## Syllabus Environmental and Occupational Health Sciences (EOHS)  
(Modules 114, 115, 116)

<table>
<thead>
<tr>
<th>EOHS (114-116)</th>
<th>Environmental and Occupational Health Sciences</th>
</tr>
</thead>
</table>
| **Coordinator** | Bertrand Lefebvre, PhD Associate Professor of Geography  
Department of Environmental and Occupational Health and Sanitary Engineering, EHESP  
School of Public Health, bertrand.lefebvre@ehesp.fr |
| **Dates** | February, March and April 2018 |
| **Credits/ECTS** | 9 ECTS |
| **Duration** | 84 hours (13 days of 6 hours, 2 half-days of 3 hours) |

### Description

The impact of some environmental factors on public health is known since the Minamata disaster or Rachel Carlson’s book on pesticides (*Silent spring*). From the early 1960s up to now, the interrelations between environmental or occupational problems, politics and the health status of populations have been increasingly scrutinized. Often complex and unforeseeable, these interrelations have become central to public health policies and interventions. The aim of this module is to analyse and understand:

1. The interdisciplinary context of public health challenges of environmental or occupational origin,
2. The main environmental or occupational risk factors for public health and the corresponding issues,
3. And the weight of related uncertainty in a changing context (climate change, spatiotemporal variability, globalization, ...).

Lead by researchers with a high degree of professional experience, lectures, case studies and group works will be proposed to students over a five-week period. Students will regularly present paper analyses during the course of the modules.

### Prerequisites

None

### Course learning objectives

Students who successfully complete this course will be able to:

1. Identify the key public health problems related to environmental and professional exposures
2. Describe the methods of measurement of the main environmental and occupational risk factors
3. Apply the principles of study design in environmental epidemiology
4. Analyse critically the findings of environmental health papers

### Structure  
(details of sessions title/speaker/date/duration)

Details of the 12 sessions:

1. Key issues in environmental health: a historical perspective. B. Lefebvre (Ehesp)
2. Environmental metrology: pollution of surface water. M-F Thomas (Ehesp)
3. Microbial quality of drinking water. P. Le Cann (Ehesp)
4. A planetary health approach or the need for integrative thinking in public health. J-F Guégan (IRD)
5. Pollution of aquifers and impact of landfills on health. P. Rousseau-Gueutin (Ehesp)
6. From the basics concepts of physiology to the basics concepts of toxicology. A. Gely-Pernot (Ehesp)
8. Introduction to occupational epidemiology. E. Counil (Ehesp)
9. Air Pollution - Ambient air and indoor air. O. Blanchard (Ehesp)
10. The spatial turn in environmental health. B. Lefebvre (Ehesp)
11. Environmental epidemiology: articles and study design. F. Bodeau-Livinec (Ehesp)
12. Healthy urban planning. A. Roué-Le Gall & N. Lemaire (Ehesp)
## Course requirement

Students are expected to attend all lectures and seminars. Class attendance will be checked accordingly. Students are expected to read and analyse selected papers for the group work before the courses.

## Grading and assessment

- **30%** group work and Student’s presentation which are broken down in
  - 10% in Microbial Quality and drinking water
  - 10% in Environmental epidemiology
  - 10% on Healthy Urban Planning
- 70% for a 2 Hour closed book final sitting exam
  The sitting exam will be scheduled in April 2018 (date will be confirmed in due time)

## Location

EHESP 20 Avenue George Sand 93210 LA PLAINE ST DENIS

## Readings

- References are provided below for some sessions.

## Session 1

**Key issues in environmental health: a historical perspective**

### Speakers

Bertrand Lefebvre (Ehesp), bertrand.lefebvre@ehesp.fr

### Session Outline

Environmental stressors, which encompass (micro)biological, physical and chemical agents, are important health risk factors to which individuals and populations may be exposed through a variety of media (air, water, food, consumer products …) encountered in the general rural or urban environment, in occupational settings or at home. The total burden of disease associated with these factors is difficult to assess, due to scientific uncertainties and lack in exposure data. This course will appraise the health stakes of population exposure to these environmental factors along the past two centuries and worldwide, both at local and global scales.

### Learning Objectives

- Recognize the historical context of the main environmental health issues
- Identify the relationship between population health status and environmental impacts
- Analyze some public health policies able to tackle some of the issues

### Duration

2.5 hours

### Training methods

Lecture

### Readings

**Required Reading**

Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013

**Supplemental Reading**

Preventing disease through healthy environments. WHO 2016
(http://www.who.int/quantifying_ehimpacts/publications/preventing-disease/en/)
### Session Outline

Metrology is the science of measurement. It includes units of measurement and their standards, measuring instruments and their field of application, and all theoretical and practical aspects relating to measurement. Looking at the environmental metrology applied to the pollution of surface water we will:

- Describe the environmental context of water pollution
- Present the water contamination (sources) and the main pollutants, their fate in the environment, and the human exposure
- Present the monitoring objectives and the monitoring tools

### Learning Objectives

At the end of the session, the students should be able to:

- Identify the main sources of water contamination
- Discuss the monitoring objectives
- Use the monitoring tools

### Duration

3 hours

### Training methods

Lecture

### Readings

About drinking water, sanitation and water scarcity:

- UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) 2017 report Financing universal water, sanitation and hygiene under the Sustainable Development Goals

About monitoring:


About pollution and fate of pollutants:


About Policy:


### Session 3

Microbial quality of drinking water

### Speakers

Pierre Le Cann (Ehesp), pierre.lecann@ehesp.fr
The most common and widespread health risk associated with drinking-water is microbial contamination, the consequences of which mean that its control must always be of paramount importance (WHO). The microbial and enteric microbial agents will be presented along with the methods to detect them in contaminated waters. Some country regulations will be analyzed. Last, disinfection processes for destroying and preventing microbe growth will be discussed.

At the end of the session, the students should be able to:
- Enumerate the classical agents that have been shown to contaminate waters
- Identify the methods to detect agents in contaminated waters
- Analyze the effectiveness of some national regulations
- Implement some prevention interventions in given adverse environment

At the end of the session, the students should be able to:
- Recognize the dimensions planetary health brings to human health
- Describe the necessary changes to be made in terms of public health programs
- Identify actions to be made at the local and global levels
- Discuss the main implications in terms of policy implementation

The increased mobility of people, domestic animals and insect vectors or host reservoirs, together with major impacts exerted on ecosystems around the world, have ranked the spread of new emerging infections second only to water crises as a serious global threat the modern human civilization is facing with. In this course, using different illustrations, we will show that too-narrowly focused vertical programs in medicine and public health cannot address the existing overlap between animal and human health, nor incorporate the necessary social, economic and ecosystem expertise. Adopting more integrated approaches to human health is central in planetary health. There is a need for a major shift to be made in public health to better address the pressing global health challenges and achieve policy implementations by the UN’s sustainable development goals.


**Session 5**  
**Pollution of aquifers and impact of landfills on health**

<table>
<thead>
<tr>
<th>Speakers</th>
<th>Pauline Rousseau-Gueutin (Ehesp),  <a href="mailto:pauline.rousseau-gueutin@ehesp.fr">pauline.rousseau-gueutin@ehesp.fr</a></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session Outlines</strong></td>
<td>The session include what follows:</td>
</tr>
<tr>
<td></td>
<td>- Key concepts about groundwater</td>
</tr>
<tr>
<td></td>
<td>- Assessment of the vulnerability of groundwater</td>
</tr>
<tr>
<td></td>
<td>- Importance of groundwater in the hydrological cycle</td>
</tr>
<tr>
<td></td>
<td>- Impact of groundwater on health</td>
</tr>
<tr>
<td></td>
<td>- Importance of protecting groundwater to protect health</td>
</tr>
</tbody>
</table>

Through paper analyses and the study of different cases of groundwater degradation (landfill impacts, Arsenic, saline intrusion), the students will be introduced to the various uses of water and the protection and mitigation measures taken to preserve this resource.

<table>
<thead>
<tr>
<th><strong>Learning Objectives</strong></th>
<th>At the end of the session, the students should be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Use different concepts studied about groundwater</td>
</tr>
<tr>
<td></td>
<td>- Discuss the vulnerability of groundwater</td>
</tr>
<tr>
<td></td>
<td>- Identify the role of groundwater in the hydrological cycle</td>
</tr>
<tr>
<td></td>
<td>- Assess the impact of ground water on health</td>
</tr>
<tr>
<td></td>
<td><strong>Duration</strong> 6 hours</td>
</tr>
<tr>
<td><strong>Training methods</strong></td>
<td>Lecture and Case Study</td>
</tr>
</tbody>
</table>

**Session 6**  
**From the Basics concepts of Physiology to the basics concepts of Toxicology**

| Speakers              | Aurore Gely-Pernot (Ehesp)  
Associate Professor EHESP  
aurore.gely-pernot@ehesp.fr |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session Outline</strong></td>
<td>The aims of this course are to give some basic concepts of biology systems, physiology and organ functions, both at a cellular level (cell biology) and at a molecular level (proteins functions, receptors, signaling pathways...). The first part will be necessary for students to understand the second part of the course about some basic knowledge in toxicology as it applies to environmental health (“Is Human fertility affected by environmental contaminants?”). The second part will be an example of the impact of environment on one physiological process, the biology of reproduction.</td>
</tr>
<tr>
<td><strong>Learning Objectives</strong></td>
<td>At the end of the session, the students should be able to:</td>
</tr>
<tr>
<td></td>
<td>- Mobilize basic concepts studied from biology, physiology and organ functions</td>
</tr>
<tr>
<td></td>
<td>- Identify some key process from biology to toxicology associated to environmental contaminants</td>
</tr>
<tr>
<td></td>
<td>- Describe the impact of environment on reproduction system and fertility</td>
</tr>
<tr>
<td></td>
<td>- Assess some of these impacts</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>6 hours</td>
</tr>
<tr>
<td><strong>Training methods</strong></td>
<td>Lecture and Case Study</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Session 7</strong></td>
<td><strong>Occupational health: an introduction</strong></td>
</tr>
<tr>
<td><strong>Speakers</strong></td>
<td>John Ballard (AWP), <a href="mailto:john@atworkpartnership.co.uk">john@atworkpartnership.co.uk</a></td>
</tr>
<tr>
<td><strong>Session Outline</strong></td>
<td>This session will provide an overview of occupational health and its relevance to public health. It will explore the impact of work on health and of health on work, the professional disciplines involved, and further analysis of key topics: Defining occupational health, Some history, OH service delivery Functions of an OH service Occupational diseases (work-caused and work-related) And of some key issues: Confidentiality, Disability at work, Fitness for work, Bloodborne viruses, Sickness absence, Overcoming obstacles to return to work, Cost–benefit of OH interventions</td>
</tr>
<tr>
<td><strong>Learning Objective</strong></td>
<td>At the end of the session, the students should be able to: - Discuss occupational health in relation to public health - Define occupational health, and some occupational diseases - Describe some current issues in occupational health - Interpret some Cost-benefit finding from occupational health interventions</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>6 hours</td>
</tr>
<tr>
<td><strong>Training methods</strong></td>
<td>Lecture &amp; Case study</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Session 8</strong></td>
<td><strong>Introduction to occupational epidemiology</strong></td>
</tr>
<tr>
<td><strong>Speakers</strong></td>
<td>Emilie Counil (Ehesp), <a href="mailto:emilie.counil@ehesp.fr">emilie.counil@ehesp.fr</a></td>
</tr>
<tr>
<td><strong>Session Outline</strong></td>
<td>Students will be introduced to main concepts in occupational epidemiology along with appropriate designs and methods used to investigate occupational health issues.</td>
</tr>
<tr>
<td><strong>Learning Objectives</strong></td>
<td>At the end of the session, the students should be able to: - Identify key concepts in occupational epidemiology; - Discuss the appropriate design and methods for investigating an occupational health question; Critically read results of a study in terms of PH decision.</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>9 hours</td>
</tr>
<tr>
<td><strong>Training methods</strong></td>
<td>Lecture and Case Study Teaching is based on lectures (basic concepts and study designs, 3h; occupational exposure assessment; 3h) which are made interactive to make sure basic concepts in epidemiology in general are understood, and a step-by-step case study (investigating a cluster at an industrial plant, 3h).</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Session 9</strong></td>
<td><strong>Air Quality and Health - Ambient and Indoor Air</strong></td>
</tr>
<tr>
<td><strong>Speakers</strong></td>
<td>Olivier Blanchard (Ehesp), <a href="mailto:olivier.blanchard@ehesp.fr">olivier.blanchard@ehesp.fr</a></td>
</tr>
</tbody>
</table>
### Session Outline

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or that damages the natural environment, into the atmosphere. This session will provide the students with key topics such as: air pollution history, air pollutants, some regulations related to air pollution, Impact on emissions, Ambient Air Monitoring, Health effects of Air Pollution Indoor Air Expope Study (a case study)

### Learning Objectives

At the end of the session, the students should be able to:
- Describe how ambient & indoor air pollution impact population health
- Provide examples of each of the major impacts
- Identify national and international regulation, recommendations

### Duration

3 Hours

### Training methods

Lecture

---

### Session 10

The Spatial Turn in Environmental Health

**Speakers**

Bertrand Lefebvre (Ehesp), bertrand.lefebvre@ehesp.fr

**Session Outline**

Geographic Information Systems have been absolutely fundamental in revealing patterns of inequalities in environmental exposures and mapping them. Many advances (GPS, remote sensing, open geographic data…) that have occurred in the past 20 years have helped us to better understand the spatial and temporal dimensions of exposures that are either harmful or beneficial for people’s health. We will present state-of-the-art methods, assessing environmental exposure and analyzing data on population, health events, and risk factors. We will address several methodological issues related to the use of geographic information and spatial analysis and modelling in environmental health (privacy, MAUP, ecological fallacy, homogeneity/heterogeneity…). Case studies will be developed to illustrate the current methods used and the potential of spatial data and GIS tools (examples of different health effects, ways of exposure in urban and rural areas…)

**Learning Objectives**

At the end of the session, the students should be able to:
- Describe the spatial and temporal dimensions of environmental exposures
- Summarize the state of the art GIS methods assessing environmental exposures
- Discuss major methodological issues while using GIS analysis for environmental health

**Duration**

6 hours

**Training methods**

Lecture & case studies

---

**Readings**

- **Required Reading**
  
  Richardson D et al., Spatial Turn in Health Research Science. 2013 March 22; 339(6126): 1390–1392

  Yang, Shoff, Noah, Spatializing health research: what we know and where we are heading Geospat Health. 2013 May ; 7(2): 161–168.


- **Case studies**
  

### Session 11

**Environmental epidemiology: articles and study design.**

**Speakers**
Florence Bodeau-Livinec (Ehesp), florence.bodeau-livinec@ehesp.fr

**Session Outline**
In this course students will apply concepts taught in Environment (i.e. exposure), Epidemiology and Biostatistics. A first lecture will remind students of the importance of exposure in environmental epidemiology and review epidemiological concepts applied to the environmental field. Through a mix of readings and lab work on epidemiological data about lead in children and child psychomotor development, we will present different types of study design in environmental epidemiology and discuss issues related to exposure in environmental epidemiology and how to analyze results from an epidemiological and environmental point of view.

**Learning Objectives**
- Identify epidemiological concepts used in the environmental field
- Identify the basic principles of exposure assessment in environmental epidemiology
- Apply epidemiological and biostatistical methods to children lead exposures and their impact on neurodevelopment
- Analyze main findings
- Discuss major methodological issues related to environmental epidemiology

**Duration**
15 hours

**Training methods**
Lecture and Lab work on STATA

### Session 12

**Promoting Healthy Urban Planning: focus on concepts & tools**

**Speakers**
Anne Roué Le Gall (Ehesp), anne.roue-legall@ehesp.fr  
Nina Lemaire (Ehesp), nina.lemaire@ehesp.fr

**Session Outline**
Nowadays, in developed countries, obesity, asthma, health inequalities, mental health problems, social isolation and exposure to different types of pollution are inherent to the challenges faced by public health. These are conditioned by the quality of our living environments, themselves a product of the urban planning and development policies implemented by municipalities.

**At the end of the session, the students should be able to:**
- Clarify the definition of determinants of health
<table>
<thead>
<tr>
<th><strong>Duration</strong></th>
<th>12 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training methods</strong></td>
<td>Lecture and Case study (Role playing)</td>
</tr>
</tbody>
</table>
P. Harris, F. Haigh, M. Thornell b, L. Molloy, P. Sainsbury (2014) Housing, health and master planning: rules of engagement  
Hugh Barton (2009) Land use planning and health and well-being  
Hugh Barton and Marcus Grant (2011) Urban Planning for Healthy Cities A Review of the Progress of the European Healthy Cities Programme |
| **Assignments** | Group work: site visit  
Group Presentation  
Date of presentation  
10% of final grade |