Roles and Responsibilities of Public Health Agencies for Surveillance of Antimicrobial Resistance
CSTE-CDC Task Force on Strengthening Antimicrobial Resistance Surveillance

These tables are being developed by the CSTE-CDC Antimicrobial Resistance (AR) Surveillance Task Force and are intended to provide a three-to-five-year vision for AR surveillance conducted at the local, state, and federal levels; to describe the roles and responsibilities of public health agencies for AR surveillance at each level, in conjunction with pertinent organizations and stakeholders, and identify the gaps that need to be addressed to achieve this vision. Although not fully illustrated in the tables in detail, it should be clear that the local, state, and federal activities will very often be conducted in coordination with a variety of key partners (e.g., CSTE, ASTHO, NACCHO, APIC, IDSA, SHEA, APHL, ASM, WHONET).

The tables describe three main mechanisms by which public health agencies receive AR surveillance data or surveillance specimens from laboratories and healthcare facilities: 1) as a legally mandated reportable condition, specified by local or state reporting requirements, AR surveillance data are conveyed by laboratories, including those within healthcare facilities, via electronic laboratory reporting (ELR) to local and state health departments, where the data are analyzed, and may subsequently be reported as nationally notifiable conditions to the Centers for Disease Control and Prevention (CDC); 2) as a microbiologic specimen, including isolates and swabs, diagnostic laboratories submit to specialized state, regional, and federal laboratories for organism identification and susceptibility testing; and 3) as a report to CDC's National Healthcare Safety Network (NHSN), AR surveillance data are submitted by healthcare facilities either when a resistant organism is implicated in a healthcare-associated infection (HAI) that is reportable to NHSN or when a healthcare facility identifies an organism that meets NHSN's AR criteria regardless of whether the organism is implicated in an infection. While these three mechanisms account for a substantial proportion of AR surveillance data coverage, other AR surveillance pathways do exist to meet specific reporting requirements between healthcare providers, state health departments, and federal agencies. Because these additional mechanisms are limited to specific diseases and conditions, they require further review and evaluation to determine best inclusion in the existing tables.

The tables also describe three broad areas of activity for which concerted efforts are needed to either sustain or bolster AR surveillance. The first section, collection of AR surveillance data, includes discussion of the responsibility for providing guidance on reporting criteria and requirements, assistance for data and isolate submission, support for collection of clinical and epidemiologic data, and maintenance, management, and communication of these data across public health agencies. The second section, analysis, interpretation, and use of AR surveillance data, discusses the need for early recognition and immediate public health response to AR events, monitoring over time and place to identify high-risk populations and the burden of infection, and the use of the data to create antibiograms, drive antimicrobial stewardship, and inform research and prevention efforts. The third section recognizes gaps for which responses are needed to assure that AR surveillance is comprehensive, and identifies shortcomings in current laboratory testing and reporting systems, lack of resources for timely response efforts, difficulties using ELR for AR reporting, issues with storing and using the complex AR data, and challenges with coordination of surveillance efforts.

These tables, in draft form, now include input from the individuals invited to the expanded AR Surveillance Task Force, as well as other external experts and partners.

Table 1. Roles and Responsibilities of Local, State, and Federal Public Health Agencies in Collection of Antimicrobial Resistance Surveillance Data for Comprehensive Surveillance (Future, 3-5 Year Time Horizon)

Roles and Responsibilities	Local (small and medium)†	State (and large, urban LHDs where appropriate*)	Federal
1. Establish, maintain, and disseminate surveillance criteria for AR pathogens, including which pathogens are reportable in each state, which are nationally notifiable, and specifications for reporting AR data to public health agencies.	A. Maintain close relationships with local healthcare providers and laboratories to represent their input and provide relevant feedback on criteria and specifications to those with a lead role in the CSTE processes.	A. Lead role in designating AR pathogens as publicly reportable in their jurisdictions; and collecting, analyzing, and reporting these data to the public. B. Lead role in CSTE processes for establishing, maintaining, and disseminating criteria and specifications for AR surveillance via electronic laboratory reporting (ELR). C. Lead role in CSTE processes for establishing, maintaining, and disseminating criteria and specifications for AR surveillance via isolate-based surveillance.	A. CDC works with states and the CSTE processes for establishing, maintaining, and disseminating criteria and specifications for nationally notifiable AR surveillance via appropriate electronic reporting through states to CDC. B. CDC contributes to CSTE processes for establishing, maintaining, and disseminating criteria and specifications for AR surveillance via isolate-based surveillance. C. Apply WHO guidance for early reporting of emerging AR resistant bacteria.

† Level of capabilities and capacity to provide expert staff, technical assistance, and infrastructure will vary across local health agencies.

* Legal structure varies by state and determines the accepted authority and roles held by large, urban local health departments (LHDs).

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		D. Apply WHO guidance for early reporting of emerging AR resistant bacteria. E. Lead role in CSTE processes for collaborating with CDC on criteria and specifications for AR surveillance. F. Lead role in updating the RCKMS for state jurisdictional specifications.	D. CDC works with other federal agencies (e.g., DoD, VA, CMS) to coordinate surveillance requirements and efforts. E. CDC has lead role, with CSTE input, in establishing, maintaining, and disseminating criteria and specifications for AR surveillance via NHSN.

2. Provide technical assistance and/or support to laboratories and healthcare facilities that enables them to electronically report AR data and submit isolates to public health agencies in accordance with specifications for completeness, accuracy, timeliness, and record format.	A. Maintain close relationships with local healthcare providers and laboratories to assist in providing support when and where laboratories or healthcare facilities report AR data directly to local health department. B. Maintain close relationships with local healthcare providers and laboratories to assist in providing support to laboratories and healthcare facilities that provide specimens, including isolates and swabs, to the state and multi-state (regional) laboratories for AR surveillance. C. Maintain close relationships with local healthcare providers and laboratories to assist in providing support to healthcare facilities to enable AR surveillance.	A. Provide direct technical assistance to all laboratories and healthcare facilities that report AR data directly to health department via ELR. B. Provide direct technical assistance in concert with APHL and ARLN to all laboratories and healthcare facilities that provide specimens, including isolates and swabs, to the state and multi-state (regional) laboratories for AR surveillance. C. Provide technical assistance to healthcare facilities to enable AR surveillance.	A. CDC provides direct technical assistance and/or support to state and local health departments for laboratory-based reporting of AR data via ELR directly to health department. B. CDC provides direct technical assistance and/or support to state and local health departments when isolates are submitted for AR surveillance. C. Provide direct technical assistance to state and multi-state (regional) laboratories for competency in new and existing test methods to detect, confirm, and report AR pathogens. D. CDC provides technical assistance and support to healthcare facilities and developers of electronic reporting solutions that enable AR surveillance via NHSN.

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3. Provide technical assistance and support to healthcare facilities to enable them to report clinical and epidemiological data to a public health agency in accordance with the completeness, accuracy, timeliness, and record format requirements of a public health investigation of an AR instance or cluster.	A. Maintain close relationships with local healthcare providers and laboratories to assist in providing support when and where healthcare facilities report clinical and epidemiologic data directly to health department.	A. Provide direct technical assistance that enables healthcare facilities to report clinical and epidemiological data directly to health department.	A. CDC provides direct technical assistance and support to state and local health departments when clinical and epidemiological data are reported as part of an investigation of an AR instance or cluster.
4. Maintain technical infrastructure and staff that serve as dedicated resources to support field investigations and collection and maintenance of AR data for surveillance purposes.	A. Maintain close relationships with local healthcare providers and laboratories to assist in providing support and access when and where AR data are reported directly to health department via standard or electronic transmission.	A. Maintain technical infrastructure and staff to respond to AR data that are reported directly to health department via standard or electronic transmission.	A. CDC provides direct technical assistance and/or support to state and local health departments to maintain technical infrastructure and staff for response to AR data reported via standard or electronic transmission. B. CDC maintains technical infrastructure and staff for AR surveillance via NHSN.

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Roles and Responsibilities	Local (small and medium)[†]	State (and large, urban LHDs where appropriate[*])	Federal
5. Maintain technical infrastructure and staff that serve as dedicated resources for providing guidance on isolate collection and submission requirements, as well as for receiving, processing, and testing microbiologic isolates for AR for purposes of isolate-based AR surveillance.	A. Maintain close relationships with local healthcare providers and laboratories to assist in providing guidance support when and where isolates are sent directly to health department for purposes of isolate-based AR surveillance.	A. Maintain technical infrastructure and staff to handle isolates and swabs sent directly to state and multi-state (regional) laboratories for purposes of AR surveillance.	A. CDC maintains technical infrastructure and staff for diagnostic and confirmatory isolate testing, provides guidelines for sending, receiving, processing, and testing, and supports training, testing, and verification of state and local laboratory capacities for AR surveillance purposes.
6. Assure that AR surveillance data are in readily usable public health databases with capability to link or merge the epidemiologic with laboratory data for analysis and other public health purposes.	A. Maintain close relationships with local healthcare providers and laboratories to assist in providing access to AR epidemiologic and laboratory surveillance data that can be linked or merged and are readily usable.	A. Maintain AR epidemiologic and laboratory surveillance database(s) that can be linked or merged and are readily usable.	A. Maintain AR epidemiologic and laboratory surveillance database(s) that can be linked or merged and are readily usable.
7. Maintain infrastructure and staff for open communication and exchange of AR surveillance data with public health partners.	A. Maintain close relationships with local healthcare providers and laboratories to assist in providing access to staff for open communication and AR surveillance data exchanges.	A. Maintain infrastructure and staff for open communication and AR surveillance data exchanges.	A. Maintain infrastructure and staff for open communication and AR surveillance data exchanges.

Table 2. Roles and Responsibilities of Local, State, and Federal Public Health Agencies in Analysis, Interpretation, and Use of Antimicrobial Resistance Surveillance Data for Comprehensive Surveillance (Future, 3-5 Year Time Horizon)

Roles and Responsibilities	Local (small and medium)†	State (and large, urban LHDs where appropriate*)	Federal
1. Early recognition of AR cases and/or clusters that warrant immediate investigation or intervention.	A. Maintain or consider maintaining a plan for accessing AR surveillance data when AR cases and/or clusters are recognized and an immediate response by the local health department is warranted.	A. Maintain capacity for analysis, interpretation, and use of AR surveillance data for early recognition of AR cases and/or clusters and immediate response.	A. CDC provides direct technical assistance and/or support to state and local health departments for early recognition of AR cases and/or clusters and immediate response by the health department.
2. Complete an immediate epidemiological investigation triggered by AR case and/or cluster reporting to identify, track, and stop case and contact spread across healthcare settings and in the community.	A. Maintain or considers maintaining a plan for accessing reports of epidemiological investigations triggered by AR case and/or cluster reporting when a response by the local health department response is warranted.	A. Maintain capacity for analysis, interpretation, and use of AR surveillance data and additional data for purposes of completing immediate epidemiological investigations triggered by AR case and/or cluster reporting and prevent spread.	A. CDC provides direct technical assistance and/or support to state and local health departments for immediate epidemiological investigations triggered by AR case and/or cluster reporting by the health department and prevent spread.

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Roles and Responsibilities	Local (small and medium)†	State (and large, urban LHDs where appropriate*)	Federal
3. Monitor the epidemiology, epidemiologic trends, and spread of AR pathogens over time and place.	A. Maintain or consider maintaining a plan for accessing data used to monitor the epidemiology, epidemiologic trends, and spread of AR pathogens over time and place when a response by the local health department is warranted.	A. Maintain capacity for analysis, interpretation, and use of AR surveillance data for monitoring the epidemiology, epidemiologic trends, and spread of AR pathogens over time and place.	A. CDC provides direct technical assistance and/or support to state and local health departments for monitoring the epidemiology, epidemiologic trends, and spread of AR pathogens over time and place by the health department. B. CDC maintains capacity for monitoring the epidemiology, epidemiologic trends, and spread of AR pathogens over time and place by analyzing, interpreting, and using AR surveillance data available via NHSN and other systems.

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Roles and Responsibilities	Local (small and medium)†	State (and large, urban LHDs where appropriate*)	Federal
4. Measure the burden of infection with AR pathogens (e.g., estimates of morbidity, mortality, healthcare costs, and other societal and healthcare system impacts), which may involve special research projects or surveys.	A. Maintain or consider maintaining a plan for accessing data that measure the burden of infection with AR pathogens when a response by the local health department is warranted.	A. Maintain capacity for analysis, interpretation, and use of AR surveillance data to measure the burden of infection with AR pathogens.	A. CDC provides direct technical assistance and/or support to state and local health departments for measuring the burden of infection with AR pathogens. B. CDC maintains capacity for measuring the burden of infection with AR pathogens by analyzing, interpreting, and using AR surveillance data available via NHSN and other systems.

Table 2. Roles and Responsibilities of Local, State, and Federal Public Health Agencies in Analysis, Interpretation, and Use of Antimicrobial Resistance Surveillance Data for Comprehensive Surveillance (Future, 3-5 Year Time Horizon)

Roles and Responsibilities	Local (small and medium)†	State (and large, urban LHDs where appropriate*)	Federal
5. Identify populations at high risk for AR pathogens (e.g., chronically ill, immunosuppressed, patients with frequent healthcare visits).	A. Maintain or consider maintaining a plan for accessing data that identify populations at high risk for AR pathogens when a response by the local health department is warranted.	A. Maintain capacity for analysis, interpretation and use of AR surveillance data to identify populations at high risk for AR pathogens.	A. CDC provides direct technical assistance and/or support to state and local health departments for identifying populations at high risk for AR pathogens. B. CDC maintains capacity for identifying populations at high risk of infection with AR pathogens by analyzing, interpreting, and using AR surveillance data available via NHSN and other systems.
6. Use AR surveillance data to generate cumulative antibiograms at the facility, local, state, regional, and national levels.	A. Maintain or consider maintaining a plan for accessing cumulative antibiograms at the facility and local levels.	A. Use AR surveillance data to generate cumulative antibiograms at the facility, local, and state levels.	A. Use AR surveillance data to generate cumulative antibiograms at the facility, local, state, regional, and national levels.

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Roles and Responsibilities	Local (small and medium)†	State (and large, urban LHDs where appropriate*)	Federal
7. Use AR surveillance data for antimicrobial stewardship.	A. Maintain or consider maintaining a plan to access AR surveillance data as part of health department's role in antimicrobial stewardship.	A. Maintain capacity for analysis, interpretation, and use of AR surveillance data as part of health department's role to inform antimicrobial stewardship in healthcare settings and the community.	A. Maintain capacity for analysis, interpretation, and use of AR surveillance data as part of CDC's role in antimicrobial stewardship.
8. Use AR surveillance data to suggest hypotheses and inform research.	A. Maintain or consider maintaining a plan for accessing AR surveillance data that suggest hypotheses or inform local research.	A. Maintain capacity for analysis, interpretation and use of AR surveillance data to suggest hypotheses and inform state level research.	A. Maintain capacity for analysis, interpretation and use of AR surveillance data to suggest hypotheses and inform local, state, regional, and national level research.

9. Use AR surveillance data to monitor changes in healthcare or healthcare practices that may have potential to change risks for acquisition or spread.	A. Maintain or consider maintaining a plan for accessing AR surveillance data used to monitor changes in healthcare or healthcare practices that may have potential to change risks for acquisition or spread.	A. Maintain capacity for analysis, interpretation and use of AR surveillance data to monitor changes in healthcare or healthcare practices that may have potential to change risks for acquisition or spread.	A. CDC provides direct technical assistance and/or support to state and local health departments for monitoring changes in healthcare or healthcare practices that may have potential to change risks for acquisition or spread. B. CDC maintains capacity for monitoring changes in healthcare or healthcare practices that may have potential to change risks for acquisition or spread by analyzing, interpreting, and using AR surveillance data available via NHSN and other systems. C. Centers for Medicare and Medicaid Services (CMS) maintains capacity through the Quality Improvement Network – Quality Improvement Organization (QIN-QIO) program or successor programs for monitoring and responding to changes in healthcare or healthcare practices that may have the potential to change risk for acquisition or spread.

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Roles and Responsibilities	Local (small and medium)†	State (and large, urban LHDs where appropriate*)	Federal
10. Identify and issue alerts for identified AR pathogens with rare and novel resistance mechanisms.	A. Maintain or consider maintaining a plan for issuing alerts for identified AR pathogens with rare and novel resistance mechanisms.	A. Maintain capacity to identify and issue alerts for AR pathogens with rare and novel resistance mechanisms.	A. CDC provides direct technical assistance and/or support to health departments for identifying and/or issuing alerts for AR pathogens with rare and novel resistance mechanisms. B. CDC maintains capacity to identify (via NHSN and other systems) and issue alerts for AR pathogens with rare and novel resistance mechanisms.
11. Use AR surveillance data to drive appropriate control and prevention efforts, including measurement and evaluation of effectiveness to guide revisions to response.	A. Maintain or consider maintaining a capacity to gain access to AR surveillance data to drive appropriate control and prevention efforts.	A. Maintain capacity for analysis, interpretation and use of AR surveillance data to drive appropriate control and prevention efforts.	A. CDC provides direct technical assistance and/or support to state and local health departments for driving appropriate control and prevention efforts. B. CDC maintains capacity for driving appropriate control and prevention efforts by analyzing, interpreting, and using AR surveillance data available via NHSN and other systems.

Table 3. Gaps for which Responses are Needed to Assure that Antimicrobial Resistance Surveillance is Comprehensive (Future, 3-5 Year Time Horizon)

Gap	Response	Responsible Entity or Entities	Incentives for Action
1. Shortcomings in available AR surveillance data because of selective reporting of AR laboratory results from test devices and LISs.	Discuss amending CLSI recommendations for selective reporting of AR laboratory data.	CDC, APHL, CLSI	May be missing important susceptibility info on lab reports.
2. Lack resources needed to support comprehensive AR surveillance at all levels of public health.	Complete ARS strategic plan demonstrating the gaps and needs in surveillance and the resources needed to fill them. In the interim, work with CDC/ELC grants to assure that the current funding aligns with likely strategic plan priorities.	Taskforce and CDC	ELC is the primary method by which states can receive funding to carry out the needed work, and this funding needs to continue to support the work of the strategic plan.
3. Lack of mechanism for identifying and flagging emerging AR problems for public health response (e.g., MRC-1 and MRC-2).	Leverage current ELC funding to states and regional laboratories to develop timely test methods and reagents to detect emerging resistance mechanisms.	ARLN (CDC, state and regional labs)	Need for timely identification of emerging AR pathogens and need to be prepared for each next imminent emergence. To avoid rapid spread across the country of increased and multiple resistance.

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4. Shortcomings in timeliness of surveillance response to new forms of AR.	Provide state and local health departments, healthcare facilities, and clinical laboratories with timely recommendations for surveillance and responses for newly emerging AR pathogens.	CDC	Surveillance drives response and therefore needs to be timely. Also, requires accurate information on direction and resources to react appropriately.

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5. Operational challenges in using ELR for AR surveillance.	Agree on a single ELR HL7 format for reporting AR organisms.	CSTE ELR sub-work group with appropriate CDC representation.	Electronic reporting and manipulation of these data is required to streamline the process. ELR as a basic tool for surveillance needs to be standardized.
	Support personnel and infrastructure in state and local health departments to receive and process ELR data.	CDC, states	
	Ensure disease surveillance systems are configured appropriately to integrate ELR and other data into the epidemiologic investigation.	States	
	Support clinical laboratories to develop and send ELR messages.	CDC, states	
	Ensure ELR data at state can be readily reported on to the CDC.	CDC, states	

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6. Need systematic study to collect more information to help establish which AR data and public health measures are most appropriate to provide the best means to identify and guide which public health responses are most effective and efficient.	Conduct studies on the most effective public health measures for controlling AR organisms.	CDC, states	Need to identify the most useful data to drive effective responses to control AR organisms, for public health action to be successful.
7. Need ongoing evaluation of surveillance systems used for AR tracking. Requires the need to evaluate and update the existing guidelines to ensure the most effective purposes of AR tracking and implementation are defined.	Make sure the surveillance guidelines are up-to-date and pertinent to conduct meaningful evaluations. Conduct surveillance evaluations at state and national level.	CDC (e.g., EIS program), CSTE, states Meet with EIS program to facilitate coordinated evaluation of established state systems.	Evaluation is key to ensure surveillance is meeting objectives.

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8. Data are stored in complex databases from which AR data may not be readily available. Need to ensure capable people and programs are available to allow for the extraction of data in usable format for statistical analysis for public health purposes.	Establish configuration guidelines for implementing disease surveillance systems assuring that AR databases are easily linkable and available. Involve state health departments in reviewing software and standards including pilot testing before production. Share state-based solutions with other states that use similar systems, so that efforts are not duplicated. Use existing work groups to establish standards and share best practices, and create new groups as needed.	CDC, CSTE, states, APHL	Complex data need to be effectively managed for surveillance to be successful. Take advantage of existing work to disseminate for more readily and easy uptake.

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Gap	Response	Responsible Entity or Entities	Incentives for Action
9. Need ongoing support and recognition of importance at the national level to continue successful AR surveillance efforts.	Leverage the current attention that policy makers and the media are giving to the AR problem in ways that can help build capacity for AR surveillance and increase resources for response efforts. Assure that communications and policy groups throughout public health have AR surveillance within their media plans and policy recommendations.	Taskforce, CDC, CSTE, states	Important to keep priority and recognition by taking advantage of the current spotlight.
10. Need inventory of what is currently being done and coordinated actions and responses across the continuum of entities involved in successful AR surveillance efforts, from case identification, specimen collection, and testing to appropriate containment, response, and prevention.	Leverage the history of successful collaborations between CDC, CSTE, other federal agencies, and professional organizations around public health surveillance (e.g., standardizing the process of nationally notifiable conditions and expansion of reporting requirements). Leverage the long history of collaboration between healthcare and public health and the current interest and activity between	Taskforce, CDC, CSTE, states, APHL, CLSI, CLIA, IDSA, SHEA, APIC, DoD, VA, CMS, HENs, QIN-QIOs, commercial vendors	Need integrated and coordinated AR tracking, response, and communication efforts between public health and clinical medicine to ensure seamless and successful control and prevention.

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	public health and clinical medicine on AR issues.		
11. Continue to expand coordination across the One Health spectrum to include AR related foodborne issues, STDs, TB and other respiratory illnesses, environmental matters, and animal health.	Leverage the current interest and existing collaborations between CDC, CSTE, and a variety of other federal agencies and professional organizations that recognize the dependencies and associations between humans, animals, and the environment.	Taskforce, CDC, CSTE, FDA, USDA, states, APHL, DoD, VA, EPA	Need integrated and coordinated efforts for antimicrobial stewardship and use, along with AR tracking, response, prevention, and communication efforts across the One Health continuum.