HRM 748: Population and Public Health

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Course description
This course provides an overview of core concepts and methods in population and public health. The course will be structured into five sections. The first section will introduce the population health approach by exploring the historical evolution of definitions of health, and population and public health. The next two sections will examine the definitions and measurement of health outcomes and determinants at the population level. We will then discuss study designs and methodological issues relevant to investigating population health issues. This will consist of a review of related concepts and methods at the individual level, an exploration of the concepts and methods at the population level, and discussion of the differences and implications of a population level approach. The course will be structured as student and faculty-led discussion sessions, using relevant literature as background and case studies to illustrate the components and to stimulate discussion and learning.

Course Objectives

1) To understand the population approach to health.
2) To understand health outcomes and health determinants at the population level, to be familiar with sources of data to measure population health, and to be able to appraise the validity of these data.
3) To explore the methodologies available for investigating the health of populations.

Educational method

Readings for the course will be drawn from published journal articles, textbook chapters, and web-based resources. Prior to each lecture, students are expected to become familiar with the content of the required readings and to be prepared to discuss them in class. Each class will consist of a student and faculty-led group discussion of the readings to specifically address the objectives for that session. Examples will be used to stimulate discussion and to illustrate the application of the concepts. A didactic component will be included when necessary and at the discretion of the faculty member facilitating the session.

Pre-requisites

Pre-requisites for this course include one graduate level statistics course, HRM 721 (or equivalent) and HRM 751 (or equivalent).

Evaluation method

1) Class participation 15%

Students are expected to prepare for class by reading the required materials and integrating this material with the related class objectives. Participation will be assessed based on:

- Evidence of background preparation and understanding of the material.
- Effectiveness in contributing to class discussions.
- Support of the group's learning by contributing to a positive class environment.

2) Preparation of a researchable question for the final project 15%

The researchable question will address a health issue at the population level. Students will submit an overview (2 pages maximum – double spaced, 12 pt. Times New Roman font) that describes their research question and objectives, and outlines their research approach. This will be submitted by **February 13 , 2020.**

3) Final paper

Paper 50%
Presentation 20%

Students will prepare a paper on the population health issue identified as their researchable question. The paper will take the form of a research grant to investigate the issue, included objectives, justification, review of the literature, materials and methods, proposed statistical analysis, and potential problems and their solutions. The paper also

will include a statement on the potential public health impact of the results. The paper length should not exceed 20 double-spaced pages in 12 pt. Times New Roman font.

Students will present their paper to the group. The presentation should highlight the importance of the issue to population and public health and discuss the important aspects of the proposed research. The use of audio-visual aids is appropriate and encouraged. Each student will have 12 minutes to present their paper.

Due Dates for Final Paper

1. **April 9**: Come to class to present your paper.
2. **April 16**: Submit the final versions of your paper to the course coordinators via e-mail. You must submit by 5PM.

Course overview

A) Setting the context
Session 1: Evolving concepts of population and public health

B): The determinants of health
Session 2: Health determinants

C) The health of populations
Session 3: Defining health in populations
Session 4: Measuring health in populations
Session 5: Heterogeneity in health within and between populations

D) Methodological issues in population and public health
Session 6: Observational Studies for Population Health
Session 7: Analysis of Observational Studies in Population Health
Session 8: Analysis of Observation Studies in Population Health
Session 9: Design and Conceptual Issues in Multi-level Designs
Session 10: Analytical Issues in Multi-level Designs
Session 11: Causal concepts in population and public health
Session 12: Class presentations and discussion

NOTES: April 2, is HEI Research Day, please plan to attend.
This course WILL run during reading week (Feb 20). There will be no class March 5. The final class will be April 9, with presentations.

Course outline

A) SETTING THE CONTEXT

SESSION 1: EVOLVING CONCEPTS OF POPULATION AND PUBLIC HEALTH

Objectives:

1) To understand the current definitions and concepts of population and public health.
2) To understand the advantages of the high risk versus population health strategies.

Required readings:

1) Rose G. Sick individuals and sick populations. Int J Epi. 2001; 30; 427–432. http://libaccess.mcmaster.ca/login?url=http://dx.doi.org/10.1093/ije/30.3.427

2) Kindig D and Stoddart G. What is population health? Am J Publ Health. 2003; 93; 380-383. http://ajph.aphapublications.org/cgi/reprint/93/3/380

3) Bayer and Galea, 2015. Public health in the precision-medicine era. NEJM, 373(6); 499-501. http://www.nejm.org/doi/full/10.1056/NEJMp1506241

4) Frieden TR. The Future of Public Health. N Engl J Med. 2015;373(3):366-369. http://www.nejm.org/doi/full/10.1056/NEJMsa1511248#t=article
http://www.nejm.org/doi/full/10.1056/NEJMsa1511248#t=article

Additional (optional) readings:

1) Hippocrates. Airs, waters, places. In: The challenge of epidemiology: Issues and selected readings. Pan American Health Organization. Sci. Publ. #505. 1988; 18-19.

B) THE DETERMINANTS OF HEALTH

The section on the determinants of health assumes that students have an understanding, from pre-requisite courses, of common measure of disease frequency, including prevalence, incidence, and standardization of rates.

SESSION 2: HEALTH DETERMINANTS

Objectives:

1) To review the definition of 'health', and the categories of health indicators associated with it.
2) To define determinants of health.
3) To understand the models and pathways through which determinants of health affect health of the population

Required readings:

1) Huber et al, 2011. How should we define health? *BMJ* (343). http://www.bmj.com/content/343/bmj.d4163

2) Halfon N, Hochstein M. Life Course Health Development: An Integrated Framework for Developing Health, Policy, and Research. The Millbank Quarterly. 2002; Vol 80, No. 3, 433-479. http://www.jstor.org/stable/3350561?seq=1#page_scan_tab_contents

3) Galea S, Annas GJ. Aspirations and Strategies for Public Health. JAMA. 2016;315(7):655. doi:10.1001/jama.2016.0198

Additional (optional) readings:

1) Catalano R, Pickett KE, A Taxonomy of Research Concerned with Place and Health. The Handbook of Social Studies in Health & Medicine, Sage Publication, ISBN 0761956174. 2000; 64-83

2) Beland F, Birch S, Stoddart GL. Unemployment and Health: Contextual Level Influences on the Production of Health in Populations. Soc Sci Med. 2003;55(11); 2033-2052. http://www.sciencedirect.com/science/article/pii/S0277953601003446

3) Social determinants of health: The Canadian facts". http://www.thecanadianfacts.org/the_canadian_facts.pdf

C) THE HEALTH OF POPULATIONS

The section on health of populations assumes that students have an understanding, from pre-requisite courses, of common measure of disease frequency, including prevalence, incidence, and standardization of rates.

SESSION 3: DEFINING HEALTH IN POPULATIONS

Objectives:

1) To assess indicators commonly used to monitor changes in population health.
2) To understand why and how mortality and morbidity indicators have been combined into summary measures.
3) To review how indicators and summary measures can be used to understand patterns of health and disease in populations.

Required readings:

1) Gold MR, Stevenson D, Fryback DG. HALYs and QALYs and DALYs. Oh my: Similarities and differences in summary measures of population health. Annu Rev Public Health. 2002; 23; 115-134. http://www.annualreviews.org/doi/abs/10.1146/annurev.publhealth.23.100901.140513

2) Spasoff, R., Epidemiologic Methods for Health Policy. Oxford University Press. New York, 1999. ISBN 0-19-511499-X. "Some Tools of the Trade" Chapter 2, pgs. 32-56.

3) Forouzanfar MH, Afshin A, Alexander LT, et al. Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016;388(10053):1659-1724. Doi:10.1016/S0140-6736(16)31679-8. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5388856/pdf/main.pdf

4) Raina P, Sohel N, Oremus M, Shannon H, Mony P, Kumar R, Li W, Wang Y, Wang X, Yussoff K, Yusuf R, Iqbal R, Szuba A, Oguz A, Rosengren A, Kruger A, Chifamba J, Mohammadifard N, Darwish EA, Dagenais G, Diaz R, Avezum A, Lopez-Jaramillo P, Seron P, Rangarajan S, Teo K, Yusuf S, on behalf of the PURE Investigators. Assessing global risk factors for non-fatal injuries from road traffic accidents and falls in adults aged 35-70 year in 17 countries: a cross-sectional analysis of the Prospective Urban Rural Epidemiological (PURE) study. *Injury Prevention*. 2016Apr;22(2):92-98. Doidoi: 10.1136/injuryprev-2014-041476. Epub 2015 Oct 28

Additional (optional) readings:

1) CDC. Statistical Notes. Summary measures of population health: Methods for calculating healthy life expectancy, No. 21, 2001. Available at: http://www.cdc.gov/nchs/data/statnt/statnt21.pdf.

2) Sorlie PD, Thom TJ, Manolio T, Rosenberg HM, Anderson RN, Burke GL. Age-adjusted death rates: consequences of the year 2000 standard. Ann Epidemiol. 1999; 9; 93-100. http://www.sciencedirect.com/science/article/pii/S1047279798000611

3) Bonneux L. How to measure the burden of mortality? J Epidemiol Community Health. 2002; 56; 128-131. http://jech.bmj.com/content/56/2/128

4) Schrijvers CTM, van d Mheen HD, Stronks K, Mackenbach JP. Socioeconomic inequalities in health in the working population: The contribution of working conditions. Int J Epidemiol. 1998; 27; 1011-1018. http ://ije.oxfordjournals.org/content/27/6/1011

5) Addington-Hall J and Lalit K. Who should measure quality of life? BMJ. 2001; 322; 1417-1420. http://www.bmj.com/content/322/7299/1417

SESSION 4: MEASURING HEALTH IN POPULATIONS

Objectives:

1) To review the definition of health surveillance and how surveillance is carried out.
2) To be aware of the potential strengths and weaknesses of a variety of surveillance databases.
3) To understand how surveillance data can be used for planning and evaluating health programs.
4) To be aware of different source of data for population and public health

Required readings:

1) Jang L, Provost M, Sherk A. Challenges in the Design of the Canadian Community Health Survey on Healthy Aging, Paper presented at the Joint Statistical Meeting, Vancouver, BC. August 2010.

2) Buelher C. Surveillance. Chapter 22. *In:* Modern Epidemiology, 3rd edition. Rothman KJ and Greenland S. (eds.). Lippincott Williams & Wilkins. 2008; 459-480.

3) Bonita R, Winkelmann R, Douglas KA, deCourten M. The WHO Stepwise approach to surveillance (Steps) of non-communicable disease risk factors Global Behavioral Risk Factor Surveillance. Kluwer Academic/Plenum Publishers ISBN 0306477777 2003; Chapter 3; 9-22.

Additional (optional) readings:

1) Myers KA and Farquhar DRE. Improving the accuracy of death certification. CMAJ. 1998; 158; 1317-1323. http://www.cmaj.ca/content/158/10/1317.reprint

2) Health Surveillance Coordination Division, Population and Public Health Branch. Chronic disease surveillance in Canada, a background paper. Health Canada, 2003. P 1-35.
3) http://www.phac-aspc.gc.ca/csc-ccs/pdf/hscchronic_disease_surveillance_background_paper_e.pdf

D) METHODOLOGICAL ISSUES IN POPULATION AND PUBLIC HEALTH

SESSION 5: OBSERVATIONAL STUDIES FOR POPULATION HEALTH

Objectives:

1) To understand levels of measurement, levels of analysis, and levels of inference used in studies at the population-level.
2) To understand study design for investigating health in populations
3) To compare and contrast the advantages and disadvantages of individual and population-based study designs and to discuss the implications of each with respect to addressing population health issues.

Prior to this session, it is assumed that students are familiar with experimental and observational study designs, including randomized controlled trials, case-control studies and cohort studies.

Required readings:

1) Szklo M, Nieto FJ. Basic Study Designs in Analytical Epidemiology. Chapter 1. Epidemiology Beyond the Basics (2nd ED), Jones and Bartlett Publishers, ISBN 10: 0-763729272

2) Morgenstern H. Ecologic Studies in Epidemiology. Annu Rev Public Health 1995; 16:61-81.

3) Diez-Roux AV. Bringing context back into epidemiology : Variables and fallacies in multilevel analysis. Am J Public Health. 1998; 88; 216-222. http://ajph.aphapublications.org/cgi/reprint/88/2/216

4) Kaczorowski J, Chambers L, Dolovich L, et al. Improving cardiovascular health at population level: 39 community cluster randomised trial of Cardiovascular Health Awareness Program (CHAP). BMJ. 2011; 342:d442. Doi:10.1136/bmj.d442

Additional (optional) readings:

1) Mann CJ. Observational research methods. Research design II: Cohort, cross sectional, and case-control studies. Emerg Med. 2003; 20; 54-60. http://emj.bmj.com/content/20/1/54

2) Diez-Roux AV. Multilevel analysis in public health research. Annu Rev Public Health. 2000; 21; 171-192. http://www.annualreviews.org/doi/abs/10.1146/annurev.publhealth.21.1.171

3) Reidpath DD. Population health. More than the sum of the parts? J Epidemiol Community Health. 2005; 59; 877-880 http://jech.bmj.com/content/59/10/877

SESSION 6: HETEROGENEITY IN HEALTH WITHIN AND BETWEEN POPULATIONS

Objectives:

1) To introduce and discuss the concept of social structure that influences population and individual health.
2) To understand heterogeneity in population health as a product of differences within and between individuals.
3) To learn about methods of measuring health inequalities.
4) To discuss health as a cultural construct.

Required readings:

1) Hertzman C, Frank J, Evans RG. Heterogeneities in health status and the determinants of population health. *In:* Evans RG, Barer ML, Marmor TR (eds.). Why Are Some People Healthy and Others Not? The Determinants of Health of Populations. New York: Aldine de Gruyter. 1994; 67-92.

2) Kawachi I and Berkman L. Social cohesion, social capital, and health. *In:* Berkman L, Kawachi I (eds.). Social Epidemiology. New York: Oxford University Press, Inc. 2000; 174-190.

3) Chow et al. Tobacco control environment: cross-sectional survey of policy implementation, social unacceptability, knowledge of tobacco health harms and relationship to quit ratio in 17 low-income, middle-income and high-income countries. *BMJ Open*. 2017;7(3):e013817 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5387960/

4) Attaei et al. Availability and affordability of blood pressure-lowering medicines and the effect on blood pressure control in high-income, middle-income, and low-income countires: an analysis of the PURE study data. Lancet Public Health. 2017;2: e411-19. http://www.thelancet.com/pdfs/journals/lanpub/PIIS2468-2667(17)30141-X.pdf

Additional (optional) readings:

1) McElroy A, Jezewski MA Cultural Variation in the Experience of Health and Illness. The Handbook of Social Studies in Health & Medicine, Sage Publications, ISBN 0761956174. 2000; 191-209.

2) Kirmayer LJ. The cultural diversity of healing: Meaning, metaphor and mechanism. Br Med Bull. 2004; 69; 33-48. http://bmb.oxfordjournals.org/content/69/1/33

3) Wilkinson RG. Income distribution and health. *In:* Unhealthy Societies: The Afflictions of Inequality. London: Routledge. 1996; 72-109.

SESSION 7: ANALYSIS OF OBSERVATIONAL STUDIES IN POPULATION HEALTH

Objectives:

1) To define and measure noncausal associations in observational research
2) To understand analytical approaches to addressing noncausal associations
3) To define and measure effect modification
4) To understand analytical approaches to addressing effect modification
5) To understand advanced analytical strategies for observational studies

Prior to this session, it is assumed that students are familiar with sampling strategies and the concepts of bias, confounding, and interaction as they apply to individual-level studies.

Required readings:

1) Szklo M, Nieto FJ. "Identifying Noncausal Associations: Confounding." Chapter 5, pgs. 153-184. *In:* Epidemiology Beyond the Basics (3rd ED), Jones and Bartlett Publishers 2014, ISBN 10: 1449604692 https://www.r2library.com/resource/detail/1449604692/ch0005s0080

2) Szklo M, Nieto FJ. "Defining and Assessing Heterogeneity of Effects: Interaction." Chapter 6, pgs. 185-225183-223. *In:* Epidemiology Beyond the Basics (3rd ED), Jones and Bartlett Publishers 2014, ISBN 10: 1449604692. https://www.r2library.com/resource/detail/1449604692/ch0006s0108

3) Greenland S, Lash TL and Rothman KJKJK. Concepts of Interactions. *In*: Modern Epidemiology, 33nd edition. Rothman KJ and Greenland S. (eds.). Lippincott Williams & Wilkins. 2008; Chapter 5.

4) Checkoway H., Pearce N., Kriebel D., "Advanced Statistical Analysis" Chapter 9, pgs. 263-293. *In:* Research Methods in Occupational Epidemiology 2nd Edition. Oxford University Press, 2004. ISBN 0-19-509242-2.

SESSION 8: DESIGN AND ANALYSIS OF CLUSTER RANDOMIZED TRIALS

Objectives:

1) To understand advanced analytical strategies for cluster randomized trials
2) To understand sample size estimation for cluster randomized trials

Prior to this session, it is assumed that students are familiar with sampling strategies and the concepts of bias, confounding, and interaction as they apply to individual-level studies.

Required readings:

1) van Breukelen GJ1, Candel MJ, Calculating sample sizes for cluster randomized trials: we can keep it simple and efficient! *J Clin Epidemiol*. 2012 Nov;65(11):1212-8.

2) Murray DM, Varnell SP, Blitstein JL, Design and analysis of group-randomized trials: a review of recent methodological developments, Am J Public Health. 2004 Mar;94(3):423-32. Review.

3) Chaillet N, Dumont A, Abrahamowicz M, Pasquier JC, Audibert F, Monnier P, Abenhaim HA, Dubé E, Dugas M, Burne R, Fraser WD; QUARISMA Trial Research Group, A cluster-randomized trial to reduce cesarean delivery rates in Quebec, N Engl J Med. 2015 Apr 30;372(18):1710-21.

SESSION 9: DESIGN AND CONCEPTUAL ISSUES IN MULTI-LEVEL DESIGNS

Objectives:

1) To understand sampling in population health studies.
2) To understand how to design multi-level studies.
3) To understand biases in multi-level studies.

Required readings:

1) Snijders T and Bosker R. Multilevel Theories, Multi-stage Sampling, and multilevel models. *In*: Multilevel Analysis: An introduction to basic and advanced multilevel modelling. Sage publication. 2000; Chapter 2.

2) Greenland S and Morgenstern H. Neither within-region nor cross-regional independence of exposure and covariates prevents ecological bias. Int J Epidemiol. 1991; 20; 816-818.

3) Snijders T and Bosker R. Designing Multilevel Studies. *In:* Multilevel Analysis: An introduction to basic and advanced multilevel modelling. Sage publication, 2000; Chapter 10.

4) Duncan C, Jones K, Moon G. Context, composition and heterogeneity: Using multilevel models in health research. Soc Sci Med. 1998; 46; 97-117. http://www.sciencedirect.com/science/article/pii/S0277953697001482

Additional (optional) reading:

1) Greenland S and Morgenstern H. Ecological bias, confounding, and effect modification. Int J Epidemiol. 1989; 18; 269-274. http://ije.oxfordjournals.org/content/18/1/269.short

2) Austin, Goel, and van Walraven, 2001. An introduction to multilevel regression models. *Canadian Journal of Public Health*, 92(2); 150-154. http://sitemaker.umich.edu/emjournalclub/files/an_introduction_to_multilevel_regression_models.pdf

3) Dunn et al., 2014. Translating multilevel theory into multilevel research: challenges and opportunities for understanding the social determinants of psychiatric disorders. *Soc Psychiatry Psychiatr Epidemiol*, 49(6); 859-872. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4067412/

SESSION 10: ANALYTICAL ISSUES IN MULTI-LEVEL DESIGNS

Objectives:

1) To understand the role of spatial analysis for population health data.
2) To understand the basics of the analysis of multilevel models for population health data.

Required readings:

1) Pfeiffer, DU, Robinson, TP, Stevenson M, Stevens KB, Rogers DJ, Clements ACA. Spatial Analysis in Epidemiology. Oxford University Press. 2008 ISBN 978-0-19-850989-2(Pbk). Chapter 2.

2) Pfeiffer, DU, Robinson, TP, Stevenson M, Stevens KB, Rogers DJ, Clements ACA. Spatial Analysis in Epidemiology. Oxford University Press. 2008 ISBN 978-0-19-850989-2(Pbk). Chapter 6.

3) Jerrett M, Gale S, Kontgis C. Spatial Modeling in Environmental and Public Health Research. *Int J Environ Res Public Health*. 2010;7:1302-1329. Doi:10.3390/ijerph7041302 http://www.mdpi.com/1660-4601/7/4/1302/htm

Additional (optional) reading:

1) Birch S, Stoddart GL, Beland F. Modelling the Community as a Determinant of Health. Can J Public Health. 1998; 89; 402-406. http://journal.cpha.ca/index.php/cjph/article/view/1125/1125

2) Pfeiffer, DU, Robinson, TP, Stevenson M, Stevens KB, Rogers DJ, Clements ACA. Spatial Analysis in Epidemiology. Oxford University Press. 2008 ISBN 978-0-19-850989-2(Pbk). Chapter 7.

SESSION 11: CAUSAL CONCEPTS IN POPULATION AND PUBLIC HEALTH

Objectives:

1) To review evolving theories of causation over time.
2) To understand why models for causation at the individual level may not be appropriate at the population level.
3) To understand current theories of causation at the population level.

Required readings:

1) Koopman JE and Weed DL. Epigenesis theory: A mathematical model relating causal concepts of pathogenesis in individuals to disease patterns in populations. Am J Epidemiol. 1990; 132; 366-390.

2) Siegrist J. The social causation of health and illness. *In:* Social studies in health and medicine. Albrecht GL, Fitzpatrick R, Scrimshaw SC. (eds.). Sage Publications. 2000; 100-114.

3) Rothman and Greenland, 2005. Causation and causal inference in epidemiology. *Public Health Matters,* 95(1). http://ajph.aphapublications.org/doi/abs/10.2105/AJPH.2004.059204?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub%3Dpubmed&

Additional (optional) readings:

1) Diez-Roux AV. On genes, individuals, society, and epidemiology. Am J Epidemiol. 1998; 148; 1027-1032. http://aje.oxfordjournals.org/content/148/11/1027.full.pdf+html

2) McMichael AJ. Prisoners of the proximate: Loosening the constraints on epidemiology in an age of change. Am J Epidemiol. 1999; 148; 867-897. http://aje.oxfordjournals.org/content/149/10/887.full.pdf+html

3) Mathers CD, et al. Causal decomposition of summary measures of population health. *In*: Summary Measures of Population Health: Concepts, Ethics, Measurement and Applications. Murray, CJL, Solomon JA, Mathers CD and Lopez AD (eds.). World Health Organization, Geneva. 2002.

SESSION 12: CLASS PRESENTATIONS AND DISCUSSION