Sleep Interview Transcript:

Intro: Hi there! I'm Haley and I'm Sophie and we're your Perspectives podcast hosts. The Perspectives podcast is a graduate run program exploring various public health topics in an effort to learn from experts in the field and the community from varied backgrounds and areas of inquiry. We explore topics within and outside of standard public health discourse, but our conversations relate to subjects that impact all of us on various levels of wellbeing. We're glad you're here and we're excited to learn alongside you.

Haley: Thank you both so much for joining us today, could you introduce yourself to us?

Erika: Okay, I'm Erika Hagen, and I'm a sleep researcher and I work here at the University of Wisconsin - Madison in the Department of Population Health Sciences.

Paul: And I am Paul Peppard and I am a Professor of Population Health Sciences and also a sleep researcher.

Haley: And what interested you both about sleep research specifically? How did you get started with this?

Erika: Well so, I think of myself as an epidemiologist first, my training is in epidemiology and I was trained mostly in longitudinal, observational studies. And so I came with that or I come with that perspective to sleep and that's the kind of work that we do here. So I came to sleep after my training. I wasn't trained in sleep during grad school and I've learned about sleep for the last 11 years when I've been working with this cohort and have been working with Dr. Peppard in this department. So I kind of came into sleep after my training and have become a sleep researcher through this work.

Pau: And my introduction to sleep was partially happenstance. There was a faculty member in our department back in the 1990s, who was a pioneer in the field of sleep epidemiology. I mean nobody knew what that was, it was being invented at that time. And she asked me if I wanted to be involved and she had just gotten a grant from NIH to do some pioneering sleep epidemiology stuff. I said sure, sounded interesting. So, I was interested because it was a nascent field. I mean, the meetings were small, the number of people in the world who would call themselves sleep epidemiologists at that time you could count on one maybe two hands. And so it was a wide open field and very exciting in that sense. It has matured over you know the following generation, but that's what got me involved, was that it was just brand new and there were so many questions to ask. It was startling to me when I learned about the existence of this new field, this thing that we do for a third of our life had not been deeply investigated by the epidemiology community, which had been around, you know, which had been around with professional societies and that sort of thing for over a hundred years, and we were finally getting around to this thing that we spend so much of our time doing.

Haley: And when was all of that, when did you get started in it?

Paul: I wrapped up a master's degree focused on environmental epidemiology in 1993 or 4 and something like that and then I was immediately asked as I transitioned into the PhD program if I wanted to go into sleep epidemiology. So it was the mid-early 90s.

Haley: Okay, so it's still relatively new to the field of research. And what do your current projects look like?

Erika: So, right now we are working on a project that focuses on exposures during mid-life, so your exposure to sleep quality and duration over mid-years, and how that affects cognitive trajectories in later life. So this is within the context of the Wisconsin sleep cohort study, which started just before Paul got involved in the late 1980s. And this group of people has been followed since then and we are lucky enough to now be working with that same group of people, so there is a wealth of data from their mid-life years, and now many of them are quite old, the mean age is about 75, but we've got people who are in their 90s, so we are able to use cognitive data that's been collected all this time to look at trajectories and then their very well characterized sleep over their mid-life years, so that is one of their current projects that I'm leading, but there are a whole bunch of other things that are going on in this cohort as well.

Paul: Yeah, and I'll talk about two of them. One is very parallel to Erika's cognitive trajectories project, which is looking at sleep duration and sleep quality in mid-life predicting weight gain or weight loss and metabolic trajectories in later life, so those are both grants funded by the NIH. Then we also have a funded project looking at the prevalence of a condition called idiopathic hypersomnia,which translated means there are some people who are very sleepy all the time who are getting adequate sleep for which we can't explain the source of their sleepiness, it isn't due to sleep apnea, it isn't due to not getting enough sleep, it isn't due to having shift work issues, so that's the idiopathic part and then the hypersomnia just means they're super sleepy. So, we don't know how many people have idiopathic hypersomnia because those cases end up in clinics and there isn't really a population base for estimating the prevalence of that, and we have most of the right tools for doing a pretty good job with estimating that, so that's another funded project we have right now, and then there's just all sorts of side projects where an investigator comes to us from some other institution and says we know what kind of data you have we'd like to ask this question of your data, and then oftentimes we'll end up collaborating with those investigators and then another thing that we sort of have going right now is that about five years ago something called the National Sleep Research Resource was funded by the NIH where we put some of our data, a subset of our data, which our informed consent allows to be publicly accessible, those are available through an NIH website and there's an approval process and I would say they're 2-3 request from around the world (every year) to access our data that ask all sorts of different questions.

Erika: Every week

Paul: What did I just say?

Erika: You said every year. 2-3 a week, yeah, it's a lot.

Paul: Yeah, hundreds of requests, and then Erika and I go through that approval process, mostly we're looking for is this really science, is there not a commercial interest involved here, because ours consents don't allow us to do that sort of thing, but we're pretty wide open in approving that for all sorts of different projects. I would say the most common projects people want to use our data for are machine learning, we generate a lot of information as people sleep through the night and we get different channels

of what their brain is doing and people from around the world are interested in using different computer algorithms to glean as much information as they can from the data about sleep

Haley: And are you only looking at the sleep people are getting at night, or are you also taking into account naps throughout the day?

Erika: We also investigate naps, and we ask people about taking naps, so we have some self-reported data about frequency of napping and we also get some information from sleep diaries, that's part of our data collection process, when people have exams we send them home with a sleep diary so we collect a week of sleep no matter what time of day they're getting that sleep. And then we also do have some studies that are specific to napping, that are called nap studies, where we try to, they're mostly about how sleepy people are, like how quickly they fall asleep when they have the opportunity to nap, so we have some of that data that's collected in labs as well.

Haley: Okay, so I guess just speaking more generally, can you give us an overview of why sleep is important? I mean, we all do it, we all need it, but what about sleep is so important to humans?

Paul: Sure, I'll take this one. The issue here is that there is such a multi-dimensional answer I could give and you could take a semester long class to try and address this. So I'll try to do it quickly, but I will give a multi-dimensional answer. Foremost without sleep, we die, it's a vital component of our existence, it's like food, and actually there is a condition called fatal familial insomnia where people are unable to sleep and eventually they have psychiatric manifestations and die, probably around the time course over months of starvation. It (sleep) in some sense is like food, it's vital. Furthermore, and more commonly an issue, is that we know that inadequate sleep or poor quality of sleep is related to a host of outcomes - including reduced cognitive functioning, mood disorders, reduced quality of life, metabolic dysfunction etc., and the list goes on. And from a public health significance standpoint, it checks a lot of the public health significance checkboxes. Sleep disorders are common, they're often treatable, they're often screenable in some way, and they have specific poor outcomes associated with them, including the ones I just mentioned as well as things like possibly cancer, definitely cardiovascular disease and all the way up to increased rates of death associated with some of the more serious sleep disorders. So, it's important for a lot of different reasons.

Some of the most fundamental of why sleep is important is under active investigation. Like why do humans need to spend eight hours of their time laying down removed from environmental input. There are theories out there and most of them have to do with if you have a big smart brain, you need to spend time during the day to essentially process the information you learned or took in during the day, and that particular processing is not really compatible with being up, walking around, and taking in the environment. So there are some fundamental questions of why this has evolved, why sleep has evolved to look like what it looks like in human beings, but the answer to why it's important is pretty clear, without it you die, with poor or inadequate sleep you have all sorts of bad things, bad health outcomes associated with them.

Haley: And are there certain groups or types of people that are most affected by lack of sleep? Or are there trends in your findings?

Erika: I mean, yeah, lots of people who don't get enough, as Paul was talking about, everybody needs it, it's important for everybody, but there are groups of people, various categories of people, who are more likely to get inadequate sleep. So adolescents are a group of people who are frequently underslept for various reasons, so there are developmental reasons why their circadian clock gets shifted later and that this isn't always compatible with the constraints in their lives like school start times. Then there are competing reasons for staying up later than what is best for them, lots of them are developmental related, they are supposed to be having lots of social interactions, and they are, and then there's also lots of demands of school, and activities that kids get involved with, so anyway, there's a whole host of reasons why adolescents don't get sufficient sleep. Shift workers are another group, often their schedules are out of alignment with their natural circadian rhythm demands, and so being out of alignment is problematic for getting sufficient sleep, and also because of social role constraints and their work constraints, there's frequently not enough time to get enough sleep. People in their elderly years struggle with getting sufficient sleep for different reasons. And then over the last ten-ish years, there's been an increased focus on evaluating racial and ethnic differences in how much sleep people get and how adequate their sleep is. And so non-white populations tend to get recommended amounts of sleep as much as white populations do and they are also more likely to have poor sleep deficiency, which means the amount of time you're spending in bed you're not getting as much sleep during that time. And there's more variable sleep timing patterns in non-white populations. And there's some evidence that white people more frequently suffer from insomnia. So it does seem like there's differences across racial and ethnic groups. And the reasons for this are most likely due to environmental and social exposures that are not distributed evenly and equitably racial and ethnic groups.

Haley: Yeah, that's kind of the root cause of so many disparities too, so that logically makes sense, and it's still nonetheless frustrating and difficult to fix.

Erika: Yeah, and the way to fix it, like you're saying, is really to address those root causes, like the neighborhoods that people live in and the housing conditions that they live in and the roles and constraints in their built environment and their social roles.

Haley: The social determinants of health.

Erika: Exactly.

Haley: So, in your research, I guess however recent or distant the research was, what have been some of the most surprising findings?

Paul: So I've selected two. Sometimes we're surprised by what we don't find. You write a big grant and you go looking for something you're pretty sure is there and you know that happens in every science endeavor and science career. So sometimes we're surprised by, we thought something would be there and it's not, but two interesting cases of when I didn't think something was there or what I thought would be there ended up being very different over the last couple of decades. One was, starting in about the 2000s. So, when I came into the sleep field I had also been interested in physical activity from a research perspective throughout this whole stretch of the last two decades. I knew that when you were awake you

burn more calories just to live and exist than when you sleep. So my assumption when I was a grad student was that if you got less sleep you would be leaner, because you were awake more and therefore burning more calories. Data coming out of the University of Chicago and other places and then our own group in the early 2000s, so experimental data from the University of Chicago, epidemiological observational data from our group, showed just the opposite, people who didn't get enough sleep actually tended to be heavier than people who got adequate sleep, and both the observational data and the experimental data pointed a finger at metabolic regulation. Basically, if you don't get enough sleep it looks like you alter the levels of appetite regulating hormones in such a way that you lead to people eating more than they otherwise would eat, despite there being a slightly higher calorie cost to being awake to being asleep all else equal. So, all else is not equal, is the issue, people eat more. Furthermore, for most people in the United States food, whether it's high quality or low quality, is plentifully available and if you're awake at 10 or 11 pm, instead of asleep at 10 pm, and you're like me, you're probably stopping in the kitchen and snacking, so there's just more opportunities to get calories and consume calories when you're awake. So that was a surprise, it was counter to what I thought I understood about the caloric burdens of being awake versus asleep and then what you actually observe when you collect good data.

The other thing that surprised me, and this is more recently, and there's a little story behind it, is I went to a scientific meeting in Barcelona, and met a researcher from Spain, who had just done, we don't do animal experiments, but this was a general sleep conference around sleep apnea. Where this researcher had put melanoma tumors on rats and then randomly exposed the rats, well actually it might have been mice, rodents, let's go with rodents, and randomized the mice to either be exposed to a sleep apnea-like state or normal sleep, and it turns out that the tumors grew considerably quicker, like a lot quicker, on the mice that were exposed to sleep apnea. And that was like, wow, that's interesting and scary, and so that researcher that we interacted with asked us if we could look in our data to see if there was some association between sleep apnea and cancer in our own data. Now, we didn't have good cancer incidence data, but we have cancer mortality, so we went with that and we looked in our own data and low and behold it was like a 5-fold higher rate of cancer mortality amongst people with sleep apnea, then who didn't have sleep apnea. This was sort of a fall off of your chair surprise. The field as a whole, the sleep apnea field as a whole, was not looking much at cancer, we were looking at cognition and cardiovascular disease and it seemed sort of natural to look at those things, so that was very much a surprise. Now, the metabolic stuff that I talked about first, that's held up over time, there's like no question, inadequate sleep and metabolic function have been linked solidly. The cancer and sleep apnea question, that's more recent, and we're about the strongest association that has been found amongst all of the groups that have looked at this question, so it's still more of an open question. There's still surprised to be had for sleep apnea and cancer.

Haley: That's really interesting and really surprising too. And it's allowing you to continue doing your research I guess.

Paul: Yeah, yeah, for sure.

Haley: Dr. Hagen, what have been some of the surprising findings for you?

Erika: He took them.

Haley: Okay, so I guess then moving forward, what could you say to someone currently having a hard time getting enough sleep?

Paul: Sorry, I'm an academic, I have to start with well it depends. I'm not a sleep clinician, so I would ask a few questions if it became clear we were talking about a potentially serious sleep disorder. My first piece of advice would be to go talk to a health professional, you're probably going to start with a generalist, family medicine or an internist or pediatrician etc., and then hopefully that person has adequate training to recognize that you might need to be referred to a sleep specialist. So I would say that to a friend that came up to me and said something like I get enough sleep, I snore a lot, I have headaches, I've been taking my blood pressure and it's high blood pressure, these things to me sound like sleep apnea, but I'm not a clinician, so I would say go to your primary care physician, tell them about these symptoms, and make sure to ask, do you think I should be referred to a sleep specialist. If it was more like how I sleep, like I don't quite get enough sleep and I spend too much of the day a little bit sleepy, that sort of thing, my general advice would be the sort of advice that sleep professionals everywhere give: which is prioritize sleep as a health factor, just as you think of diet and exercise, sleep should be on that short list of things that you just give a health priority to. Standardize your sleep schedule, don't be in the habit of you know 10:30 on work nights but then 2:00 am on weekends, you're going to pay a price for that lack of standardized sleep schedule. As much as you can no screens or like tv watching in the bed, that sort of stimulation makes it harder to fall asleep, no alcohol use or caffeine use before bedtime that sort of thing, give those things a try, like really try. And after doing that if you find you aren't getting enough restful sleep, then again it's time to talk to a professional.

Haley: They seem like such easy behavior changes right? Yet, so many people have such a hard time doing that, and I mean, I for one still struggle to get enough sleep and when I do I sometimes have a hard time falling asleep or don't sleep as deeply as I would like. And it is unfortunate and surprising how long it takes people to figure out the things that we need as humans to get good sleep or the things that we have to do to ensure that we get good sleep. It takes so long for people to realize that, if ever.

Paul: Yeah, agreed, and generally speaking, those of us who are health professionals, or health scientists, we know the list of things we're supposed to do, though very few of us check all of the boxes, on a very regular basis, whether it's diet or exercise, sleep etc. Sleep is probably one of those things that probably isn't on the same mental list as diet and exercise, and it should be moved into that mental list. But even if you do move it in, I mean yeah, my diet is shameful at times and I sometimes will have a drink before bedtime as well, I mean we're just human.

Haley: Exactly, exactly. How do you anticipate the attitudes around sleep will change in the future? Do you think people will be moving it to be in that priority list?

Erika: I do think it will be, I mean as Paul was talking and I was thinking about this next question I was thinking about that, because I think just like the field of sleep epidemiology is relatively new, sleep as a medical specialty is also relatively new. I don't exactly know when it started, but I think kind of around the same time that sleep epidemiology was a thing it was becoming a specialty that physicians go into. And so I think it does take a long time for things to be elevated up to the place that they need to be in the short list, and I also think that another sort of social shift is probably underway in terms of short sleep

being like this badge of honor and a status sort of thing, like I'm so important that I don't even have time to sleep. I think that sort of feeling was much more of a thing I don't know you know 15 years ago, and I think that's changing a little bit. And I'm hopeful that as it becomes more of a thing on people's checklists that it will also change people's perceptions of how it does really affect so many aspects of your health. And I'm thinking in particular about the current state of, you know, the mental health crisis that we're experiencing for everybody and especially among adolescents and young people, and how sleep might be one of the very important things that's on the table that gets prioritized in young people's lives to help with what feels like kind of an exploding crisis. So I think there's reason to be optimistic that that will happen and I think it's really important that it does.

Haley: Thanks for sharing that. And our last question is how can students and others who are interested in getting involved in sleep research, how can they do that?

Paul: So, I will speak to college students or graduate students, just from a practical standpoint, that's where you're going to have access to research opportunities, though it's certainly not out of the question for high school level students to have some opportunities. So unlike when I started being a student, a graduate student looking at sleep back in the 90s, there were a handful of institutions where you could sort of go to do high end cutting edge research. And you could count them on your hands, there was Stanford, Harvard, Wisconsin, a couple of schools in Pennsylvania and I don't want to leave anybody out, there were others, but there was a short list. These days most major institutions are going to have some research group, Minnesota does, Mayo does, Mayo actually is one of the early ones in the game, most major institutions will have some research group or often multiple research groups who are doing sleep epidemiology but also all the way to the most basic sleep science, neuroscience, basic lab work, it's become a part of public health in the last couple of decades as well. So yeah if you're at a major research institution, there'll most likely be a research program where a student can google around, find out who those investigators at that institution are, and then just cold call them, I mean sleep scientists are super friendly and we entertain people reaching out to us, students reaching out to us all the time.

Haley: This just proves that!

Paul: So yeah, those opportunities are wide now. Now if you're at an institution that's not research focused, or is a smaller research focused institution you might not have a dedicated sleep research group there, we work with other institutions all the time, so that's another case of if you're a student who's interested but can't find a sleep research group or sort of the right type of sleep research at your institution, you can google around and find the type of folks who do the type of research you're interested in and again you can just give them a cold call and see what kind of opportunities might be available. The other thing that's happened recently, and this is the last five years, and I alluded to it before when I talked about the National Sleep Research Resource, is that there is a wide range, it's not just our data, but there are other research groups who put sort of publicly accessible data, there's a barrier, but it's generally a pretty easy barrier to get through, you just have to show that you're doing genuine science with your proposal to the National Sleep Research Resource. We have student requests from around the world, including high school students, but most often it will be somebody working on a thesis or a dissertation project, and they're in Asia or Europe or South America or North America and they submit a request for access to our data and I think the most recent one we looked for there was five requests from a week and I

think four requests were thesis projects. Yeah it was just from different areas of the world, students asking for access to our mostly publicly available data to do research on their thesis projects. And some of the institutions I know, and they have sleep researchers and specialists there and some I don't. I mean these might be students who have an advisor who's interested, but there's not a big sleep program there and certainly from the high school students that we've seen requests for, they don't come from institutions that have big research, sleep research programs. So, that's another way to do it, there is publicly accessible data and if you say that you're interested in doing research for science, sleep research for science, we'll generally say, okay, you're good you can use the data for that. It's a little bit uncomfortable because we used to have sort of tight control over making sure that the people who used our data knew what they were getting into because there's some nuance in scientific sleep data, but this is the way things are going, publicly accessible data and while I think there are costs the benefits outweigh them readily. There are hundreds of people looking at our data, asking questions that we just don't have time to ask, most of them are students.

Haley: Interesting, well thank you both so much for sharing your expertise with us, do you either of you have anything else you'd like to add?

Erika: No, I can't think of anything.

Paul: No, this was great, thanks for inviting us on.

Haley: Yeah, absolutely, thank you so much!

Outro: If you would like to learn more about this topic we've attached resources for you in the description of this episode. Thank you again for joining us today and we hope we'll see you next time.