HEALTH INFRASTRUCTURES & LEARNING SYSTEMS

MEDICAL SCHOOL
DEPARTMENT OF LEARNING HEALTH SCIENCES
UNIVERSITY OF MICHIGAN
LETTER FROM THE PROGRAM DIRECTOR

Welcome to Health Infrastructures and Learning Systems!

We invite you to lead healthcare improvement through transformative research into health systems. Housed in the University of Michigan Medical School, the Department of Learning Health Sciences (DLHS) is a first-of-its-kind basic science department focused on learning at all levels of scale, from individuals to systems spanning states and nations. We’re part of an international movement to promote learning health systems, which are organizations or networks which continuously self-study and adapt using data and analytics to generate knowledge, engage stakeholders, and implement behavior change to transform practice. The Health Infrastructures and Learning Systems (HILS) graduate programs will place you at the forefront of this emerging science.

HILS is unique in its joint, equal emphasis on information sciences and social sciences related to behavior change and continuous improvement in health. The program develops leaders and researchers in learning health systems and implementation science. Graduates will be able to create innovative solutions to address some of the most demanding health care challenges.

I encourage you to learn more about this dynamic, interdisciplinary graduate program, including its distinctive curriculum, innovative research, and exceptional scholars. Please join us in the Health Infrastructures and Learning Systems community at Michigan!

Sincerely,
Anne Sales, PhD, RN
HILS Program Director
Continuous improvement in individual and population health requires health professionals, health care delivery organizations, and ultra-large scale health systems that are capable of data-directed self study and adaptive change.

The multidisciplinary MS and PhD in Health Infrastructures and Learning Systems (HILS) programs will undertake research to address the social and technical challenges of making continuous health improvement routine.

The concept of Infrastructure provides a point of focus and differentiation for the program. Infrastructure is defined as integrated technologies, policies, and patterns of human behavior that, together, support a broad range of activities in a given domain of human endeavor. Successful infrastructures are dynamic and adapt to changes in quantitative and qualitative demands that drive changes in policies, and in supportive technological advances.

Because health care delivery is an information and human intensive domain, we define Health Infrastructures as the creation, curation, and application of information at multiple levels of refinement ranging from raw data to actionable knowledge. The goal of health infrastructures is to improve the health of individuals and populations.

Learning Systems promote improvement through simultaneous execution of multiple learning cycles, each focused on a specific health problem or improvement goal. What makes these learning processes sustainable at a large scale, where hundreds, perhaps thousands, of these cycles will be ongoing simultaneously, is a socio-technical infrastructure platform.

Scientists are needed to study and help evolve sociotechnical systems for discovering and disseminating biomedical knowledge for the purpose of greatly improving the applicability, reach, and positive impact of such knowledge for the benefit of everyone.
The HILS program emphasizes the role of learning and the tools needed to facilitate change at the system level. HILS focuses on learning in the healthcare environment and introduces distinct models of adaptive change. HILS is a unique program, in which students will learn to apply their skills immediately to existing problems with current infrastructures for health.

Defining characteristics include:

- nature of health information
- role of information technology and informatics
- translation of biomedical research knowledge into clinical practice or consumer advice
- complex organizational, social, and regulatory environment in which learning in the health sciences takes place

In a Learning Health System, communities committed to solving health-related problems assemble and analyze data relevant to the problem, which leads to discovery of new knowledge from the data. They complete a learning cycle by applying that knowledge to change practice and improve health. Infrastructure – technology, policy, and people – is absolutely essential to a successful learning system that can address a range of health problems and function at any level of scale from single organizations to entire nations.

Charles P. Friedman, PhD - Chair, Department of Learning Health Sciences; Professor Learning Health Sciences, Information, and Public Health
INTERDISCIPLINARY CURRICULUM

Four types of courses are required for all students in the MS and PhD programs: research methods courses, courses in the components of the learning cycle, courses in health infrastructures, as well as at least one cognate and one elective course tailored to the student’s area of scholarship. The cognate requirement is intended to foster intellectual breadth, which, due to the highly interdisciplinary nature of the HILS program, will be inherent in the courses required of and elected by students.

Students will be thoroughly grounded in each of the phases of the learning cycle and the infrastructure required to enable learning cycles to function in a Learning Health System (depicted on the previous page). The health infrastructures courses bookend the learning cycle, ensuring that students gain an initial understanding of the concepts and approaches to building and maintaining health infrastructure, with opportunities to apply and experience actual creation and maintenance activities.

Courses required to achieve program objectives, master the domains, demonstrate skills, and have the capacity to create the products, include:

- Learning system infrastructure
- Health systems
- Research methods
- Behavior change/implementation methods
- Policy and ethics
- Aggregation and analytics
- Knowledge management

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<th>FALL Year 1 MS + PhD</th>
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<td>Health Infrastructures Pro Seminar 1</td>
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<td>Data Science in Health</td>
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The Master’s program is designed to appeal to professional students (clinicians and engineers, among others) who wish to gain new knowledge and skills in a short, intensive program.
APPLIED PRACTICE AND IN-DEPTH RESEARCH

An implementation project, completed the summer following the first year of the program, provides students with an opportunity to apply their knowledge and skills. Most students will work with faculty on projects related to their focal area. A student interested in learning implementation and behavior change skills may work with a faculty member involved in implementing guideline-concordant care for low-income patients with diabetes in community settings.

Doctoral students begin the dissertation proposal early on. Working closely with their advisor and planning committee, they draft a proposal for their dissertation, following guidelines for nationally-funded research applications.
INTERDISCIPLINARY EXPERT FACULTY

The University of Michigan has broad and deep expertise in HILS domains among faculty across many schools and colleges. The HILS Program fosters intellectual ties and opportunities for synergy among these faculties. The nature of the program engages many schools and colleges across the University of Michigan, including but not limited to: the Medical School, School of Information, School of Public Health, College of Engineering, and School of Education.

The department includes an interdisciplinary mix of researchers with expertise in behavior and organizational change, data science, informatics, systems science, and quality and performance improvement methods.

FACULTY PROFILES

Anne Sales, PhD, RN
Professor, Division of Learning and Knowledge Systems; Director of the Health Infrastructures and Learning Systems (HILS) program; Research Scientist, Center for Clinical Management Research, VA Ann Arbor Healthcare System

Dr. Sales, the HILS program director, is a Professor in DLHS, and Research Scientist at the Center for Clinical Management Research at the VA Ann Arbor Healthcare System. Her work involves theory-based design of implementation interventions. She is co-Editor-in-Chief of Implementation Science, an international online, open-access journal.

Charles P. Friedman, PhD
Chair, Department of Learning Health Sciences; Josiah Macy Jr. Professor of Medical Education; Division Chief, Learning and Knowledge Systems; Professor of Information; Professor of Public Health

Professor Friedman’s research focuses on information and knowledge interventions in health: how to design them, how to implement them, and how to study their efficacy and effectiveness through the rigorous application of behavioral and social science methods. He is leading the pursuit of national and international high performance Learning Health Systems.
FACULTY PROFILES

Raymond G. De Vries, PhD
Professor of Learning Health Sciences; Co-Director of the Center for Bioethics and Social Sciences in Medicine; Professor of Sociology; Professor of Obstetrics and Gynecology

Dr. De Vries is interested in the ethics of research, in qualitative and quantitative research methods, and in the comparative study of health care systems. He is widely known for his work on the sociology of bioethics and the sociology of maternity care.

Zachary Landis-Lewis, PhD, MLIS
Assistant Professor of Learning Health Sciences

A biomedical informatician with expertise and training in implementation science, and library and information science, Dr. Landis-Lewis has worked extensively in both the U.S. and Sub-Saharan Africa, most recently in Malawi.

Gretchen A. Piatt, MPH, PhD
Assistant Professor of Learning Health Sciences; Assistant Professor of Health Behavior and Health Education

Dr. Piatt is a chronic disease epidemiologist, with expertise in designing and evaluating efforts to improving health systems and health care delivery for people with chronic illness. She is an Implementation and Dissemination scientist.

Jodyn E. Platt, MPH, PhD
Assistant Professor of Learning Health Sciences

Dr. Platt conducts qualitative and quantitative survey development and analysis to determine the weaknesses and pivot points of complex health systems, investigating attributes like trust, facilitators, and barriers to improved public health outcomes and public health policy.
**Timothy A. Pletcher, DHA**  
Adjunct Research Investigator of Learning Health Sciences;  
Executive Director of the Michigan Health Information Network Shared Services (MiHIN)

Dr. Pletcher’s areas of expertise include information systems architectures, system dynamics modeling, multi-stakeholder engagement, effective large-scale change management, strategic alignment of policy and technology, and management of information technology.

**F. Jacob Seagull, PhD**  
Assistant Professor of Learning Health Sciences; Director of the Patient Safety and Quality Leadership (PASQUAL) Scholars program

Dr. Seagull’s work is centered on the study of human behavior in complex medical settings, using human factors to understand how education and technology can facilitate human performance in high-stakes environments.

**Karandeep Singh, MD, MMSc**  
Assistant Professor of Learning Health Sciences; Assistant Professor of Medicine, Division of Nephrology

Dr. Singh is interested in improving patient care through technology. His research focuses on understanding disease epidemiology through high-dimensional statistics and machine learning, and mobile health apps.

**V.G. Vinod Vydiswaran, PhD**  
Assistant Professor of Learning Health Sciences; Assistant Professor, School of Information

Dr. Vydiswaran’s research involves developing and evaluating text mining and natural language processing techniques, resources, and tools for medical informatics, data mining, information trustworthiness, and machine learning.
WHY U-M? The University of Michigan is ranked consistently among the nation’s finest. What matters most in choosing your graduate program is the match between your particular interests, abilities, and goals with the programs, approaches and opportunities offered.

U-M EXCELS AT GRAD EDUCATION
Of more than 125 U-M graduate programs, 103 are ranked in the top ten.

HILS is highly interdisciplinary – drawn from highly ranked U-M disciplines: Public Health (#4), Health Care Management (#1), Health Policy and Management (#5), Information Systems (#1) and Engineering (#6), Psychology (#4), Sociology (#4), Social Psychology (#1)


U-M ranks 19th in the world based on academic reputation - 3rd amongst US public institutions.


LOOKING FOR IMPACT? The scope of U-M’s research programs and high number of doctoral degree recipients contribute to the University’s position (#5 of public national universities), highlighting the U-M’s contributions to society. SOURCE: Washington Monthly (2015)

U-M led the nation’s public universities in total research spending: $1,375 million in 2013 (latest data available). SOURCE: National Science Foundation, Higher Education Research and Development Survey

A CLASSIC COLLEGE TOWN
Ann Arbor is consistently voted one of the best places to live in the country.

• #1 Most Educated City in America

• #2 The 50 Best College Towns In America
  SOURCE: Best College Reviews (2015)

• #13 Top 100 Best Places to Live
HILS Program

HILS attracts students and scholars with backgrounds from a variety of disciplines. Prospective students should be passionate about collaboratively addressing the grand challenge of transforming health systems locally, regionally, nationally, and globally into entities that learn and improve through self-study to benefit the health of individuals and populations.

DLHS is fully committed to establishing and supporting a diverse faculty, staff, and student community. Creating an academic community that is representative of our national and global community is essential to the healthy development of all learning, teaching, and research activities, and to those of the HILS program in particular. Establishing a new body of science demands consideration of a wide variety of experiences and viewpoints, particularly those of traditionally underrepresented populations in the health sciences and essential related disciplines.

ADMISSIONS

Applications for admission to the PhD and MS programs should be made through U-M’s Rackham Graduate School, www.rackham.umich.edu. The Rackham Admissions website includes a step-by-step guide to the process, the online application, a checklist of required supporting documentation, and information about fellowships and other funding opportunities.

Additional specific information for HILS admissions is on the departmental website: hils.med.umich.edu. Most of the HILS doctoral students have received at least four years of full funding through a Graduate Student Research Assistant appointment, which includes tuition, stipend and graduate student health insurance. All students admitted to the HILS doctoral program are considered for financial support.
To ensure that you receive the most current information about the Health Infrastructures & Learning Systems program and requirements, please review our website.

hils.med.umich.edu

Contact HILS Admissions:
HILS-PhD-MS@umich.edu • (734) 936-1644