



HPM 625 (section 001)

Applied Public Health Informatics: Diagnosis and Design of Public Health System Intelligence

(3 Credit Hours)

Department of Health Policy and Management
School of Public Health

Spring 2015 Syllabus

Class Location (McGavran-Greenberg Rm 2308)

Meeting Times (5:00-7:30pm)

Faculty:	Timothy Jay Carney	TA:	
Office:	1101-C McGavran- Greenberg	Location:	
Email:	tcarney@unc.edu	Email:	
Phone:	919.966.6907	Phone:	
Office Hours:	TBD	Office Hours:	

Course Overview

This course will expose students to the information-centric view of public health surveillance as a driver/enabler of public health intelligence.

This course will present the concept of situational awareness derived from the public health information value chain, which examines public health outcomes from their most discrete data elements, information resources, knowledge products, and core decisions.

Students will gain knowledge of the metrics, measures, and methods used to evaluate public health intelligence in public health and health care delivery settings such as local public health interventions, national HIT initiatives, and global health initiatives.

Resources

Website

HPM 625 has its own Sakai website. All course materials are in the [Course Resources](#) tab.

Books

Primary Textbooks

Endsley, Mica. Designing for Situational Awareness: An Approach to User-Centered Design. (second edition)

Allee, Verna. The Knowledge Evolution: Expanding Organizational Intelligence. (first edition)

Secondary Textbooks

Kerstin Denecke, Event-Driven Surveillance: Possibilities and Challenges (available online free PDF download)

Mark Smith, Robert Saunders, Leigh Stuckhardt, J. Michael McGinnis, Editors; Committee on the Learning Health Care System in America; Institute of Medicine. Best Care at Lower Cost: The Path to Continuously Learning Health Care in America (available online free PDF download)

Optional Reading

Allee, Verna. The Future of Knowledge: Increasing Prosperity Through Value Networks

Articles

Available through Electronic Reserve via Sakai in the Course Resources tab, organized by week.

Web Sources

A list of web resources will be compiled by both the instructor and students as the semester progresses

Other Resources

Other resources will be identified where the instructor and students agree they can aid in learning

Requirements and Expectations

<i>TJC</i>	<i>Class participants</i>
Be ready to learn and teach	Be ready to learn and teach
Select carefully integrated set of readings	This semester, sometimes skimming <i>will</i> suffice! However, active, thoughtful

	engagement with concepts and tools before each session remains vital. Please devote ~6 hours to preparing for each session.
Provide specific guidance on readings to maximize efficiency of participants' preparation time (see reading list below)	Post thought-provoking discussion questions for each session as well as any additional materials requested
Respond w/in 24 (or 36 on a bad day) hours to emails	Email with advance notice if missing a class or not contributing materials. Submit all assignments on time
Be available in office hours or by appointment to provide feedback and advice on assignments	Respect questions asked and project length – it's important to be succinct! Be ready to talk with classmates about your thoughts

Discussion Forums:

Course Format

Directed readings, streaming videos, web based lectures, guest speakers, and threaded discussions

Course Competencies

Upon the successful completion of the course, the student will be able to:

1. Understand the value of a highly effective information/knowledge culture in support of public health and health care delivery priorities such as (1) eliminating health disparities, (2) increasing overall situational awareness, (3) increasing informed decision making at all levels, and (4) improving quality & health outcomes while reducing costs.
2. Identify the socio-technical (organizational, technical, and human) factors, theory, and principles that shape a complex adaptive knowledge environment/culture.
3. Construct an assessment strategy to diagnoses and design a smart health system for care delivery and public health practice.
4. List evaluation methods and measures for Learning Health System Performance (e.g., systems science, computational modeling, etc.).
5. Learn how to develop informatics solutions to public health intelligence problems.
6. Design a public health informatics maturity model to examine evolutionary changes in collective public health intelligence
7. Identify gaps/vulnerabilities in a public health or health care delivery information technology landscape in managing uncertainty and promoting informed decision making.

Class structure -- modules

The course is broken into an introduction/background and four modules including: 1) Assess; 2) Plan; 3) Execute; and 4) Evaluate/Observe. The background lectures will provide core theories, definitions, and principles surrounding public health intelligence, situational awareness, and surveillance systems that will shape the discussions in future models. And, as appropriate along the way, we will discuss (compare and contrast) additional relevant applied public health informatics methods along the way.

Class Participation

I will expect all participants to be prepared to address anyone's questions about any reading during each session. Please be prepared to cite pages/tables/figures within readings to enhance the specificity and thus utility of our conversations. I will discourage sweeping statements in favor of concrete and careful articulations of your understanding-in-progress of each concept or tool and its relevance to health.

Actionable Intelligence Briefings Reports

Students will be placed in the role of Director of Public Health and Health Care Delivery Intelligence for their consulting organization. In such a role the end objective is to create a comprehensive plan for improving organizational situational awareness to address some objective(s). Student are expected to provide the host leadership with weekly Actionable Intelligence Briefings (AIBs) that will represent opportunities for students to demonstrate comprehension of the readings, discussions points, and real-world intelligence. These AIB's will demonstrate how learned concepts can be applied to their assigned target agency's situational awareness needs, capabilities, and performance levels. Each student will submit a 1-2 page brief on a specific topic that applies the models, methods, measures, approaches, etc. to their specific public health/health care delivery topic areas.

In some cases where guest speakers may appear in class a review of the guest lecture's topic/material may be used in lieu of the agency specific AIB. Students will be alerted ahead of time when such changes may occur in the scheduling.

Project proposals

Depending on class size and number of case study assignments students will be divided into small groups (2-4) or carried out individually. During each learning module students will have the opportunity to present their respective strategy in their evolving case study report to include: Problem Statement, Strategic Plan, Survey and Assessment Plan, Execution Strategy, and Evaluation Plan for addressing one or more public health or health care delivery threats where applied public health informatics can impact on the systems level or individual level outcomes.

The final will be divided in two sections...The written report and final presentation:
The written report (no less than 10 – no more than 20 pages)

- This report will represent your complete idea from start to finish which will include:
 - o Problem statement (what is the problem and why should we care)
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- o Background and significance (your review of the literature from our readings (8 - 15 references) (listed at the end as references cited...use APA or whatever you're comfortable with)
- o Your proposed solution and conceptual model
- o The Learning Health System SA assessment strategy used to gather intelligence requirements

- § The target audience (stakeholders, patients, providers, etc.)
 - o Outline your proposed informatics solution (e.g., decision support, integrated information system, disease registry) application in brief

- § Present your data flow diagram
 - o Outline conclusions, limitations, implementation challenges, and next steps

The presentation

- 20 minute presentation on your project highlighting the same sections as above in the written report

Due dates (I will need to check and confirm with Lynette on these):

- Oral presentation – Due last day of class
- Written report – Due on your final exam date

Cell Phones and Laptops

Turn off cell phones in class and during exams. Laptops may be used in class only for taking notes and for looking up information relevant to the topic being discussed.

Evaluation Method

Honors level will reflect consistently timely submission of all deliverables; thoughtful questions and additional preparatory materials (i.e., genuinely grappling with the ideas at hand); consistently engaged and constructive participation in class; and high quality submissions for the intelligence briefings, case study reports, and final project. I do not grade on curves (i.e., force distributions) but do grade to reflect the actual diversity of performance in any given class.

Grade Components

The grading system for this course focuses on four essential components: Weekly Actionable Intelligence Briefings, In-class and/or online discussion participation, and case study assignments, and a final group project assignment. The weights assigned to these four components are as follows:

<i>Grade Components</i>	<i>% of Grade</i>
Weekly assignment; Actionable Intelligence Briefings	40%
In-Class and Online Discussions	10%
Case Study Assignments	25%
Final Assignment	25%
	TOTAL 100%

Grade Scale

Your final grade will be computed as the weighted average of your scores on the course requirements. The following scale will be used to convert numeric scores into letter grades:

Graduate Scale		Undergraduate Scale	
94 - 100	H	94 - 100	A
90 - 93	H-	90 - 93	A-
87 - 89	P+	87 - 89	B+
83 - 86	P	83 - 86	B
80 - 82	P-	80 - 82	B-
77 - 79	L+	77 - 79	C+
73 - 76	L	73 - 76	C
70 - 72	L-	70 - 72	C-
69 or below	F	67 - 69	D+
		63 - 66	D
		60 - 62	D-
		Below 60	F

NOTE: Numerical grade ranges above are without rounding (e.g., 94 = 94.00). For example, 89.5 does not equate to an H-. Instructor discretion may be used in determining whether to round numerical grades, depending on the distribution of grades. Also, a student's grade may be adjusted upward one level (e.g., from P+ to H-) if the quality of the student's participation in class warrants.

UNC Honor Code

The principles of academic honesty, integrity, and responsible citizenship govern the performance of all academic work and student conduct at the University as they have during the long life of this institution. Your acceptance of enrollment in the University presupposes a commitment to the principles embodied in the Code of Student Conduct and a respect for this most significant Carolina tradition. Your reward is in the practice of these principles.

Your participation in this course comes with the expectation that your work will be completed in full observance of the Honor Code. Academic dishonesty in any form is unacceptable, because any breach in academic integrity, however small, strikes destructively at the University's life and work.

If you have any questions about your responsibility or the responsibility of faculty members under the Honor Code, please consult with someone in either the Office of the Student Attorney General (966-4084) or the Office of the Dean of Students (966-4042).

Read “The Instrument of Student Judicial Governance” (<http://instrument.unc.edu>).

Recognizing, Valuing, and Encouraging Diversity

The importance of diversity is recognized in the mission statement of HPM. In the classroom, diversity *strengthens* the products, *enriches* the learning, and *broadens* the perspectives of all in the class. Diversity requires an atmosphere of inclusion and tolerance, which oftentimes challenges our own closely-held ideas, as well as our personal comfort zones. The results, however, create a sense of community and promote excellence in the learning environment. This class will follow principles of inclusion, respect, tolerance, and acceptance that support the values of diversity.

Diversity includes consideration of: (1) life experiences, including type, variety, uniqueness, duration, personal values, political viewpoints, and intensity; and (2) factors related to “diversity of presence,” including, among others, age, economic circumstances, ethnic identification, family educational attainment, disability, gender, geographic origin, maturity, race, religion, sexual orientation, social position, and veteran status.

Course Evaluation

The Department of Health Policy and Management is participating in the Carolina Course Evaluation System (CES), the university's online course evaluation tool, enabled at the end of each semester. Your responses will be anonymous, with feedback provided in the aggregate; open-ended comments will be shared with instructors, but not identified with individual students. I use this feedback to improve learning experiences for subsequent cohorts, and so will ask all of you to take a few minutes to complete the survey. Thank you in advance.

Course Schedule

Background

Lecture 1: What is public health intelligence?

-Overview of public health intelligence and its central tenants, overview of informatics

-What is public health intelligence (defn, history, etc); how PH intelligence relates to PH informatics; why we need an intelligence approach to informatics; other domains which use an intelligence framework

1. *Informing Healthier Choices: Information and Intelligence for Healthy Populations*. 2007.

2. Yasnoff, et al. *Public Health Informatics: Improving and Transforming Public Health in the Information Age*. 2000.

Lecture 2: What is situational awareness?

-Overview of 4 central tenants: Assess, Plan, Execute, Observe

-What is situational awareness; how does it relate to PH intelligence; why do we need situational awareness to inform PH intelligence; basics of theory and conceptual framework

1. *Situational Awareness for Biosurveillance*.

2. Endsley, M. *Theoretical Underpinnings of Situation Aware: A Critical Review*. 2000.

3. Staton, et al. *Situational Awareness and Safety*. Safety Science. 2001.

Lecture 3: Systems, data, and public health

-Current systems in place for public health surveillance

-What are the PH intelligence systems nationally and globally; what roles do they play in gathering and informing PH intelligence; what types of data do they gather and/or analyze; what are the main focuses of this intelligence (i.e., surveillance)

1. Detmer, D. *Building the national health information infrastructure for personal health, health care services, public health, and research*. BMC Medical Informatics and Decision Making. 2003.

2. Studnicki, et al. *Comparing Alternative Methods for Composing Community Peer Groups: A Data Warehouse Application*. Public Health Management Practice. 2001.

Lecture 4: Organizational theory

-Overview of organizational theory, and how it relates to PHI

-What is org theory; why is org theory important in PH intelligence; how does org theory look at the world of information; how can this worldview be used to improve our analysis of PH intelligence

1. Aiken, et al. *Studying Outcomes of Organizational Change in Health Services*. Medical Care. 1997.

2. Flood, A. and Fennell, M. *Through the Lenses of Organizational Sociology: The Role of Organizational Theory and Research in Conceptualizing and Examining Our Health Care System*. Journal of Health and Social Behavior. 1995.

Lecture 5: Uncertainty and entropy

-Knowledge management, knowledge discovery, and decision support from a PHI perspective

1. Sneed, J. *Entropy, Information, and Decision*. Synthese. 1967.

Assess

Lecture 6: Introduction to surveillance

-How we assess need, equity and impact

-What is surveillance; types of surveillance (outbreaks, etc); levels of surveillance (global, local, etc); agencies and disciplines involved in

1. CDC's *Vision for Public Health Surveillance in the 21st Century*. 2012.
2. Morse, S. *Global Infectious Disease Surveillance and Health Intelligence*. Health Affairs. 2007.
3. Toner, E. *Creating Situational Awareness: A Systems Approach*. 2009.

Lecture 7: Strategic organizational design

-How to incorporate knowledge of org structure into PHI; knowledge bases

1. Friedman, et al. *Achieving a Nationwide Learning Health System*. 2010.
2. Mason and Barton. *The Emergence of a Learning Health System*. Clinical Nurse Specialist. 2013.

Lecture 8: Describing the environment; levels of aggregation

-What are the central PHI organizations? Federal/state/local levels.

-How is PH intelligence organized; what functions do local/state/Federal/global organization serve

1. Buehler, et al. *Syndromic Surveillance Practice in the United States: Findings from a Survey of State, Territorial, and Selected Local Health Departments*. Advances in Disease Surveillance. 2008.
2. German, et al. *Updated Guidelines for Evaluating Public Health Surveillance Systems*. 2001.

Lecture 9: Organizational IQ

- How are the central PHI organizations structured? How does this help/hinder PHI?

1. Nonaka, I. *A Dynamic Theory of Organizational Knowledge Creation*. Organizational Science. 1994.
2. Friedman and Rigby. *Conceptualizing and creating a global learning health system*. International Journal of Medical Informatics. 2013.

Lecture 10: Determining policy needs

-How to determine policy needs of PHI organizations

-How do policy goals get made; how to interpret higher-level policy needs/goals to an implementation level

1. Lavrac, et al. *Data Mining and Visualization for Decision Support and Modeling of Public Health-Care Resources*. Journal of Biomedical Informatics. 2007.
2. Yasnoff, et al. *A National Agenda for Public Health Informatics: Summarized Recommendations from the 2001 AMIA Spring Congress*. Journal of the American Medical Informatics Association. 2001.

Lecture 11: Determining information asymmetries

-Overview of information asymmetry; relationship to org structure and PHI

Lecture 12: Deriving intelligence from data

-How surveys are incorporated and used in PHI; overview of pertinent surveys

-What are the different types of data collection methods (observational studies, surveys, primary data collection); how are each important for PH intelligence

1. Hakenewerth, et al. *North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) and the National Hospital Ambulatory Medical Care Survey (NHAMCS): Comparison of Emergency Department Data*. 2008.

2. Etheredge, L. *A Rapid-Learning Health System*. Health Affairs. 2007.

Lecture 13: Student presentations

Plan

Lecture 14: Approaches to evaluation

-Methods for evaluation

-What is evaluation; what techniques are used for evaluation; what techniques work best for different situations

1. Safran, et al. *Toward a National Framework for the Secondary Use of Health Data: An American Medical Informatics Association White Paper*. Journal of the American Medical Informatics Association. 2007.

Lecture 15: Determining priorities

-How to determine and prioritize PHI goals

-What are the goals of a PH intelligence program; how to determine the priorities of a program; how to create specific, attainable goals

1. Yasnoff, et al. *A Consensus Action Agenda for Achieving the National Health Information Infrastructure*. Journal of the American Medical Informatics Association. 2004.

Lecture 16: Determination of misfits

-How to diagnose issues within existing systems

-What is a misfit; how to determine where misfits are present; how to evaluate misfits

1. Baker, et al. *The Public Health Infrastructure and Our Nation's Public Health*. Annual Review of Public Health. 2005.

2. Heeks, R. *Health Information Systems: Failure, Success and Improvisation*. International Journal of Medical Informatics. 2006.

3. Kushniruk, A. *Evaluation in the design of health information systems: application of approaches emerging from usability engineering*. Computers in Biology and Medicine. 2002.

Lecture 17: Toolkit for evaluation

-Situational awareness mapping

-Tools for evaluating PH intelligence systems; first stage of situational awareness mapping from Endsley text

1. Hsu, et al. *Towards Shared Situational Awareness and Actionable Knowledge – An Enhanced, Human-Centered Paradigm for Public Health Information System Design*. Journal of Homeland Security and Emergency Management. 2010.

2. Wang, et al. *Social Computing: From Social Informatics to Social Intelligence*. 2007.

Lecture 18: Working in teams; strengths of different fields

-Overview of different fields which contribute to PHI

-Discussion of different fields which interact in PH intelligence; the strengths (and weaknesses?) of the different fields; how to best work in teams

1. Spalleck, et al. *Good Partners are Hard to Find: The Search for and Selection of Collaborators in the Health Sciences*. 2008.

Execute

Lecture 19: Statistical tools

-Includes disease prevalence modeling and model-based behavior estimates

-What are the most common statistical tools used in PH intelligence; how and when are they used

1. Herasevich, et al. *Informatics Infrastructure for Syndrome Surveillance, Decision Support, Reporting, and Modeling of Critical Illness*. Mayo Clinic Proceedings. 2010.

Lecture 20: Decision modeling

-Situational awareness mapping, part 2

-How to model PH intelligence decisions; second stage of situational awareness mapping from Endsley text

1. Kushniruk, A. *Analysis of Complex Decision-Making Processes in Health Care: Cognitive Approaches to Health Informatics*. Journal of Biomedical Informatics. 2001.

Lecture 21: Systems analysis

-Using systems analysis techniques to inform PH intelligence decisions

1. Mnatsakanyan, Z. and J. Lombardo. *Decision Support Models for Public Health Informatics*.

Johns Hopkins APL Technical Digest. 2008.

Observe

Lecture 22: Performance monitoring and benchmarking

-Overview of evaluation of performance

-What is performance; what is performance monitoring and benchmarking; how to best define performance; how to best monitor performance; basic techniques of benchmarking

1. Lurio, et al. *Using electronic health record alerts to provide public health situational awareness to clinicians*. Journal of the American Medical Informatics Association. 2010.

Lecture 23: Performance metrics

-Introduction to performance metrics

-What are performance metrics; examples (and/or case studies) of performance metrics; why are performance metrics an important tool in PH intelligence

1. Fraker, et al. *Performance Metrics for Surveillance Schemes*. Quality Engineering. 2008.

2. Lenihan, et al. *The Operational Definition of a Functional Local Public Health Agency: The Next Strategic Step in the Quest for Identity and Relevance*. Journal of Public Health Management Practice. 2007.

Lecture 24: Developing strategies for analyzing metrics

-Common techniques for analyzing metrics

-How are performance metrics best analyzed; what are the techniques for analyzing; how to determine best method for analyzing

1. Buckeridge, et al. *Understanding Detection Performance in Public Health Surveillance: Modeling Aberrancy-detection Algorithms*. Journal of American Informatics Association. 2008.

Lecture 25: Optimizing performance and measurement

-Best practices in evaluation

-What does optimizing performance mean; how is optimization best measured; techniques for measuring; how to determine what technique is most applicable in a situation

1. Aarts, et al. *Organizational Issues in Health Informatics: A Model Approach*. International Journal of Medical Informatics. 1998.

Lecture 26: Evaluation of intelligence

-Situational awareness mapping, part 3

-How to evaluate the information which comes out of PH intelligence; third stage of situational awareness mapping from Endsley text

1. Ammenwerth, et al. *Evaluation of Health Information Systems- Problems and Challenges*. International Journal of Medical Informatics. 2003.

2. Ammenwerth, et al. *Visions and strategies to improve evaluation of health information systems*. International Journal of Medical Informatics. 2004.

Lecture 27: Disclosure; effective communication; technical writing

-Optional lecture, catch-up time if needed

-Overall disclosure rules; how to present PH intelligence data and findings; best practices in technical writing as applied to PH intelligence

1. Gopen, G and J. Swan. *The Science of Scientific Writing*. 1990.

Lecture 28: Student presentations