

# Research Brief

October 2012

## Having the cake and eating it too:

### Improved surveillance outcomes and decreased costs associated with electronic reportable disease surveillance system in North Carolina, 2010

Over the past 10 years, communicable disease surveillance has transitioned from traditional paper-based disease reports to electronic reporting. The transition to electronic reporting has resulted in corresponding modifications to surveillance. There is little documented information on the cost or cost-effectiveness of electronic communicable disease surveillance systems. Since funds for local public health are scarce and must be prioritized based on costs and benefits, information about the costs of electronic disease surveillance is needed.

The goal of this study was to describe the resources dedicated to communicable disease surveillance using the North Carolina Electronic Disease Surveillance System (NC EDSS) <sup>1</sup> in local health departments (LHDs). This study examined the cases reported prior to and following NC EDSS implementation at LHDs and calculated personnel costs associated with communicable disease reporting using the NC EDSS system. Finally, LHDs were assigned composite scores based on accuracy and timeliness of case reports, and costs and surveillance practices for LHDs with higher and lower scores were compared.

#### Methods

A simple random sample of 30/100 North Carolina counties (representing 30/85 LHDs) was created to identify LHD staff for participation. An NC EDSS supervisor and a randomly selected communicable disease staff member with responsibility for reporting cases in NC EDSS from each LHD were invited to respond to a survey administered in face-to-face interviews between May and August 2010 (60 staff in total).

The cost of staff time per month was calculated using the best available salary data for each job title.<sup>2</sup>

Benefit costs (30%) were added to estimated salary figures. To calculate local personnel cost per case report, the FTEs reported for each county were multiplied by the appropriate salaries and by the number of months in the study period, and the total local personnel cost was divided by the total number of cases reported during the study period. Cost per capita per year was calculated as the total personnel cost for 12 months divided by population served by the LHD. A comparison of estimated personnel cost per case report was calculated for those LHDs that did not report adding staff after implementation of NC EDSS (18 LHDs). For this calculation, the number of FTEs reporting communicable disease cases was assumed to be the same in 2007 and 2010.

#### 2 findings from this study are:

- Data suggest that the LHD personnel cost per case reported has decreased following the implementation of electronic case reporting.
- Efficient use of NC EDSS and use of surveillance data for local purposes were reported more frequently by counties with lower cost per case and best surveillance outcomes.

Communicable disease data from May 1 through August 31 for 2007 and 2010 were compared to assess the number, accuracy and timeliness of case reports. Data on vaccine-preventable, sexually transmitted and other notifiable communicable diseases were assessed; syphilis, HIV and latent tuberculosis infection (LTBI) were excluded from the study. Timeliness and accuracy calculations excluded tuberculosis.

Accuracy was measured as the proportion of case reports returned to the LHD for corrections or missing data. Timeliness was calculated as the proportion of cases reported to the state within 30 days of receipt by the LHD. Timeliness could be assessed only for completed case reports. To assess incomplete case reports, we evaluated the proportion of case reports created but not further processed for 45 or more days.

To summarize surveillance performance, we created a composite score for each LHD, with one point awarded for being in the “best” third of the LHDs surveyed for timeliness, for accuracy, and for case reports created but not further processed. LHDs with 2 or 3 points were classified as having “best” surveillance outcomes, while those with 0 or 1 points were considered “not best.”

## Results

### *Population and cases*

Surveys were completed for 28 of 30 LHDs invited to participate, for a 93% response rate. One outlier LHD was removed from analysis for a final population of 27 LHDs. County populations ranged from 8,888 to 923,944 persons; there were 9 small (<55,654 persons), 8 medium (population served 55,655 to 107,427), and 10 large LHDs (>107,427 persons).

From May to August 2007, 8,701 cases of communicable disease were reported to these LHDs via paper cards; during the same period in 2010, 10,868 cases were reported electronically via NC EDSS, an increase of 2,167 (25%) cases.

### *Local personnel costs*

The average LHD dedicated 1.2 FTEs (range, 0.1-6 FTEs) to using NC EDSS and most of this time (on average, 0.9 FTEs) was contributed by communicable disease nurses.

The number of case reports processed per FTE per month varied widely (range, 16-154 cases per FTE per month; *Figure 1* on next page). The average number of

case reports processed per FTE was smaller in small LHDs (50 cases per FTE per month) than in medium or large LHDs (72 and 89, respectively;  $P=.09$ ). Local personnel costs per case report ranged from \$27 to \$373 (*Figure 2* on next page), and the average cost per case report was higher for small LHDs (\$162) than medium (\$91) or large LHDs (\$74;  $P=.05$ ). The average local personnel cost per capita per year for electronic disease surveillance activities was \$0.70.

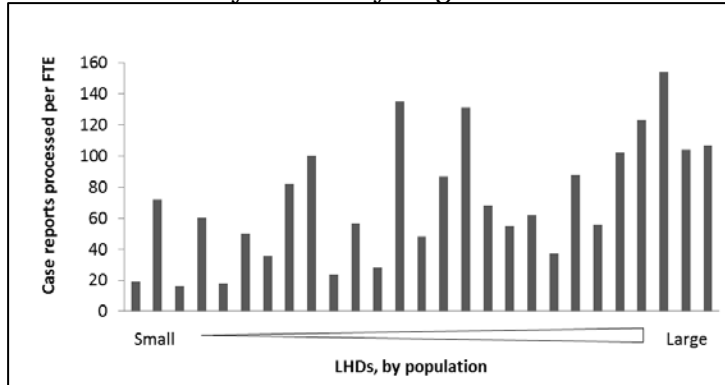
In the 18 LHDs where NC EDSS leads did not report adding staff as one of the changes made in response to NC EDSS implementation, the average number of cases per FTE per month reported in 2007 was less than that reported in 2010 (52 vs. 63 cases per FTE per month). The average personnel cost per case report in 2007 (\$163) was greater than the cost in 2010 (\$119;  $P=.29$ ).

### *Surveillance outcomes and practices*

Eight LHDs were classified as having “best” surveillance outcomes; these were 3/9 small LHDs, 3/8 medium LHDs, and 2/10 large LHDs. LHDs with “best” surveillance outcomes had lower average personnel cost per case (\$71) than LHDs in the “not best” group (\$124;  $P=.03$ ; *Figure 3* on next page). Among LHDs with “best” surveillance outcomes, the cost per case report did not differ by LHD size; among LHDs in the “not best” group, the cost per case was lower in larger LHDs (*Figure 3*), but this difference was not significant ( $P=.27$ ).

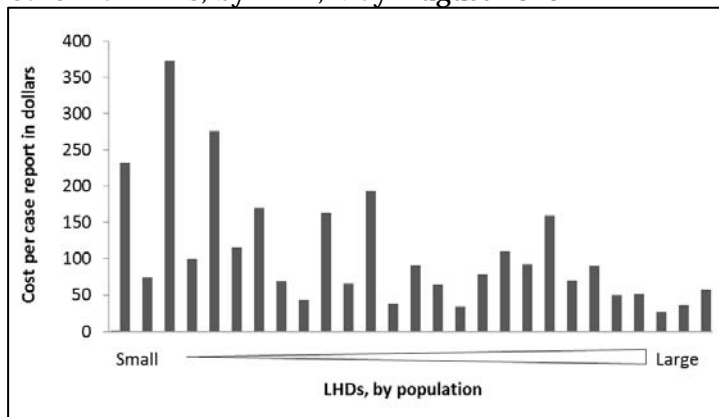
Practices reported more frequently by counties with both lower cost per case and “best” surveillance outcomes fall into two categories: (1) practices that result in more efficient use of NC EDSS (using the “wizard” for data entry, daily review of the lab results workflow) and (2) practices that result in use of surveillance data for local purposes (using surveillance data for program evaluation, including surveillance data in annual reports, using data from Part II of the surveillance form for local purposes.)

**Figure 1:** Case reports per FTE per month in 27 North Carolina LHDs, by LHD, May-August 2010



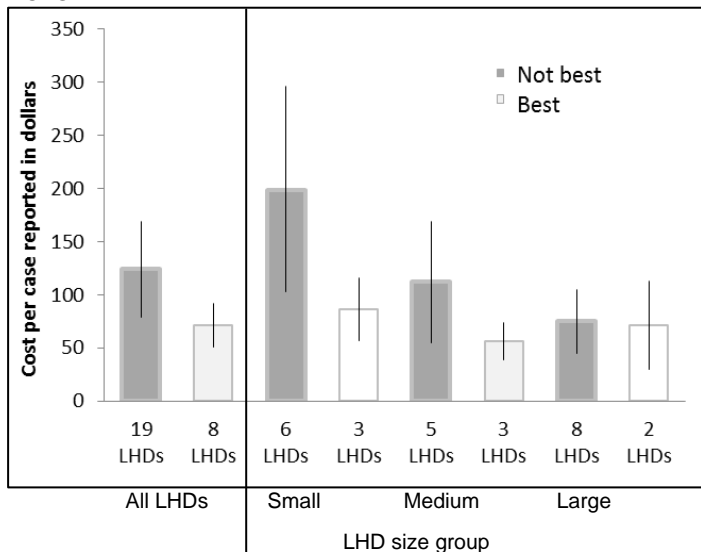
Abbreviations: FTE, full-time equivalent

**Figure 2:** Personnel cost per case report in 27 North Carolina LHDs, by LHD, May-August 2010



Abbreviations: LHD, local health department

**Figure 3:** Average personnel cost per case report and 95% confidence intervals by surveillance outcome and LHD size group, 27 North Carolina LHDs, May-August 2010



## Discussion

Our findings suggest that the transition to electronic case reporting has translated into a lower personnel cost per case report processed.<sup>3</sup> The average personnel cost per case report and per capita were lower in LHDs with “best” surveillance outcomes, suggesting that “best” practices can be identified and applied in all LHDs to increase efficiency and lower personnel cost.

Practices reported more frequently by counties with “best” surveillance outcomes and lower cost per case may be worthy of adopting more broadly. These practices fall into two categories: practices that result in more efficient use of NC EDSS (such as using the “wizard” and checking case lists every day) and practices that result in incorporation of surveillance data for local purposes (such as using surveillance data for program evaluation and annual reports). While our findings cannot demonstrate that these practices are directly responsible for more timely and accurate or lower cost surveillance, the practices are logical and can be recommended to all LHDs.

Our study found that better surveillance outcomes and some surveillance practices were associated with lower personnel costs per case report among LHDs in North Carolina. LHDs with higher personnel costs per case report may be able to reduce these costs with improvements to the timeliness and accuracy of case reporting.

## Authors & Acknowledgements

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## Foot notes

1. In 2007-2008, North Carolina began implementation of the North Carolina Electronic Disease Surveillance System (NC EDSS).
2. Average salaries for administrative assistants and CD nurses were available by county from the UNC School of Government. Average nursing supervisor salaries from the North Carolina Division of Public Health were used to approximate salary for nursing supervisors. These three staff categories made up most of the NC EDSS users; their salaries were applied to the few other laboratory and clinical staff users as appropriate.
3. Cost estimates were based solely on salaries and did not include direct costs such as local infrastructure, resources and supplies and training or indirect use of the NC EDSS system such as some case and contact investigation activities performed away from the system interface. Inclusion of these costs would increase the personnel cost per case report. Latent tuberculosis infection (LTBI) case reports were excluded from all analyses because not all LHDs report these cases. Inclusion of these cases would decrease the personnel cost per case report. Finally, because we do not have administrative data prior to and following NC EDSS implementation, our calculation of costs in 2007 and 2010 must be regarded as an estimate.



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