EEP 153: POPULATION AND FOOD (SYLLABUS)

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Theme: This course concerns itself with quantitative and theoretical approaches to understanding the food system: how do we "feed the planet?"

Prerequisites: Data8, EEP100 or equivalents required; Math 54 recommended.

Schedule: Meet two times per week. Typically a lecture, followed by discussion one day, then lab session with most of the time devoted to some new computational or empirical tools, which can then be applied in a group project.

1. Logistics

1.1. **Schedule.** In Spring 2021 we'll generally meet twice per week, Mondays and Wednesdays from 2–4p Pacific Time. We'll meet via zoom, at `https://berkeley.zoom.us/j/99663373861`. We'll typically have some lecture and class discussion on Mondays; we'll plan to set aside Wednesdays for days where collaborative work in groups is emphasized.

1.2. **Office Hours/Individual Assistance.**

Questions/Discussion: Please use `https://edstem.org/us/courses/3990/discussion/` to ask questions of the instructor or assistants; we're likely to miss email. Note that you can post anonymously and/or privately.

Instructor's Office Hours: You may also make an appointment to speak with Professor Ligon during his office hours via `https://are.berkeley.edu/~ligon/appointment.html`.

Drop in office hours: Student assistants will staff office hours to help with technical problems at `https://berkeley.zoom.us/j/96715456769` on Tuesdays 5–6p and Fridays 10–11p.

1.3. **Grades/Evaluation.** You must take the course for a letter grade. The grade you receive for the course will be a weighted average of grades for each of the projects, based principally on the following different sources:

. *Date*: Spring 2021.

(1) Other's ranking of your teams' performance on each class project;
(2) Your teammates' rankings of your contribution to each project.

In addition, there will also be some credit given for participation in class discussions on edstem.org, and in the event that your peers' evaluations seem very unfair you may petition to take a final exam. I would recommend the exam option only in very unusual and unpleasant cases.

2. Content

This course takes a quantitative, hands-on approach to understanding the challenges of feeding the human population of the planet Earth. We'll discuss topics of nutrition, subsistence food consumption, and consumer demand for food to develop our understanding of the current situation. We'll then develop both theories and computer models of population dynamics taking into account people's decisions about child-bearing, changes in mortality, and changes in food supply in order to learn something about the future of food. Focus throughout the course will be on developing practical tools to work with real-world data. Those tools will include linear programs, globally regular demand systems, and a variety of econometric tools. The course will rely on a knowledge of the programming language `python`.

3. Plan of the Course

The course revolves around a sequence of topics, each exploring a substantive issue involved in "feeding the planet" and each introducing novel tools. Students will work in small groups to complete one structured project for each topic.

3.1. **Population & Food Supply.**
Students will construct datasets on the distribution of characteristics in the world population, including measures of resources, and the age and sex composition of the world population. A separate dataset allows us to think about food supply.

3.1.1. *Readings.*

- Malthus An Essay of the Principle of Population (1798)
- de Janvry-Sadoulet (2015), Chapter 11 of Development Economics
- Fuglie (2012), `https://www.ers.usda.gov/amber-waves/2012/september/global-agriculture/`

3.2. **Subsistence nutritional requirements.** Every living human has some minimal, or subsistence, nutritional requirements; should these not be satisfied health and even life may be threatened. People satisfy these needs by eating various kinds of food, but there may be many different food diets which satisfy people's subsistence requirements. One criterion for choosing among these diets is *cost*.

In this topic students use contemporary data on different kinds of foods available to the US population along with prices to construct estimates of *minimum cost* subsistence diets.

3.2.1. *Readings.*

- Stigler (1945) "The Cost of Subsistence"
- Ligon's notes on the Minimum Cost Diet Problem

3.3. **Consumer food demand.** In practice, even very poor people seldom choose their diets on the basis of minimum costs. Instead, people balance nutritional requirements against considerations of cost and what we might call the gastronomical value of different diets. Here we explore the theory of demand as it pertains to these diets—how does demand for food depend on income, prices, and other observables? How well (or poorly) do these diets serve nutritional ends?

3.3.1. *Readings.*

- Review basic demand theory (e.g., Chapters 3–5 in Nicholson-Snyder)

3.4. **Estimating Food Demand Systems.** Students will use data on household food expenditures for populations from different countries to estimate systems of food demand, and relate these to demands to the subsistence diets calculated in the earlier topic.

With these results in hand you will construct aggregate demand functions that allow one to make predictions regarding how aggregate demand for different kinds of foods depends on the distribution of resources and the demographic composition of the global population.

3.5. **Hacking Food & Nutrition.** This project exploits our work on demand for food and is focused on evaluating what kinds of **policies** might be effective at improving nutritional outcomes for particular populations. Our earlier work addressed the question of how demand for different kinds of food depends on prices, budgets, and household characteristics, taking as given prices, budgets, and so on.

One of the take-aways from our earlier project is that the food people *choose* to eat may be quite different from the foods that people *should* eat, from a nutritional perspective.

But if dietary choices respond to prices and budgets, it may be possible to manipulate nutritional outcomes by changing either prices or budgets. We can assess the costs of this kind of manipulation (e.g., the deadweight cost of a tax or subsidy); where these costs are large we can also think about the value of innovation in either the desirability or nutritional content of food.

3.5.1. *Readings.*

- Technical change: Borlaug (2000), Ars Technica (2019)
- Changes in budget: Deaton-Dreze (2009)
- Changes in relative prices: Falbe et al (2016)