Jeff Stanaway, Graduate Student, Epidemiology, University of Washington

Clip #1 (Lesson 1)

Interviewer: Jeff, I would like you to give a brief introduction on what you do here and a little introduction into epidemiology.

Jeff: Ok, I'm a third year PhD student in epidemiology. And I do research on infectious diseases and their relationship to climate and ecology. In terms of work, I'm also a teaching assistant, so I help teach the epidemiology methods courses. In terms of what epidemiology is, the easy, the best description I've heard is epidemiologists are disease detectives; we go out and try to look for association between various risk factors and diseases in the world. It's probably the easiest way, and the other way is to think about the word epidemic, and we study epidemics.

Interviewer: Could you describe your path and how you chose epidemiology? How did you heard of it even?

Jeff: I probably first heard of it when I was in undergraduate. So my undergraduate degrees are in biology and nutrition and when I finished college I really didn't know what I wanted to do. And I worked a few random jobs and then I decided to go into peace corp. And I went to Southern Africa and spend two years working and living in Southern Africa and being there I knew that I wanted to do something related to international public health. So when I came back I went to the University of Arizona and got masters in public health and my plan was originally to go and do sort of applied international public healths work. I ended up though working as a research assistant there in a group that does epidemiologic research and I really felt in love with and I realized I really wanted to do research and I became pretty excited about it and that's kind of how my path appeared. And so after that I knew wanted to go into epidemiology research and so I came up here to the University of Washington to get my phD in epi.

Interviewer: When you're conducting research projects, who do you collaborate with? And what kind of interactions do you have? And how important do you feel that is?

Jeff: Collaboration absolutely key because if you don't collaborate, you have to know everything, and you have to make no mistakes and the thing about being able to collaborate is you can bring in experts on various fields. So for example in my dissertation, my team has, I have a virologist, cause the diseases I look at are mostly viral diseases and she helps me with the biological and the clinical end of things. I have two statisticians who help me on my methods and ensure that I'm using the right statistical methods. I have an expert in spatial stuff; he does satellite work and work with mapping and things like that. And he ensures that I'm making good decisions and helps me make good decisions in that area. I have someone who is a medical geographer who actually does very similar work to what I do and he's kind of my key partner, we work really closely and going back on forth on ideas, so collaborators want the help to fill gaps in your knowledge. We can't be experts in everything and we can't know every statistical

method, we can't know all the clinical insides and outs, we can't know all the design considerations. So we need people who have, who are experts in those things and come in and offer their expertise. The other things is, we make mistakes, and we overlook things, and we miss things, and when you work with other people, they're likely to catch your mistakes, and you're likely to catch their mistakes so your work ends up being better because of it. People pick up your errors and you're able to correct that and improve your work, those are the really big benefits and sometimes you get really great meetings with collaborators where, I think its probably like writing a song alone versus writing a song as a band, sometimes when you have a band that everyone is really kind of clicks together, the music becomes much much better because of that collaborative writing experience, and same thing with science you get people who really click and mesh together and you get together and you can have a great meeting where you come up with a incredible ideas, and the science is much much better would have been had you all worked on your own, its just that sort of synergy of people working together, its really really important, its really important

Clip #2 (Lesson 4)

Interviewer: So what makes epidemiology unique compare to other sciences?

Jeff: I don't think there's any single thing that makes it unique, its a combination of things, one of the, the sort of hard side is the thing that makes distinguishes it, is that we are often completely incapable of controlling who has what risk factors. In chemistry or physics you can have control experiments in the laboratory; chemistry you could mix specific chemicals together to look for a reaction. We often don't have that ability. We rely on what happens out in the world in reality and you know we can't take a hundred people and make them smoke and see what's going to happen. We simply see that these people smoke and this is what happens. So, we do a lot of work that is observational and based on what is really occurring in the world as oppose to being able to isolate things in the laboratory.

Clip #3 (Lesson 5)

Interviewer: How often do you work with the databases?

Jeff: How often do I work with databases? In some extent I work with databases almost everyday.

Interviewer: And how do you work with them?

Interviewer: How do you go about analyzing data?

Jeff: How do I go about analyzing data, so it obviously depends on the type of data and the type of question but the idea is to typically I know what my data are going to look like, I know what my question I want to ask is, and based on my knowledge on

epidemiology and statistics, I also can then connect the two with some analytical method, so that might be a simple test, or might be a complex multivariate model but its your question of interest and the data you have. should drive your analytical choices and once you made those choices you have a plan and you know in order to do this analysis, I need to do these steps and you follow your steps. its one of those things that once you know what you're doing and you're really familiar with your methods, it sort of happens pretty, pretty intuitively.

Interviewer: Have you conducted a case control study? What are the limitations of case control studies that students should be aware of?

Jeff: I've conducted one case control and one case cross over, case cross over is a type of case control study. The limitations with case control studies, there's a few limitations, one is that again you're observing things as they occur out there in the world, rather that in some sort of controlled environment like a laboratory. So there are a lot of other things, that association that are out that that you have to know about. Case control studies also, because you're looking back in time, sometimes its difficult to determine what came first, you end up with a chicken and egg question, you don't know whether the exposure led to the outcome or the outcome led to the exposure. It's difficult to figure out the timing of things and there are certain ways around that, with careful design but that's certainly an issue. There are also problems for example, if you're doing a case control study and you are basing your information on interviews, and you interview people who have a disease and you interview people who don't have a disease about things they've done in their past life. People will often remember differently, people who have a disease are much more likely to remember some exposure they've had in the past. And people who don't have a disease are most likely to forget so you have to deal with things like that, of course there are the ethical concerns of maintaining patient or participant confidentiality.

Interviewer: How do you limit those confounding biases that you just mentioned?

Jeff: You limit them through a combination of clever design and clever analysis is really what it comes down to. And the biggest thing is you need to be aware of what the potential is for confounding and bias in your study. And once you're aware of, of what all those potentials confounders and sources of bias are, then you can begin to figure how to address them one by one, and with confounders, you can address them the most common ways are matching exclusion or restriction and statistical adjustment. So matching would be lets say age is a confounder that you're worried about, for every case you have who is 35 years old, you get controls that are 35 years old. So you match your cases and controls on that particular cofounder. Restriction would be you restrict everyone in your study to be, let's say you think gender is a cofounder, you might restrict everyone and you start with just be men or just be women, so you'd eliminate that. the other ways through statistical control which is probably today the most common way to do it because of some of the statistical tools we have and the computing power we have allows us to do a lot of things statistically that people couldn't do statistically 20 years ago. and without really getting into the deep statistics, I'll just say there are some basic methods for when you have simple confounders that you could do back of the envelop type calculations.

And an example would be something called the Mantle Hansel technique, and then there are some more sophisticated methods that require a lot of computing power like the multi variant regression modeling, so those are the ways we deal with things like confounding. Biases, things like selection biases or recall biases are really had to be dealt with the design phase. There's really no way of dealing with it after the fact. Once you you're your data collected, there's not much you could to do deal with those things. So for selection bias, you make sure you are selecting an appropriate control and that requires a lot of thought, I mean, you could spend, a month of time just figuring what control group is going to be, really carefully thinking it through carefully. Things like recall bias, you need to make sure that cases and controls are equally likely to remember an exposure. And there are various ways you can do that in terms of ways to improve recall through better interview technique, through showing visual aids and things of that nature, so its through intelligent design and intelligent analysis its really how you deal with these things.

Interviewer: How do epidemiologists imply causality in case control studies?

Jeff: So if you have something like a case control study, to imply there is some sort of casual association, you need more than just the results of your study. You need typically; one of the most important things is what called a biological plausibility. So there needs to be some biologic reason that this particular exposure could cause this particular outcome. We need to have; it's much easier to believe say that that smoking would cause lung cancer because you're ingesting some sort of chemical into your lungs than it is say to believe that smoking would cause you to stub your toes I mean that wouldn't make much sense. So we like some sort of biologic plausibility. There's a reason this would happen. We like to be able to establish timing, called temporality. So we are much more likely to belief that something is causal if we can be absolutely certain that the exposure came first and the outcome came later. And sometimes you can establish that in case control studies, we are much more likely to believe causation when we've seen multiple studies that have seen the same result. More studies with the same result are better evidence. The stronger the association seen in the study the more likely we're to believe that's its causal. Quality of study design, the better job the investigators did or dealing with things like bias and confounding, the more the more convincing the evidence will be, so really we determine, we infer causation based on sort of an overall picture of all of these factors and when all of them come together, we're certainly exposure came first and we're certain that these studies were well done. And they really did a good job on dealing with confounding and there have been several studies and they all show similar things and we have a biological, its biological plausible and we understand how this could happen and then we can begin to infer causation even if we can't make a randomized control trial. One of the examples I love is that we've never done a randomized control trial on effectiveness of parachutes. It would be ridiculous to randomize people to jump out of the plane, half of them with parachutes and half of them without. we know that parachutes work, you know its plausible and they makes sense they work , we see it over and over again, its you know, so you don't need a randomized control trial to be able to infer causation. You do need a sort of collection of other things though.