**DEPARTMENT:** Environmental Health / Global Health  
**COURSE NUMBER:** EH 582 / GH 582  
**SEMESTER:** Fall 2016  
**CREDIT HOURS:** 2  
**COURSE TITLE:** Global Climate Change: Health Impacts and Response  
**DATE/TIME:** Monday, 10:00-11:50 am; August 24 – December 14, 2016  
**LOCATION:** CNR 1055

**INSTRUCTOR:** Stefanie Ebelt Sarnat, ScD  
**INSTRUCTOR CONTACT INFORMATION**  
EMAIL: sebel@emory.edu  
PHONE: 404-712-9636  
OFFICE/MAILBOX LOCATION: CNR 2035  
OFFICE HOURS: By appointment

**COURSE DESCRIPTION**

This course will explore the public health effects of global climate change, epidemiologic and other methods for understanding and studying these effects, the public health adaptation response, and potential mitigation efforts and activities. Public health responses will be discussed with particular focus on global health issues. The course will emphasize a practical approach to vulnerability and risk assessment, and students will develop skills assessing the risks of particular climate-related health impacts.

**LIST SCHOOL LEVEL, DEPARTMENT, AND/ OR PROGRAM COMPETENCIES**

- Describe major environmental risks to human health ranging from the local to global scale.  
- Assess the sources and movement of contaminants through the environment.  
- Characterize major relevant exposure pathways and elaborate on how they are used to study the magnitude, frequency, and duration of environmental exposures.  
- Apply the principles of epidemiology to assess health effects of environmental exposures.  
- Assess the major forces that influence the health of populations around the world.  
- Critique major global priorities and the reasons for their prioritization.  
- Appraise the environmental, behavioral and social factors that contribute to the emergence, reemergence, and persistence of infectious diseases.  
- Interpret the geographic and demographic distributions, as well as morbidities and mortalities, of major infections in the US and globally.  
- Explain major policy issues in Environmental Health including regulatory frameworks.  
- Design environmental health programs, policies, interventions and/or research intended to improve the health of individuals, communities, and populations.
LIST LEARNING OBJECTIVES ASSOCIATED WITH THE COMPETENCIES

- Understand climate change including major drivers, time course, uncertainties, impacts, and temporal and spatial distributions of associated risks.
- Describe epidemiological and other research methods to ascertain the relationships between climate and health, and to project the health effects of climate change.
- Understand the major anticipated health effects of climate change.
- Understand the health impacts of climate change specific to vulnerable populations in the developing world, considering the health burden and solutions from a development perspective.
- Articulate the importance of integrating climate mitigation/adaptation activities with existing global health initiatives.
- Develop strategies for communicating the health risks of climate change to global health funders, agencies, and populations in the field.
- Communicate the public health response to climate change from several perspectives.
- Understand important tools used for assessing vulnerability to climate change impacts and to facilitate public health involvement in adaptation and mitigation decisions.
- Develop skills in literature search and review, synthesis, public speaking and collaboration.
- Synthesize learning in an oral presentation reviewing either a particular exposure-outcome association in detail, or the range of exposure-outcomes for a particular locale.
- Understand policy options for climate change mitigation and adaptation at the global, national, institutional, and individual scales.

EVALUATION

The course grade will be determined by a combination of class participation, performance on weekly in-class exercises, and a final oral presentation.

Grades will be assigned based on the following formula:
Class participation: 10%
In-class exercises: 50% (10 exercises at 5% each)
Final presentation: 40%

Class participation will be assessed by the instructor and will be based on the student’s attendance, preparation for class, contributions to class discussion, in-class questions, and participation in group activities. If you will miss a class, you must notify the instructor in advance of your absence. Students that receive full credit will have participated regularly, meaningfully, and through multiple means.

In-class exercises will assess students’ engagement with course readings. Exercises will vary from short multiple-choice quizzes, to short-answer questions, to basic problem solving. Each exercise will be worth 5% of the final grade. In-class exercises are closed-book and closed-notes. If you will miss a class, you must notify the instructors in advance of your absence and a make-up assignment will be determined.
EVALUATION cont’d

**Final presentations** will be a team exercise. Teams of 3-4 students will develop a 30-minute presentation on an applied climate change health impacts projection analysis that will constitute the main project for the semester. Projects will be based on CDC’s Building Resilience Against Climate Effects (BRACE) framework, which is used by state/city grantees to identify likely climate impacts in their communities, potential health effects associated with these impacts, and their most at-risk populations and locations; helps states develop and implement health adaptation plans. To complete their projects, teams will draw on publicly-available data together with literature review, basic analytical and problem solving skills to: determine potential climate changes and hazards in a given location; develop and use models to predict potential health impacts associated with these climate changes and identify specific areas most vulnerable to these effects; and propose strategies and/or programs to confront the health implications of climate change in this location. Groups, topics, and framework for projects will be discussed during Week 3. Groups must meet with the instructor and/or TA to discuss their approach and progress made (both during Weeks 5-6 and again later in semester). Presentation time limits will be enforced, and teams should practice presentations beforehand to resolve timing, A/V and clarity issues. The presentation will comprise 40% of the course grade. More details about the specific requirements of this exercise will be provided in the ‘*Group Project & Final Presentation Handbook*’ (to be introduced during Week 3).

**TOPICS COVERED**

This course explores the public health effects of global climate change, epidemiologic and other methods for understanding and studying these effects, the public health adaptation response, policy options for mitigating and adapting to climate change, and health impacts of mitigation efforts and activities.

Major topics include:

1. **An overview of climate change**, including causes and projections.
2. **Epidemiological methods** required to study climate-health associations.
3. The **burden of disease** stemming from climate change, with a particular emphasis on impacts in the developing world, global and local equity issues, and the interaction between climate change mitigation/adaptation activities and existing global health initiatives.
4. **Exposures** most confidently associated with climate change, including direct exposures such as temperature (increases in average temperature as well as extreme heat events), changes in the hydrologic cycle (drought and extreme precipitation), and sea-level rise; and indirect exposures such as changes in vector-borne and zoonotic disease distributions, water quantity and quality, air quality, conflict, population displacement, and others.
5. **Health effects of these exposures**, including heat-related morbidity and mortality; water- and food-borne disease; vector-borne and zoonotic disease; malnutrition; health impacts of mass population movements such as waterborne disease outbreaks, violence, and exacerbation of chronic disease; injury morbidity and mortality; respiratory and cardiovascular disease; and mental health.
6. **Policy options** for both mitigating future climate change and preparing for and responding to current and projected climate impacts.
7. The **public health response** will be discussed, with particular focus on global health issues. The course will emphasize a practical approach to vulnerability and risk assessment, and students will develop skills assessing the risks of particular climate-related health impacts.
**LOGISTICS**

*Canvas* will be used to post important announcements, required readings, and slides.

**Instructor office hours** are by appointment - send an email to [sebelt@emory.edu](mailto:sebelt@emory.edu) to schedule a time to meet.

**Teaching assistant (TA) for the course is Jessica Abbinett.** TA office hours are Thursdays 1-3 pm in CNR 2045. For any other appointment requests, send an e-mail to Jessica.Abbinett@emory.edu to schedule a time and location to meet.

**ACADEMIC HONOR CODE**

All material submitted by a student in fulfillment of his or her academic course of study must be the original work of the student.

Written assignments submitted in fulfillment of the requirements for this course will be analyzed using plagiarism detection software, and instances of academic dishonesty will be dealt with according to RSPH policy, which can be reviewed at: [http://www.sph.emory.edu/studentservice/enrollment_conductcode.php](http://www.sph.emory.edu/studentservice/enrollment_conductcode.php)

At minimum, students found to have plagiarized others’ work will fail the relevant assignment, though more significant action including failure of the course may result. Repeat infraction will result in automatic course failure. Any questions regarding the appropriate use of references and others’ material should be directed to the instructors well in advance of the assignment due date. Students who are concerned with their language skills and would like assistance with their writing should make use of Emory’s writing center to ensure that they are following appropriate style and citation guidelines.
# COURSE OVERVIEW

EH 582 / GH 582 meets Mondays, 10:00-11:50 am in CNR 1055; August 29 – December 12, 2016

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Instructor, Affiliation</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLIMATE CHANGE AND HEALTH OVERVIEW</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>August 29, 2016</td>
<td>Course introduction</td>
<td>Stefanie Sarnat, EH</td>
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</tr>
<tr>
<td></td>
<td>September 5, 2016</td>
<td>No Class – Labor Day</td>
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</tr>
<tr>
<td>2</td>
<td>September 12, 2016</td>
<td>Climate data and USGCRP reports</td>
<td>Jesse Bell, NOAA/CDC</td>
<td>Stefanie not in class</td>
</tr>
<tr>
<td>3</td>
<td>September 19, 2016</td>
<td>Climate and health: a view from the CDC</td>
<td>Shubhayu Saha, CDC</td>
<td>Assign groups; groups rank topics</td>
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<tr>
<td>HUMAN HEALTH IMPACTS OF CLIMATE EXTREMES</td>
<td></td>
<td></td>
<td></td>
<td>Assign topics</td>
</tr>
<tr>
<td>4</td>
<td>September 26, 2016</td>
<td>Extreme events</td>
<td>Kathryn Conlon, CDC</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>October 3, 2016</td>
<td>Extreme heat</td>
<td>George Luber, CDC</td>
<td>Stefanie not in class; Groups meet with Stefanie/TA to discuss project</td>
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<tr>
<td></td>
<td>October 10, 2016</td>
<td>No Class – Fall Break</td>
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</tr>
<tr>
<td>HUMAN HEALTH IMPACTS OF SUBTLE CLIMATE CHANGES</td>
<td></td>
<td></td>
<td></td>
<td>Project check-in</td>
</tr>
<tr>
<td>6</td>
<td>October 17, 2016</td>
<td>Water-borne disease</td>
<td>Karen Levy, EH</td>
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</tr>
<tr>
<td>7</td>
<td>October 24, 2016</td>
<td>Vector-borne disease</td>
<td>Uriel Kitron, ENVS</td>
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</tr>
<tr>
<td>8</td>
<td>October 31, 2016</td>
<td>Climate and conflict</td>
<td>Matthew Gribble, EH</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>November 7, 2016</td>
<td>Outdoor air pollution</td>
<td>Yang Liu, EH</td>
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<tr>
<td>SOLUTIONS AND THE WAY FORWARD</td>
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<td>Project check-in</td>
</tr>
<tr>
<td>10</td>
<td>November 14, 2016</td>
<td>Climate change policy</td>
<td>Daniel Rochberg, EH</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>November 21, 2016</td>
<td>Indoor air pollution</td>
<td>Tom Clasen, EH</td>
<td>Project check-in</td>
</tr>
<tr>
<td>12</td>
<td>November 28, 2016</td>
<td>Climate regulation &amp; litigation</td>
<td>Kate Hodgins, EH</td>
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</tr>
<tr>
<td>FINAL PRESENTATIONS</td>
<td></td>
<td></td>
<td></td>
<td>Course evals</td>
</tr>
<tr>
<td>13</td>
<td>December 5, 2016</td>
<td>Student presentations</td>
<td>Class</td>
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<tr>
<td>14</td>
<td>December 12, 2016 (during exam period)</td>
<td>Student presentations &amp; wrap up!</td>
<td>Class</td>
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DETAILED SCHEDULE

CLIMATE CHANGE AND HEALTH OVERVIEW

1. **August 29, 2016: Course Introduction (Stefanie Sarnat, EH)**
   - Course introduction, course goals and overview of syllabus
   - Instructor and student introductions
   - What is climate change?
   - Causes and consequences of climate change
   - Historical view of climate change in public health sphere
   - Introduction to available resource materials

   **Readings to follow-up from this class:**

2. **September 12, 2016: Climate Data and the USGCRP Climate Reports (Jesse Bell, NOAA/CDC)**
   - More on climate change: indicators of a warming world; human vs. natural influences on climate
   - Climate science basics: climate vs. weather, climate change vs. variability
   - Climate data, climate projections, and uncertainties
   - Overview and insider’s view of the US Global Change Research Program (USGCRP) reports:

   **Readings to prepare for this class:**

3. **September 19, 2016: Climate and health: a view from the CDC (Shubhayu Saha, CDC)**
   - In-class exercise #1
   - Overview of ongoing work within CDC’s Climate and Health program
   - Introduction to CDC’s Building Resilience Against Climate Effects (BRACE) framework
   - Introduction to group projects: handout and review project handbook, assign groups, discuss project topic options, groups to submit topic rankings by Friday, September 23rd (Stefanie)
Reading to prepare for this class:

**HUMAN HEALTH IMPACTS OF CLIMATE EXTREMES**

4. **September 26, 2016: Extreme Events (Kathryn Conlon, CDC)**
   - In-class exercise #2
   - Types of extreme events, health impacts, factors that determine health impacts, solutions
   - Group project check-in: assign topics to groups based on rankings

Reading to prepare for this class:
b) Other to be determined

5. **October 3, 2016: Extreme Heat (George Luber, CDC)**
   - In-class exercise #3
   - Temperature exposures, heat waves, heat-related illness and mortality, risk factors and populations of concern, projected impacts, solutions
   - Group project check-in: between now at Week 6, make appointment to meet with Stefanie/TA outside of class to discuss project approach and timeline

Reading to prepare for this class:

**HUMAN HEALTH IMPACTS OF SUBTLE CLIMATE CHANGES**

6. **October 17, 2016: Water-Borne Disease (Karen Levy, EH)**
   - In-class exercise #4
   - Linkages between diarrheal diseases and climate
   - Exploring evidence for climate and diarrhea relationships
   - Case study on rainfall and diarrhea

Reading to prepare for this class:

b) Other to be determined

7. October 24, 2016: Vector-Borne Disease (Uriel Kitron, ENVS)
   - In-class exercise #5
   - Types of vector-borne diseases
   - Geographic distribution
   - Impacts of climate and weather
   - Projected impacts

Readings to prepare for this class

8. October 31, 2016: Climate and Conflict (Matthew Gribble, EH)
   - In-class exercise #6
   - Temperature and violence
   - Water scarcity, crop failure, and political unrest
   - Mass migration due to physical displacement

Readings to prepare for this class

9. November 7, 2016: Outdoor Air Pollution (Yang Liu, EH)
   - In-class exercise #7
   - Climate impacts on outdoor air pollutants: ground-level ozone, aerosols
   - Projected health impacts
   - Group project check-in

Readings to prepare for this class


**SOLUTIONS AND THE WAY FORWARD**

10. **November 14, 2016: Global and National Climate Change Policy (Daniel Rochberg, EH+)**
   - In-class exercise #8
   - Fighting climate change: adaptation vs. mitigation, how to
   - Greenhouse gas stats
   - Global, US, Georgia policy: history and current status

   **Readings to prepare for this class**
   b) Other to be determined

11. **November 21, 2016: Indoor Air Pollution (Tom Clasen, EH)**
   - In-class exercise #9
   - Group project check-in and assignment of presentation dates

   **Readings to prepare for this class**
   a) To be determined

12. **November 28, 2016: Climate Regulation & Litigation (Kate Hodgins, EH)**
   - In-class exercise #10

   **Readings to prepare for this class**
   a) To be determined

**FINAL PRESENTATIONS**

13. **December 5, 2016: Student final presentations**
   - 25-minute presentations by 3-4 groups
   - Course evaluations

14. **December 12, 2016: Student final presentations**
   - 25-minute presentations by 3-4 groups
   - Course wrap up!