

*Full Length Research Paper*

## Routine dissemination of summary syndromic surveillance data leads to greater usage at local health departments in North Carolina

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Public health surveillance data is critical as it provides actionable information to guide public health response. Thirty interviews were conducted across North Carolina from May to September, 2009 with local public health department staff to describe the use of routine syndromic surveillance data during a local outbreak and compared this to usage during a large, statewide outbreak, during which the state disseminated syndromic data. The study examined the use of the syndromic surveillance system (NC DETECT) and the reportable communicable disease system (NC EDSS) during the 2009 novel influenza A (H1N1) pandemic and during another respondent-selected infectious disease outbreak. A larger percent of local health department (LHD) staff reported using information from NC DETECT (52%) during the 2009 H1N1 pandemic than during another infectious disease outbreak (20%) (P value = 0.01). North Carolina local public health staff used information from syndromic surveillance data more when the state health department disseminated summary syndromic surveillance reports than when this summary information was not provided. State aggregation and dissemination of timely and disease-relevant syndromic surveillance data may facilitate greater usage of such information at the local health department level.

**Key words:** Public health surveillance, public health practice, outbreaks, influenza A virus (H1N1) subtype.

### INTRODUCTION

Public health departments receive surveillance data from a variety of sources, including clinicians, syndromic

surveillance systems and more traditional infectious disease reporting systems (Burkom et al., 2005).

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Syndromic surveillance systems are able to identify some cases of interest, such as clusters, more rapidly than traditional reporting systems (Miller et al., 2004). However, at the local health department level, it is often difficult to use syndromic surveillance systems to obtain actionable information because of the over-abundance of records and the nonspecific nature of the information provided (Szpiro et al., 2007). Surveillance data cannot be used as part of optimally controlling an outbreak unless it is effectively integrated into public health practice at the local health department level (Stoto et al., 2004). Providing summary syndromic surveillance reports, rather than or in addition to requiring local level staff to directly access the syndromic surveillance system and generate their own reports, may facilitate the integration of this information with the other types of information used for outbreak response at the local level. Use of all available data may lead to a more rapid and precise outbreak control.

North Carolina has both a syndromic surveillance system (NC DETECT) and a reportable communicable disease surveillance system (NC EDSS), in addition to a sentinel provider network surveillance system which is used to monitor influenza-like-illnesses during flu season. NC DETECT captures data from emergency department, poison control center, and emergency medical services settings (Samoff et al., 2012). These data are made available in a timely manner through the NC DETECT web portal. Employees of any public health agency may receive access to NC DETECT appropriate to their jurisdiction, but only communicable disease (CD) staff at local and state public health agencies can access NC EDSS. Currently, NC DETECT is primarily used by state-level epidemiologists and hospital-based public health epidemiologists (PHEs), who specialize in interpreting and using syndromic surveillance data. In general, LHD staff receive NC DETECT information from PHEs or state surveillance staff (Samoff et al., 2012; Markiewicz et al., 2012); this distribution occurs on an as-needed basis. Syndromic surveillance data are distributed to LHDs by telephone call; a small number of LHDs also received regular reports from hospital-based PHEs in 2009. Some PHEs also regularly distribute reports to local counties, although the report may cover the hospital rather than the LHD jurisdiction. During outbreaks, state staff and PHEs can serve as a link between syndromic surveillance data and LHD staff.

During the 2009 novel influenza A (H1N1) pandemic, state health department staff took a different approach to distribution of syndromic surveillance information. State-wide syndromic surveillance case numbers were distributed to North Carolina's local health departments (LHDs) by email in a weekly influenza surveillance summary report produced by the state (Lee, 2010). The first page of the report provided a description of state information and the sample from which the data were derived. The second page contained information on the

number of influenza-like illness cases reported by sentinel surveillance systems during each week of the outbreak. Graphical representations of the data followed as well as the characterization of confirmed cases by virus type for cases reported by sentinel surveillance. The syndromic surveillance data were presented graphically in as many as four different but complementary figures to detail the status of the outbreak distribution, magnitude, and morbidity and mortality. A short description of influenza-related deaths was included in the report, and it concluded with a list of sentinel surveillance data providers.

This study compared the use of syndromic surveillance information during the H1N1 pandemic and a reportable disease outbreak occurring between June 2008 and June 2009.

## MATERIALS AND METHODS

The 85 NC local health departments (LHDs) were stratified by NC state population tertiles, and then 1 very large (population >200,000, 10 of 85 LHDs), 7 large (population 53,377 -200,000, 41 of 85 LHDs), and 7 small (population <53,377, 37 of 85 LHDs) LHDs were randomly selected for study. The LHD Director and a CD Nurse from each LHD were invited to participate, with a total of 30 LHD staff invited to participate. Face-to-face interviews using a standardized questionnaire were conducted with LHD Directors and communicable disease nurses (CD Nurses) across North Carolina from May to September, 2009. The project was exempted from review by the Institutional Review Board of the University of North Carolina at Chapel Hill.

The interview survey captured information on responses to two outbreaks: one was chosen by the respondent ("an event you responded to in the past year") and the other was the 2009 H1N1 influenza pandemic. These will be referred to as the "infectious disease outbreak" and the "H1N1 influenza outbreak". The survey captured qualitative and quantitative data, including questions on how staff received information from NC EDSS and NC DETECT ("Do you access NC DETECT/NC EDSS yourself?" "Do you look at NC DETECT/NC EDSS data provided by someone else?" and, "If someone else, who?") and on NC EDSS and NC DETECT usage for both the H1N1 pandemic and another prior reportable disease outbreak ((during this outbreak) "Did anyone look at data from NC DETECT/NC EDSS?"). The survey also asked how public health officials first learned about each outbreak ("From what source did you first learn about this event?"), and what other data sources were used to learn about an outbreak ("Please list data sources used to learn whether there was an increase in cases"). Proportions were calculated to compare users and uses of NC DETECT and NC EDSS by outbreak. Fisher's exact test was used to test for differences. Respondents were asked to describe the response to the outbreaks, how surveillance data were used in the response, and whether the surveillance data were useable and timely; these responses were transcribed and Atlas.ti was used to code qualitative responses. All quantitative data analyses were performed using SAS 9.1 (Cary, NC). Statistical significance was determined using an alpha of 0.05

## RESULTS

Interviews were completed with 27 LHD staff members

**Table 1.** Sources by which initial outbreak notice was received, 27 Public Health Agency Staff, North Carolina, May-August 2009.

Source	Infectious disease outbreak (n Sources listed by respondents (%))	H1N1 Pandemic (n Sources listed by respondents (%))
NC EDSS	22 (34)	17 (20)
Other	13 (20)	15 (18)
Clinicians/Practitioners	13 (20)	9 (11)
Public health staff	5 (8)	13 (15)
NC DETECT	4 (6)	14 (16)
Laboratory	5 (8)	8 (9)
Hospital	1 (2)	3 (4)
NC HAN	2 (3)	3 (4)
Media	0 (0)	2 (2)
Epi X	0 (0)	1 (1)
Total	65	85

Epi X: CDC's Epidemic Information Exchange; NC DETECT: North Carolina Disease Event Tracking and Epidemiologic Collection Tool; NC EDSS: North Carolina Electronic Disease Surveillance System; NC HAN: North Carolina Health Alert Network. Percentages do not sum to 100 because initial outbreak notification could have been received from multiple sources.

from 14 LHDs for a total of 27/30 invitees (a 90% response rate); one small LHD did not respond. When asked about knowledge of NC DETECT, 93% (25 of 27) of the respondents correctly described NC DETECT as a syndromic surveillance system, and 48% (13 of 27) reported "using information from NC DETECT to learn about public health events."

Respondents described surveillance data use for infectious disease outbreaks of shigellosis, salmonellosis, hepatitis A, norovirus, pertussis, and rabies exposure, as well as H1N1 influenza.

Our hypothesis that LHD staff may be contacted by PHEs and state surveillance staff when a case is of public health interest was confirmed with qualitative data; for example, one survey respondent stated [the PHE] "is really good about calling ... and giving me a heads up". However, only a subset of the 27 respondents (29%) reported contact with a PHE during the infectious disease outbreak. All LHDs responded to the H1N1 influenza outbreak, and all received the previously described influenza surveillance report.

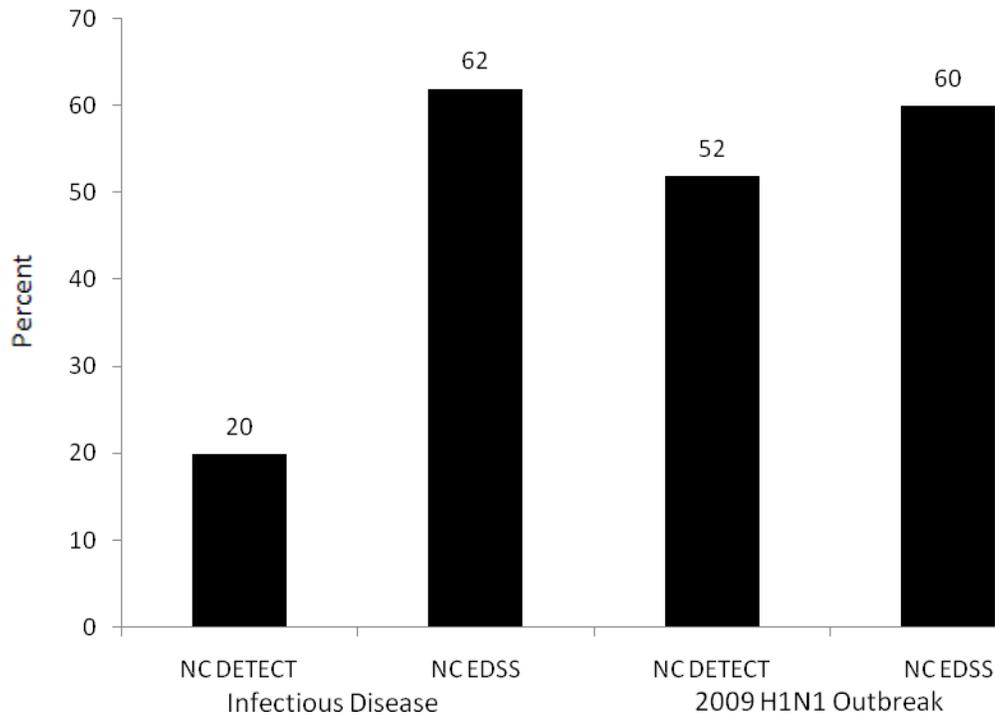
Local public health staff reported receiving initial notice of outbreaks from several different sources. During the infectious disease outbreak, NC EDSS (34%), other public health staff (20%), and clinicians and practitioners (20%) were the most commonly reported sources for initial notice of the outbreak by local staff (Table 1). In contrast, during the H1N1 pandemic, local public health staff most frequently reported receiving initial notice from NC EDSS (20%), other (18%), and NC DETECT (16%) (Table 1).

The percentage of the 27 local public health staff who reported using information from the NC DETECT or NC EDSS systems for outbreak monitoring was greater than

the percentage receiving initial notice of an outbreak from either NC surveillance system for both the infectious disease outbreak and H1N1 pandemic. During the infectious disease outbreak, 6% of the local public health staff reported monitoring the outbreak in NC DETECT, and 20% reported using NC DETECT data (Fig. 1). Similarly, during the infectious disease outbreak, 34% of local public health staff reported monitoring the outbreak in NC EDSS, and 62% reported using NC EDSS data during the outbreak (Figure 1). During the H1N1 pandemic, 16% of local public health staff reported monitoring the outbreak in NC DETECT, and 52% reported using NC DETECT data during the outbreak; 20% of local public health staff reported monitoring the outbreak in NC EDSS, and 60% reported using NC EDSS data during the outbreak (Figure 1). A statistically significant larger percent of LHD staff reported using information from NC DETECT during the 2009 H1N1 pandemic than during the infectious disease outbreak ( $P$  value = 0.01). A similar increase in LHD staff using information from NC EDSS during the pandemic was not observed (Figure 1).

## DISCUSSION

Local health departments in North Carolina find syndromic surveillance information useful (Samoff et al., 2010), but may have difficulty using NC DETECT to identify an outbreak because of the overwhelming number of signals these types of systems produce (Szpiro et al., 2007). Local public health staff in this study, conducted between May and September 2009, reported using information from NC DETECT as well as



**Figure 1.** NC EDSS and NC DETECT data usage by type of outbreak, 27 public health agency staff, North Carolina, May-August 2009. NC DETECT: North Carolina Disease Event Tracking and Epidemiologic Collection Tool; NC EDSS: North Carolina Electronic Disease Surveillance System.

the reportable communicable disease system more frequently for monitoring and responding to outbreaks than for identifying outbreaks. During the H1N1 pandemic, North Carolina's state public health department distributed frequent reports to all counties on the status of the outbreak. These reports provided syndromic surveillance data to help local public health staff monitor the outbreak. More public health staff reported using syndromic surveillance data during the H1N1 pandemic than during the comparison infectious disease outbreak. Similarly, more public health staff reported using syndromic surveillance information to monitor the H1N1 pandemic than reported using reportable disease surveillance information. During the H1N1 influenza outbreak, syndromic surveillance data reached more LHDs and provided additional state-wide outbreak information than during other outbreaks; more frequent use of syndromic surveillance data was reported by all public health staff during this outbreak. Thus, changes in summary information distribution likely resulted in an increased use of the information by local public health staff.

Production of summary syndromic surveillance reports by specialist staff employed by the state health department may be more efficient than production of individual reports by LHDs. The number of staff available to do this work at LHDs is limited. One study found that local health departments devote an average of 1.0 FTE to

syndromic surveillance data analysis and signal response (Buehler et al., 2008). That would equate to 85 FTEs in North Carolina; however, the actual number of NC DETECT users in NC counties (from NC DETECT system data) is much lower (0.46 per LHD), and in none of the LHDs with staff using NC DETECT is a full FTE devoted to syndromic surveillance. Centralizing report production at the state-level decreases the need for FTEs devoted to syndromic surveillance data analysis at the local level and may result in a more efficient distribution of labor between the state (analysis) and the LHD (local action), and better syndromic surveillance data integration in local health departments. Similarly, programming NC DETECT to produce reports customized for each LHD's data may achieve better data integration in LHDs. Since the completion of this study in 2009, dashboard interfaces with LHD specific data have been implemented resulting in a small increase in local system use.

This work has several important limitations. While case-patients from many of the outbreaks described by local health department staff may present in settings where the syndromic surveillance data originates in North Carolina (e.g. the emergency department), case-patients were known to have presented at the emergency department for the H1N1 pandemic, making emergency department surveillance more important to this outbreak response than it may have been in the participant selected infectious disease outbreak. The H1N1 pandemic may

have been more memorable to local public health staff than another infectious disease outbreak, possibly resulting in recall bias. Furthermore, the study sample was small and the sample included only 1 large urban county which may not be representative of the other NC large urban county. Finally, the interviews were conducted in person, possibly leading to social desirability bias in the form of over-reporting of NC DETECT and NC EDSS use.

## Conclusions

During the 2009 H1N1 pandemic, North Carolina's state health department reported summary H1N1 influenza data obtained from syndromic surveillance systems to LHDs. Aggregation of syndromic surveillance data at the state level decreased the need for data analysis at the local level, allowing LHDs to focus on public health action. This summarization and dissemination of syndromic surveillance information allowed LHD staff to quickly use these surveillance data for public health response. The increase in access to aggregated syndromic surveillance data may account for the increase in syndromic surveillance data usage in LHDs during the H1N1 pandemic. In times of outbreak, when staff resources are even more limited than usual, using state resources to provide summary syndromic surveillance reports to LHDs may facilitate an effective outbreak response.

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## Conflict of Interest

The authors have no conflicts of interest to declare.

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