



# Improving immunization rates of underserved children: a historical study of 10 health departments

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## Abstract

**Background:** Despite high immunization rates, hundreds of thousands of poor and underserved children continue to lack their necessary immunizations and are at risk of acquiring a vaccine-preventable disease. Local Health Departments (LHDs) and public health clinicians figure prominently in efforts to address this problem.

**Methods:** This exploratory research compared ten (10) North Carolina LHDs with respect to immunization delivery factors. The study sample was identified based on urban designation as well as county demographic and socio-economic indicators that identified predicted “pockets” of underimmunization. Survey instruments were used to identify specific LHD immunization delivery factors.

**Results:** It was found that hours of operation, appointment policies, use and type of tracking systems, and wait times influence a health department's ability to immunize underserved children. This exploratory research is of particular importance, because it suggests that the implementation of specific policy interventions may reduce the morbidity and mortality related to vaccine-preventable diseases in poor and underserved children. This research also highlights the significance of the nurses' role in the policy making process in this important area of community health assurance.

**Conclusion:** To improve childhood immunization rates, policy-makers should encourage adequate and appropriate funding for LHDs to adopt service delivery factors that are associated with higher-performing local health departments. LHDs should study the population they serve to further refine service delivery factors to meet the population's needs.

**Keywords:** Health Status, Immunizations, Public Health Department, Children, Uninsured

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**Citation:** Haley DR. Improving immunization rates of underserved children: a historical study of 10 health departments. *Int J Health Policy Manag* 2014; 2: 193–197. doi: 10.15171/ijhpm.2014.46

## Article History:

Received: 26 March 2014

Accepted: 9 May 2014

ePublished: 13 May 2014

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## Introduction

In the late 1980s, there was a large resurgence of measles throughout the United States. It was believed that this resurgence resulted from a lack of timely and proper immunization of our nation's children (1). This epidemic disproportionately affected preschool children in urban areas with “pockets” of lower socioeconomic indicators (2). In fact, the incidence of infection among racial and ethnic preschoolers was almost ten-fold higher than that of Caucasian children (3). The study also found that immunization coverage levels for routine childhood vaccines in selected urban areas varied considerably. Some counties had “pockets” of underimmunization where vaccination coverage rates for 4 DTP, 3 OPV, & 1 MMR among children 24 months of age ranged from as low as 10–52%, far below the Year 2000 goal of 90% (4).

Immunization rates have made significant gains since the 1990s. However, maintaining and improving rates among underserved populations (5), remains a priority for public health (6). Local public health departments figure prominently in this effort by providing immunization programs and services in both urban and rural communities. Public health nurses, often make up the largest group of providers serving in the public health arena, play significant roles in all phases of LHD immunization programs, from serving as direct care providers to roles in management and administration of local programs and departments (7). However, the success of

immunization programs requires more than public concern and professional providers. Ongoing vigilance in the area of program design, service delivery procedures and the resulting outcomes is required to maintain successful programs. There is evidence that some LHD service delivery policies and practices can actually present barriers to immunizing poor and underserved children (8). While there are empirical studies of service delivery providers, including nurses, and LHD effectiveness, there are far fewer studies researching department specific delivery factors and their relationship to vaccination coverage rates (9). Some delivery factor variables that have been studied include: hours of immunization delivery, the use and type of immunization tracking systems and services, appointment systems, length of wait times for service, and staff-to-population ratios (10).

This exploratory study provides historical insight into a sample of North Carolina LHD immunization programs and their delivery practices that can be targeted for intervention to improve a county's immunization rates. North Carolina was chosen because, as a universal purchase state since 1994, it offers all vaccines recommended by the Advisory Committee on Immunization Practices to all health care providers to serve all patients, including those who are fully insured.

The investigation of immunization delivery factors is of particular interest because evidence suggests that policy changes associated with the delivery of services can improve the health of the poor and underserved (10). Study results

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may have implications for the future study and development of policies and guidelines for LHDs and for public health nurses and other professionals who work in this field.

**Methods**

Dietz and colleagues studied immunization programs in 227 Georgia public health clinics. Their research was based on a conceptual framework of management culture, population characteristics, and immunization practices. Dietz and colleagues found that there was not one single factor that was responsible for raising vaccination coverage levels (11). Our research expands on Dietz’s and colleagues’ conceptual framework by including an assessment of LHD’s intra- and inters organizational linkages theorizing that these linkages influence the immunization status of their community (Figure 1).

We obtained a list of North Carolina’s LHDs from the North Carolina Department of Health and Human Services. We identified an exploratory sample of ten North Carolina counties that were comparable in demographic and socio-economic indicators that are believed to be consistent with “pockets” of underimmunization (12). “Pocket” indicators included education, marital status, average household income, and average number of family members. Sampling was limited to urban counties because vaccine-preventable epidemics and “pockets” of underimmunization have been most prevalent in urban communities. For the purpose of this study, urban counties were defined as counties with an average of more than 1,500 births annually.

From the sample, LHDs with more successful immunization programs were identified using the North Carolina Clinic Assessment Software Application (CASA). CASA is a software package developed by the National Immunization Program

and the Centers for Disease Control and Prevention (CDC). CASA assessments were performed in all 100 North Carolina counties in 1995, 1996, and 1997 to assess up-to-date (UTD= 4 DTP, 3 OPV, & 1 MMR by age 24 Months) status for a sample of children age 24–35 months. Table 1 summarizes average CASA rates (1995–7) for all 100 North Carolina LHDs after stratifying clinic-specific up-to-date (UTD) coverage levels into three groups:

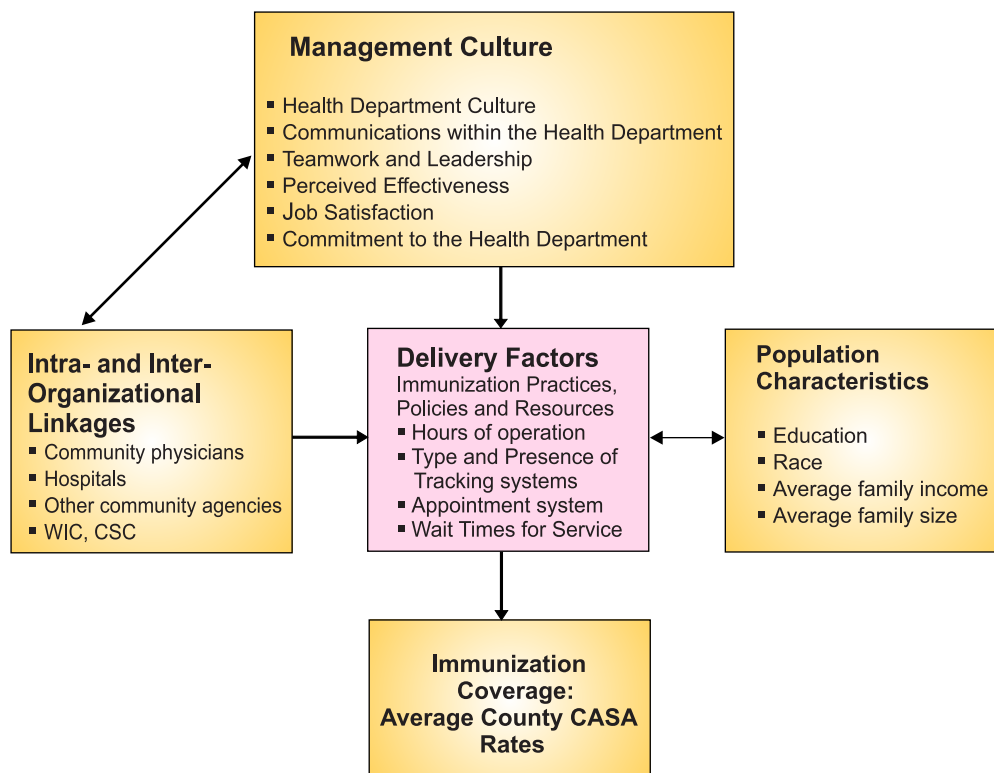
- 1) Those with levels greater than 75%,
- 2) Those with levels 60 to 74%, and
- 3) Those with levels below 60%.

This stratification was identified based on research by Dietz and colleagues who used a similar method to identify three segmentation points for their study of Georgia public health department immunization programs (13).

Two survey instruments were used to identify immunization delivery factors of the sample. In 1996, the North Carolina Department of Environment, Health and Natural Resources surveyed LHD immunization policies and practices through the 1996 Annual Immunization Action Plan (IAP) survey instrument. This instrument gathered information from coordinators from each North Carolina LHD immunization program. The IAP instrument was developed to:

- 1) Identify specific organizational processes;
- 2) Estimate the performance of local public health department immunization programs in providing services; and to
- 3) Identify specific areas in need of improvement.

Data from the IAP was supplemented through the administration of a second instrument called *The*



**Figure 1.** Conceptual model for the evaluation of ten North Carolina local public health departments

**Table 1.** 1995–7 average county CASA rates for all North Carolina counties and for the sample counties, stratified into three groups.

	All North Carolina Counties (n= 100)	Sample Counties (n= 10)
CASA rate $\geq$ 75%	48% (n= 48)	40% (n= 4)
75% > CASA rate > 60%	39% (n= 39)	40% (n= 4)
CASA rate $\leq$ 60%	13% (n= 13)	20% (n= 2)

*Immunization Organization Questionnaire (IOQ).* The IOQ instrument was developed to study immunization delivery factors of two hundred LHD immunization programs in Georgia (11). The IOQ measures variables hypothesized to influence vaccination coverage rates such as clinic hours, wait times for service, type of tracking systems, and immunization procedures and resources (i.e., types of reminder systems, community promotions, staffing). Average wait time was self-reported and is defined as the time of arrival until the time a patient is seen for service.

The IOQ was administered without modification by the researcher through face-to-face interviews with immunization personnel at each of the ten study sites. Interviewees were limited to individuals who had worked with the health department for at least a one-year period and who had administered immunizations, coordinated and performed the tracking program, direct supervisors of the immunization program, and clerical support personnel.

Interviews of LHD staff were audio taped and field notes, in the form of interview and observational records, were developed. To limit variability, one person entered the data into a database and developed a matrix of factors based on the conceptual model. The matrix allowed us to conduct cross-case analysis case analysis for common features and differences of the factors (13).

## Results

### *Hours of immunization service delivery*

All four of the higher performing LHDs offer vaccination services during the traditional lunchtime hour from noon

through 1:00 PM. Alternatively, only one of the two lower performing programs offer services during this time.

### *Immunization tracking system and services*

Eight of the ten immunization programs perform some type of immunization tracking (Table 2). All of the higher performing immunization programs utilized a computerized tracking system and designated a full-time employee to perform tracking services on a daily basis. Alternatively, only one of the two lower performing immunization programs performed limited immunization tracking.

### *Appointment systems*

Neither of the two lower performing health departments encourages an appointment system for immunization services. Alternatively, two of the four higher performing LHDs encourage an appointment system in addition to accepting walk-in patients indicating.

### *Average wait time for service*

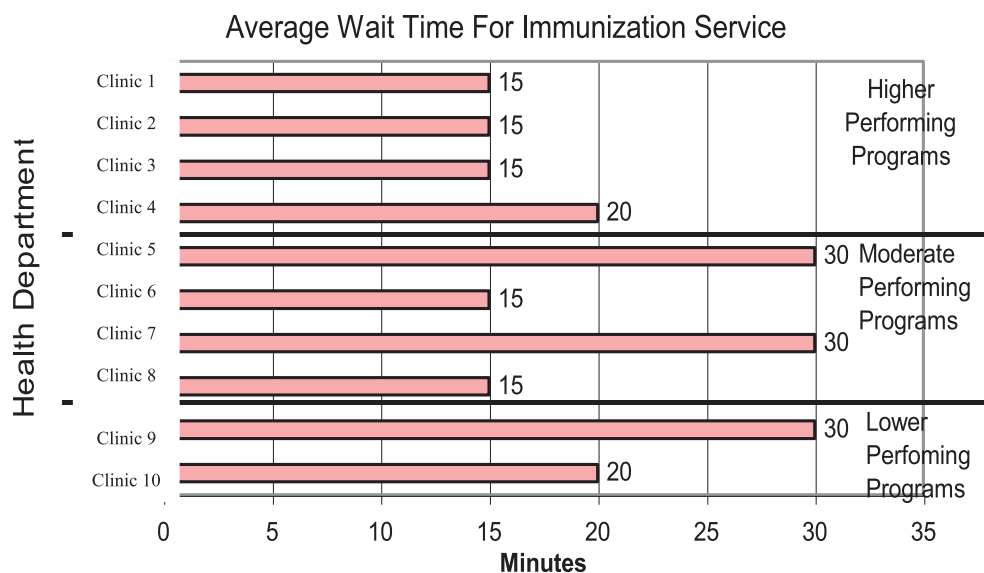
Average wait time for immunization service for all ten LHDs range from 15 to 30 minutes. Three of the four higher performing immunization programs report an average wait time of 15 minutes. Alternatively, both of the lower performing immunization programs report that they have average wait times greater than 15 minutes (Figure 2).

### *Limitations*

Whenever field research is conducted, the researcher is often confronted with certain constraints that may affect the design, gathering of data and analysis. Several constraints and issues were prevalent with the CASA data used to stratify the LHDs into the three outcome groups. One limitation of using CASA rates is that this data only reflects samples drawn from LHDs. With the fragmentation of immunization service in the state of North Carolina, county CASA rates may be artificially low due to incomplete records i.e. half a child's record in the LHD and half at a private provider. Therefore, what we really have is a rate for complete immunization histories within each LHD.

**Table 2.** Type of tracking system and amount of tracking performed by each local public health department immunization program.

Category	Health department immunization program	Computerized or manual tracking?	Daily tracking performed?	Comments
Higher performing immunization programs	Clinic 1	Computerized	Yes	Performed until 1997
	Clinic 2	Computerized	Yes	Employs an immunization tracker
	Clinic 3	Computerized	Yes	Employs an immunization tracker
	Clinic 4	Manual and computer	Yes	Employs an immunization tracker
Moderate performing immunization programs	Clinic 5	Manual	No	Need to employ a tracker
	Clinic 6	No tracking services	No	No Tracking Performed
	Clinic 7	Manual	No	Need to employ a tracker
Lower performing immunization programs	Clinic 8	Computerized	No	Not enough staff to perform tracking.
	Clinic 9	Manual before February 1998. Computerized after February 1998.	No	Minimal manual tracking performed before February 1998. Focus on tracking after February 1998.
	Clinic 10	Computerized	Yes	Limited tracking. Targets Specific Zip Codes. A need for more trackers to track more children.



**Figure 2.** Average wait time for immunization service

Unfortunately, it is not known what the “coverage rate” is for the children of each county. It is assumed that LHDs track all children known to their system, so the records should be accurate. However, this research found that this assumption is not consistent among North Carolina LHDs.

A limitation to our interview and survey method is the potential for information or misclassification bias. Information bias can occur when there is inaccuracy, either random or systematic, in measurement. There is the potential that respondents may have provided inaccurate or misleading information based on what they hope to accomplish as to what is currently in practice. In addition, since health department staff are reporting on the IOQ they may have a bias to report shorter wait times than what is actually occurring in the field.

### Discussion

In our sample, it was found that there were significant service delivery variations among higher performing immunization programs compared to lower performing programs. Service delivery factors characteristic of higher performing immunization programs were the provision of immunization services from noon to 1:00 PM, daily immunization and computerized tracking systems, and lower average wait-times for service. In addition, the use of computerized tracking systems is a characteristic of higher performing LHDs, it was also found that the higher performing immunization programs performed tracking on a daily basis and communicated that they were very committed to expanding these systems to include community physicians.

Lower performing LHDs consistently indicated that they were “overwhelmed” with the number of children that they are required to track and that they were more likely to cease tracking for reasons ranging from facility to manpower issues. Finally, higher performing programs were more inclined to use an appointment system in addition to accepting patients on a walk-in basis. An appointment system may result in lower wait times, which was indicative of higher performing programs. Longer wait times impose barriers to access and appear to influence a health department’s ability to provide

needed immunization services to vulnerable children.

While this exploratory and historical research was limited to ten North Carolina immunization programs, it does raise some intriguing questions for further research. For example, would we find similar findings in rural North Carolina LHDs? What influence does intra- and inter-organizational linkages have on an LHD’s ability to assure the immunization status of its community? How does an LHD’s management culture influence immunization rate? Do immunization rates vary when nurses serve as administrators of immunization programs?

### Ethical issues

IRB approval was granted by the University of North Carolina at Chapel Hill’s Internal Review Board.

### Competing interests

The author declares that he has no competing interests.

### Author’s contribution

DRH is the single author of the manuscript.

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## Key Messages

### Implications for policy makers

- Policy-makers should develop policies that facilitate LHDs to adopt service delivery factors associated with higher-performing public health departments.
- Staffing of LHDs during the hours of noon to 1:00 PM was associated with higher performing health departments.
- Policy-makers should encourage LHDs to implement immunization tracking to improve immunization rates.
- In addition to allowing walk-in immunization services, LHDs should adopt an appointment system.
- Policy-makers should identify opportunities to reduce wait times for immunization services.

### Implications for public

The result of this study indicate that service delivery factors influence the ability of local health departments to immunize children. Therefore, there is a need for health departments to study the population they serve to determine hours of service and frequency of immunization communications and education. Immunization schedules are complex and appear to be difficult for the population track. Therefore, successful immunization programs employ tracking systems to remind the public these schedules.