ACKNOWLEDGEMENT

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xwməθkwəy̓əm (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

COURSE INFORMATION

Course Title	Course Code Number	Credit Value
Application of Epidemiological Methods	SPPH 504, section 007 (**Tue 9 am - 12 pm in SPPH 143**) **Lab**: SPPH 504 T01 (**Thu 10 am - 12 pm in SPPH B151**)	3

PREREQUISITES

- SPPH400 Statistics for Health Research, and
- SPPH500 Analytical Methods in Epidemiological Research, and
- SPPH502 Epidemiological Methods I, and
- one of
    - SPPH503 Epidemiological Methods II, or
    - SPPH506 Quantitative Research Methods, or
    - SPPH519 Qualitative Methods for Health Research Design, or
    - SPPH530 Epidemiology of Occupational and Environmental Health

CONTACTS

Course Instructor(s)	Contact Details	Office Location	Office Hours
Ehsan Karim	ehsan.karim@ubc.ca The typical response time is within 48 hours on weekdays.	SPPH 126A	By appointments, or as posted on canvas.

COURSE INSTRUCTOR BIOGRAPHICAL STATEMENT

Dr. M. Ehsan Karim is an Assistant Professor at the UBC School of Population and Public Health (SPPH), a Scientist & a Biostatistician at the Centre for Health Evaluation and Outcome Sciences (CHÉOS), an associate member of the Department of Statistics (UBC) and a Michael Smith Foundation for Health Research (MSFHR) Scholar. He obtained his PhD in Statistics from the University of British Columbia, and completed his postgraduate training in the Department of Epidemiology, Biostatistics, and Occupational Health at McGill University. His current research focuses on causal inference, real-world observational data analyses, and applications of machine learning approaches in epidemiologic studies.

OTHER INSTRUCTIONAL STAFF

TAs: Derek Ouyang (R computing), and Kate McLeod (Scientific writing). To communicate with the computing TA, come to weekly mandatory labs and specified office hours (as announced in Canvas). If you need further support, contact the course instructor, and additional office hours will be assigned accordingly.

COURSE STRUCTURE

The purpose of this course is to provide students with learning opportunities to understand fundamental epidemiological concepts through the application of methods using population and public health datasets. The purpose is also to introduce students to emerging epidemiological methodologies that are frequently being applied to population and public health-related research questions in prestigious epidemiology journal publications. Basic components of this class include class lecture (**Thu 9 am - 12 pm [Online via Zoom]**) and lab activities (**Tue 10 am - 12 pm [Online via Zoom]**; see 'Learning Activities').

SCHEDULE OF TOPICS

Week #	*Methods & Concepts*	*Scientific Writing*	*Lab topics*	*Weekly Submission deadlines*
# 1 (Week of Sept 7th)	• Overview of the course • Complex survey design	• Components of a Research Topic (PICOT)	• Lab 1: Rstudio and R: data manipulation. Rmarkdown for writing.	•
# 2 (Week of Sept 14th)	• Confounding: identification and related concepts	• Creating a statistical analysis plan (SAP)	• Lab 2: Rstudio and R: data manipulation II	• *Sept 16th, 12 pm (noon): [i] quiz 1, [ii] lab 1 exercise, [iii] concept 1.*
# 3 (Week of Sept 21st)	• Regression: Confounding adjustment and prediction	• Manuscript writing: Introduction section	• Lab 3: R lab on regression fitting	• *Sept 23rd, 12 pm (noon): [i] quiz 2, [ii] lab 2 exercise, [iii] concept 2, [iv] Proposal.*
# 4 (Week of Sept 28th)	• Survey data analysis	• Manuscript writing: Methods section	• Lab 4: R lab on analysis of complex survey data	• *Sept 30th, 12 pm (noon): [i] quiz 3, [ii] lab 3 exercise, [iii] concept 3, [iv] SAP (with Tables 1 and 2 without survey features).*
# 5 (Week of Oct 5th)	• Propensity score	• Presenting tables and figures	• Lab 5: R lab on propensity score modelling	• *Oct 7th, 12 pm (noon): [i] quiz 4, [ii] lab 4 exercise, [iii] concept 4.*
# 6 (Week of Oct 12th)	• Missing-data	• Manuscript writing: Results section	• Lab 6: R lab on missing data analysis	• *Oct 14th, 12 pm (noon): [i] quiz 5, [ii] lab 5 exercise, [iii] concept 5*

Week #	*Methods & Concepts*	*Scientific Writing*	*Lab topics*	*Weekly Submission deadlines*
# 7 (Week of Oct 19th)	• Mediation analysis	• Peer-reviewing/letter to the editor	• Lab 7: R lab on mediation analysis algorithms	• *Oct 21st, 12 pm (noon): [i] quiz 6, [ii] lab 6 exercise, [iii] concept 6, [iv] Writing assignment 1 (Methods + Results)*
# 8 (Week of Oct 26th)	• Machine learning	• Manuscript writing: Discussion section and abstract	• Lab 8: R lab on machine learning	• *Oct 28th, 12 pm (noon): [i] quiz 7, [ii] lab 7 exercise, [iii] concept 7, [iv] peer-review feedback for writing assignment 1.*
# 9 (Week of Nov 2nd)	•	•	• Mid-term Exam (Nov 5th 9 am-12 pm)	•
# 10 (Week of Nov 9th)	• Overview of survival and multinomial outcomes • Discussion and review	• Presenting at seminars and conferences	• Lab 9: R lab on regression with complex outcomes	• *Nov 11th, 12 pm (noon): [i] Manuscript critique.*
# 11 (Week of Nov 16th)	• Overview of longitudinal data analysis • Discussion and review	• Responding to reviewer's comments	• Lab 10: R lab on longitudinal data analysis	• *Nov 18th, 12 pm (noon): [i] Presentation slide distribution.*
# 12 (Week of Nov 23rd)	• In-class presentation of the final project: part 1 (24 Nov 9-12)		• In-class presentation of the final project: part 2 (26 Nov 9-12)	• *Nov 25th, 12 pm (noon): [i] Writing assignment 2 (1st draft of the full manuscript)*
# 13 (Week of Nov 30th)	• Discussion and review	• Authorship	• Discussion and review	• *Nov 30 (Mon), 4 pm (afternoon): [i] Peer-review feedback for writing assignment 2*
				Final paper *submission*

Week #	*Methods & Concepts*	*Scientific Writing*	*Lab topics*	*Weekly Submission deadlines*
				deadline: Dec 10 (4 pm).

LEARNING OUTCOMES

By the end of this course, students will develop practical skills to:

- Design an appropriate study for a population/public health research question that will help reduce bias;
- Create an analytic dataset from a complex population/public health survey to answer an epidemiological research question, including statistical programming/coding and data management/documentation skills;
- Recognize the scenarios where various data analysis methods are appropriate to answer a research question;
- Apply an appropriate data analysis method to answer a population/public health research question;
- Interpret estimates and conclusions from data analysis methods;
- Describe the assumptions and limitations of data analysis methods;
- Communicate an epidemiological study (design, analytic method, findings and discussion (including issues related to limitations, biases)) in a format suitable for submission to an academic health journal; and
- Present an epidemiological study and analytic method in a format suitable for an academic health conference.

LEARNING ACTIVITIES

1. **Pre-class survey and in-class quizzes**: The surveys consist of several multiple-choice questions assessing understanding of pre-class readings (published academic papers and/or textbook chapters describing advanced epidemiologic methods). Pre-class readings are focused on the application of an epidemiological method to a population/public health issue/research question that will be explored further in class through lectures, instructor demonstrations, in-class student application activities.
2. **Weekly lab data analysis activities**: Students will complete in-lab data analysis exercises to apply concepts covered in pre-class reading materials, and in instructor lectures/in-class demonstrations.
3. **Statistical Analysis Plan/research proposal related to final project**: Students will propose their own research questions through a statistical analysis plan (SAP). Students will be evaluated on the design of a study and choice of analytic method to answer their research question that reduces bias.
4. **Scientific Writing assignments**: 4 scientific writing assignments on given topics. Each assignment will deal with the following sections of a manuscript: introduction, methods, results and discussion.
5. **Mid-term exam**: An in-class mid-term written examination (based on topics covered before the mid-term).

6. **In-class presentation**: In-class presentation: Students will present the analytic approach for their research question with a focus on the justification of the choice of approach, in a format suitable for an academic health conference.
7. **Critique of a published manuscript**: Students will critique manuscripts provided by the instructor.
8. **Class Participation**: For this course, it is essential that students actively participate in-class and lab sessions. Part of the learning objective is how to express statistical and epidemiologic concepts in discussions, and students are expected to make sufficient efforts to contribute positively to the discussions. Grades will be assigned according to the following criteria: (1) clarity and conciseness (2) thoughtfulness (3) insights evident in the verbal contributions.
9. **Final Paper**: The Final Paper will have 5 sections: (i) objective and motivation of the study with a brief literature review, (ii) methods description, (iii) bivariable and multivariable results, (iv) discussion outlining strengths and limitations of the study, and (v) appendix with project /statistical analysis coding.

LEARNING MATERIALS

Required pre-class and weekly reading lists (published papers or textbook chapters) will be updated in the Canvas each week. There is no required textbook. The following textbooks are suggested for further reading (also available via UBC library):

- Scientific writing (available via UBC library): Heard, S. B. (2016). The scientist's guide to writing: How to write more easily and effectively throughout your scientific career. Princeton University Press.
- Analysis (available via UBC library): Heeringa, S.G., West, B.T., Berglund, P.A (2010) Applied Survey Data Analysis, Taylor & Francis, Florida.

ASSESSMENTS OF LEARNING

The course will involve pre-class reading materials (journal article focused on the application of epidemiological methods), lectures based on the discussion of the pre-class reading content, and in-class activities and course assignments focused on the application of epidemiological methods. Although students will gain some expertise in statistical computation and programming, this course is focused on the application of epidemiologic analytic methods. Students will be evaluated based on the following elements: (a) understanding of key epidemiologic concepts, (b) understanding of analytic approaches to reduce study biases, (c) the application of epidemiological methods to population and public health research questions, and (d) the appropriate interpretation of analytic estimates from analytic output.

1.	Pre-class survey and in-class quizzes (participation required)	0%
2.	Weekly lab data analysis activities (11 lab activities)	30%
3.	Statistical Analysis Plan/research proposal related to the final project	1%
4.	Scientific Writing Assignments (4; not directly related to the final project)	10%
5.	Mid-term exam	15%
6.	In-class presentation	4%
7.	Critique papers / published manuscripts	5%
8.	Explaining advanced concepts from the literature	10%
9.	Peer-Review and Class Participation*	5%
10.	Final Paper	20%

*Points from the grades of 'class-participation' will be deducted if a student doesn't participate in pre-class survey, in-class quizzes, or do not submit the peer-reviews in time. Peer-review quality will be judged by whether or not the reviewer can identify potential weaknesses of the work they are reviewing, express them in a professional manner, and can suggest a practical way forward (if possible).

Late Assignments: Pre-class/in-class/weekly survey answers, Assignments, and the Final Paper must be submitted via Canvas. Typically, no late submissions will be accepted. Extensions of the due date for the assignments will be considered pending extenuating circumstances with the approval of the instructor. The instructor will require documentation of extenuating circumstances (medical certificates, etc.). Assignments submitted later than the due date will be penalized 10% of the possible grade for each day past due.

UNIVERSITY POLICIES

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on **the UBC Senate website.**

OTHER COURSE POLICIES

Plagiarism: Students are expected to review the Student Discipline section of the UBC Calendar and know what constitutes plagiarism and academic misconduct, and that such activities are subject to penalty.

Grading: This course has very specific rubrics for scientific writing. For everything else, we follow the following strategy: Adapted from the UBC Department of Educational Studies, Graduate Course Grading Policy, D. Pratt:

• A Level (80% to 100%): A+ is from 90% to 100%: It is reserved for exceptional work that significantly exceeds course expectations. Also, achievement must satisfy all the conditions below. A is from 85% to 89%: A mark of this order suggests a very high level of performance on all criteria used for evaluation. Contributions deserving an A are distinguished in virtually every aspect. They show that the individual (or group) significantly shows initiative, creativity, insight, and probing analysis where appropriate. Further, the achievement must show careful attention to course requirements as established by the instructor. A- is from 80% to 84%: It is awarded for the high quality of performance, no problems of any significance, and fulfilment of all course requirements.

• B Level (68% to 79%): This category of achievement is typified by adequate but unexceptional performance when the criteria of assessment are considered. It is distinguished from A-level work by problems such as one of the more significant errors in understanding, superficial representation or analysis of key concepts, the absence of any special initiatives, or lack of coherent organization or explanation of ideas. The level of B work is judged by the severity of the difficulties demonstrated. B+ is from 76% to 79%, B is from 72% to 75%, and B- is from 68% to 71%

• C Level (55% to 67%): Although a C+, C, or C- grade may be given in a graduate course, the Faculty of Graduate Studies considers 68% as a minimum passing grade for doctoral graduate students.

LEARNING ANALYTICS

Learning analytics includes the collection and analysis of data about learners to improve teaching and learning. This course will be using Canvas that capture data about student's activity and provide information that can be used to improve the quality of teaching and learning. In this course, the instructor plans to use analytics data to:

- View overall class progress
- Track students' progress in order to provide them with personalized feedback
- Review statistics on course content being accessed to support improvements in the course
- Assess the student's participation in the course.

LEARNING RESOURCES

• All course materials (lecture slides, pre-class readings and video, assignments) will be posted on the Canvas course website.

• Required pre-class/weekly readings (listed at the end of this document) can be downloaded from either the Canvas course website or from the UBC library website.

• Access to a computer with R software (R, RStudio, R markdown, free of charge) is necessary for all course work. Students need to bring their own laptop computer to class with the R software installed. Course instruction will be provided strictly in R.

COPYRIGHT

All materials of this course (course handouts, lecture slides, assessments, course readings, etc.) are the intellectual property of the Course Instructor or licensed to be used in this course by the copyright owner. Redistribution of these materials by any means without the permission of the copyright holder(s) constitutes a breach of copyright and may lead to academic discipline.

The instructor/TAs do not permit students to record class sessions/labs. The class/TA sessions will be recorded by the instructor/TAs, and only the necessary parts will be released within the class for viewing outside of the class sessions. If you have an objection about parts of these recordings, contact the instructor immediately.

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