

# HLTH403: Environmental Health 2025

## Introduction

### Description and purpose of the course

Environmental health (HLTH 403) is a post-graduate level study in the second semester and aimed at students of public health. Environmental health is a public health topic that deals with environmental risks to health. These include pollution of air, water, and land, unsafe foods and hygiene practices, sustainable development practices, global warming and climate change, and infectious or non-infectious diseases and other health conditions brought about by unsustainable practices and increasing global temperature as a result of climate change. The course consists of three components: environmental epidemiology, environmental toxicology, and human health risk assessment as explained in the subsequent sections.

The goal and objectives of this course is to enable students in understanding of environmental epidemiology (principles and practices of epidemiology applied to environmental health issues), environmental toxicology (how environmental toxins affect humans and how humans deal with such toxins), and how to conduct human health risk assessment ("HHRA"). This way a student will be able to apply principles of epidemiology and toxicology, to identify health hazards due to environmental exposure and determine safe limits of environmental toxins to which we are all exposed.

### Course content

This is a 30-point (0.25 EFT or Equivalent Full Time) course. This implies:

- You are required to spend 10 hours a week studying (one week = 40 hours total, 0.25 of 40 hours = 10 hours) for a total of 120 hours over 12 weeks.
- You will spend 36 of 120 hours face to face or in-class (videoconference or physically present in a classroom) and/or in field activities if conditions permit
- The course occurs in blocks of three hours per day for two days in a block (3 HRS X 2 DAYS X 6 BLOCKS = 36 HRS), so we have six blocks over 12 week, a block every two weeks, see the timetable for block days and contents
- You will complete three assessments on Epidemiology, Toxicology, and Human Health Risk Assessment. Details are provided in the following sections

## Learning objectives and outcomes

Upon successfully completing this course, you will:

- Demonstrate mastery of their knowledge and skills to investigate and address health problems that have origins in the physical, chemical, and social environments (LO1)
- Demonstrate understanding of New Zealand Food Safety and Codex Alimentarius (LO1a)
- Critically appraise a range of literature on Environmental conditions as source of illnesses and burden of disease (LO2)
- Design studies to address environmental health related problems (LO3)
- Demonstrate understanding of the larger community based issues related to Environmental sources of illness (LO4)

## University Graduate Attributes Addressed

Analytical, critical thinking and problem-solving in diverse contexts (GA1:

Employable, innovative and enterprising)

Treaty of Waitangi and Aotearoa NZ's bicultural history (GA2: Bicultural Competence and Confidence)

Other indigenous models of development (GA2: Bicultural competence and confidence)

Understanding the global nature of Environmental Health (GA3: Globally aware)

Application: Understanding and articulating how the content of Environmental Health enhances the community (GA4: Community Engagement)

## List of topics

- Environmental Epidemiology, this will include:
  - Understanding of cause and effect in Epidemiology relevant to Environmental Health
    - Potential outcomes/Counterfactual outcomes
    - Directed Acyclic Graphs and Graphical Causal Models
    - Sufficient and component causes
  - Epidemiological measurements relevant for Environmental Health
    - Incidence rate, ratios, proportions
    - Standardised mortality and morbidity
    - Prevalence and relationship between prevalence and incidence measures

- Survival analysis, concepts of proportional hazards, and competing risks
  - Time Series and spatial data analysis with respect to air pollution
- Epidemiological study designs relevant to Environmental Health
  - Case series and principles of disease surveillance
  - Case control study
  - Cohort study
  - Ecological studies (Air pollution and spatial epidemiological study designs)
- Epidemic Investigations (Hands on examples with in-class exercises)
  - How to investigate food borne disease outbreaks
  - How to collect data for epidemiological investigations and line listings
  - How to analyse environmental epidemiological data using R
- Toxicology
  - Different types of toxins (food, chemicals, physical, venom, concepts of neurotoxicity, haematotoxicity)
  - Toxicokinetics (pathways of entry and action of the toxins)
  - Toxicodynamics (what the body does to the toxin, metabolism and excretion of the toxins)
- Human Health Risk Assessment
  - Hazard identification
  - Dose Response Effect
  - Exposure Assessment
  - Risk Characterisation
  - Risk Communication
  - Risk Mitigation
- Within these broad topic areas, we will discuss the following specific issues
  - Infectious Disease, pandemics, and onehealth
  - Air Pollution and health effects due to air pollution
  - Water, sanitation, and hygiene (WASH)
  - Soil and agriculture related health issues (pesticides, fertilisers, and related toxins)
  - Noise and other physical agents (noise, pressure, and other related issues)
  - Food Safety and toxins mediated via food and drinks, Codex Alimentarius
  - Sustainable development goals and issues around sustainability
  - Health effects of climate change
  - Regulations and Law applicable to New Zealand
  - Maori and indigenous health

## Assessments

### Assessment 1. Annotated Bibliography of an Environmental Health Problem

#### Instructions:

Write an analytical annotated bibliography of an environmental health topic of your choice where you will focus on epidemiology of an exposure and a health effect. For example: you can write about health effects of air pollution in a city.

The following topics are all good examples of environmental health topics:

- Health effects of air pollution
- Soil or water pollution
- Agricultural wastes
- Noise pollution
- Water, sanitation, and hygiene
- Climate change and sustainability

### How to write an Annotated Bibliography

An analytical annotated bibliography, or a critical annotated bibliography does the following:

- It summarises the material from a source;
- It then **analyses what is being said**.

Here is the step by step way to write an annotated bibliography for each paper:

- Step 1. Identify the area of research for which you will write the annotated bibliography
- Step 2: Identify at least five papers
- Step 3: For each paper, summarise the content
- Step 4: For each paper, **examine the strengths, weaknesses, and biases** presented; note how epidemiological data and literature are presented. Ask yourself, what is the question? What is the study design? is the study design appropriate? What about the causal inference?
- Step 5: Describe how you will apply the conclusions from the paper to build argument for your own research or topic relevant to Environmental Health

### Rules and structure

- You must complete the task in Learn page set up for that purpose
- Follow the instructions in the Learn Assessment page

- In the text block labelled “Write Annotated Bibliography”, you should write the annotated bibliography structured as an organised list of sources, similar to a reference list. Each reference is referred to as a “paper” here.
- Next to each paper write a paragraph-length annotation, about 200 words.
- Write the citation first, then the annotation (follow the above guidelines while writing the annotation, in five paragraphs)
- If you want to include further citations and references of your own (other than the list of papers you have selected), write your references and citations in your annotation following Vancouver square bracket style. For example, mention [1] for the first citation, [2] for the second citation and so on. Then place the list of citations in a separate block of text (you will see the space in the Learn page). Each reference MUST include a DOI and you must read the full text if you cite it.

Follow the question prompts in the Learn Page to complete this assessment task.  
Soft Deadline: 22nd August 2025, Submit on Learn

## Assessment 2. Research Project Proposal

### Instructions

Throughout this course you will be exposed to many different environmental health problems and many different ways to address them. You will learn about epidemiology, toxicology, and human health risk assessment. You will read papers and listen to lectures as to how epidemiologists go about solving water borne disease outbreaks, how teams of researchers are engaged in community health, and you will also learn about how to think of climate change related issues. You will also learn about the technical details of environmental epidemiology — the science of distribution and determinants of diseases of environmental origin and how to address public health needs. You will learn about toxicology, the science of how we interact with the toxins and how toxins affect us or what mechanisms they use to interact with us. Finally you will learn how to conduct human health risk assessments where the skills of epidemiology and toxicology come together. In the course, you will also learn how to think of innovative ways to solve problems using design thinking approach, and you will form teams to address environmental issues and create novel solutions. As an integral part of this course you will learn about design thinking and team building, problem identification and exercises and you will actually get to test your own project ideas.

## How to write the project proposal

- Step 1. Do your own research and identify an environmental health related problem that you will solve. Do a literature review.
- Step 2: Think of a solution or approach to address this environmental health issue
- Step 3: Actively participate in the Design Thinking Training we have organised for you with the UCE. Use the knowledge and experience you gain there. In particular, gain experience of working with you teammates to address and solve health issues. You will have conducted a design sprint on a selected environmental health issue (see the class schedule section).

## Rules and structure

Write an introduction where you will write about the epidemiology of the problem what is known, what is missing and what you will add.

- Then write about your materials and methods as to how you will address solving the problem.
- Supplement the proposal with figures, tables, and references.
- Host the figure elsewhere (such as imgbb), then copy and paste the URL of the figure to the respective box in Learn with reference to the figure
- Save a table as a figure and host the figure in imgbb and then copy and paste the URL of the figure to the respective box in Learn with reference to the table
- References and citations must follow Vancouver square bracket style (see Assessment I)
- Working on Learn, answer the questions posted on Learn Quiz module.
- Even though you may have worked as part of a team in developing your solution, what you will write is YOUR OWN work.

Deadline: 19th September, 2025 Submit on Learn

Word Limit: 200 words per section

## Assessment 3. Health Risk Assessment

### Instructions:

Select one of the following Write a commentary on a human health risk assessment task (select one of eight given)

Review the Human Health Risk Assessment yourself, and answer the questions posted on Learn.

## How to write the Human Health Risk Assessment Critique

Human health risk assessment has four parts. You begin with hazard identification. This exercise is conducted using data from animal experiments, epidemiological studies, and tissue experiments in most cases. This establishes whether the toxin in question is a carcinogen or not a carcinogen; accordingly different models need to be considered. Following this step are two parallel steps: exposure assessment and dose response relationship. Exposure assessment usually has a set of equations where the authors identify how much of the toxin is present in the environmental medium, the rate of ingestion of the medium by humans (adults and children separately) and depending on the health effects whether cancerous or not, different formulae are used to deduce a formula about the dose and its corresponding response. The final step in HHRA is to calculate a hazard quotient or hazard index (depending on whether the authors are working with a single toxin or a mix of toxins), and for carcinogens, the authors develop what is referred to as ELCR (excessive lifetime cancer risk).

Your task is to read each of the following Risk Assessments carefully or the listed risk assessments given to you carefully and then identify each of the above steps and summarise it. You can also create a scenario where you will be applying the results of the risk assessment and write about it.

## Rules and Structure

Follow the instructions in the Learn Assessment page.

You will work with the following list of risk assessments:

- <https://www.esr.cri.nz/expertise/specialist-services/#Riskassessments>
- <https://www.esr.cri.nz/digital-library/health-risk-assessment-petrol/>
- <https://www.esr.cri.nz/digital-library/health-risk-assessment-glowsticks/>
- <https://www.esr.cri.nz/digital-library/health-risk-assessment-glyphosate-formulations/>
- <https://www.esr.cri.nz/digital-library/health-risk-assessment-drain-cleaner/>
- <https://www.esr.cri.nz/digital-library/health-risk-assessment-dishwasher-powder/>
- <https://www.esr.cri.nz/digital-library/health-risk-assessment-household-bleach/>

- <https://www.esr.cri.nz/digital-library/health-risk-assessment-hydrogen-sulphide/>
- <https://www.esr.cri.nz/digital-library/health-risk-assessment-heavy-metals-in-jewellery/>
- <https://www.esr.cri.nz/digital-library/health-risk-assessment-mercury-in-skin-lightening-products/>
- <https://www.esr.cri.nz/digital-library/health-risk-assessment-parabens-in-personal-care-products/>

Deadline: 17th October, submit on Learn

## Grading Rubric of the Assessments

### Annotated Bibliography

#### A plus to A minus band

- You have followed the structure of the assessments in Learn
- You have identified a relevant environmental health research problem or issue
- You have identified MORE than FIVE papers (the more papers you will identify, the higher will be your grade towards A plus)
- For each paper you have summarised the study
- For each paper you have identified the strengths related to the study design
- For each paper you have identified the weaknesses related to the statistical power and sample size, confounding variables, biases, and causal considerations
- For each paper you have provided a commentary about how this study contributes towards your own research problem
- For each paper, you have written about 200 words of text with relevant references and citations
- You have made use of referencing and citations
- You have made use of tables and figures (you can keep tables and figures as images in imgbb or elsewhere and you can add links to these figures and tables in your text)

#### B plus to B minus band



- You have followed the structure of the assessments in Learn
- You have identified a relevant environmental health research problem or issue
- You have identified about FIVE papers (the fewer papers you identify the more likely you will be graded lower towards B minus)
- For each paper you have summarised the study
- For each paper you have identified some strengths and weaknesses related to the study design
- For each paper you have NOT provided a commentary about how this study contributes towards your own research problem
  - Or even if you have done the above, you have not done that for all papers you identified
- For each paper, you have written fewer than 200 words of text
- You have NOT made use of referencing and citations or if you have these citations and references are irrelevant or few to justify your statements
- You have NOT made use of tables and figures (you can keep tables and figures as images in imgbb or elsewhere and you can add links to these figures and tables in your text)

### **C plus or lower**

- Any piece of assignment that does not meet the above conditions of at least B minus

## **Research Project Proposal Assessment Task**

### **A plus to A minus band**

- You have followed the structure of the assessments in Learn
- You have identified a relevant environmental health research problem or issue
- You have actively participated in the Design Thinking Lessons to craft your research project proposal
- You have taken leadership in the Design Sprints and Innovation Sprints and have led your team
- You have clearly thought through a research problem related to Environmental health
- You have clearly articulated a solution or a way to investigate the Environmental Health Problem

- You have identified the relevant sets of studies that describes aspects of the Environmental health problem
- You have identified the strengths and weaknesses of the existing solutions
- In your research method you have identified many approaches and discussed their strengths and weaknesses
- In your research method section, you have clearly articulated how you will select people you want to conduct the study
- In your research method section, you have stated step by step how you will conduct the study
- In your research methods section, you have stated the strengths and weaknesses of your study design
- In your research methods section you have clearly described how you will apply the skills you learned in the innovation and design thinking sprints to your specific situation
- In each section, you have written about 200 words of text with relevant references and citations (between 200-220 words)
- You have made use of referencing and citations
- You have made use of tables and figures (you can keep tables and figures as images in imgbb or elsewhere and you can add links to these figures and tables in your text)

### **B plus to B minus band**

- You have followed the structure of the assessment in Learn
- You have identified a relevant environmental health research problem or issue
- You have participated in at least some Design Thinking Exercises and Innovation Sprints in the course
- You have demonstrated a research problem and a solution
- You have identified a correct study design
- You have discussed the strengths and weaknesses of your study design
- You have demonstrated at least SOME learning from your experiences in participating in the design sprint
- You have written about 200 words in most sections
- You have NOT made use of referencing and citations or if you have these citations and references are irrelevant or few to justify your statements
- You have NOT made use of tables and figures (you can keep tables and figures as images in imgbb or elsewhere and you can add links to these figures and tables in your text)

### **C plus or lower**

- Any piece of assignment that does not meet the above condition of at least B minus

## **Health Risk Assessment Task**

### **A plus to A minus band**

- You have followed the structure of the assessments in Learn
- You have identified a relevant HHRA task
- You have correctly identified each of the steps of HHRA
- For each step you have correctly answered each question posted

### **B plus to B minus band**

- You have followed the structure of the assessment in Learn
- You have NOT identified a relevant HHRA task
- You have NOT correctly answered questions posted in each section (the less you answer the more likely you will get a B minus score)

### **C plus or lower**

- Any piece of assignment that does not meet the above condition of at least B minus

## **Time Table**

Session	Date time venue	
0	Monday, 14th July, 10-1,	Workshop on learning how to solve problems, optional workshop for design thinking
1	Monday, 28th July, 10AM-1PM, KP508	Introduction, Epidemiology part 1
1.1	Saturday-Sunday 2-3 August	Disrupt Challenge (Optional)

2	Wednesday, 30th July, 9-12, Psyc116	Epidemiology part II
3	Monday, 4th August, 10-1, KP508	Epi Part III
4	Wednesday, 6th August, 9-12, PS116	Epi part IV
5	Monday, 18th August, 10-1, KP508	Toxicology, I
6	Wednesday, 20th August, 9-12, PS116	Toxicology 2
7	Monday, 15th September, 10-1, KP508	HHRA 1
8	Wednesday, 17th Sept 9-12, PS116	HHRA 2
9	Monday, 29th Sept, 10-1, KP508	Special topic 1
10	Wednesday, 1st Oct, 9-12, PS116	Special topic 2
11	Monday, 13th Oct, 10-1, KP508	Idea Presentations
12	Wednesday, 15th Oct, 9-12, PS116	Final Class

## An Introduction to Design Thinking For Environmental Health Education

Design Thinking is a people centric, collaborative, optimistic and experimental way of working to drive innovation. It is a pragmatic approach that aims to nurture deep curiosity about an issue, unleash creativity in how to approach it, and ensure clarity when it comes to implementing solutions.

In these sessions we introduce a process that can be used to approach problems with this new perspective. We work with a lot of new tools and techniques that will help teams collaborate in more creative ways. And we use these to address live business/organisational/societal issues to show how this method can be practically applied.

#### Workshop 1:

- Overview of design thinking
- Understand the important role of curiosity
- Define and (re)frame opportunities
- Apply a new set of tools to approach problem discovery
- Conduct a good discovery interview;
- Understand the value of field based research,
- Create insight while avoiding bias as much as possible;
- Apply understanding phase methods, tools and techniques.

Each workshop will provide some theory and be focused on practical application of tools and techniques.

Note that the final questions from Te Papa Hauora are:

The focus of the Challenge is to 'help create a sustainable health system' with the challenge questions being:

- Prevention – 'How can we more effectively prevent, detect and treat health issues?'
- Promotion – 'How can we better support healthy communities?'
- Environment – 'How can we shape our health system to responsibly utilise resources?'

If we frame it that the teams need to pick one of the question/problem areas to focus on and then a specific problem within that area (which they'll likely have an solution idea forming). Each team needs to do this prior to the 1<sup>st</sup> session. Or, if we can't get them to do that prior, this can be done after the 1<sup>st</sup> session – please let me know.

