

PhD Epidemiology Competencies – Approved 9 March 2012

General Area	Competency
A. Understanding the System	1. Describe major historical phases in the development of epidemiological thought and methods.
	2. Describe the national and international public health burden of major diseases, both new and emerging, as well as incidence and prevalence patterns of these diseases over time.
	3. Demonstrate a broad understanding of the determinants of population health and a deeper understanding of health determinants as they relate to one's thesis topic.
	4. Be able to explain and demonstrate the use of conceptual models in addressing a research question.
	5. Apply theoretical reasoning to study design and analysis (e.g., selection of potential confounding factors based on theory).
	6. Interpret findings within a causal framework.
	7. Recognize important public health insights from previous research.
B. Understanding Data Sources; Critical Appraisal	1. Know sources of health information in Canada and globally, describe their characteristics, and identify appropriate uses for these data.
	2. Identify relevant scientific literature using a variety of bibliographic databases.
	3. Critically synthesize and appraise the scientific literature with respect to study design, methods, and findings (e.g., in a systematic review).
	4. Develop questions requiring further research.
C. Databases, Technology, Surveillance	1. Establish and manage a database, including the implementation of procedures for ongoing quality assurance throughout data intake, coding, cleaning, and movement across computer programs or platforms.
	2. Demonstrate broad familiarity with a variety of common software packages (e.g., SAS, Stata, SPSS, R/S+, ArcGIS/QGIS, NVivo) and be proficient in at least one of the key statistical software packages (i.e., SAS, Stata, R).
	3. Identify and interpret national and international sources of surveillance data.
D. Epidemiologic Methods	1. Identify gaps in knowledge and refine these into practical into practical research questions.
	2. Recognize the appropriate study design(s) for answering a specific research question and justify the selection of a design by considering its strengths and weaknesses.
	3. Justify selection of specific measures of exposure, outcome, and covariates to answer a research question.
	4. Explain the properties (reliability, validity, responsiveness) of a measurement tool, their implications for inference, and the statistical methods used to quantify these properties (e.g., Kappa, ICC).
	5. Develop data collection instruments for the measurement of exposures, covariates, and outcomes using a variety of data methods (e.g., questionnaires, physical examination, lab assays). Includes the design sub-studies to evaluate the properties of a measurement tool.
	6. Recognize potential ethical problems related to the use of human subjects in research (e.g., confidentiality), submit a protocol to a research ethics board, and apply ethical principles throughout study implementation in accordance with the Tri-Council Policy Statement.
E. Biostatistics, Data analysis.	1. Calculate and interpret fundamental epidemiologic measures of occurrence, association, and risk.
	2. Distinguish between effect modification and statistical interaction.
	3. Recognize potential sources of bias and variance, assess the direction and magnitude of bias, and implement strategies for their control.
	4. Explain the rationale for implementing weighting or adjustment in the analysis of data.
	5. Estimate power, sample size, and precision for all major study designs.
	6. Differentiate between data types (e.g., continuous, categorical, multilevel, qualitative) and justify the use a particular statistical approach to analyze these data.
	7. Conduct multivariable statistical analyses including analysis of contingency tables; Kaplan-Meier estimation; linear, logistic, Cox, and Poisson regression.

General Area	Competency
	<p>8. Describe the theory and assumptions inherent to various statistical models (e.g., underlying distribution, independence).</p> <p>9. Demonstrate a broad understanding of more specialized statistical techniques (e.g., longitudinal and repeated measures analysis, principle component analysis, structural equation modeling, hierarchical models, generalized estimating equations, Bayesian approaches, bootstrap/jackknife approaches to variance estimation, qualitative data analysis).</p> <p>10. Demonstrate familiarity with current developments in statistical methods (e.g., genome-wide association studies, advances in hierarchical modeling, simulation).</p> <p>11. Identify and apply alternative or emerging statistical methods, where appropriate, to address one's own research question.</p> <p>12. Interpret statistical results and draw appropriate inferences.</p>
F. Public Health Guidance	1. Engage in discussion and debates on the public health implications of research findings with scientific colleagues, practitioners, and the lay public.
G. Communication, Health Promotion and Protection	<p>1. Apply the principles of grantsmanship in the development of a research proposal.</p> <p>2. Prepare scientific papers for publication in the peer-reviewed literature.</p> <p>3. Organize and deliver oral presentations to academic and non-academic audiences. This may include demonstrated evidence of teaching effectiveness.</p> <p>4. Effectively communicate research findings to knowledge users outside of the scientific community (e.g., general public, practitioners, policy makers) using a variety of dissemination vehicles (e.g., press releases, newsletters, summaries/briefings, websites, brochures, tools).</p>
H. Partnerships	<p>1. Engage in team writing and determine relative contributions in multi-authored work, including applying accepted conventions with regard to authorship.</p> <p>2. Build and maintain the interdisciplinary partnerships necessary for the development and implementation of a research program.</p>
I. Policy and Evaluation	1. Understand the role of epidemiology in: program evaluation, cost effectiveness analysis, advocacy, risk assessment, and the development of evidence-based public health policy. ¹
J. Leadership and Management	<p>1. Engage in scientific service and demonstrate leadership through activities such as: peer review of manuscripts and project proposals, mentoring of junior researchers, and participating in other scholarly activities (e.g., department committees, research ethics board, journal club).</p> <p>2. Demonstrate the skills required for successful grantsmanship (e.g., identification of appropriate funding sources; development of a clear, logical, and persuasive proposal; management of the proposal submission process; effective budget development).</p> <p>3. Demonstrate professional skills (e.g., communication and interpersonal skills, personal effectiveness, organizational skills, project management, job search skills, networking).</p> <p>4. Lead a research study, including adherence to timelines and budget and management of human resources.</p>

¹ Also taught in CHL5004H Introduction to Public Health