TEXAS A&M UNIVERSITY SCHOOL OF PUBLIC HEALTH (Spring 2020)

PHPM 672 Data Science for Health Services Research
PHPM 677 Data Science in Public Health

COURSE WEBSITE
https://pinformatics.org/phpm672/
You are required to check the class website regularly (at least three times a week) as it will have important class announcements.

CLASS SESSION(S)
Course Time: Tuesdays & Thursdays, 11.10 am to 12.25 pm
Location: SPH Classroom Building 119 (Computer Lab)

INSTRUCTOR
Hye-Chung Kum, PhD, MSW;
Adm. Building, Rm 124; Office hours: schedule via email (kum@tamu.edu)

TA: Nikita Wagle & Mohammad Karim (will hold lab office hours and lab TBD)

COURSE DESCRIPTION
Data science is the systematic study of digital data using scientific techniques of observation, theory development, systematic analysis, hypothesis testing, and rigorous validation. Data scientists are those that can apply data science to continuously changing deluge of digital raw data that are often inconsistent and erroneous to extract and deliver actionable knowledge in a timely manner. Data scientists are interdisciplinary scientists who have a combination of skills in statistics and data management (to turn raw data into information), programming (to build the data pipeline and infrastructure for efficient processing of raw data into information), and domain expertise (to (a) correctly interpret the data, information, and results, (b) know what information is required, and (c) how accurate it needs to be).

The primary purpose of this course is to apply data science to health data for health services research and public health in order to improve the three core dimensions in healthcare: (1) improve quality, (2) reduce costs, and (3) improve access.

PREREQUISITES
PHPM672: PHPM 601, PHPM 671, STAT 652, or approval by the instructor.
PHPM677: PHEB 602 Biostatics I, or approval by the instructor.

COURSE REQUIREMENTS
This course requires substantial programming, submission of programming assignments bi-weekly, a midterm, and completion of a final project.

Required Text
The little SAS book (NOT the enterprise guide version). Online book available at the library.

Other Required Readings
Additional materials beyond that found in the texts will be required reading.
These materials will be available on the course website.

Additional Recommended, but NOT required texts/materials
https://stats.idre.ucla.edu/sas/modules/

Assessment and Grading Policy

Student grades will be based on:

[Homework Assignments (6 * 8 points each)] ……. [48] points [48%]
[Midterm Exam] ……..…….. [20] points [or 20%]
[Final Project (different requirements for PHPM672 & PHPM677)]*… [32] points [or 32%]

* for students pursuing the MCH certificate and using this course to meet certificate requirements (you need to let me know this during the proposal & approval phase) their project should have an MCH focus.

Homework Assignments

There will be a homework assignment due roughly every other week. Homework assignments and related materials will be made available on the course website. **I strongly advise students to begin to work on their homework assignments soon after they are assigned, so that if they need help from the instructor they have time to ask and receive assistance.** There will be ***six (6)*** regular HW assignments during the semester. The overall weight of the assignments on the final course grade is ***48%, HALF the grade.***
All assignments are due at 11:59pm the day before the class they are due. Typically Tuesday.

Late Assignments. Each student will be allowed one late assignment, due 7 days from the due date. NO other late assignments or make up will be accepted.

Collaboration: Collaboration on assignments, in class labs and homeworks, IS encouraged. However, what you hand in must be in your own writing/typing. Good scholarship requires that all collaborations must be acknowledged. Thus, if you collaborate on the solution of the problem set, we expect that you list your collaborators at the top of the page. Collaboration on in-class evaluations (quizzes, mid-terms, and the final exams) is, of course, a violation. This includes a discussion of questions on a quiz, midterm, or final with students from sections that has not yet taken the evaluation.

Plagiarism: If you consult any outside sources when doing your work, you are expect to further document these sources. Give credit where credit is due. Plagiarism will not be tolerated.

All handed in homework should state at the top any assistance with debugging and programming, as well as citations of any program segments copied from a website.

Assignments and Exam Schedule (Minor modifications may be made as needed with notice)

	Date	Assignment Given	Assignment Due
1.1	1/14	Assignment 1	
1.2	1/16 (THUR)	Assignment 2	Assignment 1 (THUR)
2	1/23 (THUR)		
3	1/30 (THUR)	Assignment 3	Assignment 2
4	2/4		
5	2/11		
6	2/18	Assignment 4	Assignment 3
7	2/25		
8	3/3	Assignment 5	Assignment 4
	3/10	SPRING BREAK	
9.1	3/17	Midterm Part 2 take home	Assignment 5
9.2	3/19 (THUR)	Midterm Part 1 In class (THUR)	
10	3/24	Assignment 6	Midterm Part 2 take home
11	3/31		
12	4/7	Final Project (FP)	Assignment 6
13	4/14		FP MileStone 1
14	4/21		FP MileStone 2
15	4/30	Scheduled Final 3-5 pm	Final Project

***** April 28 seems to be a redefined class to a Friday class.

Seeking Help: Language classes are cumulative; don't fall behind. Ask for assistance from your fellow students, TA, or from the instructor, especially if you find yourself struggling. But remember in the end, programming classes are like skill building math classes. Either you know how to do them or not. No amount of watching others or the instructor program or debug it will suffice for you to build these skills. Only your hard work to work through them will build your skills. It is a lot of work to build these skills, but data skills are highly valuable in the job market in the modern digital world, so it will be well worth your effort. Furthermore, once you learn to think in this manner, it's not something you forget.

Elegance: There is always more than one way to say something, but some ways will be more "elegant" than others. This is true for computer languages as well. You will learn to recognize elegant expressions as you become more familiar with a language and use the elegant idioms as you become more skilled.

COURSE TOPICS

The detailed schedule of classes is posted on the course website. In general, Tuesdays will be lecture based, and Thursdays will be lab based.

The following topics in data science will be covered

- What is data science? What is big data?
- How is big data different from traditional sources of data ?
- How do you effectively convert big data to useful information and knowledge?
- What are the privacy issues in using sensitive data for research, and how should we address these issues?

The following programming topics will be covered: variables, assignments, conditional logic, loops, control flow and program design, indirection (functions/macros), arrays, fie I/O, debugging, and reshaping tables.

COURSE LEARNING OBJECTIVES

The following presents core/discipline specific course objectives relative to competencies**:**

Core Competency	Course Objectives	Assessment
PHPM672: PhD Competencies C3: Identify, collect, and prepare appropriate data through primary or secondary sources with adequate documentation for replication. C4: Execute quantitative and qualitative analytical techniques to explore and clarify associations between variables and to delineate causal inferences. C5: Effectively communicate the findings and implications of health services research through multiple modalities to technical and lay audiences. **PHPM677: MPH Competencies** **D2. MPH Foundational Competencies Evidence-based Approaches to Public Health** D2.3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate D2.4. Interpret results of data analysis for public health research, policy or practice D2.19. Communicate audience-appropriate public health content, both in writing and through oral presentation	Design and build modular data processing pipelines (identify, obtain, prepare, and analyze) in a tractable and replicable manner to convert raw data into useful information that can measure meaningful constructs for research, policy, decisions, and action. Conceive of a research design that would allow these hypotheses to be tested in a manner that would stand up to peer review, including appropriate hypothesis-generating and hypothesis-testing research Draw appropriate conclusions from the analysis using available observational (operational) data fully understanding the limitations which result in selection biases and measurement validity and reliability issues including appropriate interpretations of results from sensitivity analysis. Effectively communicate the findings and implications through multiple modalities to technical and lay audiences. Describe the issues of privacy in sensitive health data and explain the different security technology available to protect the sensitive data.	Midterm Exam Final Project

OTHER RELEVANT MATERIAL

Attendance and Make-up Policies

Attendance: Class attendance and participation is an individual student responsibility. Students taking traditional face-to-face courses are expected to attend class and to complete all assignments by stated due dates. Students enrolled in distance education courses are expected to regularly engage with instructional materials and complete all assignments by stated due dates.

A university-excused absence is the ***only*** excuse acceptable for missing an assignment credit. For information regarding what constitutes an excused absence, required documentation, and timing of notifications and provision of documentation, please see http://student-rules.tamu.edu/rule07. Unexcused absences will result in a grade of a 0, for missed assignments.

University-excused absences do not relieve the student of responsibility for prior notification (where possible) and documentation. In cases where prior notification is not feasible (e.g., accident or emergency) the student must provide notification by the end of the second working day after the absence, including an explanation of why notice could not be sent prior to the class. Failure to notify and/or document properly may result in classification as an unexcused absence. Falsification of documentation is a violation of the Honor Code.

Other absences may be excused at the discretion of the instructor with prior notification and proper documentation.

Make-Up Policies: If an absence is excused, the instructor will either provide the student an opportunity to make up any work that contributes to the final grade or provide a satisfactory alternative by a date agreed upon by the student and instructor. If the instructor has a regularly scheduled make up exam, students are expected to attend unless they have a university-approved excuse. Make-up work must be completed in a timeframe not to exceed 30 calendar days from the last day of the initial absence.

eCampus (Blackboard)

eCampus, powered by Blackboard Learn, is the university-wide learning management system for uploading syllabi, managing grades, and teaching courses either partially or completely online. eCampus is a secure, centralized system that features: grade center, assignments, quizzes, surveys, chat rooms, discussions, blogs, email, and content management tools.
In order to access the course materials you will need to log in to Howdy, then click the **eCampus** button or go to http://ecampus.tamu.edu. ***Your eCampus login is the same as your Howdy login (NetID).*** Review the eCampus Tutorials (in the EdTech Tools & Resources section of School's Office of Academic Assessment and Instructional Technology website) or visit the Student Documentation for eCampus.

Computer Requirements for Online Courses

For this and all online courses we recommend the minimum technical requirements outlined on our Computer Requirements web page.

For technical support, contact HelpDesk hdc@tamu.edu, or phone to (979) 845-8300

Important!!! Save your work as you go along. Nothing is more discouraging than to lose an assignment due to a computer hang ups! You may want to also make hard copies of your work to have "proof" and save yourself time and trouble!

Academic Integrity

Academic integrity is the pursuit of scholarly activity free from fraud and deception and is an educational objective of this institution. Students are expected to adhere to all TAMUS, TAMU, HSC, and School policies regarding academic integrity and classroom conduct. Academic dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person

or work previously used, or tampering with the academic work of another student. Individuals found responsible of academic dishonesty may be dismissed from the degree program, and at a minimum will receive an F for the course**. It is the student's responsibility to have a clear understanding of how to reference other individuals' work, as well as having a clear understanding in general as to the various aspects of academic dishonesty.**

Information on the Aggie Honor Code is found at http://aggiehonor.tamu.edu .

Students are encouraged to view two short videos at: https://aggiehonor.tamu.edu/Student-Resources/AHSO-Videos

As well as review available materials and examples of academic dishonesty found at: https://library.tamu.edu/services/library_tutorials/academic_integrity/index.html

Remember:
"An Aggie does not lie, cheat, or steal, or tolerate those who do."

Course Evaluation
Constructive feedback from students on course evaluations is held in high regard at the School of Public Health. Your assistance in helping the School in its assessment of courses and faculty through participation in the evaluation of courses is requested. As public health professionals you will one day have the responsibility to evaluate colleagues and health initiatives. The School views providing feedback on the School's courses as part of your professional responsibility.

SPH Mission
The Texas A&M School of Public Health is committed to transforming health through interdisciplinary inquiry, innovative solutions, and development of leaders through the Aggie tradition of service to engage diverse communities worldwide.

Americans with Disabilities Act (ADA)
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

Copyright Statement
The materials used in this course are copyrighted. These materials include but are not limited to syllabi, quizzes, exams, lab problems, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy or share, unless permission is expressly granted by the instructor.

FERPA
The Federal Education Rights & Privacy Act requires that we advise students that by registering for this course, their University assigned e-mail address will be revealed to classmates and the instructor. By continuing your enrollment in the course you acknowledge your understanding of this policy. By enrolling in this course you agree to the following statement: "I understand that as a result of registering for this course, my University assigned e-mail address will be revealed to classmates and the instructor."

Equal Opportunity Statement
Texas A&M University is an Equal Opportunity/Affirmative Action/Veterans/Disability Employer committed to diversity. Inquiries regarding nondiscrimination policies may be directed to the Human Resources by phone at 979-845-4141 or to Texas A&M University Division of Human Resources and Organizational Effectiveness, 750 Agronomy Road, General Services Complex Suite 1201, College Station, TX 77843-1255.

Title IX

Title IX of the Education Amendments of 1972 protects people from sex discrimination in educational programs and activities at institutions that receive federal financial assistance. Texas A&M University and the Texas A&M Health Science Center are committed to maintaining a learning environment that is free from discriminatory conduct based on gender. As required by Title IX, the University does not discriminate on the basis of sex in its education programs and activities, and it encourages any student or non-student who thinks that he or she has been subjected to sex discrimination, sexual harassment (including sexual violence) or sexual misconduct by another student, member of the faculty or staff, or campus visitor or contractor, to immediately report the incident to any of the individuals persons or offices listed below.

For complaints against students:

Dr. Anne Reber
Dean of Student Life
Student Services @ White Creek
Student Life #3 (Bldg. #0072), Room 101
Texas A&M University
College Station, TX 77843-1257
(979) 845-3111
studentlife@tamu.edu

For complaints against faculty, staff, visitors, contractor, vendors, or unknowns:

Kevin McGinnis
Chief Compliance Officer
Medical Sciences Library
202 Olsen Blvd., Suite 007
College Station, TX 77843
(979) 458-8407
CivilRights@tamu.edu

The University encourages students to immediately consult with or report incidents of sex discrimination, sexual harassment (including sexual violence) or sexual misconduct to the TAMHSC Title IX Coordinator. Students may also report incidents of sex discrimination, sexual harassment (including sexual violence) or sexual misconduct to any School of Public Health administrator, university administrator, official or unit supervisor, who is then responsible for promptly notifying any of the above Title IX coordinators of the reported incident.

DISCLAIMER

This syllabus is representative of materials that will be covered in this class. It is subject to change. These changes will be communicated via email or posted as announcements. If you have any problems related to this course, please feel free to discuss them with the instructor.

APPENDIX A: SCHOOL OF PUBLIC HEALTH COMPETENCIES- *Council on Education for Public Health (CEPH)*

D1. MPH & DrPH Foundational Public Health Knowledge

Profession & Science of Public Health

D1.1. Explain public health history, philosophy and values
D1.2. Identify the core functions of public health and the 10 Essential Services
D1.3. Explain the role of quantitative and qualitative methods and sciences in describing and assessing a population's health
D1.4. List major causes and trends of morbidity and mortality in the US or other community relevant to the school or program
D1.5. Discuss the science of primary, secondary and tertiary prevention in population health, including health promotion, screening, etc.
D1.6. Explain the critical importance of evidence in advancing public health knowledge

Factors Related to Human Health

D1.7. Explain effects of environmental factors on a population's health
D1.8. Explain biological and genetic factors that affect a population's health
D1.9. Explain behavioral and psychological factors that affect a population's health
D1.10. Explain the social, political and economic determinants of health and how they contribute to population health and health inequities
D1.11. Explain how globalization affects global burdens of disease
D1.12. Explain an ecological perspective on the connections among human health, animal health and ecosystem health (e.g., One Health)

D2. MPH Foundational Competencies

Evidence-based Approaches to Public Health

D2.1. Apply epidemiological methods to the breadth of settings and situations in public health practice
D2.2. Select quantitative and qualitative data collection methods appropriate for a given public health context
D2.3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate
D2.4. Interpret results of data analysis for public health research, policy or practice

Public Health & Health Care Systems

D2.5. Compare the organization, structure and function of health care, public health and regulatory systems across national and international settings
D2.6. Discuss the means by which structural bias, social inequities and racism undermine health and create challenges to achieving health equity at organizational, community and societal levels

Planning & Management to Promote Health

D2.7. Assess population needs, assets and capacities that affect communities' health
D2.8. Apply awareness of cultural values and practices to the design or implementation of public health policies or programs
D2.9. Design a population-based policy, program, project or intervention
D2.10. Explain basic principles and tools of budget and resource management
D2.11. Select methods to evaluate public health programs

Policy in Public Health

D2.12. Discuss multiple dimensions of the policy-making process, including the roles of ethics and evidence
D2.13. Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes
D2.14. Advocate for political, social or economic policies and programs that will improve health in diverse populations
D2.15. Evaluate policies for their impact on public health and health equity

Leadership

D2.16. Apply principles of leadership, governance and management, which include creating a vision, empowering others, fostering collaboration and guiding decision making
D2.17. Apply negotiation and mediation skills to address organizational or community challenges

Communication

D2.18. Select communication strategies for different audiences and sectors
D2.19. Communicate audience-appropriate public health content, both in writing and through oral presentation
D2.20. Describe the importance of cultural competence in communicating public health content

Interprofessional Practice

D2.21. Perform effectively on interprofessional teams

Systems Thinking

D2.22 Apply systems thinking tools to a public health issue

HPMC. MPH in Health Policy and Management Concentration Competencies

HPMC.1. Use policy and management tools to evaluate implications of specific programs, policies, and interventions on organizations and populations.
HPMC.2. Develop and justify budgets that support programs and organizations in the public health and health care sectors.
HPMC.3. Communicate evidence-based options to address public health management and policy problems.
HPMC.4. Apply project management and strategic management tools to create public health program goals, strategies, and objectives.
HPMC.5. Recommend and justify policies or organizational initiatives for implementation after examining their feasibility and implications.

APPENDIX B: THE MHA PROGRAM COMPETENCY MODEL

DOMAIN: Health Care Environment and Community (the relationship between health care operations and their communities and local, state, regional, and national organizations and policies)

- **Public and Population Health Assessment** Historic, current, and anticipated future characteristics and requirements for health care at local, state, regional, and national markets
- **Delivery, Organization, and Financing of Health Services and Health Systems** Resources, structure, process, and outcomes associated with providing health care informed by theory, data, and analytic methods
- **Policy Analysis** Creation, analysis, and implications of policy for health care structures and delivery systems
- **Legal and Ethical Bases for Health Services and Health Systems** Laws, regulations, and social or other norms that formally or informally provide guidance for health care delivery

DOMAIN: Leadership Skills (the motivation and empowerment of organizational resources to achieve a shared vision)

- **Ethics, Accountability, and Self-Assessment** Professional and personal values and responsibilities that result in ongoing self-reflection, professional awareness, learning, and development
- **Organizational Dynamics** Organizational behavior methods and human resource strategies to maximize individual and team development while ensuring cultural awareness and inclusiveness
- **Problem Solving, Decision Making, and Critical Thinking** Data, analytic methods, and judgment used in support of leadership decisions
- **Team Building and Collaboration** Partnerships that result in functional, motivated, skill-based groups formed to accomplish identifiable goals

DOMAIN: Management Skills (the control and organization of health services delivery)

- **Strategic Planning** Market and community needs served by defined alternatives, goals, and programs supported by appropriate implementation methods
- **Business Planning** Develop and manage budgets, conduct financial analysis; identify opportunities and threats to organizations using relevant information
- **Communication** Verbal and non-verbal communication to convey pertinent information
- **Financial Management** Read, understand, and analyze financial statements and audited financial reports
- **Performance Improvement** Data, information, analytic tools, and judgment used to guide goal setting for individuals, teams, and organizations
- **Project Management** Design, plan, execute, and assess tasks and develop appropriate timelines related to performance, structure, and outcomes in the pursuit of stated goals

DOMAIN: Analytic and Technical Skills (the successful accomplishment of tasks in health services delivery)

- **Systems Thinking** Interrelationships between and among constituent parts of an organization
- **Data Analysis and Information Management** Data, information, technology, and supporting structures used in completing assigned tasks
- **Quantitative Methods for Health Services Delivery** Economic, financial, statistical, and other discipline-specific techniques needed to understand, model, assess, and inform health care decision making and address health care questions

APPENDIX C: PhD-HEALTH SERVICES RESEARCH COMPETENCIES

C1: Identify, assemble, evaluate, and critique a large body of existent research addressing a specific research agenda.
C2: Develop a theoretically grounded research design that allows for rigorous evaluation of health services research questions that stand up to peer review, including the use of appropriate methods for the research question at hand.
C3: Identify, collect, and prepare appropriate data through primary or secondary sources with adequate documentation for replication.
C4: Execute quantitative and qualitative analytical techniques to explore and clarify associations between variables and to delineate causal inferences.
C5: Effectively communicate the findings and implications of health services research through multiple modalities to technical and lay audiences.
C6: Develop policy solutions to public health problems that are based on the best evidence available and that will hold up to scrutiny from others.
C7: Demonstrate knowledge of economic principles and their application for research questions in health services research.
C8: Exhibit knowledge of the institutions, organizational structures, and management strategies used to enhance effectiveness in health delivery systems.