage of individual immunization histories, and, consequently, help enhance the performance immunisation program.

• Immunisation registries can also be paper-based and non-individual
Immunisation information systems (IIS)

- Produce information that will guide the strategic, managerial, and operational decisions of the EPI within each country.
Health information systems (HIS)

- Tool for collection, processing, analysis, and transmission of information required for organizing and operating health services
- Provide useful, high-quality data in a timely fashion. Improvements in health information systems arise from the changing information needs of programs, sectors, users, and the population.
- Not just visualisation
Inter-relationships among HIS and IIS

Do you have an immunisation registry in your area/country?
How can EIRs be used?
Australian Immunisation Register

- Established 1996 – childhood vaccines <7 years
- Maintained by Services Australia on behalf of Australian Government Department of Health
- Jan 2016 – expanded to age 19 years
- Oct 2016 – expanded to include all ages
- 2018 – National HPV vaccine register data transferred to AIR

Australian Childhood Immunisation Register (ACIR)

**Identifying and definitional attributes**

<table>
<thead>
<tr>
<th>Item type:</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>The Australian Childhood Immunisation Register (ACIR) is a national register administered by Medicare Australia that records details of vaccinations given to children under seven years of age who live in Australia. It was established in 1996 in response to a decline in childhood immunisation levels and an increase in preventable childhood diseases.</td>
</tr>
</tbody>
</table>
How does AIR work?

• Anyone Medicare-registered automatically added and assigned PIN
• If not Medicare-registered but vaccination reported assigned SIN
• 6/8 jurisdictions report directly into AIR
• Overseas vaccinations can also be added
• Limited data fields
  • Vaccine, dose number, date
  • Age, sex, Indigenous status, postcode of residence
  • Provider type
  • Exemptions (validated by authorised providers)
• But Medicare number is not a unique ID...

Slide courtesy: A/Prof Frank Beard
Individual level follow-up

- Compliance with vaccination schedule
- Reminder for those who maybe overdue (eg SMS)
- Safety monitoring for individuals
- Vaccine certificates (eg COVID-19 vaccine certificate)
- Immunisation history statement (eg for school entry program)
Program evaluation for population impact

Coverage

Figure 6: Cumulative percentage of infants vaccinated with the second dose of 13vPCV* by age in months and indigenous status, Australia, 2020

Figure 11. Coverage of 4 doses of diphtheria-tetanus-acellular pertussis (DTaP)-containing vaccine at 24 months of age* by Statistical Area 3, Australia and major capital cities, 2020

*Shown as cumulative percentage vaccinated (number of infants who received vaccine dose at particular age / total number of infants who received the vaccine dose, expressed as a percentage).
13vPCV - 13-valent pneumococcal conjugate vaccine
Cohort born in 2018
Source: Australian Immunisation Register; data as at 30 March 2021.

Program evaluation for population impact

Coverage using administrative and survey methods

**Routine administrative method**

**Advantages:**
- Based on data necessary for service provision
- Timely management monitoring tool
- Provides data at local level

**Disadvantage / Limitations:**
- Denominator (target population may be projected based on old/poor census data)
- Transcription or calculation errors
- Incomplete reporting
- May include vaccination conducted outside the target group
- May not include private sector

**Survey method**

**Advantages:**
- Estimate of coverage can be obtained if the denominator is unknown.
- Provides additional information on social economical status, maternal characteristics, sex, etc of reached and unreached children
- Vaccinations given by the private sector reflected
- Allows assessing timeliness (among those with cards)

**Disadvantage / Limitations:**
- Bias – selection, information and sampling error
  - Provides information on the previous birth year’s cohort.
  - Immunization card availability and quality
  - Reliance on recall in absence of card
  - Representativeness
- Interviewer interaction
- Length or complexity of the questionnaire may compromise accuracy
- Resource intensive

Adapted from WHO, Dr Jan Grevendonk
Program evaluation for population impact

Tailoring immunisation programs

Zero-dose children, and reaching other hard-to-reach populations

See Thomas et al 2022 Vaccine.
Program evaluation for population impact

Effectiveness

- Vaccine effectiveness
  - Needs individual vaccine data linked to disease outcome data
  - Context-specific data
  - Builds confidence in program

- Cost-effectiveness

- Efficiency, outbreak response

- Adverse events monitoring

---

https://www.gavi.org/vaccineswork/what-difference-between-efficacy-and-effectiveness

Nordic countries

- Most advanced
- Unique identifier
- Norwegian SYSVAK (established 1995)
- Danish vaccination register (established 2013)
- Finnish national vaccination register (established 2009)
- Based on unique PIN issued at birth or immigration
- Facilitates linkage to other national health registers
- Eg MMR/autism cohort study (657,461 children) linking data on autism diagnoses and risk factors

Adapted from A/Prof Frank Beard
Observational data from Tanzania

- Add value to immunization stakeholders at all levels of the health system.
- Individual-level data can enable new analyses to understand service delivery or care-seeking patterns, potential risk factors for under-immunization, and where challenges occur.
- To achieve this potential, country programs need to leverage and strengthen the capacity to collect, analyze, interpret, and act on the data.
How do you use?
- individual data
- aggregated data
- what barriers have you experienced
Considerations for implementation
To make the most of new EIRs....

• Unique identifier
  • Denmark, Norway, Finland, New Zealand

• Clinical decision support systems to aid medical practitioners and improve individual experience Population denominator

• Data quality
  • Incomplete reporting and timeliness
  • Audit of the Australian Register*
  • Mandated through COVID-19 in Australia

• All-of-life esp in the context of COVID-19 vaccines

To make the most of new EIRs....

• Alignment with other components of immunisation information systems
  • VPD surveillance, notification, hospitalisation, deaths
• Real-time data analyses
• Interaction with electronic medical records/ 2-way interactive platform
• Inter-operability
• Resource allocation – hardware, software and human resources for data quality
• Data governance and privacy
Conclusions

- EIRs and Immunisation Information Systems can **improve vaccine coverage** and strengthening immunisation programs
- Data can enable **data-drive decision making**
- Strengthen immunisation information systems
- For settings where COVID-19 registries have been established, **program and process evaluation** can help with integration – don’t waste a crisis!
- **EIRs take a long time to mature** – ensure resource allocation
General architecture of the National Vaccination Register in Finland

Automated processes are indicated by solid arrows and manual processes by dashed arrows

Baum et al, 2019, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5434884/