



BUILDING STATE-BASED CHRONIC DISEASE EPIDEMIOLOGY CAPACITY



CSTE™
COUNCIL OF STATE AND
TERRITORIAL EPIDEMIOLOGISTS

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This capacity building plan is a products of a CSTE Chronic Disease Advisory Workgroup lead by Juliet VanEenwyk, an Epidemiology Consultant. This plan outlines priority recommendations, and potential strategies to implement selected priorities to increase chronic disease epidemiology capacity.

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EXECUTIVE SUMMARY

Background

Chronic diseases are major contributors to morbidity and mortality among adults in the United States, affecting both younger and older adults and accounting for the majority of our nation's annual health care costs.¹ Chronic disease epidemiologists use data to monitor levels of chronic diseases and how these vary within population subgroups and to understand individual, sociocultural and environmental factors that put people at high risk of developing or failing to control chronic diseases. This information allows program planners and policy makers to maximize opportunities for preventing and controlling chronic diseases through program interventions and policy development. Chronic disease epidemiologists at state and local health departments bring local perspectives and knowledge to the analytic process and are often in the best positions to bring information about determinants and distributions of chronic diseases to local public health leadership, elected officials, healthcare providers and community organizations.

In spite of the important contributions of chronic disease epidemiologists at state and local health departments in preventing and controlling chronic diseases, the Council of State and Territorial Epidemiologists' (CSTE) epidemiology capacity assessment (ECA) indicates that many state health departments have less than optimal chronic disease epidemiology capacity in terms of the number of chronic disease epidemiologists, their skill levels and access to resources needed to do their work. Anecdotal information since the last ECA in 2013 suggests that this insufficiency is growing more acute and that chronic disease epidemiology at local health departments also suffers from insufficient capacity.

In April 2015, CSTE issued a report with findings from the 2013 ECA for chronic disease, maternal and child health (MCH) and oral health epidemiology.² The report included recommendations for increasing chronic disease, MCH and oral health epidemiology overall, as well as recommendations specific to each program area. In December 2015, the CSTE chronic disease workgroup hired a consultant and convened an advisory group to consolidate, clarify, and prioritize the overall and chronic disease-specific recommendations in the April 2015 report and to suggest potential activities for implementing priority recommendations with the goal of increasing chronic disease epidemiology capacity at state and local health departments.

Methods

The advisory group used email and teleconference to achieve consensus on:

- A preliminary set of recommendations that consolidated the overall and chronic disease-specific recommendations from the April 2015 report, refining or adding detail to the original recommendations as needed for clarification.
- A set of overarching principles to guide the work, two of which were developed from recommendations in the April 2015 report.

In a qualitative process, the advisory group used information from key informant interviews, criteria designed to help state health departments prioritize problems and activities,³ and their experiences and judgment to suggest up to five primary actions that they would most like CSTE and state and local chronic disease epidemiologists to focus on in order to build chronic disease

epidemiology capacity. The group initially focused on potential actions because the availability of feasible actions was a key criterion for prioritizing recommendations to expand capacity.

The group used a modified multi-voting technique to narrow the list of primary actions. The consultant initially prioritized and modified the preliminary recommendations based on the actions that received the most votes. Before finalizing, advisory group members had opportunities to recommend changes to the priorities and to add or modify potential activities to implement the priority recommendations.

Results

The process resulted in three guiding principles, two high priority recommendations and two medium priority recommendations.

Guiding Principles

In implementing recommendations for building state-based chronic disease epidemiology capacity, including increasing the number of state-based epidemiologists, their skill levels and access to resources needed for their work, CSTE will:

- Work with the Centers for Disease Control and Prevention to develop a plan to achieve optimal chronic disease epidemiology funding and capacity.
- When possible, give preference to jurisdictions with minimal to no chronic disease epidemiology capacity and consider their needs when prioritizing actions.
- Consider the need to build chronic disease epidemiology capacity in local health jurisdictions.

High Priority Recommendations

- **Promote a minimum workforce** that includes state health departments having a minimum of five chronic disease epidemiologists including a dedicated lead epidemiologist who is responsible for coordinating across chronic disease programs and with MCH and oral health epidemiology groups, and at least four additional chronic disease epidemiologists. One of the five epidemiologists should have doctoral-level training.
- **Build partnerships with local academic institutions** to improve awareness, understanding and appreciation of the roles and functions of chronic disease epidemiologists in state and local public health departments; to promote chronic disease-related applied epidemiology fellowships; and to offer coursework that includes training in competencies identified by practicing chronic disease epidemiologists as needing additional focus.

Medium Priority Recommendations

- **Promote and offer training** for state and local chronic disease epidemiologists.
- **Monitor gaps and needs** in state-based chronic disease program epidemiology capacity and disseminate findings widely.

Discussion and Conclusions

This project narrowed the list of recommendations in the April 2015 report that contained findings from the 2013 ECA for chronic disease, MCH and oral health epidemiology² by identifying two high and two medium priority recommendations to implement in order to expand chronic disease epidemiology capacity at state health departments. The April 2015 report defined expanding capacity as increasing the number of chronic disease epidemiologists, their skill levels and their access to resources needed to do their work. Recognizing the importance of chronic disease epidemiology at local health jurisdictions, local health was explicitly included in many of the activities suggested to implement the priority recommendations.

The group identified increasing the number of chronic disease epidemiologists as the most basic need, because increasing skill levels and expanding access to resources is moot in the absence of sufficient numbers of chronic disease epidemiologists to take advantage of training and resources. Thus, promoting a minimum workforce was a high priority with activities focused on strengthening support for chronic disease epidemiology in state health departments and recruitment and retention of state-based chronic disease epidemiologists. Building partnerships with academic institutions was also a high priority with most suggested activities serving to promote a minimum workforce by fostering interest in both chronic disease epidemiology and careers in public health practice among students and by working with schools and programs of public health to assure teaching chronic disease epidemiology skills needed in applied settings. Additionally, state health departments might be able to leverage resources needed for their work through partnering with academic institutions for research and program implementation and evaluation.

That the group identified promoting and offering training as a medium priority recommendation does not diminish its importance, but rather recognizes that with too few chronic disease epidemiologists, those who do work in state health departments often lack the time and organizational support needed to learn and implement new skill sets. Potential activities for training focus on the wide array of current offerings from organizations and agencies interested in fostering public health practice, controlling and preventing chronic diseases, or training chronic disease epidemiologists. Activities also include a focus on using the annual CSTE conference as a mechanism to offer training.

The group identified monitoring gaps and needs of state-based chronic disease epidemiologists as a medium priority in recognition of the desire to know whether capacity-building efforts have been successful and to identify evolving gaps and needs.

The primary focus of this work was to prioritize recommendations from the April 2015 report.² The group focused on availability of potential actions to implement recommendations as a key criterion for determining priorities. The group did not thoroughly vet the suggested actions, but rather considered the primary actions in a qualitative manner relying on information from key informants and their own experiences to gauge their feasibility and effectiveness. Thus, refining and prioritizing actions in support of the two high and two medium priority recommendations is needed as the next step in furthering this work.

BACKGROUND AND OBJECTIVES

The Centers for Disease Control and Prevention (CDC) notes that chronic diseases are responsible for seven of 10 deaths in the United States annually and that treating people with chronic diseases accounts for 86 percent of our nation's healthcare costs.¹ The high burden of chronic disease is not due solely to the aging of the population. Chronic diseases are major killers among non-elderly adults, as well. For example, in 2014, cancer caused 27 percent, heart disease and stroke about 23 percent and diabetes about 5 percent of the more than 660,000 deaths among adults ages 20–64 in the United States.⁴

Public health policies and programs help to prevent chronic diseases, minimize their progression and maximize the quality of life for those with chronic diseases. Programs and policies are most effective when we understand what modifiable risk factors are most salient and which populations have the highest levels of chronic diseases and related risks, and when we monitor programs and policies to ensure that they are achieving their desired effects. Chronic disease epidemiologists at state and local health departments bring local perspectives and knowledge to the analytic process and are often in the best positions to bring information about determinants and distributions of chronic diseases to state and local public health leadership, elected officials, healthcare providers and community organizations.

The Council of State and Territorial Epidemiologists (CSTE) conducted the first epidemiology capacity assessment (ECA) in 2001 to evaluate epidemiology capacity in state and territorial health departments in order to monitor progress towards achieving Healthy People 2020 Public Health Infrastructure objective 13—provision of epidemiology services. Follow-up assessments in 2004, 2006, 2009, and 2013 provide longitudinal measures to evaluate core epidemiology functions, a basis for estimating epidemiology capacity, and a gauge of the competencies and training needs of the epidemiology workforce. In April 2015, CSTE published a technical report that included results for chronic disease, maternal and child health (MCH) and oral health from the 2013 ECA.²

In spite of the need for chronic disease epidemiology at state and local health departments to support state and local efforts to prevent and control chronic diseases, the April 2015 report noted insufficient chronic disease epidemiology capacity at many state health departments in terms of the number of chronic disease epidemiologists, their skill levels and their access to resources needed to do their work. Anecdotal information since the 2013 ECA suggests that this insufficiency is growing more acute and that chronic disease epidemiology at local health departments also suffers from insufficient capacity.

The April 2015 report included a set of recommendations for expanding epidemiology capacity across chronic disease, MCH and oral health and another set of recommendations specific to chronic disease. In late 2015, the CSTE chronic disease workgroup identified the need to develop a plan to begin implementing the recommendations in the April 2015 report in order to increase the number of chronic disease epidemiologist at state health departments, their skill levels and their access to resources needed to do their work. CSTE hired a consultant and convened an advisory group (Appendix A) to establish priority recommendations and to suggest activities for their implementation.

METHODS

The overall approach was iterative and relied primarily on qualitative information.

The advisory group and consultant began by consolidating the overall (chronic disease, MCH and oral health) and chronic disease-specific recommendations from the April 2015 report,² noting areas potentially needing clarification. The group used teleconference and email to comment on and discuss drafts developed by the consultant to achieve consensus on a preliminary set of consolidated recommendations.

The advisory group compiled a list of key informants from whom to gather information relevant to potential priorities and actions for implementing recommendations in the preliminary consolidated set. The consultant interviewed the key informants using a semi-structured approach to gain their perspectives on strengths and weaknesses internal to their organizations and opportunities and threats in the external environment (SWOT) for building primarily state-based chronic disease epidemiology capacity. Key informants also provided information on what they experienced as the most important deficits in relation to chronic disease epidemiology at state health departments and potential strategies for increasing capacity. Several key informants also provided their perspectives in relation to local or tribal health jurisdictions. The consultant provided the advisory group with notes from the key informant interviews, a summary across the interviews, and a summary of similar SWOT information submitted by advisory group members.

The group reviewed criteria designed to help health departments prioritize problems and activities.³ Because the availability of feasible actions to address problems is a key prioritization criterion, the group used the SWOT information and their experiences and judgment to suggest up to five activities for implementing recommendations in the preliminary consolidated set or for addressing additional issues raised by key informants. The actions they suggested were those that they would most like CSTE and state-based chronic disease epidemiologists to focus on in order to expand state-based chronic disease epidemiology.

We used a modification of the multi-voting technique described in the [National Association of County and City Health Officials \(NACCHO\) Guide to Prioritization Techniques](#) to narrow the list of potential primary actions. (Appendix B describes the rationale for using multi-voting technique.) The modification included one round of voting and retaining two items that received less than half the votes. Given the small number of voters and different granularities among the action items, final decisions on modifying and prioritizing recommendations and suggesting actions considered the voting results, as well as email and verbal feedback from the advisory group.

RESULTS

Guiding Principles and Preliminary Set of Consolidated Recommendations

The following list consolidates the two sets of recommendations from the April 2015 report: the overall recommendations that focus on issues, needs and actions that cut across chronic disease, MCH, and oral health program areas and recommendations specific to chronic disease epidemiology.² The advisory group changed the language of the recommendations for clarification or specificity; treated two of the recommendations as guiding principles, because the concepts cut across all recommendations; and added one guiding principle and one recommendation. The numbers and sources of the original recommendations on which the guiding principles and consolidated recommendations are based are in parentheses. “Overall” refers to the set of recommendations that cuts across chronic disease, MCH and oral health;

“chronic disease” refers to the set of chronic disease-specific recommendations. The bolded text in each recommendation provides a shortened title for the recommendation. Appendix C summarizes this information.

In seeking to implement recommendations for building state-based chronic disease epidemiology capacity, CSTE shall observe the following guiding principles. CSTE will:

- Work with CDC to achieve optimal epidemiology funding and capacity to increase the number of state-based chronic disease epidemiologists and their access to and use of tools to support their work so that all state chronic disease programs have personnel, skills and resources needed. (overall #1, introduction to chronic disease #9)
- When possible, give preference to jurisdictions with minimal to no chronic disease epidemiology capacity and consider their needs when prioritizing actions. (modified from overall #1, chronic disease #2)
- Consider the chronic disease capacity building needs of local health jurisdictions. While important for all recommendations, this might be particularly relevant for recommendations related to access to resources (such as technology resources and data sets) and skills to use relevant technology [such as geographic information systems (GIS)] where local and state-level needs might diverge. (advisory group)

Preliminary consolidated recommendations include:

1. **Participate in national discussions.** CSTE should ensure that chronic disease epidemiology and related technology capacity are part of national discussions on:
 - A. Overall state-based epidemiology capacity. (overall #2)
 - B. Addressing gaps identified in the core ECA. (chronic disease #1)
 - C. Capacity needed to provide essential data for public health action. (chronic disease #1)
2. **Monitor gaps and needs.** CSTE should continue to regularly monitor and evaluate gaps and needs in state-based chronic disease epidemiology capacity and disseminate results widely. (overall #8, chronic disease #3)
3. **Promote a minimum workforce.** CSTE should promote a minimum workforce that includes state health departments having a minimum of five chronic disease epidemiologists including a dedicated lead epidemiologist responsible for coordinating across chronic disease programs and with MCH and oral health epidemiology groups and at least four additional chronic disease epidemiologists. One of the five epidemiologists should have doctoral-level training.^a (overall #3, chronic disease #9)

^a The minimum number of chronic disease epidemiologist recommended in the April 2015 report² could range from five to seven depending on whether the epidemiologists with specified functions represent unique positions. The advisory group chose five as the minimum number following confirmation from the chair of the CSTE chronic disease workgroup that the report intended a minimum of five. Five chronic disease epidemiologists might seem too ambitious, unrealistic, or unnecessary. The Discussion section of this report outlines the extensive scope of work ideally undertaken by state-based chronic disease epidemiologists. In the advisory group’s judgment, at least five chronic disease epidemiologists would be required to achieve the needed depth and breadth of chronic disease epidemiology work to support chronic disease-related program and policy development, implementation and evaluation.

4. **Promote access to resources.** CSTE should promote all state chronic disease epidemiology programs having access to resources, technology and tools needed to address Essential Public Health Services including:
 - A. Appropriate statistical software. (overall #7)
 - B. Encryption software. (overall #7)
 - C. GIS software. (overall #7, chronic disease #4)
 - D. Routinely geocoded population-based chronic disease data that lend themselves to geocoding, beginning with birth and death data. (chronic disease #4.)
 - E. Unfettered timely access, ability, and technical support to analyze key datasets, including state mortality, hospital discharge, tumor registry, Behavioral Risk Factor Surveillance System (BRFSS), emergency department and emergency medical services, and Medicare data. (chronic disease #9)
 - Special attention should be given to access to mortality and Medicare data because both have recently been decreasing, as has the timeliness of mortality data. (chronic disease #9)
 - F. Adequate information technology support services. (chronic disease #9)
 - G. Adequate clerical support services. (chronic disease #9)
 - H. A wide variety of medical, dental, nursing, other healthcare, and public health journals. (overall #7, chronic disease #9)
5. **Offer training.** CSTE and state chronic disease programs should offer and enhance training opportunities for chronic disease epidemiologists that:
 - A. Enable state chronic disease epidemiologists to calculate confidence intervals for mortality rates and complex survey data, especially BRFSS prevalence estimates. (chronic disease #9)
 - B. Coordinate across chronic disease, MCH and oral health. (overall #4)
 - C. Are offered at annual meetings, by webinar, and through resources and mentorship programs of chronic disease, MCH and oral health-related national associations by sharing identified training needs with these groups. (overall #4)
 - D. Include competencies identified by practicing epidemiologists as needing additional focus by promoting these competencies to organizations involved in training the public health workforce, including CDC, CSTE and schools of public health. (overall #5, chronic disease #7)
 - The most prominent needs for training identified by the 2013 ECA were in use of informatics and information systems, fiscal issues, and community health assessments. (chronic disease #7)

6. **Build partnerships.** To efficiently and effectively use resources, conduct surveillance, and plan and implement evidence-based strategies for chronic disease prevention and health promotion, CSTE and state chronic disease programs should work to build partnerships:
 - A. Within state health departments including with substance abuse, mental health, occupational health, injury, environmental health, oral health, MCH and public health preparedness epidemiologists and programs. (chronic disease #5)
 - B. Among state agencies. (overall #6; chronic disease #6)
 - C. With local health jurisdictions. (advisory group)
 - D. With local academic institutions. (overall #6, chronic disease #6)
7. **Incorporate substance abuse and mental health.** In the absence of state substance abuse and/or mental health surveillance capacity, CSTE should promote and chronic disease programs should consider incorporating substance abuse and mental health surveillance into their surveillance activities. (chronic disease #5)
8. **Assist in public health emergencies.** Chronic disease and mental health are major public health issues during times of natural and human-made disasters. CSTE should promote chronic disease epidemiologists being prepared in advance to assist in a public health emergency. (chronic disease #5)

Key Informant Interviews

In February 2016, the consultant conducted 14 telephone interviews and one email exchange with 20 key informants. (Appendix D) The informants provided their perspectives on strengths and weaknesses internal to their organizations and external opportunities and threats (SWOT) to building state-based epidemiology capacity. Advisory group members provided similar information.

The information summarized below represents the perspectives of key informants and advisory group members and not necessarily the official policies or positions of the agencies or organizations with which they are affiliated. Due to concerns about confidentiality—especially around weaknesses and threats—the summary is provided as a high level overview that for the most part does not name specific organizations. Thus, its usefulness for guiding future work may be limited. In contrast, the advisory group had access to detailed information that included who provided what information at what institution or agency.

Summarizing the SWOT information proved challenging due to:

- An opportunity or strength for one organization or program representing a threat or weakness to another organization or program.
- Differences among individuals in viewing challenges as weakness and threats or as opportunities for improvement and renewed efforts. In summarizing the information, challenges that seemed to have proximate solutions were classified as strengths or opportunities; those with more distal solutions as weaknesses or threats.
- Variable—and sometimes unknown—likelihood of terminating current opportunities for expanding state-based chronic disease epidemiology and of implementing new potential activities. Current activities that might not continue due to lack of resources are noted as

such. New activities with unknown likelihood of implementation are noted as potential opportunities.

The following summary of SWOT information is from the perspective of CSTE and chronic disease epidemiology in state and local health departments. Thus, for the summary, strengths and weaknesses are factors internal to CSTE, chronic disease epidemiology in health departments or both; opportunities and threats are external to these organizations. However, classifying some items as internal or external fell into a gray area due to interconnections of CSTE and state and local health departments with many of the key informants' organizations.

Funding: Funding was more likely to be identified as a weakness or threat than a strength or opportunity.

- **Strengths**

- Funding opportunity announcements (FOA) include surveillance and evaluation components requiring chronic disease or oral health epidemiologists.

- **Weaknesses:** Where indicated, key informants from organizations external to CSTE reported similar funding issues. These issues at external organizations constitute threats to CSTE or state-based chronic disease epidemiologists who benefit from their programs and activities. To minimize repetition, these issues are not repeated under threats below.

- Funding is insufficient due to funding cuts, insufficient allotments or competing priorities. (Also reported by key informants from external organizations.)

- Insufficient funding results in insufficient staff limiting the ability to continue current activities or take on new activities related to chronic disease epidemiology. (Also reported by key informants from external organizations.)

- Funds historically received by CSTE are going to other organizations.

- Limited CDC funding to CSTE for chronic disease has resulted in inadequate CSTE staff support of the chronic disease workgroup's projects and limited their number and scope.

- Funding is not sufficiently diversified. (Also reported by key informants from external organizations.)

- Lack of discretionary funds limits the ability to take on new work.

- State health departments prioritize funding for chronic disease program interventions limiting funds for chronic disease epidemiology.

- Siloed funds (partially due to FOA requirements discussed in Strengths above) make it difficult to leverage resources across chronic disease programs.

- Is block grant funding working as anticipated?

- **Opportunities**

- Several organizations reported steady or diversified funding allowing continuation of current activities and ability to expand.

- Funders have increased or renewed their interest in chronic disease due, in part, to:
 - Increased longevity and the aging population.

- Media campaigns bringing attention to chronic disease-related issues.

- Changes in leadership offer CSTE the potential to revisit relationships and funding for chronic disease epidemiology with selected organizations.

- **Threats**

- Diversified funding is not secure and takes time and effort to maintain.

- Funding is not stable and even when funding is restored, lack of consistent funding contributes to losing momentum.

- The recent federal budget reduced resources available for chronic disease epidemiology.
- Staying innovative and keeping pace with interests of elected and appointed officials in a way that translates into funds is challenging.
- National Institutes of Health (NIH) funding levels have decreased in recent years potentially leading to fewer chronic disease epidemiology opportunities for students in academic settings.
- Collecting and maintaining high quality local data is expensive.
 - Can we be more creative with data already collected?
- The public does not recognize day-to-day contributions of public health and so funding support is weak.
- CDC policy restricting use of CDC funds for cost sharing can make it challenging to obtain technical assistance in a cost effective manner.

Staff: As with funding, staffing issues were more likely to be identified as weaknesses or threats than strengths or opportunities. Multiple key informants noted insufficient staff within their organizations and one noted an insufficient number of senior level state-based chronic disease epidemiologists. Reasons for insufficient staff in addition to lack of funding and ramifications of insufficient staff are enumerated below.

- **Strengths**

- All states have the equivalent of at least one full time tobacco epidemiologist due to FOIA requirements discussed above.
- CSTE maintains one position whose job responsibilities cover several content areas, one of which is chronic disease epidemiology.

- **Weaknesses**

- Lack of a full time equivalent staff at CSTE to support the work of the chronic disease workgroup has limited the number and scope of the workgroup's activities.
- State health departments experience high turnovers of chronic disease epidemiologists resulting in the need for constant retraining and relationship building.
- With state legislatures limiting the number of full time equivalents (FTEs) allotted to state agencies, hiring epidemiologists can be a lower priority than hiring staff for other functions.
- Limits on state salaries for epidemiologists and lack of opportunities for advancement within health departments reduce incentives for state employment.
- Backfilling the retiring workforce with competent professionals is challenging and raises concerns about losing institutional knowledge, historical context and strong advocates at state and national level. (Several key informants noted this concern in relation to their organizations and thus, it constitutes a threat, as well as a weakness. It is not repeated below.)
- Sharing state-based chronic disease epidemiologists across chronic disease and related content areas can be challenging due to lack of training in diverse chronic disease content areas, oral health, and MCH.
- State and local chronic disease epidemiologists can be reluctant to branch into new areas such as health services and community intervention research often based on a lack of understanding of the relationship with public health. Lack of institutional support and competing priorities also contribute to this reluctance. (Key informants also noted this reluctance as an issue in their organizations.)

- In small health departments when epidemiologists need to function across broad content areas (e.g. infectious disease), capacity and skill sets needed for chronic disease epidemiology suffer.
- States fail to take advantage of:
 - CDC/CSTE Applied Epidemiology Fellowships.
 - Epidemic Intelligence Service (EIS) including Epi-Aids.
 - Public Health Associate Program (PHAP).
 - CSTE Informatics Fellows.
 - CDC direct assignee and similar opportunities.
- **Opportunities**
 - State health departments can take better advantage of programs listed above and:
 - A National Association of Chronic Disease Directors (NACDD) CDC-funded program that partially funded states to hire chronic disease epidemiologists with states assuming full funding after three years. (Note: Funding might have ended.)
 - The Epidemiology Scholars Program that offers students 10-week paid internships primarily in chronic disease epidemiology in urban health departments. (Currently Seattle and New York City participate. The original funding from the deBeaumont Foundation ended and current funding sources are not clear.)
 - CSTE can work to increase funding for chronic disease Applied Epidemiology Fellowships by investigating MCH’s model in which CDC MCH provides funding for MCH Applied Epidemiology Fellowships from their core funding and garners end-of-year unspent funds from CDC MCH programs for additional slots.
- **Threats**
 - The goal of a minimum of five chronic disease epidemiologists for each state might not be credible or realistic—especially for small states—for a variety of reasons including funding and limits on the number of state employees.
 - Prescriptive grants, including a focus on evaluation, limit activities for chronic disease epidemiology and contribute to retention issues.
 - The pool of trained chronic disease epidemiologists is insufficient due, in part, to
 - Declining interest in chronic disease among applicants to schools and programs of public health.
 - Students being unaware of chronic disease EIS opportunities.
 - Applicants to schools and programs of public health being unaware of—and schools and programs often not emphasizing—non-academic careers, especially for MS and PhD students.
 - Siloed funding presents challenges in sharing chronic disease epidemiologists across programs.
 - Lack of CDC chronic disease program funding for Applied Epidemiology Fellowships limits the number of potential chronic disease slots. The lack of funding is due, in part, to the tension between the content-specific nature of the funding and the fellows’ need for experience in a broad array of chronic disease content areas.

Training and Technical Assistance: This section includes activities that provide training, technical assistance or web-based query systems available to state-based chronic disease epidemiologists and formal academic training. Additional training needs related to informatics and small area analysis are listed under “Informatics and Small Area Analysis” below.

- **Strengths**

- CSTE collaborates with other organizations to provide several of the webinars and web-based query systems discussed under opportunities below.
- The CSTE annual meeting includes chronic disease-related pre-conference workshop(s) and sessions.
- CSTE allocates funding for two chronic disease Applied Epidemiology Fellowships from general funding for the program.
- **Weaknesses**
 - State chronic disease epidemiologists do not take sufficient advantage of training opportunities, due in part, to lack of time and competing priorities.
 - High staff turnover poses a sustainability issue for training.
 - CSTE has insufficient resources to develop a systematic approach to training in a wide array of competencies. The current approach might be too topic or area specific (e.g., occupational health, drug overdose).
 - Funding and support for chronic disease epidemiologists to attend meetings and conferences is limited including attendance at:
 - Conferences geared to program staff where epidemiology participation would foster better integration of epidemiology and programs. (This is also an external threat, because external organizations do not prioritize participation by epidemiologists in programmatically oriented meetings. It is not repeated below.)
 - The CSTE conference. State health departments and CSTE allocate insufficient slots for chronic disease epidemiologists.
 - State and local chronic disease epidemiologists have insufficient training, insufficient access to technical assistance or both in:
 - Program, outcome and economic evaluation, including qualitative methods and evaluation design.
 - Understanding the difference between epidemiology and evaluation and how the two work together to improve outcomes and meet grant-based reporting requirements.
 - Building partnerships for data access and analysis.
 - Identifying and reporting health systems level data.
 - Working on policy development in novel settings.
 - Communicating data to policy makers around a range of evidence-based issues.
 - Data visualization and graphic design to effectively communicate data.
 - Addressing upstream causes of chronic disease, such as poverty, poor housing and racism. Political polarization and lack of software also create barriers to addressing upstream risk and protective factors for chronic disease.
 - Use of tax data.
- **Opportunities**
 - The chronic disease epidemiology mentoring program provides mentoring to new and junior epidemiologists in state and local health departments. (Note: Funding is at risk.)
 - Opportunities for training in GIS include:
 - CDC, NACDD and Rice University's GIS Capacity Building Project.
 - CDC webinars.
 - CDC direct technical assistance to state and local health jurisdictions.
 - GIS Exchange website—a CDC-hosted forum for sharing and learning.
 - Learning collaboratives organized through the Association of State and Territorial Health Officers (ASTHO) bring states together for shared learning experiences to understand

- data sources, interpretation and communication. Two current chronic disease-related projects include:
- 3-state collaborative to explore disparities in breast cancer mortality.
 - 15-state collaborative related to the Million Hearts Initiative.
- Monthly phone calls for sharing and learning, online discussion boards, webinars include:
 - NACDD Science, Epidemiology and Evaluation Committee monthly calls.
 - 1305 and 1422-related monthly calls for 1305 and 1422 grantees.
 - 1305 and 1422-related webinars that are open to all health department staff.
 - Tobacco Evaluators Network for tobacco program surveillance staff. The network includes a newsletter, webinars, and an online discussion board.
 - Washington University in St. Louis offers evidence-based practice training for the public health workforce that:
 - Focuses on chronic disease at the state level.
 - Includes modules on descriptive epidemiology and program evaluation.
 - Raises awareness among managers and leadership of the benefits of evidence-based decision-making that often relies on epidemiologic data.
 - Trains practicing professionals—relying on students gaining needed skills will be slow.
 - CDC or its contractors provide technical assistance in data use, surveillance and evaluation to epidemiologists in state and local health departments for heart disease and stroke, cancer, oral health, and tobacco control. CDC is working to identify epidemiology and surveillance subject matter experts to provide technical assistance in diabetes and obesity for states with 1305 grants.
 - Multiple organizations develop and maintain websites that provide national, state, county and/or sub-county data including:
 - Chronic disease, MCH and oral health indicators—national, state and large health departments for selected indicators.
 - Interactive Atlas of Heart Disease and Stroke—chronic diseases, risk factors, health services data at multiple levels including some sub-county.
 - Cancercontrolplanet.cancer.gov developed in collaboration with the National Cancer Institute—national, state and sub-state cancer-related data.
 - Oral Health Data web-based open data platform—national and state data on oral health indicators.
 - CDC collaboration with the Robert Wood Johnson Foundation to develop web-based applications that will facilitate targeting resources to areas of highest need. The application will include data on chronic diseases and related risk factors for states, counties and 500 large cities and tools for developing maps, fact sheets, and presentation slides.
 - Faculty with backgrounds in chronic disease epidemiology at schools and programs of public health offer:
 - Training through core epidemiology courses that include a solid focus on chronic disease.
 - Opportunities for chronic disease epidemiologic analysis, dissertation work, elective courses and independent study.
 - The deBeaumont Foundation is working with CSTE to look at training needs of epidemiologists based on the Public Health Workforce Interest and Needs Survey.
 - MCH models could potentially be used to expand chronic disease epidemiology training. The CDC MCH program:

- Funds preconference trainings at the Association of Maternal and Child Health Programs, CSTE and MCH epidemiology (biennial) conferences and hosts the MCH Epidemiology conference.
- Partners with an academic institution for a year-long course via webinar for direct assistance assignees and CSTE fellows.
- Co-leads some of the training institutes offered by federal partners.
- **Threats**
 - CDC's limiting of travel to the CSTE conference makes it difficult to organize chronic disease pre-conference workshops and sessions.

Informatics and Small Area Analysis: These activities are in addition to activities covered in Training and Technical Assistance above.

- **Strengths**
 - At the 2016 CSTE Conference, there will be a pre-conference training session on a new tool co-developed by CDC and Rice University to generate stable rate estimates at the county and sub-county levels.
- **Weaknesses**
 - Many state and local chronic disease epidemiologists lack an understanding of how to access, assess quality, use, and communicate findings from big data, including electronic medical records, claims data, and other health services data.
 - Many state and local chronic disease epidemiologists have insufficient training in GIS, spatial analysis and mapping.
- **Opportunities**
 - Chronic disease can benefit from money being allotted to expand informatics capacity in infectious disease and emergency preparedness.
 - Workplace turnover due to retirement offers opportunities for new thinking about replacing traditional data sources with data from electronic health records that offer more timely and accurate information at smaller geographic levels than traditional data sources.
 - New partnerships with healthcare organizations offer potential for collaboration related to access to and use of the electronic health record.
 - The Department of Health and Human Services has formed a subcommittee to explore greater use of local data reflecting increased interest in local data.
 - The availability of advanced spatial statistics offers opportunities for chronic disease epidemiologists to develop more geographic-specific data than previously. (This also generates training needs for using and interpreting statistics.)
- **Threats**
 - Access to Medicare and Medicaid data is challenging.
 - The focus on big data and electronic medical records, while years off for many states, is one of many factors impacting BRFSS funding.

Partnerships: Many of the opportunities in the previous two sections involve partnerships. This section includes partnerships not noted above.

- **Strengths**
 - CSTE's strategic plan includes improved collaboration, data linkages and data use across infectious and non-infectious diseases.

- CSTE has a history of positive relationships with CDC resulting in historically robust funding for projects that fostered building state-level chronic disease epidemiology capacity.
- **Weaknesses**
 - State-based and local chronic disease epidemiologists are not sufficiently engaged with CSTE due, in part, to insufficient recruiting and marketing the benefits of engagement.
 - Less than optimal communication across chronic disease programs, with other programs that include chronic disease components such as oral health and MCH, and with academic institutions results in missed opportunities for collaboration.
 - Communication with CDC can be less than optimal.
- **Opportunities**
 - Partnering with academic institutions could facilitate:
 - Analysis of state databases—due to decreased research funding from NIH, academics might be more interested than previously in working with state-based datasets to gain experiences that make them more competitive for NIH grants.
 - Learning experiences for students in state and local health departments.
 - More complete inclusion of skill sets needed by applied chronic disease epidemiologists in public health curricula—potential for involvement in the Association of Schools and Programs of Public Health’s work on a new set of competencies.
 - Students becoming aware of and interested in chronic disease fellowship opportunities such as EIS and Applied Epidemiology Fellowships.
 - Interest in applying epidemiologic methods to questions with a health services research focus and work to integrate primary care and public health might facilitate access to electronic health records.
 - Opportunities to form or strengthen partnerships with oral health include:
 - The Models of Collaboration for State Chronic Disease and Oral Health Programs FOA, which could also foster collaboration between oral health and chronic disease epidemiologists.
 - Oral health’s support for shared chronic disease and oral health epidemiologists.
 - Chronic disease’s partnering with oral health to collect data in schools, such as collecting heights and weights during the Smile Survey.
 - Oral health’s review and expansion of oral health indicators including developing indicators that cut across chronic disease.
 - Recent research showing links between cancer and other chronic disease topic areas such as diabetes and obesity supports increased collaboration between cancer epidemiologists and epidemiologists in other chronic disease-related content areas.
 - Emerging interests of organizations with primary missions that do not include controlling or preventing chronic disease could potentially offer new opportunities for partnerships, such as Housing and Urban Development’s interest in tobacco control.
 - MCH’s model of a program structure and tools to facilitate communication and interactions internally and with diverse partners might have lessons that would foster increasing chronic disease epidemiology capacity.
 - Potential opportunities for expanding under-utilized partnerships could support chronic disease epidemiology capacity building. These include organizations:
 - Whose missions are directly or indirectly related to the goal of increasing chronic disease epidemiology capacity.
 - That have ongoing relationships with state health department leadership.

- **Threats**
 - Some organizations no longer view CSTE as the lead organization for several chronic disease epidemiology-related projects or for communicating with state and local health jurisdictions on chronic disease epidemiology-related issues.

Organizational characteristics. This section does not include issues related to funding or staff that are discussed above.

- **Strengths**
 - CSTE’s strategic plan includes building epidemiology capacity for non-infectious conditions, including chronic disease.
 - CSTE supports collaboration and innovation.
- **Weaknesses**
 - Due to organizational and communication structures within state health departments, chronic disease epidemiologists sometimes lack sufficient understanding of program implementation strategies and thus, do not optimally contribute to improving program implementation and outcomes or to reporting performance measures needed for grant funding.
 - Programs with chronic disease epidemiology components experience ongoing needs to defend themselves. (Several key informants at external organizations raised this issue and thus it also represents a threat to building chronic disease epidemiology capacity.)
- **Opportunities**
 - Epidemiologists in leadership and management positions foster organizational support for the value of epidemiology.
 - Staffing structures that include positions focusing on chronic disease epidemiology foster organizational focus on chronic disease epidemiology and better integration of epidemiology into other parts of the organization.
 - Support for using data to drive public health policy can offer opportunities for epidemiologists to:
 - Interact with executive leadership in their agencies fostering an understanding of each other’s roles and needs.
 - Build community partnerships.
 - State health profiles developed by ASTHO outline organizational structures of state health departments including where chronic disease epidemiology sits. This information could potentially be used to determine associations between organizational structures and meeting the minimum chronic disease epidemiology capacity recommendations.
- **Threats**
 - Academics and employees of national public health organizations often lack experience in and understanding of how state and local health departments prioritize activities.
 - Organizational structures at health departments can result in health officers and their executive teams having little understanding of the roles and functions filled by chronic disease epidemiologists.
 - Chronic disease epidemiology often receives lower priority for information technology services and needed software than epidemiology in other areas.
 - Organizational barriers to evidence-based decision making include:
 - Lack of skill or expertise among public health staff.
 - Lack of funding.

- Unclear incentives for staff. Agency leaders and managers need to actively support evidence-based decision making for staff to value it.
- A range of political pressures not based on sound evidence.

Miscellaneous: Advisory group members and key informants raised two additional issues that do not fit into the previous categories.

- **Strengths**

- The ECA provides data on epidemiology capacity to assess changes and trends, to identify needs and states with lower capacity, and to use data to communicate issues related to chronic disease epidemiology capacity.

- **Opportunities**

- Cancer cluster investigations get on executive leaderships' radar screens because they are high profile and offer opportunities for:
 - Visibility for chronic disease epidemiology.
 - Partnering with non-traditional partners, such as toxicologists and risk communicators.
 - Learning from states with epidemiologists skilled in this area.

Prioritized Recommendations and Suggested Potential Actions

The advisory group and consultant used the SWOT findings, NACCHO criteria for prioritizing problems and activities³ and their experiences to suggest up to five activities they judged to be most important for expanding state-based chronic disease epidemiology capacity. Combining similar actions resulted in a list of 17 primary actions not all of which were mutually exclusive. The group voted on the primary actions only and not on the many sub-actions suggested as activities to implement the primary actions. Based on the voting, the group agreed to two high and two medium priority recommendations:

- High priority recommendations
 - Promote a minimum workforce
 - Build partnerships with local academic institutions
- Medium priority recommendations
 - Promote and offer training
 - Monitor gaps and needs

Promoting a minimum workforce was prioritized because action items that garnered the most votes (between four and six with eight people voting) were actions that addressed this recommendation. That multiple advisory group members focused on this recommendation when proposing actions also suggested its importance. Building partnerships with academic institutions as an action item also received votes from half of those voting placing it on a par with most of the actions related to promoting a minimum workforce. Multiple group members also suggested actions involving working with academia. These suggestions were combined into one primary action for voting. Thus, that there was only one primary action related to partnering with academic institutions was an artifact of how items were compiled and not an indication of lack of support for this recommendation.

Each medium priority recommendation received three votes. Action items that received at least two votes were retained in part or in full as potential actions under the recommendations that they supported. For items that were not mutually exclusive, Advisory Group members favored the broader actions. The actions with a narrower focus were included under the broader item even if they did not receive votes. Items that received zero or one vote were dropped if they did not correspond to one of the priority recommendations. Appendix E provides details on the 17 action items and voting results.

The following list provides detail on the two high and two medium priority recommendations and potential actions for implementing the recommendations. The list does not include the organizations or groups within organizations that the advisory group thought might best have responsibility for implementing actions to accomplish the recommendations. Since this work was conducted under the auspices of the CSTE chronic disease workgroup, in many instances, it is that group, working with CSTE staff, CDC and chronic disease epidemiologists at state and local health departments that would need to provide leadership for implementing actions.

Starred items in the following list were included as primary actions for voting and thus were discussed and received minimal vetting by the group. The group did not discuss or vet potential activities that are not starred. Most of the potential activities that are not starred were originally proposed as sub-actions in support of a primary action on which the group voted; some were added after the voting. Thus, non-starred potential actions represent a wide range of feasibilities, effectiveness, and cost effectiveness. **The order in which the actions are listed does not represent a prioritized list.**

High priority recommendations and suggested potential actions include:

1. **Promote a minimum workforce** that includes state health departments having a minimum of five chronic disease epidemiologists including a dedicated lead epidemiologist responsible for coordinating across chronic disease programs and with MCH and oral health epidemiology groups and at least four additional chronic disease epidemiologists. One of the five epidemiologists should have doctoral level training. (Note: Many of the activities listed under “build partnerships with local academic institutions” and “promote and offer training for state and local chronic disease epidemiologists” also serve to promote a minimum workforce. Activities specific to academia and training are included in those sections below and are not repeated here unless otherwise noted.)
 - a. *Develop best practices and tools for retaining chronic disease epidemiology staff and fellows.
 - i. Assess strengths and limitations (e.g., capacity level, opportunities for professional and career growth, job satisfaction, and collaboration and partnerships) of various organizational structures by analyzing data from the most recent ECA in conjunction with ASTHO’s state profiles that show where epidemiology sits organizationally in state health departments and by conducting focus groups or key informant interviews with chronic disease epidemiologists in state health departments.
 - ii. Draft example chronic disease epidemiology position descriptions, similar to the general epidemiology position statements that are part of the CSTE Applied Epidemiology Competencies Toolkit, but updated and made specific to chronic disease epidemiology; develop a case study describing how one state was successful in creating an epidemiologist job series and their lessons learned.
 - iii. Develop and routinely host a virtual chronic disease epidemiologist orientation, similar to CSTE’s New State Epidemiologist Orientation.

- iv. Develop a CDC/CSTE orientation manual or virtual meeting for those supervising chronic disease epidemiologists to address the issue that many of their managers have a limited understanding of epidemiology.
- b. *Update and widely disseminate CSTE's 2004 Essential Functions of Chronic Disease Epidemiology White Paper. (NOTE: This work would address the need to define the roles, skills and functions of state and local chronic disease epidemiologists. Because the document could be used broadly—for example, to interest students in chronic disease, to work with schools of public health to broaden curriculum, and to garner leadership support for chronic disease epidemiology—this action is also included in “build partnerships with local academic institutions” below.)
- c. *Develop strategies to help chronic disease epidemiologists promote their work within their organizations, including organization leadership, and with policymakers.
 - i. Develop an infographic on what chronic disease epidemiologists do.
 - ii. Brainstorm and compile other strategies for chronic disease epidemiologists to promote their work (e.g., requesting agenda time at health department leadership and management meetings and at Board of Health meetings)
 - iii. Raise awareness of the benefits of evidence-based decision making for chronic disease programs and policies.
 - iv. Draft a project summary template to document purposes, methods, decisions and outcomes of chronic disease epidemiology projects. This activity could help chronic disease epidemiologists document and showcase their work. These documents could serve as historical references for new staff and showcase impacts of that work and why it was important.
 - v. Show hypothetical examples of what work can be completed with one chronic disease epidemiologist, two chronic disease epidemiologists, etc.
 - vi. Create a calculator for state-specific optimum numbers of chronic disease epidemiologists. Inputs could include number of chronic disease grants, partnerships, leveraging of resources and staff including those with skills that could assist with chronic disease epidemiology projects—for example, data analysts, graphic designers, and those with GIS and program evaluation skills.
- d. *Promote chronic disease positions in fellowship programs at state and local levels such as Applied Epidemiology Fellowships, EIS, Public Health Associate Program; direct assistance/assignee programs; student internships; and other programs such as the American Cancer Society's Collaborative Evaluation Fellowship.
 - i. Develop and host a webinar for state and local health departments that describes opportunities for chronic disease-related fellowships and assignees such as EIS, CSTE's Applied Epidemiology Fellowship, Public Health Associate Program, Epi-Aids, Info-Aid, and CDC state assignees.
 - ii. Develop potential strategies to increase the number of chronic disease EIS officers, such as asking for chronic disease pre-match positions and increasing the number of generalist state positions that include chronic disease opportunities.
 - iii. Work with CDC's state chronic disease epidemiology assignee program to increase and sustain the number of assignees; explore options from MCH's model, such as CDC paying 10–20 percent of salary.
 - iv. Explore impacts and lessons learned from the NACDD/CDC chronic disease epidemiologist placement program and options to regain funding from CDC or others sources, if appropriate.

- v. Increase the funding and resource mechanisms to obtain direct assistance from CDC and CSTE.
 - vi. Strategize for improved funding for CSTE chronic disease Applied Epidemiology Fellowships including revisiting CDC chronic disease program-specific funding and possible use of year end unspent funds as well as non-CDC funding sources.
 - vii. Work with CSTE to guarantee placement of people accepted into the Applied Epidemiology Fellowship program. Unlike EIS, CSTE applicants granted interviews with potential host sites are not guaranteed slots and so they continue to look for and often find other jobs during the match process.
 - viii. Work with CSTE and state epidemiologists to explore and promote CSTE Applied Informatics Fellowship opportunities in chronic disease.
- e. Conduct case studies or interviews with health department personnel in states with minimal to no chronic disease epidemiology capacity to understand barriers and constraints.
2. ***Build partnerships with local academic institutions** to improve awareness, understanding and appreciation of the roles and functions of chronic disease epidemiologists in state and local public health departments; to promote chronic disease-related applied epidemiology fellowships; and to offer coursework that includes training in competencies identified by practicing chronic disease epidemiologists as needing additional focus.
- a. Improve connections with academic institutions to communicate the need to train applied chronic disease epidemiologists.
 - b. Collaborate with academic institutions to develop and pilot applied chronic disease epidemiology curricula for graduate and undergraduate students, potentially establishing a chronic disease epidemiology-specific track.
 - c. Foster, support and encourage collaboration between state and local health departments and academic institutions in teaching, research, and development of student internship opportunities.
 - d. ***Develop tools** (e.g., PowerPoint presentations) for CSTE and state-based chronic disease epidemiologists to use to raise student interest in chronic disease and awareness of chronic disease-related fellowships such as EIS and Applied Epidemiology Fellowships; use tools to recruit students on campus through career fairs and presentations.
 - e. Develop applied chronic disease epidemiology case studies (like CDC's EIS case studies) to use in courses at schools and programs of public health. These would be based on real-life epidemiologic investigations and used for teaching epidemiology concepts specific to chronic disease.
 - f. ***Update and widely disseminate CSTE's 2004 Essential Functions of Chronic Disease Epidemiology White Paper.** (NOTE: This addresses the need to define the roles, skills and functions of state and local chronic disease epidemiologists. If updated, the document could also be used to interest students in chronic disease and work with schools of public health to broaden curriculum. Because the document would have additional uses, it is also included in "promote a minimum workforce" above.)
 - g. Collaborate with the CSTE workforce development subcommittee's work with academia to assure inclusion of issues specific to chronic disease epidemiology and to address some of the recommendations and actions listed here.

Medium priority recommendations and potential actions include:

1. ***Promote and offer training** for state and local chronic disease epidemiologists.
 - a. Promote training in and use of GIS and spatial analysis for issues related to chronic disease epidemiology.
 - i. Encourage state health departments to routinely geo-code chronic disease data (especially vital records and registry data).
 - ii. Partner with national organizations, such as National States Geographic Information Council (<https://www.nsgic.org/>), that both dispute the HIPAA-related decision that addresses alone are personal identifiers and that support creating a national address database. HIPAA's treatment of addresses as personal identifiers creates barriers to accessing and geocoding addresses. The U.S. Office of Management and Budget has recommended that Congress consider revising statutes to allow release of addresses without personally identifiable information.
 - iii. Continue and expand the CDC/NACDD-funded GIS trainings currently offered through Rice University; open training to states that have already participated but have new staff; offer advanced, in-depth training on specific topics to those who have already participated, such as the week-long topic-specific trainings done previously.
 - iv. Explicitly incorporate and emphasize GIS in the NACDD and other mentoring programs.
 - v. Publicize existing GIS and small area analysis CDC webinars; work with CDC to develop and host new webinars on GIS and small area analysis, with the initial focus on GIS.
 - vi. Collaborate with the CDC Small Area Analysis Team to develop (and offer to test) useful tools for chronic disease epidemiologists.
 - vii. Promote access to geocoded Medicaid and Medicare data.
 - viii. Explore opportunities for training in GIS and small area analysis at CSTE preconference workshops.
 - ix. Explore the possibility of travel scholarships for chronic disease epidemiologists to attend the Environmental Systems Research Institute's (ESRI) health conference or determine topics of interest from the conference agenda on which CSTE could host webinars.
 - b. ***Promote training in and use of informatics** for issues related to chronic disease epidemiology.
 - i. Incorporate a chronic disease focus into Informatics Training in Place and Applied Epidemiology Fellowship programs.
 - ii. Explicitly incorporate and emphasize informatics in the NACDD and other mentoring programs.
 - iii. Explore opportunities for training in informatics at CSTE preconference workshops.
 - c. Promote the CSTE conference as the key chronic disease epidemiology conference.
 - i. Organize an annual chronic disease preconference workshop.
 - ii. Expand the number of chronic disease sessions.
 - iii. Secure travel scholarships for chronic disease epidemiologists.
 - d. Develop opportunities for mentoring, networking and/or peer-to-peer consultation among chronic disease epidemiologists including:
 - i. Linking senior and junior epidemiologists in state and local health departments. This would be similar to the NACDD program, but less formal, less resource intensive and not project based.
 - ii. Develop a peer-to-peer consultation program that includes continued support.
 - iii. Engage CDC to develop a mentorship program for all entry-level chronic disease epidemiologists.

- e. Provide webinars and training opportunities throughout the year in topics of interest to chronic disease epidemiologists such as training in the use of analytic software, chronic disease epidemiology methods, and GIS; consult with state and local chronic disease epidemiologists to determine relevant topics.
- f. *Coordinate collaboration and leveraging of resources among national organizations involved in providing training to chronic disease epidemiologists. This would include continued development of webinars in partnership with NACDD, Association of State and Territorial Dental Directors, CDC and others.

2. **Monitor gaps and needs** in state-based chronic disease epidemiology capacity and disseminate results widely.
 - a. Work with CSTE to revise the ECA to address issues raised by the current project, such as needs around informatics, economic analysis, program evaluation; potential duplication of efforts due to similar surveys by the deBeaumont Foundation and ASTHO; percent of states where chronic disease epidemiologists have access to routinely geocoded birth and death files; and others.
 - b. Develop a short survey potentially fielded independently of the ECA to assess current chronic disease epidemiology capacity. This would provide timely information to inform CSTE's capacity-building activities and recommendations for inclusion of Epidemiology and Surveillance (CDC's Domain 1) in future CDC chronic disease grants.

DISCUSSION

An April 2015 technical report on the 2013 National Assessment of Epidemiology Capacity provided recommendations for improving epidemiology capacity at state health departments.² The report included overall recommendations for chronic disease, MCH and oral health, as well as recommendations specific to chronic disease. In January 2016, the chair of the CSTE chronic disease workgroup convened an advisory group to refine and prioritize the April 2015 recommendations in order to help CSTE, state chronic disease epidemiologists and other stakeholders focus their work in expanding chronic disease epidemiology capacity at state and local health departments. This work resulted in the advisory group selecting two high priority and two medium priority recommendations and suggesting potential activities for implementing the four prioritized recommendations.

The two high priority recommendations are to promote a minimum workforce and to build partnerships with local academic institutions.

The recommendation to promote a minimum workforce addresses the advisory group's primary concern of an insufficient number of chronic disease epidemiologists at state health departments due primarily to insufficient funding of chronic disease epidemiology, high staff turnover, and shortages of chronic disease epidemiologists, rather than a lack of public health work that would be enhanced by having additional chronic disease epidemiologists. The group viewed insufficient funds as stemming from a combination of inadequate public health funding in general, as well as state health departments placing a relatively low priority on chronic disease epidemiology. Thus, several of the suggested actions are aimed at clarifying the roles and responsibilities of chronic disease epidemiologist in state health departments, as well as highlighting the key role of chronic disease epidemiology in informing program and policy development aimed at preventing and controlling chronic diseases. Other suggested activities focus on staff recruitment and retention.

The minimum number of chronic disease epidemiologists recommended in the April 2015 report² could range from five to seven depending on whether the epidemiologists with specified functions represent unique positions or whether one person could fill multiple functions. The advisory group chose five as the minimum number following confirmation from the chair of the CSTE chronic disease workgroup that the report intended a minimum of five, including a dedicated lead epidemiologist who is responsible for coordinating across chronic disease programs and with MCH and oral health epidemiology groups and at least four additional chronic disease epidemiologists. One of the five epidemiologists should have doctoral level training. Although the April 2015 report noted that 53 percent of participating states had at least five chronic disease epidemiologists, a minimum of five might seem unrealistic, especially for smaller states and states with more limited public health resources. Nonetheless, the advisory group maintained the minimum at five, because the large burden of chronic disease in the U.S. population results in a broad scope of work for chronic disease epidemiologists in all state health departments.

Ideally, state health departments need sufficient numbers of chronic disease epidemiologists to enable in-depth understandings of the distribution of chronic diseases and related risk factors in their states, requiring familiarity with a large and growing number of diverse datasets. Chronic diseases include cancer, heart disease, stroke, diabetes, and perhaps others, such as asthma. Risk factors encompass lifestyle factors such as tobacco use, nutrition, and physical activity, and perhaps others, such as substance abuse; factors often related to lifestyle such as obesity and hypertension; and demographic and sociocultural factors including age, gender, racial and ethnic group, education, economic factors, and geographic location. Chronic disease epidemiologists at state health departments are also called upon to delineate the distribution of chronic disease-related healthcare services by demographic and sociocultural factors, as well as relationships between receipt of healthcare and rates of chronic diseases and disease progression or control. In addition to these more traditional surveillance activities, chronic disease epidemiologists are needed to bring diverse data together for community health assessments, applied research, and program evaluation. Finally, while most chronic disease cluster concerns do not yield causes of chronic disease, chronic disease epidemiologists can provide data and other assistance to help with understanding cancer and other chronic disease cluster concerns.

The advisory group concurred with the April 2015 report that recommended at least one chronic disease epidemiologist with doctoral-level training at each state health department.² The group recognized that experienced masters-level epidemiologists often have the same skill sets as doctoral-level epidemiologists. Nonetheless, the group agreed that having at least one chronic disease epidemiologist with formal training at the doctoral level would provide skill sets that might, otherwise, be lacking.

With one exception, the actions under building partnerships with academic institutions are geared toward increasing the number of students interested in chronic disease epidemiology, recruiting them into public health practice careers, and assuring they have skills needed in applied settings. The one exception is a potential action around collaboration for research and teaching, which is consistent with the focus of the recommendation related to partnering with academic institutions in the April 2015 report.

The two medium priority recommendations are to promote and offer training and to monitor gaps and needs in state-based chronic disease epidemiology capacity. The former

recommendation recognizes the need to enhance the skills and abilities of practicing chronic disease epidemiologists. This recommendation is similar to the recommendation in the April 2015 report for CSTE to offer training, but shifts the focus to promoting training opportunities offered by others. This shift recognizes the high quality and underutilization of a broad array of current training opportunities noted by the key informants, as well as CSTE's limited resources for organizing relevant and ongoing training for chronic disease epidemiologists. The one exception to promoting, rather than offering, training focuses on CSTE's annual conference and preconference workshops.

The medium priority recommendation to monitor gaps and needs in state-based chronic disease epidemiology is unchanged from the recommendation in the April 2015 report. This recommendation recognizes the use of the CSTE's ECA as an instrument to evaluate progress toward increasing state-based epidemiology capacity and to identify emerging needs. The actions note the need to rethink some ECA questions related to chronic disease, as well as the desire to gather basic information in a manner that is less time intensive than the ECA for both those taking the survey and those compiling and disseminating results.

The actions included in this report represent the ideas of advisory committee members. Information from key informants, NACCHO criteria for prioritizing problems and interventions, and members' experiences and judgment informed their selection of suggested actions. Nonetheless, beyond minimal discussion and email exchange the group did not vet, refine or prioritize the suggested actions beyond eliminating those among the original 17 primary actions that received few votes and could not be subsumed under a high or medium priority recommendation. Thus, the actions, especially those that are not starred in the listing beginning on page 18 of this report, represent wide ranges of potential effectiveness, cost-effectiveness, and feasibility of implementation. As such, vetting suggestions for feasibility, effectiveness and cost effectiveness and prioritizing actions is needed as a next step.

The first guiding principle—working with CDC for optimal epidemiology funding and capacity-building—is a recommendation in the April 2015 report. The advisory group included this as a guiding principle in recognition of CDC's key role in assuring a well-trained public health workforce that can meet the needs of the 21st century, as well as the historically close collaboration between CSTE and CDC. CDC is not only the major funder of state-based chronic disease epidemiology capacity—the 2013 ECA found 75 percent of state-based chronic disease epidemiology funded through the federal government²—but also has expertise and resources for training that are unavailable at the state level.

The second guiding principle—when possible, giving preference to jurisdictions with minimal to no chronic disease epidemiology capacity and considering their needs when prioritizing actions—is a modification of the April 2015 report's recommendation to focus on state health departments with least capacity. The modification attempts to balance the needs of health departments with little or no chronic disease epidemiology capacity with the advisory group's recognition that innovation, expansion of skill sets and the ability to take advantage of new resources are most possible in health departments that already have more than minimal capacity. Innovation, expansion of skills sets and access to resources among health departments with more than minimal capacity can set demonstrate the value of training and access to resources and thus, pave the way for health departments with minimal chronic disease epidemiology capacity.

The advisory group added the guiding principle to consider the chronic disease epidemiology-building capacity needs of local health departments. This principle recognizes that state health departments are closely tied to local health jurisdictions in most states. Where partnerships are strong, building state chronic disease epidemiology capacity could also foster chronic disease epidemiology capacity in local health jurisdictions. Adequate chronic disease epidemiology capacity at local health jurisdictions can, in turn, support state level chronic disease epidemiology especially in large local jurisdictions that serve densely populated areas and optimally use health-related data at finer levels of geographic granularity than do states.

The advisory group considered including tribal and territorial public health organizations in this guiding principle in recognition of CSTE's involvement with epidemiologists in territorial health organizations and both CSTE's and state health departments' relationships with tribal health organizations. However, neither the advisory group nor the key informants included representatives from these organizations and so their perspectives could not be included. Including representatives from these groups is needed if the chronic disease epidemiology capacity-building efforts are to include the needs of territorial and tribal health organizations.

CONCLUSIONS

This project narrowed the list of recommendations in the April 2015 report that contained findings from the 2013 ECA for chronic disease, MCH and oral health epidemiology² by identifying two high and two medium priority recommendations for expanding chronic disease epidemiology capacity at state health departments. The April 2015 report defined expanding capacity as increasing the number of chronic disease epidemiologists, their skill levels and their access to resources needed to do their work. Recognizing the importance of chronic disease epidemiology at local health jurisdictions, local health was explicitly included in many of the activities suggested to implement the priority recommendations.

The group recognized increasing the number of chronic disease epidemiologists in state and local health departments as the most basic need, because increasing skill levels and expanding access to resources becomes moot in the absence of sufficient numbers of chronic disease epidemiologists to take advantage of training and resources. Thus, promoting a minimum workforce was a high priority with activities focused on strengthening support for chronic disease epidemiology in state health departments and recruitment and retention of state-based chronic disease epidemiologists. Building partnerships with academic institutions was also a high priority with most suggested activities serving to promote a minimum workforce by fostering interest in both chronic disease epidemiology and careers in public health practice among students and by working with schools and programs of public health to assure curricula include chronic disease epidemiology skills needed in applied settings. Additionally, state health departments might be able to leverage resources needed for their work through partnering with academic institutions for research and program implementation and evaluation.

That the group identified promoting and offering training as a medium priority recommendation does not diminish its importance, but rather recognizes that in an environment of insufficient staff, chronic disease epidemiologists often lack the time and organizational support to learn and implement new skill sets. Potential activities for training focus on the wide array of current offerings from organizations and agencies interested in promoting public health practice, controlling and preventing chronic disease, or advancing skills related to chronic disease

epidemiology. Activities also include a focus on using the annual CSTE conference as a mechanism to offer chronic disease epidemiology training.

The groups identified monitoring gaps and needs of state-based chronic disease epidemiologists as a medium priority in recognition of the desire to know whether efforts to increase state-based chronic disease epidemiology capacity have been successful and to identify evolving gaps and needs.

The primary focus of this work was to prioritize recommendations from the April 2015 report that presented the findings from the 2013 ECA for chronic disease, MCH and oral health.² The group focused on availability of feasible actions to address problems as a key criterion for determining priorities. The group did not thoroughly vet the suggested action, but rather used them in a qualitative manner relying on information from key informants and their experiences to gauge the feasibility of higher level actions. Thus, refining and prioritizing actions in support of the two high and two medium priority recommendations is needed as the next step in furthering this work. In prioritizing actions, consideration needs to be given to the efficacy of the action and potential return on investment; availability of skills and funds needed for implementation; and whether the organization, agency or group in the best position to take leadership for implementation is willing to do so. In many cases, responsibility will fall to the CSTE chronic disease workgroup in collaboration with other groups within CSTE, CDC and chronic disease epidemiologists from state and local health departments.

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³ National Association of County and City Health Officials (NACCHO) (Not dated). Guide to Prioritization Techniques. Accessed at <http://www.naccho.org/uploads/downloadable-resources/Guide-to-Prioritization-Techniques.pdf> on 21 December 2015.

⁴ Centers for Disease Control and Prevention, National Center for Health Statistics. Compressed Mortality File 1999-2014 on CDC WONDER Online Database, released December 2015. Data are from the Compressed Mortality File 1999-2014 Series 20 No. 2T, 2015, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at <http://wonder.cdc.gov/cmfiCD10.html> on 22 March 2016.

Appendix A. Advisory Group Members

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Appendix B: Prioritization Methods

Draft Processes and Criteria for Prioritizing Recommendations

Prepared by Juliet VanEenwyk, 3 January 2016, for discussion by the advisory group.

This document summarizes the National Association of County and City Health Officials (NACCHO) Guide to Prioritization Techniques (Accessed at <http://www.naccho.org/uploads/downloadable-resources/Gudie-to-Prioritization-Techniques.pdf> on 21 December 2015). I selected this guide because it was developed by a public health group and offered a summary of multiple approaches. The guide is geared toward prioritizing health problems, while this project focuses on prioritizing recommendations from the 2013 National Assessment of Epidemiology Capacity: Findings and Recommendations for Chronic Disease, Maternal and Child Health, and Oral Health (Council of State and Territorial Epidemiologists, April 2015) to increase chronic disease epidemiology capacity. I modified of NACCHO material as needed for relevance to our focus. I also provided comments with my perspective on the feasibility of using each technique for this project.

NACCHO's 5 approaches to prioritization. NOTE: References are those in the document. I provided them for your information. I did not go to the original references.

1. **Multi-voting Technique** is typically used when a long list of issues must be narrowed to a top few. (NACCHO citation: American Society for Quality. Evaluation and Decision Making Tools: Multi-voting. Available at <http://www.asq.org/learn-about-quality/decision-making-tools/overview/mutivoting.html>. Accessed December 2, 2009.)

- A. Each participant votes for their highest priority recommendations either voting for as many recommendations as desired or a maximum number as established.
- B. Recommendations identified as priority by at least half the participants remain on the list.
- C. Each participant votes for their highest priority items on this condensed list voting for as many half of the recommendations.
- D. Repeat C until the list is narrowed down to the desired number of recommendations.

COMMENT: Renee Calanan, chair of the CSTE chronic disease workgroup, and I recommend using this technique. We think that it is the technique best suited to the qualitative nature of most of our information and that it is the most straightforward of the five methods and thus, most likely to work within the time and resources allotted to this project.

2. **Strategy Grids** can provide a mechanism to take a thoughtful approach to achieving maximum results with limited resources. (NACCHO citation: Duttweiler, M. 2007. Priority Setting Tools: Selected Background and Information and Techniques. Cornell Cooperative Extension.)

- A. Choose two broad criteria that are most relevant. (See below for list of potential criteria and Attachment 2 for draft matrix of criteria and recommendations.)
- B. Set up a grid with four quadrants and assign one broad criteria to each axis. Create arrows on the axes to indicate 'high' or 'low.'
- C. Based on the axes, label each quadrant as either High/High, High, or Low/Low.
- D. Place each recommendation in the appropriate quadrant.

COMMENT: This technique might not be feasible because achieving consensus on the two most relevant criteria and gathering information to allow assigning the recommendations to the proper quadrants are likely to require more time than available for this project. This method is also less flexible than the multi-voting technique because it narrows prioritization criteria to two.

3. **Nominal Group Technique** is useful in the early phases of prioritization when ideas need to be generated in a short amount of time and when input from multiple individuals must be taken into consideration. (NACCHO citation: American Society of Quality. Idea Creation Tools: Nominal Group Technique. Available at <http://www.asq.org/learn-about-quality/idea-creation-tools/overview/nominal-group.html>. Accessed December 2, 2009.) NOTE: Most of the process is devoted to generating a list of the issues. I have summarized only the prioritization process, since we have the list of recommendations.

- A. On a note card, participants rank each recommendation on a scale from 1 to 10 (can be altered based on needs of agency) and the moderator collects, tallies, and calculates total scores.
- B. Once the results are displayed, the group can vote to repeat the process if items on the list receive tied scores or if the results need to be narrowed down further.

COMMENT: This technique seems feasible within the current time frame, but it requires ranking recommendations at a precise level of granularity. For this project, prioritizing recommendations as a high, medium, or low might be more compatible with the qualitative nature of most of the information relevant to establishing priorities.

4. **Hanlon Method** is advantageous when the desired outcome is an objective list of health priorities based on baseline data and numerical values. (NACCHO citation: National Association of County and City Health Officials. 1996. Assessment Protocol for Excellence in Public Health: Appendix E) (NOTE: This approach does not seem feasible in the time available, because the 2013 National Assessment of Epidemiology Capacity: Findings and Recommendations for Chronic Disease, Maternal and Child Health, and Oral Health (Council of State and Territorial Epidemiologists, April 2015) does not provide baseline data for most of the recommendations. See Attachment 1 for availability of baseline data.)

- A. On a scale 0–10, rate each gap addressed by a specific recommendation on: number of people (or, perhaps, health departments for this project) affected, seriousness of the gap, and effectiveness of potential interventions. Ratings increase as numbers, seriousness and availability of interventions increase.
- B. Use the ‘PEARL’ Test, to screen out recommendations based on the following feasibility factors:
 - Propriety – Is a program to address the recommendation suitable?
 - Economics – Does it make economic sense to address the problem? Are there economic consequences if a recommendation is not carried out?
 - Acceptability – Will a community accept implementing the recommendation? Is it wanted?
 - Resources – Is funding available or potentially available for implementing the recommendation?
 - Legality – Do current laws allow relevant activities to be implemented?
- C. Eliminate any recommendation that receive a “No” to any of the above factors or proceed with corrective action so that priorities meet all five of the feasibility factors.

- D. Based on the three criteria rankings assigned to each recommendation in Step A, calculate the priority scores using the following formula:

$$D = [A + (2 \times B)] \times C, \text{ where}$$

D = Priority Score

A = Size of health problem ranking

B = Seriousness of health problem ranking

C = Effectiveness of intervention ranking

*Note: Seriousness of the gap is weighted as being twice as important as the other factors.

- E. Assign ranks to the health problems with the highest priority score receiving a rank of '1,' the next high priority score receiving a rank of '2,' and so on.

COMMENT: This technique is not feasible in the current project's time frame. Baseline data are needed to quantify the number of people or health departments affected by the gap that each recommendation addresses. As shown in Attachment 1, some of these data are available in the 2013 National Assessment of Epidemiology Capacity: Findings and Recommendations for Chronic Disease, Maternal and Child Health, and Oral Health [Council of State and Territorial Epidemiologists (April 2015)]. Gathering additional baseline information and information needed for the PEARL test represents a scope of work well beyond the time frame and resources allotted to this project.

5. **Prioritization Matrix** is ideal when issues are considered against a large number of criteria or when an agency is restricted to focusing on only one priority health issue. (Duttweiler, M. 2007. Priority Setting Tools: Selected Background and Information and Techniques. Cornell Cooperative Extension.)

- A. List all recommendations down the first column of the matrix and all criteria horizontally across the first row. Include an additional column for the priority score.
- B. If each criterion has a differing level of importance, assign a weight to each criterion. For example, if 'Criterion 1' is twice as important as 'Criterion 2' and 'Criterion 3,' the weight of 'Criterion 1' could be .5 and the weight of 'Criterion 2' and 'Criterion 3' could be .25.
- C. Fill in cells by rating each recommendation against each criterion. An example of a rating scale can include the following: 3 = criterion met well, 2 = criterion met, 1 = criterion not met.
- D. Multiply the rating established in Step A with the weight established in step B. If the chosen criteria all have an equal level of importance, this step can be skipped.
- E. Calculate the final priority score for each recommendation by adding the scores across the row.
- F. Assign ranks to the recommendations with the highest priority score receiving a rank of '1.'

COMMENT: This method would be hard to implement because the level of detail needed to complete the prioritization matrix is not readily available. Achieving consensus on the importance of each criterion might also be difficult in the time allotted for this project.

Criteria to Identify priority problems. The NACCHO guide provides criteria for identifying priority health problems. The current project defines problems as gaps in capacity. The guide uses criteria developed by the Public Health Foundation, "Commonly Used Prioritization Criteria." (NACCHO citation: Public Health Foundation. Priority Setting Matrix. Available at <http://www.phf.org/infrastructure/priority-matrix.pdf>. Accessed February 9, 2010.) I have listed the criteria (bolded) and added my perspective on how these might or might not be feasibly applied to the current project.

If we use Multi-voting or Nominal Group technique, we can discuss these criteria in relation to each recommendation to inform our voting or ranking.

- **Cost and/or return on investment (ROI):** We could, perhaps, rank costs or potential ROI as low, medium or high based on the group's judgment of what it would cost to fill a gap. For example, I might rank "talking with schools of public health about curriculum" as lower cost and higher ROI than other activities because talking with schools of public health does not take a lot of person-hours and graduating epidemiologists with needed skill sets seems to offer a potentially high ROI. I would rank training as medium, because planning and implementing training take substantial person hours but can also have a high ROI. I view every health department being at full capacity as high cost because it would be expensive in terms of initial and ongoing salaries. If the full complement of chronic disease epidemiologists is not the optimal use of resources for all 50 state health departments and the potential ROI could be diminished.
- **Availability of solutions:** I think this is essential, because part of the task for the group is identifying interventions (or solutions) to implement the recommendations. We could rate this criteria as yes or no depending on whether solutions are, in theory, available. The issue of resources to implement a solution is covered separately.
- **Impact of problem:** I think we could do this qualitatively by assuming that the more upstream gaps have higher impacts. Thus, not having adequate chronic disease epidemiology staff might have the highest impact on capacity because there is insufficient capacity to develop chronic disease epidemiology data to inform public health program planning and policy development. Lack of access and ability to use BRFSS might have a larger impact than lack of access to Medicare data because of the importance of upstream interventions to prevention.
- **Availability of resources (staff, time, money, equipment) to solve problem:** We could rank as low, medium or high once we understand the potential resources available. We might use advisory group brainstorming and key interviews to understand availability of resources.
- **Urgency of solving problem (H1N1 or air pollution):** I'm not sure how this criterion applies to the problem of gaps in capacity, but we could make judgments on which gaps are most urgent to fill.
- **Size of problem (e.g., number of individuals affected):** The 2013 National Assessment of Epidemiology Capacity: Findings and Recommendations for Chronic Disease, Maternal and Child Health, and Oral Health [Council of State and Territorial Epidemiologists (April 2015)] provides the percent of respondents (health departments and chronic disease epidemiologists) that experience some of the gaps. For example, we have data on the percent of health departments with a lead chronic disease epidemiologist. As Attachment 1 shows, however, this document does not provide information to understand the size of the problem for all of the recommendations.

Criteria to identify interventions. Below is the Public Health Foundation's list of criteria to prioritize interventions as cited in the NACCHO guide. I did not elaborate these. For this project, some of the criteria seem somewhat redundant. In particular, availability of solutions and resources to implement solutions are covered in the prioritizing of problem areas above.

How we use these criteria depends on our prioritization process. For example, with multi-voting technique, we could discuss these criteria in relation to each recommendation to inform our voting or ranking.

- Expertise to implement solution
- Return on investment
- Effectiveness of solution
- Ease of implementation/maintenance
- Potential negative consequences
- Legal considerations
- Impact on systems or health
- Feasibility of intervention

Attachment 1: Availability of Baseline Data from the 2013 National Assessment of Epidemiology Capacity: Findings and Recommendations for Chronic Disease, Maternal and Child Health, and Oral Health [Council of State and Territorial Epidemiologists (April 2015)]

Guiding Principles and Consolidated Recommendations		
Guiding Principles	Baseline Data	Comments
Work with CDC for optimal epidemiology funding and capacity to increase the number of state-based epidemiologists and their access to and use of tools to support their work so that all state chronic disease programs have personnel, skills and resources needed.	no	
Prioritize jurisdictions with least capacity	no	
Consider the chronic disease capacity building needs of local health jurisdictions and tribal and territorial public health organizations.		
Recommendations		
1. Participate in national discussions.		No measure of how many discussions occurred and how many included chronic disease.
1A. Overall state-based epi and technology related capacity	no	
1B. Gaps identified in ECA	no	
1C. To provide essential data for public health action	no	
2. Monitor gaps and needs	yes	
3. Promote a minimum workforce	yes	
4. Promote access to resources		
4A. Statistical software	yes	
4B. Encryption software	yes	
4C. GIS software	yes	
4D. Routinely geocoded population-based chronic disease data beginning with birth and death data	no	
4E. Access, ability, and technical support to analyze key datasets: mortality, hospital discharge, tumor registry, BRFSS, ED, EMS, Medicare; prioritize mortality and Medicare.	partial	access: yes ability: limited technical support: no

Guiding Principles and Consolidated Recommendations		
4F. Information technology support services	yes	
4G. Clerical support services	yes	
4H. Scientific journals	partial	Baseline for: 1) no access and 2) combined measure of “meets needs” and “access but doesn’t meet needs”
5. Offer training		
5A. To enable states to calculate confidence intervals for BRFSS prevalence estimates and death rates	no	
5B. Coordinate across chronic disease, MCH and OH	no	
5C. Share training needs with chronic disease, MCH and oral health national associations so that epi-specific training and mentoring can be included in annual meetings, webinars, developed resources and mentorship program	no	
5D. Promote to organizations involved in training the public health workforce, including chronic disease, CSTE and schools of public health, inclusion of training in competencies identified by practicing epidemiologists as needing additional focus	no	
6. Build partnerships		
6C. Within state health departments including substance abuse, mental health, occupational health, public health preparedness, environmental health, oral health, MCH	yes	
6B. Among state agencies	yes	
6C. With local health jurisdictions	no	
6D. With local academic institutions	yes	
7. Incorporate substance abuse and mental health	no	
8. Assist in public health emergencies	no	

Appendix C: Summary of Consolidated Recommendations

Guiding Principles and Consolidated Recommendations	Recommendation Source	
	Overall	Chronic Disease
Guiding Principles		
Work with CDC for optimal epidemiology funding and capacity to increase the number of state-based epidemiologists and their access to and use of tools to support their work so that all state chronic disease programs have personnel, skills and resources needed.	1	9: Intro
Prioritize jurisdictions with least capacity	1	2
Consider the chronic disease capacity building needs of local health jurisdictions and tribal and territorial public health organizations.	Added by Advisory Group	
Recommendations		
1. Participate in national discussions	2	1
1A. Overall state-based epi and technology related capacity	2	
1B. Gaps identified in ECA		1
1C. To provide essential data for public health action		1
2. Monitor gaps and needs	8	3
3. Promote a minimum workforce	3: Does not specify doctoral level; total number of chronic disease epidemiologists is ambiguous	3: Specifies lead epi only; 9: Combines lead and coordinating epi; ambiguous about total.
4. Promote access to resources	7	
4A. Statistical software	7	
4B. Encryption software	7	
4C. GIS software	7	4
4D. Routinely geocoded population-based chronic disease data beginning with birth and death data		4
4E. Access, ability, and technical support to analyze key datasets: mortality, hospital discharge, tumor registry, BRFSS, ED, EMS, Medicare; prioritize mortality and Medicare.		9
4F. Information technology support services		9

Guiding Principles and Consolidated Recommendations	Recommendation Source	
	Overall	Chronic Disease
4G. Clerical support services		9
4H. Scientific journals	7	9
5. Offer training	4	
5A. To enable states to calculate confidence intervals for BRFSS prevalence estimates and death rates		9
5B. Coordinate across chronic disease, MCH and oral health	4	
5C. Share training needs with chronic disease, MCH and oral health national associations so that epidemiology-specific training and mentoring can be included in annual meetings, webinars, developed resources and mentorship program	4	
5D. Promote to organizations involved in training the public health workforce, including CDC, CSTE and schools of public health, inclusion of training in competencies identified by practicing epidemiologists as needing additional focus	5	7: Prioritizes use of informatics and information systems, fiscal issues, and community health assessments
6. Build partnerships	6	6
6C. Within state health departments including substance abuse, mental health, occupational health, public health preparedness, environmental health, oral health, MCH		5
6B. Among state agencies	6	6
6C. With local health jurisdictions	Added by Advisory Group	
6D. With local academic institutions	6	6
7. Incorporate substance abuse and mental health		5
8. Assist in public health emergencies		5

Appendix D: Key Informants

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Appendix E: Initial Action Items and Voting

The actions listed below were compiled from up to five actions suggested by each advisory group member and the consultant based on information in the 2013 National Assessment of Epidemiology Capacity: Findings and Recommendations for Chronic Disease, Maternal and Child Health, and Oral Health,^a key informant interviews, prioritization criteria published by the National Association of County Health Officials^b and their experiences as epidemiologists in public health practice. Group members then voted for up to five primary actions that in their judgment were most likely to support the goal of increasing the number of epidemiologists in state health departments, their skill levels or access to resources needed to do their work.

In the following list, the numbered actions are the primary actions. Actions with letters were considered sub-actions providing examples of how the primary actions might be accomplished. A vote for a primary action did not imply support for all of the sub-actions. (NOTE: Some of the sub-actions listed below were later refined and so might not match the sub-actions in the Results section of the main text.)

Eight people voted. The number of votes cast for each primary action and how the action was incorporated into the high and medium priority recommendations are in parentheses following each primary action.

1. Develop best practices and tools for retaining staff and fellows. (4 votes; included in high priority recommendation to promote a minimum workforce.)
 - a. Assess strengths and limitations (e.g., capacity level, opportunity for professional/career growth, job satisfaction, and collaboration and partnerships) of various organizational structures.
 - b. Draft examples of chronic disease epidemiology position descriptions; develop a case study of creating an epidemiologist job series.
 - c. Develop and routinely host a virtual Chronic Disease Epidemiology Orientation similar to the New State Epidemiologist Orientation.
 - d. Engage CDC and academic institutions to develop mentorship programs for all entry-level chronic disease epidemiologists. [This action is in “Training” (#10) and “Collaborating with schools of public health (#6) below.]
 - e. Develop a peer-to-peer program for epidemiologists to consult with. [This concept is also in “Training” (#10) below.]
 - f. Form a chronic disease epidemiology coalition across states, facilitated by CSTE/CDC.
 - g. Provide webinars/training opportunities throughout the year – SAS, chronic disease epidemiology methods, GIS, etc. [This action is also in “Training” (#10), below.]

^a Council of State and Territorial Epidemiologists (April 2015). 2013 National Assessment of Epidemiology Capacity: Findings and Recommendations for Chronic Disease, Maternal and Child Health, and Oral Health. Accessed at <http://www.cste2.org/Publications/2013%20National%20Assessment%20of%20Epidemiology%20Capacity-Findings%20and%20Recommendations%20for%20Chronic%20Disease%20Maternal%20and%20Child%20Health%20and%20Oral%20Health.pdf> on 16 November 2015.

^b National Association of County and City Health Officials (NACCHO) (Not dated). Guide to Prioritization Techniques. Accessed at <http://www.naccho.org/uploads/downloadable-resources/Guide-to-Prioritization-Techniques.pdf> on 21 December 2015.

- h. Develop a CDC/CSTE orientation manual or virtual meeting for those supervising chronic disease epidemiologists to address the issue that many of their managers have a limited understanding of epidemiology.
2. Increase recruitment of chronic disease epidemiologists. (4 votes; included in high priority recommendation to collaborate with local academic institutions.)
 - a. Collaborate with CSTE, CDC, and state health departments to recruit students on campus through career fairs, presentations, etc. [This is also an action item under “Collaborate with academia” (#6) and “Expand CSTE chronic disease-related fellowships” (#11).]
 3. Update and widely disseminate CSTE’s 2004 Essential Functions of Chronic Disease Epidemiology White Paper. (NOTE to group members for clarification in voting: This addresses suggestions to define the roles, skills and functions of state and local chronic disease epidemiologists. If updated, the document could also be used broadly as for example, to interest students in chronic disease, work with schools of public health to broaden curriculum, etc.) (3 votes; included in high priority recommendation to promote a minimum workforce.)
 4. Develop strategies to help chronic disease epidemiologists promote their work within their organization and with policymakers. (4 votes; included in high priority recommendation to promote a minimum workforce.)
 - a. Develop an info-graphic on what chronic disease epidemiologists do.
 - b. Brainstorm and compile other strategies for chronic disease epidemiologists to promote their work (e.g., requesting agenda time at health department leadership/management meetings and Board of Health meetings)
 - c. Raise awareness of benefits of evidence-based decision making for chronic disease program and policy development.
 - d. Draft a project debrief template to document decisions and outcomes related to chronic disease epidemiology projects.
 - e. Show hypothetical examples of what work can be completed with one chronic disease epidemiologist, two chronic disease epidemiologists, etc.
 - f. Create calculator for state-specific optimum numbers of chronic disease epidemiologists.
 5. Coordinate collaboration and leveraging of resources among national organizations involved in providing chronic disease epidemiology technical assistance and working to increase chronic disease epidemiology capacity. (2 votes; sub-actions dropped; collaborating with national organizations for training included under medium priority recommendation to promote training.)
 - a. Assess activities of CSTE, National Association of Chronic Disease Directors (NACDD), CDC chronic disease and maternal and child health (MCH) programs, oral health, Association of State and Territorial Dental Directors, the deBeaumont Foundation, Association of State and Territorial Health Officers, etc. and determine which cross-cutting pieces could be shared more widely (across program areas) or which efforts could have collaboration to increase impact; could include epidemiology methods, health equity and social determinants of health, etc.; determine how to best reach local public health agencies.
 - b. Provide a free consultant to states to assist with writing manuscripts (MCH example)
 - c. Suggest updates to CDC’s Coordinated Chronic Disease Prevention website, <http://www.cdc.gov/coordinatedchronic/index.htm> , especially the Epidemiology & Surveillance section.

- d. Draft White Paper defining a chronic disease surveillance system (similar to the work led by the Association of State and Territorial Dental Directors for defining the Oral Health Surveillance System)
6. Collaborate with schools and programs of public health to improve awareness, understanding and appreciation of the role and function of chronic disease epidemiologists at the state and local levels. (4 votes; included as a high priority recommendation to collaborate with local academic institutions.)
 - a. Collaborate with academic institutions to develop, pilot and implement chronic disease curricula for graduate and undergraduate students and potentially establish a track students can enter.
 - b. Improve connections with academic institutions to communicate the need to train chronic disease epidemiologists.
 - c. Foster, support and encourage collaboration between state and local health departments and academic institutions in teaching and research.
 - d. Collaborate with academic institutions to recruit students on campus through career fairs, presentations, etc. [Also in “Increase recruitment of chronic disease epidemiologists” (#2) above.]
 - e. Engage academic institutions to develop a mentorship program for all entry-level chronic disease epidemiologists. [Also in “Improve staff retention” (#1) above.]
 - f. Develop tools (e.g., PowerPoint presentations) for chronic disease epidemiologists to use at local schools and programs of public health to increase student interest in chronic disease and awareness of chronic disease-related fellowships. [Also in “Promote chronic disease positions in fellowships, direct assistance and related programs” (#12) below.]
 - g. Develop applied chronic disease epidemiology case studies (like the EIS case studies) for chronic disease epidemiologists to use in courses at schools and programs of public health. [Also in “Collaborate with academia” (#6) above. and “Promote chronic disease positions in fellowships, direct assistance and related programs” (#12) below.]
 - h. Host a webinar that describes all the related opportunities (e.g., EIS, Applied Epidemiology Fellowships, Public Health Associate Program, CDC state assignees, informatics fellowships, Epi-Aids, Info-Aids, etc.) and promote the webinar to schools and programs of public health. [Also in “Promote chronic disease positions in fellowships, direct assistance and related programs” (#12) below.]
 7. Build partnerships with health systems to identify epidemiology-specific needs of health services. (0 votes; dropped.)
 8. Promote training in and use of GIS and spatial analysis for issues related to chronic disease epidemiology. (2 votes; included in the medium priority recommendation to promote and offer training.)
 - a. Push routine geo-coding of chronic disease data (especially birth and death data).
 - b. Under HIPAA addresses are considered personal identifiers creating barriers to accessing and geocoding addresses. To help remove this barrier, we could partner with national organizations, such as National States Geographic Information Council (<https://www.nsgic.org/>), that both dispute that address alone acts as a personal identifier and support the creation of a national address database. The federal Office of Management and Budget has recommended that Congress consider revising statutes to allow release of addresses without personally identifiable information.

- c. Continue offering Rice University training to new states and consider changes in the current program such as opening the training to states that have already participated but have new staff; offer advanced training to those who have already participated.
 - d. Explicitly incorporate/emphasize GIS in the NACDD and other mentoring programs.
 - e. Publicize existing GIS and small area analysis CDC webinars; work with CDC to develop and host new webinars on GIS and small area analysis, with the initial focus on GIS
 - f. Collaborate with CDC Small Area Analysis Team to develop (and offer to test) useful tools for chronic disease epidemiologists.
 - g. Promote access to (and geocoding of) Medicaid and Medicare data—ideally with those agencies geocoding their data.
 - h. Explore opportunities for training in GIS and small area analysis at CSTE preconference workshops.
9. Promote training in and use of informatics for issues related to chronic disease epidemiology. (0 votes; included in the medium priority recommendation to promote and offer training.)
- a. Incorporate a chronic disease focus into Informatics Training in Place and applied epidemiology fellowship programs.
 - b. Explicitly incorporate/emphasize informatics in the NACDD and other mentoring programs.
 - c. Work with CSTE and state epidemiologists to explore CSTE informatics fellowship opportunities in chronic disease.
 - d. Explore opportunities for training in informatics at CSTE preconference workshops.
10. Promote training for state and local chronic disease epidemiologists. (NOTE to group members for clarification in voting: This is a general action and does not preclude training in GIS, spatial analysis and informatics that are specifically mentioned above.) (3 votes; included as the medium priority recommendation to promote and offer training.)
- a. Promote the CSTE conference as the key chronic disease epidemiology conference; maintain presence of an annual chronic disease preconference workshop; secure travel sponsorship
 - b. Mentoring program – link senior and junior epidemiologists in states. This would be similar to the NACDD program, but less formal and less resource intensive and not project based (tie to virtual orientation?)
 - c. Develop a peer-to-peer consultation program that includes continued support. [This concept is also in “Improve staff retention” (#1) above.]
 - d. Develop webinars in partnerships with NACDD, Association of State and Territorial Dental Directors, CDC and others.
 - e. Engage CDC to develop a mentorship program for all entry-level chronic disease epidemiologists. [This action is also in “Improve staff retention” (#1), above.]
 - f. Provide webinars/training opportunities throughout the year – SAS, chronic disease epidemiology methods, GIS, etc. [This action is also in “Improve staff retention” (#1), above.]
11. Expand CSTE chronic disease-related fellowship programs at state and local levels including Applied Epidemiology Fellowship chronic disease positions and CSTE informatics fellowships. (0 votes; sub-actions included in high priority recommendations to promote a minimum workforce or collaborate with academia.) Work with:
- a. CDC chronic disease programs to secure funding for Applied Epidemiology and Applied Informatics Fellowships; strategize for improved funding for CSTE chronic disease Applied Epidemiology Fellowship funding.

- i. Explore issue of using CDC chronic disease program-specific funding for fellows to gain experience in a broad array of chronic disease issues.
 - b. CSTE to develop tools to facilitate working with schools and programs of public health to increase student interest in chronic disease and awareness of CSTE chronic disease fellowship opportunities.
 - c. CSTE to guarantee placement of people accepted into program. Unlike EIS, people in the CSTE program are not guaranteed slots and so they continue looking for and often finding other jobs while interviewing with CSTE.
 - d. CSTE and state epidemiologists to explore CSTE informatics fellowship opportunities in chronic disease.
 - e. Collaborate with CSTE, CDC, and state health departments to recruit students on campus through career fairs, presentations, etc. [This is also an action item under “Increase recruitment of chronic disease epidemiologists (#2) and “Collaborate with academia (#6)].
12. Promote chronic disease positions in fellowship programs at state and local levels such as Applied Epidemiology Fellowship, EIS, Public Health Associate Program; direct assistance and assignee programs; student internships; and other programs such as the American Cancer Society’s Collaborative Evaluation Fellowship. (NOTE to group members for clarification in voting: This is a general action and does not preclude CSTE chronic disease-related fellowships specifically mentioned above.) (6 votes; sub-actions included in high priority recommendations to promote a minimum workforce or collaborate with academia.)
- a. Develop tools (e.g., PowerPoint presentations) for chronic disease epidemiologists to use to increase interest in chronic disease and awareness of chronic disease-related fellowships at local schools and programs of public health. [Also in “Collaborate with academia” (#6) above.]
 - b. Develop applied chronic disease epidemiology case studies (like the EIS case studies) for chronic disease epidemiologists to use in courses at schools and programs of public health. [Also in “Collaborate with academia” (#6) above.]
 - c. Host a webinar that describes all the related opportunities (e.g., Applied Epidemiology Fellowship, EIS, Public Health Associate Program, CDC state assignees, informatics fellowships, Epi-Aids, Info-Aids, etc.) and promote the webinar to schools and programs of public health. [Also in “Collaborate with academia” (#6) above.]
 - d. Develop potential strategies to increase the number of chronic disease EIS officers (e.g., asking for chronic disease pre-match positions; increasing the number of state positions that are “general” and include both infectious and non-infectious conditions; increasing the number of state-based chronic disease positions).
 - e. Work with CDC State Chronic Disease Epidemiology Assignee Program to increase and sustain the number of assignees (e.g., see what could be implemented from the MCH model, such as CDC paying 10–20% of salary)
 - f. Explore why the NACDD/CDC chronic disease epidemiology placement program was de-funded and whether there was an evaluation of that program or lessons learned.
 - g. Increase the funding and resource mechanisms to obtain direct assistances from CDC/CSTE.
13. Secure funding. (1 vote; dropped.)
- a. Leverage funding mechanisms for direct epidemiology and technical assistance across CDC chronic disease-related programs such as 1305, BRFS, Preventive Block Grant.
 - b. Work with CDC and suggest standard language for requirements and recommendations related to Epidemiology and Surveillance (Domain 1) in NCCDPHP FOAs.

14. Promote access to resources. (1 vote; dropped)
 - a. Research Digital Library [<https://nndm.gov/ner/initiatives/phia.html>] opportunities and, if possible, promote to low capacity states.
 - b. Improve access to technology resources such as GIS and other statistical analysis tools.
15. CSTE should work with state, local, or territorial epidemiologists to identify new ways of analyzing existing datasets (i.e., BRFSS, Medicare claims data). (1 vote; dropped)
16. CSTE should work with state, local, or territorial epidemiologists to identify ways to incorporate substance abuse and mental health surveillance into chronic disease activities. (1 vote; dropped)
17. Work with CSTE to revise the CSTE Epidemiology Capacity Assessment to address issues raised by the key informants for this project such as needs around informatics, economic analysis, program evaluation; potential duplication of efforts due to potentially similar surveys by the deBeaumont Foundation and Association of State and Territorial Health Officers; percent of states where chronic disease epidemiologists have access to routinely geocoded birth and death files; and others. (3 votes; included as medium priority recommendation to monitor gaps and needs.)