Epi-X 2008 System-Wide Notification Proficiency Test

Janet L. Fath, Ph.D.; James Schwendinger, MSN, MPH, CCRN, ANP-C; Dahna Batts, MD, FACEP

Centers for Disease Control and Prevention (CDC), Atlanta, GA

Background

On the recommendation of the Council of State and Territorial Epidemiologists (CSTE), CDC collaborated with partner organizations to develop The Epidemic Information Exchange (*Epi-X*), a system for rapid communication and notification of outbreaks and other health events as they are identified and investigated. Important features of the system are the abilities 1) to post sensitive information on the secure website, 2) to notify one, some, or all members when the information is posted, and 3) to view and discuss information posted on the secure website. Outbreaks such as monkeypox, SARS, and avian influenza underscored the need to understand the dynamics of *Epi-X* notification and response.

In January 2004, the *Epi-X* team initiated a notification proficiency testing program to prepare users for receiving and responding to information about a public health emergency and to improve the processes and technology that support *Epi-X* notifications. Through this program, an annual notification test has been conducted for each state and for key public health roles (e.g., State Epidemiologists, EIS Officers, CDC Emergency Operations). On April 3, 2008 a system-wide notification test was conducted. Never before had all 5065 users been notified emergently for a single report.

Method

Early in March 2008, *Epi-X* staff sent an e-mail message to users to help them to prepare for the upcoming system-wide test. Users were asked to log on to *Epi-X*, verify their contact information, and conduct a notification self test. They were also reminded to save a copy of their digital certificate on their work, home, and laptop computers. They were not told the precise date of the test.

On Thursday, April 3, 2008 at 2:18 p.m. Eastern time, the test report was posted as an *Epi-X* Alert. Immediately upon the posting of the report, the system sent e-mail messages to each user's work e-mail and home e-mail addresses. The system then started contacting users through their mobile devices (pager and/or cell phone), followed by their work and then their home telephones. If a user answered any one of these devices, the system would not call the remaining devices. Notifications instructed users to log on to *Epi-X*, view the test report, and complete a survey.

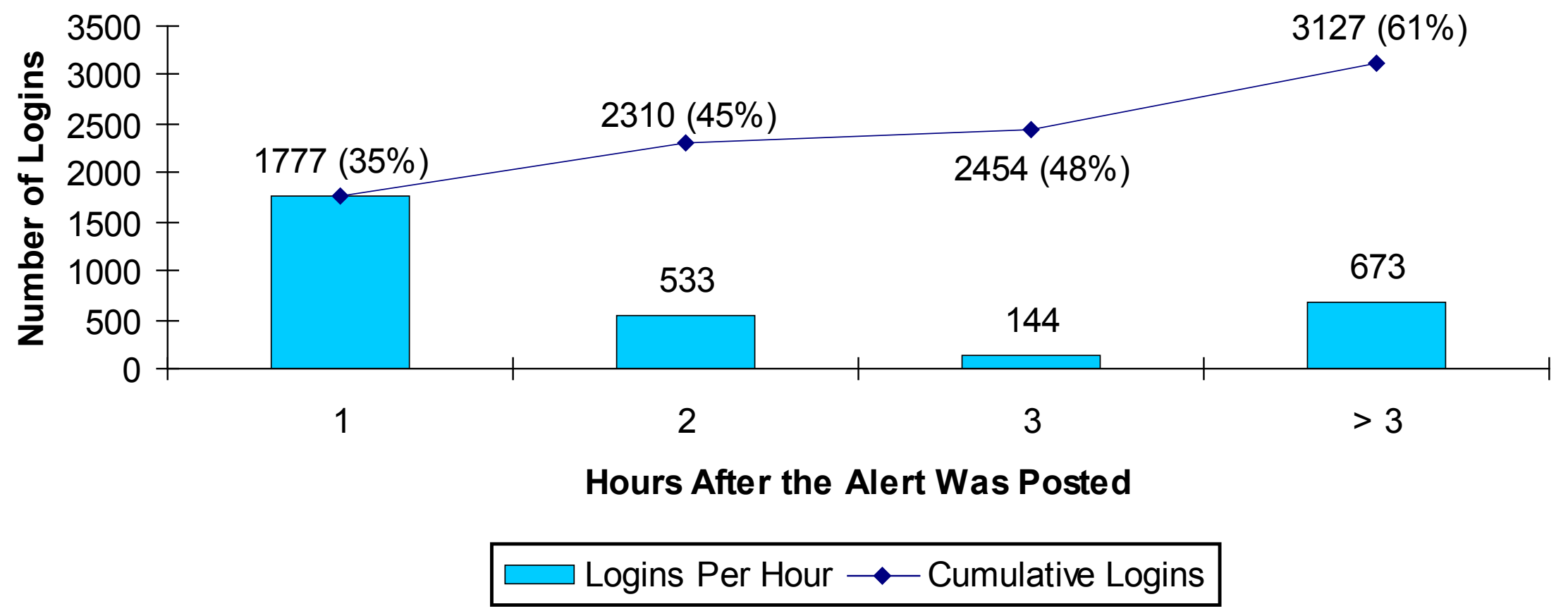
Data collected for the test were the time the system took to call all users, number of undeliverable e-mail messages, number of unique logins to the secure site, user comments (either added to the test report or delivered to *Epi-X* staff), and survey results. Following the test, two sessions with *Epi-X* staff were conducted to identify problems and suggest solutions for future tests.

Results

Time to Call Users – All telephone and pager notifications were sent within 74 minutes after the alert was posted on the secure *Epi-X* website. *Epi-X* calls key public health officials before calling all other users. These key officials are assigned to a public health role (e.g., State Epidemiologist, State Public Health Laboratory Director, CDC Emergency Operations) in *Epi-X*. The last user with a public health role in *Epi-X* was notified 55 minutes and 44 seconds after the alert was posted.

Number of Undeliverable E-mail Messages – When *Epi-X* sends an e-mail notice and receives an "Undeliverable" message in return, it could indicate that the user has outdated contact information or has changed jobs. A total of 160 undeliverable e-mail messages were returned for the system-wide test, 87 (54%) of which were for a home or mobile telephone number. *Epi-X* staff routinely follow up with individual users for out of date home or mobile contact information. *Epi-X* staff check with the authorizing official when a work e-mail message bounces or when investigation reveals that the user has an expired digital certificate[1] or security training. This ensures that only the users who need access to *Epi-X* are permitted on the system and that users have updated contact information.

Number of Unique Logins to the Secure Site – Within three hours, 2454 (48%) users logged on to view the test report. Two weeks after the report was posted, a total of 3127 (62%) users had logged on. This fact is worth mentioning because the difficulties associated with digital certificates create uncertainty as to the number of users who are able to log on to the secure site. Approximately 20% of *Epi-X* users have expired digital certificates or security training. They receive notifications but cannot log on to the system. Other users who did not log on may have had other problems with their digital certificates (e.g., they forgot their challenge phrase or they may have been away from a computer on which their digital certificate was installed). Users who logged on after the day of the test could have been coming back from leave.



User Comments – A total of 136 users commented on the test report. Of those, 63 (46%) indicated that the user had successfully viewed the test report. These comments required no additional action. A total of 35 (20%) of the comments were from users who were confused when they received multiple messages. Often, they received e-mail notification well before they received telephone calls. A total of 16 (12%) requested alternative ways to respond to an alert, either by telephone or by a portable device such as a BlackBerry. Most of the remaining comments noted problems with the telephone notifications, with the testing process, or with logging on to the system.

Survey Results – A total of 3046 users completed the survey. Responses to the following question confirm that most users first received notification by e-mail.

How did you first receive the test message?

o Work E-mail	56%
o Cell Phone	24%
o Work Telephone	11%
o Pager	3%
o Other E-mail	2%
o Other	2%
o Home Telephone	1%
o Voice Mail	1%

In comments added to the survey, users expressed confusion about receiving multiple messages and about receiving messages after they had logged on to the secure web site and viewed the test report. Other recurring themes from the survey comments indicate a desire to access *Epi-X* on mobile devices (e.g., Blackberry or cell phone), problems with digital certificates (e.g., not installed on a computer the user could access at the time), trouble logging on to the secure site, difficulties with the Dialogic system, and suggested improvements for the testing process itself.

After-Action Feedback from *Epi-X* Staff – *Epi-X* staff provided the following observations in two meetings that were conducted after the test:

- *Epi-X* staff were better prepared for this test than for previous tests. Technical staff were available to monitor the system for problems. Help Desk had surge staff, but were still strained during the test.
- There were few reports of persons who could not log on because of slow system response time.
- The *Epi-X* Help Desk streamlined the process for reporting user problems, which prevented a large backlog of issues to address later.
- Canned e-mail messages allowed the Help Desk to respond more quickly to users who had the same or similar questions.

Discussion and Conclusions

We conduct tests to identify and address problems before a real event occurs. In the April 3 test the technology functioned as designed, users received notifications, and many of them were able to log on to the secure site. In the future, however, there are three areas that need improvement:

Tradeoff Between Redundancy and User Confusion – When an *Epi-X* Alert is posted on the secure website, telephone and numeric pager messages are sent through a separate mechanism than e-mail and alpha pager messages. This situation does not cause confusion when the number of users to be notified is small and the time between receiving e-mail messages and telephone calls is short.
For the system-wide alert, however, it took over an hour to notify all users by telephone. Some persons had already logged on to the secure site in response to the e-mail messages when they received a telephone call. They were then not sure whether to log on again or to complete the survey a second time. In a real event, there may be multiple alerts in a short period of time, which could increase the level of confusion.

Possible solutions include

- Determine the utility of alerting all *Epi-X* users at one time. Perhaps only the key public health officials should ever be notified emergently.
- Explore ways to ensure that any user who logs on to the secure website before receiving a telephone call does not receive a telephone call.
- Increase the number of telephone lines so that calls are made more quickly (and users who call back to hear the message do not receive a busy signal). Note that if *Epi-X* sends text to speech messages in the future, each call will last longer and it will take longer to call all users. The need for more telephone lines will be even greater then.

Mobile Users – Public health officials often leave their desks to investigate and respond to outbreaks. It is likely, however, that their need for secure information will increase in emergencies. *Epi-X* must support them by providing mobile access to *Epi-X* information. Users should be able, for instance, to log on to the secure website through their BlackBerry or other mobile browser. Secure voice messages should be available by telephone. (Currently, users are informed by telephone only that there is an alert and are then instructed to log on to the secure website for more information.) Alternative ways to respond to emergency alerts, including the ability to respond by text message and telephone, must also be developed.

Access to the Secure Website – Approximately 20% of *Epi-X* users are unable to access the secure website because of an expired digital certificate or expired security training. Digital certificates and security training are required by the CDC to provide the level of security necessary for at least some of the information posted on *Epi-X*. This added security creates an added burden on users (e.g., they must work with their IT departments to install the digital certificate on their work computer, save a copy of their digital certificate, install their digital certificate on other computers from which they will need to access *Epi-X*, and remember their challenge phrase). To ensure that all approved users can access the secure website, users need to understand and accept the need for added security. IT support staff need training so that they can adequately manage user's digital certificates. There are also opportunities to improve the usability of digital certificates and the processes that support them within the CDC.

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[1] A digital certificate is an electronic means of verifying a user's identity. It is used in addition to a challenge phrase (password) to ensure that only authorized persons have access to the *Epi-X* website.