

## **BIOL1455 Planetary Health: Global Environmental Change and Emerging Infectious Disease**

**Instructor:** Katherine F. Smith, PhD. Senior Associate Dean of Biology & Associate Professor of Medical Science. [katherine\\_smith@brown.edu](mailto:katherine_smith@brown.edu).

**Location:** Online

**Modality:** *Planetary Health* will be a fully online asynchronous course

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### **Course Description**

Will a warmer world be a sicker world? What is it about the New England landscape that supports the proliferation of Lyme Disease? How are local wildlife trade and global species invasions contributors to emerging diseases like the 2003 outbreak of monkeypox virus in the USA? We will explore these and related questions in *Planetary Health: global environmental change and emerging infectious disease*. Planetary health is a timely new field focused on understanding the human health implications of human-caused disruptions to Earth's natural systems. The facet of 'health' that we focus on in this course is infectious disease. Students will learn how, when, where and why infectious diseases emerge in association with anthropogenic environmental impacts, specifically climate change, land-use change, and increased human interaction with animals.

### **Learning Outcomes**

Students who successfully complete this course will be able to:

- Define Planetary Health, provide examples of the kinds of topics the field focuses on, and explain its importance.
- Describe a list of patient-planetary health co-benefits.
- Define emerging infectious disease and describe the global increase and geographic distribution of emerging infectious diseases in the human population over the last century.
- Communicate the ecology and epidemiology of one zoonotic infectious disease to a general audience, and be able to briefly describe a few others.
- Draw on evidence-based examples to describe how climate change, land-use change, and species invasion/animal trade can lead to the emergence of infectious disease in humans and wildlife.
- Explain, using examples, how and why the environmental and emerging disease impacts of our changing planet are not distributed evenly across populations and geographies.
- Draw on peer-reviewed evidence and investigative works to construct and defend an argument in support of covid-19's origin being nature or the lab setting.

- Assemble and critique a list of actions that can help to prevent infectious disease emergence resulting from environmental change.
- Research and develop an evidence-based opinion on a Planetary Health topic of choice.

### **Instructor Contact Information**

Hello and welcome to *Planetary Health!* I am Kate Smith (*she/her*), Senior Associate Dean of Biology for Curricular Affairs and Associate Professor of Medical Science. Most students call me Professor Smith, Dr. Smith, or Dean Smith. You can learn more about me on [Researchers@Brown](mailto:Researchers@Brown). This course is fully online and asynchronous which means we won't meet in person. That said, my office is in room 134 in Arnold Lab and I invite you to make an appointment to come say hello. During the course it will be most efficient if you contact me through the Canvas course page, but my direct email is [katherine\\_smith@brown.edu](mailto:katherine_smith@brown.edu).

### **Course Requirements**

#### **Required Reading materials**

- One book: *Spillover: Animal Infections and the Next Human Pandemic* by David Quammen.
- Other literature will be assigned in each module and made available directly through Canvas.

#### **Technical Requirements**

- Computer or tablet with reliable internet access and browser.
- Headphones, earbuds, and/or computer speaker.
- Canvas supported Browser.
- Ed Discussion (communications software accessed through the course navigation menu).

### **Diversity, Equity, and Inclusion**

As a member of the [Planetary Health Alliance \(Links to an external site.\)](#) (PHA) I embrace the organization's vision, mission, and values and aim to instruct our course with these as guiding principles always in mind. Two PHA values are especially noteworthy as we proceed to learn about Planetary Health together:

*'Justice, Equity, and Compassion: The health burden of degraded natural systems disproportionately affects future generations and people with the fewest resources who are often least responsible for environmental changes. This is deeply unfair and mirrors vast existing disparities and structural inequities worldwide. The PHA holds that justice, equity, and compassion must be the driving forces behind a future of planetary health for all.*

*Partnership and Inclusivity: The PHA strives to form lasting partnerships marked by deep respect and interdependence within our communities and in our relationships between people and nature. PHA members are a diverse community that is transdisciplinary, multicultural, and intergenerational. All voices must be at the table to share ideas, explore different perspectives, and collaborate to enable all people to act as changemakers.'*

All members of our course are asked to uphold these values by showing compassion to nature and one another, ensuring all voices are heard, valued for their diverse perspectives, and supported. By committing to these values we can each be the changemakers our planet requires. It is also important that course members actively help to foster a learning environment that supports a diversity of experiences and identities. It is my job as the instructor to ensure this is happening, but I am a work in progress as are many of us. I welcome you educating and correcting me when I misstep, get something wrong, am not aware of an issue that needs attention, or when you have some advice on content or pedagogy. The course and I can only improve with awareness, so please talk with me. If something is communicated during the course that makes you feel uncomfortable, I hope you will feel comfortable reaching out to me. If you prefer to speak with someone outside of the course, Senior Associate Dean of the College Maitrayee Bhattacharyya is a reliable contact on matters of diversity, equity and inclusion.

## **Student Support & Expectations**

### **Student Accessibility Services**

Brown University is committed to full inclusion of all students. Students who, by nature of a documented disability, require academic accommodations should contact the instructor directly. Students may also speak with [Student Accessibility Services](#) to discuss the process for requesting accommodations.

### **Practice Academic Integrity**

Ensure you are aware of Brown's [Code of Student Conduct](#).

## **Time Commitment**

Successful completion of Planetary Health will require students to engage with the course most days during Summer/Wintersession. What follows is a general breakdown of my estimate for how much time students will spend on the major components of the course. Because the course is fully online it behooves every student to be disciplined about creating a schedule and initiating the major projects early.

- (100 hrs.) Modules 1-5 lessons and assessments: Modules 1-5 will include a mix of brief online lectures, assigned readings, case studies, quizzes, reflections, and virtual discussions. You should expect to dedicate ~20 hours to fully engage with and successfully complete each module.
- (80 hrs.) Projects/Course Assessments: There are three major projects associated with the course: the zoonotic assignment, the *Spillover* book assignment, and the op-ed. These three projects will take between 20-25 hours each. You will also complete a pre

course assessment and a post course assessment, each of which should take you ~1.5-2.5 hours.

### **Primary Course Activities**

There are five modules in the course, each lasting roughly seven days. Each module covers a portion of the course learning objectives. Module 1 introduces students to the field of Planetary Health and rise of emerging infectious diseases. Modules 2, 3 and 4 dive deeply into the connection between a specific environmental change (invasive species, land-use change, and climate change) and disease emergence. Module 5 capstones the courses and makes connections learned to pandemic preparedness. Each module assesses learning through notes-based quizzes, reflections, and virtual discussions with peers.

There are three primary projects: 1) contributing a research-based exhibit for a class Virtual ZOO(noses), 2) reading and an assignment based on *Spillover: Animal Infections and the Next Human Pandemic* by David Quammen, and 3) a Planetary Health op-ed on any topic of your choosing for an audience of your choosing.

There will be pre and post course assessments that will be graded. The pre-assessment will allow us to learn about your knowledge-base up front so we can tweak the course as needed. The post-assessment will allow you to showcase your new found knowledge after taking the course and reflect on what you have learned. Neither are graded for your content knowledge, but instead for detailed completion of each prompt to the best of your ability.

### **Ed Discussion**

We will use Ed Discussion throughout the course as a way to connect regularly. You can find the link in the course navigation menu. Ed Discussion is the best place to ask questions about the course, whether curricular or administrative. You will get faster answers here from instructors and peers than through email. We will use Ed Discussion for announcements, reminders, informal chatting, etc. Ed Discussion will also be the place where you showcase and share your final Zoonotic and op-ed projects. Check it out by clicking on the Ed Discussion link in the course navigation.

### **Grading and Evaluation Criteria**

The course may be taken for a grade or S/NC. Final grades are based on the total possible points earned through the course assignments. The point distribution for final grades is: 90-100% of ttl pts=A; 80-90%=B; 70-80%=C; >70%=S; <70%=NC. Extensions for assignments will not be granted. This means you should begin working on each assignment in advance, with the aim of turning in your work ahead of time. If you are aware of a circumstance during Wintersession that will prevent you from turning in your work on time you should email me before the start of the session so we can discuss potential alternative arrangements. I will work with you as extenuating circumstances arise. In these cases please reach out to me as early as you can to let me know you need assistance and so we can work together most effectively.

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**Extensions for assignments will not be granted and work will not be accepted late.** This means you should begin working on each assignment in advance, with the aim of turning in your work ahead of time. I recommend you take a look at all deadlines prior to the start of class. Note that assignment deadlines are eastern standard time. I will work with you as extenuating circumstances arise (those that are severe and exceptional; and, unforeseen or unavoidable). In these cases it is important that you reach out to me as early as you can to let me know you are in a challenging moment / need assistance, and so we can work together most effectively.

### **Weekly Quizzes, Reflections & Discussions (15 points each)**

There will be several low stakes Canvas based assignments per module, each worth 15 points: quizzes, discussions and reflections. These will be an opportunity to showcase your learning in various ways and engage with peers and the instructor virtually. On time, thoughtful, complete, constructive and detailed contributions to module assessments will garner full points towards the final grade.

### **Projects (100 points each)**

There are four primary projects each worth 100 points. Find the details for each on the Assignments page in Canvas and below (subject to slight change):

- Project 1. Contributing a research-based exhibit for a class Virtual ZOO(noses).
- Project 2. Reading and an assignment based on *Spillover: Animal Infections and the Next Human Pandemic* by David Quammen.
- Project 3. A Planetary Health op-ed on any topic of your choosing for an audience of your choosing.
- Project 4. A final response / reflection on your learning in the course.

### **Pre and Post-Course Assessments (100 points each)**

The pre-course assessment and post-course assessment will each be worth 100 points. Students must complete both assessments fully and thoroughly to pass the course.

### **Project 1**

#### ***Assignment Overview***

More than ¾ of human infectious diseases are zoonoses – infectious diseases caused by pathogens that originate in non-human domesticated species and/or wildlife.

The class will work together to develop a Virtual Zoo featuring zoonoses of the world. This assignment offers the opportunity to research and learn more deeply about a zoonoses of interest and to learn from peers about a diversity of zoonoses that afflict humans.

Each student will select a zoonotic disease to research and summarize in a depth-with-brevity maximum two page exhibit targeted to a general audience.

### ***Choosing a Zoonotic Disease***

You may select any zoonotic disease that personally interests you. A good starter for a full list of zoonoses known to date is Table 1 in the [Rantsios 2015 paper](#). This is not the only source, however, and a simple google search of zoonoses will offer quite a number of options. Be sure to do some research ahead so you choose zoonoses with enough known and written about them that you can put together a detailed exhibit.

### ***Feedback***

There will be opportunities for peer and instructor feedback as you develop your ZOOnotic exhibit.

### ***An Evidence-based Exhibit***

Just as a typical zoo includes evidence-based information in their exhibit documentation, so will you. A minimum of five primary references (peer-reviewed publications) and a minimum of two evidence-based informational sites (i.e. WHO, CDC) should be used to develop your exhibit. These are minimums - you can use more.

### ***(10pts) Format***

- You will submit your Zoonotic assignment via Canvas as a pdf no later than the due date.
- Writing should be clear, concise and formally edited for proper spelling and grammar.
- We are aiming for consistency across exhibits (because we will unite them in a single showcase) so use black calibri font 12, single spaced, text justified, with 1" margins, and numbered pages at the bottom in the middle.
- Use an in text superscript footnote system to reference your work (see references below).
- The title of your exhibit in the document should be the name of the zoonotic diseases - at the top in bold font 20.
- Your assignment should be no more than 2 pages.
- Your name should be a header in the margins on each page.
- Graphics should have brief captions.

### ***(100pts) Content***

The following subsections should be addressed in your document to organize material. The content requested here is the minimum expected for each subsection - you can certainly go deeper. Each of the following should be its own subsection in your exhibit – stated in bold.

- **Zoonotic disease** (5 pts) - What is the name of the disease and what are the symptoms it causes in humans? What is the prognosis, morbidity and mortality?

- **Causal pathogen** (5 pts) - Taxonomy including species name, what type of pathogen it is (parasite, virus, bacteria, fungus, prion), and history of discovery.
- **Geography** (20 pts) - Where in the world does this pathogen and causal disease occur and how has this changed over time) What do we know about the history of the disease and it's impacts on humans? Are certain places / peoples disproportionately infected (why if so)?
- **Ecology and Transmission** (20 pts) - How is the pathogen transmitted between any and all host species it relies on? What are the key host species and what roles do they play in transmission? If relevant, what is the lifecycle of the parasite and/or vector hosts that influence transmission?
- **Environmental linkages** (20 pts) - What are the known environmental factors that influence transmission of the pathogen, the hosts it uses, and/or where it occurs (i.e. temperature, rainfall, land-use change, host population demographics, etc.)? If these are not specifically known please offer some evidence-based speculation of your own. Aim to use writing that makes clear what is your speculation ('it is plausible that...') vs. what is published (via citation).
- **Treatment and Prevention** (10 pts) - What is available clinically to treat infection in humans and how effective is it? What can be done to prevent infection? What efforts are underway to prevent and treat the disease?
- **Graphics** (10 pts) - Include at least three and no more than five visuals (with brief captions). These might be maps of disease occurrence, microscopic images of the pathogen, images of wildlife/animal hosts, or images that illustrate environmental changes the impact disease. So we remain sensitive to human well-being, please *do not* include any images of humans exhibiting signs of disease. Visuals should be clear and selected wisely to complement the text with additional useful information.
- **References** (10 pts) - Use numbered footnotes to list the primary references and evidence-based informational sites that informed your work and which are cited as appropriate in the text. Primary sources should be (*First author last name, year*) hyperlinked to the source. Informational sources should be (*Organization name*) hyperlinked to the specific page referenced. Any graphics included should be referenced here as well (*Graphic name*) hyperlinked to the source. Keep your foot note references in a running list and small so not to eat up space.

## Project 2

### ***Assignment Overview***

We will have opportunities to discuss *Spillover*, but this assignment is a final opportunity for you to showcase what you learned and what resonated with you in the book, and to tie it back to other lessons from the course.

### ***Format and Content***

Format

- You will submit your Spillover assignment via the Canvas site (in the assignment page as instructed) no later than the due date.
- Writing should be clear, concise and formally edited for proper spelling and grammar.
- You can write this assignment single spaced.

(100pts) Content

- **Glossary** (25 pts) - As you read *Spillover* you will notice that the author is writing for a general audience and works hard to define scientific concepts and terms. Many of the concepts presented may be new to you, for example a 'reservoir host' or ' $R_0$ '. As you read *Spillover*, create a running glossary of no less than 25 concepts/terms you encounter and which are new to you. You can use the definitions provided in the book or research them using external sources. You are encouraged to use a combination of formal informational websites (like CDC, WHO), education resources (i.e. textbooks), and the primary literature in your investigations. Include at least 1 reference for each term if you used them in addition to how Quammen defines the concept/term in the book. Cite these additional references briefly using any format that works for you (just be consistent). The aim is to define a minimum of 25 terms/concepts in whatever amount of space you need (no word limit).
- **Personal interest** (25 pts) - What was the most interesting thing you learned reading *Spillover*? Perhaps it was a new concept or a chapter on a specific disease case study. In your own words summarize the part of the book that was most interesting to you and reflect on why you think it captured your attention. What additional research did you do to learn more, if any. Did this particular interest or the book in general change anything for you personally in terms of your interests moving forward – in your academic interests, career prospects, or the way you will live as an informed citizen? Please elaborate. This reflection should be ~500 words.
- **Putting covid-19 in context and looking forward** (25 pts) - How did *Spillover* help you to better understand the covid-19 pandemic, put it in perspective, and think about its origins? If David Quammen visited Brown and asked you what the world should do to mitigate future spillover events, to reduce the risk of more pandemics, what three suggestions might you offer and why? This response should be ~500 words.
- **Book review** (25 pts) - Provide a formal review of the book for a general audience of your choosing. You should offer formal detailed critique of the content and tone using specific examples, but you can write as if offering a review for a book in your local library newsletter, for a book club blog, the NYTimes, amazon.com, any venue you like. It is easy to be critical but a good book review includes some positives and some negatives. Think about your audience and name it at the start of your review. Your review should be ~500 words.

**Project 3**

## ***Assignment overview***

Students will develop an op-ed on a Planetary Health topic of personal interest that is tailored for a specified audience their choosing. There will be opportunities for peer and instructor feedback. A full rubric is linked below for detailed guidance on maximizing success on this project.

## ***Choosing a topic***

The op-ed can focus on any topic addressed in the course, or one related more broadly to Planetary Health (i.e. non-infectious disease outcomes of environmental change that we were not able to cover in class, but which are of personal interest). The topic can be broad (i.e. an op-ed on why Planetary Health should be part of every MD's training or the environmental impacts of the health care sector) or specific (i.e. an op-ed on why and how pediatricians in New England should be talking with families about Lyme Disease awareness, or the importance of integrating patient exposure histories in clinical settings). For inspiration you might spend time on the Planetary Health Alliance website reviewing the breadth of topics covered by experts and budding experts in the field.

## ***Choosing an audience***

A specific venue and accompanying target audience should be identified for the op-ed. Options are endless and include widely read news outlets (e.g. *The NYTimes*, *The Hindu*), local news outlets (e.g. *The Times-Picayune* / *The New Orleans Advocate*), peer-reviewed journal publications (e.g. *Lancet* editorial or correspondence), organizational outlets (e.g. op-ed for the Planetary Health Alliance blog), and more. The goal is to think about the audience you are writing for and tailor the language and content to them.

## ***Evidence-based***

Opinions and recommendations should be informed, at least in part, by the primary literature and other evidence based sources (i.e. policy communications, white-papers, etc). Primary references that inform the op-ed content will be expected.

Resources for op-ed writing you should refer to and use

- [The Medical Society Consortium on Climate and Health How to Write and Format Op-Eds \(Links to an external site.\)](#)
- [AAAS Writing an Op-Ed \(Links to an external site.\)](#)
- [The Writing Cooperative: A quick guide to writing a better lede \(Links to an external site.\)](#)
- [The Op-Ed Project's Op-Ed Writing: Tips and Tricks \(Links to an external site.\)](#)
- [Smith College News Office Op-Ed Guidelines \(Links to an external site.\)](#)
- [Harvard Kennedy School How to Write an Op-Ed or Column \(Links to an external site.\)](#)

## ***Submission, Format & Content***

- (2pts) **On time submission:** Your final project will be submitted in a Google doc, shared with me by email (katherine\_smith@brown.edu). Title the document '*Last Name\_First Name\_OpEd\_Planetary Health*'. Be sure to grant me editing privileges so I can most effectively offer you comments and suggestions both on writing and content. You will also share your op-ed as a pdf in EdDiscussion (similar to what you did for the ZOOnotic project). Watch for the prompt.
- (5pts) **Offer some context:** Open your document with a paragraph defining the target audience you wrote for and the venue/source you had in mind as you wrote. This paragraph should also include your reasons (personal and/or professional) for choosing the topic and audience you did. Lastly, please share which op-ed writing resources you used and a brief note on which you found most useful. There are resources below for you to use, but certainly a lot more out there not identified.
- (80pts) **Op-Ed:** The op-ed title and text. Your op-ed should be ~800 words (hard range limits are 700-900 words). Writing should be clear, concise and formally edited for proper spelling and grammar. There is no specific format requirement, but do ensure your writing is clear and consistent. The op-ed should include a lede and clearly state your opinion/point. Your op-ed should build on your lede with facts, statistics, examples, and anecdotes (things that bolster your case with your audience of choice). Points here are awarded for evidence-based writing that is clear, concise, compelling and appropriate for the intended audience (i.e. no jargon if you are writing for a kids science blog).
- (3pts) **Acknowledgement:** Acknowledge and thank those who helped you/inspired along the way. Here, please specifically recognize the peers in class who offered you constructive feedback, what worked well, and anything they did specifically that you found helpful.
- (10pts) **References:** List the seven (minimum) primary references that informed your work (any format for this reference list is fine, just be consistent, and include enough for me to find the reference). In this section please also offer a brief paragraph describing your literature search process (i.e. search engines and search terms used, websites used as starting points, etc).