

Adaptation of the HIV Care Continuum as a Method for Evaluating Syphilis and Gonorrhea Disease Control Activities in Los Angeles County

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Background: Treatment verification and contact elicitation are core approaches used to control the spread of sexually transmitted diseases (STDs). Methodology adapted from the HIV care continuum is presented as an evaluation and communication tool for STD control activities.

Methods: Sexually transmitted disease surveillance and program data for Los Angeles County in 2013 were used to construct a 2-part continuum to examine syphilis (all stages) and gonorrhea outcomes among index patients and elicited contacts. The Index Case Continuum (Part 1) assesses the proportion of patients who were treated, assigned for interview, interviewed, and provided name and locating information for at least 1 contact. The Elicited Contact Continuum (Part 2) assesses the proportion of contacts who were located, interviewed, and treated.

Results: Among 3668 patients with syphilis, 97% (n = 3556) were treated, 72% (n = 2633) were interviewed, and 25% (n = 920) provided name and locating information for at least 1 contact. The corresponding numbers for 12,541 gonorrhea cases were 95% (n = 11,936), 45% (n = 5633), and 16% (1944), respectively. Among the 1392 contacts elicited from syphilis cases, 53% (n = 735) were either interviewed or determined to not need an interview and 43% (n = 595) were treated. The corresponding numbers for the 2323 contacts elicited from gonorrhea cases were 53% (n = 1221) and 46% (n = 1075), respectively.

Conclusions: Adaptation of the HIV continuum is a useful tool for evaluating treatment verification and contact elicitation activities. In Los Angeles County, this approach revealed significant drop-offs in the proportion of index cases naming contacts and in the proportion of contacts who are interviewed and treated.

Verification of treatment for patients with a sexually transmitted disease (STD) and the elicitation, testing, and treatment of their contacts (herein referred to collectively as field services) have been a traditional method of STD disease control for more than 100 years.¹ By ensuring appropriate treatment for patients and their contacts, reinfection can be prevented in the original patient and forward transmission can be slowed.^{2,3} The US Centers for Disease Control and Prevention (CDC) recommends that local health jurisdictions (LHJs) conduct field services follow-up for all persons with

newly diagnosed HIV, early syphilis, and, to the extent that resources allow, persons diagnosed as having gonorrhea.⁴

In an environment of increasing STD infections and decreasing resources, LHJs are seeking to increase efficiencies in the deployment of resource-intensive field services activities.⁵⁻⁹ Although a national set of program operation guidelines for field services is useful, variation between jurisdictions in disease morbidity, characteristics of the populations served, and the structure of STD programs necessitate the use of site-specific data to guide local program policies and operations.¹⁰ In fact, a recent analysis on the potential efficiencies of targeted partner elicitation efforts found contradictory results across 4 different LHJs.¹¹

There is a need for simple and replicable evaluation tools that LHJs can use to assess the overall efficacy of STD field services programs and guide the expenditure of limited resources. Although methodologies exist for the evaluation of field services activities, a common practice is to calculate a series of measures in a stepwise fashion so that the numerator of each measure serves as the denominator for the one that follows.^{4,10} For example, when assessing how successful a program is at working with index cases, many jurisdictions will calculate the following: (1) the proportion of reported patients who are contacted, (2) the proportion of contacted patients who are interviewed, and (3) the proportion of interviewed patients who identified at least 1 sexual or cluster contact. Although this information is invaluable for program managers, the stepwise denominator approach is usually presented in tabular form and can be confusing for individuals not involved in the day-to-day program activities. Moreover, embedding each measure within the one that preceded it can obscure the population-level impact of field services efforts.

In contrast, the widely used HIV care continuum was developed to assess HIV linkage, retention, antiretroviral therapy treatment use, and viral load suppression among all HIV-infected persons as a tool for measuring key health indicators at the population-level using a single denominator.¹²⁻¹⁶ Use of the HIV care continuum has highlighted the need for improvement of all measures to reduce ongoing HIV transmission and effectively manage individual patients and has been a useful guide to LHJs for policy and program planning.

An adaptation of the HIV care continuum for STD field services activities is presented using syphilis and gonorrhea surveillance and programmatic data from Los Angeles County (LAC), an urban jurisdiction with the second highest number of STD cases in the United States.⁵ The 2-part STD field services continuum presented below is a simple and easily replicated tool that is graphically appealing and has facilitated communication and evaluation of STD field services activities in LAC.

MATERIALS AND METHODS

California state laws mandate the reporting of all cases of syphilis and gonorrhea by providers and laboratories to the local health department.¹⁷ In LAC, with the exception of infections occurring among residents of the cities of Long Beach or Pasadena

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(which have their own health departments), syphilis and gonorrhea cases are reported to the LAC Department of Public Health (DPH). Upon receipt of a case report and/or positive laboratory result, LACDPH opens the case and assigns it to a staff member for investigation. Field services investigations are conducted by individuals working under a variety of job classifications within a few departments in DPH and/or at community-based organizations. For the sake of clarity, field services staff will be used as an umbrella term to refer to all individuals conducting field services investigations. Cases are assigned to particular job classifications based on the disease being investigated, titer results (syphilis only), patient demographics, reporting facility, and geographic location. Descriptions of case assignments by job classifications are as follows: approximately 17 Division of HIV and STD Programs (DHSP) Public Health Investigators (PHIs) work on (1) primary, secondary, and early latent syphilis cases reported throughout the county and (2) syphilis and gonorrhea cases arising from custody settings; approximately 45 District PHIs housed at 1 of 12 STD clinics work on (1) all syphilis and gonorrhea cases diagnosed at their respective STD clinic and (2) late latent/unknown duration syphilis and gonorrhea cases who reside within the geographic boundary that their clinic serves; approximately 10 Community-Embedded Disease Intervention Specialists¹⁸ housed at community-based organizations work on (1) patients arising from 2 high-volume HIV/STD clinics not operated on by the county and (2) patients with gonorrhea who reside in specific high-prevalence communities; and approximately 6 DHSP Public Health Nurses (PHNs) and 200 district PHNs work on (1) congenital syphilis cases and (2) syphilis and gonorrhea cases diagnosed among pregnant women and children younger than 12 years. Although DHSP PHIs and Community-Embedded Disease Intervention Specialist work full time on syphilis and gonorrhea field services activities, this is only a portion of job duties for DHSP PHNs, district PHNs, and district PHIs. After assignment to the appropriate staff, a field services investigation consists of (1) determining the stage of the infection (for syphilis only), (2) verifying that the index patient received appropriate treatment, (3) eliciting name and locating information for sexual and/or cluster (non-sex partners who would benefit from an examination) contacts, and (4) ensuring that recent contacts are notified and treated. Before closing an investigation, staff verify that the necessary activities have been completed and assign a disposition code to indicate the outcome for every index case and elicited contact. All reported cases of syphilis and gonorrhea currently undergo this procedure.

The STD surveillance database was queried to identify all cases of syphilis and gonorrhea reported to the LACDPH in 2013. These cases were then combined with programmatic data (including disposition codes) from field services to construct the “LAC Field Services Continuum,” which consists of 2 parts: one that assesses outcomes among index cases (“Index Case Continuum”) and another that assesses outcomes among elicited contacts (“Elicited Contact Continuum”). The methods used to construct both parts of the continuum were applied uniformly for syphilis and gonorrhea. A description of the methodology is provided using syphilis as an example (unless otherwise noted).

Part 1—Index Case Continuum

After excluding cases that were out of jurisdiction, all 3668 cases of syphilis reported in LAC in 2013 comprise the first bar of the Index Case Continuum and serve as the denominator for all subsequent calculations. The highlighted portion of bar 1 reflects the subset of cases that were reported by county-operated STD clinics and hospitals. Information on the numbers of syphilis cases

by stage is included in the footnotes. The second bar, titled “Treated,” is the proportion of cases with documented treatment information in the surveillance and/or field services databases. For gonorrhea, the highlighted portion of bar 2 reflects the subset of patients who, based on having received the proper medications and dosages, were treated with a CDC-recommended or CDC-alternative regimen.¹⁹ The third bar, titled “Assigned for Interview,” is the proportion of patients who were assigned for follow-up. The fourth bar, titled “Interviewed,” reflects the proportion of patients who received an interview by field services. The last bar, titled “Identified a Contact,” is the proportion of patients that provided name and locator information for at least 1 sexual or cluster contact to the investigator.

Part 2—Elicited Contact Continuum

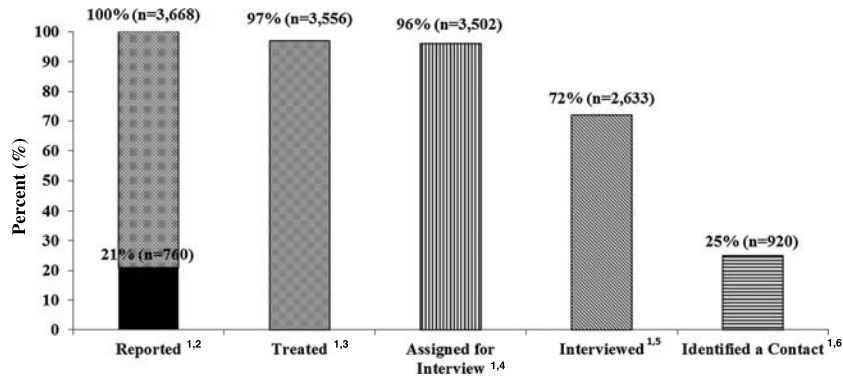
The 920 patients identified in the final bar of the Index Case Continuum provided name and locator information for 1392 sexual or cluster contacts. These individuals comprise the first bar of the Elicited Contact Continuum and serve as the denominator for all subsequent steps. Information on the types of contacts elicited (i.e., sexual vs. cluster) are provided in the footnotes. The second bar, titled “Located,” is the proportion of contacts whose whereabouts were ascertained by the investigator. The third bar, titled “Interviewed/No Interview Necessary,” reflects the proportion of contacts who were either interviewed or determined to not need an interview. Interviews were considered unnecessary if existing surveillance/field services data indicated that the contact was either not infected or had already received treatment. The footnotes of bar 3 contain information on the number of infections that were newly identified as a result of field services interviews. The final bar, titled Treated, is the proportion of contacts with documented treatment information in the surveillance and/or field services databases. The highlighted section of this bar reflects the subset of contacts with dispositions indicating that treatment was received with the aid of field services staff. Information on the numbers of contacts by disposition, including those who received preventative treatment, is provided in the footnotes.

RESULTS

Syphilis

As shown in Figure 1, a total of 3668 cases of syphilis were reported in LAC in 2013. The number of cases by stage was: 365 primary, 646 secondary, 1304 early latent, and 1353 late latent/unknown duration. Among the total reported cases, 21% were reported by county-operated STD clinics and hospitals. The remaining cases (79%) were reported by private providers, health maintenance organizations, and hospitals not operated by LAC. Treatment was confirmed for 97% of cases. One quarter of cases identified at least 1 sexual or cluster contact for follow-up with an investigator.

The second part of the syphilis continuum (Fig. 2) includes 1392 total contacts elicited from the index syphilis cases. Eighty-nine percent of elicited contacts were sexual partners, 9% were cluster contacts, and 2% were missing data on this variable. Among all elicited contacts, 72% were located and 53% were interviewed or it was determined that no interview was necessary. A total of 190 new syphilis infections were identified among the interviewed contacts. These new cases were staged as primary ($n = 28$), secondary ($n = 33$), early latent ($n = 102$), and late latent/unknown duration ($n = 27$). Forty-three percent of contacts had treatment information confirmed in the STD surveillance system including 30% ($n = 424$) with a disposition of



1. Denominator is 3,668 syphilis (SY) cases reported in Los Angeles County (LAC) in 2013, after excluding cases that were out of jurisdiction (OOJ). These cases were staged as: primary (n=365), secondary (n=646), early latent (n=1,304), and late latent/unknown duration (n=1,353).
2. Numerator is # of SY cases reported in LAC in 2013 after excluding cases that were OOO; 17% were reported by county-run STD clinics and 4% were reported by county-run hospitals.
3. Numerator is # of SY cases with documented treatment information.
4. Numerator is # of SY cases assigned to a field services staff member for investigation.
5. Numerator is # of SY cases interviewed by field services.
6. Numerator is # of SY cases who identified at least one sexual and/or cluster contact; does not include cases that notified contacts themselves or that received provider-delivered partner services.

Figure 1. Index continuum for LAC: syphilis (all stages), 2013.

“infected—brought to treatment” (n = 190) or “preventative treatment—new” (n = 234).

Gonorrhea

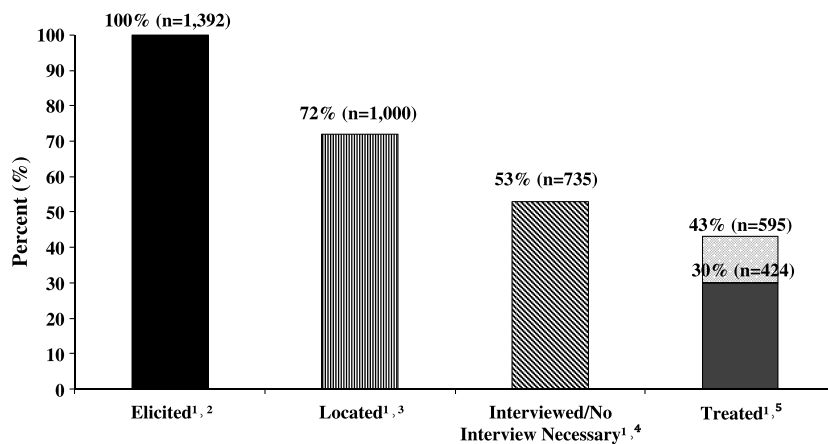
As shown in Figure 3, a total of 12,541 cases of gonorrhea were reported in LAC in 2013. Among the total reported cases, 11% were reported by county-operated STD clinics and hospitals. The remaining (89%) were reported by private providers, health maintenance organizations, and hospitals not operated by LAC. Treatment was confirmed for 95% of cases; 80% (n = 9,993) were confirmed to have received either a CDC-recommended (n = 9313) or a CDC-alternative (n = 680) treatment regimen. Three-fourths of patients with gonorrhea were assigned for follow-up and 45% were interviewed. Sixteen percent of cases identified at least 1 contact for follow-up with an investigator.

The second part of the gonorrhea continuum (Fig. 4) includes 2323 total contacts identified by the index cases.

Ninety-five percent of elicited contacts were sexual partners, 4% were cluster contacts, and 1% were missing data on this variable. Among all elicited contacts, 62% were located and 53% were interviewed or it was determined that no interview was necessary. A total of 295 new gonorrhea infections were identified among the interviewed contacts. Forty-six percent of contacts had treatment information confirmed in the STD surveillance system including 21% (n = 491) with a disposition of “infected—brought to treatment” (n = 284), “infected—field delivered therapy” (n = 2), or “preventative treatment—new” (n = 205).

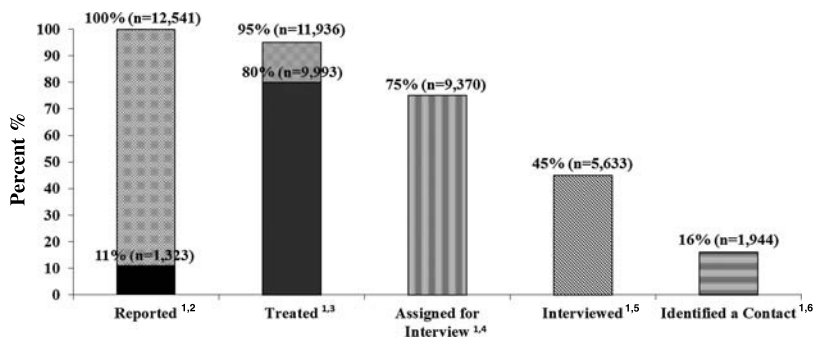
DISCUSSION

Adaptation of the HIV Care Continuum to STD field services activities provides many advantages that may be attractive to LHJs. First, this approach yields a small number of figures (2 per disease) that are graphically appealing and easy to understand. Such simplicity is critical when describing field services



1. Denominator is 1,392 contacts elicited from 920 syphilis (SY) index cases in 2013. Of these contacts: 1,237 were sexual partners, 132 were clusters, and 23 were missing information on contact type.
2. Numerator is # of contacts identified by index cases in 2013.
3. Numerator is # of contacts located by field services; excludes contacts with a disposition of “unable to locate,” “insufficient information to begin investigation,” “administrative/system closure,” or that were missing a disposition.
4. Numerator is # of contacts who were either interviewed or had a disposition which indicated that their infection and/or treatment status was confirmed. A total of 190 new cases of syphilis were identified from these interviews. These new cases were staged as: primary (n=28), secondary (n=33), early latent (n=102), and late latent/unknown duration (n=27).
5. Numerator is total # of partners with documented treatment information; 30% of contacts had a disposition of “infected – brought to treatment” (n=190) or “preventative treatment – new” (n=234).

Figure 2. Elicited contact continuum for LAC: syphilis (all stages), 2013.



1. Denominator is 12,541 gonorrhea (GC) cases reported in Los Angeles County (LAC) in 2013, after excluding cases that were out of jurisdiction (OOJ).
2. Numerator is # of GC cases reported in LAC in 2013; 10% were reported by county-run STD clinics and 1% were reported by county-run hospitals.
3. Numerator is # of GC cases with documented treatment information; 80% received either a CDC-recommended (n=9,313) or CDC-alternative (n=680) treatment regimen.
4. Numerator is # of GC cases assigned to a field services staff member for investigation.
5. Numerator is # of GC cases interviewed by field services.
6. Numerator is # of GC cases who identified at least one sexual and/or cluster contact; does not include cases that notified contacts themselves or that received provider-delivered partner services.

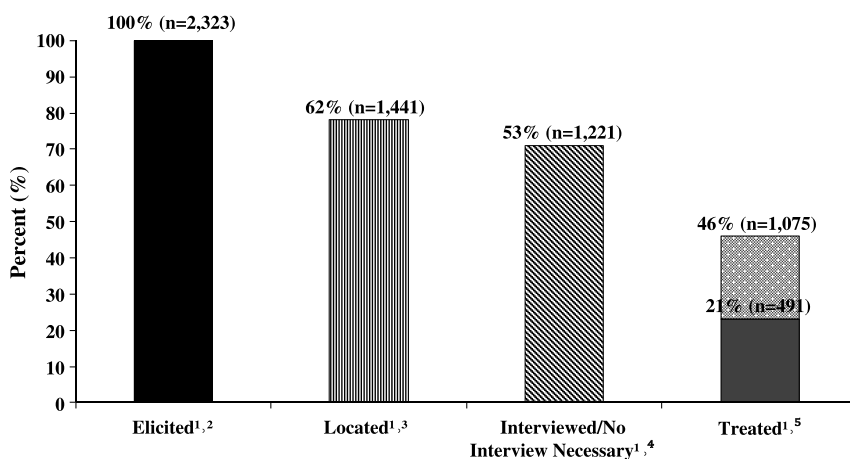
Figure 3. Index case continuum for LAC: gonorrhea, 2013.

activities to lay audiences, justifying a program to decision makers, and identifying areas of improvement to maximize the overall impact of field services activities. Second, by using disposition codes and programmatic data that are routinely collected during the course of an investigation, these figures can be generated without the need for additional data collection. Third, the calculations used are straightforward and can be conducted in settings with limited epidemiological/statistical support. Lastly, the STD field services continuum is highly adaptable; individual bars and footnotes can be added/removed and the continuum can be stratified by additional characteristics to fit locally available data and identify intervention opportunities. A generic template that allows users to recreate the continuums by inputting the desired categories and data are available from the authors.

In LAC, the index case continuum showed that 21% of syphilis cases and 11% of gonorrhea cases are reported by county-operated STD clinics and hospitals. Although these facilities play an important role in STD diagnoses, previous research has shown that compared with those seen at STD clinics, patients

diagnosed at other facilities are less likely to be interviewed, name a sexual contact, and have a contact who is brought to treatment.^{7,11} When stratified by diagnosing facility, improved outcomes for syphilis and gonorrhea cases diagnosed at STD clinics (vs. non-STD clinics) are observed for nearly all bars of the LAC index case continuum and elicited contact continuum, highlighting the need for continued and enhanced collaboration with the nonprofit and private sector to deliver STD field services activities (data not shown).

In addition to enumerating the proportion of cases reported by county-operated STD clinics and hospitals, the field services continuums clearly demonstrate areas of strength within the program as well as provide key programmatic data that can be used to identify areas in need of improvement. For both syphilis and gonorrhea, treatment verification activities are highly successful and provide valuable insight into communitywide treatment practices. For gonorrhea, the index case continuum shows that most cases in LAC in 2013 received a CDC-recommended or CDC-alternative treatment regimen. This information is crucial for



1. Denominator is 2,323 contacts elicited from 1,944 gonorrhea (GC) index cases in 2013. Of these contacts: 2,198 were sexual partners, 95 were clusters, and 30 were missing information of contact type.
2. Numerator is # of contacts identified by index cases in 2013.
3. Numerator is # of contacts located by field services; excludes contacts with a disposition of “unable to locate,” “insufficient information to begin investigation,” “administrative/system closure,” or that were missing a disposition.
4. Numerator is # of contacts who were either interviewed or had a disposition which indicated that their infection and/or treatment status was confirmed. A total of 295 new cases of gonorrhea were identified from these interviews.
5. Numerator is total # of partners with documented treatment information; 21% of contacts had a disposition of “infected – brought to treatment” (n=284), “infected – field delivered therapy” (n=2), or “preventative treatment – new” (n=205).

Figure 4. Elicited contact continuum for LAC: gonorrhea, 2013.

evaluating adherence to treatment guidelines and assessing the potential risk of cephalosporin-resistant gonorrhea in LAC.

From a programmatic standpoint, the LAC field services continuums highlight challenges associated with partner elicitation efforts. Despite substantial numbers of patients with syphilis and gonorrhea who are interviewed, investigators were only able to elicit contacts from a minority of patients. For syphilis, the subsequent follow-up with these contacts yielded 190 newly identified cases and 424 contacts receiving treatment. The corresponding numbers for gonorrhea were 295 newly identified cases and 491 contacts receiving treatment. Programmatic data within the continuums can also be used to calculate additional measures that may be useful. An estimate of the proportion of cases that are identified via contact elicitation can be calculated by dividing the number of new cases identified among elicited contacts by the total number of index cases reported. Dividing the total number of index patients interviewed by the number of new patients identified among elicited contacts provides an estimate of the number of patients who need to be interviewed to identify one case of disease. In LAC, we estimate that 5% of all patients with syphilis are identified through field services activities and that 14 patients with syphilis need to be interviewed to find one new case of disease. For gonorrhea, we estimate that 2% of all patients are identified through field services activities and that 19 patients need to be interviewed to find one new case of disease. Presentation of field services data as a continuum (compared with the stepwise denominator approach described earlier) encourages these outcomes to be interpreted within the context of overall disease morbidity, which is especially important in LAC given the fact that there were 3.4 times as many cases of gonorrhea than syphilis reported in 2013.

The data included in this analysis are limited to what is routinely collected in the LACDPH STD surveillance and field services databases. Although this approach can be replicated without the expenditure of additional resources, there are several limitations that should be considered. For the index case continuum, the LAC surveillance and field services databases contains limited information on provider- and patient-delivered partner notification activities. As a result, individuals who either notified contacts by themselves or with the help of their medical provider were not included in the numerator of the Identified a Contact bar. Prior research has noted higher levels of partner notification when self-reported by index patients than when derived from field services disposition codes.²⁰ The proportion of index patients who identified a contact should therefore be used to provide insight into the relative benefits of LACDPH's field services program and not to infer overall levels of partner notification within the community. For the elicited contact continuum, the biggest limitation is that it does not include (1) partners of index patients who could not be interviewed, (2) partners of index patients who were interviewed but refused to provide name and/or contact information to the investigator, and (3) partners of index patients who were interviewed but who did not know, and therefore could not provide, the name and contact information to the investigator. The total number of sexual partners who were exposed to all reported cases is likely to be substantially larger than the number of elicited contacts. Findings from the elicited contact continuum may therefore not be generalizable to nonelicited partners.

The STD field services continuum is an easily replicable tool that can be adapted to conform to an LHJ's existing surveillance and field services databases. This method is advantageous because it encourages outcomes to be interpreted within the context of overall disease morbidity. Future analyses should compare continuums across LHJs to identify best practices and conduct ecological analyses related to specific field services activities and disease prevalence; stratify the continuums by age, race/

ethnicity, sex, sexual orientation, diagnosing provider type, and neighborhood to identify opportunities for intervention; and calculate metrics such as cost per case identified and/or averted by incorporating operational cost and/or workforce data into the continuums. Local health jurisdictions may wish to consider using the continuum approach as a complement to traditional field services program evaluation metrics.

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