

**Improving Timeliness of Communicable Disease Reporting in Arizona: Program Evaluation Perspective**

Laura M. Erhart, Sara Imholte, Teresa Jue, Irene Ruberto, Ken Komatsu, Jessica A. Rigler, Sonja Damnjanovic Radovanovic

**Arizona Department of Health Services**, Phoenix, Arizona

**For questions, contact Laura Erhart:** leraht@azdhs.gov

---

**BACKGROUND**

Program evaluation is a well-known practice, using various types of data to understand a program’s performance and improve its outcomes, yet it is under-utilized within public health communicable disease programs. One evaluation focus has been on evaluating outcomes of implementing electronic laboratory reporting (ELR), which is attributed to improved timeliness of disease reporting.

**Electronic Laboratory Reporting (ELR)**

- **Timely and accurate reporting of case information to public health authorities is key to effectively and quickly initiating case investigations; detecting aberrations, clusters, and outbreaks; and ultimately more expeditiously enacting any necessary disease control measures.** Laboratory reporting is central to this process.
- **Technological changes over the last decade have allowed for a transition from traditional methods of laboratory reporting (mail, fax, and telephone) to electronic laboratory reporting (ELR).** Various public health agencies have in fact shown ELR to be timelier than traditional reporting.1-4
- **Program evaluation is a well-known practice, using various types of data to understand a program’s performance and improve its outcomes, yet it is under-utilized within public health communicable disease programs.** One evaluation focus has been on evaluating outcomes of implementing electronic laboratory reporting (ELR), which is attributed to improved timeliness of disease reporting.

**PROGRAM EVALUATION FRAMEWORK**

- **We used CDC’s program evaluation framework, which includes the steps of engaging stakeholders, describing the program, focusing the evaluation design, using credible evidence, justifying conclusions, and ensuring use and dissemination of lessons learned (Figure 1).**
- **During the program description phase, we created a logic model to illustrate the many inputs, activities and intended results of the Bureau of Health Information Systems Program (Figure 2).**
- **We determined that one major program outcome is reduction in time to report a disease.** Measurable indicators for this outcome are a lower mean reporting time and a higher proportion of cases received within required timeframes, by ELR compared to traditional reporting methods.
- **We identified how we would gather credible evidence by using data already being collected as part of Arizona’s surveillance system (MEDSIS) and study conclusions by using appropriate methods to analyze and interpret these data.**
- **Plans have been developed to ensure use of these results and share the lessons learned with stakeholders.**

### EVALUATION QUESTION:

Is ELR helping achieve more timely communicable disease reporting within Arizona?

Justification for the selection of this evaluation question:

- The transition from traditional lab reporting to ELR does not occur easily, and requires significant work, expense, and expertise.
- Although ELR “went live” for the first reporting laboratory in Arizona in 2009, as of mid-2015, approximately 55% of lab reports are received via ELR from 19 reporting laboratories.
- Thus, the Arizona Department of Health Services chose to evaluate the outcome of these efforts by answering the question of whether ELR improves the timeliness of reporting compared to traditional methods.
- An affirmative answer will help to provide validation and stimulus for the continued efforts necessary to sustain investments in ELR implementation and maintenance.

**GATHERING CREDIBLE EVIDENCE AND JUSTIFYING CONCLUSIONS**

**Data analysis methodology:**

- **Confirmed and probable cases for laboratory-reportable conditions (Arizona Administration Code R9-6-204) were reported to public health agencies during the 2014 surveillance year, were analyzed.** Cases of tuberculosis, hepatitis C and sexually transmitted diseases were excluded, as they are managed by different ADHS programs.
- **See Table 1 for additional details on case exclusions and rationale.**
- **Urgent and non-urgent conditions were analyzed separately.**

**Definition of terms used:**

- **Urgent and non-urgent conditions:** Reporting timeframes are defined in the reporting rules. Conditions to be reported within 24 hours or 1 working day are categorized as urgent. These timeframes are adjusted for weekends (though not holidays).
- **ELR status, or Method of first report:** A case was considered to be “first reported” by ELR if the earliest-received lab report in the case came through the ELR system.
- **Time to report:** The difference, in days, between the earliest lab result date for a case and the date the result was received by a public health agency. Timeframes for “1 working day” or “5 working days” conditions were adjusted for weekends (though not holidays).
- **Received within required timeframes:** Cases are within the required timeframe if the time to report was 0 or 1 days for urgent conditions, or 0 to 5 days for non-urgent conditions.

**Outcome measurements:**

- **The time to report, in days, was compared between cases first received by ELR and non-ELR.** Differences between the two groups were analyzed by ANOVA and by the Wilcoxon rank-sum test.
- **The proportion of cases received within the required timeframes was compared using a chi-squared analysis.**
- **The means were also performed to see if they differed if identified by the overall outcomes:**
  - Salmonella and Shiga-toxin producing E. coli (STEC) cases only (both urgent conditions that warrant public health investigations)
  - Non-urgent conditions, excluding influenza and RSV, which account for a large proportion of cases and require no public health case investigations.

**Results:**

- **14,723 cases were included in the analysis.** (Table 1) 53% of included cases were first received by ELR. A higher proportion of cases of urgent conditions were received by ELR (61%, compared to non-urgent conditions (52%) (Table 2).
- Of the 2,314 cases excluded because of merge status, problems with the time to report calculation, or extreme values, a disproportionate number were non-ELR (75%, p-value for chi-square test <0.0001) and urgent conditions (6%, p-values<0.0002).

**LIMITATIONS**

- **This evaluation does not examine differences in timeliness for laboratory reporting based on whether a single lab initially reported the results, although multiple reports may be received for a single case.**
- **True times to report may be different for cases excluded because they were merged (8%) or a positive time to report could not be calculated (3%).**

**CONCLUSIONS AND LESSONS LEARNED**

**Our evidence demonstrates:**

- **Significantly faster reporting from laboratories via ELR than by traditional methods, for both urgent and non-urgent communicable diseases;**
- **The Arizona Division of ELR reports received within the required timeframes; and**
- **Less overall variability in reporting timeliness for reports received by ELR.**

This evaluation has provided helpful justification and incentive within our agency to continue the extensive work to transition lab reporting to ELR. Preliminary outcomes and interpretations have been shared with ADHS stakeholders. Other benefits, not examined here, include increased data quality and reduced staff time to enter data from each report. Integrating a formal evaluation process into routine program activities should continue to aid epidemiologists in monitoring, and demonstrating the effects of, our work.

**Future activities include:**

- **Sharing these outcomes and lessons learned with external partners and stakeholders.**
- **The ongoing transition to ELR of reporting from hospital and clinical laboratories.**
- **Continuing to gather and report on new findings, as more laboratories begin reporting via ELR.**
- **Regularly repeating this evaluation to ensure that these outcomes continue to be achieved and that reporting timeliness improves even more, with additional labs using ELR.**

---

**REFERENCES**

5. True times to report may be different for cases excluded because they were merged (8%) or a positive time to report could not be calculated (3%).