**U.S. Centers for Disease Control and Prevention, Deputy Director for Infectious Diseases (DDID), National Center for Emerging and Zoonotic Infectious Diseases (NCEZID), and National Center for Immunization and Respiratory Diseases (NCIRD)**

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# Implementation Guide for the Molecular Epidemiology Fellowship (MEF) Core Activities of Learning (CALs)

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# 1. Introduction and Background

CDC's Molecular Epidemiology Fellowship (MEF) program is designed to **train molecular epidemiologists** and leaders in public health by expanding career potential for laboratory scientists with experience in generating or analyzing genomic data and bioinformaticians with laboratory experience, providing training in applied epidemiology and opportunities to conduct molecular epidemiology work.

The mission of the MEF program is to equip laboratory scientists and bioinformaticians with the knowledge to interpret and apply genomic data for infectious diseases to accomplish the following:

- Detect outbreaks faster
- Identify outbreaks that otherwise would go undetected
- Recognize and classify the sources of outbreaks
- Guide an investigation by confirming or refuting transmission among epidemiologically linked cases
- Monitor and predict variant emergence and spread
- Address data modernization needs involving managing and sharing genomic data elements and linking them with epidemiologic data
- Adapt to emerging technologies like metagenomics for routine public health use

The vision behind MEF started with the Epidemic Intelligence Service (EIS), a post-doctoral training program in applied epidemiology with competencies developed by the CDC and the Council of State and Territorial Epidemiologists (CSTE) called The Competencies for Applied Epidemiologists in Governmental Public Health Agencies. The Molecular Epidemiology Fellowship program has utilized these competencies built-in EIS and modified them to fit the MEF vision.

The Core Competencies are a consensus set of skills for the broad practice of public health and reflect foundational skills desirable for public health professionals. These core competencies are organized into nine domains, reflecting skill areas within public health representing career stages for public health professionals. Successful completion of the MEF CALs will result in varying levels of competence throughout the nine competency domains.

MEF CALs provide flexibility on how each CAL is accomplished; the focus remains on the accomplishment of skill and the evaluation around mastery in the future rather than solely on completing a pre-defined activity, such as a CAL. Ultimately, completion of the CALS has two main objectives: a) activities through which, when completed, the fellow can demonstrate the acquired competencies set forth by the program, and b) activities that graduates from the MEF program should be able to successfully conduct as a part of their subsequent public health Molecular Epidemiologist positions.

# 2. How to Use This Guide

MEF fellows and supervisors can use this guide to understand the fellowship requirements, deliverables, and options to fulfill the requirements. It can help fellows and supervisors plan fellowship-related activities and projects and prepare for annual reviews. This document walks supervisors and fellows through the implementation of the CALs.

The CAL review section below presents each CAL with the following two attributes.

1. **CAL Requirements** - Describes components that must be included in an activity to be eligible to complete the CAL.
2. **CAL Deliverables** – Documents must be submitted to the MEF program to complete the CAL. All deliverables should be uploaded to each fellow's folder on SharePoint.

The CALs are:

1. Evaluate a public health surveillance system that relies on molecular data.

2. Conduct or participate in a field investigation of a potentially serious public health problem that requires a timely response.
3. Conduct molecular epidemiology to inform a public health response.
4. Enhance integration of laboratory and epidemiologic data in a surveillance system.
5. Write or present material to increase agency awareness of advanced molecular detection.
6. Communicate findings and share openly and rapidly.
7. Provide service to an agency (health department or CDC), department, team, or project that focuses on health equity.

The CALs are reviewed in more detail in the following section, and a chart is provided detailing the specific requirements for each activity. The chart also shows approved options for how to complete each CAL. Other options might be appropriate; please contact the MEF Program if you want to explore a different option.

# 3. CAL Review

This document serves as guidance for supervisors and fellows. The fellows are expected to complete the seven Core Activities for Learning (CALs) before the end of the two-year training.

**CAL 1**

fellows will evaluate a surveillance system by interviewing stakeholders, identifying areas for improvement, developing recommendations, and presenting and communicating findings and recommendations.

| **CAL Number** | **1** |
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| **CAL** | Evaluate a public health surveillance system that relies on molecular data |
| **Deliverables** | 1. Surveillance evaluation report<br>2. Oral presentation of findings and recommendations<br>3. Follow-up evaluation post one year |
| **Requirements** | To receive credit for this CAL, the activity must include the following components:<br>1. If not already available, a map of the key data flow steps for the surveillance system<br>2. Conduct an evaluation that contributes to the assessment of the surveillance system of local, state, national, NGO, or international significance<br>3. Adhere to guidance provided by MMWR and Chapter 8 of Principles and Practice of Public Health Surveillance (3rd Ed)<br>4. Submit initial surveillance evaluation report and follow-up surveillance report to primary and secondary mentors<br>5. Through an evaluation report and an oral presentation to stakeholders, communicate areas that are identified as needing improvement and recommendations on how to improve<br>6. Follow-up to assess surveillance system one year after initial evaluation |
| **Recommended Timeframe** | By the end of the first year |
| **Competency Domains** | Assessment and Analysis<br>Communication<br>Community Dimension of Practice<br>Operational Planning and Management<br>Leadership and Systems Thinking<br>Policy Development |

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**CAL 2**

This CAL is also a CAL of the EIS Fellowship. It emphasizes investigative techniques, critical thinking, and decision-making skills.

| **CAL Number** | **2** |
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| **CAL** | Conduct or participate in a field investigation of a potentially serious public health problem that requires a timely response. |
| **Deliverables** | Summary report |
| **Requirements** | To receive credit for this CAL, the activity must include the following components:<br>1. Collect original data (e.g., interviews, chart reviews)<br>2. Work with state, local, tribal, international, or non-governmental organization (NGO) partners<br>3. Lead or participate in planning, fieldwork, data collection, data analysis, and follow-up |
| **Recommended Timeframe** | By the end of the first year |
| **Competency Domains** | Assessment and Analysis<br>Basic Public Health Sciences<br>Communication<br>Community Dimension of Practice<br>Cultural Competency<br>Operational Planning and Management<br>Leadership and Systems Thinking |

**CAL 3**

The goal of this analysis is to learn new or practice genomic epidemiology.

| **CAL Number** | **3** |
|---|---|
| **CAL** | Conduct molecular epidemiology to inform a public health response. |
| **Deliverables** | 1. Data analysis summary report (study design, data integration, bioinformatics software, descriptive findings)<br>2. Data visualization through advanced tools (e.g., Microreact, MicrobeTrace) |
| **Requirements** | To receive credit for this CAL, the activity must include the following components:<br>1. Develop a data analysis plan that incorporates both molecular and epidemiologic data<br>2. Perform bioinformatics analyses to identify pathogens, assess genetic relatedness among isolates, and/or characterize mutations associated with antimicrobial resistance<br>3. Use epidemiological methods that account for study design, assess associations, and enhance the interpretation of molecular results<br>4. Interpret the analyses and make public health recommendations or describe potential implications |
| **Recommended Timeframe** | By the end of the first year |

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| **Competency Domains** | Assessment and Analysis<br>Basic Public Health Sciences<br>Communication |

**CAL 4**

This CAL is meant to promote an agency-wide initiative for increasing data integration efforts, especially those integrating laboratory and epidemiologic data sources.

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| **CAL Number** | **4** |
| **CAL** | Enhance integration of laboratory and epidemiologic data in a surveillance asystem. |
| **Deliverables** | Oral presentation of data integration accomplishment to stakeholders |
| **Requirements** | To receive credit for this CAL, the activity must include the following components:<br>1. Identify a data integration effort that will benefit public health surveillance or outbreak response<br>2. Interview stakeholders on IT infrastructure, logistical challenges, and available resources to inform the implementation of a data integration effort that is sustainable<br>3. Work with epidemiologists, laboratorians, bioinformaticians, public health analysts, and data scientists to implement data integration effort<br>4. Communicate data integration accomplishments to stakeholders |
| **Recommended Timeframe** | By the end of the second year |
| **Competency Domains** | Assessment and Analysis<br>Basic public health sciences<br>Communication<br>Community Dimension of Practice<br>Operational planning and management |

**CAL 5**

This CAL will allow the fellow to provide critical service to the agency to help grow awareness and workforce development in advanced molecular detection. This will also allow the fellow to engage with the Office of Advanced Molecular Detection (OAMD)

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| **CAL Number** | **5** |
| **CAL** | Write or present material to increase agency awareness of advanced molecular detection. |
| **Deliverables** | 150-word Summary of activity, including descriptive metrics about the audience and activity |
| **Requirements** | To receive credit for this CAL, the activity must include the following five components:<br>1. Written or oral communication developed with consideration of the specific target audience<br>2. Consult with a health communication specialist<br>3. Include the public health context of the work and the public health relevance of findings<br>4. Explain the importance and value of the public health laboratory<br>5. Disseminate the message to the appropriate audience |
| **Recommended Timeframe** | By the end of the second year |

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| **Competency Domains** | Assessment and Analysis<br>Basic Public Health Sciences<br>Communication |

**CAL 6**

Communicating, presenting, writing, and submitting a scientific manuscript or talk is a critical skill. The fellow will communicate findings; this can be through oral presentations, written publications, podcasts, webpages, and videos. It will be essential that findings and data are shared openly and rapidly.

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| **CAL Number** | **6** |
| **CAL** | Communicate findings and share openly and rapidly. |
| **Deliverables** | Oral presentations, publications, webpages, and/or videos that are shared openly and rapidly |
| **Requirements** | To receive credit for this CAL, the activity must include the following components:<br>1. Present to a scientific, medical, or public health audience beyond the fellow's branch or team<br>2. Give a focused, formal presentation on the fellow's original work conducted during the 2-year MEF assignment (e.g., data analysis, field investigation)<br>3. Provide information about background, methods, results, and public health recommendations or potential implications of work<br>4. Answer questions not known in advance (Q/A section)<br>5. Include appropriate graphics |
| **Recommended Timeframe** | By the end of the first year |
| **Competency Domains** | Assessment and Analysis<br>Basic Public Health Sciences<br>Communication<br>Operational Planning and Management |

**CAL 7**

There are two primary purposes for including this CAL. First, many of the skills listed below will help round out the fellow's experience. Second, MEF is underlining the importance of understanding health equity and its impact on public health.

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| **CAL Number** | **7** |
| **CAL** | Provide service to an agency (health department or CDC), department, team, or project that focuses on health equity |
| **Deliverables** | 150-word Summary |
| **Requirements** | To receive credit for this CAL, the activity must include the following components:<br>1. Provide service activities for about 5% of the time during the 2-year MEF assignment (approximately two weeks) |
| **Recommended Timeframe** | By the end of the second year |
| **Competency Domains** | Assessment and Analysis<br>Communication |

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|---|---|
| | Leadership and Systems Thinking<br>Health Equity |