

# Improving Quality of Health Care Using the North Carolina Immunization Registry

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The North Carolina Immunization Registry (NCIR) is a secure, Web-based clinical tool that serves as an official record of immunization status. This commentary provides an overview of the NCIR and describes how providers, communities, and public health agencies use its data to improve quality of care.

The North Carolina Immunization Registry (NCIR) began in 1996 as a part of the Health Service Information System, a mainframe computer system accessible only by local health departments. In 1998 the North Carolina Immunization Branch, which is part of the North Carolina Division of Public Health, began the arduous process of moving the NCIR from the mainframe to a Web-based system. The process took years and involved securing funding, finding and contracting with a vendor who could customize and maintain the system, and enhancing a similar immunization registry from Wisconsin to meet North Carolina's specifications. By 2005 the North Carolina Immunization Branch finally had a secure, Web-based registry; this registry now serves as the official source for North Carolina immunization information and produces an official, legal vaccination record.

This new and improved immunization registry began with much of the data from the older system, including the records of approximately 3.5 million individuals. The NCIR also has a number of important features, chief among them the ability to provide clinical decision support by recommending the appropriate vaccines by age according to state requirements and national standards. The upgraded registry also streamlines the vaccine ordering process and has a variety of reporting features to help users better manage vaccine inventory and identify which clients need immunizations.

Rollout of the NCIR started with local health departments and gradually expanded to include private provider offices that receive vaccines from the federally funded Vaccines for Children (VFC) program, which provides vaccines at no cost to children who otherwise might not be vaccinated because of inability to pay. To date, more than 1,200 health care provider offices use the NCIR (Figure 1), including 100% of the state's local health departments and more than 90% of the pediatric offices and family physicians who administer VFC

vaccines [1]. Health care providers who receive VFC vaccines are required to document administration of those vaccines either in the NCIR or by printing out and completing the Vaccines Administered Log available on the Web site of the North Carolina Immunization Branch [2]. There is no requirement for these providers to document administration of privately purchased vaccines, although many do so (Figure 2). Additionally, there is no state requirement for health care providers (other than pharmacists) who do not participate in the North Carolina Immunization Program to use the NCIR.

Despite a modest beginning, the NCIR has a large amount of immunization information, with more than 83 million doses of vaccine recorded in the registry (Figure 3). The NCIR is a life-span registry and contains more than 7 million clients—about 74% of the state's total population. Thanks to an interface with North Carolina Vital Records, nearly 100% of the infants and young children in the state have records in the NCIR. Furthermore, 95% of children between 4 months and 5 years of age and 86% of adolescents aged 11–17 years who have a record in the NCIR have at least 2 immunizations documented. About 50% of adults aged 19 years or older have a record in the NCIR, and 43% of those with a record have at least 1 immunization documented [1].

## Improving Care Through NCIR Utilization

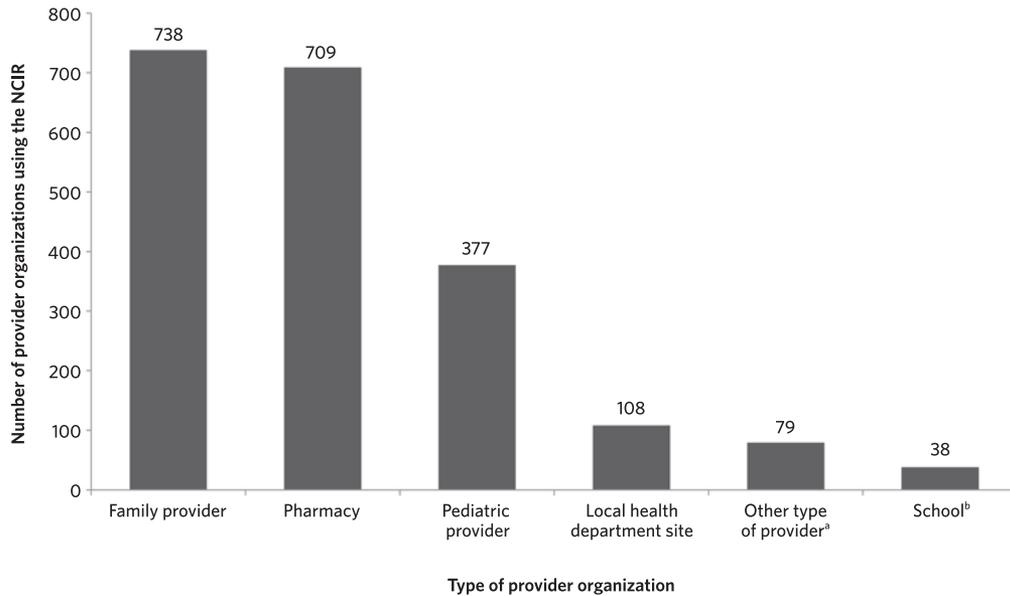
The vast amount of immunization data available in the NCIR enhances the ability of health care providers, communities, and public health agencies to improve the quality of care for North Carolina's citizens. One of the greatest benefits is assuring that providers have timely access to complete, accurate, relevant immunization data. Having this information available in a consolidated record enhances patient safety both by preventing overimmunization and by identifying those who are underimmunized and therefore at risk for disease. The NCIR also saves money by ensuring that duplicate vaccines are not administered to individuals

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**FIGURE 1.**  
**Number of Provider Organizations Using the North Carolina Immunization Registry (NCIR), by Type of Organization**



<sup>a</sup>Other providers include health maintenance organizations, hospitals, Indian Health Service organizations, internal medicine providers, providers in other specialties, juvenile justice correctional facilities, or state agencies.

<sup>b</sup>School includes grades K-12, colleges, and universities.

who are already immunized, and it can decrease the need to treat vaccine-preventable disease by identifying those in need of immunizations and preventing unnecessary prophylaxis of contacts with a vaccination history. Multiple studies [3-5] have shown how the use of an immunization information system (IIS) such as the NCIR can improve health care quality, reduce the prevalence of infectious diseases, and save money.

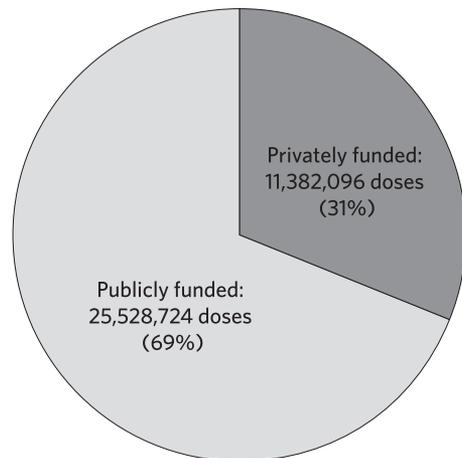
From a clinical perspective, the data in the NCIR offer additional advantages to immunizers by providing clinical decision support. Health care providers have the ability to document in the registry any medical or religious exemptions, parental refusal, adverse reactions, and contraindications to a vaccine. The registry then recommends the vaccines needed for each client at the time of the visit, based on the client's age, immunization history, and medical history. These recommendations follow immunization requirements specific to North Carolina, as well as standards set by the Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention. This clinical decision support ensures that the individual patient is protected from disease by receiving the appropriate vaccine at the appropriate time.

Communities also benefit from the information in the NCIR when data are used to assess immunization coverage and to identify areas of underimmunization. The NCIR can easily calculate coverage rates for any age group for a specific vaccine or combination of vaccines. Reports can determine the coverage rate for an individual provider office or

health department, and at the level of the county, zip code, or state. Health departments use these reports to identify areas where vaccination is needed and to focus education and outreach on specifically targeted areas. University researchers have also used NCIR data to study the impact of interventions designed to boost immunization rates, factors associated with vaccine uptake, and the degree of agreement between practice records and the NCIR [6-10].

Many provider offices currently use the NCIR to improve

**FIGURE 2.**  
**Number of Immunization Doses Given From Inventory Documented in the North Carolina Immunization Registry, by Type of Funding Source**



their immunization rates by producing reminder/recall reports that identify which specific clients need vaccines. The NCIR can generate client-specific reminder letters and mailing labels, and it can also produce data for use in auto-dialer systems. This functionality helps providers ensure that their patients are fully protected at all times, and it helps ensure they do not miss opportunities for vaccination.

The NCIR has also proved to be an invaluable tool to ensure the public's safety in the event of public health emergencies, such as natural disasters, disease outbreaks, vaccine recalls, and vaccine shortages. After Hurricane Katrina, North Carolina had access to the Louisiana immunization registry and to the immunization records of children who

were forced to evacuate. In addition, North Carolina has seen a number of vaccine-preventable disease outbreaks in the past few years, including cases of hepatitis A, pertussis, and measles. In each of these instances, registry data were used to ensure that appropriate quantities of vaccine were available to providers in areas affected by disease, and to facilitate the redistribution of vaccine as necessary. The NCIR was also used to assess the immunization status of those in the community who had been exposed and those deemed to be at risk. During vaccine recalls, the NCIR assists in the public health response; for example, during the 2007 recall of vaccine for *Haemophilus influenzae* type b (Hib), the NCIR determined which providers had already

received the lots of Hib vaccine that were being recalled and which patients had received those specific doses.

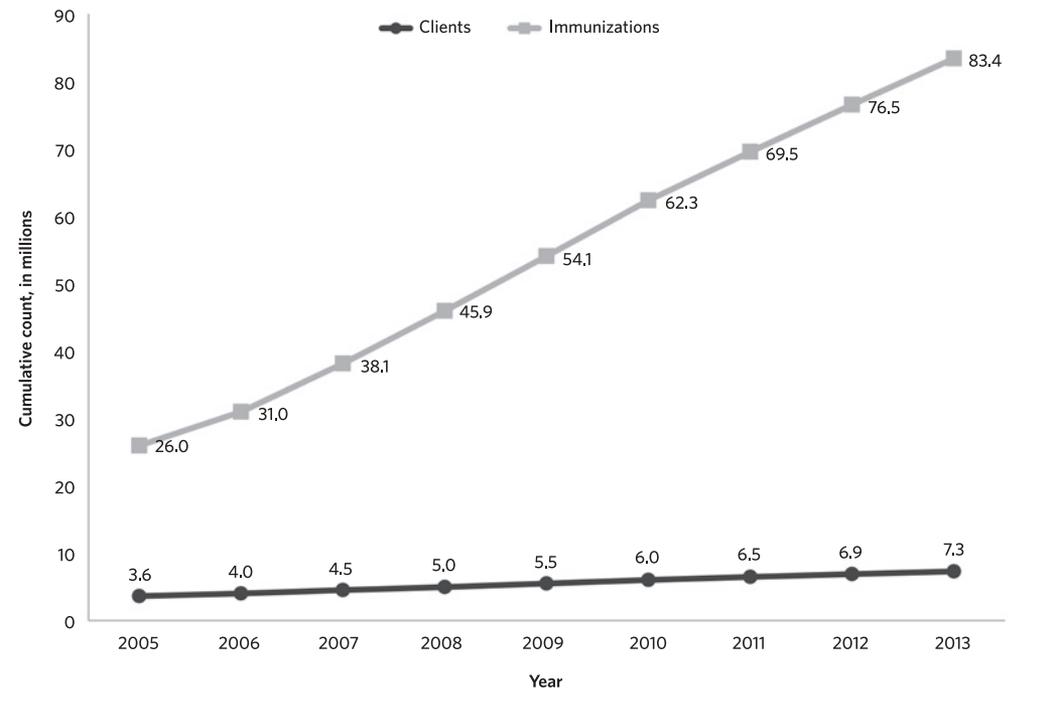
### **Expanding Access to the NCIR**

To date, the NCIR has been used primarily by providers who are participating in the North Carolina Immunization Program and are receiving VFC vaccines. However, more than 200 provider organizations that do not participate in the VFC program also use the NCIR. This latter number is expected to increase over the coming years because of opportunities presented by recent state and federal mandates. As access to the NCIR increases, a number of challenges must be overcome in order to protect the quality of the data in the registry, because high-quality data is what makes the registry such a valuable clinical resource.

**Opportunities.** House Bill 832 [11], which expands the role of immunizing pharmacists by allowing them to administer recommended vaccines to adults, directly increased access to the NCIR. The bill requires immunizing pharmacists to consult the patient's immunization history and to document administered vaccines in the NCIR. The passage of this bill is expected to add approximately 2,000 new pharmacy organizations to the NCIR. The quantity of adult immunization information in the registry is expected to grow exponentially as a result of this bill.

An additional driving force that is improving access to immunization registries is the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 (Title XIII of the American Recovery and Reinvestment Act [12]). This law encourages providers

**FIGURE 3.**  
**Number of Client Records and Number of Documented Immunizations in the North Carolina Immunization Registry, 2005–2013**



with electronic health records (EHRs) to submit electronic immunization data to an IIS in a “meaningful” manner to improve quality of care. In order to receive financial incentives, providers must meet certain criteria, including those related to sharing electronic data with an IIS, at 3 successive stages [13, 14].

Over the past few years, the North Carolina Immunization Branch has secured federal grants to make modifications to the NCIR so that it will be able to interface bidirectionally with EHR systems. This interface will allow providers to access the NCIR directly from their EHRs in order to obtain a client’s immunization history and vaccine recommendations before administering a vaccine and to update the NCIR after the vaccine is administered. Providers will no longer need to maintain immunization information in both systems separately, as they do now. Eliminating this duplicate data-entry has the potential to significantly improve providers’ work flow. In North Carolina, the plan is to facilitate the connection between the NCIR and EHRs through the use of the North Carolina Health Information Exchange and other vendor hubs. These efficiencies and opportunities for improved care—which will benefit providers, communities, and public health departments—are expected to continue as access to the NCIR increases.

**Challenges.** The NCIR interface supports interoperable functionality above what the Centers for Medicare & Medicaid Services require for practices to meet stage 1 or stage 2 meaningful use criteria. Providers who are trying to

meet stage 1 meaningful use criteria must submit a test file. Those who are trying to meet stage 2 meaningful use criteria are required to send updated transactions to the NCIR on an ongoing basis. It is not until they are trying to meet stage 3 meaningful use criteria that EHR systems will need the capacity to query and receive a response from the IIS [13].

This presents a challenge for all users of the NCIR, because the value of the registry lies in its clinical support capabilities. If providers only update client information in the NCIR, without first querying the registry to get a complete picture of the patient’s history (including contraindications and adverse reactions), then the clinical benefits of having such a system are reduced. In addition, providers cannot rely exclusively on the clinical decision support services found in their EHR system, because studies have shown that those services are limited compared with what is found in immunization registries [14]. There is currently wide variation among EHRs in their capacity to support bidirectional interoperability. This capability is crucial in order to optimize the NCIR’s clinical decision support features.

An additional challenge for VFC providers, because of the potential impact on vaccine ordering, is that a high level of accuracy is required for the data being transmitted through their EHR systems to the NCIR. If there is a large discrepancy between inventory in the NCIR and the doses administered as reported by the EHR system, it could affect the amount of VFC vaccine that the provider is able to order.

## Conclusion

The NCIR has been a widely accepted, valuable asset to immunization providers across the state for a number of years. The quality and accuracy of the data within the registry make it a useful tool that health care providers, communities, and public health agencies can use to improve the quality of care provided to North Carolina's citizens. With improved access to the NCIR, the benefits that make it so valued—such as its clinical decision support and timely access to complete, accurate, relevant immunization data—will be available to more health care providers, which will further patient safety and saving of both time and money. However, this increased access presents a unique challenge, in that a high standard of data accuracy is necessary for the registry to remain clinically beneficial for all. **NCMJ**

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