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## Disease Detective Applies Skills to Surveillance Evaluation

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I am a second-year Epidemic Intelligence Service (EIS) officer assigned to the Centers for Disease Control and Prevention's (CDC's) National Environmental Public Health Tracking Program (Tracking Program). EIS officers, commonly referred to as "disease detectives," have opportunities to apply our skills to many public health activities beyond outbreak investigations and emergency response. One of the projects I worked on for the Tracking Program was assessing the utility of the hospital discharge data in the National Environmental Public Health Tracking Network (Tracking Network).

CDC's Tracking Program funds health departments in 25 states and 1 city (grantees) to build local tracking networks that integrate health and environmental data (National Environmental Public Health Tracking Program, 2010). These state and local networks feed into the Tracking Network where data can be used to observe trends of exposures and health outcomes, identify populations at risk, plan and evaluate protective and preventive measures, and facilitate research. One of the main sources of data from the Tracking Network grantees is hospital discharge data (HDD). HDD are created and maintained at hospitals for billing and payment purposes (Love, Rudolph, & Shah, 2008). Every year, Tracking Program grantees submit de-identified HDD for display on the Tracking Network. Currently, HDD on the Tracking Network provide information on asthma, heart attack, carbon monoxide poisoning, and heat stress health effects dating back to 2000. Currently, these data are available for 23 states.

We consistently use surveillance data to evaluate programs and interventions in public health, but many of us may not think about the need to evaluate surveillance data and systems. Periodic evaluation is necessary to ensure systems are operating efficiently and

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### Editor's Note

As part of our continuing effort to highlight innovative approaches and tools to improve the health and environment of communities, the *Journal* is pleased to publish a bimonthly column from the Centers for Disease Control and Prevention's (CDC's) Environmental Public Health Tracking Network (Tracking Network). The Tracking Network is a system of integrated health, exposure, and hazard information and data from a variety of national, state, and city sources. The Tracking Network brings together data concerning health and environmental problems with the goal of providing information to help improve where we live, work, and play.

Environmental causes of chronic diseases are hard to identify. Measuring amounts of hazardous substances in our environment in a standard way, tracing the spread of these over time and area, seeing how they show up in human tissues, and understanding how they may cause illness is critical. The Tracking Network is a tool that can help connect these efforts. Through these columns, readers will learn about the program and the resources, tools, and information available from CDC's Tracking Network.

The conclusions of this article are those of the author(s) and do not necessarily represent the views of CDC.

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effectively. An opportunity for this type of evaluation presented itself in 2012 after the Tracking Network's data file structure changed.

Because of the file-structure change, we asked our Tracking grantees to resubmit all previous years' HDD (2000–2010). That gave us two sets of 2000–2010 data: the original submissions with the old file structure (old submission) and the resubmitted data with the new file structure (new submission) for 21 grantees, which allowed us to evaluate HDD quality by comparing the old and new submissions.

We used CDC-recommended guidelines to evaluate public health surveillance systems to assess the utility of HDD in the Tracking Network (Centers for Disease Control and Prevention, 2001). Our evaluation focused on the following attributes: usefulness, simplicity, flexibility, data standards, data quality, completeness of reporting, acceptability, representativeness, timeliness, and stability. We assessed these attributes by calculating the absolute percentage change between the old submission and the new submission. We determined the absolute percentage change by using the following steps (Figure 1):

1. Subtracted the value of the old submission from the value of the new submission.
2. Divided the number value from step one by the value of the old submission.
3. Multiplied the number value from step two by 100%.
4. Determined the absolute value of the number value from step three.

## Evaluation Highlights Two Main Challenges

The evaluation results indicated that the following attributes of HDD were satisfactory for use in the Tracking Network: usefulness, simplicity, flexibility, data standards, data quality, acceptability, representativeness, timeliness, and stability. The main challenges were with timeliness and completeness of reporting, two critical elements in the Tracking Network.

### Timeliness

Timeliness describes the amount of time at and between steps in data collection and processing. Figure 2 describes data flow of state HDD. Data flow begins in hospitals where patient transaction information is created and maintained. In most states, hospitals submit HDD for records that have closed (i.e., charges have been paid) to state data stewards. Data stewards are health data agencies within a state; they can be public organizations (such as part of the state government) or a delegated authority (such as a hospital association or private entity). HDD are submitted usually to data stewards quarterly, 45–90 days after the end of the quarter. State data stewards then provide HDD to state tracking programs, usually annually, for surveillance purposes. State tracking programs then submit de-identified HDD as monthly aggregates per year to the national Tracking Program every fall. De-identified data are available on the Tracking Network the following spring.

Although the delay between patient discharge and HDD submission to the data steward is 45–90 days, a complete calendar year's HDD may not be available until mid-year of the following calendar year. This circumstance is due to an iterative updating and validating

process between the data stewards and hospitals. For example, most data stewards will finalize 2012 calendar year HDD by mid-2013. Because the Tracking Network receives HDD in the early fall, in some states, a short time period may occur between the data steward finalizing the previous year's HDD and when the state tracking programs need to submit HDD to the Tracking Network. Our evaluation showed that not all states were able to submit HDD every year during fall annual data submissions (Figure 3), especially for the most recent year; this may be partially due to this compressed timeline.

## Completeness

Completeness describes how well data submitted to the Tracking Program represent the total numbers of known hospitalizations for a health outcome at the time of data submission. Our evaluation found that when HDD were resubmitted during the new submission, the data generated most recently before submission to the Tracking Network changed by a larger percentage when compared to the earliest data generated. This finding is evident in the increasing absolute average percentage change over time (Figures 4 and 5). In addition, the most current five years of data showed the most change. This situation likely occurs because data stewards only receive patient files that have closed, a process that can take multiple years with hospital billing and payment systems.

## Recommendations to Balance Timeliness and Completeness

After analyzing the results, we devised two proposed strategies to improve timeliness and completeness of the HDD submitted to the Tracking Network. The first strategy is to consider receiving HDD from grantees in the following spring instead of the fall. This change could give grantees more time between data steward finalization and state tracking programs HDD submission to the Tracking Network. Grantees would gain an additional six months to receive and process the most recently completed calendar year's HDD before submission to the Tracking Network. While this would mean that data are published to the Tracking Network six months later, it would potentially increase the number of grantees that submit the most recent year's HDD. In addition, shifting HDD submission to the following spring actually may allow more states to have their HDD published as much as six months earlier than it when it would have otherwise been published the following year.

The second strategy is to consider a three-year HDD resubmission policy. This strategy would have grantees resubmit the previous three years of HDD annually to maximize completeness of reporting. A three-year data resubmission policy would standardize timing and volume of data resubmission for all grantees to balance the needs for both timeliness and completeness.

As "disease detectives," EIS officers are most well known for participating in outbreak investigations and emergency responses, but my experience as an EIS officer in CDC's Tracking Program is a good example of the wide range of responsibilities we might have. Data are at the heart of every public health action, and having quality data makes it possible to deliver quality public health service. HDD remain a useful health outcomes source for the Tracking Network that can be joined with environmental exposure data and used to observe trends that guide public health decisions. Targeting improvements to timeliness and

completeness of reporting will help the Tracking Network provide the most accurate and up-to-date data for the public.

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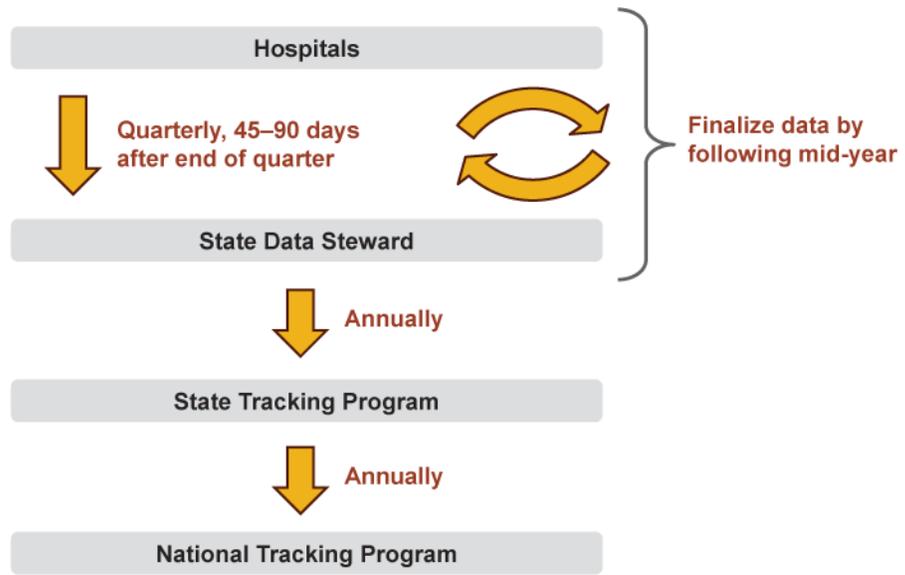
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$$\text{Absolute Percent Change} = \left| \frac{\text{New} - \text{Old}}{\text{Old}} \times 100\% \right|$$

**FIGURE 1.**  
Formula



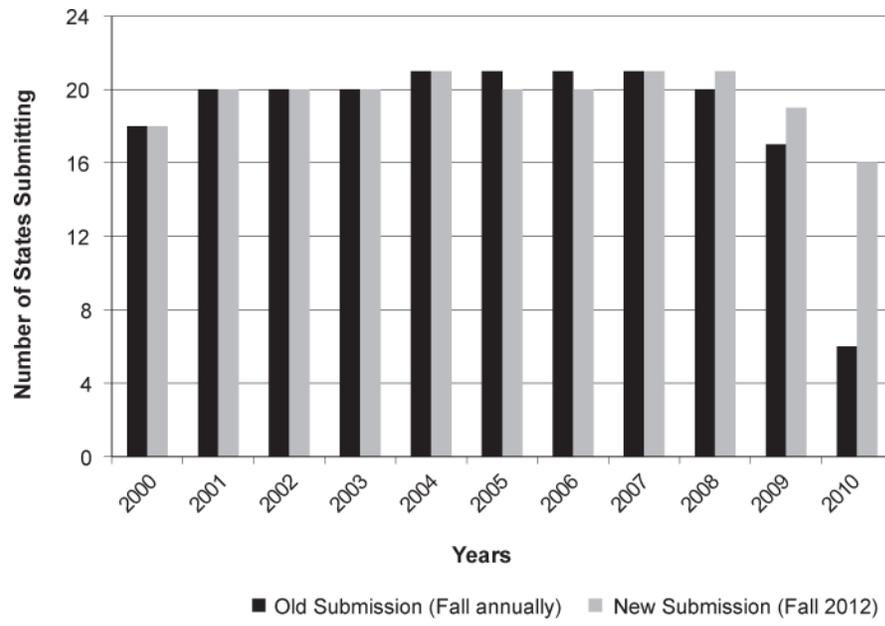
**FIGURE 2.**  
Hospital Discharge Data Flow

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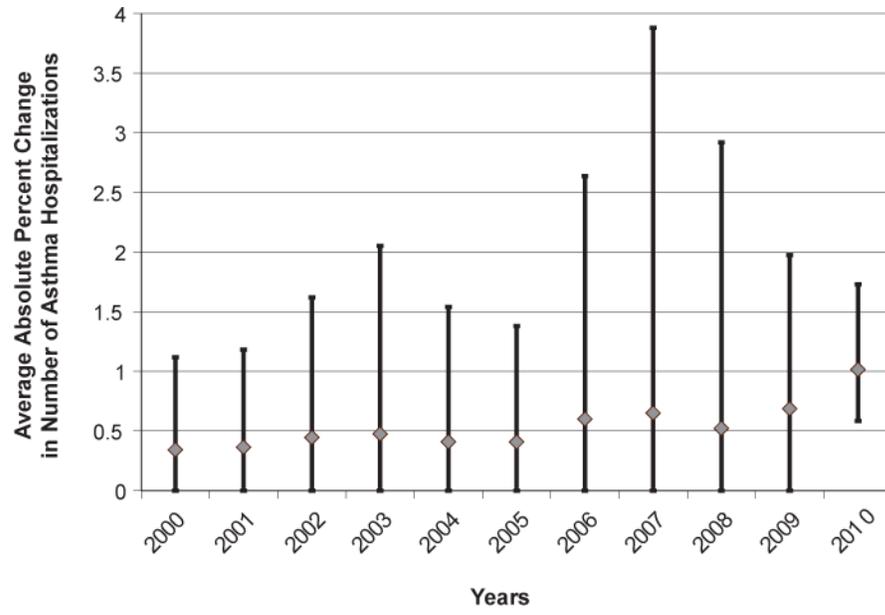
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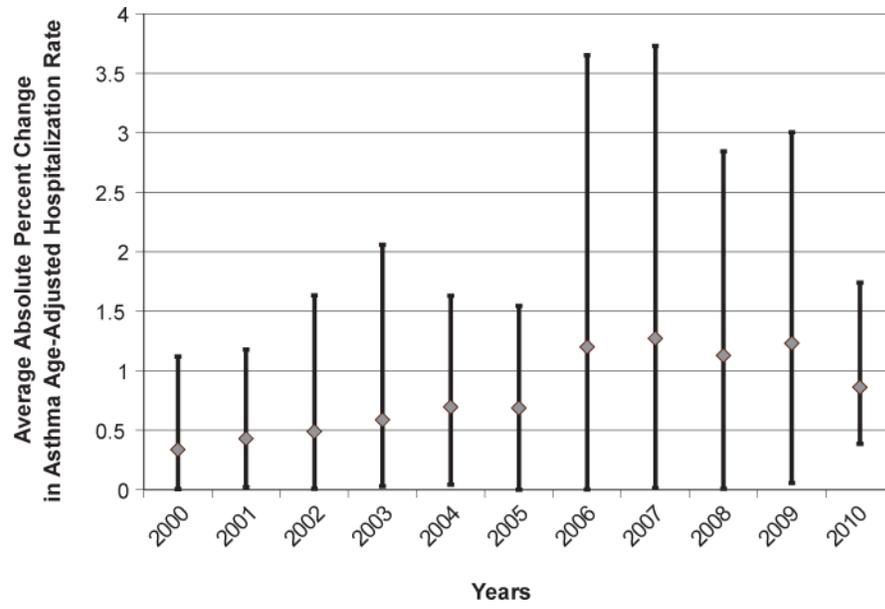
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**FIGURE 3.**  
Timeliness



**FIGURE 4.**  
Completeness of Reporting: Number of Asthma Hospitalizations



**FIGURE 5.**  
Completeness of Reporting: Age-Adjusted Asthma Hospitalizations Rate