Interview with Allen Wilcox, M.D., Ph.D.

Conducted on October 14, 2016 by Robin Arnette, Ph.D.
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RA = Robin Arnette, interviewer
AW = Allen Wilcox, interviewee

RA: Today is Friday, October the 14th, 2016. I'm interviewing Allen Wilcox, MD, PhD, a principal investigator in the NIEHS epidemiology branch. This interview is part of an effort to collect oral histories of NIH scientists.

Good morning and welcome.

AW: Good morning. Thank you for having me.

RA: Let's get started. Have you always been interested in science?

AW: I have to say not exactly. In high school, my interests were in math, and biology, and English, and in college I guess I kind of continued to have a wide range of interests and not very focused. In retrospect, I think that's probably true for a lot of epidemiologists, that you can look at it two ways. Either we're dilettantes and don't focus very well on any one thing, or we have a very broad set of interests. I think a lot of my epidemiology colleagues share my kind of eclectic background.

RA: Can you describe your academic background in terms of your degrees? You have a PhD and an MD.

AW: Right. I started college at University of Michigan. I grew up in Michigan. At the end of my undergraduate years, I still really didn't have a good idea of what I wanted to do, so medicine seemed like a good option in that there were so many different directions that you could go with an MD. I went to medical school in Ann Arbor, and at the end of that ... Well, during medical school, in the fourth year we had a lot of opportunity for electives. I took extra electives in pediatrics and obstetrics, and some public health school electives. I found that I really liked public health school. I liked that broader view of the world, in a larger context, but I still didn't quite know what I wanted to do. After finishing an internship, I thought, "Maybe I should go back to public health school and see if I can find my niche there."

We moved to North Carolina, and I started at University of North Carolina School of Public Health, and got a master's degree in maternal and child health. Beginning to sound like a broken record, at the end of that program, I still didn't quite know what I wanted to do. One of my advisors in the public health school said to me, "You know, I think you actually want to be an epidemiologist." I said, "Really?" She said, "Why don't you go over and talk to the Chair of Epidemiology, and see if he has a place for you." I went over there and John Castle was the chair. He said, "Sure. Come on over. Take a few courses. Go to the seminars. Just see what you think." I wasn't there a month when I realized that this was my place in the world. I ended up staying and getting a PhD in that department.

RA: Tell me about your current research here in NIEHS.

AW: My research has kind of grown out of my interest in pediatrics and obstetrics. My research has been about human reproduction, about fertility, and early pregnancy, and fetal development, and then early childhood development. I guess if I were to summarize what I've done, I've used the tools of epidemiology to try to describe human biology around the time of reproduction. To try to measure fertility in better ways so we can look for effects, for example, of environmental exposures on fertility. We've done some of the first research on looking at what happens in early pregnancy in humans, how much pregnancy loss there is before women know they're pregnant. Some of the stages of early implantation and development.

You might think, "Well, how do epidemiologists do that? That sounds very laboratory based." It's a sort of thing you can only do by studying groups of people. You can't put women under a microscope, or not very easily. I guess there's in vitro fertilization, where these events are looked at under a microscope. To understand what goes on in natural pregnancy, looking at groups of people who are willing, women who are willing to collect daily urine samples is what we've been using, and then applying laboratory methods to follow the hormone patterns in pregnancy, we've found that we can extract a huge amount of information about what goes on. In a nutshell, I guess, that's what my mission in life has been. To understand human reproduction using those kind of tools.

RA: You've been involved in several discoveries. Which one was your most surprising?

AW: Surprising to me, or surprising to everybody else?

RA: Let's say everyone else.

AW: Everyone else. I think it's easier to talk about what surprises other people. One of the first studies I carried out was one in which we were trying to measure the proportion of pregnancy loss, as early during pregnancy as it could be measured. The idea was that women may be losing, may be getting pregnant and losing pregnancies before they even know that they're pregnant. No one had ever measured that in a really careful way.

With some combination of being at the right time and the right place, we did a study where we enrolled women who were about to try to get pregnant, who were stopping their birth control, and asked these women to collect urine samples daily. Then we measured the pregnancy hormone HCG in that urine. We were able to look at pregnancy at the very earliest stages, from about the time the fertilized egg implants in the uterus, and what we found after ... How long did it take us? About six, seven years from the time we started the study to the time we published the first results, was that about 25 percent of conceptions ended before the women even knew they were pregnant. They got pregnant and they had bleeding that looked just like menstrual bleeding, but it was actually a failed pregnancy.

That result actually got on the cover of Newsweek Magazine. You can see the magazine cover there on my wall. The fact that it was regarded as so newsworthy I guess would be some evidence that people found it surprising.

RA: I see this is dated 1988.

AW: '88. That's right. That's when our paper came out in the New England Journal.

RA: Which of your discoveries was the most surprising to you as a scientist?

AW: You know, there's so many wonderful things that, especially when you're trying to do descriptive epidemiology in contrast to hypothesis testing. Where you're testing a hypothesis, you have the idea that something might be true and then you try to see whether it really is true in the data that you can put together. Those results you can't really say are surprising, because you're hypothesizing it might be there. When you're doing description, sometimes you stumble on things that you didn't expect. There are so many to choose from, and I guess I'm going to pick one that's in my mind because it's relatively recent.

We found that in the same group of women who were trying to get pregnant, we had about 200 pregnancies that we recorded. Because we were measuring daily urine samples, we could identify the day of ovulation. The day of ovulation is also the day of conception. That meant we knew the time from conception to delivery. We knew the exact length of pregnancy. One of the things we're able to find is that the variability in the length of pregnancy is actually surprisingly broad. Even in healthy pregnancies, women might deliver plus or minus 10 days. From what is the average. A woman goes to see her doctor when she's pregnant and he says, "Okay, your due date is someday 40 weeks from your LMP." But in fact your chance of delivering on that due date is only 4 percent. What we found is even when we have an exact measure of pregnancy, not going from last menstrual period but right from the day of conception, there's still a lot of variability.

An interesting thing in that is we also were able to look at the date of implantation. That is the first day at which we could measure HCG. We found that the time from conception to implantation also varied. It might be six to 12 days, and that the longer it took to implant, then the longer it took from implantation to delivery. That would suggest that pregnancies that are slower to implant are also a little slower to mature, to get to the point of delivery. The rate of fetal development shows up even in the very earliest days.

RA: That was something that hadn't been known before?

AW: Nobody knew that. Right.

RA: What scientific advances would you like to see in your field in the next five or 10 years?

AW: In my field specifically, a scientific tool that would be so useful to understanding more about human biology, human reproductive biology, would be a measure of conception. A measure of when the egg is fertilized. There is no measure of that now that we can use on women who are conceiving naturally. We can't identify pregnancy for six to 12 days after conception. There's kind of this dark period in pregnancy where we can't measure anything that goes on because we can't determine whether pregnancy has occurred. It's biologically plausible that there are some vital markers that result from the fertilized egg that could be measured in a woman's blood or urine somehow, but nobody's been able to find it yet. I'm still hoping that somebody figures that out.

RA: What brought you to NIEHS and how has the institute contributed to your success as a scientist?

AW: Some people are very careful about their career decisions, and my experience is I sort of back into things. When I finished my PhD at Chapel Hill, my wife was just starting a residency in Chapel Hill. We were kind of trading off our training and it was my turn to kind of be responsible for our kids and support my wife while she was doing this thing. We were going to stay here, and I had to find a job around here. NIEHS was just trying to form an epidemiology program at that time.

RA: What year was that?

AW: 1979. Walter Rogan had been here maybe a year or a year and a half, and they had just hired a person to be the head of the epidemiology program. A young guy from Berkeley. They had just hired two other epidemiologists, Dale Sandler, who was a new graduate from Hopkins, and Richard Everson, who had finished his post-doc at the Cancer Institute. I showed up and they said, "Geez. We'd really like to have somebody who does reproductive stuff, but we don't have a position for you. Would you be willing to take a one-year temporary position?" I said, "Sure." I've been here for 37 years.

RA: Name one skill that you think every scientist should have?

AW: I think a skill that is supremely important and difficult to teach is creativity. So much of what we learn in graduate school is the tools for doing our job. What is harder to teach is how to think outside the box, how to not just stay in the same grooves of research that other people have been doing but to think about what the possibilities are. Of course, especially in something like biology, which is supremely intricate and complicated and beautiful, just to do what's been done before is not enough to really break new ground. I think anything we can do to cultivate creativity in ourselves and in the young people who we're mentoring is an important thing to do.

RA: If you had not become a scientist, what career would you have chosen?

AW: It's so hard to say. I love teaching, so I might have ended up being a teacher in high school or in college. I have a strong interest in architecture, and I still ... A lot of my travels are around seeing buildings that I've heard of or I'm curious about. We did some extensive remodeling of our house. My wife and I did the designs. I didn't understand anything about architecture when I was in college, but I think if I were starting over again I might be interested in being an architect.

RA: Finally, what advice would you give young people who are interested in having a science career?

AW: My advice would be to protect your idealism. We live in an era where idealism is kind of outmoded, and cynicism is rampant. Yet to be a scientist, the joy of science is in trying to understand a truth that exists outside ourselves. It means not imposing our own values or expectations. We always do, but to the extent we can control those, to try and understand what is out there without prejudicing ourselves either consciously or unconsciously. That's what I think about when I mean idealism. It means sticking to a set of principles about how we judge what is true and not, and not compromising that. That's a lifelong endeavor. To do that, I think we have to consciously align ourselves with colleagues who are also idealistic, who support that approach to science, and also I think we have to avoid putting ourselves into situations where our idealism is going to be compromised.

We know that scientists who worked for the tobacco industry in the 1950s ended up compromising their science in terrible ways. Some of that maybe they have to take the blame for, but some of them might have been at first willing to do honest work, but there's so many subtle pressures to please the person who's paying your salary and all that stuff. I think we have to be very careful about putting ourselves in a situation where our idealism is going to be eroded.

RA: Thank you again for your time.

AW: My pleasure.