

**Davies Public Health Award of Excellence Application
Wisconsin Immunization Registry (WIR)**

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Section A: Identifiers

Submitted by:

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7. Wisconsin is in the Great Lakes region of the country, with an estimated 2008 population of more than 5.6 million. Broken down by age, 6.4 percent were under the age of 5, 23.4 percent under 18, and 13.3 percent were 65 or older.

In 2009, the United Health Foundation (UHF) ranked the Badger State 12th in overall health, a substantial improvement from 17th in 2008. Our strengths include a low incidence of infectious disease at 6.1 cases per 100,000 population, a low rate of uninsured population at 8.9 percent, and a relatively low percentage of children in poverty at 13.1 percent of children under 18.

In addition, UHF ranked Wisconsin 3rd in the nation for child immunizations in 2009 with 83.6 percent of children ages 19 to 35 months receiving complete immunizations. This ranking is a major improvement since 2000, when UHF ranked Wisconsin 12th for childhood immunizations, with 78.6 percent.

A key factor in Wisconsin's subsequent success with immunizations is the widespread acceptance and use of the Wisconsin Immunization Registry (WIR). The WIR is an innovative, nationally recognized information system. A confidential, web-based computerized system, it collects vaccination data from health care providers in Wisconsin.

The principal focus of the WIR is to help public and private health care providers and parents keep children on schedule for recommended immunizations, and help Wisconsin meet the goal of 90 percent of children receiving their primary series of immunizations by their second birthday.

A birth-to-death system, the WIR contains immunization records of individuals of all ages; it can analyze available data and determine if and when additional immunizations are needed. The WIR is offered to any health care provider at no cost. The user only needs a personal computer with Internet access.

(The Davies Public Health Committee requested additional information be added to the original WIR submission, from new insightful information shared during the site visit, and therefore this application exceeds the required page limit.)

Currently more than 11,000 users from 1,609 provider organizations operating at some 4,200 facility sites are on the WIR. More than 2,500 schools have "look-up" access to the WIR. There are more than 6.8 million client records with 49 million associated immunization records. Each working day, 18,000 new or historical vaccine administration records are added to the WIR. In addition, 1,000 users are accessing the WIR at any given time throughout the day. Public access accounts for some 17,800 accesses monthly for a total of 213,654 accesses in 2009.

8. Number of FTEs

- a. Wisconsin Department of Health Services: approximately 5,541
 - Division of Health Care Access & Accountability: approximately 501
 - Division of Public Health: approximately 404
 - Bureau of Communicable Diseases Prevention and Emergency Response: approximately 86
 - Immunization Section: 21
- b. Directly involved in submission project: 4

9. Description of public health program directly affected by WIR

- a. The WIR is available via the web 24/7/365, with daily backups.
- b. Full system access available to:
 - Public and Private Providers
 - HMO's
 - Hospitals
 - Women, Infants and Children's Nutrition program (WIC)
 - Tribal Agencies
 - Correction facilities
 - Nursing Homes
 - Medicaid
 - Schools and colleges that administer vaccines
- c. Read-only access is available to:
 - Head Start facilities
 - Schools and Colleges
 - Families
- d. Public Health programs integrated into the system:
 - Immunization
 - Medicaid
 - WIC
 - Strategic National Stockpile (SNS)
 - Childhood Lead Poisoning Prevention

10. Electronic Public Health Information Team

Thomas Maerz	Manager, Wisconsin Immunization Registry
Stephanie Schauer	WIR Epidemiologist
Matt Verdon	WIR Training Coordinator
Gerald Gabor	Program Staff
James Malone	DPH Communications Coordinator

Section B: The Organization

The WIR is a computerized, internet database application that was developed in a collaborative effort between the Wisconsin Division of Public Health and the Wisconsin Division of Health Care Access and Accountability. Both divisions are part of the Wisconsin Department of Health Services. The department's mission is to protect and promote the health and safety of the people of Wisconsin.

The WIR was developed to consolidate the immunization records of the citizens of Wisconsin in a central database and to share this information with health care providers, schools, other health related programs and families for the purpose of improving the immunization status of its citizens and to prevent the occurrence of vaccine preventable diseases.

The day-to-day operation of the WIR is under the direction of the Wisconsin Immunization Program within the Division of Public Health. Statewide release of the WIR began in May 2000.

Management

The vision of WIR is to improve the immunization status of all Wisconsin children and to ensure that children are appropriately immunized was its primary focus. By consolidating immunization information and sharing it with health care providers, schools, Health Maintenance Organizations (HMO's), families and other agencies concerned with children's health, overall immunization rates increased and missed opportunities to vaccinate were reduced.

1. Objectives

- a. Remain current with all functional standards associated with immunization information systems, to increase user participation with the WIR thereby expanding the systems client base and also to maintain a high degree of health care provider satisfaction.
- b. Continue to meet the 12 functional standards as outlined by the National Vaccine Advisory Committee as well as those functional standards outlined by the Centers for Medicare and Medicaid services.
- c. WIR will be able to track individuals from birth to death and access immunization status and needs.
- d. Remind parents and providers of individuals who need immunization services.
- e. Continue to de-duplicate and monitor client and immunization records to ensure the highest quality of data.
- f. CDC Advisory Committee on Immunization Practices (ACIP) immunization schedules will be implemented in the WIR within 2 working days of publication in the MMWR.
- g. Maintain and develop new interfaces to process immunization data from providers statewide. Integration with other partners includes the Childhood Lead Program, WIC's ROSIE system, Maternal and Child Health Management System (SPHERE), Wisconsin Health Information Exchange (WHIE) and the Wisconsin Electronic Data Surveillance System (WEDSS).
- h. Reach and maintain 95% of children between the ages 0 and 6 years that are enrolled in the WIR, and have two or more immunizations recorded in the system.
- i. The WIR system will be available 24/7, 365 via the web to assist providers in assessing and immunizing patients during any encounter.

- j. On an ongoing basis, WIR will promote and monitor utilization of parent/public access.
- k. Improve interoperability with the Electronic Medical Record (EMR) and Electronic Health Record (EHR) systems.

2. Project Organization

Roles & Responsibilities. Specific project roles and responsibilities include:

- WIR Project Manager: Is responsible for systems administration and security, technical consultation, design, implementation and high level support for the WIR.
- WIR epidemiologist: Provides analysis for the WIR data, ranging from data quality to immunization rates. Quarterly reports are run for childhood and adolescent immunization rates, and are used at the state and national level. A yearly submission for publication in a peer-reviewed journal is also developed.
- WIR training coordinator: Is responsible for registry installation, training, technical assistance and help desk support, connectivity trouble shooting, program application changes, disaster recovery, technical documentation development and backup assistance to the Wisconsin Immunization Registry Systems Manager.
- Immunization Program Manager: Is responsible for setting programmatic direction, approving IIS grant objectives, negotiating contractual details with registry contractor, supervising state staff, overseeing contractors' progress, reporting progress to CDC and the Wisconsin Department of Administration.
- Immunization Program Staff Member: Is member of the team responsible for ensuring forecasting module reflects the most recent immunization schedule outlined by the Advisory Committee on Immunization Practices (ACIP).
- WIR Help Desk: Two individuals are available during regular business hours to assist WIR users with issues related to WIR use and questions about functionality.

Implementation

1. Public Health Organization – Segments Involved

- a. The Wisconsin Immunization Program, central office (n=13):
 - Analyses of statewide WIR data related to data quality issues, assessment of rates for specific series or individual antigens, determining uptake of new vaccines and impact of vaccine shortages are performed.
 - The Wisconsin Immunization Program also uses the WIR in the investigation of vaccine-preventable diseases, and in confirming the immunization status of confirmed and suspect cases.
- b. Regional Staff (n=8)
 - Regional immunization staff assist local health departments (county and city level) and private health care providers in their region regarding the use of the WIR. This includes training, trouble shooting, running reports and using the inventory tracking feature. Site visits are made to participating providers on a regular basis.
- c. Local Health Departments (n=92) and Tribal Entities (n=14):

- Local health departments (LHD) and tribal entities use the WIR to record immunizations they give, as well to enter historic immunization records that patients have only on paper. In addition, these entities receive funds based on WIR-generated reports that measure specific, population-based immunization benchmarks.
 - Report features allow assessment of their entire jurisdiction or just their own immunization efforts.
- d. WIC (n=74 agencies):
- WIC program data have been downloaded in the WIR since 2002. WIC staff use the WIR to look up the immunizations for clients to see if there are additional doses they are unaware of, or to see what is recommended.

2. Scope

a. Data Access

- The WIR is a web-based application primarily Java and PL/SQL based utilizing an Oracle database that provides data access through a variety of methods.

b. User Interface

- The user interface allows anyone that can connect to the Internet and is enrolled with WIR access to the client and immunization data.
- The user interface provides role-based access to WIR that specifies what data and functionality a specific user can execute.

c. WIRLite

- WIRLite provides a downloadable version of the WIR application that can run locally on a computer without Internet access.

d. Public Access

- WIR also offers access to the general public. Through the Internet, WIR provides an access point where a person can enter specific identifying information (i.e. SSN, Medicaid ID, First Name, Last Name, and DOB) to obtain their immunization history and recommendations as recorded in WIR.

e. Electronic Data Exchange

WIR also provides data access through electronic data exchange. The following technical components are utilized to facilitate these exchanges:

- American Standard Code for Information Interchange (ASCII), is a fixed format layout using 3 separate files (client demographic, immunization history and adverse events/comments) linked by a client ID.
- Health Level Seven (HL7) is an international framework and standard used for the exchange, integration, sharing, and retrieval of electronic health information.
- Hypertext Transfer Protocol Secure (HTTPS) is a web protocol used for sensitive material transactions to provide data encryption and secure identification. It creates a Virtual Private Network (VPN) through the use of certificates.
- Public Health Information Network Messaging System (PHINMS). Public health includes many organizations that need a secure Internet connection to exchange sensitive data between a variety of health information systems. The exchange uses a Collaboration Protocol Agreement (CPA) approach to

security and encryption, which provides rules for dealing with a variety of firewalls, and Internet protection schemes.

- The WIR has multiple electronic interface options to access data:
 - Providers can receive a flat-file download of client and immunization data using ASCII text, .pdf, or .xls file formats.
 - Providers use HL7 messaging to do batch and real-time queries.
 - URL Encoding to do real-time queries from within an EMR system to present immunization history and forecasting information.

f. Data Entry

- Data is entered into WIR using primarily the user interface or one of the electronic data exchange options as outlined in Section e.
- All of these methods require the submitted data to be processed through a strict validation and record matching algorithm before being placed into the production area of the database. Having many options for providers to submit their data has been key to its success.

g. Decision Support

- Immunization Forecasting (Vaccines due based on age and history)
 - The WIR application allows a user to see real-time immunization forecasts to improve the efficiency and accuracy of immunizations given during a patient visit.
 - These forecasts are generated in real-time allowing providers flexibility to view prior to the visit or while the patient is being seen.
 - The immunization forecaster is driven through rules available to the system manager for updates and configuration. This allows for updates to occur with the schedule without programming changes and in real-time as new recommendations to the ACIP schedule occur.
- WIR also allows recording of patient-specific comments that track the reactions, contraindications and exemptions for patients to guide whether a patient should receive an immunization or not.

h. Reporting (Ad-Hoc/Benchmark/Assessment/Reminder Letters)

- The Ad Hoc Reports function in WIR allows the user to create customized reports to identify and analyze client and immunization data for people within their organization.
- The Assessment Report feature in WIR compiles an organization's immunization data into a useful format. It shows an overall view of all immunization benchmarks and missed opportunities to give a client additional immunizations to bring them up to date.
- The Benchmark report allows WIR users to retrieve a list and count of clients who have met an immunization benchmark or predefined series of immunizations.
- Results from all of these reports can be used to generate a GIS map. This provides a decision tool to help providers identify pockets of need and identify targeted outreach strategies for these areas of need.
- WIR generates immunization reminder/recall notices in either a postcard or letter format and can produce mailing labels for providers who choose to use

their own letters. WIR allows providers to customize the letters to meet specific needs or clinic schedules.

i. Workflow

- One of the most attractive features of WIR is its patient searching and de-duplication capacities. A provider can search for any patient in WIR if they know the first name, last name, and date of birth. The sharing of data prevents unnecessary immunizations and/or missed opportunities.

j. Vaccine Inventory Management

- WIR provides a vaccine management functionality to manage vaccine inventory. This feature provides inventory notices when supplies drop to a certain level. WIR electronically facilitates Vaccines for Children program ordering.

k. User Support and Communications

- WIR utilizes an announcement function within the system home page to notify users of important immunization and system level announcements. Examples of its use include notifying users of WIR application enhancements, vaccine shortages, user enrollment signature needs, or WIR maintenance downtimes.
- WIR also provides on-line help screens, on-line user manuals, and video training clips to provide independent support to the user community.
- The program also holds 14 user group meetings throughout the state annually to communicate upcoming system enhancements and gather feedback on application needs to prioritize future work.

3. Exchange and Interoperability Levels

- a. Technical integration of WIR with other information systems is ongoing. Through electronic interfaces the WIR has processed more than 142 million immunization records to date.
- b. The WIR has existing interfaces with:
 - Vital records for Birth, Death and Adoption information
 - Medicaid for claims and encounter data
 - WIC
 - HMO's for claims data
 - Immunization Providers
 - State to State registry query and data sharing
- c. The WIR has interface options for providers:
 - Data conversion of existing database via a flat file specification to WIR. Even billing data can be converted and loaded into WIR. Clinicians can then use WIR to track clients and immunizations.
 - Provider continues to use existing system and interfaces with WIR via an ASCII text file or HL7 to download immunization data to the WIR.
 - Clinicians use WIR for data entry and then the WIR sends data back to the provider via an ASCII text file or a HL7 compliant interface immunization records.
 - Clinicians can use both systems with a bi-directional interface to keep each synchronized.

- Use HL7 to do real-time queries and/or updates to the WIR from within an Electronic Medical Record (EMR) System or another registry.
- Use URL Encoding to do real-time queries from within an EMR system.

4. Privacy Protection

- a. Security systems are in place to prevent unauthorized access or manipulation of the information. Prior to use of the WIR, the organization and user must sign the Security and Confidentiality Agreements.
 - All WIR data is encrypted and password protected.
 - Parents have the option to "opt out" through the birth certificate application, as well as at any time a provider administers a vaccine.
- b. The WIR application accomplishes this with the use of a Secure Site License Certificate (SSL certificate). This third party service ensures that data transferred between the end user's browser and the WIR web server is encrypted and secure.
- c. WIR also uses three-tier architecture to improve security.
- d. The application also requires 3 levels of authentication to access the data. That authentication includes a provider identifier, a user name, and a password.
- e. Session timeouts are employed based on session inactivity.
- f. Real-time data-exchange interfaces use the CDC's PHINMS 2.1 messaging transport system with Collaboration Protocol Agreements exchanged between endpoints before communications may be made.
- g. For batch data-exchange interfaces the user must login to the firewalled WIR application (browser-based, HTTPS/username/password/role-based access) to upload or obtain data-exchange files.
- h. Alternate access is HTTPS-based with URL-encoding using an authentication key generated by the WIR application and available only to those with username/password and role-based access to the system.

5. System Implementation

- a. Implementation Timeline
 - 1999
 - WIR Pilot
 - Replaced non-Y2K compliant application. Focus on de-duplication, validation, and recommendation.
 - 2000
 - LHDs given access to WIR.
 - Help Desk established to provide user support.
 - 2001
 - WIR access extended to private providers
 - 2002
 - HL7 and Automated Data Exchange
 - HMOs given the ability to query on their clients.
 - Schools given access to view student immunization history
 - LHDs able to report on all clients who reside in their jurisdiction.
 - 2003
 - VFC providers able to order VFC vaccines and VIS sheets from the Division of Public Health through WIR.

- Providers able to generate and print VFC summary reports.
- 2004
 - Geographic Information Systems (GIS) Mapping enables providers to view data geographically
- 2005
 - WIR allows the querying and accepting of client and immunization data from other registries.
 - Users with the System Administrator (SA) role able to generate customized reports that list or count client and immunization data.
- 2006
 - Users receive an annual security and confidentiality notice that allows them continued use of the WIR.
 - Benchmark reports added.
 - Providers able to request real-time HL7 client updates through data exchange.
- 2007
 - WIRLite made available to users.
 - WIR implements support of signature pads.
 - On-line training released.
- 2008
 - The school renewal process automated on-line.
- 2009
 - Mass vaccination immunization module released.
- b. Client implementation:
 - All demographic information for births occurring in Wisconsin were back-loaded from January 1995 forward and continues to be downloaded on a weekly basis.
 - Clients may be added via the user interface, or through data exchange.
- c. Staff Training:
 - Staff are required to attend a full-day hands-on training.
- d. Provider recruitment:
 - Currently, there are 1,609 health care providers and 4,200 health care sites using the WIR. Providers are recruited to use the WIR in several ways:
 - The WIR is featured at the annual departmental spring seminar series.
 - A brochure outlining the features and benefits of the WIR is distributed to providers via mail.
 - During Vaccines for Children site visits, where DPH staff visit individual providers to assess immunization practices and compliance with the federal entitlement program, the WIR is demonstrated and benefits explained.
 - Some LHDs included WIR provider recruitment activities as grant objectives.
 - Registry presentations are provided at health care conferences throughout the state as requested.

- LHDs and immunization coalitions routinely promote the advantages of immunization registries as part of their outreach efforts to physicians in their area.
- Promotion of the WIR by HMOs to their participating providers.

e. Schools:

- Currently, there are more than 2,500 schools using the WIR (includes some school districts).

6. Current State

a. Local Public Health and Tribal Entities:

- Use the WIR's Assessment and Benchmark reports to measure the progress toward and the achievement of immunization grant objectives. They also use Recall/Remind & GIS for outreach to targeted pockets of need.

b. Wisconsin Division of Public Health staff:

- The WIR team consists of a systems manager, a training coordinator, an epidemiologist, a program consultant, and two help desk staff; team efforts include data quality analysis, general systems evaluations, trouble shooting, and adapting the system as new vaccines become available, or new recommendations are made by the Advisory Committee on Immunization Practices.
- Types of statewide immunization assessments include determining the effects of vaccine shortages, the uptake of new vaccines, identifying providers with recalled vaccines, etc.
- Wisconsin Division of Public Health regional immunization staff use WIR to routinely assess providers and immunization rates in their region.

c. Private Providers:

- It is estimated that more than 85 percent of pediatric providers in the state are using the WIR directly or through an interface.
- 20 HMOs with subscribers in the state, as well as Medicaid, submit claims and encounter data to the WIR. HMOs also use the WIR for HEDIS reporting and outreach efforts.

d. Schools:

- More than 90 percent of schools in Wisconsin use the WIR for immunization look-up. Efforts are underway to obtain Family Education Rights and Privacy Act (FERPA) releases from parents so that school immunization data can be entered into the WIR and shared with health care providers. Analysis of data from one large school district alone discovered over 200,000 immunization records that were not in the WIR.

e. Public Access:

- Since 2005, public access has grown from 6,000 requests per month on average to nearly 18,000 with some peak months over 30,000 during the H1N1 outbreak of 2009.

- The number of calls by parents to providers at back-to-school time has decreased significantly.

f. EMR/EHR system Integration:

- Numerous EMR/EHR system vendors are working with the WIR to integrate their systems due to the American Recovery and Reinvestment Act (ARRA) stimulus fund incentives. Health Care providers will reap benefits from the seamless integration with the registry and having one point of data access.

7. *Data Quality*

a. Monitoring of Data Quality

- Data quality of the WIR is monitored at several levels
 - At the time the data is presented whether it is via the user interface or through data exchange,
 - On a weekly, monthly and yearly basis via reports looking for data anomalies and even by statistics all of which are reviewed by the systems manager.
 - Individual data loads are also monitored and unusual activity is reported (such as a larger than normal proportion of clients without immunizations, birth dates falling on the 1st or 15th of the month).
- The WIR is a highly functional system with a de-duplication process that has yielded results of less than 1% of the records being identified in the WIR as either a client or immunization duplicate.
- Automatic de-duplication processes for clients and immunizations as the data is presented. There are more than 50 business rules regarding the de-duplication of incoming immunization record.
- The client de-duplication process works to minimize duplicate client records by identifying probable duplicates via a weighted score algorithm. It compares incoming client records to an indexed list of all clients, kept in core memory.
- Scoring for individual elements are incorporated into 3 scores, the scores are then summed to create a composite score.
 - Individual: First, Last and Middle Name; Gender; SSN
 - Birth Event: Date of Birth
 - Family: Mothers First and Maiden Name; Complete Address
- The composite score indicates the probability that 2 clients are duplicates. Scoring is done probabilistically, with less common names scoring higher than common names, and “close” names/addresses scoring a high percentage of an “exact” score. The matching algorithm understands data variations and assigns positive or negative scores to each element tested for each candidate. Examples include:
 - Common first-name abbreviations (e.g. Robert vs. Bob)
 - Typo’s
 - Differences in spacing and punctuation in names (e.g. McMann vs. Mc Mann or O’Reilly vs. Oreilly)
 - Differences in address formats
 - Reversed first-and-last names

- The cut-point score for identifying potential matches to the user is set low enough to present non-matches, based on the logic the user is presented with a list of potential candidates and basic demographics on each the user can view the records of each candidate.

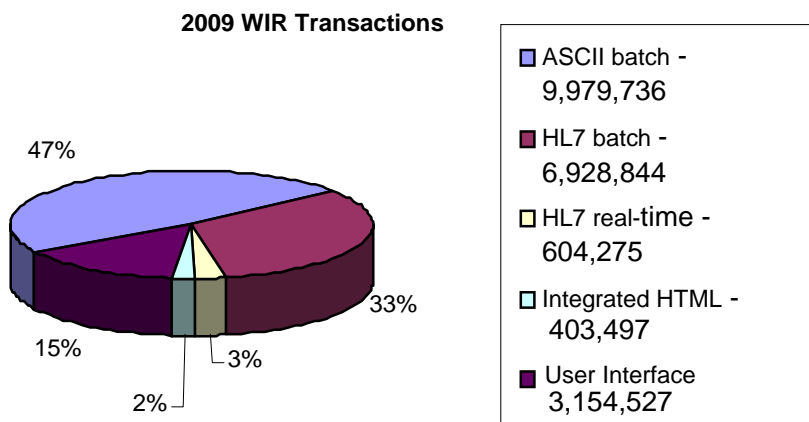
Value

The WIR application provides significant value to the Wisconsin public health and private provider communities through incorporation of technology and standards to present timely and accurate data to system users.

a. Impact on Population Health and Public Health Practice

- Data Accessibility
 - Some clinics choose to use WIR directly at the time of encounter. Other clinics prefer to do data entry after a clinic, while others use their own local database and upload information to WIR through data exchange processes.
 - WIR also provides value through allowing the general public to view their immunization history or that of their children.
 - WIR also provides school specific access to meet the unique needs of school nurses and administrators in validating their student populations meeting the state minimum immunization requirements for school enrollment. This gives schools the power of WIR's features while tailoring the display, reporting, and data needs to that of a school population.
- Clinical Forecasting
 - WIR provides complete real-time clinical immunization forecasts specific to a patient's immunization history, age, and patient comments (i.e. reactions, contraindications, etc.).
- Data Exchange
 - The WIR application facilitates a variety of methods for data exchanges facilitating national HL7 standards as well as proprietary WIR-based formats in both batch and real-time between provider organizations and EMRs.

- The following provides a breakdown of volumes of data exchanges (data access and data uploads) completed by the WIR system:



- Technology Integration
 - WIR has signature pad technology to capture and store electronic signatures on required immunization forms. This reduces the amount of paper and manual record keeping required.
 - WIR uses GIS software to provide the user community with a graphical display of their patient community as well as maps of the immunization rates within their community.
 - WIR has integrated on-line video clip training sessions to allow users to take courses on-line at their convenience.
- Data/Resources
 - WIR receives demographic data from Vital Records on a weekly basis reporting births, adoptions and deaths within the state. Greeting cards are sent to parents of all children born in Wisconsin to remind them of the immunization schedule for children.
 - WIR receives weekly Medicaid loads.
 - WIR is incorporating a Blood Lead Testing module that will store test results for lead levels as well as any recommendations for next testing.
 - WIR also contains a SNS module that allows management of patient and inventory data in case of an outbreak like H1N1, as well as tracking of quarantine status.
- Reporting – Data Use
 - Reports at the patient, provider and population levels are readily available in the WIR and are used in many ways such as of vaccination rate assessment, reminder/recall, and grant requirements.
 - The abstract below pertains to data analysis on the impact of a vaccine on disease morbidity in Wisconsin using data from the WIR and disease incidence, laboratory and hospitalization reports related to the specific disease.

Stephanie L. Schauer¹, Richard T. Heffernan¹, Jonathan L. Temte², Carol J. Kirk³, Peter A. Shult³, Thomas R. Maerz¹ and Jeffrey P. Davis¹

Impact of rotavirus vaccine on acute care visits, hospitalizations and laboratory testing in Wisconsin, 2002-2008

Rotavirus is a highly communicable virus and the most common cause of severe gastroenteritis among infants and young children in the United States. In February 2006, a new rotavirus vaccine was licensed, and in August 2006 the Advisory Committee on Immunization Practices recommended its routine use in infants. Additionally, a second rotavirus vaccine was licensed in April 2008. To assess the uptake of rotavirus vaccine and evaluate its effect on rotavirus morbidity throughout Wisconsin we analyzed data from the following sources: the population-based Wisconsin Immunization Registry, a statewide hospital inpatient surveillance system, a network of outpatient clinics with 2.4 million outpatient visits during 2002 through 2008, and a network of up to 27 testing sites. By March 2008, 63% of children aged less than 12 months had received the complete series of 3 doses of rotavirus vaccine. Rotavirus hospitalizations (ICD-9=008.61) during January –June 2008 decreased from an annual mean of 418 during 2002-2006 to 66 in 2008 (84% decline). Acute care visits for all-cause diarrheal illness among children aged less than 12 months decreased by 50% in 2008 compared to 2006. While the average number of rotavirus tests conducted weekly has remained relatively constant from 2005 through 2008, the percentage of tests positive for rotavirus decreased by nearly two thirds. The brisk uptake of rotavirus vaccine among Wisconsin's infants appears to have significantly impacted rotavirus morbidity during the first two seasons following licensure of the new vaccines.

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2. Costs and Benefits Offsetting Costs

- a. The initial development of the WIR was through Immunization grant monies received from CDC. An Advanced Planning Document (APD) for implementation of Medicaid enhancements was approved by the Centers for Medicare and Medicaid Services (CMS) in March of 2001. This was for development costs, which provided 90% funding by CMS with 10% state match funds. In December of 2002 an update to the APD was approved, which added additional funding and extended full deployment to May of 2003.
- b. After June 2003, WIR funding was broken into three categories: Enhancement (90/10); Maintenance (75/25); and Operational (50/50. CMS requested a cost allocation plan. This is based on the number of clients in the WIR system that are Medicaid eligible, which at that time was 42.1%.

- c. Costs for enhancements and maintenance after June of 2003 were paid using the following breakdown formula.
 - Medicaid-only modifications 75/25 (such as changes to Medicaid ID)
 - 75/25 on 42.1 % of all cost for jointly agreed upon items (changes to reports)
 - The Immunization Program provides funding through the immunization grant for the remaining 57.9 %.
- d. The Immunization program has procured over the years extra funding for such enhancements as HL7 Interfacing, Strategic National Stockpile, and H1N1.
- e. The Immunization program has procured extra funding for enhancements from funding sources such as Public Health Emergency Funding (PHER) to create a rapid, streamlined H1N1 data entry module for the WIR, as well as the purchase of additional hardware to ensure adequate capacity and speed given added stress on the WIR during the H1N1 campaign.
- f. American Recovery and Reinvestment Act (ARRA) funding was obtained for developing additional HL7 interface capabilities, for enhancing features for school users and performing some data quality improvements.
- g. Wisconsin is one of 8 recipients of an Immunization Information Systems sentinel site grant from the CDC, which funds some operational costs and a WIR-focused epidemiologist.

3. Lessons Learned/Critical Success Factors

- a. Legacy data needs to be accounted for in the recruitment process. Loading legacy data after providers have been recruited proved to be a barrier in getting providers to use the system on a regular basis. Clinicians found little value in using an IIS system when all of their data was not in one place.
- b. School access should be granted earlier in the Registry implementation process. Using the WIR helped schools reduce the staff time needed to gather immunization records—a key benefit that aids recruitment. Also, using IIS data can help schools access compliance of students in states that have school immunization laws.
- c. The technology regarding interfacing which was built early on wasn't actually used for several years and only now are we seeing a huge movement to real-time interfacing due to migration to EMR systems by healthcare providers. By planning for EMR integration WIR was able to offer solutions to the migration of provider data from a variety of EMR systems currently being used.
- d. Sharing the WIR and its software has proven to be an advantage to improving system functionality and in the development of new modules (see Transportability). The WIR is an evolving IIS system that requires constant review to remain current with the changing immunization world. Coalitions and workgroups have been formed to review technical requirements and to share responsibility and costs for developing solutions and to implement new requirements, industry standards and system modifications.
- e. Sharing of immunization data is encouraged but barriers still exist in exchange of data between IIS systems and immunization providers. WIR staff continues to bridge gaps in data exchange with CMS in order to capture seasonal influenza data and with Vital Records and Hospitals in collecting birth dose

information (Hepatitis B Immune Globulin and Hepatitis B Vaccine and in securing timely reporting of ED-administered vaccines.

- f. Sharing immunization information between states is progressing slowly due mostly to the lack of national standards regulating the sharing of vital records information between registries. Individual State laws must be satisfied before data can be exchanged on a regular basis and this usually involves working with each state's vital records staff to develop cooperative agreements.

4. Awards for WIR

- a. 2000 Smithsonian Award – Innovative Use of Technology
- b. 2004 Connect Award from CDC - The Connect Award acknowledges an immunization registry that has made significant progress toward establishing automated, real-time connections with other computerized health care information systems. These systems include, but are not limited to, other immunization registries, private- and public-sector health care provider software systems, and government information systems. Evaluation of the nominees is based according to the degree to which the registry has implemented the HL7 Implementation Guide.
- c. 2009 National Immunization Survey Coverage Award - presented to the WI Immunization Program by CDC at the National Immunization Conference in recognition of Wisconsin's extraordinary accomplishments in achieving 83.7% coverage for basic immunization series among 2 year old children.

Dissemination

- a. Throughout the history of the WIR system, there has been a focus on sharing best practices and lessons learned with public health communities nationwide. The WIR is made available at no cost to other public entities (currently 21). This has been facilitated through the following:
 - WIR staff regularly IIS presentations at Conferences.
 - WIR facilitates ongoing consortium meetings with the community of states to share lessons learned, upcoming enhancements, and recent releases with the member states.
- b. WIR also provides information and publications to the community at large through the following state based websites outside of the application.
- c. WIR is a part of a monthly Immunization Evaluator Workgroup for all programs utilizing the WIR software. This group reviews new ACIP recommendations as well as new vaccines that are hitting the market place.

Transportability

- a. WIR is a highly transportable system and is utilized as a basis for immunization systems and programs in 21 state, local, and territory systems. This data is based on those entities that have signed a licensing agreement with the State of Wisconsin. The licensing agreement provides these entities full access and use of system code and documentation for their particular program. Entities receiving the system code and documentation may enhance or modify the application in any way to meet their needs, they are only required never to charge for use of the application and to make any enhancements available to Wisconsin for incorporation into the base system and distribution as part of the

Licensed Copy of WIR (LCW). The following entities have received the LCW: Arkansas, California, Georgia, Hawaii, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Mexico, New York, North Carolina, Oregon, Virginia, Vermont, Puerto Rico, U.S. Virgin Islands, San Diego County, and Duke University. Three additional states are considering adoption of the WIR.

- b. Sharing the WIR allows programs to quickly implement a proven application that meets their immunization system needs.
- c. As enhancements are developed, they are shared with this community of programs; each program decides what they want to incorporate or not incorporate. Some examples of this were states sharing code for Countermeasure Response Administration (CRA) requirements for the H1N1 reporting and priority group requirements that emerged in 2009. Ultimately, each program has the ongoing ability to add or modify any new enhancement to the WIR application, based on specific program needs and requirements.
- d. Immunization Projects interested in obtaining the WIR software can contact Thomas Maerz, WIR Project Manager, (e-mail: thomas.maerz@wisconsin.gov, phone: 608-261-6755) or Daniel Hopfensperger, Immunization Program Manager, (e-mail: dan.hopfensperger@wisconsin.gov, phone: 608-266-1339).

Appendix I Additional Information

Q.) What guidance can you provide to public health agencies preparing their immunization registries for meaningful use?

A.) HL7 is a fairly complex messaging layout. It is critical to have a developer who understands it thoroughly when working with a clinical entity. Having an understanding of IT file structure is also important. Work with the vaccine tables in regards to CPT/CVX/Tradename is of special importance and creating the proper cross walk tables. They need to know going in that the EMR systems do not automatically update themselves when new vaccines are introduced. As an example the provider may report that the vaccine was "RotaShield" when in fact it was "RotaVirus". Therefore, working with EMR vendors and health care providers will be ongoing.

While the specification allows for many fields to be transferred, not all are required. There may be fields that public health providers feel are necessary and therefore want them required. This needs to be conveyed to private health care providers and vendors to ensure proper error return messages for hard and soft errors. For "soft" errors such as a non-required field having bad data (SSN having all 9's) that just that portion of the data being provided is rejected. However, if the vaccination date is before the child's date of birth then the entire record is rejected with an appropriate message being returned.

Provide options in regards to the Transport of the HL7 messages whether it is in accepting batch or real-time messages or the flavor of the transport which also has various levels of authentication and security. Vendors systems vary widely as some are PC based such as small clinical entities, while the large clinical entities tend to be UNIX/Linux/AIX. Therefore providing options that are supported such as URL-Encoding, PHIN-MS and Web Services allows for integration with a broader health care base without having to incur modification costs.

Last item to mention is be prepared to provide a lot of ongoing support whether it's with the vendor or the health care provider. Interpretation of specifications is going to vary and be prepared to provide a means for testing that is outside the Production arena.

Q.) Do you share/exchange vaccine-related data regularly with the CDC?

A.) The Immunization Program regularly shares vaccine related data with the CDC through the Immunization Information Systems (IIS) Sentinel Site Project. Wisconsin is one of eight Immunization Programs participating in the project. The goal is to promote population-based analysis and quality improvement of IIS data for immunization program assessment, evaluation and to assist in disease surveillance activities. In addition we sent data to the CDC regarding smallpox vaccine uptake in response to an effort earlier this decade to immunize health care personnel. We also regularly sent aggregate data pertaining to H1N1 vaccine uptake during the recent H1N1 Immunization Campaign. Finally, during Hurricane Katrina the CDC helped facilitate the exchange of data related

to the immunization status of victims that received vaccine through the states to where they were relocated back to their home state.

Q.) Can any correlations be drawn between vaccine preventable disease (VPD) incidence and the WIR?

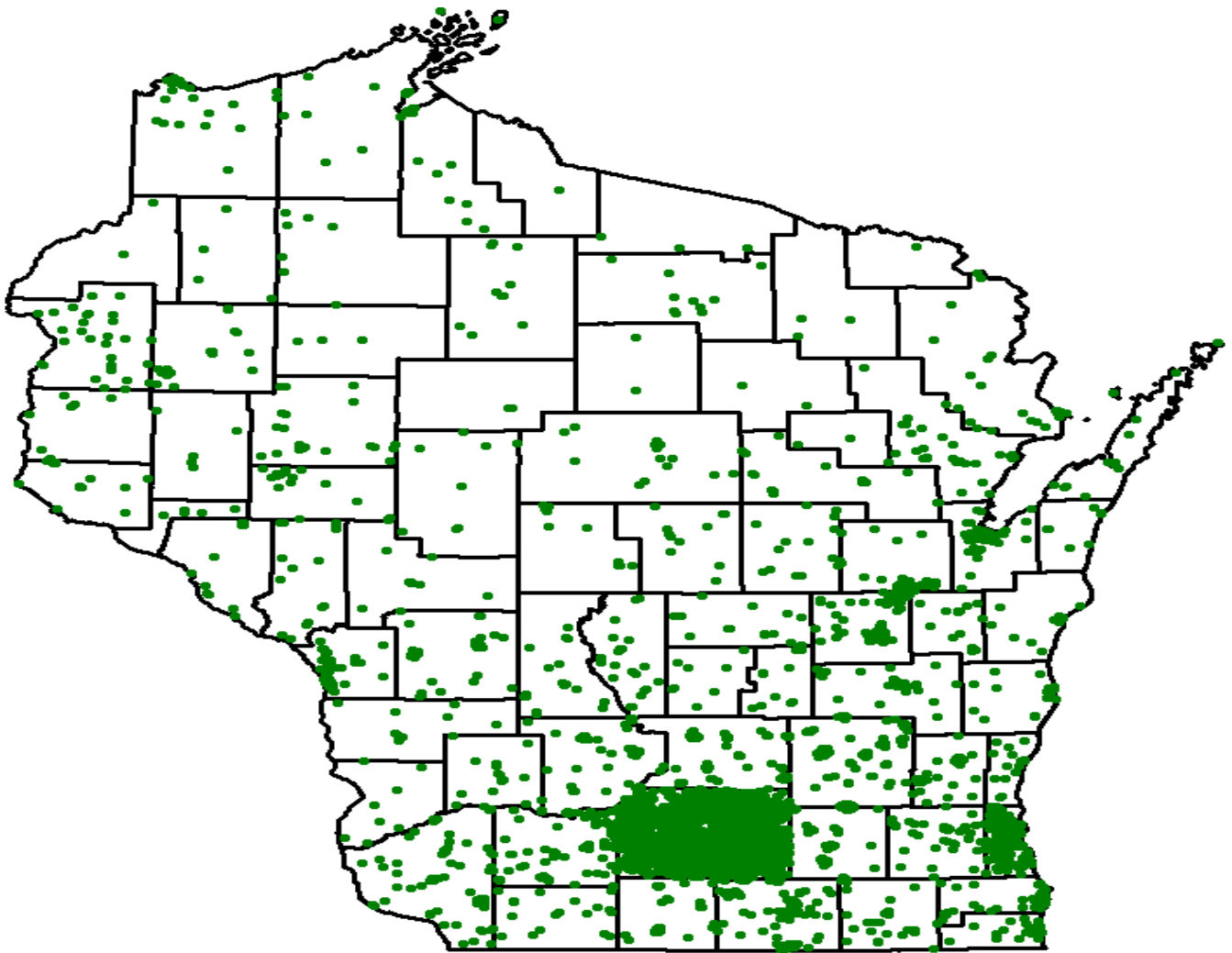
A.) We have not specifically looked at the correlation of the data in the WIR and VPD incidence. However, during recent outbreaks of VPDs in WI public and private health care providers relied on data in the WIR to determine the vaccine needs of their patients that were directly exposed to VPDs through potential community exposure. Specifically, we are referring to a large statewide outbreak of pertussis in 2003-2004, a multistate outbreak of mumps in 2006 and a multistate outbreak of measles in 2008.

In addition, during the recent H1N1 Immunization Campaign the WIR was used to monitor vaccine uptake by region of the state and then compared it with disease incidence.

Q.) Are there screenshots of the WIR's GIS capabilities that illustrate the utility of having GIS in the WIR?

Two illustrations of the WIR's GIS capabilities can be found on the following two pages.

On the map of Wisconsin each green dot indicates the current address of persons that received any immunizations from the Madison/Dane County Public Health Department. We like to show this slide during on registry demonstrations as it clearly indicates that people move around thereby showing the need for a central repository of immunization records.



Each green dot on this GPS map indicates children who are behind schedule for their recommended immunizations. High concentrations of dots can indicate potential problems such as:

- Health care providers in the area not sharing data with the WIR
- Concentrations of families that have religious or personal objections to immunization
- True pockets of need due to low immunization rates indicating the need for increased outreach and or clinical services.

