Evaluating the Completeness and Accuracy of the Wisconsin Immunization Registry

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Importance of Immunization Information Systems (IIS)

IIS have been recommended for improving vaccination rates through their ability to:

- Determine patient vaccination status and forecast recommended vaccinations
- Assist with reminder/recall efforts
- Assess population vaccination coverage
- Facilitate vaccine management and accountability

Groom et al. Immunization Information Systems to Increase Vaccination Rates: A Community Guide Systematic Review. *JPHMP*. 2014.

Effectiveness of IIS

IIS effectiveness depends on:

- Completeness
  - Patients need a client record in the IIS
  - Vaccinations need to be documented in the IIS
- Accuracy
  - Administration dates
  - Trade names
  - Lot numbers

Wisconsin Immunization Registry (WIR)

- Since 2000, collects immunization information for Wisconsin residents of all ages.
- Gathers information from vital records, public and private health care organizations, pharmacies, HMOs, Medicaid, WIC.
- Receives data through manual entry and data exchange.
- Performs all IIS functions identified as effective for increasing immunization rates.

Evaluation of the WIR

Purpose: Evaluate the completeness and accuracy of the WIR.

Method: Compared vaccination histories recorded in provider medical records (MR) with vaccination histories recorded in the WIR.

Population: Patients born during 2009 and the vaccinations they received during 2009-2011.

Data collection and analysis

Data collection from WIR

Extracted data for all clients born in 2009 and all vaccinations received 2009-2011.

Data collection from MRs

Recruited VFC-affiliated clinics during VFC site visits and via phone.

Selected random sample of MRs of patients born in 2009, vaccinations received 2009-2011.

Comparison of MR and WIR records

For each selected patient MR, WIR was searched for a matching client record.

Among patients with a WIR client record, MR and WIR vaccination histories were compared.

Comparison of MR and WIR records

Completeness

- Percent of patients up to date (UTD) with ACIP-recommended number of doses: MR only, WIR only, National Immunization Survey (NIS).
- For each patient, attempted to match MR vaccinations to WIR record vaccinations by vaccine type and administration date (±10 days).

Accuracy

- Among matched vaccinations, compared MR and WIR records to detect differences in administration dates, trade names, and lot numbers.

ACIP, Advisory Committee on Immunization Practices; MR, medical record

By method of data entry into WIR

Evaluated associations between the clinic method of WIR data entry with:

Completeness	• Percent of clinics' patients with WIR client records • Percent of patients' MR vaccinations matched to vaccinations in the WIR
Accuracy	• Percent of patients' matched DTaP, Hib, PCV, and rotavirus vaccinations with the same trade name

DTaP, diphtheria-tetanus-acellular pertussis vaccine; Hib, *Haemophilus influenzae* type b vaccine; PCV, pneumococcal conjugate vaccine

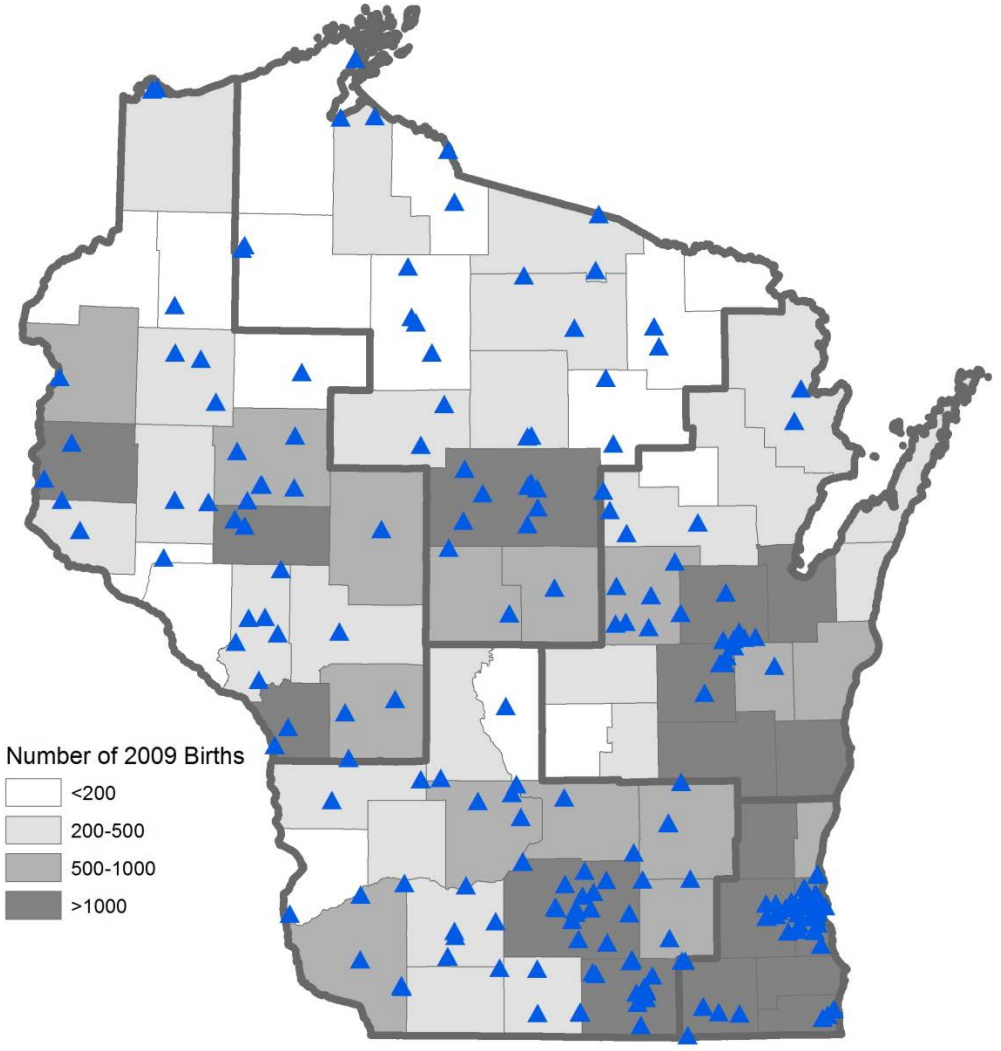
Results

Participating providers

251 providers

1,863 patients

30,899 vaccinations



Completeness

- **98%** (1,833/1,863) of the selected patients had WIR client records.
- **97%** (30,046/30,899) of their vaccinations were documented in the WIR.

Percent of children up to date by vaccine and data source

Vaccine (number of doses)	Medical Record (N=1,833)	WIR (N=1,833)
4:3:1:3:3:1:4	**49.3%**	**76.5%**
DTaP (4)	60.9%	86.4%
Polio (3)	65.6%	92.1%
MMR (1)	71.7%	91.1%
Hib (3)	66.6%	92.1%
Hepatitis B (3)	60.2%	89.5%
Varicella (1)	69.6%	88.9%
PCV (4)	59.8%	83.8%

DTaP, diphtheria-tetanus-acellular pertussis vaccine; MMR, measles, mumps, rubella vaccine
Hib, *Haemophilus influenzae* type b vaccine; PCV, pneumococcal conjugate vaccine

Percent of children up to date by vaccine and data source

Vaccine (number of doses)	Medical Record (N=1,833)	WIR (N=1,833)	NIS 2012
4:3:1:3:3:1:4	**49.3%**	**76.5%**	**75.2%**
DTaP (4)	60.9%	86.4%	87.8%
Polio (3)	65.6%	92.1%	88.9%
MMR (1)	71.7%	91.1%	89.3%
Hib (3)	66.6%	92.1%	90.3%
Hepatitis B (3)	60.2%	89.5%	88.4%
Varicella (1)	69.6%	88.9%	88.5%
PCV (4)	59.8%	83.8%	84.5%

DTaP, diphtheria-tetanus-acellular pertussis vaccine; MMR, measles, mumps, rubella vaccine
Hib, *Haemophilus influenzae* type b vaccine; PCV, pneumococcal conjugate vaccine
NIS, National Immunization Survey 2012
NIS data: http://www.cdc.gov/vaccines/imz-managers/coverage/nis/child/data/tables-2012.html

Accuracy

Among vaccinations documented in the MR and the WIR, accuracies of:

- Admin dates: **99%** (29,807/30,046)
- Lot numbers: **95%** (10,330/10,843)
- Trade names[a]: **96%** (11,617/12,070)

[a]DTaP, Hib, PCV, and Rotavirus vaccinations only

Accuracy: Trade names

Vaccine	Percent of matched vaccinations with the same trade name
DTaP	99% (3,664/3,710)
Hib	**96%** (2,909/3,030)
PCV	**92%** (2,960/3,223)
Rotavirus	99% (2,084/2,107)
Total	96% (11,617/12,070)

DTaP, diphtheria-tetanus-acellular pertussis vaccine
Hib, *Haemophilus influenzae* type b vaccine
PCV, pneumococcal conjugate vaccine

Completeness and accuracy by method of data entry into WIR

Clinic method of data entry into WIR	Percent of clinics with all patients having WIR client records OR[a] (95% CI)	Percent of patients with all vax documented in WIR OR[b] (95% CI)	Percent of patients with all vax[c] having accurate trade names OR[b] (95% CI)
Data exchange with EMR	93% Reference	95% Reference	84% Reference
Data exchange with billing records	94% 2.1 (0.3–15.8)	88% 0.6 (0.3–1.3)	86% 1.3 (0.6–3.3)
Manual entry via user interface	83% **0.3 (0.1–0.9)**	88% 1.4 (0.4–4.9)	68% **0.3 (0.1–0.5)**
Does not provide data to WIR	100% --	27% **0.1 (0.0–0.6)**	56% **0.1 (0.0–0.5)**

a: Adjusted for clinic size and whether clinic was affiliated with a multi-clinic organization
b: Adjusted for clinic size, whether clinic was affiliated with a multi-clinic organization, and for repeated measurements within clinics.
c: Among DTaP, Hib, PCV, and Rotavirus vaccinations
Vax, vaccinations; EMR, electronic medical record; OR, odds ratio; CI, confidence interval

Summary: Completeness

- Almost all of the selected patients and their vaccinations were documented in the WIR.
- WIR generally contained a more complete vaccination history than the MR, indicating the WIR is consolidating vaccination histories as designed.
- WIR provided a vaccination coverage assessment similar to the NIS.

Summary: Accuracy

- Administration dates, lot numbers and trade names were highly accurate.
- PCV and Hib trade names were less accurate, perhaps because of changes in product use or confusion with similar trade names.
- Important to quickly update EMRs, IIS, and data exchange methods to indicate changes in products used.

Summary: Method of WIR entry

- Factors associated with greater WIR data completeness and accuracy:
  - Regularly sharing data with WIR
  - Sharing data via data exchange with an EMR

- Implications for impact of Meaningful Use on IIS data quality.

Limitations

- Gathered data only from VFC clinics.
- Results may not be generalizable to data entered into WIR during a different time period.
- Not able to verify accuracy of information not recorded in the participating clinic's record.
- Not able to assess completeness or accuracy for clinics that only entered information into WIR.

Next steps

- Disseminate results of evaluation to recruit and retain providers.
- Disseminate best practices to improve data entry via user interface.
- Continue to monitor completeness and accuracy of WIR data.
- Continue to modify WIR functionality to improve completeness and accuracy.

Conclusions

- WIR was largely complete and accurate.
- Supports expectation[1, 2] that IIS data quality will improve as Meaningful Use progresses.
- IIS and provider staff should regularly monitor IIS data quality and data exchange methods.
- With complete and accurate IIS, we can improve vaccination rates and reduce vaccine-preventable diseases.

1) Groom et al. Immunization Information Systems to Increase Vaccination Rates: A Community Guide Systematic Review. *JPHMP*. 2014. 2) CDC. Progress in immunization information systems, United States, 2012. *MMWR*. 2013.

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