

## LHS Scholar Core Competencies

Learning health system scientists are generally embedded in the systems in which they work as employees or invited partners. This embeddedness enables the assessment and improvement of outcomes in everyday clinical settings in ways that reflect a deep understanding of the setting's workflows, roles, and priorities. The integration of these scientists into the health systems with which they work or collaborate ensures an appreciation for the perspectives of those operating the system and those the system serves. A second point is that the learning health system can be any facility or network of facilities that provide health services--hospitals, clinics, primary care practices, retail clinics, pharmacies, federally qualified health centers, or any configuration of these organizational units—and the communities in which patients' health and wellbeing is produced. Third, stakeholders refer to patients, parents, clinicians, system leaders, and other individuals who interact to carry out the functions of the health system. Finally, the word rapidly was used to connote the need to ensure efficient knowledge generation and its application back to the point of care.

### **Core Competencies**

LHS scientists use identifiable core competencies to function successfully within the health system to generate evidence, conduct research, and feed information back to support quality improvement. The competency summary presented here is based on the AHRQ-sponsored definitions. Full discussions of these competencies can be found at

<https://www.ahrq.gov/learning-health-systems/about.html> and Forrest, Chesley, et al.

Development of the Learning Health System Researcher Core Competencies (2018).

Beyond the seven core competencies defined by the AHRQ research team, we include an eighth competency to address health and health system Equity and Justice. While these principles are acknowledged within the first seven competencies, there are defined skills required to advance healthcare equity and justice. Thus, we specifically list these skills as an eighth competency.

The definitions of LHS competencies and LHS scientists are likely to evolve with time. This summary provides an initial profile of LHS scholars. The two-year ACCELERAT K12 program is designed to provide foundational exposure to all domains, and to foster emerging proficiency within a subset of the domains. We recognize that proficiency across all domains requires many years of ongoing research effort that will continue beyond the K12 timeframe.

## Domain 1: Systems Science

In order to conduct research within the context and complexity of a learning health system, LHS scientists must understand the components of the health system and how they function together to serve target populations. Further, the LHS scientist must understand the health care delivery system and the contribution new knowledge makes to the value proposition in order to facilitate implementation of new knowledge generated from learning health systems research.

Systems Science
<b>Domain Definition</b> To understand how health systems operate and how to apply systems theory to research and implementation.
<b>Domain Competencies</b>
1.1: Demonstrate knowledge of how systems theories can be used to understand how the interactions of the parts of health systems operate to produce value for stakeholders.
1.2: Demonstrate systems thinking in the design and conduct of research and implementation of its findings within the context of complex health systems.
1.3: Demonstrate knowledge of the financing, organization, delivery, and outcomes of health care services and their interrelationships.
1.4: Demonstrate the ability to assess the extent to which research activities will likely contribute to the quality, equity, or value of health systems.

## Domain 2: Research Questions and Standards of Scientific Evidence

The focus of learning health system research is the applicability of findings to the health care setting and its stakeholders. LHS scientists work with stakeholders to identify meaningful research questions and work within the health system in conducting rigorous research.

Research Questions and Standards of Scientific Evidence
<b>Domain Definition</b> To ask meaningful questions and evaluate the usefulness of scientific evidence and insights.
<b>Domain Competencies</b>
2.1: Demonstrate the ability to compose feasible and timely research questions and hypotheses, incorporating stakeholder priorities, to generate evidence that informs meaningful clinical and policy decisions.
2.2: Demonstrate the ability to engage with all relevant stakeholders (patients, families, clinicians, and system leaders) in the elicitation and prioritization of research questions that address current and future stakeholder needs.
2.3: Demonstrate the ability to critically analyze and assess available scientific evidence from peer-reviewed articles, systematic reviews, meta-analyses, and gray literature to identify novel LHS questions and to judge the applicability of the evidence to a local care setting.

### Domain 3: Research Methods

LHS scientists will use research models and frameworks, select and evaluate study designs, measure outcomes and perform data analysis for research done within the context of a health system.

Research Methods
<b>Domain Definition</b> To conduct research within the context of complex health systems using appropriate study designs and analytic methods to assess outcomes of interest to health system stakeholders.
<b>Domain Competencies</b>
3.1: Demonstrate the ability to use theory and conceptual models in the design and interpretation of LHS research.
3.2: Demonstrate the ability to develop an appropriate observational, quasi-experimental, or experimental study design while mitigating threats to internal and external validity for research that is minimally disruptive to operations in real world health systems and practices.
3.3: Demonstrate knowledge of mixed methods and how they can be used to improve LHS research studies.
3.4: Demonstrate knowledge of how to assess multilevel determinants of health and health care disparities when designing studies.
3.5: Demonstrate the ability to select and interpret appropriate clinical, financial, and patient-centered outcomes of interest based on the concepts they measure and their measurement properties.
3.6: Demonstrate the ability to apply the principles of hypothesis testing and statistical inference to data collected routinely through the course of care as well as supplemental data from patients, providers, and health systems.

## Domain 4: Informatics

LHS scientists will use the science of information as a core capability. This includes the technologies, processes and personnel involved in the use of information.

Informatics
<b>Domain Definition</b> To know how to use information systems to conduct LHS research and improve patient and health system outcomes.
<b>Domain Competencies</b>
4.1: Demonstrate the ability to use data derived from electronic health records and other clinical information sources for research and quality improvement.
4.2: Demonstrate knowledge about additional data sources that can be linked to health system clinical data in order to augment exposure and outcome ascertainment.
4.3: Demonstrate the ability to assess data quality and apply data quality assurance processes, including error prevention, data cleaning, data monitoring, documentation, and relevant data standards.
4.4: Demonstrate knowledge of population health informatics, including disease surveillance, monitoring of community health, assessment of social and behavioral determinants of health, and geographic information systems.
4.5: Demonstrate knowledge of clinical information systems, including electronic health records, clinical documentation, computerized physician order entry, clinical decision support systems, electronic prescribing, medical imaging, and clinical/population dashboards.

## Domain 5: Ethics of Research and Implementation in Health Systems

LHS scientists will receive basic ethics training provided for all clinical research projects. In addition, specific competencies related to research projects embedded in learning health systems will be addressed.

Ethics of Research and Implementation in Health Systems
<b>Domain Definition</b> To ensure that research and quality improvement done in health care settings adheres to the highest ethical standards.
<b>Domain Competencies</b>
5.1: Demonstrate the ability to apply ethical principles in the engagement of health systems, including issues of business ethics and the importance of publishing both positive and negative findings in the public domain.
5.2: Demonstrate knowledge of what activities constitute research as opposed to quality improvement activities and seek appropriate oversight for each.
5.3: Demonstrate knowledge of specific Health Insurance Portability and Accountability Act requirements associated with varied data sources used in health systems research activities, and seek appropriate approvals.
5.4: Demonstrate the ability to identify and minimize potential conflicts of interest in the design, conduct, and reporting of research conducted in health systems.
5.5: Demonstrate knowledge of ethical and legal considerations when engaging in multi-system studies for compliant collaboration and study conduct.

## Domain 6: Improvement and Implementation Science

LHS scientists will apply and integrate knowledge generated from clinical research projects. This requires an understanding of quality improvement methodology and its relationship to clinical research performed in a learning health system. Further, using performance measurement techniques enable LHS scientists to assess quality improvements.

Improvement and Implementation Science
<b>Domain Definition</b> To reduce avoidable variation in process and outcomes and ensure the systematic uptake of research findings in a health system.
<b>Domain Competencies</b>
6.1: Demonstrate the ability to employ specific quality improvement methods to reduce avoidable variation in clinical processes and outcomes in routine practice.
6.2: Demonstrate the ability to employ specific implementation science or quality improvement methods to study and promote systematic uptake of research findings and other effective clinical interventions into routine practice.
6.3: Demonstrate knowledge regarding when to mount larger efforts to scale up, spread, and sustain successful interventions based on strength of clinical evidence and organizational and provider readiness to change and adopt interventions.

## Domain 7: Engagement, Leadership, and Research Management

LHS research utilizes an applied approach. Therefore, LHS scientists will engage diverse system stakeholders and lead the team in all aspects of the research process.

Engagement, Leadership, and Research Management
<b>Domain Definition</b> To engage stakeholders in all aspects of the research process and effectively lead and manage LHS research teams and projects.
<b>Domain Competencies</b>
7.1: Demonstrate the ability to build and lead research teams with diverse health system stakeholder representation.
7.2: Demonstrate knowledge of the values and communication mechanisms used by stakeholder groups involved in research in health systems.
7.3: Demonstrate the ability to translate, disseminate, and communicate the value proposition and business case for research to diverse health system stakeholders.
7.4: Demonstrate the ability to conduct effective team-based project management, employing skills in leadership, communication, negotiation, consensus building, and problem solving.
7.5: Demonstrate the ability to develop protocols consistent with health systems needs and timelines, employing patient and clinician engagement, and using a mix of conventional and alternative funding sources.
7.6: Demonstrate the ability to implement protocols aligned with health systems operations and integrated into clinical settings, including engaging clinicians in the research process.
7.7: Demonstrate knowledge of participatory research approaches that foster participation and engagement of vulnerable populations.

## Domain 8: Health Equity and Justice

LHS research should include diverse populations that are representative of the health system.

Health Equity and Justice
<b>Domain Definition</b> Know how to assess health equity and apply LHS science methods to advance equity and justice in healthcare delivery systems and health
<b>Domain Competencies</b>
8.1 Assess how existing health inequities affect population-level health, individual health, and health care delivery systems with methods grounded in an awareness of the multilevel factors contributing to such inequities.
8.2 Apply methods to optimally engage diverse participants (including clinicians, staff, patients, community members, and caregivers) in LHS initiatives throughout each initiative, from priority-setting to design to implementation through evaluation.
8.3 Demonstrate awareness of the value and limitations of sub-group analyses in LHS research and improvement activities to understand heterogeneity of health system effectiveness.
8.4 Apply LHS knowledge and methods to translate, implement, and scale research innovations to advance equity and justice in health and healthcare delivery.
8.5 Demonstrate awareness of measurement tools related to health equity at the population, community, healthcare practitioner, and individual patient and community member levels.

## Learning Health Systems Science Competencies

