- Jessie Bump, PhD & Jason Tilan, PhD
- Social & Population science vs. Bench science

- Basic science

"What is your question" and "What do you want to answer"

- You continue to move your question towards "How do I kill cancer," etc → keep distilling until you find the fundamentals. The basic application may not be evident, but the goal of JT's role in pediatric cancers is how particular cancers respond to a lack of oxygen with respect to growth in blood vessels.
- Very focused perspective but can extrapolate in many directions. When it comes to the scientific method, hypothesis, experimentation, results. It's very broad. But hypotheses change and that's okay.
- Be flexible with whatever you're working on. Establish the framework you're working in. In general, what you're trained to do in graduate school – you're trained how to THINK. Any system. Training is HOW to THINK. This is applicable to anything. The way he goes about any sort of challenge, question – goes about the method he almost perfected from graduate school.
- Career life for researcher? A job is different from a career. To be a career/academic scientist – it involves a lot of grant writing and publications. You have to be good in the lab. Identify a problem no one else is addressing. Then address its relevance. You're then judged by your peers. If you publish a manuscript, and publish more, you get more money. If you have translatable science, you can go into pharm. development or biotechnology.
- You have to be good with people. There are other options for PhDs – lots go into policy, science writing, advertising and marketing. That's not as well-known. You can apply that thinking towards other concepts within the framework of whatever you're getting into.
- The easiest way to get involved is to check within your department. Talk to your faculty. As much as you may or may not like it, you have to read in order to formulate a good question. What are you doing? Why are you doing what you're doing? Check with your academic advisors for opportunities. There are many opportunities. Look into how you can get involved by either formal or informal mechanisms. Read, read, read.

Dr. Bump: as an undergraduate majored in Astronomy & History at Amherst.

- Science, medicine and technology PhD. Got a MPH from Harvard. As a social scientist, it's a kind of way of life. It's a perspective, but also a religion. It's a driving urge to understand stuff. We in social science, take those things as ingredients to figure out why people do the things they do. Why the phenomena you see are the way they are. How do you know the things you know? Many things overlap with bench science but all of this overlaps in reality.
- You have to publicize the knowledge, convince others its worth paying for, its worth investigating. Those aren't sciences, those are processes of influencing power. What makes one scientific question more valuable than others? Why does one career work when some others don't? When you get on to this, it's hard to stop asking questions. The discipline that you have at first is a lens.

- He started as a historian and was interested in why poor countries are poor and what to do about it. Look at what you have today. Just like in bench sciences, we move from explanations to predictions. What they're after in Global Health, you're looking into control: improve health status, sell more stuff, explain things and stop there – these are all valid questions. It doesn't really matter how you do that. Those things are of personal interest. You end up converging as the same space from other disciplines. It gets down to how do you know what you know. There's a 7/11 in P and 11 St. You know what's inside the 7/11. Circle K – you know exactly what it is. They fit into the category of "convenience stores." This is a process of forming a denominator. You don't have to have seen that specific 7/11, just know that they're similar.
- Social scientists are always thinking about the numerator and denominator. Numerator – I learned something from that.
- The way you interact.
- It's not true if you talk to different people. Racism = classifying people who look like people from other groups. What can I know if what I've seen is true? Link the numerator (You) with the denominator (your group). You can't know until you figure out what the right denominator is until you look to complex social phenomena. Take a big thing like health reform. All it means is allocating resources. How do you know what worked in Mexico? How do you know it worked in Brazil? How do you know that what you got to work for an individual can work for others?

Bench science revolves around methods that take the investigator completely out of the process. They write in a passive voice. They delineate. In theory another investigator could come in and repeat your results.

- In social sciences, we don't have that luxury. It's hard to replicate peoples' interactions. You don't stumble upon results the same way. These Aha moments don't come again. You have to do more pilots and more studies. I'm pretty sure – let's go do it.
- In the social science realm, we rely on the same kinds of methods – we think really carefully about what exactly happened – who did it –
- The process of social science is to figure out which of these is the right thing? Hypothesis generation → question modification based off observations.
- Ex: Go to Mexico – see what the conditions, culture, history, government were. See what really matters, did it have the same outcome or different outcome? Go to a different country and see what happened? Do they have the same inputs. This involves for non-social scientists – selecting a dependent variable. You look at things that work. You will know this under the name as "Best Practices", "Case Studies". You can't learn about causality when you do that. You don't know whether any of the variables you observed or it might be some other sharable characteristic that caused that. Anyone over 4 feet tall and less than 6.5 ft gets into Georgetown. We're all here. We're all in height range. Until you look at the street and you see tall people and you know they weren't here.
- It doesn't mean you can even find it. It does mean it is in there somewhere. Formulate the hypotheses. We don't get the luxury when we narrow farther and farther down. You might look at cells, you might look at genes. We do refine things, but as a matter of course, we don't know where to start.

- Look at phenomena and ask yourself a question. Ex: Where does this food come from? What results came up with this? Whose preferences reflect this meal? Why that contractor? How much? Does it have to cost what it costs? It doesn't mean you could actually control it, but as customers you might have power in this process. Why are there students in groups? Why is the University here? So why do people do stuff? Why are the things you observe the way they are?
- What we're trying to do is take knowledge from the lab to transform health outcomes. As all of you know, even in lives that are basically helpful, sometimes following health related advice are difficult. Parents will tell you to get some sleep. When you're older, get more exercise. People would prefer medication. In health, we want people to act on information.
- How do you take stuff that works in the lab setting (vaccination, procedure, drug), how do you get people to use it?
    - Ex: Seat belts – can you buy one Alla Carte.
- Social science: how stuff gets done. How one gets knowledge from one form and transforms it into objects. You don't know whether things are going to work with regular people. Testing different weighted crash test dummies, both genders, pregnant people, car seats with infants → expanding the denominator. What you observe and know is more representative of what you don't know. There's only a fine line between Bench & social Sciences.
- When you're thinking about how to proceed, figure out what to do.

- Question: What do you do when you can't find steady data? Look at the country of interest. Identify the variables you think are relevant: soil characteristics, acreage of land, labor supply, technology use, education levels, is it subsidized, is land in production already – things you can tell from GIS – don't need Country data. You can invent an answer. That'll tell you something about the potential of that land from elsewhere.
- Ohio is extremely fertile – some of the most agricultural. Other lands may be different. You're guided by some question.
- JB did a trade study in Tanzania – all in agriculture. They're farming. What happens if we switch this labor into different crops. Look at available crops, soil, market – see if you can make more money that way. You'll never have as much data as you'd like. To a first order, how do they collect data, who do they ask?
- 2nd level: Go there and look around. Usually you get a different story and the stories are stories of social science. When the farmers bring their grains – they soak it first. Not finding moisture content of grains. Adjust the data.

- Question: What brought people here today?
- Question: Creativity in research? Absolutely – there's a creativity in how you string ideas together
- We care about methods. One of the first things you look at – make these big claims – this is what we found before, this is what brought us to our question now, this is what we found. Take their claims, take their results, did the way they test their question direct their results? How?

- It is a story – you're trying to communicate something that is logical. Creativity can come from methods, your interpretation data. In the lab, we discover stuff. We establish the knowledge that goes into the textbooks.
- There is a stigma – the way science is taught up through high school, maybe college where the creative side isn't as necessary. Memorization. But to be able to put that into something that's appealing and useful takes a lot of creativity. We try to distill things to its fundamental elements and put it into a vacuum.
- There's unlimited latitude for creativity. What kind of questions are you interested in?
- How priorities are set in global health? We go after HIV? Why does the community decide that? To whom is it a problem? How do you measure what a hot item is? It's not like you can track things on ITunes. How do you like to track the rise and fall?
- The interest in an area of inquiry should be reflected in the number of PhD dissertations written on it. There's a database of discipline abstracts. They got resources, they got mentors who wanted to do that, that's a way to capture a sense of what's going on? This area's hot, this area's not. You don't find the rules for doing this stuff written down.

- Question: What do you enjoy the most & least in research?
- JB: Least – the grunt work. In the process of knowledge production, you start with a question, something you've seen – why is this. It's fun when you start to uncover some of the reasons – generating knowledge – feeding into your knowledge about the world. These are things that nobody knows. You pursue the research process and it stays really fun when you're learning a lot. Then you end up with a manuscript – a paper that you've written. That's where the fun starts to taper off. Transforming that manuscript into a published work. Anyone can download it and do things with it. Otherwise, it stays private.
- JT: Least – grunt work – usually things like generating the data – you have to do the same things over and over and over again. There's a level of monotony in order to generate enough data. But we are trained in a particular way to think. Dr's of philosophy – thinking is really fun. Whether it's asking a question, thinking about the larger implications of our work.
- Used to think he worked long and hard hours because he had to, but you stop looking at the clock because it's something you really like to do? You are held to a standard by your peers. This other group studies a different protein. Whether he agrees with me or not but says the rationale is there and it's solid even if I don't agree, that's exciting. The job in and of itself is fun. Don't like pipetting but when you're away for a while – It's fun to see if I can reproduce the data. Doing surgery on mice is fun. I like building things. When you have limited resources, test something with low levels of tools. Give me money to do it the expensive way, but I can do it the Mickey Mouse way.