



PUBH 6112

Environmental Health Risk Assessment:
Application to Human Health Risks from Exposure to Chemicals
Fall 2019

COURSE & CONTACT INFORMATION

Credits: 2

Meeting Day(s): Mondays and Wednesdays

Meeting Time: 4:00 pm – 5:50 pm

Meeting Place: 1155 Mayo

Instructor: Elizabeth Wattenberg, Ph.D.

Associate Professor, Division of Environmental Health Sciences

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Office Phone: 612-626-0184

Office Hours: e-mail to make an appointment

Office Location: 1110 Mayo

COURSE DESCRIPTION

Students will learn and apply the basic risk assessment framework for chemical exposures: exposure assessment, hazard identification, dose-response evaluations, and risk characterization. Students will also learn about the challenges of applying this framework for risk management.

COURSE PREREQUISITES

Needs to be revised

COURSE GOALS & OBJECTIVES

- Learn the basic process and fundamental steps involved in conducting an environmental health risk assessment
- Learn how to search for health effects information in different databases
- Learn how to apply risk assessment methods to evaluate the potential of chemicals to harm human health
- Write a health risk assessment document for professionals
- Present environmental health risk assessment information to professionals
- Work in an interdisciplinary team to conduct research, write a professional document, and create a presentation for a professional audience

METHODS OF INSTRUCTION AND WORK EXPECTATIONS

This course includes lectures, in-class activities, and a project and presentation. **Attending class is very important because you will spend class time working with your team on a risk assessment project.** Grading percentages are based on total performance on the assignments. Extra credit projects will not be accepted to improve a grade or as a substitute for assignments. The curve may be adjusted depending on the overall performance of the class. Course grades will be determined by the following:

Class participation (25 points)

- All students must attend class on Wednesday, December 11 when you will give your final presentations to Minnesota Technical Assistance Program (MnTAP) staff. Students must attend all of the presentations.
- Students will receive 25 points for attendance and participation in in-class activities. You can miss up to two classes (except for December 11) without losing any points. If you miss a class, you will be responsible for completing any in-class activities related to the course project. If class notes are not posted, you will be responsible for obtaining notes from another student. Please see the following website for a list of legitimate reasons for missing class: <https://www.sph.umn.edu/current/resources/student-policies/>

Project (75 points)

You will assist [MnTAP](#) with a project to reduce the use of the solvent trichloroethylene (TCE). TCE is commonly used by many industries to degrease metal parts. It is also classified by the United States Environmental Protection Agency (USEPA) as a [hazardous air pollutant \(HAP\)](#); the USEPA regulates HAP emissions under the Clean Air Act. There have been [proposals to ban the use of TCE in Minnesota](#).

The Minnesota Technical Assistance Program (MnTAP) is an outreach program at the University of Minnesota that helps Minnesota businesses develop and implement industry-tailored solutions that prevent pollution at the source, maximize efficient use of resources, and reduce energy use and costs to improve public health and the environment. Quoted from the [MnTAP website](#).

Your specific job is to compare the human health risks of TCE to potential substitutes of TCE. You will rank TCE and the other solvents based on their potential to harm human health and the environment. You will make a recommendation to MnTAP regarding which solvent is least hazardous and thus “greener” for the environment. *MnTAP will not accept any conclusion along the lines of “more research is needed.”*

Deliverables: Please note that specific detailed instructions for each deliverable will be given in class and posted on Canvas. Some deliverables will be developed as part of in-class exercises.

1. Summary of your analysis and recommendation (50 points).

This document will include the following:

- a. Your recommendation regarding which solvent is the least hazardous, a justification for your recommendation, and a discussion of uncertainties and assumptions.
- b. A table that compares the general safety information for the three solvents.
- c. A table that compares the health hazards of the three solvents.
- d. A document that lists exposure limits for each solvent or component of the product.
- e. A description and summary of your exposure analysis.
- f. An analysis of the marketing page for each solvent or product for factuality.
- g. An annotated bibliography that summarizes health hazard and dose response information for each solvent, and lists the sources of this information.

2. A presentation to MnTAP staff on your analysis and recommendation (25 points).

Learning Community

We come to our courses with diverse backgrounds and experiences. We will build on what we already know about collaborating and listening to engage with each other in respectful and thoughtful ways.

In group work, this can mean:

- Setting expectations with your groups about communication and response time during the first week of the semester (or as soon as groups are assigned) and contacting the instructor if scheduling problems cannot be overcome.
- Setting clear deadlines and holding yourself and each other accountable.
- Determining the roles group members need to fulfill to successfully complete the project on time.
- Developing a rapport prior to beginning the project (what prior experience are you bringing to the project, what are your strengths as they apply to the project, what do you like to work on?)

In group discussion, this can mean:

- Respecting the identities and experiences of your classmates.
- Avoid broad statements and generalizations.
- Consider your tone and language.

Like other work in the course, all student-to-student communication is covered by the Student Conduct Code (<https://z.umn.edu/studentconduct>).

COURSE TEXT & READINGS

Readings from government reports, research papers, or websites may be listed under each lecture in this syllabus or on Canvas, along with information on how to access these resources.

Additional Resources:

Risk Assessment in the Federal Government: Managing the Process. National Research Council; National Academy Press, Washington, D.C., 1983. Available free online at: <http://www.nap.edu/read/366/chapter/1>

Science and Decisions: Advancing Risk Assessment. National Research Council; National Academy Press, Washington, D.C., 2009. Available free online at: <https://www.nap.edu/catalog/12209/science-and-decisions-advancing-risk-assessment>

United States Environmental Protection Agency introduction to risk assessment
<https://www.epa.gov/risk/human-health-risk-assessment>

Good review of basic principles in toxicology

Toxicology Tutor I, National Library of Medicine
<https://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenu.htm>

Toxicology Tutor II, National Library of Medicine
<https://sis.nlm.nih.gov/enviro/toxtutor/Tox2/amenu.htm>

COURSE OUTLINE/WEEKLY SCHEDULE

The dates of the lectures and activities may be modified depending on the progress of the class

See the following pages

Week	Topic	Readings	Activities/Assignments
Week 1 Wednesday October 23	<ul style="list-style-type: none"> Introduction to Environmental Health Risk Assessment Guest from MnTAP: Jane Paulson, Senior Engineer 	<ul style="list-style-type: none"> Review the slides shown on the website below under the section Toxicology Tutor I: Risk Assessment. These slides present a good, general overview of environmental health risk assessment. Taking the quizzes included in this module is highly recommended. You may want to review different sections of this slide set when specific topics are discussed in class. http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenu.htm 	<ul style="list-style-type: none"> Introduction to risk assessment project
Week 2 Monday October 28	<ul style="list-style-type: none"> Hazard Identification: Determination of what types of toxicity chemicals can cause; Application of read across and computational toxicology in hazard identification; QSAR Guest lecturers from 3M: Catherine F. Jacobson, Robert Roy, and Colin Owens 	<ul style="list-style-type: none"> Review the slides shown on the website below under the section <i>Toxicology Tutor I: Risk Assessment</i> that describe Hazard Identification. http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenu.htm Read: A systematic approach for evaluating the quality of experimental toxicological and ecotoxicological data. HJ Klimisch et al., Regul Toxicol Pharmacol 25:1-5, 1997. Available online through the Bio-Med Library. Read: Recognition of Adverse and Nonadverse Effects in Toxicity Studies. RW Lewis et al. <i>Toxicologic Pathology</i> 30:66-74, 2002. Available online through the Bio-Med Library. Watch the video: Hazard vs. Risk – Same Difference? https://www.youtube.com/watch?v=VF-8QksiU7c 	<ul style="list-style-type: none"> Learn the general process of hazard identification Learn about alternative methods for assessing hazard when toxicological or epidemiological data are not available Practice doing quantitative structure activity relationship (QSAR) analysis
Week 2 Wednesday October 30	<ul style="list-style-type: none"> Hazard Identification continued: application of traditional <i>in vivo</i> toxicology studies in hazard identification Guest lecturers from 3M: Catherine F. Jacobson and Robert Roy 	<ul style="list-style-type: none"> Same as Monday, October 29 	<ul style="list-style-type: none"> Learn about traditional toxicological studies that are used to generate data for hazard identification

Week	Topic	Readings	Activities/Assignments
Week 3 Monday November 4	<ul style="list-style-type: none"> Application of hazard identification for course project Introduction to databases used in hazard identification 	<ul style="list-style-type: none"> Same as Monday, October 29 See list of commonly used databases posted on Canvas 	<ul style="list-style-type: none"> Begin hazard identification for your project Instructions for this activity will be posted on Canvas Receive assigned products for your report Bring a lap top to class Receive instructions for your presentation
Week 3 Wednesday November 6	<ul style="list-style-type: none"> Application of hazard identification for course project continued 	<ul style="list-style-type: none"> Same as Monday, October 29 	<ul style="list-style-type: none"> Continue to work on the hazard identification part of your project
Week 4 Monday November 11	<ul style="list-style-type: none"> Basic Characterization of Products for course project 	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Find and compare information on VOC content, ozone-producing potential, general safety, and marketing information for each product. Instructions for this activity will be posted on Canvas Begin working on your presentation of Hazard ID, basic characterization, instructions for use, likely routes of exposure, your evaluation of marketing information for each product.
Week	Topic	Readings	Activities/Assignments

Week 4
Wednesday
November 13

- Exposure Evaluation
- Guest lecturer from the Division of Environmental Health Sciences: Professor Susan Arnold
- **Review the slides** shown on the website below under the section Toxicology Tutor I: Risk Assessment that describe Exposure Assessment. <http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenue.htm>
- **Due at the beginning of class:** Draft of Hazard ID and Basic Characterization of Products sections of your project paper
- You will compare and contrast your draft documents to those submitted by the other teams. Instructions for this assignment will be posted on Canvas.
- Practice estimating exposure to a mixture
- Instructions for this activity will be posted on Canvas

Week 5
Monday
November 18

- Hazard ID and Basic Characterization of Products for course project

- **You will present:** Hazard ID, basic characterization, and your evaluation of marketing information for each product.
- **Due at the beginning of class:** The written report your comparison of your draft documents with the draft documents of the other teams.
- **Discussion:** Come together as work group to come to consensus on the best and most important information to include in the risk assessment document for MnTAP.

Week	Topic	Readings	Activities/Assignments
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Week 5 Wednesday November 20	<ul style="list-style-type: none"> • Components of a Cumulative Risk, Cumulative Impacts and Cumulative Effects Assessment • Guest lecturer from the Minnesota Pollution Control Agency: Kristie Ellickson 	<ul style="list-style-type: none"> • Read the EPA document “Guidance on Cumulative Risk Assessment of Pesticide Chemicals That have a Common Mechanism of Toxicity”. Read through Figure 1 on page 11. Then, read pages 30-42. This document is online at this URL: https://www.epa.gov/sites/production/files/2015-07/documents/guidance_on_common_mechanism.pdf • Read: <i>Cumulative Risk: Toxicity and Interactions of Physical and Chemical Stressors</i>. C.V. Rider et al. Toxicological Sciences, 137:39-11, 2014. Available online through the Bio-Med Library • Read: <i>Cumulative Risk Assessment Toolbox: Methods and Approaches for the Practitioner</i>. M.M. MacDonell et al. Journal of Toxicology. Volume 2013 (2013), Article ID 310904, 36 pages. Available online through the Bio-Med Library 	<ul style="list-style-type: none"> • Cumulative risk exercises
Week 6 Monday November 25	<ul style="list-style-type: none"> • Dose Response 	<ul style="list-style-type: none"> • Review the slides shown on the website below under the section Toxicology Tutor I: Risk Assessment that describe Dose-Response Assessment and Risk Characterization. http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenu.htm • Read: <i>Quantitative risk assessment methods for cancer and noncancer effects</i>. Baynes RE. Prog Mol Biol Transl Sci 112: 259-283. (2012). Available online through the Bio-Med Library • Read the following for discussions of significant/acceptable cancer risk levels: <ul style="list-style-type: none"> ○ <i>Significant risk decisions in federal regulatory agencies</i>. Rodricks JV et al. Regulatory Toxicology and Pharmacology. 7:307-320 (1987). Available online through the Bio-Med Library ○ <i>Water quality: Guidelines, standards and health</i>. Edited by Lorna Fewtrell and Jamie Bartram Published on behalf of WHO by IWA Publishing (2001). See chapter 10 on Acceptable Risk. http://www.who.int/water_sanitation_health/publications/whoiwa/en/ • Watch the video: What does “Probably Cause Cancer” actually mean? https://www.youtube.com/watch?v=CbBkB81ySxQs 	<ul style="list-style-type: none"> • Identify exposure limits for each component of each brand of the products • Instructions for this activity will be posted on Canvas
Week	Topic	Readings	Activities/Assignments

Week 6 Wednesday November 27	<ul style="list-style-type: none"> • Work on deliverables 	<ul style="list-style-type: none"> • You will present: Exposure limits • Due at the beginning of class: Exposure limits and the exposure evaluation of mixtures exercise • Discussion: Come together as work group to come to consensus on the best and most important information to include in the risk assessment document for MnTAP. • Work on conclusions, recommendations, draft paper
Week 7 Monday December 2	<ul style="list-style-type: none"> • Exposure Evaluation and Biomonitoring • Guest lecturers from the Minnesota Department of Health: Jessica Nelson and Chris Greene 	<ul style="list-style-type: none"> • Review the slides shown on the website below under the section Toxicology Tutor I: Risk Assessment that describe Exposure Assessment. http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/amenue.htm • Due at the beginning of class: Draft paper
Week 7 Wednesday December 4	<ul style="list-style-type: none"> • Work on deliverables 	<ul style="list-style-type: none"> • Due at the beginning of class: Draft presentation • Workshop draft paper
Week 8 Monday December 9	<ul style="list-style-type: none"> • Work on deliverables 	<ul style="list-style-type: none"> • Workshop draft presentation
Week 8 Wednesday December 11	<ul style="list-style-type: none"> • Final presentations to MnTAP staff 	<ul style="list-style-type: none"> • Due at the beginning of class: Electronic copies of project paper

SPH AND UNIVERSITY POLICIES & RESOURCES

The School of Public Health maintains up-to-date information about resources available to students, as well as formal course policies, on our website at www.sph.umn.edu/student-policies/. Students are expected to read and understand all policy information available at this link and are encouraged to make use of the resources available.

The University of Minnesota has official policies, including but not limited to the following:

- Grade definitions
- Scholastic dishonesty
- Makeup work for legitimate absences
- Student conduct code
- Sexual harassment, sexual assault, stalking and relationship violence
- Equity, diversity, equal employment opportunity, and affirmative action
- Disability services
- Academic freedom and responsibility

Resources available for students include:

- Confidential mental health services
- Disability accommodations
- Housing and financial instability resources
- Technology help
- Academic support

EVALUATION & GRADING

[Enter a detailed statement of the basis for grading here. Include a breakdown of course components and a point system for achieving a particular grade. Include expected turnaround time for grading/feedback. Please refer to the University's Uniform Grading Policy and Grading Rubric Resource at <https://z.umn.edu/gradingpolicy>]

Grading Scale

The University uses plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following, and you can expect the grade lines to be drawn as follows:

% In Class	Grade	GPA
93 - 100%	A	4.000
90 - 92%	A-	3.667
87 - 89%	B+	3.333
83 - 86%	B	3.000
80 - 82%	B-	2.667
77 - 79%	C+	2.333
73 - 76%	C	2.000
70 - 72%	C-	1.667
67 - 69%	D+	1.333
63 - 66%	D	1.000
< 62%	F	

- A = achievement that is outstanding relative to the level necessary to meet course requirements.

- B = achievement that is significantly above the level necessary to meet course requirements.
- C = achievement that meets the course requirements in every respect.
- D = achievement that is worthy of credit even though it fails to meet fully the course requirements.
- F = failure because work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (Incomplete).
- S = achievement that is satisfactory, which is equivalent to a C- or better
- N = achievement that is not satisfactory and signifies that the work was either 1) completed but at a level that is not worthy of credit, or 2) not completed and there was no agreement between the instructor and student that the student would receive an I (Incomplete).

Evaluation/Grading Policy	Evaluation/Grading Policy Description
Scholastic Dishonesty, Plagiarism, Cheating, etc.	<p>You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis (As defined in the Student Conduct Code). For additional information, please see https://z.umn.edu/dishonesty</p> <p>The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: https://z.umn.edu/integrity.</p> <p>If you have additional questions, please clarify with your instructor. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.</p> <p>Indiana University offers a clear description of plagiarism and an online quiz to check your understanding (http://z.umn.edu/iuplagiarism).</p>
Late Assignments	All assignments must be turned in by due date and time
Attendance Requirements	Students can miss up to two classes (except for December 12) without losing any points.
Extra Credit	Extra credit projects will not be accepted to improve a grade or as a substitute for assignments.

CEPH COMPETENCIES

Competency	Learning Objectives	Assessment Strategies
19. Communicate audience-appropriate public health content, both in writing and through oral presentation	<ul style="list-style-type: none"> Practice writing a health risk assessment document for professionals Practice presenting environmental health risk assessment information to professionals 	<ul style="list-style-type: none"> The instructor will review and grade each paper The instructor will review and grade each presentation
21. Perform effectively on interprofessional teams	<ul style="list-style-type: none"> Practice working with an interdisciplinary team to conduct research, write a professional document, and create a presentation for a professional audience 	<ul style="list-style-type: none"> Students will evaluate the contributions of each team member to the paper and presentation The instructor will observe how the team interacts and performs in-class activities that involve team work

ENVIRONMENTAL HEALTH SCIENCES COMPETENCIES

Competency	Learning Objectives	Assessment Strategies
Determine what hazards exist in specific environments	<ul style="list-style-type: none"> Practice searching for health effects information in several different databases 	<ul style="list-style-type: none"> The instructor will review and grade each the section of the paper on hazard identification and the presentation of hazard identification
Integrate exposure and health effects knowledge to understand health risk and inequity	<ul style="list-style-type: none"> Learn the basic process and fundamental steps involved in conducting a health risk assessment Practice applying risk assessment methods to evaluate the potential of chemicals to harm human health 	<ul style="list-style-type: none"> The instructor will review and grade each paper and presentation that requires the integration of exposure and health effects knowledge to understand health risk and inequity Participation in the exercises for assessing cumulative risk