

HMP 611 - SI 611
Population Health Informatics
Winter, 2020

Wednesday 4:00pm – 7:00
Room 3755 SPH I

Professor: Kevin Dombkowski
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Office Hours:
Thursday 2:00 - 3:30 and by appointment

(Important note: Office hours may be rescheduled in some weeks. Updates will be sent via email.)

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Course Description:

This course explores the foundations of population health informatics, including information architecture; data standards and databases as they pertain to population health management. This course examines key concepts related to registries, electronic health records, epidemiological databases, biosurveillance, health promotion, and quality measurement in population health management.

Course Materials:

This course will use a textbook: *Public Health Informatics and Information Systems* (2nd Edition)
Editors: J.A. Magnuson, Paul C. Fu, Jr.

Do not purchase the textbook. This textbook is **free** to all students in pdf which can be accessed from the UM library website: <http://mirlyn.lib.umich.edu/Record/012544264>

From that page click the link "[Available Online](#)" link near the bottom. It's found in the "**Holdings**" tab under "**Electronic Resources**".

The University of Michigan's Canvas system will host the course website. Unless otherwise noted, all other course materials will be available on Canvas. Any changes in schedule and procedures will be both posted on Canvas and pushed as an e-mail message to all students.

Prerequisites:

HMP 668 / SI 542 / BIOINF 668 Introduction to Health Informatics or permission of instructor.

Course Goals:

At the end of this course, students will be able to:

- Demonstrate and apply a working knowledge of population health terminology;
- Understand and apply health informatics concepts that are salient to population health;
- Apply data concepts, standards and architectures for sharing information to meet population health objectives;
- Demonstrate how various information technology tools and strategies are applied in the practice of population health; and
- Understand current challenges in population health and evaluate potential informatics solutions.

Competencies:

This course provides training toward the following HMP major competencies:

- A.3 Develop, understand and use data from performance, surveillance or monitoring systems.
- A.8 Operational analysis: Analyze, design, or improve an organizational process, including the use of quality management, process improvement, marketing and information technology principles and tools.
- A.9 Population health assessment: Understand and apply basic epidemiologic principles, measures, and methods to assess the health status of a population; identify risk factors in individuals and communities; evaluate the impact of population-based interventions and initiatives.

This course also addresses the following Master of Health Informatics (MHI) competencies:

1. Assess the needs and resources of individuals, organizations, and communities where individuals live and work to ensure that information technology deployed to improve health will sustainably meet these needs.
2. Appropriately utilize theories of individual behavior, social science, health management, and organizational change in the design and implementation of socio-technical interventions.
3. Evaluate socio-technical interventions to ascertain their effects on health and healthcare.

In addition, the following HMP minor competencies will be also addressed:

- B.1 Convey: Speak and write in a clear, logical, and grammatical manner in formal and informal situations; prepare cogent business presentations; facilitate an effective group process.
- E.1 Actively seek feedback from others, reflecting and learning from successes and failures.
- E.2 Develop an accurate view of own strengths and developmental needs, including the impact one has on others.

Course Requirements:

The course will meet in 3755 SPH I on Wednesdays, 4-7pm. Class sessions will start promptly at 4:00pm. At the first class session each student will create a “name tent”; please bring your name tent to each class.

Typically, the first ~60 minutes of each session will be a formal lecture. Following a 10-minute break, we will often switch to a more interactive mode addressing case studies and illustrations drawn from local, state, and national perspectives.

Readings for each session will include textbook chapters as well as published papers from peer reviewed literature or other sources. The textbook chapter associated with each session is shown on the course schedule. The reading material for each session will typically be discussed during each class session and should be read in advance. Optional resources for additional reference will also be provided.

Assignments

This course will require class participation, two written case studies, a mid-term exam, and an in-class presentation:

1. Class participation

This course requires class participation. Attendance and discussion participation will be tracked; 20% of your grade will reflect the degree to which you regularly participate in class discussions. The quality of class discussion will weigh heavily on the degree to which students actively participate in discussion and in-class exercises.

2. Assignment #1: Information Standards

The first assignment will be a case study conducted to illustrate how data standards are applied to support interoperability within any aspect of population health management. Case studies can be drawn from any aspect of population health management and may describe the uses of standards for clinical data classifications, person / provider identifiers, or electronic data interchange. Students will research the selected case study topic area which will be summarized in a paper (6-8 pages, double spaced, not including figures or tables). Assignment 1 will be posted on Canvas by **January 22** and will be due before midnight on **February 5, 2020**.

3. Midterm exam

There will be a take-home midterm exam comprised of essay questions aimed at the primary concepts discussed in class. Additional details about the midterm exam will be provided during the semester. The midterm exam will be posted on Canvas on **February 19** and will be due at 8am on **February 27, 2020**.

4. Assignment #2: Information Architectures

Our second assignment will explore the information architectures that are currently being used in the context of a real-world example of population health informatics. This assignment will be completed by teams comprised of 2 students; teams will be determined by students.

Your case studies for this paper can be drawn from any aspect of population health management illustrating how information architectures support health assessment, policy development, assurance of health services, or program evaluation. Examples include (but are not restricted to):

- vital records
- medical device registries
- epidemiological investigations
- biosurveillance / disease surveillance
- health information exchanges (HIEs)
- chronic disease registries
- disaster follow-up registries
- chronic disease management
- GIS / geospatial analysis
- e-prescribing / drug monitoring systems

The case study will describe the databases, applications, data standards, procedures, and applications being used. The case study will be summarized in a paper (10-12 pages, double spaced, not including figures or tables). Each team must have their team and topic approved by **March 6, 2020**. More details will be provided on Canvas. Paper must be submitted on Canvas by midnight **March 27, 2020**.

5. Assignment #2 Class Presentation

This assignment will be completed the same teams for Assignment #2. Your team's Assignment #2 material will be summarized in PowerPoint and presented by each team to the class. The content of the presentation will be drawn directly from information gathered to conduct the 2nd Assignment.

Presentations will be limited to 20 minutes followed by 5 minutes of questions and class discussion. Each team must decide how best to share the preparation and presentation. It is very important to rehearse your presentation to ensure that you & your teammate can clearly present the material in 20 minutes. An outline and grading rubric for the presentation will be provided on Canvas.

Grading

Grades will be determined based on a total of 100 points:

Assignment	Class Week	Date	Value (% of final grade)
Class participation – attendance and discussion	All	All	20%
Assignment #1: Information Standards	5	February 5	25%
Mid-term exam	8	February 27	20%
Assignment #2: Information Architectures			
Topic approval (required)	8	March 6	-
Paper submission	11	March 27	25%
Class Presentation	12-14	4/1– 4/15	10%

Appraisals of class participation will include evidence of preparedness with regard to the assigned reading and class discussions. Primary emphasis will be on quality as opposed to quantity of participation. Letter grades will be determined as follows:

Letter Grade	Points	Interpretation
A+	97-100	Extraordinary achievement. Rarely given.
A	94-96	Consistently distinguished performance in all course aspects, such qualities as analytical ability, creativity, and originality are exhibited at a very high level.
A-	90-93	Strong, solid achievement in most aspects of the work.
B+	87-89	Good performance. Consistent with performance expected of students in a graduate degree program.
B	84-86	Acceptable.
B-	80-83	Borderline.
C+	77-79	Poor performance. This is a marginal grade which alerts students to their limited performance in a particular course.
C	74-76	Very poor performance.
C-	70-73	Minimal. Performance not at a graduate student level. Student should review his/her progress in the program with the associate dean for academic affairs.

Classroom Expectations/Etiquette:

Come to class ready to participate. Be respectful.

Academic Integrity:

Unless otherwise specified in an assignment, all submitted work must be your own, original work. Any excerpts from the work of others must be clearly identified as a quotation, and a proper citation provided. Any violation of the School's policy on Academic and Professional Integrity (stated in the Master's and Doctoral Student Handbooks) will result in severe penalties, which might range from failing an assignment, to failing a course, to being expelled from the program, at the discretion of the instructor and the Associate Dean for Academic Affairs.

Student Well-being:

SPH faculty and staff believe it is important to support the physical and emotional well-being of our students. If you have a physical or mental health issue that is affecting your performance or participation in any course, and/or if you need help connecting with University services, please contact the instructor or the Office of Academic Affairs.

Student Accommodations:

If you think you need an accommodation for a disability, please let the instructor know at your earliest convenience. Some aspects of this course, the assignments, the in-class activities, and the way we teach may be modified to facilitate your participation and progress. As soon as you make us aware of your needs, we can work with the Office of Services for Students with Disabilities (SSD) to help us determine appropriate accommodations. SSD typically recommends accommodations through a Verified Individualized Services and Accommodations (VISA) form. Any information you provide is treated as confidential.

Feedback:

My goal is to provide objective, helpful feedback on all assignments in a timely manner. Please feel free to follow-up with me if you can't follow a particular comment I've written, or if points were miscalculated. Class participation is 20% of your grade, halfway through the semester I will individually let any students know if they are not participating at an acceptable level. Please also use it as an opportunity to let me know if there are things I can do to facilitate your participation.

Feedback is bi-directional! I would greatly appreciate your feedback on the content, structure, presentation methods, guest speakers – anything. There will be two formal opportunities for evaluation. I will conduct an anonymous mid-semester evaluation and there will also be a formal university-sponsored evaluation at the end of the semester. In addition to these opportunities, I welcome you to share feedback with me informally and via whichever channel is most comfortable to you.

Unit	Session Number	Date	Session Title
Unit 1 — Introduction to Population Health and Information Technology	1	January 8	A: Introduction to population health informatics course (course outline & syllabus) B: Population health informatics: overview of key concepts, data sources and data tools Class exercise: <i>The Future is Now</i>
	2	January 15	A: Information Architecture Class exercise: Case study illustrating silos and interoperability in public health; logical data models B: Privacy, Confidentiality and Security of Public Health Information
	3	January 22	A: Information Standards I: Data standards, types of standards, benefits of standards, standards organizations B: Information Standards II A case study of chronic disease classification <i>Overview of Assignment #1: Information Standards</i>
Unit 2 — The Science of Population Health Informatics	4	January 29	A: Administrative claims data in population health management B: Class exercise: Hands on analysis of administrative claims data
	5	February 5	Vital records and registries in public health <i>Guest speaker</i> – Jeff Duncan, PhD State Registrar and Director Division for Vital Records and Health Statistics Michigan Department of Health and Human Services <i>Assignment #1 due</i>
Unit 3 — Epidemiological Databases and Registries			

Unit 3 — Epidemiological Databases and Registries	6	February 12	A: Vital records B: Registries; Illustrations from population health: real-time EHR interoperability with immunization registries
	7	February 19	Informatics in disease prevention and epidemiology Guest speaker – <i>chronic disease management; Betsy Wasilevich, PhD, Senior Epidemiologist Division of Environmental Health, Michigan Dept. of Health and Human Services (MDHHS)</i> Mid-term exam distributed
	8	February 26	A: Health information exchange A: Quality Measurement Mid-term exam due February 27 Assignment #2 topic approval - due March 6
		March 4	NO CLASS - Winter Break
	9	March 11	Guest speaker – <i>Population Health Analytics; Anne Fischer, Senior Director of Health Intelligence springbuk</i> ** TENTATIVE **
	10	March 18	Guest speakers – <i>biosurveillance; Brad Carlson (Syndromic Surveillance) and Ed Hartwick (MDSS)</i> ** TENTATIVE **
	11	March 25	A: Geographic information systems (GIS) B: GIS exercise [TBD] Assignment #2 due March 27
	Unit 4 — Case Study Presentations	12	April 1
13		April 9	Class presentations, 6 -10
14		April 15	Class presentations, 11 - 15

Unit 1 — Introduction to Population Health and Information Technology

This unit provides an overview of public health organization and services in the United States and highlights how information technology and informatics applications intersect with public health practice. Fundamental concepts of data as they pertain to population health are reviewed.

Session 1

- Introduction to population health informatics course (course outline & syllabus)
- Population health informatics key concepts: population vs. public health; informatics
- Overview of data concepts; data sources; data tools; data quality

Topics: What is population health informatics and how does it relate to public health? How can it be applied in the 'real world'? Who are the main stakeholders? What are the fundamental types of data? How is data quality assessed? What tools are used in population health to manage and access data?

Class exercise:

The Future is Now - information technology changed the public health landscape in the past 25 years. How do we anticipate changing population health management in the coming years?

Readings:

Rowley, J. (2007). The wisdom hierarchy: representations of the DIKW hierarchy. *Journal of Information Science*, 33 (2). Retrieved from <http://jis.sagepub.com/content/33/2/163.refs>

Other references:

1. Magnuson, J. A., & Fu, Jr., P. C. (2014). *Public Health Informatics and Information Systems*. New York: Springer-Verlag London. Retrieved from <http://link.springer.com/book/10.1007%2F978-1-4471-4237-9>.
 - Population health informatics key concepts: population vs. public health; informatics (Chapter 1)
 - History & significance (Chapter 2)
 - Context and infrastructure (Chapters 3-4)
 - Data Sources and Data Tools (Chapter 7), pages 107-131. Also see pages 4, 14, 62, 522, 591, 595
2. San Diego State University. (2014 Jul 2). Finding real value in big data for public health. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2014/07/140702122432.htm

3. Brino, A. (2014, Jun 10). What can big data do for public health? *Healthcare IT News*. Retrieved from <http://www.healthcareitnews.com/news/what-can-big-data-do-public-health>
 4. Liyanage, H., de Lusignan, S., Liaw, S.T., Kuziemsky, C.E., Mold, F., Krause, P., Fleming, D., & Jones, S. (2014 Aug). Big Data Usage Patterns in the Health Care Domain: A Use Case Driven Approach Applied to the Assessment of Vaccination Benefits and Risks. Contribution of the IMIA Primary Healthcare Working Group. *Yearb Med Inform.*, 9 (1):27-35. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25123718>
 5. Google Flu Trends <http://www.google.org/flutrends/>
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Unit 2 — The Science of Population Health Informatics

This unit details the automated systems used in population health. The information architectures used to support population health are explored, as well as data standards and logical data models. Electronic health records (EHRs) as they pertain to population health are reviewed.

Session 2

- Information Architecture; silos and interoperability in public health
- Privacy, Confidentiality and Security of Public Health Information

Topics: What are information ‘silos’ and the implications? ? What are information architectures? How can data sharing be maximized in population health applications? How do *privacy, confidentiality, and security* differ? How can the practice of public health balance the rights of individuals with the needs of the community?

Class exercise:

Exploration of data silos and interoperability using public health as a case study

Readings:

1. Magnuson, J. A., & Fu, Jr., P. C. (2014). *Public Health Informatics and Information Systems*. New York: Springer-Verlag London. Retrieved from <http://link.springer.com/book/10.1007%2F978-1-4471-4237-9>
 - Public Health Informatics Infrastructure, Chapter 5, pages 69-88
 - Information Architecture, Chapter 6, pages 89-105; also see pages: 72, 73, 118, 133-136, 260, 390, 394, 535, 566
 - Privacy, Confidentiality and Security of Public Health Information (Chapter 9), pages 155-172.

Other References:

- Glaser, J. (2011). Interoperability: The key to breaking down information silos in health care. *Healthcare Financial Management*, 44-50.
 - Krisberg, K. (2014). Work to join public health, primary care moves ahead: Breaking down silos. *The Nation's Health*, 44. Retrieved from http://thenationshealth.aphapublications.org/content/44/5/1.2.short/reply#nathealth_el_8841
 - Government Accountability Office (GAO), *Electronic Health Records: Nonfederal Efforts to Help Achieve Health Information Interoperability*, GAO-15-817 (Washington, D.C.: September 16, 2015).
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Session 3

- Information Standards Part I: Data standards; types of standards, benefits of standards, standards organizations

Topics: What are information standards? Who establishes standards? Why are standards essential to interoperability? How are they applied in population health settings?

Class Exercise: Case study of chronic disease classification

Overview of Assignment: Case Study #1: Information Standards

Readings:

- Magnuson, J. A., & Fu, Jr., P. C. (2014). *Public Health Informatics and Information Systems*. New York: Springer-Verlag London. Retrieved from <http://link.springer.com/book/10.1007%2F978-1-4471-4237-9> Information Standards (Chapter 8), pages: 133-153

Other References:

CPT:

- American Medical Association (AMA). (2014). CPT® Process - How a Code Becomes a Code. Retrieved from <http://www.ama-assn.org/ama/pub/physician-resources/solutions-managing-your-practice/coding-billing-insurance/cpt/cpt-process-faq/code-becomes-cpt.page>

ICD-9 CM:

- Centers for Disease Control and Prevention (CDC). (2013). International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). In *Classification of Diseases, Functioning, and Disability*. Retrieved from <http://www.cdc.gov/nchs/icd/icd9cm.htm>

ICD-10:

- Centers for Disease Control and Prevention (CDC). (2014). Public Health Transition to ICD-10-CM/PCS: ICD-10-CM/PCS Transition: What You Need to Know. In *Classification of Diseases, Functioning, and Disability*. Retrieved from http://www.cdc.gov/nchs/icd/icd10cm_pcs.htm
- Centers for Disease Control and Prevention (CDC). (2014). International Classification of Diseases, Tenth Revision (ICD-10). In *Classification of Diseases, Functioning, and Disability*. Retrieved from <http://www.cdc.gov/nchs/icd/icd10.htm>

NDC:

- U.S. Food and Drug Administration (FDA). (2014). National Drug Code Directory. In *Drugs*. Retrieved from <http://www.fda.gov/drugs/informationondrugs/ucm142438.htm>

HL7:

- Health Level Seven International. (2014). Health Level Seven International. Retrieved from <http://www.hl7.org/>

Bar codes:

- National Center for Immunization & Respiratory Diseases. (2012). Barcodes Part 2: CDC 2D Vaccine Barcode Pilot. Retrieved from http://www.hhs.gov/nvpo/nvac/meetings/pastmeetings/2012/barcoding_part_2.pdf
- Centers for Disease Control and Prevention (CDC). (2014). Two-Dimensional (2D) Vaccine Barcodes. In *Immunization Information Systems (IIS)*. Retrieved from <http://www.cdc.gov/vaccines/programs/iis/2d-vaccine-barcodes/>
- DENSO ADC. (2011). QR Code Essentials. Retrieved from <http://www.nacs.org/LinkClick.aspx?fileticket=D1FpVAvvJuo%3D&tabid=1426&mid=4802>
- DENSO WAVE INCORPORATED. (2014). QRcode.com. Retrieved from <http://www.qrcode.com/en/index.html>
- U.S. Department of Health and Human Services, Food and Drug Administration, Center for Drug Evaluation and Research, & Center for Biologics Evaluation and Research. (2011). Bar Code Label Requirements: Questions and Answers. Retrieved from

<http://www.fda.gov/downloads/biologicsbloodvaccines/guidancecomplianceregulatoryinformation/guidances/ucm267392.pdf>

LOINC:

- Regenstrief Institute, Inc. (2014). LOINC from Regenstrief: A universal code system for tests, measurements, and observations. A universal code system for tests, measurements, and observations. Retrieved from <http://loinc.org/>

SNOMED:

- International Health Terminology Standards Development Organisation. (2014). SNOMED CT. Retrieved from <http://www.ihtsdo.org/snomed-ct/>
- U.S. National Library of Medicine. (2014). Unified Medical Language System® (UMLS®): SNOMED Clinical Terms® (SNOMED CT®). Retrieved from http://www.nlm.nih.gov/research/umls/Snomed/snomed_main.html

Session 4

- Administrative claims data in population health management

Topics: What are claims data? How are they used in population health? Why are they useful and who uses them?

Class Exercise: Hands-on claims data analysis group challenges

Session 5

- Vital records and registries in public health

Topics: Registries, including births, deaths, cancer registry and birth defects

Guest speaker – Vital records; Jeff Duncan, PhD; State Registrar and Director Division for Vital Records and Health Statistics, Michigan Department of Health and Human Services

Unit 3 — Epidemiological Databases and Registries

This unit defines the functions of epidemiology and how epidemiological reasoning can be applied to public health practice. The unit also describes the purpose of epidemiological databases and registries and explores applications illustrating how information can be exchanged with clinical entities to promote public health and assist in chronic disease management. This unit also summarizes concepts relating to quality data reporting and how it can impact population health through the use of clinical preventive services in primary care.

Session 6

A: Vital records systems

B: Registries; Illustrations from population health: real-time EHR interoperability with immunization registries

Topics: What are vital records? What information is collected by vital statistics systems? How is information collected? What are registries and how are they used in public health? How is information collected? Where does this information originate and how is it used in the US and globally?

Readings:

1. Magnuson, J. A., & Fu, Jr., P. C. (2014). *Public Health Informatics and Information Systems*. New York: Springer-Verlag London. Retrieved from <http://link.springer.com/book/10.1007%2F978-1-4471-4237-9> Informatics in disease prevention and epidemiology (Chapter 17), pages: 309-327.
2. Registries (Chapter 19), pages 355-371.
3. Ethics (Chapter 11), pages 191-209.
4. Magnuson, J. A., & Fu, Jr., P. C. (2014). *Public Health Informatics and Information Systems*. New York: Springer-Verlag London. Retrieved from <http://link.springer.com/book/10.1007%2F978-1-4471-4237-9> Electronic Health Records - Background (Chapter 10), pages 173-189.

Other References:

- MDCH vital records
- SEER
- MCIR background: www.mcir.org

Case Study: EHR interoperability with the Michigan Care Improvement Registry (MCIR): real-time HL7 reporting objectives, benefits, data quality issues, and future considerations.

Session 10

- Biosurveillance

Topics: What is biosurveillance data? How is biosurveillance data monitored, reported, and analyzed in the US and globally? What are health information exchanges (HIE) and how can they be used to support population health management?

Guest speakers – biosurveillance; Brad Carlson (*Syndromic Surveillance*) and Ed Hartwick (*MDSS*)

**** TENTATIVE ****

Readings:

1. Magnuson, J. A., & Fu, Jr., P. C. (2014). *Public Health Informatics and Information Systems*. New York: Springer-Verlag London. Retrieved from <http://link.springer.com/book/10.1007%2F978-1-4471-4237-9> Toxicology / environmental health (Chapter 15), pages 277-294 and Public health laboratories (Chapter 16), pages 295-308.

Session 11

- A: Geographic information systems (GIS)
- B: GIS Exercise – to be determined

How do health plans collect information to assess quality of care? What are geographic information systems (GIS)? How are they applied in population health? How can mobile devices and social networking play a role in population health management?

Readings:

1. Magnuson, J. A., & Fu, Jr., P. C. (2014). *Public Health Informatics and Information Systems*. New York: Springer-Verlag London. Retrieved from <http://link.springer.com/book/10.1007%2F978-1-4471-4237-9> Geographic information systems (Chapter 21), pages 399-427.
2. New technologies (Chapter 20), pages 375-398.

Other References:

1. GIS products – www.esri.com